UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

S.D. Warren Company   Project No. 2984-042

NOTICE OF AVAILABILITY OF FINAL ENVIRONMENTAL ASSESSMENT

(November 29, 2005)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Office of Energy Projects' staff has reviewed the application for new license for the Eel Weir Project, located at the outlet of Sebago Lake, and has prepared a final Environmental Assessment (EA) for the project. In the final EA, Commission staff analyzed the potential environmental effects of relicensing the project and concludes that issuing a new license for the project, with appropriate environmental measures, would not constitute a major federal action that would significantly affect the quality of the human environment.

A copy of the final EA is available for review in the Public Reference Room or may be viewed on the Commission's website at http://www.ferc.gov using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll-free at 1-866-208-3676, or for TTY, (202) 502-8659. You may also register online at http://www.fer.gov/docs-filing/esubscription.asp to be notified via e-mail of new filings and issuances related to this or any other pending projects. For assistance, contact FERC Online Support.

Magalie R. Salas
Secretary

PUBLIC

FINAL ENVIRONMENTAL ASSESSMENT
S.D. Warren Company
Eel Weir Hydroelectric Project
Docket No. P-2984-042

FINAL ENVIRONMENTAL ASSESSMENT FOR HYDROPOWER LICENSE

Eel Weir Hydroelectric Project
FERC Project No. 2984-042

Maine

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20426

November 29, 2005

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ACRONYMS AND ABBREVIATIONS

APE	Area of potential effect
ASMFC	Atlantic States Marine Fisheries Commission
CEQ	Council for Environmental Quality
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CPUE	catch per unit effort
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dbh	diameter at breast height
DO	dissolved oxygen
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
F	Fahrenheit
FERC	Federal Energy Regulatory Commission
FIRE	finance, insurance, and real estate
FOPR	Friends of the Presumpscot River
FOSL	Friends of Sebago Lake
FPA	Federal Power Act
fps	feet per second
HPMP	Historic Properties Management Plan
HIS	habitat suitability index
IFIM	Intream Flow Incremental Methodology
Interior	U.S. Department of the Interior
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
LLMP	Lake Level Management Plan
Maine	Maine, State of
Maine Geology	Maine Geological Survey
Maine Labor	Maine Department of Labor
Maine Salmon	Maine Council – Atlantic Salmon Federation
Maine SHPO	Maine Historic Preservation Office
MASC	Maine Atlantic Salmon Commission
mcf	million cubic feet
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
MDOC	Maine Department of Conservation
mi^2	square miles
mg/l	milligrams per liter

mg/m^2	milligrams per square meter
ml	milliliter
msl	mean sea level
MSPO	Maine State Planning Office
MW	megawatt
MWh	megawatt-hour
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NHPA	National Historic Preservation Act
NPCC	Northeast Power Coordinating Council
NGO	non-governmental organization
PA	Programmatic Agreement
PHABSIM	Physical Habitat Simulation
SD1	Scoping Document 1
SD2	Scoping Document 2
S.D. Warren	S.D. Warren Company
Sebago Lake Coalition	Sebago Lake Landowners/Users Coalition
ug/l	micrograms per liter
USEPA	Environmental Protection Agency
USFWS	United State Fish and Wildlife Service
USGS	United States Geological Survey
Water District	Portland Water District
WQC	water quality certification
WUA	weighted usable area
YOY	young-of-the-year

SUMMARY

S.D. Warren Company (S.D. Warren) filed an application on March 29, 2002, for the continued operation of the 1.8-megawatt (MW) Eel Weir Hydroelectric Project (FERC No. 2984). The project is located at the outlet of Sebago Lake on the Presumpscot River, with facilities in the towns of Standish and Windham, Cumberland County, Maine. The project currently operates in a store-and-release mode, to the extent permitted under a Commission-approved Lake Level Management Plan (LLMP) and a 1992 Order requiring the release of flows to the Eel Weir bypassed reach. All of the power generated by the project is used by S.D. Warren's paper mill in Westbrook, Maine. The project does not occupy any lands of the United States.

S.D. Warren proposes to continue operating its project in accordance with certain operational and environmental measures. This final environmental assessment (EA) analyzes the effects of: (1) S.D. Warren's proposed action; (2) S.D. Warren's proposed action with staff modifications; and (3) no-action. This final EA also evaluates numerous changes to the current LLMP, as recommended by various parties.

Based on our analysis, we recommend licensing the project as proposed by S.D. Warren, with some staff modifications and additional measures. The recommended staff modifications and additional measures include, or are based in part on, recommendations made by federal and state agencies and other entities that have an interest in the resources potentially affected by continued project operation. We recommend the following measures:

- Operate the project in a store-and-release mode, in accordance with the existing LLMP, with the following changes:
  - (i) manage the lake during spring fill-up to reach a target level of 266.15 feet on (or after), but not before, May 15, with an allowable target range of ± 0.5 feet;
  - (ii) lake levels may be at the spring target level any time between May 15 and June 21 (for any 3-week period), with levels exceeding the spillway crest (elevation 266.65 feet) triggering increased flows (as described in the State of Maine's operating parameters);
  - (iii) establish a 3-inch tolerance range for the August 1 target date (265.17 feet ± 3 inches); and
  - (iv) beginning January 1, and continuing until March 1, manage flows from the project to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching elevation 266.15 feet by May 15.
- Develop and implement a project operations and flow monitoring plan, which would include, at a minimum, the following measures:
  - (i) continue to operate the existing lake level gage;

(ii) continue to cooperate and coordinate with upstream pond owners to manage flood flows;
(iii) discharge the maximum flow (1,000 cubic feet per second; cfs) through the power canal during high flow events; and
(iv) flow and temperature monitoring in the Eel Weir bypassed reach.

- Release minimum flows to the bypassed reach, consisting of 75 cfs from November 1 to March 31 and 125 cfs from April 1 to October 31;
- Develop and implement an American eel passage plan, consisting of installing an upstream eel ladder, implementing measures for downstream eel passage, and effectiveness and out-migration monitoring;
- Reserve Commission authority to require fish passage facilities, as may be prescribed by Interior, pursuant to Section 18;
- Replace the existing wetlands monitoring program with a similar wetlands monitoring program that would be undertaken every 5 years;
- Develop and implement a shoreline management plan, which would include conservation easements, buffer zones, mapping of the shoreline, a permitting process, and other shoreline protection measures;
- Develop and implement a plan to construct a shallow-water boat launch in Sebago basin;
- Conduct recreation monitoring consistent with the Commission's FERC Form 80 program;
- Plan any changes to current land use(s) to be consistent with the aesthetic character of the project area; and
- Implement the Programmatic Agreement, executed on September 14, 2005, which requires the development of an Historic Properties Management Plan.

Overall, these measures, along with the standard articles provided in any license issued for the project, would reduce or minimize shoreline erosion and protect/enhance water quality, fisheries, wetlands, recreation, and historical resources, within the project area. In addition, the electricity generating by the project would be beneficial, because it would continue to reduce the use of fossil-fueled, electric generating plants; conserve non-renewable energy resources; and continue to reduce atmospheric pollution.

In section VI of this final EA, we estimate the annual net benefits of operating and maintaining the project under the three alternatives identified above. Our analysis shows that the annual net benefit would be $408,470 for the no-action alternative, $373,020 for S.D. Warren's proposed project, and $248,890 for S.D. Warren's proposed project with staff's recommended changes and additional measures.

On the basis of our independent analysis, we conclude that issuing a new license for the project, with the environmental measures that we recommend, would not be a major federal action significantly affecting the quality of the human environment.

FINAL ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing

EEL WEIR HYDROELECTRIC PROJECT
FERC NO. 2984-042, MAINE

I. APPLICATION

The Eel Weir Project (FERC Project No. 2984) is a 1.8-megawatt (MW) hydroelectric project located at the outlet of Sebago Lake on the Presumpscot River, with facilities in the towns of Standish and Windham, Cumberland County, Maine (figure A-1 in Appendix A). The project does not occupy any federal lands.

The project was initially licensed by the Federal Energy Regulatory Commission (Commission or FERC) on March 16, 1984 for a period of 20 years, with an expiration date of March 31, 2004.[1] On March 29, 2002, S.D. Warren Company (S.D. Warren or applicant) filed an application for a new license, under Part I of the Federal Power Act (FPA), to continue operating the project.

II. PURPOSE AND NEED FOR ACTION

A. Purpose of Action

The Commission, under the authority of the FPA,[2] may issue licenses for up to 50 years for the construction, operation, and maintenance of non-federal hydroelectric projects. With the filing of a license application by S.D. Warren for the Eel Weir Project, the Commission is now considering whether to relicense the project and what, if any, conditions should be placed in any license issued. A new license would allow S.D. Warren to generate electricity from the project for the term of the new license, as well as provide other developmental (*e.g.*, flood control and water supply) and a variety of environmental (*e.g.*, fish, wildlife, and recreation) benefits.

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[1] 26 FERC ¶ 62,241.

[2] 16 U.S.C. §§791(a)-825(r), as amended by the Electric Consumers Protection Act of 1986, Public Law 99-495 (1986) and the Energy Policy Act of 1992, Public Law 102-846.

As part of its licensing decision, the Commission must determine that a project would be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the purposes of energy conservation; the protection, mitigation or damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

This environmental assessment (EA), prepared in accordance with the National Environmental Policy Act of 1969 (NEPA),[3] analyzes the site-specific and cumulative effects associated with the continued operation of the Eel Weir Project. This EA evaluates the effects associated with relicensing the project as proposed and considers alternatives to the proposed action, and makes recommendations to the Commission on whether to issue a new license, and if so, what conditions to include in any new license issued.

B. Need for Power

To assess the need for power, we reviewed the needs in the operating area in which the project is located – New England Area of the Northeast Power Coordinating Council (NPCC) region, within the North American Electric Reliability Council (NERC). NERC annually forecasts electrical supply and demand in the nation and the region for a 10-year period. NERC's most recent report (2005) on annual supply and demand projections indicates that, for the period 2005-2014, the demand for electric energy in the New England Area will grow at an average rate of 1.5 percent annually, while the reserve margin will decrease from 19.4 in 2005 to 8.5 percent in 2014.

The average annual generation of the Eel Weir Project is 12,300 megawatt-hours (MWh). All of the power generated by the project is used by S.D. Warren's paper mill in Westbrook, Maine. The project provides base load power to the mill and cold start capability in the event of a mill shutdown. This results in significant cost savings for mill operations.

If the project power were not available, the power for the paper mill would have to come from other sources (*i.e.*, from the applicant's 50-MW cogeneration plant) that would be less economical than the project power. The fuel source for this replacement energy is coal and biomass, which are not environmentally friendly. The project

[3] Public Law 91-190, 42 U.S.C. §4341 (January 1, 1970), as amended by Public Law 94-52 (July 3, 1995) and Public Law 94-83 (August 9, 1975).

displaces existing and planned non-renewable fossil-fueled generation, which contributes to the production of nitrogen oxides, sulfur dioxides, and carbon dioxide.

We conclude that present and future use of the power from the project, with its displacement of non-renewable fossil-fueled generation, low cost, and its contribution to a diversified generation mix, support a finding that the power from the project would help meet a need for inexpensive and reliable power from renewable fuel sources in Southern Maine, in the short and long term.

III. PROPOSED ACTION AND ALTERNATIVES

A. Description of Existing Project Facilities

The Eel Weir Project includes the following existing facilities (figure A-2 in Appendix A): (1) a 1,350-foot-long dam, consisting of (a) a 900-foot-long non-overflow concrete retaining wall and earth-fill east embankment that varies in height from a few inches to 20 feet, (b) a 115-foot-long, 22-foot-high stone masonry and concrete spillway, (c) a 35-foot-long, 17-foot-wide stone masonry and concrete river gatehouse with five 6.4-foot-high by 4.8-foot-wide wooden gates, and (d) a 260-foot-long stone masonry and earth-fill west embankment with variable height, incorporating a 40-foot-long by 12-foot-wide canal intake gatehouse with four 8.8-foot-high by 7-foot-wide wooden intake gates; (2) a 90-foot-long fish screen with ¾-inch spacing located immediately upstream of the canal intake gatehouse; (3) a 4,820-foot-long, 15-foot-deep earthen power canal, developing a 40-foot gross head at the powerhouse; (4) a 40-foot-long, 19-foot-high canal waste gate structure with three 17-foot-wide, 11-foot-high steel slide gates each incorporating small minimum flow gates discharging up to 25 cubic feet per second (cfs); (5) a 12-mile-long impoundment (Sebago Lake) with a surface area of 28,771 acres at a normal pond elevation of 266.65 feet mean sea level (msl) and a 330,000 acre-feet gross storage and 177,120 acre-feet usable storage; (6) a 6,700-foot-long bypassed reach; (7) a 69-foot-wide, 32-foot-long powerhouse containing three turbine-generator units, each rated at 600 kilowatts (kW), with a total installed station capacity of 1,800 kW; (8) a 200-foot-long, 32-foot-wide tailrace; (9) a 3.5-mile-long, 11-kilovolt (kV) transmission line leading to the applicant's Dundee Project (P-2942); and (10) appurtenant facilities.

The existing project boundary encompasses: (a) Sebago Lake within the 267.0-foot contour; (b) the Eel Weir dam and associated facilities; (c) the power canal within the 262.65-foot contour; (d) the Eel Weir powerhouse; and (e) a 20-foot wide corridor for the transmission line that runs from Eel Weir to the Dundee Project.

B. Description of Existing Project Operation

Current Operation

S.D. Warren operates the project in a store-and-release mode, in accordance with the Commission-approved Lake Level Management Plan (LLMP)[4] and a 1992 Order requiring minimum flows in the Eel Weir bypassed reach.[5] The power station is operated 24 hours a day, and is manually controlled. S.D. Warren's hydro operations personnel visit the site daily and make necessary adjustments to the unit settings based on the flow at the project. Flows from Sebago Lake are typically set weekly, although adjustments may be made more frequently, if necessary.

The project has an estimated maximum hydraulic capacity of 822 cfs. Each of the three turbines can release from between 100 and 274 cfs. Pursuant to the LLMP, lake levels are monitored by the applicant on a daily basis using average daily lake level data generated by a U.S. Geological Survey (USGS) real time water level gage (No. 01063995), located near North Windham, Maine. The applicant paid for the installation, and currently funds the operation and maintenance, of this gage.

The Maine Department of Inland Fisheries and Wildlife (MDIFW) annually stocks the Eel Weir bypassed reach with brook trout and land-locked Atlantic salmon, and periodically with brown trout. As part of the current license, the applicant is required to release seasonally-adjusted minimum flows (as described below) to the bypassed reach. During maintenance operations, canal headgates are closed to provide access to project structures. S.D. Warren releases the appropriate minimum flow, as stipulated in the LLMP, downstream of the project via spillage into the bypassed reach. This ensures protection of aquatic habitat and water quality in the Presumpscot River. Any required maintenance of project structures at the upstream side of the dam or canal are done in the wet, using divers if necessary.

Proposed Operation

S.D. Warren proposes to continue operating the project as outlined above, except as described in the following section.

[4] 79 FERC ¶ 61,064 (1997), rehearing 80 FERC ¶ 61,207 (1997), and as amended in 92 FERC ¶ 62,180 (2000), rehearing 94 FERC ¶ 61,034 (2001).

[5] 58 FERC ¶ 62,006 (1992).

C. Proposed Action

S.D. Warren proposes to continue operating its project in accordance with the following measures:

Operational Measures

- modify the existing Commission-approved LLMP to establish a 3-inch tolerance range for the August 1 target date;

Environmental Measures

- continue to operate the project in a store-and-release mode, in accordance with the existing Commission-approved LLMP, as amended and proposed herein;
- continue operating the existing lake level gage;
- continue cooperation and coordination with upstream pond owners to manage flood flows;
- discharge flow through the project's power canal up to its maximum capacity of 1,000 cubic feet per second (cfs) during high flow events to reduce bypassed reach flows, except in the event of emergency and maintenance situations;
- continue to release Commission-approved minimum flows to the Eel Weir bypassed reach, including 25 cfs from November 1 – March 31, 75 cfs from April 1 – June 30, 50 cfs from July 1 – August 31, and 75 cfs from September 1 – October 31 each year;
- consult with resource agencies regarding the need for upstream and downstream American eel passage at Eel Weir following installation of upstream and downstream eel passage, and monitoring results demonstrate that eels use the passage facilities, at all downstream projects on the Presumpscot River;[6]

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[6] S.D. Warren's preferred option for any installed downstream eel passage at the project is via the river gates at the dam (*see* Option #3, as discussed herein and in Appendix D-10 of the license application). The downstream fish passage facility would be operated for 4 hours per night for 4 weeks during the peak downstream movement period for American eel. The timing of downstream passage operation at Eel Weir would be determined based upon a 3-year downstream eel movement study conducted as required by the existing licenses for S.D. Warren's five downstream hydropower projects.

- replace the wetlands monitoring program required as part of the 1997 Commission Order with a similar wetlands monitoring program that would be undertaken every 5 years;

- after consultation with the Maine Historic Preservation Office (Maine SHPO), (1) protect and mitigate project-related effects to archeological sites, if any are identified during on-going studies, and (2) protect project structures that have been determined to meet National Register of Historic Places criteria;

- conduct FERC Form 80 recreation monitoring program;

- upon license issuance, evaluate opportunities for establishing a conservation easement on lands around the bypassed reach with the town of Windham or Land for Maine's Future; and

- plan any changes to current land use(s) to be consistent with the aesthetic character of the project area.

D. Proposed Action with Additional Environmental Measures

1. Agency- and Interested Party-Recommended Changes to the LLMP

Several entities, including state and federal agencies, non-governmental organizations (NGO), and individuals, recommend changes to the current LLMP. We generally characterize these measures as follows.

<u>State of Maine (Maine)</u>

- The lake would reach a target level of 266.65 feet (spillway crest) on, but not before, May 1. The target range on May 1 would be 266.65 to 266.0 feet.

- Lake levels may be at spillway crest any time between May 1 and the 3rd week in June,[7] with higher lake levels triggering increased flows, as described in the operating parameters attached as Appendix B to this EA.

- Lake levels would be managed to achieve a minimum target level of 265.17 feet (~ 1.5 feet below spillway crest) on August 1.

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[7] Lake levels this time of year shall not be maintained at the top of the spillway crest for more than 3 weeks during any year.

- The target lake level would be 262.5 feet on November 1, ± 6 inches, with a maximum level of 265.0 feet on September 1.

- Water levels above a line drawn from 266.65 feet at the end of the 3rd week of June to 265.0 feet on September 1, then 263.0 feet on November 1, would trigger increased flows according to the operating parameters outlined in Appendix B.

- Lake levels below a line drawn from 266.0 feet on May 1 to 265.17 feet on August 1, then 262.0 feet on November 1 would trigger minimum flows according to the operating parameters outlined in Appendix B.

- The target lake level on or about December 1 would be 261.0 feet in 2 out of every 9 years, and would be managed to stay within 6 inches of the December 1 target level until January 1.

- From mid-October to mid-November, flows would be capped at 1,000 cfs, unless the lake level is above the target range and rising.

- From January 1 to March 1, flows would be reduced to achieve and maintain lake levels at or above the long-term (1910-1986) median levels (between 262.0 and 262.5 feet) for the period, as soon as practical. Water levels would be managed to be no higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1, and from 263.5 feet on January 1 to 266.65 feet on May 1.

The aforementioned provisions of Maine's proposed changes to the LLMP are shown in figure 1.

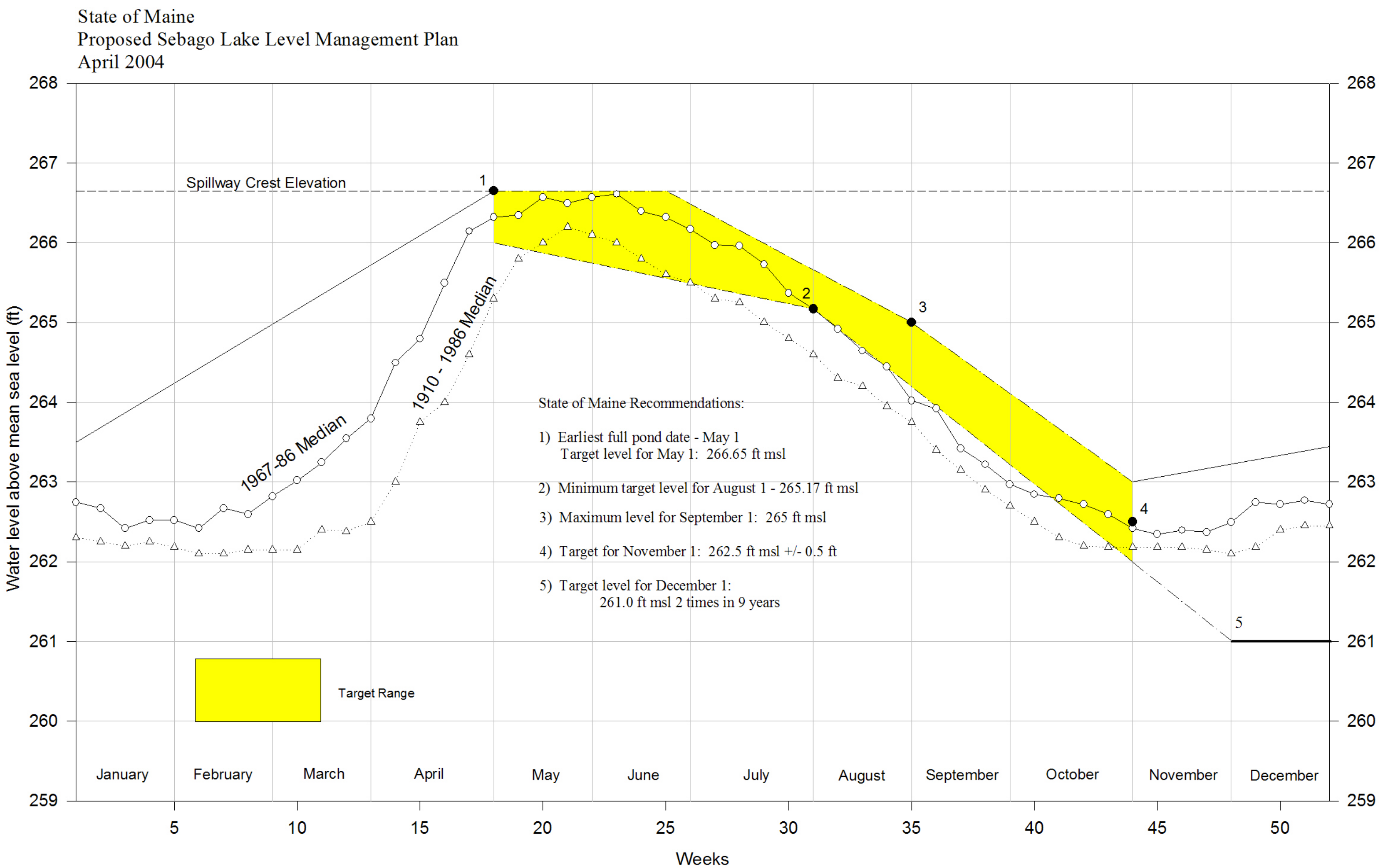

Figure 1. **Maine's recommended changes to the LLMP for Sebago Lake Maine. (Source: State of Maine, letter dated April 26, 2004, and filed May 13, 2004)**

U.S. Department of the Interior (Interior)

- Limit lake level fluctuations in Sebago Lake to no more than 2 feet during the open water season (April 1 - December 15) and no more than 3 feet during the winter ice-on season (December 16 - March 31).[8]

MDIFW

- Implement a fall/early winter drawdown to reduce lake trout spawning success, which would include a 5 to 8-foot drawdown beginning in late November, and associated effectiveness monitoring.[9]

Friends of Sebago Lake (FOSL)

- Lower the spring target level to 265.65 feet and change the fall target levels as follows: (a) in 1 of every 2 years, lower the lake to 261 feet by November 1; (b) in 1 of every 4 years, lower the lake to 260 feet by November 1; and (c) in 1 of every 10 years, lower the lake to 259 feet by November 1.[10]

Charles M. Frechette

- Maintain target lake levels in Sebago Lake at, or above, 266.0 feet from May 1 to July 7, and maintain an absolute minimum level of 263.5 feet.

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[8] Interior also recommends measures pertaining to: (a) bypassed minimum flows; (b) lake level and flow monitoring; (c) recreation use monitoring; and (d) development of a shoreline management plan.

[9] The MDIFW also recommends measures related to: (a) bypass minimum flows; (b) downstream American eel passage; (c) boat access on Sebago Lake; (d) angler foot access along the Eel Weir bypassed reach; (e) study of the lake's warmwater fishery; (f) American smelt migration barriers resulting from project operations; and (g) lost angling opportunities in the Eel Weir bypassed reach. The Maine Department of Marine Resources (MDMR) recommends measures related to upstream and downstream eel passage.

[10] FOSL also recommends measures for: (a) upstream and downstream fish passage for Atlantic salmon; and (b) increased minimum flows in the Eel Weir bypassed reach.

Stephen P. Kasprzak[11]

- Lower the spring target level by 1 foot to 265.65 feet, with an operating band of +1.0 foot and -0.5 foot;

- Lower the lake to 261.0 feet in 1 out of every 2 years, to 260.0 feet once every 4 years, and to 259.0 feet once every 10 years; and

- Evaluate the LLMP recommended by Commission staff in the 1997 EIS.

Sebago Lake Landowners/Users Coalition (Sebago Lake Coalition)[12]

- Maintain lake levels as follows: (a) between 266.0 and 266.5 feet on June 1; (b) between 266.0 and 265.8 feet on July 1; (c) between 265.8 and 265.4 feet on August 1; (d) between 265.4 and 264.9 feet on September 1; and (e) between 264.5 and 264.0 feet on October 1.

2. Additional Staff-Recommended Measures

We considered what, if any, additional enhancement measures would be beneficial to those resources affected by the project and its operation. We recommend the following changes and additions to S.D. Warren's proposed project operations and environmental measures:

- operate the project in a store-and-release mode, in accordance with S.D. Warren's proposed LLMP, with the following changes:

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[11] In a letter filed August 24, 2004, Mr. Kasprzak provided alternative LLMP recommendations. The recommendations are unclear, however. For example, Mr. Kasprzak recommends a maximum target elevation of 265.4 feet for the spring, with a tolerance of ± 1 foot. In the same letter, Mr. Kasprzak subsequently recommends that that the spring target elevation be raised to 266.0 feet, with a tolerance range of ± 1 foot. Because of what appears to be independent, yet conflicting, recommendations, we evaluate Mr. Kasprzak's originally-filed recommendations, and ask that Mr. Kasprzak clarify his recommendations for a LLMP in any comments filed on the draft EA.

[12] In a letter filed September 1, 2004, the Sebago Lake Coalition requests that we consider certain changes to the existing LLMP. These changes are different from their originally-filed recommendations. Because we are not clear as to what lake levels the Sebago Lake Coalition recommends, we evaluate the Coalition's originally-filed recommendations. We ask that the Coalition clarify its recommendations for a LLMP in any comments filed on the draft EA.

(i) manage the lake during spring fill-up to reach a target level of 266.15 feet on (or after), but not before, May 15, with an allowable target range of ± 0.5 feet;
(ii) lake levels may be at the spring target level any time between May 15 and June 21 (for any 3-week period), with levels exceeding the spillway crest (elevation 266.65 feet) triggering increased flows (as described in the State of Maine's operating parameters; and
(iii) beginning January 1, and continuing until March 1, manage flows from the project to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching elevation 266.15 feet by May 15.

- release minimum flows to the bypassed reach, consisting of 75 cfs from November 1 to March 31 and 125 cfs from April 1 to October 31;

- develop and implement a project operations and flow monitoring plan, which would include, at a minimum, certain measures proposed by S.D. Warren, as well as flow and temperature monitoring in the bypassed reach;

- develop and implement an American eel passage plan, consisting of installing an upstream eel ladder, implementing measures for downstream eel passage, and effectiveness and out-migration monitoring;

- reserve Commission authority to require fish passage facilities, as may be prescribed by Interior, pursuant to Section 18;

- develop and implement a shoreline management plan, which would include conservation easements, buffer zones, mapping of the shoreline, a permitting process, and other shoreline protection measures;

- develop and implement a plan to construct a shallow-water boat launch in Sebago basin, on S.D. Warren-owned land; and

- implement the Programmatic Agreement (PA), executed on September 14, 2005, which requires the development of an Historic Properties Management Plan (HPMP).

E. No-Action

Under the no-action alternative, the project would continue to operate as required by the original project license. The no-action alternative would result in no change to the existing environmental setting in the project area. If the project operates as in the past, there would be continued energy production, with no enhancement of existing natural resource values. We use the no-action alternative to establish baseline environmental conditions for comparison with other alternatives.

F. Alternatives Considered but Eliminated from Detailed Study

We considered several other alternatives to S.D. Warren's relicensing proposal, but eliminated them from detailed study, because they are not reasonable in the circumstances of this proceeding. These alternatives are: (1) federal takeover and operation; (2) issuance of a non-power license; and (3) project decommissioning.

Federal Takeover – In accordance with §16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric project with a license that is subject to Sections 14 and 15 of the FPA.[13] Federal takeover of the project would require Congressional approval. While that fact along would not preclude further consideration of this alternative, there is currently no evidence showing that a federal takeover should be recommended to Congress. No entity, to date, has suggested that federal takeover would be a reasonable or appropriate alternative, nor has any federal agency expressed an interest in operating the project. Thus, we do not, in this case, consider federal takeover to be a reasonable alternative.

Non-power License – A non-power license is a temporary license which the Commission would terminate whenever it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. Hence, issuing a non-power license for the project would not provide a long-term solution to the issues presented. To date, no entity has sought a non-power license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, a non-power license is not a reasonable alternative to some form of new license with enhancement measures.

Project Decommissioning – The project decommissioning alternative would involve: (1) denial of the license application for the Eel Weir Project; and (2) ceasing power generation at the project. At a minimum, project decommissioning would have the following effects: (1) the energy currently generated by the project would be lost [about 12,300 megawatt-hours (MWh) annually]; and (2) there would be significant costs associated with decommissioning the project powerhouse, power canal, and appurtenant facilities. Accordingly, in the circumstances of this case, we do not consider project decommissioning a viable alternative.

[13] 16 U.S.C. §§ 791(a)-825(r).

IV. AGENCY CONSULTATION AND COMPLIANCE

A. Agency Consultation

The Commission's regulations (18 CFR §§ 4.38 and 16.8) require that applicants consult with appropriate resource agencies and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be completed and documented, according to the Commission's regulations, before the Commission can accept an application for a license. In addition to the pre-filing consultation process, public comment periods are provided as part of the Commission's processing of a license application, which we describe below.

1. Scoping

Before preparing this EA, we conducted scoping for the Eel Weir Project to determine what issues and alternatives should be addressed. We issued Scoping Document 1 (SD1) on September 27, 2002, to invite appropriate resource agencies, Native American tribes, NGOs, and other interested entities to participate in, and contribute to, the scoping process. We also conducted two scoping meetings associated with the Eel Weir Project on October 22 and 23, 2002, in Windham and Portland, Maine, respectively, and held a site visit to the project on October 22, 2002.

The scoping meetings and site visit were announced in local newspapers and in the Federal Register. Numerous individuals provided oral testimony at the scoping meetings. In addition to these comments, the following entities provided written comments pertaining to the scope of issues for the Eel Weir Project:

Commenting Entity	Filing Date
Stephen N. Wiener	October 21, 2002
Phil M. Perry	October 23, 2002
Harvey L. Dutil	October 25, 2002
Edward and May Himelrick	October 28, 2002
Stephen M. Kasprzak	October 29, 2002
	November 6, 2002
	November 12, 2002
	November 15, 2002
	November 25, 2002
Robert P. Hennick	October 29, 2002
James A. Storer	October 29, 2002
Robert H. Jones	November 4, 2002
Carl J. Canzanelli	November 4, 2002

Lake Sebago Estates Homeowners Association	November 7, 2002
Carol L. Steiman & Neil H. Garston	November 12, 2002
Debra L. Nelson	November 14, 2002
S.D. Warren Company	November 19, 2002
	January 2, 2003
Sebago Harbor Association	November 24, 2002
P. Albert Arsenian	November 25, 2002
Portland Water District	November 25, 2002
Charles M. Frechette, Sebago Lake Marina	November 25, 2002
Friends of Sebago Lake	November 25, 2002
	December 16, 2002
Maine Department of Marine Resources	November 25, 2002
Sebago Lake Landowners/Users Coalition	November 26 & 27, 2002
U.S. Fish and Wildlife Service	December 2, 2002
Maine Dept. of Inland Fisheries and Wildlife	December 17, 2002
	February 6, 2003
Maine Dept. of Environmental Protection	December 18, 2002

After careful consideration of all scoping input, we revised SD1 and issued Scoping Document 2 (SD2) on January 30, 2003. SD2 identifies issues to be addressed in this EA, including potential effects on: (1) geology and soils; (2) water use and quality; (3) fish and aquatic resources; (4) terrestrial resources, including wetlands and shoreline vegetation; (5) recreation resources and land use; (6) cultural resources; and (7) socioeconomic resources. The scoping process did not reveal substantive issues related to threatened and endangered species. Therefore, we do not include threatened and endangered species in our detailed analysis. We address all remaining comments and concerns raised during the scoping process in this EA.

2. Interventions

On August 2, 2002, the Commission issued a notice accepting the application for new license for the Eel Weir Project, and soliciting protests and motions to intervene. This notice set October 2, 2002, as the deadline for filing protests and motions to intervene. In response to the public notice, the following entities intervened in the relicensing proceeding:

Interveners	Filing Date
American Rivers & Friends of the Presumpscot River	June 25, 2002
Friends of Sebago Lake	August 21, 2002
Stephen Kasprzak	August 29, 2002
Sebago Lake Marina	September 3, 2002
Town of Frey, Maine	September 4, 2002
Sebago Lake Landowners/Users Coalition	September 5, 2002

Douglas C. Fray and Northwest Shores Association	September 9, 2002
Sebago Pines Property Owners and Road Users Association	September 9, 2002
Kettle Cove Marina	September 9, 2002
U.S. Department of the Interior	September 26, 2002
Maine State Planning Office	September 27, 2002
Sebago Harbor Association	September 30, 2002
Maine Public Employees for Environ. Responsibility	October 1, 2002
Maine Representative Janice E. Labrecque	October 14, 2002

Sebago Lake Marina, Sebago Pines Property Owners and Road Users Association, Douglas C. Gray, and Northwest Shores Association filed interventions protesting the relicensing of the Eel Weir Project. We address intervener and other concerns in section V.C (*Environmental Analysis*) of this EA.

3. Comments on the Application[14]

On June 5, 2003, the Commission issued a public notice indicating that the license application for the Eel Weir Project was ready for environmental analysis, and soliciting comments, recommendations, terms and conditions, and prescriptions within 60 days. In response to this notice, the following entities filed comments:

Commenting Entity	Filing Date
U.S. Department of the Interior[15]	August 1, 2003
Stephen M. Kasprzak	August 1, 2003
Maine Department of Environmental Protection	August 4, 2003
Friends of Sebago Lake	August 4, 2003
Charles M. Frechette	August 4, 2003
Maine State Planning Office[16]	August 5, 2003
Sebago Lake Landowners/Users Coalition	August 11, 2003

S.D. Warren filed reply comments on September 17, 2003. We address these comments and recommendations in section V.C (*Environmental Analysis*) of this EA.

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[14] In addition to the comments and recommendations listed herein, a "Say No To Low" postcard campaign resulted in 60 + postcards from individuals recommending that lake levels not be drawn down.

[15] Interior filed comments on behalf of the U.S. Fish and Wildlife Service (USFWS).

[16] The Maine State Planning Office (MSPO) filed comments on behalf of the MDMR and the MDIFW.

4. Comments on the Draft Environmental Assessment

On July 11, 2005, we issued a draft EA for the relicensing of the Eel Weir Project. We requested comments be filed within 60 days from the issuance date (August 25, 2005).[17] A public meeting was held to receive comments on the draft EA on August 18, 2005. In addition to the verbal comments received during the public meeting, 62 letters, representing 14 entities and 42 individuals commenting on the draft EA, were filed with the Commission. S.D. Warren filed its response to the draft EA comments on October 17, 2005. We modified the text of the draft EA, as necessary, in response to these comments. Appendix D summarizes the comments that were filed and our responses to the comments.

B. Compliance with Mandatory Requirements

1. Water Quality Certification

Section 401(a)(1) of the Clean Water Act (CWA) and Commission regulations require that license applicants obtain either: (1) state certification that any discharge from the project would comply with applicable provisions of the CWA; or (2) a waiver of certification by the appropriate agency. On March 19, 2002, S.D. Warren applied to the Maine Department of Environmental Protection (MDEP) for water quality certification (WQC) for the Eel Weir Project. S.D. Warren subsequently withdrew and refiled its application for WQC on February 21, 2003, February 18, 2004, and again on February 16, 2005. Action on the application is pending.

2. Section 18 Fishway Prescription

Section 18 of the FPA provides that the Commission must require a licensee to construct, operate, and maintain such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce, as appropriate. Interior did not prescribe any fishways for the Eel Weir Project, but by its letter filed August 1, 2003, reserved its authority to prescribe the construction, operation, and maintenance of fishways at the project during the term of any new license.[18]

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[17] The Commission extended the deadline for filing comments on the draft EA to September 9, 2005.

[18] Interior does not specifically prescribe fishways, but rather recommends that S.D. Warren implement downstream eel passage measures at the project, consistent with Option #3 outlined in the license application but with a longer operating period.

We recognize that future fish passage needs and management objectives cannot always be predicted at the time of license issuance. Under these circumstances, and upon receiving a specific request from either Interior or the U.S. Department of Commerce, we recommend that the Commission follow its practice of reserving the Commission's authority to require such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce.

3. Coastal Zone Management Act

Section 307(c)(3) of the Coastal Zone Management Act (CZMA) requires that all federally licensed and permitted activities be consistent with approved state Coastal Zone Management Programs.[19] If a project is located within a coastal zone boundary or if a project affects a resource located in the boundaries of the designated coastal zone, the applicant must certify that the project is consistent with the state Coastal Zone Management Program.

The Eel Weir Project is subject to Maine's jurisdiction under Section 307 of the CZMA. Although the project is located outside of the geographic boundary of the Maine Coastal Program, the project may affect diadromous fishery resources of the coastal zone,[20] including the American eel. By letter dated September 20, 2002, S.D. Warren requested a coastal zone consistency determination from the MSPO, the CZMA certifying agency in the State of Maine (*see* response to AIR #16; S.D. Warren, 2002b). To date, the MSPO has not responded to S.D. Warren's request.

4. Endangered Species Act

Section 7 of the ESA, 16 U.S.C. § 1536(a), requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of threatened or endangered species, or result in the destruction or adverse modification of any designated critical habitat of such species. Federal agencies are required to consult with the USFWS when a proposed action may adversely affect listed species.

The federally listed bald eagle (*Haliaeetus leucocephalus*) and small whorled pogonia (*Isotria medeoloides*) are listed for Cumberland County, Maine (USFWS,

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[19] 16 U.S.C. § 1456(c)(3)(A).

[20] The boundary of Maine's designated coastal zone is at head-of-tide on the Presumpscot River, which is about 25 miles downstream from the Eel Weir Project (S.D. Warren, 2002b).

2004).[21] Both the bald eagle and the small whorled pogonia are federally listed as threatened. There is no designated critical habitat for either species in the project area.

Interior, by letter dated November 19, 2002, indicates that, based on currently available information, no federally listed species under the jurisdiction of the USFWS are known to occur in the project area, with the exception of occasional, transient bald eagles. Interior concludes that no further action (or consultation) is required under Section 7 of the ESA, unless new information reveals effects not previously considered, the action is modified in a manner not previously considered, or a new species is listed.

5. Section 106 Consultation

Relicensing is considered an undertaking within the meaning of Section 106 of the NHPA of 1966, as amended.[22] Section 106 requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register.

As described in section V.C.6 (*Archeological and Historic Resources*), to meet the requirements of Section 106, the Commission, on September 14, 2005, executed a PA for the protection of historic properties from the effects of the continued operation of the Eel Weir Project. The terms of the PA would ensure that S.D. Warren addresses and treats all historic properties identified within the project area through a HPMP. The HPMP entails on-going consultation involving historic properties for the term for the license.

V. AFFECTED ENVIRONMENT AND ENVIRONMENTAL ANALYSIS

In this section, we address, in detail, only those resources affected by the operation of the Eel Weir Project, and include analysis of comments by interested parties on the

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[21] There are no documented bald eagle nests in the project area, though there are known nesting eagles located within a 14- to 35-mile radius of the Eel Weir Project (Woodlot Alternatives, 2002). No primary roost trees (*e.g.*, trees habitually used on a daily basis) have been documented in the project area. However, potential secondary roost trees (*e.g.*, large live or dead white pine used for short periods during active feeding) occur along the shoreline throughout the project area. The small whorled pogonia occurs in the vicinity of S.D. Warren's Dundee Project (FERC No. 2942) located downstream in North Gorham, Maine. However, the small whorled pogonia has not been documented in the Eel Weir Project area.

[22] Public Law 89-665; 16 U.S.C. 470.

project's proposed operation. Unless otherwise indicated, the sources of our information include the license application (S.D. Warren, 2002a), S.D. Warren's additional information submittal (S.D. Warren, 2002b; 2003), the final Environmental Impact Statement for the Presumpscot River Projects (FERC, 2002), and supplemental filings made by the applicant and other entities.

A. General Description of the Locale

The Eel Weir Project is located at the outlet of Sebago Lake in the Presumpscot River Basin in southern Maine. The Sebago Lake sub-watershed stretches from Bethel, Maine in the north to Standish, Maine in the south, a distance of 47 miles, and is approximately 10 miles wide. Sebago Lake and the Presumpscot River are part of the Casco Bay watershed (Sebago Lake Association, 2004).

Sebago Lake is the second largest lake in the state of Maine, and is considered a significant regional recreational resource. The watershed for Sebago Lake is about 436 square miles (mi^2), and is primarily drained by the Crooked and Songo Rivers. Land use within the Sebago Lake watershed is approximately 74 percent forested, 14 percent water surface, 6 percent developed, and the remaining 6 percent is primarily farmland and open space. Sebago Lake serves as the public water supply source for residents in the greater Portland area, as well as many lake residents.

The Presumpscot River originates at the outlet of Sebago Lake. The river flows in a southeasterly direction for about 25 miles, through Gorham, Windham, Westbrook, Portland, and Falmouth, eventually emptying into the Atlantic Ocean at Casco Bay. Flow in the river is highly regulated by the Eel Weir Project, which controls nearly 70 percent of the river's drainage area.[23]

The topography of the area is gently rolling and hummocky, with a few isolated hills. Elevations range from lows of about 80 feet msl on the Presumpscot River in the vicinity of the Saccarappa Project to 188 feet between Sebago and Little Sebago Lakes. The general geology of the area is typical of southern and central Maine. Igneous rocks and highly deformed metamorphic rocks underlie Wisconsin glacial sediments of variable composition and thickness, some of which area good sources of groundwater.

The climate in southern Maine is a continental climate, highly influenced by the proximity of the North Atlantic Ocean. Average temperatures range from 22 degrees Fahrenheit (ºF) in the winter to 69º F in the summer. Peak temperatures normally occur

[23] In addition to Sebago Lake, seven tributaries feed the Presumpscot River between Sebago Lake and the Saccarappa Project in Westbrook (FERC, 2002).

in July. During a very warm summer, temperatures may reach 90º F for up to 25 days. Winters are generally cold, but it is rare that there are prolonged cold spells. Precipitation in the area averages around 43 inches annually, with about 15-30 thunderstorms per year. There are approximately 80 to 120 clear days per year. Average snowfall is about 60-90 inches (Maine Tourism Association, 2004).

The project facilities are located in the cities of Standish and Windham, in Cumberland County. Cumberland County has a total population of 266,284 with 9,285 people living in Standish and 16,142 people living in Windham (Cumberland County, 2004). The predominant land use within the Sebago Lake watershed is undeveloped vegetation, comprising 86 percent of the land area. Approximately 6.9 percent is residential. Timber operations account for 2.5 percent, agriculture accounts for 2.2 percent, and only 0.2 percent is commercial and retail. The remaining 2.2 percent of the land area has other uses (Sebago Lake Association, 2004). The land bordering the Presumpscot River is primarily undeveloped in the upper reaches of the watershed (100 persons/mi^2), and becomes more developed and industrial downstream (3,000 persons/mi^2).

Sebago Lake is used for many purposes. The main uses for the lake water are recreation (*e.g.*, fishing, boating, swimming) and drinking water. The Portland Water District (Water District) prohibits recreational use within 3,000 feet of the intakes in order to protect the drinking water supply. In addition to the above uses, Sebago Lake water is used by S.D. Warren to produce hydropower. The Presumpscot River is used for hydroelectric power generation, process water for S.D. Warren's paper mill in Westbrook, Maine, municipal and industrial wastewater treatment, and recreation. There are no consumptive uses or wastewater discharges in the project area.

There are seven hydroelectric developments along the length of the Presumpscot River (FERC, 2002).[24] The Eel Weir Project is the most upstream development (Table 1). Of the six downstream projects, five are owned by S.D. Warren (*i.e.*, Dundee, Gambo, Little Falls, Mallison Falls, and Saccarappa Projects) and one is owned by FPL Energy Maine Hydro (*i.e.*, North Gorham Project). In addition to these hydroelectric developments, S.D. Warren owns the non-jurisdictional Cumberland Mills dam, which is located immediately below its Saccarappa Project. The Cumberland Mills dam provides process water for the applicant's paper mill.

[24] Historically, an eighth hydro facility operated on the Presumpscot River. The Smelt Hill dam, the lowermost dam on the river, was removed in October 2002.

Table 1. Hydroelectric projects on the Presumpscot River (Source: FERC, 2002a).

Project Name	FERC No.	Installed Capacity (kW)	Drainage area (mi^2)	Surface area (acres)	Approx. RM
Eel Weir[a]	2984	1,800	436	29,184	25
North Gorham[b]	2519	2,250	436	98	23.6
Dundee[a]	2942	2,400	445	197	21.9
Gambo[a]	2931	1,900	493	151	18.6
Little Falls[a]	2941	1,000	500	29	16.9
Mallison Falls[a]	2932	800	501	8	16.4
Saccarappa[a]	2897	1,350	567	87	11.3

[a] Owned and operated by S.D. Warren.
[b] Owned and operated by FPL Energy Maine Hydro LLC.

B. Cumulative Effects Analysis

According to the Council for Environmental Quality (CEQ) regulations for implementing NEPA (§1508.7), an action may cause cumulative effects on the environment if its effects overlap in space and/or time with the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant actions, taking place over a period of time. Such actions can include hydropower, as well as other land and water development activities.

We evaluated the cumulative effects of the proposed action and alternatives with regard to other existing and foreseeable hydroelectric development and non-hydroelectric activities in the Presumpscot River Basin upstream and downstream from the project. Based on the information in the license application, agency comments, other filings in the proceeding, and our staff analysis, we have identified water quantity and quality and aquatic resources (specifically American eel and anadromous fish) as having the greatest potential to experience cumulative effects associated with the proposed action or action alternatives.

1. Geographic Scope

Our geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources; and (2) contributing effects from other hydropower and non-hydropower activities within the Presumpscot River Basin.

The Presumpscot River originates at the outlet of Sebago Lake. The river flows in a southeasterly direction for about 25 miles through Gorham, Windham, Westbrook, Portland, and Falmouth, eventually emptying into the Atlantic Ocean at Casco Bay. Flow in the river is highly regulated by the Eel Weir Project, which controls nearly 70 percent of the river's drainage area. The land bordering the river is primarily undeveloped in the upper reaches of the watershed, and becomes more developed and industrial downstream.

Based on our review of the record, the scope of analysis for cumulative effects on the aforementioned resources includes Sebago Lake and the full length of the Presumpscot River down to Casco Bay. To the extent necessary, we include the tributaries to the Presumpscot River, as well. We chose this geographic area for evaluation of cumulative effects because on-going activities throughout the Presumpscot River Basin (e.g., dams and hydropower development, agriculture, recreation, industrial and residential development, and wastewater discharges) could potentially cumulatively affect water quantity/quality and aquatic resources in the basin.

2. Temporal Scope

The temporal scope of our cumulative effects analysis in the EA includes a discussion of past, present, and future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of a new license, the temporal scope looks 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each resource.

C. Environmental Analysis

1. Geological and Soil Resources

a. Affected Environment:

Sebago Lake lies along the boundary between two physiographic provinces: the New England Coastal Lowlands and the New England Central Highlands. The New England Coastal Lowland province is characterized by low rocky ridges and hills separated by broad valleys with a maximum topographic relief of 300 feet. North of the lake is the central highlands province with small mountains and more rugged hills. The maximum topographical relief in the central highlands province ranges from 1,000 feet near the northern portion of the lake to nearly 4,000 feet in the headwaters of the watershed.

Geology in the Sebago Lake area consists of unconsolidated Quaternary (1.5 million to 10,000 years old) glacial deposits overlying igneous and metamorphic bedrock. Under the northern two-thirds of the lake is the Sebago batholith, an intrusion of granitic rock referred to as Sebago Granite. Glacial deposits typically covered most of the bedrock in the area, with scattered outcroppings. Around the southern one-third of the lake, the bedrock consists of metamorphosed sandstones and mudstones.

Glaciation occurred in the region many times during the Pleistocene Epoch (3 million to 10,000 years ago) with the most recent glaciation occurring approximately 30,000 to 12,000 years ago. After the retreat of the glaciers, which had depressed the land surface due to their weight, the ocean shoreline was located near the southern end of the lake which allowed for the deposition of marine clays known as the Presumpscot Formation. Following the rebound of the land, the ocean shoreline retreated to its present location.

Typical surficial geologic materials found along the shoreline of Sebago Lake consists of marine clay, glacial till and glacial outwash. Glacial till, which typically consists of sand, silt, clay and gravel, is found along Frye Island and points north. Glacial outwash, which is general composed of looser sands and gravels with a much lower percentage of clay and silt, is found along the shoreline at Sebago Lake State Park, the western shore at Long Beach and at Tasseltop Beach on the eastern shoreline. Since the last ice age, the reworking of glacial deposits by fluvial and lacustrine processes is responsible for the sandy beaches along the shoreline. Additional sand, silt and clay is brought into the lake by rivers and tributaries. The Songo River has brought in large amounts of sediment and has a formed a delta where the beach at the Sebago State Park is located.

The 1997 EIS (FERC, 1997a) summarized the two soil associations along the shoreline of Sebago Lake; the Hermon-Peru-Paxton Association and the Windsor-Hinckley-Deerfield Association. Figure 2 shows the location of the different soil associations along Sebago Lake. In addition, figure 2 shows the location of 15 different beach profiles monitored by S.D. Warren.[25]

The 15 beach profile monitoring sites shown in figure 2 are named according to the names of nearby residences or other nearby landmarks. Many of these sites have also been monitored since before the recent S.D. Warren studies, and the dates shown in figure 2 indicate when monitoring was initiated. For example, the Songo Beach profiles were started in 1990 by the Maine Geological Survey (Maine Geology). FOSL started the Marathon Street and Ossipee Street profiles, as well as the Sunningdale and

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[25] S.D. Warren initiated, on September 17, 1997, as part of the requirements of the 1997 FERC-ordered lake level management plan, a 5-year monitoring program for beach erosion and accretion along Sebago Lake. The results of this monitoring are described in more detail in section b, *Environmental Effects and Recommendations.*

Thompson profiles in 1993. FOSL and Maine Geology started the Barton, Banks and Straw #2 profiles in 1993, while the Water District began the Standish and Rockwall profiles in 1993.

Figure 2. Beach profile monitoring sites and soil association locations. (Source: Framatone, 2003a; FERC, 1997a)

Public Access for figure 2 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

Shoreline Erosion

Shoreline erosion is typically governed by the following factors (Normandeau, 1994):

- shoreline surficial geology (bedrock, sand, clay, gravel, till, etc.);
- wave climate (shoreland exposure to wave direction, fetch, prevailing winds, nearshore bathymetry, nearshore currents, etc.);
- lake water levels (extreme high and low, mean, variability);
- ice;
- lakeward water supply (groundwater seeps, surface water runoff, rivers, streams);
- shoreline vegetation; and
- man-made structures (retaining walls, piers, jetties, boat houses, etc).

Shoreline erosion is a complex process that involves all of the processes listed above. Similar to ocean beaches, the major erosion processes occurs during storm wave events. Along ocean beaches, the gentler waves and swells during non-storm events are instrumental in rebuilding the beaches. Important beach rebuilding processes for beaches associated with a lake are typically: (1) transport by ice ‘bulldozing,’ typically along windward shores of the lake during ice freeze-up periods; (2) replenishment by erosion of upper beach structures; (3) sand transport along the shore from nearby areas; and (4) tributary re-supply.

Based on wind rose data provided in the Commission’s 1997 EIS (FERC, 1997a) and in NOAA (2004), the strongest, most prevalent winds are from the southwest, west, northwest and north, from November through the end of February. During April through the end of September, wind direction is relatively variable and light, with the strongest winds out of the south. March and October are clearly transitional months, with winds out of most directions other than the east.

Sandy beaches are not common on most lakes due to the required combination of amount and size suitability of available sand, wave climate, and shore and near shore slope requirements. Along steep, bluff like shorelines, waves during higher than normal water levels often cause significant erosion since they tend to affect the toe of the bluff and cause bank failure. Lower water levels along similar shorelines typically result in the waves affecting the gentler sloping shelf below the toe, which limits bluff erosion.

Table 2 shows the percentage of different shoreline classifications along Sebago Lake.

Table 2. Sebago Lake shoreline classification. (Source: Johnston and Mixon, 1997)

Shoreline Classification	Percent of Total
Marsh	4.1%
Sand beach	14.8%
Seawall behind beach	4.8%
Groins with sand in between	2.7%
Bluff behind sand beach	4.3%
Sand beach with boulders	2.2%
Glacial till (sand, silt and clay)	57.4%
Artificial fill	5.8%
Bedrock	3.9%

The characteristics of the major beaches along Sebago Lake are summarized in table 3. All of these beaches were estimated to have a typical slope of approximately 1:10. Figure 3 shows the location of these beaches.

Table 3. Summary of Sebago Lake major beaches. (Source: Maine Geology, 1998)

Beach location	Beach length (feet)	Average sand size	Fetch direction	Fetch length (miles)
Frye Island	1370	coarse sand	S	4.2
Halls Beach	1510	very coarse sand	SSW	7.1
Harmon Beach	2840	medium and coarse sand	ENE	3.1
Long Point Beach	3175	very coarse sand	NE	6.2
Rockwall Beach	530	very coarse sand	NW	9.1
Sandbar Beach	1895	coarse sand	NE	4.4
Songo Beach	3935	coarse sand	S	6
Standish Boat Launch	3555	coarse sand	N	4.2

Figure 3. Location of major beaches on Sebago Lake. (Source: Maine Geology, 1998)

Public Access for figure 3 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

b. Environmental Effects:

Shoreline and Beach Erosion

Many organizations have recommended changes to the LLMP, other than the change proposed by S.D. Warren. These recommendations can be generally grouped into two categories, those that believe that high lake levels are increasing the amount of shoreline and beach erosion, and those that believe high lake levels do not increase erosion, but that higher lake levels are needed for other uses of Sebago Lake.

S.D. Warren's proposed change to the LLMP would be to establish a 0.25-foot tolerance range around the August 1 target elevation for Sebago Lake. This is a slight change from the current LLMP, which specifies the target level without variance. S.D. Warren does not support the changes in the LLMP recommended by Interior, the MDIFW, Sebago Lake Coalition, FOSL, Mr. Frechette, or Mr. Kasprzak. S.D. Warren states:

(1) The reports by Maine Geology, and the 5 years of beach profiling conducted by S.D. Warren show normal sand movement and stability since 1990.

(2) Although certain beaches, at points in time, show short-term changes, the beaches show long-term stability interrupted at times by changes due to storms that occur during high water periods.

(3) While seasonal erosion and accretion does occur along all surveyed areas, there is an ongoing cycle of material loss and replacement, which maintains beach profile equilibrium.

(4) The dynamics of erosion and accretion through wind and wave action result in a shifting of materials, but subsequent storm events cancel out any major change in profiles.

The Maine Geological Survey (Maine Geology) commented that the beach profiles on record do not support item 4 above, and states that in fact storm events do not "cancel out any major change in profiles, but are the sources for significant long-term changes to the profiles." The powerful storm events of October/November 1996 produced significant erosion in the upper profiles of many Sebago Lake beaches that were evident for many years thereafter.

S.D. Warren also commented on Maine's recommended revisions to the LLMP, by letter filed July 15, 2004. S.D. Warren states that:

(1) For the January to March 1 period, the target lake level should be a stated elevation of 262.0 feet, instead of the long term (1910-86) median level. The LLMP should also include an expeditious process to allow S.D. Warren to obtain a temporary variance, such as approval from the MDEP, from maintaining 262.0 feet, or the 1910-86 median level, in recognition of high snowpack or watershed saturation.

(2) Maine's recommendation requires that flows be increased immediately whenever the lake level rises above the spillway crest, up to a maximum of 1,667 cfs or higher, if needed, to prevent the lake level from reaching 267.15 feet. The LLMP should include a provision to allow S.D. Warren to obtain a temporary variance from the flow release requirements into the Presumpscot River, in recognition of flood or other severe conditions on the river downstream of the project, such as obtaining concurrence with the MDEP.

(3) The November 1 lower limit should be elevation 262.0 feet instead of 263.0 feet.[26]

(4) For the November 1 to January 1 time period, the 2 in every 9-year, low-level, drawdown to elevation 261.0 feet should be eliminated, because:

(a) the theory of beach accretion during a drawdown level of 261.0 feet is unsupported and not beneficial to the constituents of Sebago Lake as a whole;
(b) following a drawdown to 261.0 feet, S.D. Warren can not guarantee that Sebago Lake will refill the next year, due to hydrological issues;
(c) the project is not designed to pass large amounts of flow at low head, and maintaining the lake level within a 6-inch window near 261.0 feet is difficult; and
(d) significant flow releases might be required during the last two weeks in November, to meet the 261.0 feet target level, since flows from the lake are limited to 1,000 cfs from mid-October to mid-November due to salmon spawning requirements.

Maine's recommended LLMP is similar to the existing LLMP, but with some small differences. For example, there would be a minimum/maximum elevation of 266.0/266.65 feet on, but not before May 1. Lake levels may also be at the spillway crest, for no more than a 3-week period, anytime between May 1 and the 3rd week in June, but levels above the spillway would trigger flow releases to bring the lake level

[26] S.D. Warren indicates that the MDEP concurs with this change.

back down to the spillway crest elevation. After the spring fill-up, the lake would be managed to achieve a minimum target elevation of 265.17 feet on August 1. After August 1, water levels would be managed to reach a target level on November 1 of 262.5 feet plus or minus 0.5 feet. Water levels above a line drawn from 266.65 feet at the end of the 3rd week of June to 265.0 feet on September 1, then 263.0 feet on November 1, would trigger increased flows according to the operating parameters outlined in Appendix B. During 2 in every 9 years, with the exact years to be determined by Maine and S.D. Warren, the lake level would be managed to achieve a level of 261.0 feet on or about December 1. From January 1 through March 1, the lake levels would be maintained above the 1910-1986 median level, which is approximately 262.25 feet. Between March 1 and May 1, S.D. Warren would manage the lake levels so that the spillway crest elevation is reached by May 1.[27] Maine says that its revisions would:

(1) increase winter water levels to improve the likelihood that the lake would hit the May 1 full pond target level;

(2) eliminate, as a normal operating range, the lake levels above full pond, to reduce damage to beaches and shoreline;

(3) expand the target range to allow higher water levels from July to November;

(4) maintain the current periodic low water level in the fall (with a few adjustments) to promote accretion of sand to beaches; and

(5) reduce summer minimum flows to better maintain lake levels without threatening downstream water quality attainment.

Maine contends that the aforementioned changes would appropriately balance the competing uses of the lake, and would be more workable than the current plan.

Mr. Frechette recommends a water surface elevation of 266.0 feet or above from May 1 until July 7, with a limit on the lower water surface elevation of 263.5 feet during other times of the year. Mr Frechette contends that other stakeholders are more concerned about beaches than boating and other users on the lake, and elevations below 263.5 feet harm the Sebago Lake wetlands.

Interior recommends that drawdowns in Sebago Lake not exceed 2 feet from April 1 through December 15, and no more than 3 feet from December 16 through March 31.

[27] The water level would not be higher than a straight line between 263.5 feet on January 1 to 266.65 feet on May 1.

Additional discussion of Interior's recommendation is included in section V.C.3, *Fisheries and Aquatic Resources*.

The MDIFW indicates that lake level changes would be useful to reduce lake trout spawning success. The MDIFW recommends that a delayed drawdown beginning in late November, resulting in a 5 to 8-foot drop in water level, would realize the highest level of egg mortality. This is discussed in greater detail in section V.C.3, *Fisheries and Aquatic Resources*.

FOSL recommends that the spring target elevation be lowered to 265.65 feet. In addition, it recommends that in 1 of every 2 years, the water surface elevation should reach 261.0 feet by November 1, in 1 of every 4 years lower the lake to elevation 260.0 feet by November 1, and in 1 in every 10 years lower the lake to 259.0 feet by November 1. FOSL states that this range of drawdown by November 1 would mimic the 50, 20 and 10 percentile water surface elevations for the period of 1910 to 1980. FOSL also states that this lake level regime would:

(1) return Sebago Lake to the levels and range of fluctuation typical of historic conditions (1910-1980) to help preserve the size, character and stability of Sebago Lake's natural beaches and shoreline; and

(2) return a greater magnitude to the range of lake level fluctuations than what currently exists to mimic the more natural lake level regime that existed prior to 1987.

Mr. Kasprzak recommends that the spring target water level be lowered to elevation 265.65 feet, with an acceptable range between 265.15 and 266.65 feet, and the same lake drawdown regime for November 1 as recommended by FOSL. Mr. Kasprzak states that this lake level regime would:

(1) facilitate the rebuilding of the upper profile of Sebago Lake's beaches, by minimizing the opportunity for both beach and upland erosion during periods of high energy wave events when the lake is at full pond;

(2) not reduce S.D. Warren's maximum generation capacity, but would significantly increase storage capacity and mitigate flooding along the lakeshore and downstream during periods of above-normal events, including the 10 and 25-year storm events; and

(3) allow for acceleration of sand accretion on the beaches during low water levels.

Sebago Lake Coalition states that the levels in Sebago Lake are too low and recommends that the levels be between 266.0 and 266.5 feet on June 1, 265.8 and 266.0

feet on July 1, 265.4 and 265.8 feet on August 1, 264.9 and 265.4 feet on September 1, and 264.0 and 264.5 feet on October 1. Sebago Lake Coalition states that this regime would allow for greater use of Sebago Lake. The Coalition also states that:

(1) lower lake levels do not enhance sand accretion on the beaches;

(2) retaining walls along the lake shore are the cause of sand loss in several locations;

(3) the report by Maine Geology does not show a correlation between high water level and sand loss, or low water levels and sand accretion;

(4) recent personal observations indicate more sand has been lost during low water level years than during high water levels; and

(5) erosion has and will always occur no matter what the water level of the lake.

Our Analysis

Shoreline erosion is due to a complex interaction of variables such as water level, wind strength, wind direction, fetch distance, shoreline materials, shoreline configuration, ice cover and other factors.

Several shoreline erosion reports were completed for Sebago Lake during the 1990s. The 1994 Maine Geology report "Sebago Lake State Park Beach Dynamics" concluded that the beach profiles were not experiencing any permanent shifts in the positions of the beaches (Dickson and Johnston, 1994). The 1997 Maine Geology report "Summary of Sebago Lake Shoreline Change Studies, 1990-1997," included a summary of beach profiles and concluded that the beaches are stable, but susceptible to storm-event driven erosion when lake levels are high (Johnston and Mixon, 1997). The 1998 Maine Geology report "Beach Dynamics of Sebago Lake; A Report on the Results of Beach Profiling" summarized the shoreline processes, beach sites and materials, and analysis of the beach profiles (Johnston and Mixon, 1998). Johnston and Mixon (1998) also concluded that the beaches were stable over the study period, with the exception of erosion attributable to a fall 1996 storm event.

In addition to the aforementioned erosion monitoring efforts, S.D. Warren initiated, in 1997, a 5-year program to monitor beach erosion and accretion along Sebago Lake. The Duke Engineering and Services report (Duke, 2001) contains profile data from 1997, 1998, 1999 and 2000. This study monitored 15 different beach profiles, as shown in figure 2.

The 1997 and 1998 Maine Geology reports indicate the following:

(1) A fall 1996 storm event caused catastrophic changes to the beach profiles, particularly to the sites having an exposure to southerly winds.[28] The damage described was focused on the upper portion of the beach shoreline, due to the high water levels in Sebago Lake during the storm.

(2) The 1997 profiles showed that minor accretion of the shoreline occurred on an on-going basis during the summer and fall of 1997.

Figure 4 shows the average Sebago Lake water levels for various lake management periods (1910-1986; 1987-May 2004; and 1997-May 2004), and includes 2 years with documented erosion related to high lake levels and storm events (1996 and 1999). Figure 5 shows the average monthly lake level for the 1997 to May 2004 period.

The 1998 Sebago Lake beach profile study report (Duke, 2001) concludes that: (a) the beach profiles are relatively stable, though they exhibit seasonal shifting of the materials in response to wave action from climatic events of varying intensities and orientations during varying water levels; (2) seasonal changes can involve the erosion and accretion of up to one foot of material; and (3) generally, material eroded is later deposited by a different climatic event, resulting in "relative stability."

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[28] The fall 1996 storm event referenced herein was started by an extreme rainfall event on October 20-22, over coastal Maine, of about 10 to 12 inches over the southern and eastern section of Sebago Lake, and lesser amounts upstream within the Sebago Lake watershed. During the period that the lake level was much higher than normal (November), an intense low pressure system moved north of the Sebago Lake area along the Gulf of St. Lawrence and produced a long period of strong southerly winds. The resultant wave action in November caused most of the erosion that was noted in Johnston and Mixon (1997).

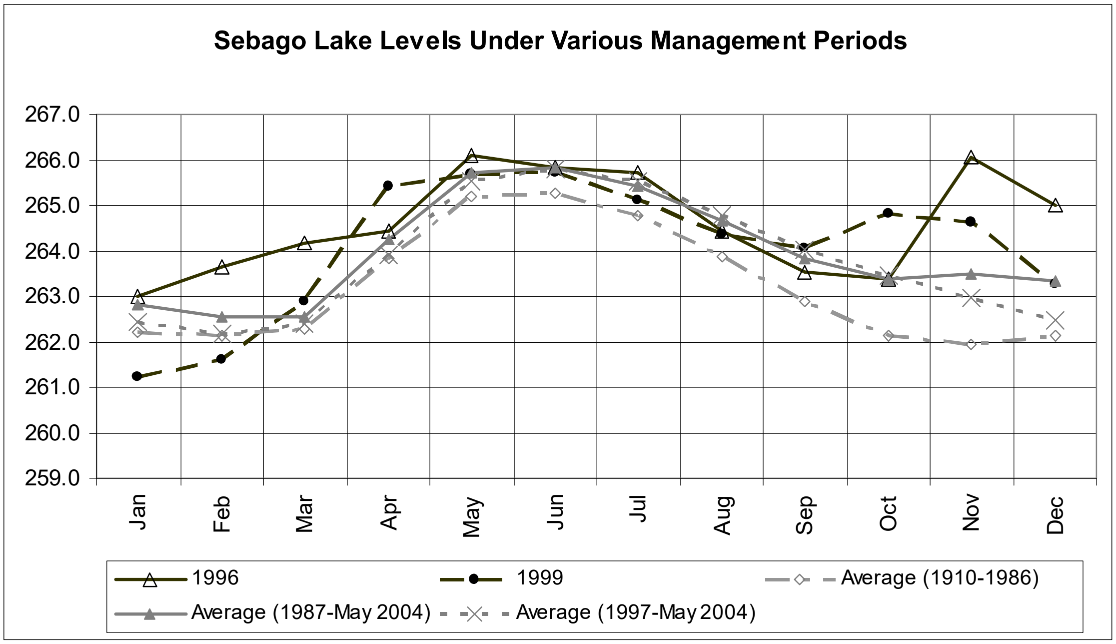

Figure 4. Sebago Lake water levels for 1997 to May 2004, with long- and short-term averages and fall high lake elevation years. (Source: Water District, 2004)

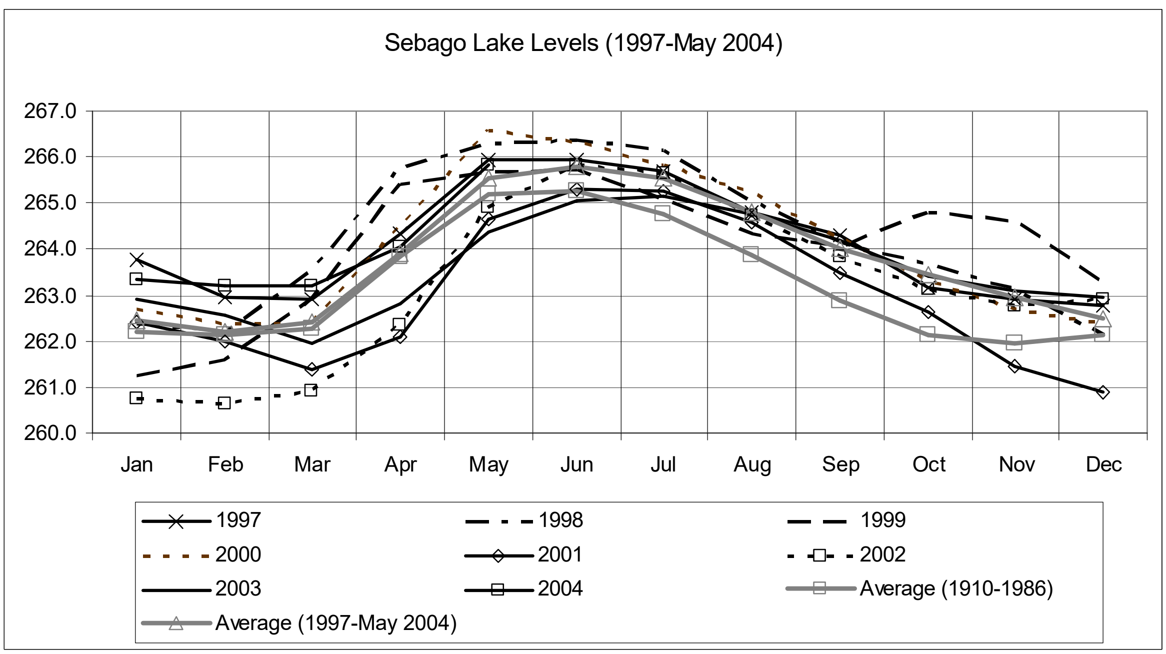

Figure 5. Sebago Lake water levels for 1997 to May 2004. (Source: Water District, 2004)

The 1999 Sebago Lake beach profile study report (Duke, 2001) concludes that: (1) nine out of the 15 sites exhibited some erosion compared to the 1997 and 1998 data; (2) the erosion that did occur may be attributable to fall 1999 storms that occurred at elevated, fairly-constant water levels, when wind driven waves were able to effect the same elevation on the beach over a longer duration of time; (3) 1999 had a greater frequency of higher winds as compared to 1998; and (4) the erosion noted is generally in mid-profile, which is the area experiencing the greatest seasonal fluctuation in profile elevation, and it is unlikely that this erosion would be permanent.

The 2000 Sebago Lake beach profile study report (Duke, 2001) concludes that: (1) seven of the 15 sites were generally stable, similar to the 1997 and 1998 data; (2) due to lower water levels, 2000 data showed erosion to the lower profile, and accretion in the upper-mid profile is apparent when compared to the 1999 data; and (3) the data demonstrate an overall stability through the years for most of the profiles. The 2001 Sebago Lake beach profile study report (Framatone, 2003a) concludes that: (1) the data show only minor changes from the previous year's data and were insufficient to indicate whether the accretion trends are permanent; (2) the minor changes are near or at the shoreline due to wave action, and these areas are much farther out along the profiles due to extended low water conditions; and (3) the exception to this stabilizing trend is the erosion along the Songo profile No. 7, where the entire profile is shown to be retreating consistently over the five years of the study, with only minor accretion at the mid-profile when comparing 2001 to 2000.

Finally, the 2002 Sebago Lake beach profile study report (Framatone, 2003b) concludes that: (1) accretion patterns at a number of sites, particularly at Thompson, showed a stabilization of the erosion patterns at the Songo Nos. 4, 5 and 7 sites; (2) the exception to this stabilization trend is the erosion along the upper and mid-profile of Songo profile No. 7, where the entire upper and mid-profile is shown to be retreating consistently over the five years of the study with only minor accretion at the bottom profile; and (3) there were no major storms or wind events from 2000 through 2002 to account for any substantial accretion or erosion, which is most likely the reason for an indication of overall stability at most of the profiles.

The following discussion centers on various options to the LLMP that have been proffered by the stakeholders, and how each alternative may affect the erosion potential.

Increase winter water levels

Shoreline and beach erosion is relatively uncommon during the winter months, since Sebago Lake is typically frozen over during most of January, February and March. During wind driven ice break-up and to a lesser extent during freeze-up periods, however, accretion of sand to the beaches from ice scour does occur. During this type of accretion event, sand is moved from areas below the water/ice level to areas higher on the beach profile.

The LLMP recommended by Maine would require that, beginning on January 1, and continuing until March 1, the lake levels would be at or above the long term (1910-1986) median level of about 262.25 feet. In its July 15, 2004, S.D. Warren states that the target lake elevation for this period should be 262.0 feet. Under Maine's plan, after March 1, hydrological conditions and operational considerations determined by S.D. Warren would govern lake levels with the goal of reaching 266.65 feet on, but not before, May 1. The maximum water level during this time period would be a line drawn from elevation 263.5 feet on January 1 to 266.65 feet on May 1. This line could result in a maximum water level of approximately 265.7 feet on April 1, and is identical to the current LLMP.

The average lake surface elevation on March 1 is approximately 262.21 feet for the 1910-1986 period, which is slightly lower than the average for the 1997-May 2004 periods (262.4). Currently, S.D. Warren manages the lake based on hydrological considerations with the goal to reach the May 1 – June 15 spillway crest target elevation. There is no evidence to suggest that S.D. Warren would make attempts to allow the lake level to reach the state's maximum allowed levels during March and April, especially in light of flood storage requirements.

Several community organizations and residents indicate that regular deep drawdowns are required for the maintenance of beaches along Sebago Lake. The beach erosion studies by Maine Geology, and S.D. Warren's later profile studies, show that profiles from 1997 and 2000, years with winter water levels above the 1910-1986 median (similar to the state's proposal) had new sand berms on the shore, which in more than one case was attributed to "ice push"(Johnston and Mixon, 1998; Framatone, 2001). These berms were later eroded down as the year went on, which supports the reports' conclusions that over the course of the year the profiles were stable. These results indicate that lake levels above the 1910-1986 median for January and February, as recommended by the state, would have little effect on beach dynamics. Figure 5 shows that the average water level for January through March for the 1910-1986 and 1997-May 2004 periods is within 0.2 feet for all three months. Implementing Maine's recommended revisions to the LLMP would likely have little effect on beach erosion during the winter months. However, it could jeopardize soils by increasing the risk associated with decreasing the available storage for possible flood events during April and May, as discussed in more detail in section V.C.2, *Water Resources*.

Eliminate the allowable lake level range above full pond

All parties appear to agree that beach and shoreline erosion potential is highest when the lake level is above the spillway crest elevation. However, the single most destructive shoreline and beach erosion event in recent memory occurred in November of 1996 during a combination of a high water level of 266.4 feet and a sustained high wind event.

Local wind data from the Portland, Maine weather station shows that sustained high wind events during May and June, when Sebago Lake is normally near its spillway crest, are much less frequent than during the fall, winter and early spring, when the lake is commonly either substantially lower and/or ice covered. After ice out (typically April 9), the lake is managed with the intent to meet the target elevation of 266.65, on or after May 1 (until June 15), which happens to coincide with a time of year that can experience strong, seasonal storms. Lowering the spring maximum water level could reduce the potential for shoreline and beach erosion in the event of a late-spring storm with high winds, similar to the conditions leading up to the flooding of April and May 2005. Moving the earliest maximum pool target to May 15, and reducing this target elevation to 266.15 feet (0.5 foot below spillway crest) would also minimize the risks associated with filling the lake during times when seasonal storms have a greater probability of affecting the area. A later fill date at a lower lake elevation could reduce the level of effects from combinations that contributed to the flooding of 2005, which would have a positive effect on the shoreline and beaches. This, however, could result in more water being released to the bypassed reach and loss of generation capacity for S.D. Warren, if additional water is released to maintain the lower lake level.

During the 1910 to May 2004 period, the weekly Sebago Lake water elevation was above the spillway crest approximately 6.5 percent of the time or slightly over 3 weeks per year. Based on lake elevation data and beach profiling data, there is the potential for some erosion to occur in the late spring as lake levels rise, so limiting the allowable lake level range above full pond would help to limit this erosion.

S.D. Warren, in its July 15, 2004, letter, states that the LLMP should include a provision to obtain a temporary variance from the downstream flow requirement to release higher flows to prevent higher lake levels, under circumstances such as flooding on the Presumpscot River downstream of the Eel Weir Project. S.D. Warren suggests that agreement with the MDEP could be a requirement for the flow variance. Issues related to increased flows in the bypassed reach and their effects on fishery resources and recreation are discussed in sections V.C.3, *Fisheries and Aquatic Resources,* and V.C.5, *Recreational Resources.* Issues related to downstream flooding are discussed in section V.C.2, *Water Resources*. An option to allow temporary exceedence of the prescribed lake elevation, to above the spillway crest, could be considered to reduce any adverse effects of high discharges on downstream resources. However, any such decision to grant a flow variance must consider the effects of flooding, both around Sebago Lake and along the lower Presumpscot River.

Expand the August 1 target

S.D. Warren's proposed change to the LLMP includes a 3-inch tolerance range for the August 1 target elevation. Lake levels could fluctuate between 264.92 and 265.42 feet, instead of exactly hitting 265.17 feet. Since 1997, as figure 6 shows, S.D. Warren has not met the precise target, and in fact, the August 1 readings have not been within the proposed target range in 3 out of the last 7 years.

Allowing a range, as proposed by S.D. Warren and Maine, would give the lake managers a slightly broader target and capability to avoid non-compliance reporting for uncontrollable climatic factors. At times when the lake is near the high end of the range, lake levels may remain higher during the summer months, which could appease some of the stakeholders that are recommending higher levels. Since recent lake levels have already shown significant variation around the existing target (figure 6), adopting the proposed target range, within what has already occurred since 1997, should have little, if any, effects on shoreline and beach erosion. A 3-inch target range would be reasonable, due to the variable hydrological parameters that affect the lake level, and that are beyond the control of S.D. Warren.

Late summer/fall lake levels

Maine recommends a maximum lake level from August 1 to November 1 each year. Specifically, water levels above a line drawn from 266.65 feet at the end of the 3rd week of June to 265.0 feet on September 1, and then to 263.0 feet on November 1, would trigger increased flows according to the operating parameters outlined in Appendix B. This recommendation would lower the October 1 maximum lake elevation from 265.0 feet in the current LLMP to approximately 263.2 feet. Mr. Frechette recommends an absolute minimum level of 263.5 feet, and the Sebago Lake Coalition recommends the following: (a) between 265.8 and 265.4 feet on August 1; (b) between 265.4 and 264.9 on September 1; and (c) between 264.5 and 264.0 feet on October 1.

The average lake surface elevation on September 1 is 264.0 feet for the 1997-May 2004 period, which is 0.62 feet above the 1910-1986 period median of 263.38 feet. The 1997-May 2004 median lake levels have been within the state's recommended range; however, maintaining these fall lake elevations on an annual basis is not without consequence, as the 1997 EIS (FERC, 1997a) concludes in its analysis of critical erosion hazard periods.

Beach profile studies (Framatome, 2001; 2003a; and 2003b; Johnston and Mixon, 1998) and the 1997 EIS (FERC, 1997a) clearly demonstrate that significant erosion has taken place during the fall months, and that the months of September, October, and November are times of significantly high wave energies, and consequently have the highest potential for upper beach erosion resulting from the combination of high lake levels and high waves generated from storms in the area. Figure 4, Sebago Lake water levels, shows that in 1996 and 1999 fall lake levels were considerably higher than the long term and LLMP medians. These were also years of large storms, which resulted in significant shoreline erosion (Johnston and Mixon, 1998; Framatome, 2003b).

Implementing the state's operating parameters could help manage lake levels somewhat, if lake levels rise above their suggested maximum. However, as our flood analysis in section V.C.2, *Water Resources,* indicates, the high lake levels of late October 1996 resulted from utilization of the flood storage capacity of Sebago Lake, to help reduce the effects of the 250-year flooding event on the lower Presumpscot River. Lower lake elevation targets and ranges in September, October and November would reduce the potential for having high lake levels during known high wave energy months, and would provide additional flood storage capacity as discussed in the 1997 EIS. A lake level below 263.5 feet, however, while providing the benefits of reduced erosion potential and additional flood storage capacity, could negatively affect the boating community. Potential effects of this proposal on boating accessibility and use numbers is discussed in section V.C.5, *Recreational Resources and Land Use*.

Maintain periodic (2 in 9 yrs.) low water levels in the fall/winter

Maine recommends a 1-month drawdown (December 1 to January 1) to elevation 261.0 feet, to provide for a period of beach sand accretion. FOSL and Mr. Kasprzak recommend a deeper fall drawdown, lasting up to 2 months. FOSL states that additional low water levels during the fall would better promote sand accretion to the beaches. The MDIFW recommends a 5 to 8-foot drawdown in late-November and possibly into mid-winter, to help control lake trout spawning. In contrast, S.D. Warren suggests that the periodic (2 in 9 years) low fall drawdown be eliminated from the LLMP, because there is no evidence that it has resulted in sand accretion to the beaches.

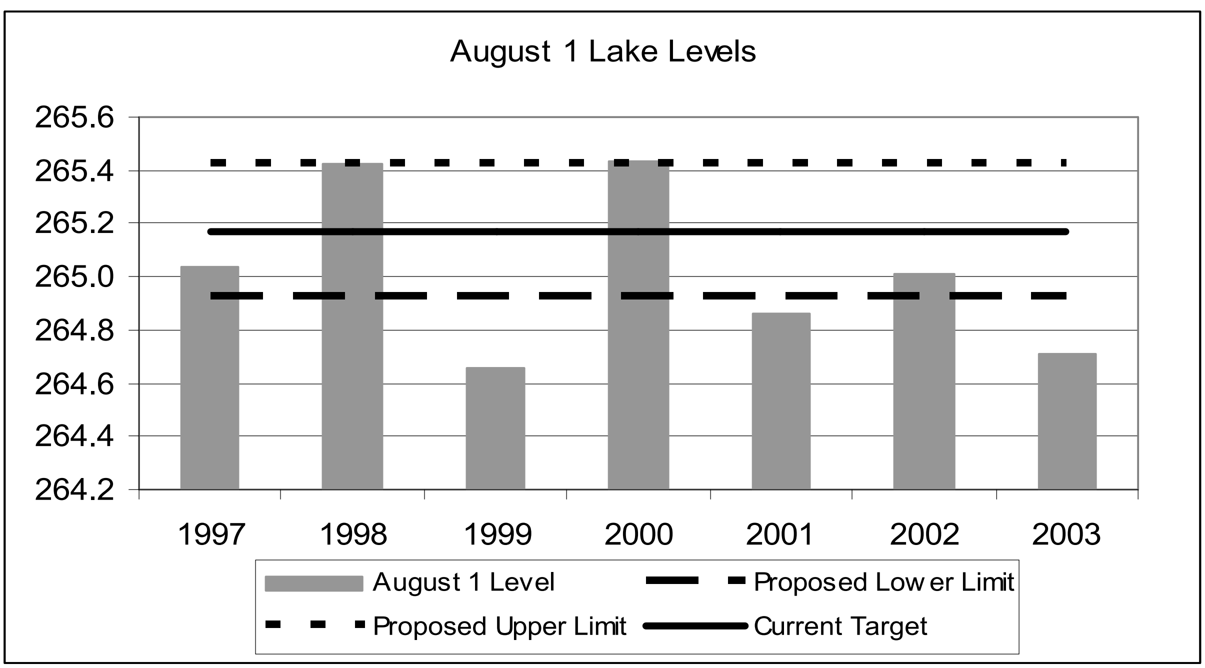

Figure 6. Sebago Lake water levels on August 1 for 1997 to 2003. (Source: Water District, 2004)

The drawdown to a lake elevation of 259.0 feet once every 10 years (by November 1), as recommended by FOSL and Mr. Kasprzak, would result in water levels that have not been reached since October 1965. FOSL and Mr. Kasprzak also recommend a drawdown to elevation 260.0 feet once every 4 years. Elevation 260.0 feet has not been reached since February 1966. Finally, FOSL and Mr. Kasprzak recommend a drawdown to elevation 261.0 feet once every 2 years. Elevation 261.0 feet has been reached more frequently (e.g., four times since 1966).

According to the beach profile reports published by Maine Geology, Duke and Framatone ANP, beach accretion may be enhanced by low water levels in the fall, but this is not as clear of a relationship as that of higher water levels near or above the spillway elevation increasing the potential for beach and shoreline erosion. In addition, historical beach stability was examined in the 1997 EIS (FERC, 1997a) and is argued by many to exist even today, with the exception of a few years where high water and high wind events caused a large amount of the erosion on the beaches and shoreline of Sebago Lake.

Lowering Sebago Lake in November, to the extent recommended by FOSL, the MDIFW and Mr. Kasprzak, would limit the ability, during some years, to refill the lake by May 1. However, should the maximum lake level be lowered to 266.15 feet and the earliest fill date moved to May 15 (as supported by staff), S.D. Warren would be able to achieve the LLMP targets in all but the driest years. Table 4 provides the approximate amount of inflow that would be required to refill Sebago Lake to the spillway crest elevation on May 15, after a November 1 drawdown to elevations of 260.0 and 261.0 feet. The MDIFW recommended 5- to 8-foot drawdown for late-November into mid-winter would result in drawdowns to elevations below 260.0 feet, and would require even more inflow to refill the lake by spring. Additional discussion of MDIFW's recommendation and its effects on fishery resources and related water resources is included in section V.C.3, *Fisheries and Aquatic Resources.*

The data in table 4 are for general reference and are conservative, since they do not consider outflow from Sebago Lake. These data illustrate that a moderate percentage of the inflow (at extreme low flows) would be required to completely refill the lake after these drawdowns, even the drawdown to 261.0 feet. Lake drawdowns, to the extent recommended by FOSL, Mr. Kasprzak, and the MDIFW would limit the ability to refill the lake during moderate to extreme dry periods, to meet the May 15 target levels, and would likely limit downstream flow releases during many years.

Table 4. Summary of the flow[a] needed to refill Sebago Lake after a November 1 drawdown. (Sources: USGS, 2004a; data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004; USGS, 2004b)

		Mean inflow (November 1 – May 15)		75% Exceedence inflow (November 1 – May 15)		90% Exceedence inflow (November 1 – May 15)	
Elevation (feet)	Million cubic feet required for refill[b]	Total (mcf)	% of inflow required	Total (mcf)	% of inflow required	Total (mcf)	% of inflow required
260.0	7,200	11,700	62%	7,200	100%	5,700	126%
261.0	6,200	11,700	53%	7,200	86%	5,700	109%

[a] Based on flows shown in table 8 for water years 1987-2004.

[b] Refill means reaching a target elevation of 266.15 feet on, or anytime after May 15.

Based on this information, there appears to be little basis for changing the current LLMP provision that requires a 2-in-9-year drawdown to elevation 261.0 feet, for a 2-month period (November 1 to January 1). This would continue to provide a 2-month "window" for sand accretion to the beaches, and would also keep lake levels low during the fall period to reduce the potential for erosion associated with fall storms (the drawdown would need to begin in October to reach the November 1 target level). Maine's recommendation to limit this drawdown to 1 month (December 1 to January 1) would result in higher lake levels during October and November, which could benefit any late-season boating, but this would increase the potential for erosion and reduce the period for sand accretion to the beaches.

Our recommendations regarding lake level management is in section VII, *Comprehensive Development and Recommended Alternative*.

c. Unavoidable Adverse Effects:

Operation of the project, as proposed by S.D. Warren, would continue to contribute to localized erosion along the shorelines of Sebago Lake. Maintaining higher lake levels, particularly during the fall and early winter, would exacerbate on-going erosion of the upper shore profile. Maintaining lower levels during the same period would reduce the effects of storm events on the shoreline, with a commensurate reduction in erosion and an increase in accretion.

2. Water Resources

a. Affected Environment:

Water Quantity and Use

Sebago Lake

The Eel Weir Project is in southern Maine at the outlet of Sebago Lake, which is the beginning of the Presumpscot River. The Sebago Lake watershed drains 436 mi^2 and includes 75 mi^2 of lakes and ponds. The headwaters of the Presumpscot River are near Bethel, Maine, approximately 50 miles north of the project site. The Presumpscot River discharges into the Atlantic Ocean via Casco Bay near Portland, Maine. In general, the Presumpscot River is bordered by the Androscoggin River watershed to the north and east and the Saco River watershed to the west.

The main tributary to Sebago Lake is the Songo River, with a drainage area of 275 mi^2. The Songo River drainage includes the 154-mi^2 Crooked River Basin. The Crooked River watershed is largely unregulated, but the rest of the Songo River watershed has many regulated lakes and ponds including Long Lake, just upstream of Sebago Lake. Long Lake is separated from Sebago Lake by the Songo lock system, a manually operated facility within the Sebago Lake State Park. Long Lake has a useable storage capacity of 29,844 acre-feet (or 1,300 million cubic feet; mcf), with a usable drawdown of approximately 5 feet. During the fall, Long Lake is typically drawn down to prevent ice damage to shoreline property. The fall drawdown of Long Lake therefore supplies significant inflow to Sebago Lake.

Limited information is available on the inflow to Sebago Lake since only two USGS stream gages have measured the inflow to Sebago Lake. Neither gage has a continuous, long-term record. Table 5 provides information on these gages.

Table 5. Summary of USGS streamflow gages upstream of Sebago Lake. (Source: USGS, 2004b).

Gage Number	Gage Name	Period of Record	Drainage Area (mi^2)
01063310	Stony Brook at East Sebago	10/1/1995 to 9/30/2003	0.81
01063100	Crooked River near Naples	5/24/1975 to 9/30/1977 10/1/1995 to 9/30/2000	150

Dudley et al. (2001) estimated that the yearly inflow to Sebago Lake was 935 cfs for water years 1996 to 1999. This estimate is based on the streamflow records for the gages shown in table 6, as well as regression analyses and other methods for the remaining ungaged drainage areas to Sebago Lake. For the same period, Dudley et al.

(2001) estimated the outflow to be 780 cfs. The difference between outflow and inflow was attributed largely to evaporation and withdrawals by the Water District. The Water District estimated that yearly withdrawals for the 1996 to 1999 water years were 1,130 mcf, or about 36 cfs.

According to the Water District, Sebago Lake has a shoreline length of 105 miles and a surface area of 47 square miles. The Water District also estimates that Sebago Lake has a maximum depth of 316 feet, a mean depth of 101 feet, a total storage volume of 995 billion gallons of water or 3.05 million acre-feet, and a residence time of 5.1 years. In addition to being a drinking water source, Sebago Lake is heavily used for recreational activities such as fishing, boating and swimming. The Water District prohibits recreational use within 3,000 feet of the water supply intakes to protect the water quality.

According to digitized aerial photographs (Water District, 2004), 86 percent of the watershed consists of undeveloped vegetated areas such as forests and fallow fields, 6.9 percent is residential, 2.5 percent is timber operation, 2.2 percent is agricultural, 0.2 percent commercial/retail, and 2.2 percent other uses. Southern Maine has a humid continental climate with warm summers and cold winters. The average temperature in January is 22º F and is 69º F in July, the coldest and warmest months. Precipitation is relatively consistent through the year, and the watershed averages about 44 inches per year. On average, according to the Maine Tourism Association (Maine Tourism, 2004), there are approximately 15 to 30 thunderstorms per year and 80 to 120 clear days per year. Yearly snowfall averages approximately 80 inches per year. During the winter, Sebago Lake is completely ice covered in most years, with only 11 years since 1940 in which it did not completely freeze over. According to Hodgkins and James (2002), the average ice-out date for the Big Bay portion of Sebago Lake is April 9.

Sebago Lake is a natural lake, and human regulation of the water levels started with the construction of the first dam at the lake's outlet in 1830. Normandeau (1994) states that prior to regulation:

> *During a typical year, January water levels would probably be at or near absolute minimum levels (perhaps near elevation 257 or 258) and remain there until the beginning of spring melt. Water levels would reach a maximum during late spring early summer and then quickly fall to near minimum levels, probably by the end of July. For the remainder of the year, water levels would fluctuate slightly about the minimum, responding only to climatic events. The height of spring maximum would depend entirely on the amount of spring precipitation/snowmelt, but it is probably safe to say that typical maximums would have been considerable lower than today. This is because winter minimums today are often held artificially high to better insure near 'full pond' conditions beginning each summer. It is probably even safer to say that without regulation, water*

levels would be at or near minimum levels for perhaps 7-8 months per year.

The lake level of Sebago Lake is managed to be within the target levels set by the LLMP (FERC, 1997b; S.D. Warren, 2002a). From May 1 to November 1, target level maximums and minimums are defined by the line segments connecting consecutive values on particular dates. S.D. Warren is not proposing any changes to the current LLMP, except the establishment of a 3-inch tolerance band around the August 1 target elevation. After November 1, water levels are managed to achieve a target level of 261.0 feet or lower in two out of every nine years, sometime between November 1 and January 1. Furthermore, from November 1 to May 1, lake levels are managed, as appropriate, by S.D. Warren based on precipitation, snow pack, energy needs, and other considerations, with the goal of reaching the spillway crest target level (266.65 feet, +/-0.5 foot) no sooner than May 1 and no later than the second week in June. Whenever possible, water levels are managed to be no higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1, and from 263.5 feet on January 1 to 266.65 feet on May 1.

Figures 7 and 8 provide graphical representation of these values as well as the historical lake elevations from 1910 to 1986 and 1987 until 2002. Prior to 1986, the licensee did not actively manage lake levels with regard to daily or weekly target elevations. Instead, the lake levels generally approached full pool (266.65 feet) during May and June and then decreased throughout the summer and early fall. Historical lake elevations were generally stable during the winter period and were followed by a typically rapid refill period during the spring snowmelt. In 1986, the licensee changed the management of the lake, to produce greater amounts of electricity during the winter period by keeping the water level at a higher level longer into the fall. As figure 9 shows, the lake elevations have averaged higher in the 1987-2002 period, as compared to the 1910 to 1986 period.

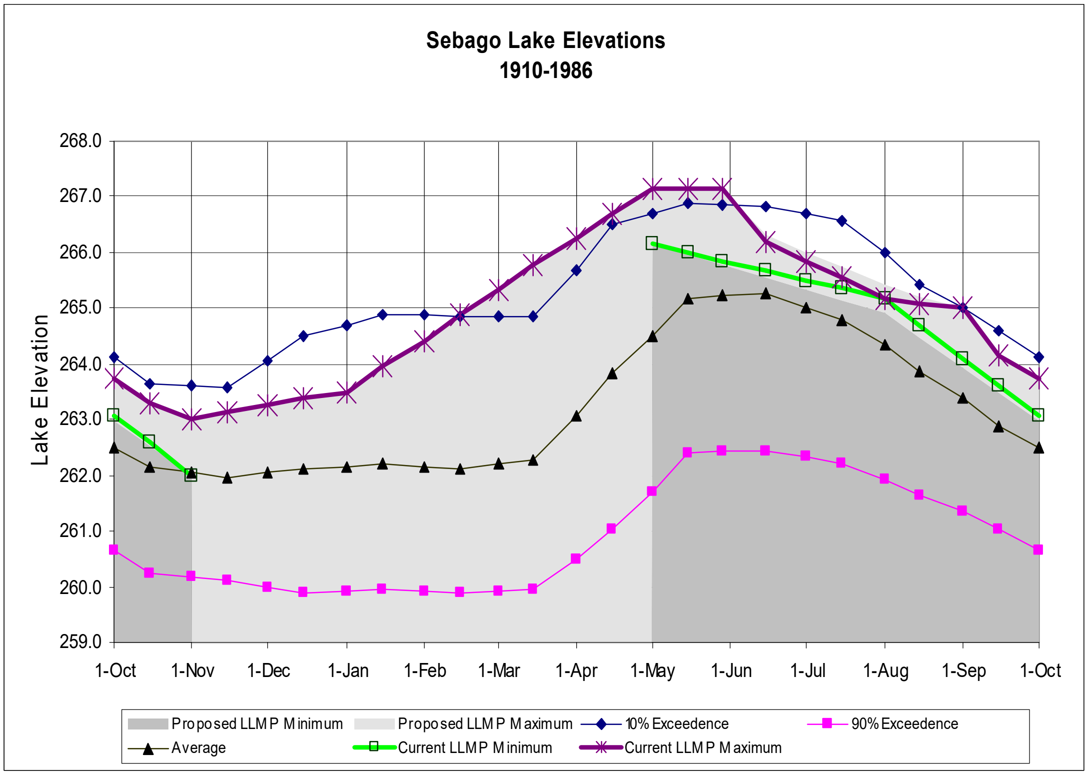

Figure 7. **Sebago Lake elevation data, 1910 to 1986, in relation to the LLMP elevations. (Source: S.D. Warren, 2003a)**

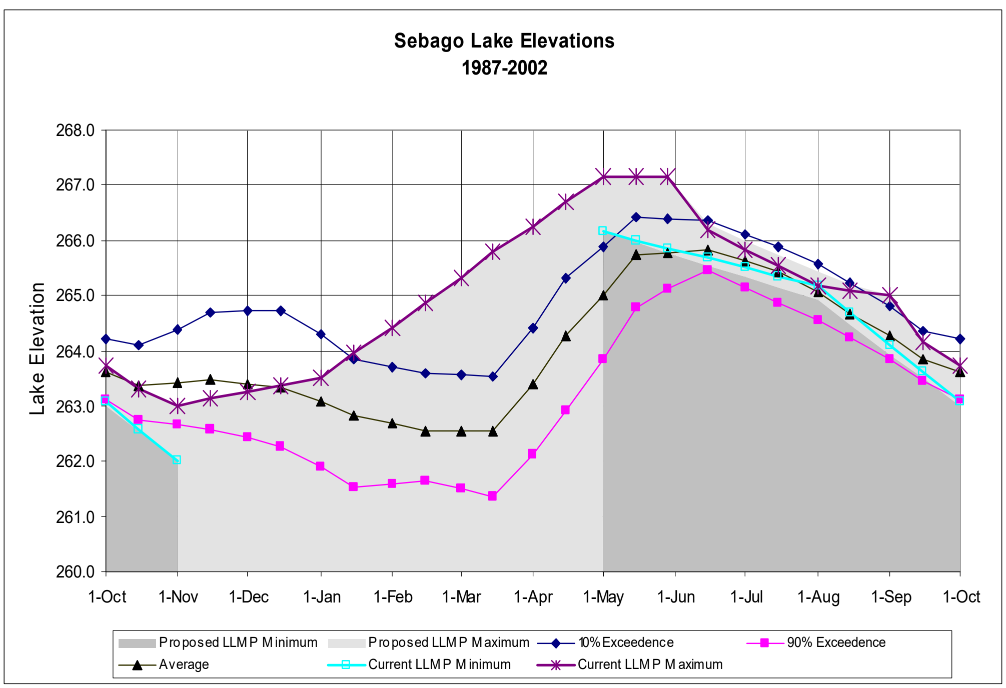

Figure 8. **Sebago Lake elevation data, 1987 to 2002, in relation to the LLMP elevations. (Source: S.D. Warren, 2003a)**

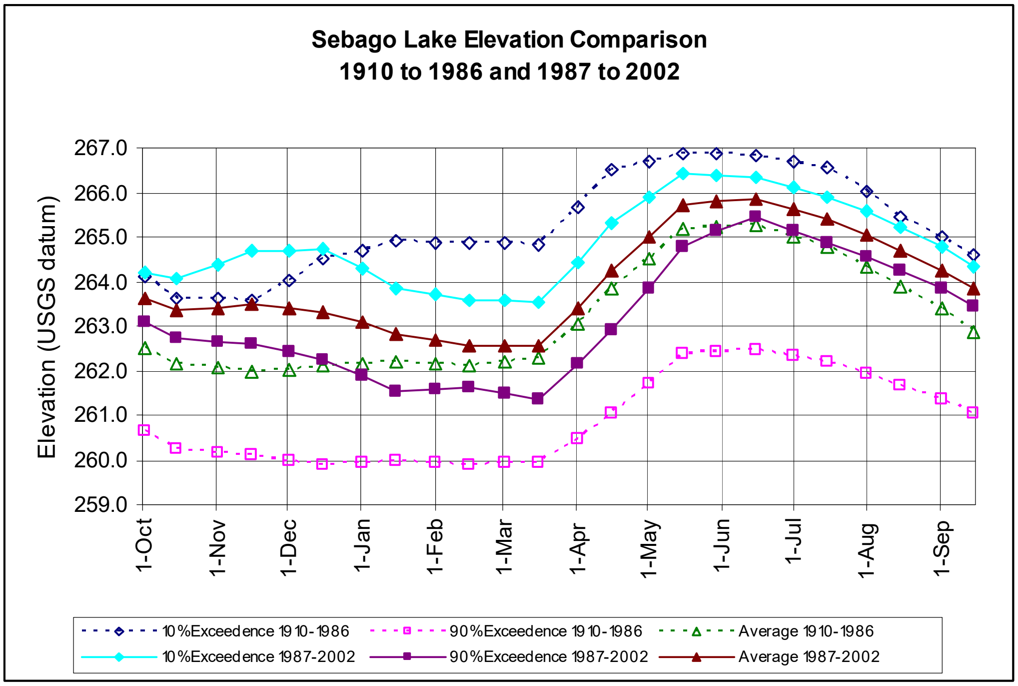

Figure 9. **Sebago Lake elevations for the 1986 to 2002 period and 1910 to 1986 period. (Source: S.D. Warren, 2003a)**

Presumpscot River

The Presumpscot River starts at the outlet of Sebago Lake and is regulated at the Eel Weir Project. Table 6 shows the minimum required flows at the outlet of Sebago Lake as governed by the LLMP.

Table 6. **Required minimum Lake Sebago outflows. (Source: Letter from Dana Murch, Dams & Hydro Supervisor, Maine DEP, to Maureen Winters, Kleinschmidt Associates, Pittsfield, ME, September 4, 2002)**

Month	Required minimum daily flows (cfs) in bypassed reach	Required minimum daily flows (cfs) below the project when Sebago Lake is within the specified target level
January	25	270
February	25	270
March	25	270
April	75	270
May	75	333
June	75	333

Month	Required minimum daily flows (cfs) in bypassed reach	Required minimum daily flows (cfs) below the project when Sebago Lake is within the specified target level
July	50	333
August	50	333
September	75	333
October	75	333
November	25	270
December	25	270

The MDEP estimates that the 7-day average low flow with a 1 in 10 year recurrence interval (7Q10 flow) at the project is 250 cfs. This flow was established by the MDEP based on the LLMP, which states that the minimum release from Sebago Lake is 250 cfs under "emergency low lake level conditions." Emergency low lake conditions are defined as when the level of Sebago Lake is 1 foot or more below the established target range, and flows from the lake have been greater than 270 cfs for at least 4 consecutive weeks. The MDEP has used the 250-cfs value for effluent dilution modeling, in its July 2, 2002, renewal and modification of the Maine Pollutant Discharge Elimination System Permit and Waste Discharge License for the discharge of waste waters from S.D. Warren's Westbrook paper mill. As discussed below, S.D Warren also follows a flow release plan, based on water temperature, to help ensure adequate DO levels in the Presumpscot River downstream of Sebago Lake.

A USGS gaging station is located at the outlet of Sebago Lake at the Eel Weir dam (USGS gage #01064000), and was operational from October 1, 1901, until September 30, 2000. S.D. Warren, however, continues to record flow data from this gage. Table 7 provides the monthly flow duration data for this gage for water years 1902 to 1986, and table 8 includes water years 1987 to 2004 excluding data past May 3, 2004. Table 9 shows the changes in the monthly flow duration data between the two time periods.

Table 7. Flow duration data (cfs) for the USGS gage 01064000, Sebago Lake outlet, water years 1902 through 1986. (Source: USGS, 2004a)

Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	835	835	839	1,000	1,040	988	2,550	1,803	1,281	842	837	838
10%	822	821	831	840	894	841	1,481	1,386	984	836	832	832
15%	802	798	818	828	834	835	995	1,100	848	831	827	819
20%	766	759	772	815	828	824	836	962	837	819	818	796
25%	740	728	736	796	818	810	828	851	833	795	792	765
30%	717	696	700	750	803	767	794	836	831	755	758	734
35%	687	675	677	712	761	726	732	831	819	731	737	704
40%	670	667	667	677	715	680	667	817	805	687	699	670
45%	655	652	650	661	676	655	638	741	745	667	671	660
50%	635	618	614	632	662	621	584	685	700	647	667	655
55%	600	586	575	594	620	571	550	660	670	610	655	624
60%	571	549	549	561	582	539	529	599	636	557	610	596
65%	538	528	508	535	548	512	504	554	588	538	583	554
70%	503	490	446	508	517	446	471	533	554	500	548	505
75%	458	428	418	469	460	402	423	497	529	414	514	480
80%	416	415	400	415	414	350	354	427	485	339	438	422
85%	350	357	326	343	346	338	312	350	371	267	350	340
90%	294	259	256	273	328	267	263	305	333	175	306	268
95%	216	182	175	195	254	191	178	190	211	42	215	175
99%	121	77	0	88	134	48	0	8	21	0	106	0
Mean	591	582	577	618	652	614	781	775	728	587	618	601
Max	1,590	1,400	2,040	1,850	2,460	3,420	7,000	3,560	3,620	3,290	1,060	2,730
Min	0	0	0	0	0	0	0	0	0	0	0	0

Table 8. Flow duration data (cfs) for the USGS gage 01064000, Sebago Lake outlet, water years 1987 through 2004, excluding data past May 3, 2004. (Source: USGS, 2004a; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	1,000	2,001	2,080	1,590	985	1,000	1,320	1,830	1,490	1,273	1,273	819
10%	969	1,000	1,183	992	856	844	1,000	1,580	998	829	829	667
15%	835	995	1,000	846	844	833	861	1,042	831	663	663	507
20%	823	985	998	844	831	831	845	996	675	546	546	423
25%	670	903	989	819	831	819	833	984	666	502	502	417
30%	651	846	843	772	819	819	670	845	662	497	497	350
35%	498	833	831	686	702	670	667	831	415	423	423	350
40%	350	819	831	671	670	668	593	819	340	410	410	340
45%	350	686	819	670	670	667	350	670	340	400	400	338
50%	340	660	670	667	667	665	350	665	338	376	376	338
55%	340	625	667	667	667	554	340	350	334	372	372	338
60%	336	500	667	667	546	501	339	348	333	352	352	334
65%	333	500	665	647	546	500	338	295	304	350	350	333
70%	298	350	619	568	501	349	334	277	298	340	340	333
75%	293	350	579	554	500	340	333	254	292	327	327	331
80%	277	340	554	508	348	333	277	250	277	325	325	300
85%	258	335	500	500	331	332	250	250	272	300	300	283
90%	254	327	500	499	325	273	175	167	167	292	292	277
95%	233	302	497	292	250	250	133	133	50	270	270	275
99%	75	233	292	250	250	133	133	57	50	250	250	250
Mean	495	736	845	743	627	610	553	722	560	516	401	399
Max	2,000	2,400	2,490	2,560	998	1,520	1,650	3,310	3,760	3,490	1,330	1,320
Min	75	25	292	250	250	91	0*	50	37	250	50	231

* 2nd lowest =133

Table 9. Differences in flow duration (cfs) for the USGS gage 01064000, Sebago Lake outlet, between water years 1987 through 2004 and water years 1902 through 1986. (Source: USGS, 2004a; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	165	1,166	1,241	590	-55	12	-1,230	27	209	431	436	-19
10%	147	179	352	152	-38	3	-481	194	14	-7	-3	-165
15%	33	197	182	18	10	-2	-134	-58	-17	-168	-164	-312
20%	57	226	226	29	3	7	9	34	-162	-273	-272	-373
25%	-70	175	253	23	13	9	5	133	-167	-294	-291	-348
30%	-66	150	143	22	16	52	-124	9	-169	-258	-261	-384
35%	-189	158	154	-26	-59	-56	-65	0	-404	-308	-314	-354
40%	-320	152	164	-6	-45	-12	-74	2	-465	-277	-289	-330
45%	-305	34	169	9	-6	12	-288	-71	-405	-267	-271	-322
50%	-295	42	56	35	5	44	-234	-20	-362	-271	-291	-317
55%	-260	39	92	73	47	-17	-210	-310	-336	-238	-283	-286
60%	-235	-49	118	106	-36	-38	-190	-251	-303	-205	-258	-262
65%	-205	-28	157	112	-2	-12	-166	-259	-284	-188	-233	-221
70%	-205	-140	173	60	-16	-97	-137	-256	-256	-160	-208	-172
75%	-165	-78	161	85	40	-62	-90	-243	-237	-87	-187	-149
80%	-139	-75	154	93	-66	-17	-77	-177	-208	-14	-113	-122
85%	-92	-22	174	157	-15	-6	-62	-100	-99	33	-50	-57
90%	-40	68	244	226	-3	6	-88	-138	-166	117	-14	9
95%	17	120	322	97	-4	59	-45	-57	-161	228	55	100
99%	-46	156	292	162	116	85	133	49	29	250	144	250

The average daily flow at this gage for the 1902 to 2000 period of record is 642 cfs. According to USGS (2004b), Sebago Lake has a usable storage capacity of roughly 222,681 acre-feet (or 9,700 mcf) between 259.0 and 266.65 feet (figure 10). Sebago Lake has a retention time of 0.48 years, based on the usable storage capacity and average annual outflow. Between 262.0 and 266.65 feet, Sebago Lake contains approximately 5,800 mcf. This amount of storage has a significant influence on the peak flood events downstream of the project along the Presumpscot River.

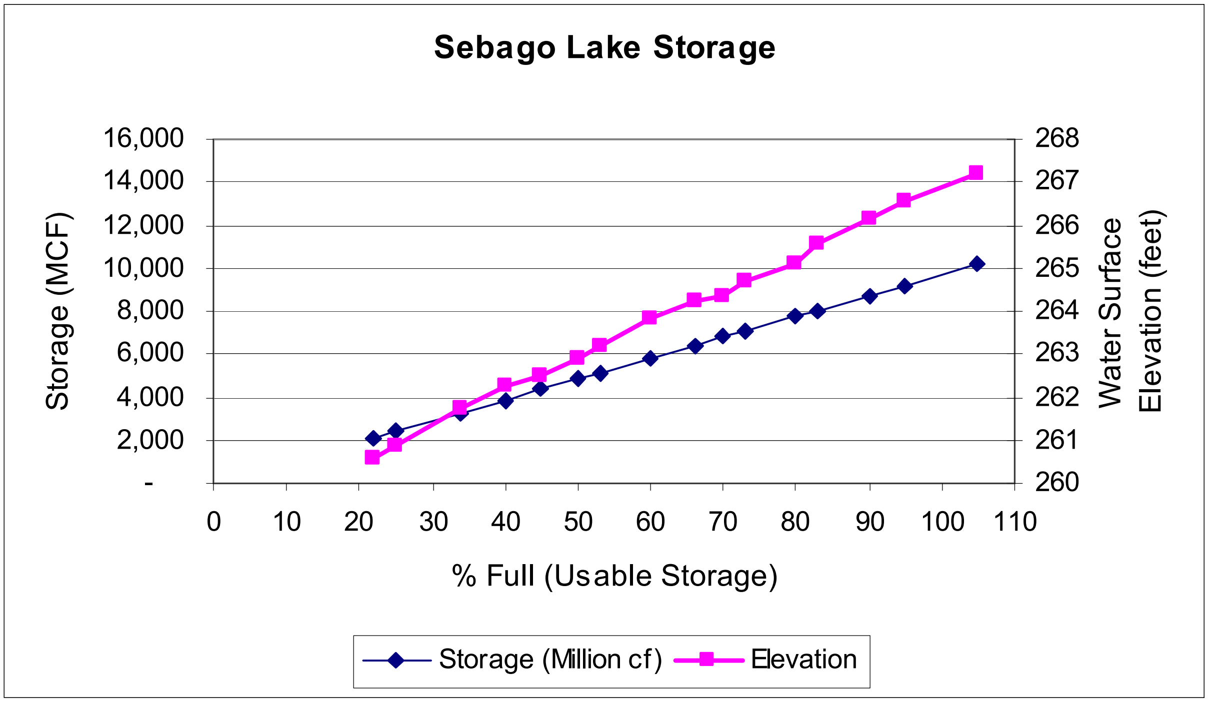

Figure 10. Sebago Lake storage information. (Source: USGS, 2004b)

Table 10 shows the estimated peak flow and maximum recorded flows for both the USGS gage at the outlet of Sebago Lake, as well as the USGS gage at Westbrook, approximately 20 miles downstream on the Presumpscot River. Among more recent flow events (not shown in the table), the third highest daily flow rate at the outlet of Sebago Lake (3,760 cfs) occurred on June 17, 1998.

Table 10. Peak flow information for the USGS gages at Sebago Lake and at Westbrook. (Sources: Hodgkins, 1999; USGS, 2004b; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

	USGS gage 01064000 Presumpscot River at outlet of Sebago Lake	**USGS gage 01064118 Presumpscot River at Westbrook**
Highest known peak and date.	7,000 cfs: April 7, 1902	23,300 cfs[1]: October 22, 1996
Second highest known peak and date.	3,790 cfs: April 3, 1936	13,900 cfs: August 20, 1991
Period of known peak flows	1886-2004	1895-1996[2]
Recurrence interval (years)		
2	1,278 cfs	5,295 cfs
5	2,090 cfs	7,837 cfs
10	2,785 cfs	9,884 cfs
25	3,883 cfs	12,990 cfs
50	4,871 cfs	15,744 cfs
100	6,072 cfs	18,850 cfs
500	9,637 cfs	27,958 cfs
Drainage area (mi^2)	441	577

[1] Flow estimated by the USGS at the I-95 Bridge in Falmouth and adjusted to Westbrook using a drainage area correction.

[2] Streamflow records ended at this gage on September 30, 1995. Stream gage height data exist for most of the 1996 to 2004 water years.

As detailed in the USGS publication, *Flood of October 1996 in Southern Maine* (Hodgkins and Stewart, 1997), the lower Presumpscot River had what was estimated to be a 250-year flood event. This report states that the outflow from Sebago Lake did not contribute a significant amount of water to the flooding downstream due to the storage capability of Sebago Lake. At the beginning of this rainfall event on October 20 and 21, the water level within Sebago Lake was approximately 262.8 feet and rose to about 265.7 feet by October 30. Discharge from Sebago Lake was 257 cfs on October 20, but was decreased by S.D. Warren to 175 cfs on October 21 and to 75 cfs on October 22, to help limit the flooding along the lower Presumpscot River. The flood discharge reached 23,300 cfs in the lower Presumpscot River at the Westbrook gage on October 22, 1996, almost all from the drainage area downstream of Sebago Lake.

Water Usage

The Water District estimates that they withdraw approximately 24 million gallons per day or 36 cfs from Sebago Lake, which is equal to 26,800 acre-feet, on a yearly basis. Evaporation estimates for Sebago Lake are 22 inches per year, or approximately 76 cfs.

The waters of the Presumpscot River, downstream of the project, are used for hydroelectric generation, millworks, municipal and industrial wastewater treatment facilities, and recreation. S.D. Warren's paper mill in Westbrook, downstream of the project, is the largest daily consumptive user of Presumpscot River water, withdrawing up to an estimated 28 cfs for process water. There are numerous seasonal homes along the upper section of the river that also draw water for domestic use. However, there are no consumptive uses associated with the Eel Weir Project area.

Water Quality

Sebago Lake

Sebago Lake is classified as Class GPA, which is the sole classification of great ponds, natural ponds and lakes under the Maine Water Classification Program. The standards for GPA waters as stated in the Maine State Statures (Maine, 2004) under Title 38 Section 465-A are provided below:

- *Class GPA waters must be of such quality that they are suitable for the designated uses of drinking water after disinfection, recreation in and on the water, fishing, agriculture, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other aquatic life. The habitat must be characterized as natural.*
- *Class GPA waters shall be described by their trophic state based on measures of the chlorophyll "a" content, Secchi disk transparency, total phosphorus content and other appropriate criteria. Class GPA waters shall have a stable or decreasing trophic state, subject only to natural fluctuations and shall be free of culturally induced algal blooms which impair their use and enjoyment. The number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 29 per 100 milliliters or an instantaneous level of 194 per 100 milliliters.*
- *There may be no new direct discharge of pollutants into Class GPA waters. Aquatic pesticide treatments or chemical treatments for the purpose of restoring water quality approved by the department and storm water discharges that are in compliance with state and local requirements are exempt from the no discharge provision. Discharges into these waters licensed prior to January 1, 1986, are allowed to continue only until practical alternatives exist. No materials may be placed on or removed from the shores or banks of a Class GPA water body in such*

> *a manner that materials may fall or be washed into the water or that contaminated drainage therefrom may flow or leach into those waters, except as permitted pursuant to section 480-C. No change of land use in the watershed of a Class GPA water body may, by itself or in combination with other activities, cause water quality degradation that would impair the characteristics and designated uses of downstream GPA waters or cause an increase in the trophic state of those GPA waters.*

In general, the water quality of Sebago Lake ranges from good to excellent based on transparency, total phosphorous, dissolved oxygen (DO) and algae. It is classified as oligotrophic, with clear, cold water, and is relatively free of algae and other plant life. The Water District has more than twenty years of water quality data for Sebago Lake.

The United States Environmental Protection Agency (USEPA) Ambient Water Quality Criteria (USEPA, 1986) suggest that to control nuisance aquatic growth and cultural or accelerated eutrophication, total phosphorus should not exceed 25 micrograms per liter (ug/l) in lakes and impoundments. The Water District has monitored total phosphorus levels at three locations around Sebago Lake (Lower Bay, Big Bay, and Jordan Bay). Monitoring has been conducted in Lower Bay since 1979. Total phosphorus concentrations within Lower Bay have not established any distinct trends, as average phosphorous concentrations have fluctuated within a range of 4.0 ug/l (3.0 ug/l to 7.0 ug/l). Phosphorus levels within Jordan Bay and Big Bay have been monitored since 1993, and average phosphorus concentrations exhibit a similar stable pattern, fluctuating no more than 3.0 ug/l at each station.

Chlorophyll *a* testing has been included in the Water District's monitoring program at three locations around Sebago Lake (Lower Bay, Big Bay, and Jordan Bay). Monitoring has been conducted in Lower Bay since 1979. Chlorophyll *a* concentrations within Lower Bay have not established any distinct trends, as average concentrations have ranged from 0.93 ug/l to 3.52 ug/l. Chlorophyll *a* levels within Jordan Bay and Big Bay have been monitored by the Water District since 1993, and average concentrations exhibit a similar, stable pattern, fluctuating no more than 1.6 ug/l at either station. There is no state standard for chlorophyll *a*. However, the levels documented by the Water District are indicative of oligotrophic waters.

The Water District has measured transparency using Secchi disk readings at three locations in Sebago Lake (Lower Bay, Big Bay, and Jordan Bay). Monitoring has been conducted in Lower Bay since 1976, and the average Secchi disk depth is 32.7 feet. Figure 11 shows the low, mean, high and 5-year mean Secchi depths in the Lower Bay portion of Sebago Lake.

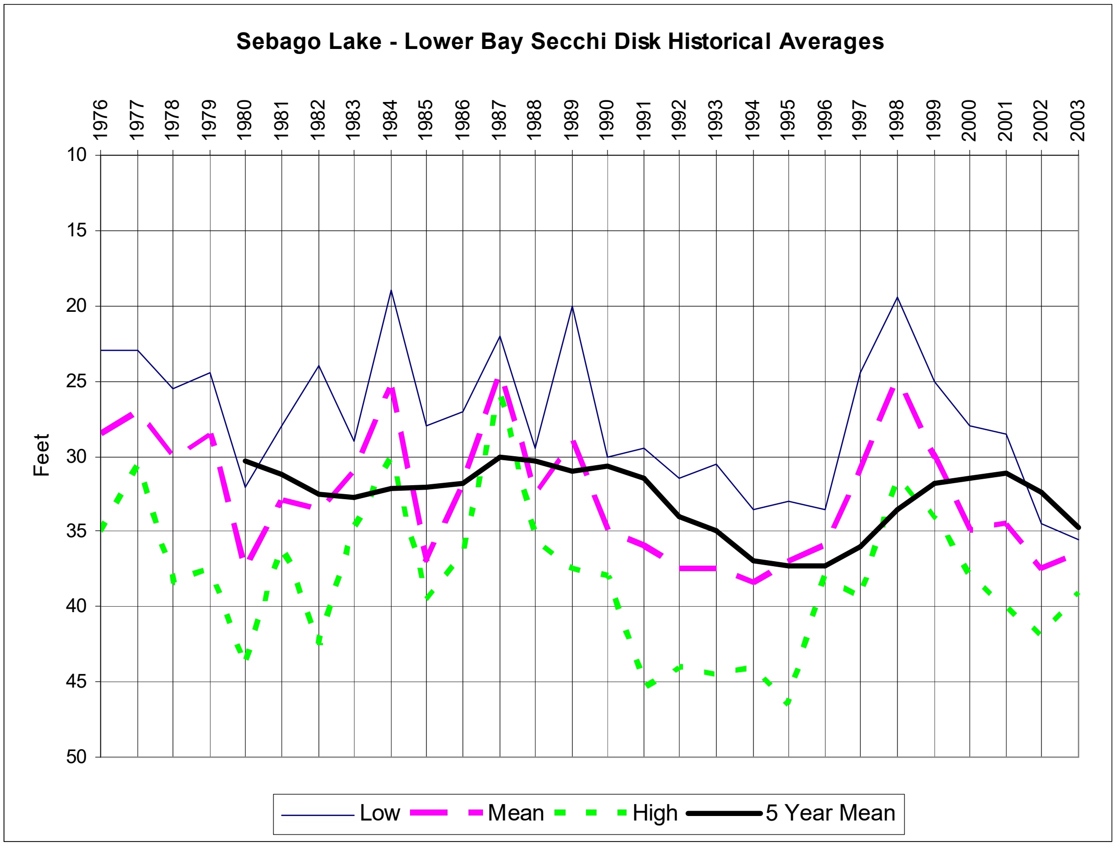

Figure 11. Sebago Lake Secchi disk depths in Lower Bay, 1976- 2003. (Source: Water District, 2004; as modified by Staff]

In compliance with FERC (1997b), S.D. Warren conducted annual near shore water quality studies. Data collected during 1998-2000 indicate that water quality in Sebago Lake is well within the standards established by the MDEP for lakes and ponds. In terms of overall lake classification, Sebago Lake fits into the oligotrophic category as an unproductive lake, with low ambient levels of phosphorus and nitrogen. A comparison of 1998-2000 data to historic data (1977) shows no substantial change in total phosphorus, conductivity, or turbidity; although turbidity and total phosphorous are lower in 2000 than earlier dates (table 11).

Table 11. Sebago Lake water quality results. (Source: Normandeau, 2001a)

		Specific Conductance (mmhos)		Turbidity (NTU)		Total Phosphorous (ug/l)	
Year	**Sampling Months**	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**
1977	July – September	36	32-60	0.42	0.24 - 1.20	7.79	1.0 - 27.0
1998-1999	June, November	--[a]	--[a]	0.42	0.08 - 2.70	5.26	2.6 - 15.2
2000	June, July, September	44	40 - 58	0.17	0.01 - 0.75	4.27	1.0 - 20.5

[a] No data due to faulty meter

Periphyton biomass and composition were also monitored as part of the annual near shore water quality studies. The impact of water level, shoreline housing density and degree of shoreline erosion on periphyton biomass and composition was analyzed. Monitoring results show little difference between stations for either Chlorophyll *a* or total biomass of attached benthic algae. Chlorophyll *a* typically ranges from 0-6 mg/m^2, significantly below the normal range for oligotrophic waters (<100 mg/m^2). Normal seasonal variations in the periphyton community were documented, with lower Chlorophyll *a* concentrations at low lake levels in the fall (October levels were 0.5-1.3 mg/m^2), and slightly higher concentrations during early summer high lake levels (July levels were 1.7-6.1 mg/m^2). Periphyton productivity is related to solar radiation and can vary seasonally. Algal blooms have not been reported in Sebago Lake.

Dissolved oxygen levels within the epilimnion in 1998, 1999 and 2000 were generally above 7.0 milligrams per liter (mg/l) and often in the 8 to 9 mg/l range during mid summer.

Presumpscot River

The Presumpscot River from the outlet of Sebago Lake to its confluence with the Pleasant River is classified as Class A, a distance of approximately 6 miles. Between the Pleasant River confluence and the Saccarappa Project, a distance of roughly 8 miles, the river is classified as Class B waters. The reach below the Saccarappa Project (Route 202) to tidewater is classified as Class C waters.

Class A waters, according to Maine statutes (Maine, 2004), must have DO concentrations at or above 7.0 mg/l or 75 percent saturation, whichever is higher, and may be used for such purposes as water supply after treatment and disinfection, fishing, water-based recreation, industrial process and cooling supply, hydropower, navigation, and fish and aquatic life habitat. The DO content of Class B waters must be above 7.0 mg/l or 75% of saturation, whichever is higher. For the period from October 1 to May 14, in order to ensure spawning and egg incubation of indigenous fish species, the 7-day mean DO concentration shall not be less than 9.5 mg/l, and the 1-day minimum DO concentration shall not be less than 8.0 mg/l in identified fish spawning areas. The DO content of Class C water must be above 5 mg/l or 60% of saturation, whichever is higher. In identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, water quality sufficient for these purposes must be maintained.

S.D. Warren conducted ambient water quality monitoring in the Eel Weir bypassed reach in the summer of 2000 and found that average DO concentrations ranged from 7.2 to 8.0 mg/l in the morning; and 9.0 to 9.4 mg/l in the evening. The water column was not stratified in this riverine reach. Secchi disk transparency measurements indicated that bottom substrates were visible at all sample locations on all sample dates.

Tables 12 and 13 show the results of the 2002 DO sampling from the Presumpscot River Watch.

Table 12. Presumpscot River DO sampling results, 2002. (Source: Presumpscot River Watch, 2004)

Class	Location	Average (mg/l)	Lowest (mg/l)	Average (% sat)	Lowest (% sat)	Number of sampling dates
A	Near outlet of Sebago Lake	7.92	7.88	80.29	72.19	2
A	Below North Gorham Impoundment	7.56	4.32	82.55	49.88	7
A	Within Dundee impoundment	7.61	6.86	84.18	75.77	7
A	Hurricane Road	7.22	6.08	80.23	65.88	7
B	Route 202	7.69	7.10	81.37	75.58	8
C	L. Presumpscot River (7 stations)	7.40	6.45	80	62.86	50

Table 13. Presumpscot River DO sampling results, 2003. (Source: Presumpscot River Watch, 2004)

Class	Location	Average (mg/l)	Lowest (mg/l)	Average (% sat)	Lowest (% sat)	Number of sampling dates
A	Near outlet of Sebago Lake	7.97	7.08	80.29	72.19	7
A	Below North Gorham Impoundment	8.12	6.30	82.55	49.88	7
A	Within Dundee impoundment	8.24	7.38	84.18	75.77	7
A	Hurricane Road	7.85	6.82	80.23	65.88	7
B	Route 202	7.92	7.22	81.37	75.58	7
C	L. Presumpscot River (7 stations)	7.84	6.30	81.72	67.86	52

The water quality criteria also have maximum concentration standards for *E. coli* bacteria. Class A waters may not reach *E. coli* concentrations above what would naturally occur. Class GPA waters may not exceed a geometric mean of 29 MPN[29] per 100 milliliters (ml) or an instantaneous value of 194 MPN per 100 ml. Class B waters may not exceed a geometric mean of 64 MPN per 100 ml or an instantaneous value of 427 MPN per 100 ml. Class C waters may not exceed a geometric mean of 142 MPN per 100 ml or an instantaneous value of 949 MPN per 100 ml. Samping by the Presumpscot River Watch in 2002 and 2003 (Presumpscot River Watch, 2004) indicates the river meets the standards for *E. coli*.

Total phosphorus concentrations in the river reaches above Saccarappa dam were within suggested EPA Ambient Water Quality Criteria guidelines, below 25 ug/l. The total suspended solids concentrations monitored during the studies by Presumpscot River Watch were low, ranging from 0.64 to 1.43 mg/l (Greater Portland Council of Governments, 1993).

S.D. Warren also conducted a study of the benthic macroinvertebrate community in the Eel Weir bypassed reach during 2000 (Lotic, 2002). Although this reach is designated Class A, the benthic macroinvertebrate community exhibits characteristics that are typical of natural lake outlet situations, where oligotrophic lake waters typically do not support the species diversity of Class A streams in Maine, and/or exhibit hyperdominance of filter feeding organisms because of the lake discharge. Nonetheless, in a letter dated February 14, 2002, the MDEP concludes that the bypassed reach supports a Class A macroinvertebrate community, because it is representative of the natural environment.

S.D. Warren manages flows in the Presumpscot River to meet state water quality standards. In the past, S.D. Warren voluntarily provided minimum flow releases from Sebago Lake that increased as a function of water temperature, to maintain adequate DO levels in the river below the Westbrook Mill. The temperature-based summer flow release plan, which is designed to help regulate the water temperature downstream of the project, was subsequently incorporated into the amended LLMP in 2001 and is provided in figure 12.

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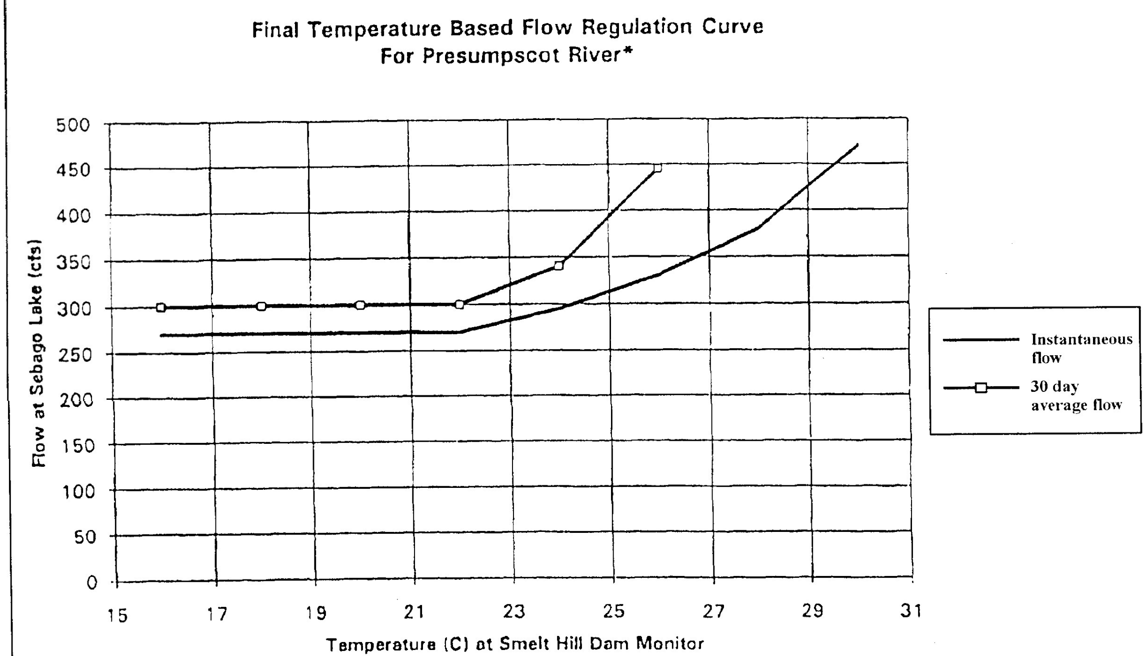
[29] MPN=Most Probable Number



*Developed in Jan of 1998 using S.D. Warren proposed license BOD5 of 6780 and 3565 lb/day, respectively for a daily maximum and monthly average. River design flows at Westbrook are 7Q10 of 300 cfs and 30Q10 of 330 cfs, respectively. Instantaneous flow curve results in compliance of minimum Class C (5 ppm and 60% saturation) and SC (70% saturation) DO standards. The 30 day average flow curve results in compliance of the 30 day average DO standard (3.5 ppm). Temperatures of 26 C and 30 C assumed ceilings for daily and 30 day average river temperatures, respectively.

Figure 12. Sebago Lake flow release curve. (Source: FERC, 2002)

Sebago Lake Tributaries

With the exception of portions of the Crooked River, which are Class AA, and Stevens Brook and Mile Brook, which are Class B, all other tributaries entering Sebago Lake are Class A waters. The Surface Water Treatment Rule of the Federal Safe Drinking Water Act requires that any public water supply not filtering its source water demonstrate that it is controlling activities in its watershed that may be detrimental to the quality of its source waters. The Water District fulfills this requirement by maintaining a rigorous watershed protection program. As part of the Water District's watershed protection program, several tributary streams are annually monitored for turbidity, total phosphorus, filtered phosphorus, fecal coliform, *E. coli*, and stream flow.

Water samples collected in 2000 near tributary inflow locations had higher turbidity and total phosphorous concentrations and slightly higher specific conductance values than sampling sites away from tributary inflow points (table 14).

Table 14. Sebago Lake water quality in the vicinity of and away from tributaries. (Source: Normandeau, 2001a)

	Near Tributaries		Away from Tributaries	
Parameter	**Mean**	**# of sites**	**Mean**	**# of sites**
Turbidity (NTU)	0.35	20	0.12	75
Specific conductance (umhos)	46.2	20	43.15	74
Total phosphorus (ug/l)	7.15	20	3.51	76

Installation of septic systems on property located within 200 feet of the high water mark of Sebago Lake requires written approval of the Water District. The Water District's jurisdiction also extends up some of the Sebago Lake's tributaries (including, for example, the area around Sebago Cove in Naples and along the Crooked River to Route 302). The approval process is based on the Maine State Plumbing Code [CMR 144A Part 241] (Water District, 2004), and, therefore, is similar to that required by the municipality in which the property is located.

b. Environmental Effects:

Sebago Lake Storage and Effects of Alternative LLMP on Flood Control

Sebago Lake, due to its large storage capacity affects both the downstream Presumpscot River flow regime and the shoreline areas of Sebago Lake. During and after substantial rainfall/runoff events, the amount of flow released from Sebago Lake is influenced by the storage capacity of the lake, which is directly related to the water surface elevation, as well as the operations of the Eel Weir Project by S.D. Warren.

Some aspects of the various LLMP alternatives have the potential to affect the flood storage capability within Sebago Lake, and the related Presumpscot River flow regime. None of the stakeholders, other than Stephen Kasprzak and FOSL, made specific recommendations for lake levels related to flooding effects or flood control. However, S.D. Warren proposes that it be granted the flexibility to modify the operation of the Eel Weir Project to reduce flooding effects downstream, in the event of higher river flows or storm events. Because Sebago Lake storage capacity may have a major effect on the Presumpscot River flows, we discuss the potential effects of the various LLMP alternatives on flooding potential.

Our Analysis

Hydrology and flood storage potential

There are substantial differences other than just area, between the 436-mi^2 Sebago Lake drainage basin and the 136-mi^2 Presumpscot River drainage basin below Sebago Lake, including:

- Climatic and snowpack differences – the drainage area above Sebago Lake typically has a deeper and more stable snowpack, due to its generally higher elevation, more snowfall and colder climate. The drainage area above Sebago Lake also releases runoff later in the spring than the warmer coastal drainage area below Sebago Lake.

- Watershed characteristics – the drainage area above Sebago Lake has a higher percentage of lakes and ponds, and is less developed. This generally leads to a delayed and a slower to rise and slower to decrease hydrograph from runoff events, than what is typical of the drainage area below Sebago Lake.

Figure 13 illustrates the difference in the timing of peak flows between the USGS gage on the Presumpscot River at Westbrook (about 20 miles downstream of Sebago Lake) and the USGS gage on the Crooked River near Naples, one of the major tributaries to Sebago Lake. This figure, based on data from 1976 (when both gages were active), indicates that the peak inflow, at least from the Crooked river is often a day or two later than the peak flow at Westbrook. Figure 14 is the snowpack water content map for Maine in mid March, 2004, which is considered “typical.” This figure shows the sharp difference in snowpack between coastal Maine and inland areas.

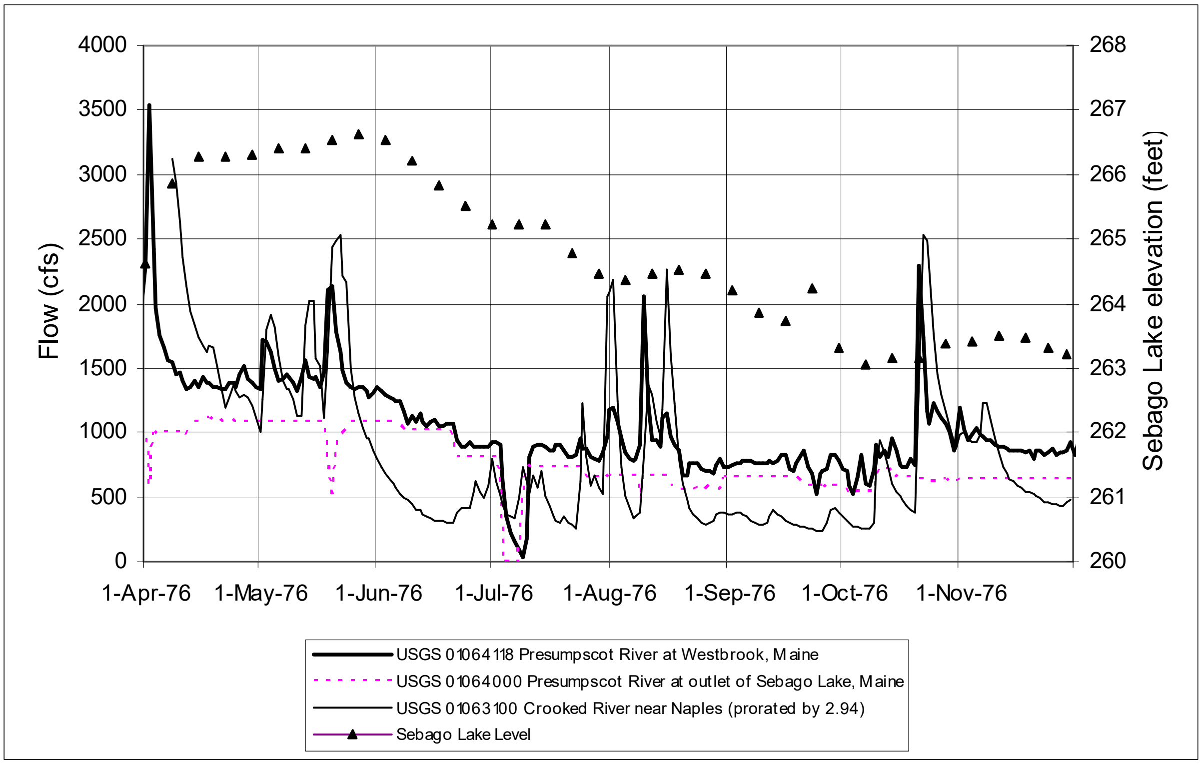


Figure 13. Presumpscot River at Westbrook and Crooked River at Naples flow timing comparison, April through November, 1976. (Source: USGS, 2004b; Water District, 2004) [*Note: the flow for the Crooked River gage was prorated by a factor of 2.94 for purely graphical reasons and is not an attempt to show that this gage is representative of all of the inflow to Sebago Lake*]

Figure 14. Snowpack water content map for March 15-16, 2004. (Source: Maine Snow Survey, 2004)

Public Access for figure 14 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

The amount of flood storage available in Sebago Lake varies by season and by lake level, as illustrated in figure 15, which shows the stage/storage relationship, in mcf . Figure 15 shows the amount of storage available below the spillway elevation of 266.65 feet, for the following scenarios:

- the average water level for the 1910 to 1986 time period (historic data);
- the maximum water level allowed in the current LLMP;
- the maximum water level allowed by the LLMP recommended by Maine;
- the maximum water level allowed by the alternative LLMP recommended by S.D. Warren.

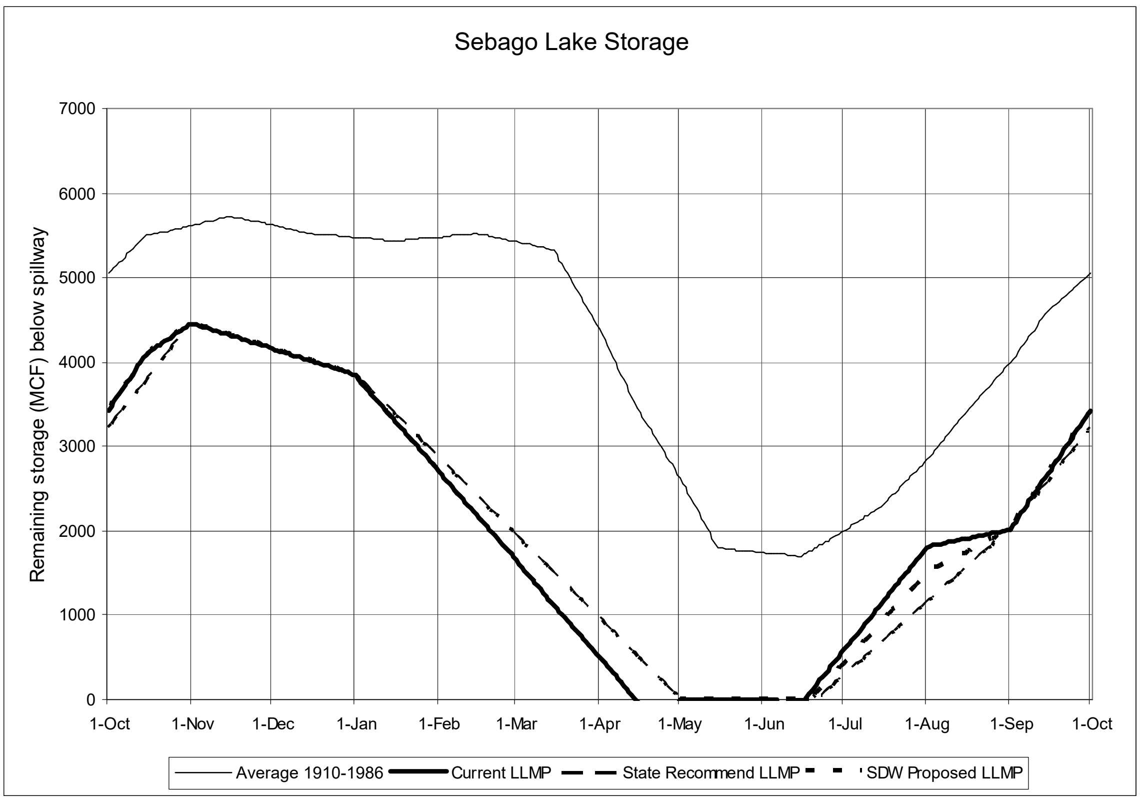


Figure 15. Approximate storage (mcf) within Sebago Lake under different LLMP scenarios. (Source: FERC, 1997b, S.D. Warren, 2002a; USGS, 2004b)

Table 15 summarizes the storage available under the different alternatives, for the first of the month water surface elevations allowed under each alternative, or as recorded during the 1910 to 1986 period.

Table 15. Approximate monthly Sebago Lake storage (mcf) under different LLMP scenarios. (Source: FERC, 1997b; S.D. Warren, 2002a; USGS, 2004a)

Date	1910 – 1986 average	Current LLMP maximum	State LLMP maximum	S.D. Warren LLMP maximum
1-Oct	5,050	3,428	3,220	3,428
1-Nov	5,611	4,452	4,452	4,452
1-Dec	5,623	4,160	4,160	4,160
1-Jan	5,477	3,842	3,842	3,842
1-Feb	5,477	2,708	2,867	2,708
1-Mar	5,428	1,647	1,939	1,647
1-Apr	4,391	500	964	500
1-May	2,623	-	-	-
1-Jun	1,744	-	-	-
1-Jul	2,000	585	280	439
1-Aug	2,842	1,805	1,147	1,500
1-Sep	3,989	2,013	2,013	2,013
Avg.	**4,188**	**2,514**	**2,488**	**2,469**

Another way to describe the Sebago Lake storage capability is to estimate the amount of runoff, in inches, that could be stored within the lake. Based on a watershed of 441 mi^2 at the outlet of Sebago Lake, table 16 shows the amount of runoff that could be stored within Sebago Lake under the different LLMPs.

Table 16. Approximate Sebago Lake storage (inches of runoff) available on the first of the month at the alternative LLMPs. (Source: FERC, 1997b; S.D. Warren, 2002a; USGS, 2004a)

Date	1910 – 1986 Average	Current LLMP maximum	State LLMP maximum	S.D. Warren LLMP maximum
1-Oct	4.9	3.4	3.2	3.4
1-Nov	5.5	4.4	4.4	4.4
1-Dec	5.5	4.1	4.1	4.1
1-Jan	5.3	3.8	3.8	3.8
1-Feb	5.3	2.7	2.8	2.7
1-Mar	5.3	1.6	1.9	1.6
1-Apr	4.3	0.5	0.9	0.5
1-May	2.6	0.0	0.0	0.0
1-Jun	1.7	0.0	0.0	0.0
1-Jul	2.0	0.6	0.3	0.4
1-Aug	2.8	1.8	1.1	1.5
1-Sep	3.9	2.0	2.0	2.0
Avg.	**4.1**	**2.5**	**2.4**	**2.4**

Data in tables 15 and 16, and in figure 15, indicate that historically more flood storage was available in Sebago Lake, because lower lake levels existed, thus providing more storage for runoff. The current and two proposed alternative LLMPs provide, on average, about 60 percent of the storage capability, because lake levels would be maintained at higher levels. Of the three alternatives shown, Maine's and S.D. Warren's plans would provide slightly less storage than the current LLMP.

Sebago Lake effects on peak flow events

Figure 16 provides a summary of the dates of the peak flow events at the Westbrook USGS gage and the USGS gage at the outlet of Sebago Lake, for water years 1976 to 2004. Peak flow events occurred on the same dates at both gages only in 1989 and 2003, with 1989 being the higher flow event representing approximately a 10-year flood event. In 1989, the Sebago Lake outflow gage accounted for 36 percent of the daily flow at the Westbrook gage and in 2003, the percentage was 30 percent.

Figure 16 shows that there are two basic time periods for peak flow events for the Presumpscot River:

- The most frequent are in winter and spring due to rainfall, snowmelt or a combination of the two, usually in the months of March and April.

- Late summer and fall events are less common but are usually the result of hurricanes or remains of hurricanes, as in August 1991, October 1996 and September 1999.

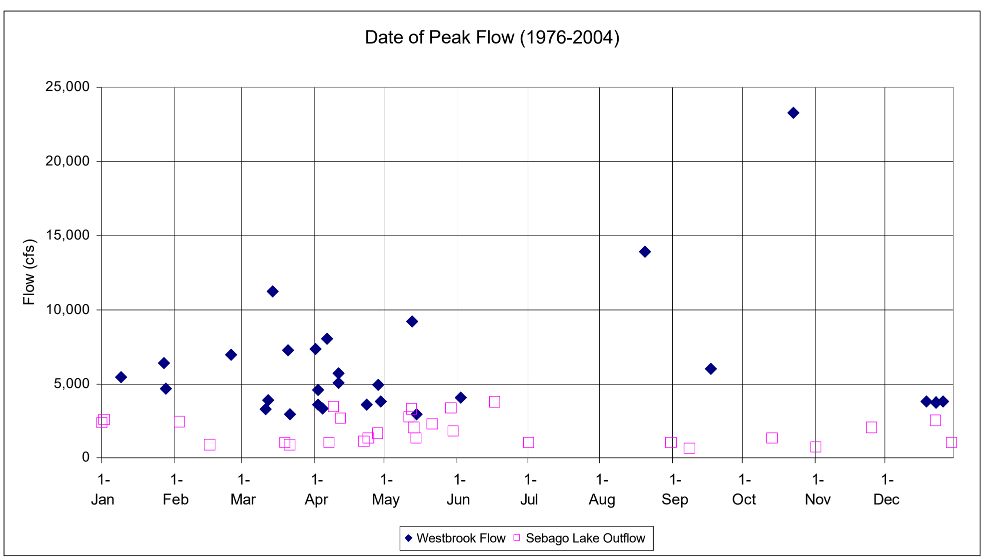


Figure 16. Peak annual flow dates at the Westbrook and Sebago Lake outflow gages. (Source: USGS, 2004b; emails from Gregory J. Stewart, Data Section Chief, USGS, Augusta, ME, September 7, 2004)

Table 17 provides a much more detailed view of the influence of the Sebago Lake outflow on the annual peak flow of the Presumpscot River at the Westbrook USGS gage. These data indicate that the contribution of Sebago Lake outflow was mostly limited, other than on May 12, 1989, when Sebago Lake was above the spillway elevation. In addition, it is clear that S.D. Warren limited the outflow from Sebago Lake on days of peak flow at Westbrook, as for water years 1977, 1983, 1987, 1991, and 1996. During these five peak flow events on the lower Presumpscot River, sufficient lake storage capacity was available to allow S.D. Warren to decrease the outflow of Sebago Lake for at least a day.

Table 18 is basically a continuation of table 17 and provides data on Sebago Lake, both outflows and peak water surface elevations within 2 weeks after the peak at Westbrook. This information helps to show that for most years, the peak flow from Sebago Lake in the 2-week period after the peak at the Westbrook gage remained relatively low and did not approach a substantial contribution to the flow in the Presumpscot River.

Table 17. Presumpscot River at Westbrook, USGS gage 01064118 peak flow summary, compared to Sebago Lake outflow. (Source: USGS, 2004b; emails from Gregory J. Stewart, Data Section Chief, USGS, Augusta, ME, September 7, 2004 ; Water District, 2004)

Water Year	Date of peak flow at Westbrook	Stream Gage Height (feet)	Peak flow (cfs)	Sebago Lake elevation (feet) on date of Westbrook peak	Sebago Lake 1910-1986 average elevation on Westbrook gage peak date[a]	Sebago Lake daily discharge (cfs) on date of Westbrook peak	Approximate % of flow at Westbrook from Sebago Lake
1976	Apr. 02, 1976	NA	3,600	264.8	263.11	583	16.2%
1977	Mar. 14, 1977	NA	11,250	262.6	262.29	35	0.3%
1978	Jan. 09, 1978	NA	5,470	265.5	262.18	889	16.3%
1979	Apr. 28, 1979	NA	4,910	266.4	264.38	676	13.8%
1980	Apr. 11, 1980	NA	5,710	262.8	263.90	263	4.6%
1981	Feb. 25, 1981	NA	6,960	262.8	262.18	131	1.9%
1982	Jun. 02, 1982	NA	4,070	266.2	265.23	670	16.5%
1983	Mar. 20, 1983	NA	7,240	265.4	262.52	63	0.9%
1984	Apr. 06, 1984	NA	8,020	265.4	263.33	340	4.2%
1985	Mar. 12, 1985	14.26	3,920	262.2	262.27	350	8.9%
1986	Jan. 27, 1986	19.11	6,400	263.8	262.17	350	5.5%
1987	Apr. 01, 1987	20.83	7,360	262.4	263.06	0	0.0%
1988	Apr. 29, 1988	14.02	3,810	264.0	264.42	254	6.7%
1989	May 12, 1989	22.26	9,200	266.7	265.04	3,310	36.0%
1990	Apr. 04, 1990	13.04	3,350	264.3	263.22	350	10.4%
1991	Aug. 20, 1991	NA	13,900	264.7	263.73	50	0.4%
1992	Mar. 11, 1992	12.89	3,280	262.5	262.27	546	16.6%
1993	Apr. 11, 1993	16.1	5,080	262.9	263.60	352	6.9%
1994	Dec. 22, 1993	14.85	3,720	263.6	262.14	856	23.0%
1995	Dec. 25, 1994	15.07	3,790	262.8	262.15	579	15.3%
1996	Jan. 28, 1996	15.82	4,700 [b]	263.3	262.17	856	roughly 20%

Water Year	Date of peak flow at Westbrook	Stream Gage Height (feet)	Peak flow (cfs)	Sebago Lake elevation (feet) on date of Westbrook peak	Sebago Lake 1910-1986 average elevation on Westbrook gage peak date[a]	Sebago Lake daily discharge (cfs) on date of Westbrook peak	Approximate % of flow at Westbrook from Sebago Lake
1997	Oct. 22, 1996	34.1	23,300	264.8	262.08	75	0.3%
1998	No data						
1999	Sep. 17, 1999	18.32	6,000 [b]	263.6	262.84	300	roughly 5%
2000	Apr. 23, 2000	13.47	3,600 [b]	265.7	264.16	991	roughly 30%
2001	Dec. 18, 2000	14.04	3,800 [b]	262.4	262.13	667	roughly 20%
2002	May 14, 2002	10.8	<3,000 [b]	265.1	265.13	133	roughly 5%
2003	Mar. 21, 2003	10.43	<3,000 [b]	261.7	262.56	833	roughly 30%
2004	Apr. 2, 2004	15.52	4,600 [b]	263.5	263.11	250	roughly 5%

[a] For dates after 1986, the elevation shown is the average lake elevation on the month and day of the peak event at Westbrook, from the 1910-1986 period.

[b] Flow estimated from stage flow relationship in prior years, accuracy is limited.

Table 18. Westbrook peak flow summary continuation. (Sources: USGS, 2004b; emails from Gregory J. Stewart, Data Section Chief, USGS, Augusta, ME, September 7, 2004 ; Water District, 2004; USGS, 2004a)

Water Year	Date	Westbrook flow (cfs)	Lake elevation (feet) on date of Westbrook peak	Daily lake discharge (cfs) on date of Westbrook peak	Peak lake discharge (cfs) within 2 weeks	Date of peak lake discharge	Elevation (feet) on date of peak lake discharge or within 2 weeks of Westbrook gage peak
1976	Apr. 02, 1976	3,600	264.8	583	1,080	14-Apr	266.3
1977	Mar. 14, 1977	11,250	262.6	35	831	18-Mar	264.6
1978	Jan. 09, 1978	5,470	265.5	889	1,000	11-Jan	266.1
1979	Apr. 28, 1979	4,910	266.4	676	2,160	2-May	267.0
1980	Apr. 11, 1980	5,710	262.8	263	263	multiple	264.2
1981	Feb. 25, 1981	6,960	262.8	131	831	3-Mar	263.9
1982	Jun. 02, 1982	4,070	266.2	670	685	9-Jun	266.4
1983	Mar. 20, 1983	7,240	265.4	63	2,320	26-Mar	266.8
1984	Apr. 06, 1984	8,020	265.4	340	3,400	9-Apr	266.3
1985	Mar. 12, 1985	3,920	262.2	350	350	multiple	262.7
1986	Jan. 27, 1986	6,400	263.8	350	833	7-Feb	264.8
1987	Apr. 01, 1987	7,360	262.4	0	860	12-Apr	265.9
1988	Apr. 29, 1988	3,810	264.0	254	254	multiple	265.0
1989	May 12, 1989	9,200	266.7	3,310	3,310	multiple	267.2
1990	Apr. 04, 1990	3,350	264.3	350	350	multiple	265.7
1991	Aug. 20, 1991	13,900	264.7	50	1,330	27-Aug	264.7
1992	Mar. 11, 1992	3,280	262.5	546	554	12-Mar	263.1
1993	Apr. 11, 1993	5,080	262.9	352	841	22-Apr	265.9
1994	Dec. 22, 1993	3,720	263.6	856	998	23-Dec	263.6
1995	Dec. 25, 1994	3,790	262.8	579	1,000	29-Dec	262.9
1996	Jan. 28, 1996	4,700[a]	263.3	856	856	multiple	263.7
1997	Oct. 22, 1996	23,300	264.8	75	592	4-Nov	266.2
1998	No data						

Water Year	Date	Westbrook flow (cfs)	Lake elevation (feet) on date of Westbrook peak	Daily lake discharge (cfs) on date of Westbrook peak	Peak lake discharge (cfs) within 2 weeks	Date of peak lake discharge	Elevation (feet) on date of peak lake discharge or within 2 weeks of Westbrook gage peak
1999	Sep. 17, 1999	6,000 [a]	263.6	300	838	29-Sep	265.0
2000	Apr. 23, 2000	3,600 [a]	265.7	991	1090	5-May	266.6
2001	Dec. 18, 2000	3,800 [a]	262.4	667	667	multiple	262.6
2002	May 14, 2002	<3,000 [a]	265.1	133	275	20-May	265.8
2003	Mar. 21, 2003	<3,000 [a]	261.7	833	833	multiple	262.5
2004	Apr. 2, 2004	4,600 [a]	263.5	250	250	multiple	264.7

[a] Flow estimates from stage flow relationship in prior years, accuracy is limited.
'Multiple' indicates that this flow value was recorded on multiple days within the 2 week period.

Effects of Alternative LLMPs on Flood Control

As we described above, three primary LLMP alternatives have been either proposed or recommended by stakeholders. In addition, alternatives have been recommended that are similar in some ways to the three primary alternatives. We discuss below how the various provisions of these alternatives would affect flooding potential.

Increase winter water levels. Maine's alternative would maintain higher winter water levels, compared to the current LLMP, which does not specify a minimum lake level. Maine recommends that S.D. Warren maintain the lake level from January 1 to March 1 at or above the long term (1910-1986) median levels, then resume normal refilling from March 1 to May 1 (on or after) to achieve the target elevation. Maine also recommends that the water levels should be managed based on precipitation, snowpack, energy needs and downstream flow requirements, with the goal of the lake level reaching the spillway crest elevation on, or anytime after, May 1. Maine also recommends that whenever possible, the maximum lake level be no higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1, and to 266.65 feet on May 1.

The long-term (1910-1986) winter drawdown was to about 262.0 feet, where it would remain for about two months. If Maine's plan is implemented, winter lake levels could range between elevation 262.0 feet and the maximum level on January 1 of elevation 263.5 feet. During the remainder of the winter the maximum level could rise to above 264.0 feet in February and above 265.0 feet in March. If the lake is allowed to reach these higher levels during the winter months, there would be significantly less storage available for spring runoff, as shown in tables 15 and 16 and figure 15. The loss of this storage could have a significant effect on flows in the Presumpscot River. To illustrate this effect, we provide an example of how storage within Sebago Lake decreased the Presumpscot River flow in the early spring (April) of 1987.

According to historical records, February and March 1987 were relatively dry, but at the end of March many areas in Maine had a remaining snowpack with a water equivalent of over 5 inches. On March 31 and April 1, 5 to 7 inches of rainfall occurred over most of the region above and below Sebago Lake. Prior to the start of the storm, the water level in Sebago Lake was lower than normal at 261.42 feet, approximately 1.4 feet below the 1910 to 1986 mean for that date, and roughly 4.5 feet below the current and proposed LLMP maximums. Due to the low lake level, S.D. Warren had the ability to basically stop the outflow from Sebago Lake on April 1, the date of the peak flow (7,360 cfs) at the downstream Westbrook gage. Other nearby rivers in Maine such as the Saco and the Androscoggin, which do not have the advantage of a large storage lake such as Sebago Lake, suffered substantial flooding due to this storm.

By calculating the change in storage, using water surface elevations on April 2 and April 9, approximately 4,000 cfs would have been released daily during this 7-day period, if Sebago Lake did not have available storage capacity below the spillway crest. Without this storage, the peak water surface for Sebago Lake during this event or soon after would have likely exceeded 266.65 feet. This would have resulted in uncontrolled spillage out of Sebago Lake. The precise effects of this, in terms of additional flow in the Presumpscot River at the Westbrook gage on the April 1 peak flow, are difficult to determine because of several factors, such as:

- the timing delay of the peak inflow reaching the Sebago Lake outlet, compared to the peak for the drainage area below Sebago Lake reaching the Westbrook gage;
- effects of any available storage, however limited, within Sebago Lake at even the higher lake levels; and
- rainfall intensity and distribution differences between the two watersheds for this storm event.

One possible result would have been a peak not much higher than recorded on April 1, 1987, but a much longer period of flow above 5,000 cfs at the Westbrook gage. Based on figure 15 and table 15, the approximately 4,400 mcf of storage (at 263.0 feet) remaining in Sebago Lake on April 1 under historical operations would substantially limit the possible effects of this type of an event, as compared to the current, S.D. Warren proposed or Maine recommended LLMPs. Maine's plan would maintain higher winter and early spring water levels, compared to the other alternatives and, therefore, would have the potential to cause the highest amount of downstream flooding, if a high runoff event was to occur in early spring.

Eliminate the springtime range above full pond. All parties appear to agree that water levels above the spillway crest should be limited or eliminated to the extent possible. The current LLMP allows a +/- 0.5-foot range on either side of the spillway crest elevation of 266.65 feet, up to 267.15 feet, on, or after, May 1 through June 15.

In its comments, Maine recommends that: (1) the fluctuation above the spillway crest be eliminated; and (2) flow releases be increased whenever the lake rises above the spillway to present the lake from reaching 267.15 feet. S.D. Warren responded to Maine's plan, in a letter dated July 15, 2004, stating the following: (1) the current LLMP recognizes that some leeway above the spillway crest, up to the limits of the flow easements (267.15 feet), is necessary to achieve full pond, and some leeway is needed if the spillway level is the target elevation; (2) increased flow releases whenever the lake level has the potential to exceed the spillway elevation would have the potential to cause or contribute to flooding downstream of the project; and (3) if the requirement to release flows when the lake has the potential to exceed the spillway elevation is adopted, a provision should be included to allow S.D. Warren to obtain a temporary variance of the flow requirement, under circumstances such as flooding on the Presumpscot River downstream of the Eel Weir Project.

Stephen Kasprzak and FOSL state that Sebago Lake has reached full pond only 38 years in the 1910 to 2004 time period, and recommend a maximum target elevation of 265.65 feet. Mr. Kasprzak also recommends a tolerance range of from +1 foot to -0.5 foot. The Sebago Lake Coalition recommends a full pond target of 266.0 to 266.5 feet occurring as early as May 1, and that the full pond target can be reached between May 1 and late-June. They also recommend that the full pond not stay at or above the spillway for more than 3 weeks, followed by a slow decline through the summer, and state that a high lake level is important to fisheries, wildlife, wetlands, and the boating economy.

Stephen Kasprzak's and FOSL's recommendation would provide approximately 1,220 mcf or 28,000 acre-feet of storage below the spillway crest at an elevation of 265.65 feet. This volume of water is equal to approximately 2,000 cfs discharging over a 7-day period. However, since Kasprzak's recommendation has a tolerance of +1 foot, the maximum elevation would be 266.65 feet, which is equal to full pond proposed and recommended by S.D. Warren and Maine.

Peak annual elevations and dates of the occurrences, since 1910, are shown in figure 17. This figure shows that the lowest peak elevations occurred from 1910 to 1986 and may have influenced the historic mean of approximately 265.4 feet for that period. For example, if the five lowest peak values, which occurred in 1911, 1941, 1948, 1957 and 1965, are removed, the mean value for the 1910 to 1986 period becomes approximately 266.0 feet. The median elevation for the 1910 to 1986 period is 266.5 feet.[30] This compares to a mean of 266.2 feet and a median of 266.3 feet for the 1987-2004 period.

[30] The median value is often used in hydrological analyses to indicate the value that is most likely to occur, because it limits the influence of peaks and valleys associated with floods or droughts.

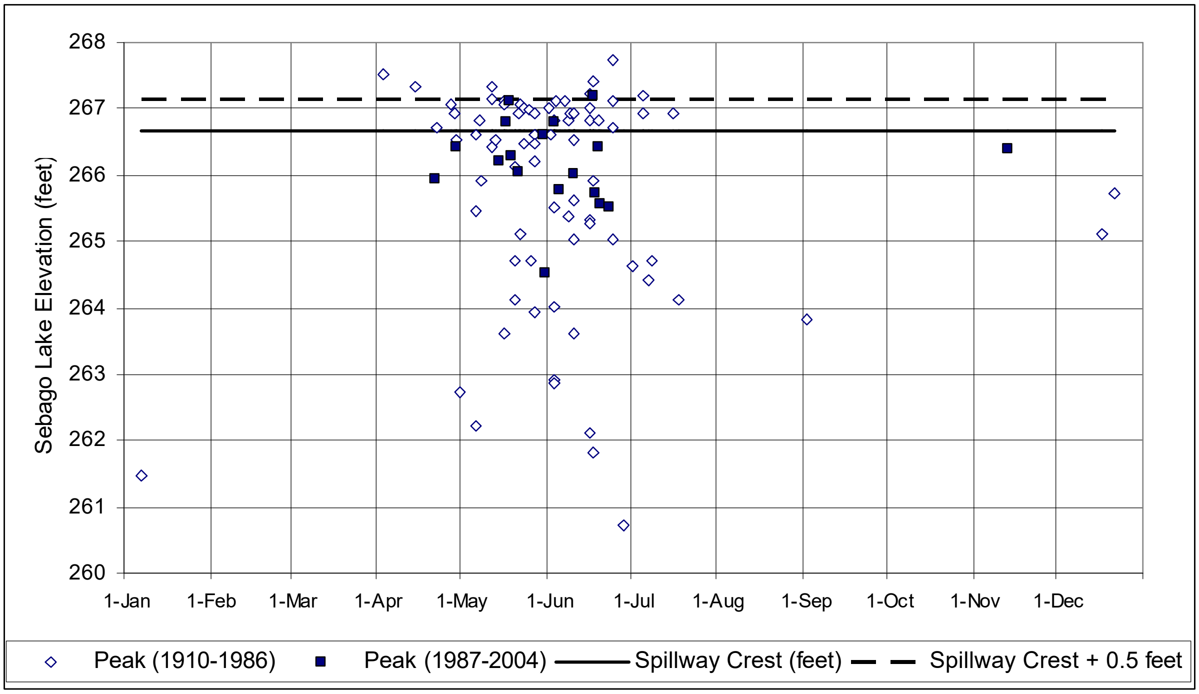


Figure 17. Date of the peak annual water surface elevation for Sebago Lake since 1910. (Sources: Water District, 2004; USGS, 2004b)

The major remaining difference between the alternative LLMPs for the spring period, is that Maine's recommendation includes the provision that flow must be released any time that the lake has the potential to exceed the spillway crest elevation. S.D. Warren has a history of attempting to reduce the discharge rate from Sebago Lake, to help limit the effect of lake discharge during or prior to flooding conditions along the downstream Presumpscot River. Maine's recommended change would reduce the short time delay for the peak outflow from Sebago Lake that has been possible by using the approximately 600 mcf (or 6,900 cfs for 1 day) of storage between 266.65 and 267.15 feet.

Figure 18 shows an example of S.D. Warren's ability to manage the outflow of Sebago Lake to help decrease the peak flow downstream on the Presumpscot River. Beginning in late-March 1983, there was limited storage available, between elevation 266.5 and 267.0 feet. This figure shows that the flow on April 25 would have approached 8,000 cfs, instead of the recorded peak slightly over 6,000 cfs, without the temporary decrease in outflow from Sebago Lake. A flow of 8,000 cfs is approximately the 5-year flood event for the Presumpscot River as indicated in table 10. Figure 18 also shows another instance, in March 1983, when outflow from Sebago Lake was reduced by S.D. Warren to limit higher flows downstream from the lake. In mid-March, however, there was substantial additional storage available in the lake because the lake had not yet reached the spillway crest elevation.

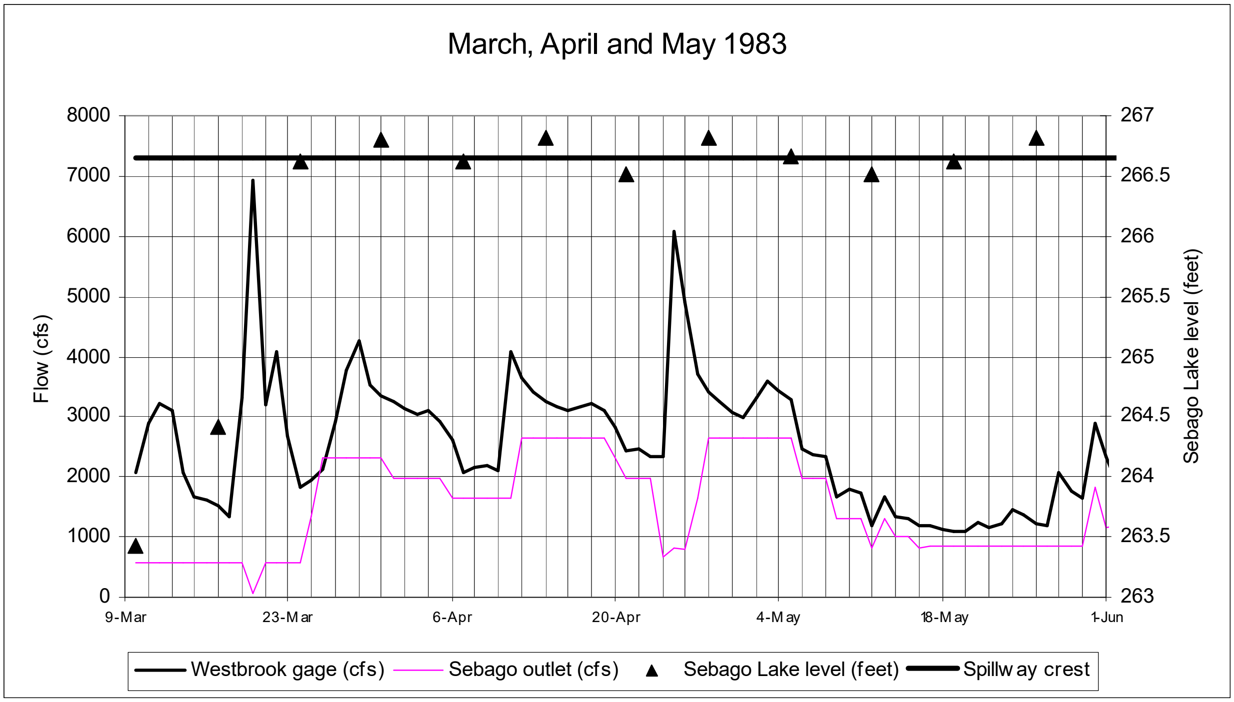


Figure 18. Relationship between the Westbrook gage, Sebago Lake outflow, and Sebago Lake water surface elevation during March, April and May 1983. (Source: USGS, 2004b; Water District, 2004)

Expand the summer/fall target range. S.D. Warren proposes to implement a 3-inch tolerance range for the August 1 target level (265.17 feet), between elevation 264.92 and 265.42 feet. Maine's recommended plan would expand the summer/fall target range by approximately 0.5 foot, based on their revised rule curve, creating a minimum target elevation of 265.17 feet and a maximum elevation of 265.7 feet on August 1. Maine also recommends an upper target level of 265.0 feet on September 1 and a target of elevation 262.0 feet on November 1.[31] In its July 15, 2004, letter, S.D. Warren concurred with these recommendations.

The Sebago Lake Coalition, in its August 15, 2004, letter, agreed with Maine's recommendations for this time period. Stephen Kasprzak states, in his August 18, 2004, letter, that setting the August 1 target level at 265.17 feet, which is 1.0 foot above the historic norm for August 1: (1) reduces S.D. Warren's ability to maximize power generation during this time period; and (2) increases the potential for the lake level to exceed S.D. Warren's flow easement of 267.15 feet during high runoff events.

[31] Maine initially recommended an elevation of 263.0 feet on November 1, but has since changed its recommendation.

As shown in figure 16, only three peak annual flood events occurred at the Westbrook gage during the months of July through November, from 1976 to 2004. These three events, including two of the highest ever recorded, based on records extending back to 1895, were the results of rainfall associated with: (1) Hurricane Bob on August 20, 1991 (13,900 cfs); (2) a complex northeaster that entrained substantial moisture from Hurricane Lili on October 22, 1996 (23,300 cfs); and (3) Hurricane Floyd on September 17, 1999 (approximately 6,000 cfs).

Tropical systems such as those mentioned above are usually the cause of substantial flooding events during the summer/fall period, since they provide the large spatial distribution of heavy rainfall. At this time of the year, other heavy rainfall events common in Maine are thunderstorms associated with frontal systems, which normally lack the widespread distribution of heavy rainfall capable of producing heavy runoff to entire river systems such as the Presumpscot, on the scale of the flooding events in 1991, 1996 and 1999.

In 1996, from the afternoon of October 20 until the morning of October 22, 17.62 inches of rainfall fell at Westbrook, Maine. Rainfall estimates at the outlet of Sebago Lake were in the 12 to 14-inch range, with 10 or less inches in most of the watershed to Sebago Lake. This flood event produced a flood of record, estimated at 23,300 cfs on October 22 at the Westbrook USGS gage. Figure 19 shows that the outflow of Sebago Lake was approximately 75 cfs on October 22, and that the lake level was relatively low, but steadily rose during and after this event.

Sebago Lake was at elevation 262.76 feet prior to this event, approximately 0.5 feet above the average level for 1910 to 1986 and approximately 0.6 feet below the existing, proposed and state recommended LLMPs. Due to the capacity for Sebago Lake to store and delay most of the rainfall from the October 1996 event, flooding was likely reduced downstream in the Presumpscot River. Lake levels proposed by the different alternatives for this late-fall period, as shown in figure 19, would still provide a similar level of flood protection (although somewhat less) as occurred in 1996.

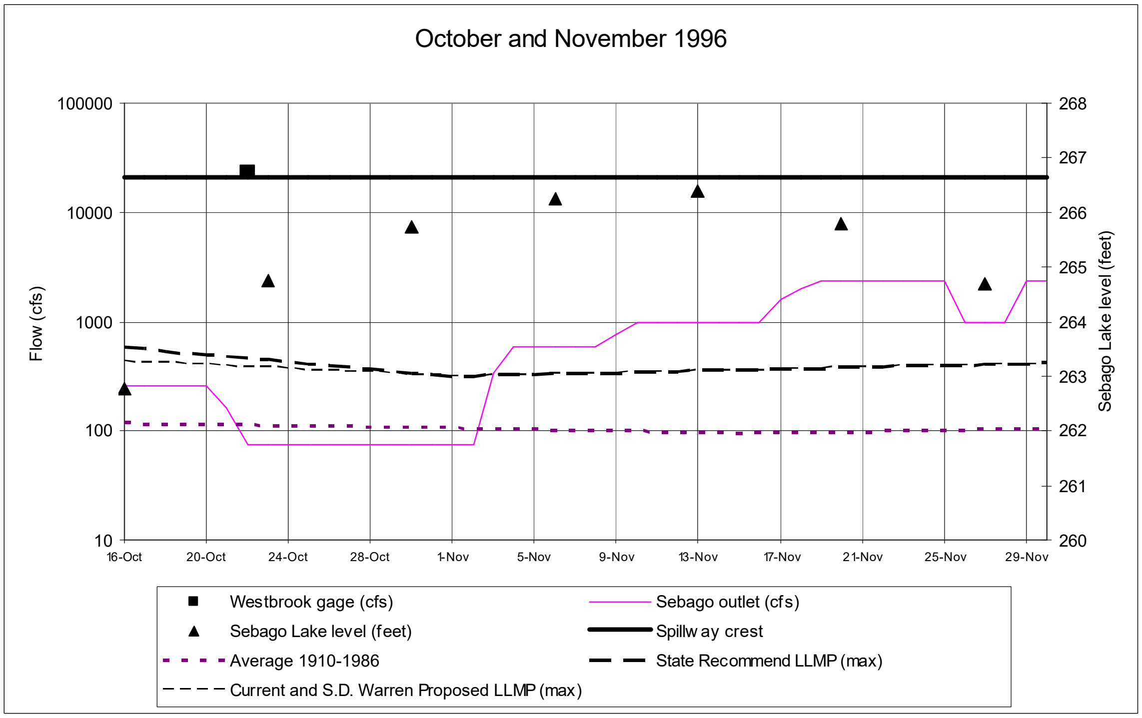


Figure 19. Relationship between the Westbrook gage, Sebago Lake outflow, and Sebago Lake water surface elevation during October and November 1996. (Source: USGS, 2004b; Water District, 2004; Hodgkins, 1997)

Maintain periodic low water levels in the fall. S.D. Warren proposes no changes to the periodic low drawdowns in the fall. However, in its July 15, 2004, letter responding to Maine's recommended LLMP revisions, S.D. Warren suggests that the periodic low level requirement of the existing and several of the alternative LLMPs be totally removed from the LLMP because:

(1) there may be difficulties reaching the May 1 target level after the lake is drawn down to 261.0 feet or below, as called for in many of the alternative plans;

(2) lowering upstream water bodies (e.g., Long Lake and Brandy Pond) could send an additional 8 inches of water to Sebago Lake during the required drawdown period, possibly requiring S.D. Warren to release even higher volumes of flow downstream;

(3) due to the design of the Eel Weir Project, there is an inability to pass large amounts of water at reduced head;

(4) leaves are an impediment to flow passage through the project at this time of the year, and opening of the river gates is sometimes necessary to avoid clogging the fish screens and tripping the generators off-line; and

(5) the combination of November being one of the wettest months of the year and dormant vegetation results in a high rate of runoff from the watershed, making it difficult for S.D. warren to maintain the lower water levels.

Maine recommends a target level of 261.0 feet on or about December 1 in two out of every nine years, with the requirement to stay within 6 inches of the target level until January 1. FOSL and Stephen Kasprzak recommend a November 1 target level of 261.0 feet in 1 of every 2 years, 260.0 feet in 1 of every 4 years, and 259.0 feet in 1 of every 10 years. These drawdowns would last up to two months and, according to FOSL and Mr. Kasprzak, enhance sand accretion to the beaches. These recommendations are discussed in greater detail in sections V.C.1, *Geology and Soils* and V.C.5, *Recreational Resources and Land Use*.

The MDIFW recommends that a 5 to 8-foot drawdown be considered for late-November into mid-winter, as a measure to reduce the spawning success of lake trout. Interior recommends that the lake not be drawn down more than 2 feet (to 264.65 feet) from April 1 to December 15, and not more than 3 feet (to 263.65 feet) from December 16 through March 31. The MDIFW and Interior recommendations are primarily related to fishery resources, which are discussed in greater detail in section V.C.3, *Fisheries and Aquatic Resources.*

Possible flooding effects to downstream and shoreline areas, due to the periodic low level drawdowns in the fall, are somewhat similar to the summer and early fall adjustment in the LLMP target. Flood events that would be worsened by the outflow from Sebago Lake are unlikely to occur due to the large amount of storage that would be available within the lake with the current and all alternative LLMPs. Maine's recommendation to maintain the 2-in-9-year drawdown for only 1 month (December 1 to January 1) would result in some reduction in flood storage capacity during the late-fall period, when storms occur.

The ability to refill Sebago Lake after the periodic low-level fall drawdown is discussed in Section V.C.1, *Geology and Soils*, and with respect to boating in section V.C.5, *Recreational Resources and Land Use*. In general, however, we found that at extreme dry, over-winter flows and lake drawdowns as low as elevation 260.0 or 261.0 feet, it is unlikely that the lake would reach 266.15 feet by May 15 (*see* table 4). At higher inflows, however, the lake would likely refill, while also providing some flood control storage benefits. The additional 8 inches of water from other lakes in the basin, of concern to S.D. Warren, if "deposited" on the 75-mi^2 surface area of Sebago Lake, would be approximately 1,400 mcf or, if released from the lake would result in a flow of approximately 2,300 cfs for 1 week. Thus, the operational concerns identified by S.D. Warren are reasonable and would, under some situations, cause Sebago Lake to rise above the low-level target(s) for a period of time. Operational allowances for these types of events should be taken into account if the periodic low level drawdowns are continued.

CONCLUSIONS – Sebago Lake levels have the potential for significantly affecting flood levels in the lower Presumpscot River. If lake levels are low during a major rainfall/runoff event, there is significant flood control storage available, which would reduce downstream flooding. Similarly, if lake levels are high during such an event, little storage would be available and there would be the potential for Sebago Lake to exceed the upper limit of the current LLMP of 267.15 feet, resulting in possible encroachment above the flowage easement and uncontrolled spillage into the Presumpscot River.

The LLMP alternatives recommended by Stephen Kasprzak and FOSL have the lowest range of winter water levels for Sebago Lake, and therefore would provide the most available storage for potential late-winter or early-spring flooding events. However, there are many competing stakeholders that recommend higher lake levels for the benefit of other resources. Whatever LLMP is adopted, S.D. Warren's request for a provision to allow for temporary variances from the LLMP levels, for flooding or other severe conditions would be appropriate.

Project Operations and Flow Monitoring Plan

S.D. Warren proposes to continue operating the Eel Weir Project as a store-and-release facility. Sebago Lake would be regulated in accordance with the existing LLMP, except that the LLMP would be modified to establish a 3-inch range for the August 1 target date. In addition, minimum flow releases to the bypassed reach would continue to be regulated in accordance with the LLMP and the 1992 Commission Order. To monitor compliance with project operations, S.D. Warren proposes to continue operating an existing lake level gage on Sebago Lake. S.D. Warren proposes no other measures to monitor compliance with project operation, including the bypass flow.

Interior recommends that the Commission require S.D. Warren to seasonally limit lake level fluctuations and provide certain minimum flows to the Eel Weir bypassed reach. Interior also recommends that the licensee prepare a plan, in consultation with the USFWS, the USGS, the MDEP, the MDMR, and the MDIFW, to monitor instream flows and impoundment water levels at the project. The monitoring plan would include temperature monitoring in the bypassed reach. While various entities recommended changes in the LLMP, no other entity recommended measures to monitor compliance with project operation.

In its September 17, 2003, letter responding to the agencies' and other entities' terms and conditions, S.D. Warren commented on Interior's recommendation for a compliance monitoring plan. S.D. Warren states that it already monitors and maintains records of flows in the bypassed reach and lake levels. S.D. Warren further contends that temperature monitoring in the bypassed reach is unnecessary.

Our Analysis

The proposed continued operation of the project as a store-and-release facility, with only a slight change to the current LLMP, would maintain existing hydraulic conditions at the project and in the lower Presumpscot River. In addition, S.D. Warren's proposal to continue providing flows to the bypassed reach would maintain the existing ecosystem stability in the reach.

To address environmental concerns related to the existing LLMP and flow management in the bypassed reach, several entities proffered proposals and recommendations that would affect lake level management at Sebago Lake. Certain of these entities also recommend alternative flows for the bypassed reach. If implemented, changes to the LLMP and the flow regime in the bypassed reach could, depending on the magnitude of the changes, substantially alter the hydraulic conditions at the project and in the lower Presumpscot River. Such effects are discussed in relevant resource sections of this EA.

Erosion, the suitability of aquatic habitat in Sebago Lake and the Presumpscot River, fish passage, recreation, aesthetics, and historic resources could be affected by inconsistent water levels in Sebago Lake, as well as flow releases in the bypassed reach and further downstream in the Presumpscot River. Thus, compliance with any recommended LLMP and bypass flow releases should be monitored.

S.D. Warren proposes to maintain the existing lake level gage on Sebago Lake. S.D. Warren also states that instrumentation to monitor bypass flows is already in place, though does not provide details of its bypass flow monitoring program or propose any other specific measures for monitoring the bypass flow releases. Thus, it is not clear what other mechanisms the applicant currently uses to monitor and maintain records of bypass reach flows and lake levels, aside from the existing lake level gage. Therefore, we agree with Interior's recommendation for a project operations and flow monitoring plan. Such a measure is necessary to ensure compliance with any recommended LLMP and bypass minimum flow requirement. Moreover, implementing such a measure would afford interested parties a greater understanding of project operations and allow them to independently verify compliance.

Interior recommends that any approved monitoring plan include water temperature monitoring in the bypassed reach. S.D. Warren contends that such monitoring is unnecessary with its proposed minimum flow regime for the bypassed reach. As described below, monitoring water temperature may have some merit under certain flow conditions.

In its letter dated July 28, 2003, the MDIFW indicates that the existing flow regime supports a substantial coldwater fishery in the bypassed reach (described further in section V.C.3, *Fisheries and Aquatic Resources*). The MDIFW also indicates that higher year-round flows, other than those currently released to the bypassed reach, significantly increases the habitat suitability for the managed coldwater fishery. Notwithstanding this increase in overall physical habitat suitability, flows higher than 115 cfs adversely affects coldwater refugia in the bypassed reach (Kleinschmidt, 2002).[32] Thus, as discussed further in section V.C.3, implementing flows in the range recommended by the resource agencies could affect the MDIFW's coldwater fishery management goals for the bypassed reach. Monitoring water temperature under such flow conditions would provide valuable information and guidance to S.D. Warren and the resource agencies regarding the adequacy of the higher flows, and the need for changes to the flow regime or other measures, to achieve the agencies goal of a year-round coldwater fishery, supported, in part, through natural recruitment.

Developing and implementing a project operation and flow monitoring plan would affect project economics. Thus, we address the costs of such a plan in section VI, *Developmental Analysis*, and make our final recommendation in section VII.B, *Comprehensive Development and Recommended Alternative*.

Flow Management in Eel Weir Bypassed Reach

S.D. Warren proposes to continue operating the Eel Weir Project as a store-and-release facility, as well as provide seasonally adjusted minimum flows to the Eel Weir bypassed reach. S.D. Warren proposes no further measures to protect or enhance water quality in the bypassed reach. Nor do the resource agencies or any other entity recommend specific measures to protect or enhance water quality in the bypassed reach.

Our Analysis

The Presumpscot River downstream from the Eel Weir Project, including the Eel Weir bypassed reach, is designated as Class A waters to the confluence of the Pleasant River (excluding Dundee Pond).[33] Class A waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection, fishing, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation, navigation, and as habitat for fish and other aquatic life. The habitat shall be

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[32] There are no significant tributaries that enter the Eel Weir bypassed reach. However, areas with coldwater seeps are present in the reach. During summer months, these coldwater seeps provide thermal refuge from warm water temperatures for brook trout and landlocked Atlantic salmon.

[33] The Pleasant River is a tributary to the Presumpscot River, whose confluence is located within the Gambo impoundment.

characterized as natural. The state standard for DO is no less than 75 percent saturation or 7.0 mg/l.

The results of S.D. Warren's 2000 water quality survey shows that water quality conditions in the Eel Weir bypassed reach attained or exceeded Class A standards for DO, even during the critical, low-flow/high temperature summer period. During the 2000 water quality study, average DO concentrations ranged from 7.2 to 9.0 mg/l during morning hours and 8.0 to 9.4 mg/l during the evening (Woodard and Curran, 2002). The monitoring data show no stratification of the riverine waters. Diurnal fluctuations were documented at most monitoring stations, with morning DO levels slightly lower than afternoon levels, due to overnight photosynthetic depletion.

In addition to the water quality survey, a benthic macroinvertebrate survey was conducted in the Eel Weir bypassed reach in 2000 (Lotic, 2002). The results of the survey indicated that the Eel Weir bypassed reach was achieving Class B water quality standards. The authors state that this attainment is due primarily to habitat conditions and is not an indication of water quality.[34] In a letter dated February 14, 2002, the MDEP concurred and determined that the Eel Weir bypassed reach is supporting a Class A macroinvertebrate community.

As outlined above, the water quality surveys performed by S.D. Warren in the Eel Weir bypassed reach document compliance with Maine's DO standards. Because S.D. Warren does not propose any changes to the existing seasonal minimum flow regime, we would anticipate little, if any, change in the reach's water quality. DO levels would remain within the acceptable range for supporting a coldwater fishery in the bypassed reach and in the lower Presumpscot River. In addition, S.D. Warren's proposed flow regime would continue to provide (a) continuity of flows, (b) mixing and aeration of river water, and (c) effectively protect the water quality in the bypassed reach.

As discussed further in section V.C.3., *Fisheries and Aquatic Resources*, the resource management goals for the Eel Weir bypassed reach include, among other things, managing the Eel Weir bypassed reach for brook trout and landlocked salmon to provide a quality, year-round recreational fishery for trout and salmon. DO levels (and water temperature) would be important to achieving this goal. The DO and macroinvertebrate data collected during the water quality surveys meet the Maine's Class A standards.

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[34] As cited in Lotic (2002), lakes often stabilize flows and temperatures in the habitat below them, along with discharging a higher load of suspended organic matter than would normally be found. Macroinvertebrate samples collected downstream from a lake contain higher numbers of organisms and are dominated by filter feeding invertebrates.

Interior and the MDIFW recommend a minimum flow of 200 cfs during the open water fishing season and a flow of 115 cfs during the winter months. The MDIFW also recommends that the flow in the summer be reduced to 100 cfs if coldwater refugia cannot be adequately protected. These flows are substantially higher than the existing, and applicant-proposed, minimum flows. Although the benefits have not been quantified, additional flow, above that proposed by S.D. Warren, would incrementally improve DO levels in the bypassed reach.

Water Quality in the Lake's Littoral Zone

Water quality in the littoral zone of Sebago Lake has the potential to be influenced by variable water levels, changes in the erosion rates, exposure of different shoreline materials, changes in the functioning of nearby septic fields, and changes in growth potential of algae and other aquatic vegetation.

S.D. Warren proposes to continue its sampling program of near-shore water quality. A number of stakeholders, such as Sebago Lake Coalition, Mr. Frechette, and Mr. Himmelman state that the current LLMP affects water quality and weed growth in the lake's littoral zone. Mr. Himmelman states that the lake level is too low and if higher water levels affect near shore septic systems, the septic systems should be upgraded.

Our Analysis

Water quality sampling programs, such as that summarized in the 2000 Sebago Lake Near-shore Water Quality report (Normandeau, 2001a), as well as earlier studies conducted in 1998 and 1999, attempted to determine the possible correlation between water levels and its effects on turbidity, specific conductance or total phosphorous. Table 19 shows data from water quality sampling conducted in June and July, 2000, when the water levels were at an approximate elevation of 266.0 feet, and in September when the water levels were lower, slightly above 264.0 feet.

Table 19. Near-shore water quality sampling comparison between high and low water levels in 2000. (Source: Normandeau, 2001a)

	High Water Level			Low Water Level		
Parameter	Mean	Standard Error	No. of Sites	Mean	Standard Error	No. of Sites
Turbidity (NTU)	0.19	0.02	48	0.15	0.03	47
Specific conductance (umhos)	43.77	0.35	48	43.83	0.44	46
Total phosphorus (ug/l)	4.65	0.49	48	3.89	0.31	48

These results show no correlation between water levels and turbidity, specific conductance, and total phosphorus. Results of the 1998/1999 study showed higher turbidity values during the higher lake level (summer 1999) sampling period than during the lower lake level (fall 1998) sampling period. However, this could be the result of: (1) variation in the wind speed, wind direction, rainfall and runoff; (2) higher algal concentrations in the summer period; and/or (3) higher recreational use in the summer, resulting in increased wave action.

Near-shore water quality samples were also collected from sites that were judged to have high, moderate and low erosion potentials (Normandeau, 2001a). Based on the data collected (table 20), no direct or expected correlation, such as higher turbidity at 'high' erosion potential sites, was evident.

Table 20. Near-shore water quality sampling comparison between near-shore areas with different erosion potentials. (Source: Normandeau, 2001a)

	High			Moderate			Low		
Parameter	**Mean**	**Standard Error**	**# of Sites**	**Mean**	**Standard Error**	**# of Sites**	**Mean**	**Standard Error**	**# of Sites**
Turbidity (NTU)	0.14	0.03	12	0.2	0.03	32	0.16	0.02	52
Specific conductance (umhos)	42.75	0.22	12	44.71	0.77	31	43.49	0.16	51
Total phosphorus (ug/l)	3.22	0.47	12	4.09	0.34	32	4.62	0.49	52

Normandeau also conducted a study on the relationship between turbidity, specific conductance and total phosphorous, and the proximity to Sebago Lake tributaries. As shown in table 21, turbidity and total phosphorus averaged higher in sampling locations near tributaries, but specific conductance was only slightly higher near tributaries.

Table 21. Near-shore water quality sampling comparison between areas with differences in tributary proximity. (Source: Normandeau, 2001a)

	Tributary Present			Tributary Absent		
Parameter	**Mean**	**Standard Error**	**No. of Sites**	**Mean**	**Standard Error**	**No. of Sites**
Turbidity (NTU)	0.35	0.05	20	0.12	0.01	75
Specific conductance (umhos)	46.2	1.08	20	43.15	0.12	74
Total phosphorus (ug/l)	7.15	0.65	20	3.51	0.27	76

Sampling to determine possible influence of shoreline erosion potential and water level on chlorophyll *a* and species composition of the periphyton communities were also conducted (Normandeau, 2001a). However, Normandeau concludes that the differences in chlorophyll *a* and periphyton concentrations at different water levels were probably the result of seasonal variability of nutrients and solar radiation. We concur that these seasonal variations likely overpower any direct influence that water levels may have on chlorophyll *a* and periphyton.

Regarding potential effects on the growth of aquatic vegetation, parameters that may affect the extent of aquatic vegetation in Sebago Lake include substrate, water temperature, clarity, and nutrients. As previously noted, lake levels appear to have little effect on water clarity and nutrients, but there may be a minor effect on water temperature. During low lake levels, normal circulation into some of the bays and inlet areas might be restricted, which could cause a slight increase in the water temperature. Substrate is not expected to be affected significantly by lake levels, although there would be normal erosion and accretion in certain areas of the lake (*see* section V.C.1, *Geology and Soils*). As discussed in the section on wetlands (*see* section V.C.4, *Terrestrial Resources*), lake water levels have little effect on aquatic vegetation.

Depending on the subsurface characteristics, vertical and horizontal separation and other factors, the lake level of Sebago Lake has the potential to effect the functioning of septic systems surrounding Sebago Lake. Currently the Water District has a formal approval process, based on the Maine State Plumbing Code, for any installation or replacement of septic systems within 200 feet of the high water mark of Sebago Lake. The Water District's jurisdictional area extends upstream to include portions of some of the tributaries, such as the Crooked River to Route 302. In the immediate shoreline areas, the lake level typically controls the groundwater level. If higher water levels were to occur during the spring and early summer, it would negatively influence some septic systems that were constructed in highly sensitive areas. However, increases in the lake levels are not proposed for the spring period by any of the alternative lake level plans, and lower lake levels that would occur the remainder of the year would help alleviate any potential septic system problems that are directly related to lake levels.

CONCLUSIONS – Current information indicates that the water quality of Sebago Lake is excellent. Based on the results of recent water quality monitoring, we conclude that there may be a slight relationship between certain lake levels and minor changes in water quality (water temperature and turbidity) in the littoral zones. This relationship, however, is not fully documented and may more likely be the result of normal seasonal changes.

Effects of Alternative LLMPs on Water Quality

Various revisions to the LLMP have been proposed or recommended by the stakeholders, as described in section III.D (*Proposed Action with Additional Environmental Measures*). Some aspects of the revisions may affect near-shore water quality, and each of those aspects is discussed herein.

Our Analysis

Increase winter water levels

Maine's recommends a revision to maintain higher winter water levels, compared to the current LLMP. Water quality changes due to possible increases in water levels during the winter are unlikely. Sebago Lake is typically frozen over during most of January, February and March, and any water quality changes due to different elevations of the shoreline being exposed to ice breakup and ice dune formation are expected to be negligible. The only possible effect of higher winter water levels would be the possible risk of slightly higher beach and shoreline erosion rates, and a temporary increase in turbidity, during storm events immediately after ice-out. By the typical ice-out date (mid-April), however, the lake would have already reached higher springtime levels that may have little to do with the previous winter's levels (Marvinney, 2002).

Eliminate the springtime target range above full pond

All parties appear to agree that beach and shoreline erosion potential is highest when the lake level is at, or above, the spillway crest elevation. Therefore, limiting the full pond target range to no higher than the spillway crest elevation would reduce the potential of shoreline and beach erosion and limit the possible short-term increase in near-shore turbidity associated with these erosion events. Limiting the full pond target level to the spillway crest elevation would also help alleviate the potential effect to near-shore septic systems, which may be adversely affected during high lake levels.

In its July 15, 2004, letter, S.D. Warren, assuming the Commission were to adopt the Maine's recommended May 1 target range, requests that a provision be included in any new license issued that would permit it to obtain a temporary variance from the downstream flow release requirement under circumstances such as flooding on the Presumpscot River downstream of the Eel Weir Project. We conclude that such an allowance, designed specifically to prevent or reduce flooding downstream, would be reasonable for any modified LLMP. Since this variance would only occur during high flow conditions, we expect there to be limited, if any, effect on water quality or water temperatures in the Presumpscot River.

Expand the summer/fall target range

S.D. Warren's proposed action includes the addition of a 3-inch tolerance range for the August 1 target level (265.17 feet), between 264.92 and 265.42 feet. This possible change would have a limited, if any, effect on the water quality of near-shore areas, since this tolerance range is within the variation recorded for August 1 since the implementation of the LLMP in 1997. In addition, since there has been no correlation observed between water levels and near-shore water quality, this small amount of variance would hardly be detectable.

Maine also recommends expansion of the summer/fall (August 1) target range by approximately 0.5 foot, based on their revised rule curve. This would result in water levels slightly higher than the range proposed by S.D. Warren, but S.D. Warren agrees with Maine's plan to maintain the somewhat higher summer lake level. This 6-inch higher level would unlikely have any significant effect on water quality in near-shore areas. If anything, there could be some slight improvement in conditions, because shallow areas would be deeper and less likely to experience increased warming and large swings in dissolved oxygen levels, resulting from increased photosynthesis during the day and high respiration at night.

Maintain periodic low water levels in the fall

FOSL and Stephen Kasprzak recommend a deeper and more frequent fall drawdown (than the current or other proposed LLMPs), lasting up to two months, for enhancing sand accretion to the beaches. Maine recommends reducing the time period for the periodic, deep-water drawdown from 2 months to 1 month (December 1 to January 1). These recommendations are discussed in greater detail in section V.C.1 (*Geology and Soils*), but should not affect near-shore water quality. In addition, since the proposed drawdowns are in the late-fall/early-winter, when biological activities are reduced, the potential for any effects are also reduced. The only potential effect could be some increase in turbidity levels in localized areas, if areas of sediment not normally exposed to wave action and erosion are exposed to such forces.

The MDIFW recommends a 5 to 8-foot drawdown in late-November or into mid-winter, as a measure to reduce the spawning success of lake trout. This proposal should have little effect on water quality. The MDIFW's recommendation would be similar to the other recommended late-fall deep drawdowns, with some potential for increased sedimentation due to wave action on newly exposed areas. Additional discussion of the effects of such a drawdown on fishery resources are included in section V.C.3, *Fisheries and Aquatic Resources.*

Interior proposal

Interior recommends that the lake not be fluctuated more than 2 feet (to 264.65 feet) from April 1 to December 15, and not more than 3 feet (to 263.65 feet) from December 16 through March 31. This recommendation would result in somewhat higher lake levels during the fall, compared to the existing LLMP and Maine's revised plan, which allow the lake to be drawn down to below 264.65 feet in late-summer and fall. This recommendation would also result in higher water levels during the winter months, compared to the existing LLMP and Maine's plan. Higher summer-time lake levels could result in minor water quality improvements, as noted above, but higher winter levels could increase the potential for shoreline erosion, if winter storms were to occur during periods when the lake is not frozen over. If higher erosion rates did occur, that could result in higher turbidity levels in localized areas, but overall lake water quality should not be affected.

CONCLUSIONS – Because lake levels and near-shore water quality have not been shown to be correlated, other resource considerations associated with recreation, beach erosion, and fisheries should probably determine which alternative LLMP should be adopted. None of the alternative LLMPs has an advantage, when considering only near-shore water quality. Septic system functioning, the one near-shore water quality issue that may be affected by higher lake levels at or above the spillway crest elevation, would essentially be the same among most of the alternatives, which call for spring target levels at or slightly below the spillway crest elevation.

c. Cumulative Effects:

Sebago Lake controls about 70 percent of the flow in the Presumpscot River. Thus, any changes to the LLMP and the requisite flow releases to maintain lake levels have the potential to affect water quality in the lower Presumpscot River. The majority of the LLMP alternatives analyzed in this EA would not result in changes to the flow release schedule. However, Maine's recommended LLMP plan could potentially lead to a reduction in flow to the lower river, if the lake level is below its target level. This situation, if it occurs during the low-flow summer months could, when coupled with the slack water areas downstream, lead to an increase in water temperature and detrimentally affect DO levels through the lower Presumpscot River.[35]

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[35] S.D. Warren's Gambo and Dundee Projects are required to release reaeration flows to improve DO levels in the river as part of their respective water quality certifications. These flows represent 37 and 18 percent of the flow available for generation at the projects, respectively. If the minimum flow under the LLMP were reduced to 250 cfs, as recommended by Maine, S.D. Warren would likely lose generation due to the reduction at all its stations with the reduced flows. In addition, S.D. Warren

We would expect incremental improvements to water quality in the Eel Weir bypassed reach with higher minimum flows, when compared with the existing flow release schedule. This could have the affect of improving DO levels and lowering water temperature throughout the lower Presumpscot River, particularly in the river directly downstream from the project.

d. Unavoidable Adverse Effects:

Sebago Lake and the operation of the Eel Weir Project provide some level of flood control and protection to communities situated along the lower Presumpscot River. Regardless of any changes made to the current LLMP, flooding downriver is likely to continue to occur on some level and at some frequency. We would expect the same level of flood control benefits under the proposed action as currently occurs. Revisions to the LLMP that increase storage volume in Sebago Lake, during critical times of the year, would enhance the project's flood control capabilities. Likewise, higher lake levels result in less storage and reduced flood control capabilities.

3. Fisheries and Aquatic Resources

a. Affected Environment:

Sebago Lake

The project reservoir, Sebago Lake, is the second largest lake in Maine, with an area of 28,771 acres (45 mi^2), and a shoreline of about 105 miles. Sebago Lake is a natural lake that was raised by the construction of the project dam on the lake outlet in the 1800's. The lake has an average depth of 101 feet and a maximum depth of 316 feet. About half of the shoreline has been developed for seasonal and year-round homes, marinas, and other recreational facilities, with the remaining shoreline mostly forested. The water quality of the lake is considered good to excellent, and is classified as an oligotrophic lake. Major tributaries to the lake include the Crooked River, Northwest River, and Jordan River, although at least 15 tributaries are considered "significant." The Crooked River is the largest tributary and has the highest inflow to the lake.

Sebago Lake supports a nationally recognized fishery for landlocked Atlantic salmon and lake trout. The MDIFW's management objectives are to maintain and improve the salmon fishery (increase the catch rate and average size), while also maintaining a self-sustaining lake trout fishery. Landlocked salmon are native to the

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may need to increase the reareation flows (with a commensurate loss of generation) to compensate for the reduced minimum flow.

lake, while lake trout were first introduced in 1972. Lake trout, however, are now self-sustaining and have not been stocked since 1982.

Since the early 1990's the salmon fishery has been in decline, with catch rates, average length, weight, and condition factor all decreasing. The MDIFW believes that this may be the result of the increasing lake trout population, which is competing with the salmon for the major forage species for both salmonids, the rainbow smelt, which has also shown a decline in recent years. The MDIFW has recently liberalized fishing regulations for lake trout, in an attempt to increase the catch rate for lake trout. Anglers are now allowed to keep 6 lake trout per day during the open-water season, with a minimum length of 14 inches, although only one fish over 23 inches may be kept. Ice-fishing regulations also now allow for up to 5 lines per angler, to increase lake trout harvest (Boland et al., 2003). Recent angling statistics indicate that the lake trout catch now is more than double the catch of salmon in some years (MDIFW, 2002a). The MDIFW has also decreased the number of salmon that it stocks annually in the lake, to reduce the feeding pressure on the remaining smelt population. In 2003, only 1,000 salmon were stocked in the lake, compared to 8,000 that were stocked in 1993 (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003).

A recent report by the MDIFW (Boland et al., 2003) indicates that there has been a slow improvement in the condition of salmon in Sebago Lake, based on the capture of spawning adult salmon in the Jordan River fish collection facility in fall 2003. The fall 2003 catch was 152 adult salmon, about 30 percent larger than in 2002. The length, weight, and condition factor were higher than in 2002 and 2001, although still significantly lower than the optimal growth rates seen in 1988. Boland et al. (2003), however, noted that production of wild salmon in tributaries to the lake remains low, based on the index of young-of- the-year (YOY) and parr at three index sites. The authors speculate that the reasons for the continued low production may be a combination of several years of drought and the presence of several beaver dams on some of the tributaries, which prevent full utilization of the tributary habitat. More recent information from the MDIFW indicates that salmon growth has continued to improve, although spawning of wild salmon remains low. Lake trout recruitment has also declined, but growth is good (information provided by Francis Brautigam, Fishery Biologist, MDIFW, at the section 10(j) meeting, Augusta, Maine, September 22, 2005).

Sebago Lake also supports an excellent warmwater fishery for smallmouth and largemouth bass, and fisheries for other coldwater, coolwater, and warmwater species. Based on unpublished data from fishing tournaments, good size quality bass are common in the lake. Other game species present include brook trout, burbot, lake whitefish, chain pickerel, white perch, yellow perch, black crappie, redbreast sunfish, pumpkinseed, and brown bullhead. Non-game species include rainbow smelt, white sucker, longnose sucker, fallfish, creek chub, common shiner, blacknose dace, golden shiner, three-spined stickleback, nine-spined stickleback, banded killifish, and slimy sculpin. The catadromous American eel is also common in the lake. In all, a total of 28 species has been reported from Sebago Lake.

Eel Weir Bypassed Reach

The Eel weir bypassed reach is a 6,700-foot-long reach of the Presumpscot River that is bypassed by the 4,820-foot-long power canal, which supplies water to the project powerhouse. The upper end of the bypassed reach begins at the project dam, and ends at the head of the impoundment for the North Gorham Hydroelectric Project (see figure A-2 in Appendix A). Based on MDIFW and S.D. Warren surveys, about half of the reach (3,000 feet) is riffle/run habitat with a substrate of gravel, cobble, and boulders. The remainder of the reach is pool or "deadwater" habitat with a substrate of sand and silt. There are several spring seeps along the reach that provide coldwater inflow important for trout refugia during the summer months. As described in section III.C (*Proposed Action*), S.D. Warren provides continuous minimum flows to the bypassed reach.

The bypassed reach supports an important fishery for brook trout, landlocked salmon, and brown trout, although the primary management objective of the MDIFW is to provide a high-quality brook trout fishery, maintained by stocking. The MDIFW indicates that the bypassed reach is a highly popular fishery and one of the most heavily fished stream reaches in southern Maine (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003). Regulations allow the harvest of one brook trout daily, and require the release (alive) of all landlocked salmon. The bypassed reach is open to fly fishing only, year-round. Angler usage was reported to be 2,811 angler days in 1993 and 6,826 angler days in 1995, with catch rates ranging from 1.17 to 1.36 legal trout per trip, and 0.08 to 0.27 salmon per trip. Anglers occasionally catch smallmouth bass and other species, but the primary focus of anglers fishing the reach is for trout and salmon.

Lower Presumpscot River

The Presumpscot River is about 25 miles long, extending from the outlet of Sebago Lake to Casco Bay. With an average gradient of more than 10 feet per mile, seven dams are located on the river, with an eighth dam, Smelt Hill, removed in fall 2002. The North Gorham Project is located immediately downstream of Eel Weir, and the Eel Weir powerhouse discharges directly into the North Gorham reservoir. Downstream of North Gorham are five hydroelectric projects owned by S.D. Warren (Dundee, Gambo, Little Falls, Mallison Falls, and Saccarappa, all recently relicensed in October 2003), and one non-hydro dam (Cumberland Mills dam), used by S.D. Warren to supply process water for its Westbrook paper mill.

With the removal of Smelt Hill dam (RM 3), the Cumberland Mills dam is now the lowermost dam on the Presumpscot River (about RM 10). Because of the several dams, the aquatic habitat of the Presumpscot River upstream of Cumberland Mills can be generally characterized as a series of relatively shallow run-of-river impoundments separated by short riverine reaches, including bypassed reaches immediately below all of the dams. The river downstream of Cumberland Mills dam is now free-flowing, with a range of habitat from riffles/runs/rapids to slow-moving pools.

The fish community of the Presumpscot River can be characterized as primarily a warmwater/coolwater assemblage, with some stocking of coldwater species (trout) by the MDIFW. Based on sampling in the reservoirs, tailwaters, and bypassed reaches of the applicant's five lower-river hydroelectric projects, smallmouth bass is the most common game species in the lower river, with smaller numbers of brook and brown trout, pumpkinseed, yellow perch, and bullhead collected.

Anadromous species such as American shad and river herring (alewife and blueback herring) also occur in the lower river downstream of Cumberland Mills dam. Based on fish lift counts (1994 to 1996) at the former Smelt Hill dam, the river herring run numbers in the thousands of fish, while only small numbers of shad (dozens of fish) have been documented. Highland Lake, the outlet of which enters the river downstream of Cumberland Mills dam, is believed to be the primary spawning area for alewife in the lower river (FERC, 2002). Sea-run Atlantic salmon do not currently occur in the Presumpscot River, although historical accounts indicate that sea-run salmon occurred in the river prior to the construction of dams, and entered the tributaries to Sebago Lake for spawning.

The catadromous American eel was commonly collected throughout the lower Presumpscot River during recent fisheries surveys (FERC, 2002). The total number of eel collected during sampling ranged from 13 in the Dundee impoundment to 60 in the Saccarappa impoundment. Catch per unit effort (CPUE) during boat electrofishing ranged from 42.7 fish/hour in the Mallison Falls impoundment to 5.5 fish/hour in the Dundee impoundment. American eel typically constituted a substantial portion of the overall catch, ranging from 5 percent at Dundee to nearly 35 percent at Mallison Falls. In addition to the lower Presumpscot River, American eels are known to occur in Sebago Lake (S.D. Warren, 2002a).

Fisheries Management Goals for the Presumpscot River

The state and federal agencies do not have a finalized fishery management plan for the Presumpscot River, but in December 2001, the MDMR, MDIFW, and Maine Atlantic Salmon Commission (MASC) issued a "Draft Fishery Management Plan for the Presumpscot River Drainage" (Wippelhauser et al., 2001). The objective of the plan was "...to guide future decisions on fisheries management in the Presumpscot River...," with the goals reflecting "...a balance between the disparate missions of the three agencies." Although two of the Maine agencies (MDIFW and MASC) have some concerns about potential management conflicts, the three agencies support the plan, with the understanding that any future management conflicts would be mutually resolved, with regular meetings among the agencies.

The management goals for the Presumpscot River and connected water bodies, as outlined in the plan, include:

- provide migratory routes, spawning, and rearing habitat for restoration of anadromous species including alewife, blueback herring, American shad, striped bass, and Atlantic salmon, and possibly Atlantic sturgeon, rainbow smelt, sea-run brook trout, sea-run brown trout, and tomcod;
- provide migratory routes and habitat suitable for the catadromous American eel;
- sustain the production of existing riverine species and targeted anadromous and catadromous species, consistent with habitat capabilities;
- manage the fisheries in accordance with interstate fishery management plans (e.g., Atlantic States Marine Fisheries Commission's [ASMFC] Interstate Fisheries Management Plan for American Eel);
- promote the existing and potential commercial and sport fisheries for both diadromous and resident species;[36]
- continue to intensively manage the Eel Weir bypassed reach for brook trout and landlocked salmon (to provide a quality, year-round, high-use recreational fishery for trout and salmon), and establish a recreational fishery for stocked trout in the mainstem of the lower Presumpscot River; and
- manage specific tributaries for the production of wild brook trout.

The overall management goals are designed for two phases. Phase I would restore anadromous fishes up to the base of Gambo dam, and Phase II would restore anadromous fishes up to the base of Eel Weir dam. Phase II, however, would not proceed until the three fisheries agencies have evaluated the results of Phase I, and agree to continue with Phase II. The Presumpscot River is also divided into eight reaches (with Sebago Lake being the ninth reach), with specific management measures tailored to each reach.

The primary measures proposed to accomplish the plan's objectives include:

- removal of the Smelt Hill dam (it was removed in October 2002);

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[36] In Sebago Lake, this includes providing a quality recreational fishery for an indigenous population of landlocked salmon and an introduced population of lake trout, and a quality warmwater fishery consisting mainly of smallmouth and largemouth bass.

- immediate installation/implementation of upstream and downstream eel passage facilities at the dams on the river;[37]
- construction of fish passage facilities for anadromous species in a phased approach, consistent with Interior's Final Fishway Prescription (for the relicensing of S.D. Warren's five lower river projects);
- establish suitable year-round minimum flows below specific dams, including in the Eel Weir bypassed reach downstream from the Eel Weir dam;
- stocking of hatchery trout in specific reaches of the mainstem river (including continued stocking of the Eel Weir bypassed reach), and in specific tributaries;
- maintenance/enhancement of MDIFW access for stocking, and adequate public access for fishing;
- promulgation of appropriate supporting regulations;
- habitat mapping and population monitoring studies, as required, and as funding allows; and
- implement measures to restore the rainbow smelt population in Sebago Lake.

The December 2001 plan also includes order of magnitude estimates for the anadromous fish production potential, for existing habitat in the Presumpscot River Basin that would be made available to these species if the plan were fully implemented. The total potential run sizes given in the plan are as follows: (1) 73,900 American shad; (2) 450,200 blueback herring; (3) 147,700 alewife; and (4) 386 Atlantic salmon.[38] The plan further states that American shad and blueback herring would be restored up to the base of North Gorham dam, alewife up to the base of Cumberland dam, and Atlantic salmon up to the base of Eel Weir dam.

Although the plan appears to focus more on the restoration of anadromous species, resident species management is a component of the plan. This is directed primarily at providing fisheries for stocked and native trout in the basin (such as in the Eel Weir bypassed reach), although the plan states that angling for other resident warmwater and coolwater species should be promoted. The plan, however, provides few specifics on stocking levels for trout, or other measures for enhancement of the resident fishery.

The American eel is a species of considerable interest to state and federal agencies because of the commercial importance of the species, and its apparent decline in recent

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[37] American eel would be managed in accordance with ASMFC's Interstate Fisheries Management Plan for American Eel, including implementing all regulations, assessment and reporting requirements found in ASMFC's management plan.

[38] Reach 8, which includes the Eel Weir bypassed reach, could support an estimated annual production of 2,178 Atlantic salmon smolts and 53 adult salmon.

years.[39] A multi-state/federal effort is currently underway to protect and restore the species to its former range and abundance (MDIFW and MDMR, 1996; ASMFC, 2000). As previously described, the American eel is distributed throughout the Presumpscot River drainage. The species provides for a commercial fishery in the lower portion of the river. State and regional management plans call for maintaining or enhancing eel abundance in the Presumpscot and other rivers through the protection or restoration of habitat and improved passage at all barriers.

The ASMFC published the Interstate Fishery Management Plan for American Eel in April 2000, and cited Maine as the leading state in modernizing its elver/eel fishery regulations. The goals of the plan are to “protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic states and jurisdictions and contribute to the viability of the American eel spawning population; and provide for sustainable commercial, subsistence, and recreational fisheries by preventing overharvest of any eel life stage.” The primary objectives of the plan are:

- improve knowledge of eel utilization at all life stages through mandatory reporting of harvest and effort by commercial fishers and dealers, and enhanced recreational fisheries monitoring;
- increase understanding of factors affecting eel population dynamics and life history through increased research and monitoring;
- protect and enhance American eel abundance in all watersheds where eel now occur;
- where practical, restore American eel to those waters where they had historical abundance but may now be absent, by providing access to inland waters for glass eel, elvers, and yellow eel and adequate escapement to the ocean for pre-spawning adult eel; and
- investigate the abundance of eel at the various life stages necessary to provide adequate forage for natural predators and support ecosystem health and food chain structure.

The MDIFW and the MDMR prepared an American eel species management plan in November 1996 (MDIFW and MDMR, 1996). This state plan is a working document that describes what is known about the species, its current status, and goals and objectives for long-term management. The goals of this plan are to: (1) maintain and enhance the

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[39] On July 6, 2005, the USFWS issued a finding in the Federal Register concluding that listing of the American eel may be warranted under the Endangered Species Act and initiated a 1-year status review (70 Fed. Reg. 38849-61). Depending on the outcome of the status review and any future listing, current efforts to manage the population of American eel, described herein, may change.

abundance of American eels in inland and coastal waters of Maine, and to contribute to the viability of the American eel spawning population; and (2) provide for sustainable recreational and commercial fisheries for American eels. The plan lists five objectives:

- maintain, or enhance, American eel abundance in all watersheds where eels now occur;
- restore American eels to all waters where they had historical presence, but may now be absent;
- provide a sustainable harvest of glass eels and elvers, resident yellow eels, and migrating silver eels;
- provide adequate upstream passage and escapement to inland waters for elvers and eels, and adequate downstream passage and escapement to the ocean for pre-spawning adult eels; and
- maintain or enhance inland and coastal water quality in order to maintain the health of Maine's eel population, and maintain the health of all consumers of eels.

Threatened or Endangered Species

No federally listed endangered or threatened fish species were encountered during the relicensing studies for the Eel Weir Project or during the studies for the relicensing of the five lower river projects, and none are believed to occur in Sebago Lake or the Presumpscot River. The federally listed endangered sea-run Atlantic salmon and the shortnose sturgeon occur in other rivers in Maine, but none have been documented in the Presumpscot River.[40]

b. Environmental Effects:

Effects of current, proposed and recommended LLMPs on lake fish populations

S.D. Warren proposes a minor change to the current LLMP, a 3-inch tolerance range around the August 1 target elevation for Sebago Lake. None of the commenting entities made specific recommendations for changes in the LLMP related to the lake fishery. The MDIFW, however, states that winter drawdowns have adversely affected warmwater fish populations, and lower lake levels in the spring have impeded smelt access into spawning tributaries. The MDIFW recommends that a study be conducted on

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[40] The Atlantic salmon has been listed as endangered in eight rivers in Maine that are considered to have remnant wild populations; the Presumpscot is not one of those rivers. Adult Atlantic salmon have occasionally been reported in the lower Presumpscot River, but may be strays from other rivers (the nearby Saco River has an active salmon restoration program using stocking of hatchery smolt).

the warmwater fishery in Sebago Lake, and that mitigation be considered for any effects of lake level management on warmwater species and on smelt spawning.

Other commenting entities made recommendations regarding changes to the LLMP for other reasons (beach erosion, recreational boating, etc.), and most of these recommendations involve minor changes to the LLMP, and are summarized in section III.D, *Proposed Action with Additional Environmental Measures*.[41] In addition, Maine recommends certain changes to the current LLMP to accommodate the various competing uses of Sebago Lake. This plan is also summarized in section III.D. According to Maine, its plan would:

- increase winter water levels to improve the likelihood that the lake will achieve the May 1 full pond target level;
- eliminate the target range above full pond to reduce damage to beaches and shoreline;
- expand the target range to allow higher water levels from July to November;
- maintain the current periodic low water level in the fall (with a few adjustments) to promote accretion of sand to beaches; and
- reduce summer minimum flows from the lake outlet to better maintain lake levels without threatening downstream water quality attainment.

Maine states that its recommended revisions to the current LLMP should improve S.D. Warren's ability to meet the target levels established in the plan. Maine recommends that the proposed plan be adopted as the preferred alternative for the future management of Sebago Lake.

Several letters of comment were filed in response to Maine's revised plan, including letters from S.D. Warren, FOSL, Stephen Kasprzak, and numerous private citizens. Nearly all the letters, except from one private citizen, oppose at least some parts of Maine's plan, with the primary concern being the potential for increasing beach and shoreline erosion. S.D. Warren's comments include recommendations to modify the existing LLMP, with changes not previously proposed. None of the comments specifically address the lake fishery, although FOSL states that Maine failed to consider the effects of the recommended plan on fish and wildlife resources in the lake.

[41] Such recommendations were made by FOSL, Charles M. Frechette, Stephen P. Kasprzak, and the Sebago Lake Coalition.

Our Analysis

The MDIFW did not provide specific data that show decreases in the warmwater fish populations in Sebago Lake, but note that catches in ongoing lake surveys have been lower in recent years. There is also no information in the license application to verify the MDIFW's statements regarding decreases in the warmwater fish populations. In response to agency recommendations during the pre-application period, S.D. Warren conducted a lake level study that examined littoral zone habitat and the potential effects of lake level management on that habitat (Duke, 2002). The applicant also funded two studies that assessed the potential effects of lake level drawdowns on smelt access to spawning tributaries (IA, 2002a; 2002b).

Effects on lake-dwelling species

For lake-dwelling species, lake drawdowns or lake-level fluctuations are primary factors that may adversely affect these species. Slow lake drawdowns over several months (as occurs in Sebago Lake and in many natural lakes) may affect fish species by reducing or eliminating certain types of habitat or habitat area during the period of lowest drawdown. If that drawdown occurs during an important life history stage for a particular species, that species may be adversely affected (*e.g.*, reduced spawning success, reduced survival of juveniles, slower growth, etc.). More rapid lake-level fluctuations typically have more immediate effects, related primarily to drawdowns. Rapid drawdowns may result in stranding and mortality of non-motile life stages such as eggs, larvae, or even juveniles of shoreline-dwelling or spawning species. Rapid drawdowns, however, do not occur on Sebago Lake. According to Duke (2002), the average water level change during the summer months (when the lake level is typically dropping) is only 0.25 inch per day. Thus, for Sebago Lake, our analysis focuses on the effects of the seasonal drawdown and refill of the lake.

The seasonal pattern for Sebago Lake has been that of highest levels occurring during the spring months (May to early-June), steadily decreasing levels during the summer and fall months, reaching the lowest levels during the November through February period, and increasing levels from March to May. Median levels since 1910 have ranged between a high of 266.65 feet to a low of about 262.0 feet, a range of about 4.5 feet. Higher and lower elevations have been recorded, but the median levels reflect the overall seasonal pattern changes. The current LLMP and all the proposed alternatives would follow the overall seasonal pattern, with some variances from this pattern.

Duke (2002) estimated the area of wetlands and aquatic habitat that would be dewatered by a lake drawdown to 261.0 feet (from 266.65 feet). This drawdown is slightly deeper than the long-term median drawdown (262.0 feet), but is equal to the maximum winter drawdown called for by both the current LLMP and Maine's recommended plan. Duke (2002) estimated that about 227 acres of aquatic beds and

2,480 acres of unvegetated habitat (total of 2,707 acres) would be dewatered at a drawdown to 261.0 feet. Since Sebago Lake has a total area of 28,771 acres, this would represent about 9.4 percent of the area of the lake. This would represent the maximum effect of drawdowns associated with the existing LLMP and that recommended by Maine. The area that would be dewatered at smaller drawdowns would be less, but was not estimated.

Duke (2002) selected five lake-dwelling species to assess the effects of seasonal drawdowns, including chain pickerel, golden shiner, smallmouth bass, white perch, and lake trout. Four of these are warmwater/coolwater species and one (lake trout) is a coldwater species. Duke (2002) concluded that any effects of lake drawdowns would be limited to primarily those species that use shallow, vegetated, littoral zone habitat, particularly during the reproductive life stages (spawning, eggs, and early fry), which have limited ability to move with receding water levels. For four of the species evaluated (other than lake trout), spawning occurs in the spring during the period of rising or maximum water levels, so it is unlikely that reproduction would be affected for these species. For lake trout, which spawn in the fall (October) during a period of receding water levels, spawning could be affected. However, the MDIFW is recommending control of lake trout spawning, to reduce the numbers of lake trout in Sebago Lake, so any effects to control lake trout spawning would be beneficial. Other more mobile life stages of these species, which may also use a wider range of habitat, including deepwater habitat, are not likely to be affected by seasonal lake drawdowns.

We generally agree with the assessment of the effects of seasonal drawdowns, as presented in Duke (2002). Since many entities recommended changes to the existing LLMP, we assess any additional effects associated with those lake level alternatives.

State of Maine

Maine's recommended changes to the LLMP are not significantly different from the existing LLMP, but would have some benefits to fishery resources. The current spring maximum lake level would be maintained, although it would be maintained from May 1 through the 3rd week in June, and would not be allowed to exceed the spillway crest elevation (266.65 feet), if at all possible. This would benefit spring-spawning species, particularly warmwater species that utilize the shoreline littoral zone, by maintaining maximum habitat area in the littoral zone for nearly two months. This would likely cover the spawning and egg incubation periods for game species such as smallmouth bass and other centrarchids, as well as many of the forage species (golden shiner and other minnows).

Through the summer, lake levels would be similar to the current LLMP, but slightly higher levels would be allowed, particularly for the August 1 target level, which could range up to about 0.5 foot higher.[42] This could benefit warmwater species (both juveniles and adults) that use the littoral zone for summer rearing, if the lake is higher and more of the littoral zone is wetted.

During the fall months, water levels would be slightly lower than the current LLMP, allowing for a drawdown of about 4 feet by November 1. This would result in some reduction in the amount of littoral zone habitat in the late-fall, but warmwater fish usage of the littoral zone would also be decreasing in late-fall as lake water temperatures cool.

Maine's plan differs from the current LLMP, for the 2-in-9-year drawdown to 261.0 feet, in that Maine's plan would maintain that drawdown only for the month of December, while the current LLMP maintains the drawdown for November and December. This could alleviate some of the concerns of the MDIFW, who believe that recent winter drawdowns may have affected the warmwater fishery. Maine's plan would allow for water levels up to a foot higher in early-November, during years that the drawdown to elevation 261.0 feet occurs, which could benefit any fish that may still be using the littoral zone during the late-fall.

During the winter to spring lake refill period, Maine recommends that the minimum elevation be equal to or greater than the 1910-1986 median levels from January 1 to March 1, with normal refilling from March 1 to May 1. The existing LLMP does not specify a minimum lake level during the January to March period, so Maine's plan does offer some additional protection of littoral zone habitat during the winter months, compared to the existing LLMP.

Maine's recommended plan also includes "operating parameters" for governing flow releases from the lake, which it claims would maintain downstream water quality but also allow maintenance of the lake levels within the target range. We further discuss these operating parameters below.

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[42] This would also be in line with the S.D. Warren's proposal to have a tolerance range of +/- 3 inches around the August 1 target level.

S.D. Warren's July 15 Comments on Maine's Recommended LLMP

In response to Maine's recommended changes to the LLMP, S.D. Warren describes additional changes to the LLMP that may be warranted, which it had not previously recommended.[43] These include:

- If the Commission were to adopt Maine's plan, the minimum lake level for the January 1 to May 1 period should be set at 262.0 feet, with provisions to go below that level if it appears that spring runoff will be high.[44]
- For the May 1 to late-June period, S.D. Warren prefers the language of the existing LLMP, for meeting the May 1 full lake level, and recommends that it be able to apply for a variance from the requirement to release more than 1,667 cfs from the lake if it would result in flooding conditions downstream.
- The target for November 1 should be 262.0 feet, instead of 262.5 +/- 0.5 feet.
- S.D. Warren recommends that the 2-in-9-year requirement to lower the lake to 261.0 feet in the late-fall be eliminated from the LLMP. If, however, the Commission retains that provision, the applicant proposes that it be relieved of the refill requirement the following spring after a drawdown to 261.0 feet. S.D. Warren objects to Maine's plan to maintain the deep drawdown for a one-month period (December), because it would require the release of large volumes of water from the lake in late-November, and would require S.D. Warren to hold the lake at the same level for 31 days, which would be difficult to do because they have no control over the larger Sebago Lake watershed.

The effects associated with the changes outlined by S.D. Warren in response to Maine's recommended plan on the lake fishery would be minor. Setting a minimum lake level at 262.0 feet during the winter months could result in slightly higher lake levels during the winter, but because this is the period of minimal biological activity, little in the way of environmental effects are likely, other than some additional protection of littoral zone habitat from freezing.

For the May 1 to late-June period, S.D. Warren proposes to maintain the current wording of the LLMP, which allows a range of +/- 0.5 foot around the spillway crest elevation, compared to Maine's plan that eliminates the 0.5-foot range above the spillway crest elevation. The lake could be slightly higher under S.D. Warren's plan, potentially

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[43] It is not clear whether S.D. Warren has formally changed its proposed action, so as we noted in Section III.D for other stakeholders' proposals, we assume that S.D. Warren's original proposal remains the proposed action.

[44] S.D. Warren would seek concurrence from MDEP to provide flood storage for the runoff.

wetting somewhat more littoral zone habitat. The overall effect on shoreline habitat, however, should not be substantially different than Maine's plan, which could still result in some exceedances of the spillway crest elevation, despite the best efforts of S.D. Warren to maintain the lower lake level.

Maintaining slightly higher lake levels during the June to November period, as recommended by Maine, would act to wet more littoral zone habitat, compared to the existing LLMP, potentially benefiting shoreline-dwelling species. Lowering the November 1 target level by 0.5 foot, as S.D. Warren proposes and Maine recommends, would result in the exposure of some additional shoreline habitat, but by November many of the shoreline-dwelling species would have vacated shallower habitat.

S.D. Warren's suggestion to eliminate the 2-in-9-year late-fall drawdown would result in less exposure of shoreline habitat, which could benefit some species. We do not expect any such benefits to be significant, since the deeper drawdown would occur during the late-fall period of reduced biological activity, and only twice in every 9 years. If the deeper drawdowns were to continue and in turn result in failure to refill the lake by May 1, as stated by S.D. Warren, more serious effects could occur, if springtime shoreline spawners were unable to fully utilize the shoreline habitat.

MDIFW

The MDIFW, aside from the recommended changes filed by Maine, recommends that a 5 to 8-foot drawdown be considered for late-November, as a measure to reduce the spawning success of lake trout.[45] The MDIFW contends that lake trout are adversely affecting the native landlocked salmon population. We discuss MDIFW's recommended measure more fully below, and conclude that such a deep drawdown (to 257.0 feet or below) could kill lake trout eggs, but there could be other adverse effects related to exposing more littoral zone habitat to freezing conditions. Such a deep winter drawdown would also appear contrary to the MDIFW's concern about the effects of deep winter drawdowns on warmwater species (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003).

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[45] During the September 22, 2005, section 10(j) meeting in Augusta, Maine, the MDIFW modified its recommendation, suggesting that the full drawdown could be delayed until later into the winter period (January/February), and that the lake should be drawn down 6 to 8 feet from the lake level that occurs in early-November, just after completion of lake trout spawning. The MDIFW is not concerned about the effects of a deep lake drawdown on the winter ice fishery, because that fishery is limited, generally only lasting for about 6 weeks.

Interior

Interior does not comment specifically on the LLMP but recommends that an operational band be established so that the lake is not drawn down more than 2 feet (to 264.65 feet) from April 1 to December 15, and not more than 3 feet (to 263.65 feet) from December 16 through March 31. Interior's recommendation would not conflict with the existing LLMP during much of the open-water season, although lake levels would typically fall below 264.65 feet during the month of September, and into October, November, and December. Interior's recommended minimum level for December through March (263.65 feet) would be about the same as the minimum target level called for in the existing LLMP for this period.

There would be some minor fisheries benefits associated with Interior's plan during the fall months, as lake levels would be higher than under the current LLMP, potentially allowing fish to use the littoral zone habitat longer into the fall. There could, however, also be adverse effects on the lower Presumpscot River, if flow releases from the lake are significantly reduced, to maintain the lake at a level not usually achieved during the fall. The same scenario could occur during the winter months, in that, although 263.65 feet is about the same as the LLMP target for these months, historical lake level data indicate that the lake is typically below that elevation from November through late-March/early-April. Maintaining a higher winter lake level, however, may offer some additional protection for littoral zone habitat.

FOSL

FOSL's recommendation is essentially the same as the existing LLMP, except that it calls for a spring peak lake level 1 foot lower, and expands the late-fall/early-winter (November/December) drawdown by requiring a drawdown to 261.0 feet every other year, a drawdown to 260.0 feet in 1 out of 4 years, and a drawdown to 259.0 feet in 1 out of 10 years.

The lower spring maximum water level would result in less littoral zone habitat being available for spring spawners, and could affect S.D. Warren's ability to maintain required water levels later in the summer and fall. The lake would have about 28,000 acre-feet less storage available at the start of the summer drawdown period, and lower summer water levels would expose more littoral zone habitat, making it unavailable for fish rearing. If flow releases from the lake are later reduced to maintain summer lake levels, this could adversely affect fisheries in the lower Presumpscot River.

The more frequent and deeper early-winter drawdowns could have some, although probably limited, benefit in reducing lake trout spawning success, by dewatering parts of the spawning shoals and killing any eggs in the dewatered areas. At the same time, these drawdowns would expose more of the littoral zone habitat that could be used by warmwater species, although since these drawdowns would occur in November/ December, warmwater fish usage of this habitat would be limited by then. The deeper drawdowns to 259.0 feet could also affect the ability of the lake to refill during the early spring, if lower than normal precipitation or runoff occurs during the refill period.

Charles Frechette

Mr. Frechette recommends that the maximum lake level be held at 266.0 feet from May 1 through July 7, and that the minimum lake level the remainder of the year be 263.5 feet. Maintaining the maximum spring lake level through July 7, compared to the second week in June for the existing LLMP, could have some fisheries benefits by maintaining a higher level of littoral zone habitat throughout the spawning, incubation, and early rearing period for spring spawners. This maximum level, however, would be 0.65 foot lower than the existing LLMP maximum spring level, so less habitat would initially be available.

As with FOSL's recommendation, lower spring levels could also affect the ability to maintain lake levels later in the summer and fall, in turn affecting fish usage of the littoral zone. At this maximum spring level, about 18,000 acre-feet less storage would be available in the lake. If flow releases from the lake are reduced to maintain summer lake levels, this could adversely affect downstream fisheries on the lower river.

As discussed for Interior's recommendation, limiting the drawdown to 263.5 feet the remainder of the year could have some fisheries benefits by maintaining littoral zone habitat, but it may be difficult to maintain this level from mid-September through mid-March, based on historical lake level data. If flow releases from the lake are reduced to maintain lake levels, this could adversely affect fisheries on the lower river. This period, however, would correspond with the period of the year that usage of the littoral zone by warmwater fishes would be less, so there would be limited direct fisheries benefit to maintaining higher lake levels during the winter period, though it would afford additional protection to littoral zone habitat.

Stephen Kasprzak

Mr. Kasprzak recommends a maximum spring lake level of 265.65 feet, with a range of +1 foot and -0.5 foot around the target. He also recommends the same deep drawdowns in November/December as FOSL. His proposal for the spring maximum level, which would allow a range from 265.15 to 266.65 feet, would not necessarily be much different from the existing LLMP, if the higher range of level is maintained. If, however, the lower range is maintained, water levels could be about 1.5 feet lower, and this would result in the lower availability of spawning and rearing habitat for spring-spawning species in the littoral zone. The deep November/December drawdowns would have the same effects as discussed for FOSL, with possibly some benefits in reducing lake trout spawning success, but at the same time dewatering more littoral zone habitat, albeit during a period of the year when fish usage of that habitat may be reduced.

Sebago Lake Coalition

The Sebago Lake Coalition recommends a lake level regime that would peak on June 1,[46] and would be reduced about 0.5 foot per month from then until October 1, to maintain higher lake levels during the boating season. They do not recommend specific levels for the remainder of the year. This proposal would have a peak spring level slightly lower than the existing LLMP, but would maintain lake levels slightly higher than the existing LLMP during the summer months. This could have some benefit for fishes rearing in the littoral zone during the summer months, but as noted for some of the other proposals, if flow releases from the lake are reduced to maintain these higher lake levels, this could have adverse effects on the lower Presumpscot River fisheries.

CONCLUSIONS – The recommended changes to the existing LLMP made by Maine would protect and enhance the existing lake fishery, while also protecting the downstream fishery in the lower Presumpscot River, by establishing criteria for flow releases from the lake. Although many of the other alternatives also have the potential for providing some fisheries benefits during parts of the year, most also have the potential for producing some adverse effects on either the lake fishery or the downstream Presumpscot River fishery. S.D. Warren's suggested revisions to Maine's plan would have minimal effects on the lake fishery. We make our recommendation regarding the LLMP in section VII, *Comprehensive Development and Recommended Alternative*.

Smelt access into spawning tributaries

IA (2002a) investigated 15 major tributaries to Sebago Lake during October 2000, at a lower lake level (263.2 feet), to identify potential barriers to upstream smelt movement during the spawning season. Smelt spawn in the early spring, just after ice-out, but observing the tributaries during a low fall lake level allowed investigators to easily observe tributary channel characteristics and possible obstructions. Zone of passage criteria were determined from the literature and from consultations with other biologists familiar with smelt migrations. A barrier to migration was judged to exist if: (1) a vertical barrier was present that was greater than 3 to 4 inches high; (2) the depth was less than 0.1 foot; or (3) velocity exceeded 2 to 4 feet per second (fps).

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[46] Staff supports a spring target elevation of 266.15 feet (± 0.5 foot), and date of May 15. The lower spring maximum water level would result in less littoral zone habitat being available spawning and rearing, and delaying full pool for two weeks could affect fish spawning by reducing the amount of habitat initially available in early May.

Table 22 summarizes the results of the IA study and provides our assessment of whether the identified barriers may be passable at typical spring lake levels.

Table 22. Results of the survey of 15 potential smelt spawning tributaries to Sebago Lake. (Source: IA, 2002a)

Tributary name	Stream discharge (cfs)	Presence of migration barrier?	Location/description	Passable at typical spring lake levels?
Sticky River	0.24	No	--	--
Rich Mill Pond outlet	10.3	No	--	--
Long Beach tributary	0.12	Yes	Boulder field with narrow passages, elev. 263.2-265.8	Probably
Northwest River	8.9	No	--	--
Nason Brook	0.25	Yes (2)	- Downstream lip of concrete box culvert – 1 ft high barrier at elev. 264.9 - Sill of concrete weir – 0.7 ft high at elev. 267.5	- Probably - No
Bachelder Brook	0.68	No	--	--
River Rd. tributary	0.3	Yes (2)	- Snag/debris dam 1.5 ft high at elev. 264.4 - Log 0.7 ft high at elev. 264.6	- Probably - Probably
Leavitt Brook	0.29	Yes (2)	- Snag/debris dam 1.5 ft high at elev. 264.1 - Alluvial gravel/cobble fan, depth < 0.1 ft, at elev. 264.8	- Probably - Probably
Muddy River	3.34	No	--	--
Trickey Pond outlet	0.35	Yes	Shallow riffle depth < 0.2 ft and < 0.1 ft, at elev. 263.2-266.7	No, at same flow
Thompson Point tributary	0.1	Yes (2)	- Sand bar 2.3 ft high at elev. 263.2 - Riffles/sand bar with depth < 0.1 ft, at elev. 265.4	- Probably - No, at same flow
Crooked/Songo River	132.1	No	--	--
Kettle Cove tributary	0.43	Yes	Snag/debris dam 0.7 ft high, at elev. 264.7	Probably

Tributary name	Stream discharge (cfs)	Presence of migration barrier?	Location/description	Passable at typical spring lake levels?
Thomas Pond outlet	0.89	Yes	Culvert lip 0.75 ft high, at elev. 268.0	No
Jordan River	40.5	No	--	--

This survey indicated that the five larger tributaries to Sebago Lake (flows ≥ 3 cfs) and two smaller tributaries did not have any barriers to smelt upstream movement. Four other tributaries that did have probable migration barriers at the time of the survey probably would be accessible at the lake levels typically achieved by mid to late April (266.0 feet). If, however, spring lake levels were lower, then some of those barriers would remain. Two tributaries that had probable barriers because of shallow depths probably would still be impassable in the spring, unless higher flows were present to increase water depth. Only two tributaries, Nason Brook and Thomas Pond outlet, had barriers (culverts) that would remain barriers to upstream movement, regardless of the lake level or instream flow. Both of these tributaries, however, were small, with flows less than 1 cfs at the time of the surveys. Nason Brook also reportedly is known to have a smelt run (IA, 2002b), but it is not known how far upstream the fish move. The identified impassable barrier is about 140 feet upstream of the mouth.

Other tributaries reported by IA (2002b) to have known smelt runs are: Bachelder Brook, Thompson Point tributary, Crooked/Songo River, and Jordan River. Only Thompson Point tributary had potential migration barriers identified from the fall 2000 survey, but these barriers were judged to be passable at either higher lake levels or higher stream flows. The Crooked/Songo River and Jordan River are the two largest tributaries to Sebago Lake, and both were judged to have no barriers to upstream smelt movement.

IA (2002b) investigated the 10 other tributaries to the lake in spring 2001, to determine whether or not smelt use the tributaries for spawning. IA observed these tributaries over three days; about 1 week after ice-out and after smelt began to move into the tributaries. Lake elevations during the survey ranged from 264.29 to 264.38 feet, about 2 feet lower than what typically occurs around May 1.

Of the 10 tributaries surveyed, two (River Road tributary and Thomas Pond outlet) were observed to have potential migration barriers. Only one smelt was observed in one of the tributaries, Trickey Pond outlet, during the survey, so the survey was unable to establish which tributaries may or may not have smelt spawning runs. Smelt were also observed in Bachelder Brook (not a surveyed tributary), indicating that smelt were moving into at least some of the lake's tributaries. IA (2002b), however, reported that MDIFW personnel indicated that very few smelt were observed in spawning streams in spring 2001, but were observed spawning along the lake shore. The MDIFW verified, during the September 22, 2005, section 10(j) meeting, that it believes that most smelt spawning now occurs along the lake shore, and that smelt numbers have increased 5-fold in the past 3 years. The MDIFW states that lake shore spawning results in higher survival than tributary spawning, and may be partly responsible for the higher numbers.

Our Analysis

The potential effects of the various LLMP alternatives on smelt access into the spawning tributaries was assessed by comparing the lake level elevations called for by each of the alternatives for the May 1 date, and comparing that to the elevations of the various barriers to migration observed during the IA surveys. Smelt spawning in Sebago Lake is typically within about a week of ice-out, in late-April to early May. Nearly all of the alternative LLMPs call for the lake to be at or near maximum elevation by May 1; although Interior does not specify a May 1 elevation, it recommends that any drawdown be less than 2 feet during the spring, summer, and fall. The existing LLMP and the alternatives recommended by Maine, the MDIFW, Mr. Frechette, and the Sebago Lake Coalition call for a May 1 elevation of 266.0 feet (or higher), while FOSL and Mr. Kasprzak recommend an elevation of 265.65 feet (although Mr. Kasprzak would allow a range of +1.0 to -0.5 foot around the target).

Table 23 shows the elevations of the various migration barriers reported by IA (2002a), compared to the May 1 target elevations called for by the alternative LLMPs. The judgment as to whether or not a barrier may be passable was simply based on elevation, such that if the barrier is submerged or mostly submerged by the lake level, it was judged to be passable. However, there may be other factors involved with each barrier, such as the streamflow in each tributary, or the nature of the barrier. Logs, debris, or sand bars may change position over time, depending on flow and other factors, so the hydraulics and passability of that barrier may also change. These site-specific hydraulic conditions, however, cannot be predicted with certainty, so we are using the more simplistic analysis based only on elevation.

Table 23. Comparison of elevations of potential blockages to smelt movement in Sebago Lake tributaries, compared to May 1 lake elevations recommended by alternative LLMPs. (Source: Staff, based on information in IA, 2002a)

Tributary name	Elevation of barrier (ft)	Passable at 266.65?	Passable at 266.0?	Passable at 265.65?
Long Beach tributary	- 263.2-265.8	- Yes	- Probably	- Maybe not
Nason Brook	- 264.9	- Yes	- Yes	- Yes
	- 267.5	- No	- No	- No
River Rd.	- 264.4	- Yes	- Yes	- Yes

Tributary name	Elevation of barrier (ft)	Passable at 266.65?	Passable at 266.0?	Passable at 265.65?
tributary	- 264.6	- Yes	- Yes	- Yes
Leavitt Brook	- 264.1	- Yes	- Yes	- Yes
	- 264.8	- Yes	- Yes	- Yes
Trickey Pond outlet	- 263.2-266.7	- Probably	- Maybe not	- No
Thompson Point	- 263.2	- Yes	- Yes	- Yes
tributary	- 265.4	- Yes	- Yes	- Probably
Kettle Cove tributary	- 264.7	- Yes	- Yes	- Yes
Thomas Pond outlet	- 268.0	- No	- No	- No

Based on the analysis in table 23, it appears that most of the eight tributaries with identified potential barriers, would be passable with nearly all the alternative LLMPs, although there does appear to be some benefit to maintaining the lake at the highest level, to provide the best passage conditions for smelt. There are two tributaries with barriers above even the highest lake level (Nason Brook and Thomas Pond outlet), but for the remaining six tributaries, all should be passable at 266.65 feet, but one may not be at 266.0 feet (or 266.15 feet) and two may not be at 265.65 feet.

Our analysis indicates that the LLMPs with the highest spring target levels would be the preferred alternatives, from the standpoint of smelt tributary spawning. Another advantage of these two alternatives, over the alternatives outlined by FOSL and Mr. Kasprzak, which call for deeper and more frequent winter drawdowns, is that the lake would be more likely to refill to the May 1 target level, because it would not be drawn down to lower levels in the winter. Maine's plan would have a slight advantage over the existing LLMP in that Maine's revisions calls for maintaining the lake somewhat higher during the winter months (≥1910-1986 median), which would help to ensure refilling of the lake during the spring, and attainment of the May 1 target level. S.D. Warren's July 15, 2004, response to Maine's plan also calls for a higher winter lake level of 262.0 feet, which would also help ensure that the lake refills.

Based on our assessment of the potential effects of the alternative LLMPs on both lake-dwelling species and on smelt spawning access to tributary streams in early spring, we conclude that Maine's revisions to the existing LLMP would provide some fisheries benefits over the existing plan, and would overall have a greater potential for protection and enhancement of fisheries resources than any of the alternative plans proposed by other stakeholders.

Potential use of the LLMP to control the lake trout population

As we described above, the current lake trout population in Sebago Lake is self-sustaining and appears to be adversely affecting the landlocked salmon population, which has been the mainstay of the Sebago Lake fishery. Sebago Lake and the Presumpscot River Basin was one of the four river basins in Maine that held native populations of landlocked salmon (Warner and Havey, 1985). Competition between salmon and lake trout is primarily the result of the use of the same forage species, the rainbow smelt, although lake trout may also be direct predators on young salmon (Warner and Havey, 1985).

The MDIFW states that the "…burgeoning, introduced population of lake trout," with its effect on smelt and the native salmon population, is a "...fishery crisis." The MDIFW indicates that the various control measures attempted, such as liberalizing the fishing regulations for lake trout, have not been successful. The MDIFW is considering whether a lake drawdown in late-November or early-December, to expose and kill lake trout eggs deposited during fall spawning, would be a feasible control measure. The MDIFW requests that the Commission assess the feasibility of such a measure for Sebago Lake. The MDIFW initially suggested that lake levels be maintained higher in the fall, to encourage lake trout spawning on shoals at as high an elevation as possible, to be followed by a drawdown of from 5 to 8 feet in late-November or early-December. As noted above, the MDIFW has since modified its recommendation, now stating that the lake should be drawn down 6 to 8 feet from the lake level that occurs in early-November, and that this drawdown could occur later into the winter (January/February).

Interior does not recommend such a drawdown to control lake trout spawning. Rather, Interior recommends that the Sebago Lake winter drawdown be no more than 3 feet, and that the open-water season drawdown be no more than 2 feet. However, the USFWS, during the September 22, 2005, section 10(j) meeting, stated that it was not opposed to a deeper drawdown to control lake trout spawning.

FOSL and Stephen Kasprzak do not recommend drawdowns for fisheries purposes. Both FOSL and Mr. Kasprzak, however, recommend that the lake be drawn down to 261.0 feet (by November 1) in 1 out of every 2 years, to 260.0 feet in 1 out of every 4 years, and to 259.0 feet in 1 out of every 10 years. This recommendation is for maintenance and enhancement of the natural beaches in the lake. Charles Frechette and other landowners around Sebago Lake recommend that the lake not be drawn down below 263.5 feet at any time during the year, to protect fish and wildlife resources, wetlands, and recreation.

S.D. Warren is opposed to a winter drawdown to assist in the control of the lake trout population, and is also opposed to the 2-in-9-year drawdown recommended by many stakeholders for accretion of beach sands (letter from Nancy J. Skancke, Counsel for S.D. Warren Company, to Magalie Salas, Secretary, FERC, July 15, 2004).

Our Analysis

Information provided by the MDIFW in this proceeding and from Boland et al. (2003), MDIFW (2002a), and Warner and Havey (1985) indicate that some control of the introduced lake trout population would be appropriate to protect the native landlocked salmon fishery. To assess whether a lake drawdown as proposed by the MDIFW would be feasible, we reviewed the spawning requirements for lake trout (particularly depth of spawning), estimated the drawdown depth that would be required to effectively kill lake trout eggs on the spawning shoals in Sebago Lake, and estimated the lake level manipulations that would be necessary (particularly flow releases) to meet the drawdown requirements.

Based on information in Scott and Crossman (1973) and MDIFW (2002b), lake trout spawn from mid-October to mid-November in Maine waters, with spawning occurring in October in northern Maine waters and as late as November in southern Maine waters. Spawning occurs over rocky/boulder shorelines and shoals at depths ranging from a few inches to over 30 feet. However, during the September 22, 2005, section 10(j) meeting, the MDIFW stated that most lake trout spawning in Maine lakes occurs at depths of 6 to 8 feet. Typically, the percent of fines increases with depth, and at depths greater than 8 feet, spawning substrate becomes less suitable. In Sebago Lake, limited post-spawning egg surveys along Frye Island found that lake trout eggs were deposited at depths of up to 16 feet, although the heaviest concentration of eggs was observed at a depth of 6 to 8 feet (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003).

For our analysis, we assume that a 6-foot drawdown would be selected for lake trout “control” (deeper drawdowns might be more effective, but would be unpopular with many of the residents around Sebago Lake and other users of the lake), and this drawdown would be from the lake level occurring during the spawning period of mid-October to mid-November. According to the current LLMP, the maximum lake level on October 15 is 263.3 feet, and the target level for November 1 is 262.5 feet, +/- 0.5 feet. If the lake is at 263.0 feet on November 15 (end of lake trout spawning), then it would have to be lowered to 257.0 feet to achieve a 6-foot drawdown.[47] Using the stage versus storage relationship for Sebago Lake (figure 10 in section V.C.2, *Water Resources* shows

[47] The MDIFW previously recommended that the lake be held higher during the lake trout spawning period, so we assume that the lake would be held at the “high end” of the range allowed by the LLMP in November.

that relationship down to 260.0 feet, and we extended the relationship line to 257.0 feet), about 161,000 acre-feet would have to be released from the lake to reach a 6-foot drawdown. A volume of 161,000 acre-feet is equal to about 7,000 mcf. Assuming the maximum drawdown should be reached by February 1 (based on the MDIFW's modified recommendation), water would be released over a 2½ month period, or about 11 weeks, to reach the required drawdown. This would require a continuous release from the lake of at least 1,052 cfs.[48]

Based on USGS flow data at the lake outlet, flow releases in the range of 1,500 to 1,800 cfs would be close to the maximum recorded flows for the lake outlet during the months of November thru January since 1902 (tables 7 and 8). A flow release in this range would approximate the maximum recorded flow for these months for the 1902-1986 period (table 7), and would be near the range of 5 percent exceedence flow for the 1987-2004 period (table 8). The maximum hydraulic capacity of the Eel Weir powerhouse is 822 cfs, so continuous spillage of about 700 to 1,000 cfs would be required over this 2½-month period to release the required volume from Sebago Lake. Continuous spillage into the bypassed reach would have negative effects on the fall sport fishery in the reach, and higher spillage flows may also result in the downstream displacement of some fish from the reach, making them unavailable to the important sport fishery.

Once the lake drawdown is reached (257.0 feet), we assume that it would be held at this level for at least two weeks, to ensure that the lake trout eggs within the drawdown zone are killed. After the two-week drawdown (say from February 1 to 15), refilling the lake could be resumed. Beginning the lake refill at an elevation of 257.0 feet, however, may result in the lake not refilling by the May 1 target date, or may not reach the target elevation at any time during the spring/early summer, if the winter and spring periods have lower than normal precipitation. Our review of the historical lake level data indicates that Sebago Lake has not been as low as 257.0 feet since 1940, although it reached 258.82 feet in 1960. The most recent lowest recorded level of 260.60 feet was in 1993.

A large mid-winter drawdown could affect the winter ice fishery; in that ice cover may not be stable on the lake, particularly along the shoreline, with a continually rising lake level after February 15. The MDIFW, however, is not concerned about any such effects on the winter fishery. Other adverse effects could occur in the lake littoral zone habitat with a deep winter drawdown. Macroinvertebrates and shoreline aquatic

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[48] This analysis does not consider the inflow to the lake, which from November-January could average from 500 to 800 cfs. So any release from the lake to achieve this drawdown would more likely be in the range of 1,500 to 1,800 cfs.

vegetation, both emergent and submerged, could be killed and result in a decrease in cover and forage for juvenile fishes during the following spring and summer season, potentially affecting both forage and game species in the lake. If the lake has not refilled in time for the spring spawning period, tributary spawners such as smelt could have difficulty entering tributary streams because of blockages to upstream movement that would normally be inundated at higher lake levels. Shoreline spawners could also be affected if less spawning area is available due to the lower lake levels.

Providing a mid-winter drawdown of up to 6 feet would likely result in the mortality of lake trout eggs spawned with the drawdown zone, but the overall effect on the lake trout population can not be predicted with certainty. The lake trout is a long-lived species, with maturation occurring at ages 5 through 8, and ages of 20 to 25 years record in Maine waters (MDIFW, 2002b). Any effects of such a drawdown on the lake trout population would likely require several years to determine, but in the meantime the drawdowns would have many adverse consequences as described above.

Effects of Alternative LLMPs on the Lower Presumpscot River Fishery

Flow releases from Sebago Lake essentially control the flow of the Presumpscot River, except under unusual flow events. The lake typically acts to dampen high flow events, but helps to maintain higher river flows during the summer low-flow period. Both the resident fishery of the several downstream impoundments and bypassed reaches, and the diadromous fisheries of the lower river (shad and river herring downstream from the Cumberland Mills dam, and American eel throughout the river), have adapted to the pattern of flow regulation from Sebago Lake. If major changes in this flow regulation were to occur, it could affect the lower river fisheries.

S.D. Warren is not proposing any changes to the flow regulation of the Presumpscot River. The current minimum required flow releases from the lake are 270 cfs from November through April, and 333 cfs from May through October. These flows would continue if no changes in the LLMP are made. No other aspects of proposed project operations and regulation of Sebago Lake would affect downstream fisheries, except for potential changes in the minimum flow in the bypassed reach, which is discussed separately herein.

Neither Interior, the MDIFW, the MDMR, nor FOSL made recommendations regarding the regulation of Sebago Lake to benefit downstream river fisheries, other than minimum flows in the bypassed reach. Similarly, Stephen Kasprzak, Charles Frechette, the Sebago Lake Coalition, and the “Say No To Low” postcard campaign did not recommend any changes in the regulation of the lake to benefit downstream fisheries. In fact, many of these commenters recommended that the lake not be drawn down, for the benefit of downstream uses, but instead maintain lake levels to protect the lake fishery.

Maine recommends changes to the existing LLMP and the flow releases from Sebago Lake. Such changes are not specifically for fishery management purposes, but are to allow the attainment of the target lake levels outlined in the plan. Part of Maine's plan provides for "operating parameters" to govern flow releases from Sebago Lake for the May 1 to November 1 period, so that the lake is maintained within the bounds of the new LLMP (*see* Appendix B).

S.D. Warren, in commenting on Maine's plan, disagrees with the lower minimum flows from the lake under the "abnormal" flow scenario, because of potential effects on the needed reaeration flows at the downstream Dundee and Gambo projects, as required by the Water Quality Certifications for those projects.

Our Analysis

Since S.D. Warren is proposing to continue project operations in accordance with the current LLMP, and no party has made specific comments or recommendations regarding the lower river fishery, our analysis focuses on how flow releases from Sebago Lake may have changed since implementation of the LLMP in 1997. We qualitatively assess how the lower river fishery may have been, and continues to be, affected, based on the timing of flows in relation to the timing of important life history stages for the diadromous and resident species. We also assess how Maine's recommended operating parameters (Appendix B) may affect downstream flow releases and fisheries.

Effects of LLMP on lower river fishery

Tables 24 and 25 provide flow duration data for the Sebago Lake outlet for water years 1986 to 1996 (prior to implementation of the LLMP) and 1997 to 2004 (after implementation of the LLMP). Table 26 shows a comparison of flow statistics for the two periods. This comparison indicates that since implementation of the LLMP, the "open-water" season of April through November, when both resident and diadromous species are most active (spawning, rearing, migration), has had mostly higher mean flows from Sebago Lake (5 out of 7 months) and only slightly lower flows in 3 months (April, May, and August). Maximum flows, however, are lower in 3 out of 7 months, the same in 1 month (April), and much higher in 2 months (June and July). Minimum flows are higher in 4 out of 7 months, only slightly lower (13 cfs) in 2 months (June and July), and lower in 2 months (October and November). During the over-winter period of December through March, mean flows are higher in 2 months and lower in 2 months, maximum flows are lower in 3 out of 4 months, and minimum flows are lower in 3 out of 4 months.

Our analysis shows that both minimum and average flows in the Presumpscot River would generally be higher than, or about the same as, flows before the LLMP, while maximum flows would be lower nearly half the time, during the "open-water" season.[49] As noted below, this flow scenario would have mostly positive effects on the resident and anadromous fisheries of the lower river.

Higher minimum and mean flows, particularly during the warm summer months, should benefit water quality by (a) reducing maximum summer water temperatures in both the impounded and riverine reaches of the river, and (b) maintaining higher DO levels. Higher minimum and mean flows during the upstream migration and spawning periods for the anadromous clupeids (April, May, and June) would assist these species in their upstream migrations, by providing adequate depths and cues for migrations, and during spawning as more higher-quality habitat would be available. Higher flows during the summer rearing period would provide better water quality and more higher-quality habitat, while higher flows during the fall outmigration period would assist in the outmigration. Reducing maximum flows during the spawning and rearing periods would also benefit the anadromous clupeids by potentially reducing the incidence of high flow events during the critical egg and larval development periods, when such events can result in high mortality of eggs and larvae. Data in table 26 indicate that maximum flows during June and July would be significantly higher, but these higher flows would occur after the critical egg and larval development period for river herring, and toward the end of the egg and larval development period for shad.

[49] Our analysis assumes that the 7.5 years of flow data since implementation of the LLMP can be considered generally predictive of flow releases from Sebago Lake during the longer-term operation with the existing LLMP.

Table 24. Flow duration data (cfs) for the USGS gage 01064000, water years 1986 through 1996. (Source: USGS, 2004a)

% Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	1330	985	2160	985	985	1510	1250	2240	1490	1200	807	819
10%	829	915	1150	856	985	844	865	1650	985	665	605	423
15%	670	827	998	844	856	844	852	1570	831	662	492	423
20%	418	819	856	834	856	831	845	1000	675	502	492	423
25%	350	671	831	831	844	831	830	998	675	501	423	350
30%	350	665	831	819	831	819	670	985	662	425	423	350
35%	350	615	831	772	831	819	668	845	508	423	423	350
40%	340	415	831	702	831	819	588	831	340	418	422	344
45%	340	350	819	680	819	695	352	831	340	400	400	340
50%	340	350	672	680	819	670	350	819	340	400	392	340
55%	338	350	667	670	702	668	350	670	338	375	383	338
60%	335	350	667	670	690	665	350	655	338	369	366	338
65%	298	340	665	667	670	658	340	350	338	350	350	338
70%	298	335	579	667	670	554	340	350	301	350	340	338
75%	290	332	579	562	670	546	338	340	298	343	340	333
80%	277	327	554	554	546	423	338	277	298	340	334	331
85%	254	306	554	531	546	365	300	254	277	340	334	301
90%	237	302	549	508	546	332	277	250	50	327	327	277
95%	233	254	499	408	325	325	250	250	50	313	327	268
99%	231	234	499	330	325	273	175	50	50	292	242	250
Mean	433	525	839	722	731	708	554	842	504	498	435	384
Max	1330	1500	2490	2490	998	1520	1650	3310	2650	1870	1330	1320
Min	212	231	437	330	325	91	0	50	50	263	50	231

Table 25. Flow duration data (cfs) for the USGS gage 01064000, water years 1997 through 2004, excluding data past May 3, 2004. (Source: USGS, 2004a; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

% Exceedence	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
5%	1000	2351	1000	1000	844	1000	2351	1000	2351	1000	1000	2351
10%	994	2321	994	994	667	994	2321	994	2321	994	994	2321
15%	838	1093	838	838	667	838	1093	838	1093	838	838	1093
20%	835	1000	835	835	667	835	1000	835	1000	835	835	1000
25%	833	999	833	833	667	833	999	833	999	833	833	999
30%	828	991	828	828	667	828	991	828	991	828	828	991
35%	821	990	821	821	657	821	990	821	990	821	821	990
40%	667	939	667	667	501	667	939	667	939	667	667	939
45%	619	903	619	619	501	619	903	619	903	619	619	903
50%	500	846	500	500	500	500	846	500	846	500	500	846
55%	465	844	465	465	500	465	844	465	844	465	465	844
60%	373	833	373	373	495	373	833	373	833	373	373	833
65%	333	833	333	333	349	333	833	333	833	333	333	833
70%	333	700	333	333	333	333	700	333	700	333	333	700
75%	333	643	333	333	333	333	643	333	643	333	333	643
80%	275	625	275	275	301	275	625	275	625	275	275	625
85%	275	500	275	275	299	275	500	275	500	275	275	500
90%	258	500	258	258	250	258	500	258	500	258	258	500
95%	256	500	256	256	250	256	500	256	500	256	256	500
99%	75	176	75	75	250	75	176	75	176	75	75	176
Mean	609	1000	994	953	498	461	552	824	641	671	381	419
Max	2000	2400	2333	2560	846	1000	1650	2750	3760	3490	670	838
Min	75	25	292	250	250	133	133	133	37	250	250	275

Table 26. Comparison of flow statistics for USGS gage 01064000, prior to and after implementation of the LLMP. (Source: Staff)

Flow period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1986-1996												
Mean	433	525	839	722	731	708	554	842	504	498	435	384
Max	1330	1500	2490	2490	998	1520	1650	3310	2650	1870	1330	1320
Min	212	231	437	330	325	91	0	50	50	263	50	231
1997-2004												
Mean	609	1000	994	953	498	461	552	824	641	671	381	419
Max	2000	2400	2333	2560	846	1000	1650	2750	3760	3490	670	838
Min	75	25	292	250	250	133	133	133	37	250	250	275
Difference[a]												
Mean	176	475	155	231	-233	-247	-2	-18	137	173	-54	35
Max	670	900	-157	70	-152	-520	0	-560	1110	1620	-660	-482
Min	-137	-206	-145	-80	-75	42	133	83	-13	-13	200	44

[a] Difference is most recent period (with the LLMP) minus the earlier period (prior to the LLMP). Shaded cells indicate reductions in flow after implementation of the LLMP.

Anadromous species have been, and will continue to be, limited to the lower 10 miles of the Presumpscot River below the Cumberland Mills dam, until fish passage is provided at that dam.[50] Thus, any beneficial effects on anadromous species would be limited to this reach of the river. If, however, fish passage is eventually provided at Cumberland Mills, that will set in motion the provisions of the recently-issued licenses for the other S.D. Warren projects, which require the phased installation of fish passage facilities. As anadromous species gain access to more of the Presumpscot River Basin, any beneficial effects of the modified flow regime from Sebago Lake (as a result of the LLMP) would be realized over a greater portion of the basin.

The effects of this modified flow regime on the American eel, however, are less clear. The American eel occurs throughout the Presumpscot River, indicating that some numbers of eels are able to pass upstream over most of the dams on the river, without the aid of fish passage facilities. Eels have been observed passing over the Presumpscot River dams in areas with very small volumes of leakage, and eel fishway criteria indicate that eels prefer such areas for passage (Clay, 1995). Thus, if higher mean flows were to continue to occur during the primary upstream movement period for eels (May, June, July), resulting in higher spillage at some of the dams on the river, this may not enhance upstream passage conditions for eel. However, the new licenses for the five S.D. Warren projects also require the installation of fishways for upstream eel passage, so passage over the dam spillways may become less important as an upstream passage route, as eel fishways are eventually installed on the dams. Overall improvement in water quality and aquatic habitat conditions, as a result of higher mean flows, would benefit the eel, as it would any species in the river. Adult eel migrate downstream in late-summer and fall, so higher mean flows during that period should enhance the outmigration.

Sea-run Atlantic salmon currently do not occur in the Presumpscot River Basin, although the draft fishery management plan for the river includes restoration of salmon as a long-term objective for the basin (Wippelhauser et al., 2001). There are no ongoing restoration activities, and the only salmon that currently occur in the river are probably strays from other rivers. Thus, the flow regime that has been in place since implementation of the LLMP has had no effect on the Atlantic salmon. If salmon restoration efforts were to begin and result in the re-establishment of a salmon run in the river, higher minimum and mean flows during the open-water season should benefit salmon by improving habitat conditions during migration, spawning, and rearing.

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[50] S.D. Warren is not proposing to install fish passage at Cumberland Mills, but the state and federal agencies have indicated that they will be pursuing fish passage at this non-jurisdictional dam.

If natural spawning of salmon was re-established in the river, however, the existing lower over-winter flows could affect egg incubation. Our flow analysis indicates that mean flows have been lower in February and March, and minimum flows lower in December, January, and February, since implementation of the LLMP. If this trend continued, incubating salmon eggs might not be sufficiently protected over the winter period. This potential effect, however, would not occur for many years, since there currently is no active salmon restoration program in the Presumpscot River. It would also only affect potential spawning areas in the mainstem river, which has limited spawning and rearing habitat for Atlantic salmon. Most of the salmon habitat in the Presumpscot River Basin is located in the tributary streams (FERC, 2002).

Resident species are likely benefiting from the improved water quality and better habitat conditions resulting from higher minimum and mean flows during the open-water season, when these species spawn and rear. However, because the Presumpscot River is mostly a series of shallow reservoirs and short riverine reaches (upstream of Cumberland Mills dam), the precise effects of these improvements cannot be predicted with certainty. The overall improvement in habitat suitability that has occurred since implementing the LLMP has likely enhanced populations of resident species, although the magnitude of enhancement may not be measurable. Reductions in the maximum flows during the open-water season are likely beneficial, particularly during the spring spawning season (May), where high-flow events may result in higher mortality of eggs and larvae. Lower flows during the over-winter period have likely had little effect on resident species, because this is a period of relative inactivity for most warmwater/coolwater species.

CONCLUSIONS – The potential effects of continued use of the LLMP and associated Sebago Lake flow releases on the lower river fishery would be mostly positive, but would vary by species and life stage. Table 27 summarizes these potential effects.

Table 27. Summary of potential effects of the current flow release regime from Sebago Lake on the fisheries of the lower Presumpscot River. (Source: Staff)

Species grouping	Species	Life stage	Potential effect[a]
Anadromous	American shad	Migration	+
		Spawning	+
		Rearing	+
	River herring	Migration	+
		Spawning	+
		Rearing	+
	Atlantic salmon[b]	Migration	+
		Spawning	+
		Egg incubation	-
		Rearing	+

Species grouping	Species	Life stage	Potential effect[a]
Catadromous	American eel	Spring migration	-
		Rearing	+
		Fall migration	+
Resident	Warmwater/coolwater species	Spawning	+
		Rearing	+

[a] Overall positive effect is indicated by a "+" and a negative effect is indicated by a "-".
[b] Salmon do not currently occur in the Presumpscot River, but may be reintroduced.

Potential effects of Maine's recommended operating parameters

Under the proposed operating parameters, flow releases would remain essentially unchanged from current operations, unless Sebago Lake levels were to deviate from the target range required by the LLMP, for the May 1 to November 1 period. Thus, if the lake stays within the target range, there would be no changes in the flow releases from the lake, with the minimum flow remaining at 333 cfs and the maximum flow released as required to maintain the lake within the target range. Assuming similar meteorological conditions, the outflow from Sebago Lake should approximate the flow record illustrated in table 26 (as long as the lake remains within the target range), with effects on downstream fisheries as described above and summarized in table 27.

If, however, the lake level was to vary from the target levels, then the operating parameters would allow "abnormal flows" to be released. If abnormal flows were implemented, the minimum flow could drop to 250 cfs, and the maximum flow would vary, depending on stage, from 1,667 cfs to 3,500 cfs. The minimum flow would be implemented to bring the lake level up to a target level, and the maximum flow would be released if the lake level was high and had to be lowered to return to the target level. The maximum flow could also be higher than these volumes, if additional flow releases were required to prevent the lake level from reaching 267.15 feet, which is 6 inches above the spillway crest elevation.

Because flow releases from the lake would depend on the lake elevation, which in turn would depend on climatic conditions, it is difficult to predict with any confidence what the flow releases from the lake would actually be, under Maine's recommended operating parameters. Essentially, during dry weather patterns, flows from the lake would likely be reduced to the minimum flow of 250 cfs, while in wet weather patterns, higher flows would be released from the lake. This would be similar to the natural flow patterns that have occurred in past lake operations. Lower outflows from the lake during the open-water season (the minimum flow would be 83 cfs less than the current minimum flow) could affect water temperatures and water quality, and reduce the availability and suitability of downstream aquatic habitat. Higher outflows, although likely to improve water quality and increase the availability of aquatic habitat, could also adversely affect some species and life stages, if high flows were to occur during critical life stages, such as spawning or egg incubation. Because of the variability in weather patterns, however, these effects cannot be predicted with certainty. However, over time, Maine's recommended operating parameters could likely result in flow releases not significantly different from those that have occurred over the recent past.

Eel Weir Bypassed Reach Minimum Flow

In 1985, the MDIFW developed a strategic plan for fisheries management in the Eel Weir bypassed reach (MDIFW, 1985).[51] The goal of the management plan was to establish a viable fishery for landlocked Atlantic salmon and other species of coldwater and warmwater sport fish in the Eel Weir bypassed reach. As a means of achieving this goal, the 1985 Plan recommended that an appropriate minimum flow be released into the bypassed reach to enhance landlocked Atlantic salmon habitat and fishing opportunities.

To address the goals set out in the 1985 Plan, a minimum flow study was conducted in 1985 by a study team comprised of representatives from S.D. Warren, the USFWS, and the MDIFW (Charles Ritzi, 1986). The existing minimum flow regime for the bypassed reach was developed based on the 1985 flow study. The existing flow regime consists of 25 cfs (11/1-3/31), 75 cfs (4/1-6/30), 50 cfs (7/1-8/31), and 75 cfs (9/1-10/31). S.D. Warren proposes to continue implementing this same flow regime. S.D. Warren argues that under the current minimum flow regime, the Eel Weir bypassed reach is achieving fisheries management objectives and provides sufficient protection to fish habitat and angling suitability.

The MDIFW indicates that the existing flow regime was developed as a way to establish a self-sustaining landlocked Atlantic salmon fishery in the Eel Weir bypassed reach. Secondarily, the flow regime was designed to enhance the fisheries for other species of coldwater and warmwater sport fish. The MDIFW states that the effort to establish a self-sustaining salmon fishery in the bypassed reach has not been successful. Consequently, the bypassed reach is currently managed principally for as a brook trout fishery, with stocking of catchable-size fish. Some salmon and brown trout are stocked to diversify angling opportunity.

At the request of the MDIFW and the USFWS, S.D. Warren conducted an instream flow study in the Eel Weir bypassed reach in 2001 (Kleinschmidt, 2002).

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[51] The MDIFW's formal management plans for the Eel Weir bypassed reach are presented in the 1985 Plan, the Presumpscot River Eel Weir Bypass Fishery – Cold Water Sport Fish Management (MDIFW, 1997), and the Draft Fishery Management Plan for the Presumpscot River Drainage (Wippelhauser et al., 2001).

Unlike the 1985 study, the 2001 study utilized state-of-the-art habitat modeling procedures to evaluate habitat-discharge relations in the bypassed reach. The 2001 study also evaluated the effects of instream flows on thermal refugia and angling opportunities in the bypassed reach.

Based on the 2001 instream flow study, the MDIFW, Interior (on behalf of the USFWS), and FOSL recommend minimum flows for the Eel Weir bypassed reach that differ from those proposed by S.D. Warren. The MDIFW recommends a non-winter flow (5/1-10/31) of 200 cfs[52] and a winter flow (11/1-4/30) of 115 cfs. Interior recommends a similar flow regime, 200 cfs from 4/1 to 10/31 and 115 cfs from 11/1 to 3/31.[53] Interior also recommends that S.D. Warren monitor water temperatures in the bypassed reach to determine what, if any, effects increased minimum flows have on the cold-water refugia in the reach. FOSL recommends a year-round bypass minimum flow of at least 100 cfs.

Our Analysis

The Eel Weir bypassed reach extends from the toe of the Eel Weir dam downstream approximately 6,700 feet to the Eel Weir powerhouse (figure 20). The MDIFW mapped the habitat in the bypassed reach in 1985 (MDIFW, 1985). As described below, S.D. Warren updated the MDIFW habitat mapping data in May 2001.

The MDIFW and S.D. Warren surveys both indicate that nearly half of the Eel Weir bypassed reach (about 3,000 feet) is comprised of riffle and run habitat, with coarse (gravel, cobble, and boulder) substrates (figure 20). Approximately 500 feet of the upper bypassed reach, immediately downstream from the Eel Weir dam, consists of braided riffle areas. Boulders provide good instream cover for fish in the riffle/run areas. Narrow stream widths (less than 100 feet), forested land, and shoreline vegetation provide moderate shading in the riffle/run areas. Aquatic habitat in the remainder of the bypassed reach (some 3,500 feet) consists of deadwater areas with fine (sand and silt) substrates (figure 20). Depths in the deadwater areas are predominantly less than 5 feet and stream widths are typically greater than 100 feet. Little shading is available within the deadwater areas. Although there are no significant tributaries to the bypassed reach, areas with coldwater seeps are present, which provide important thermal refuge for trout and landlocked salmon during the warm summer months.

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[52] If the natural spring refugia can not be adequately protected, summer minimum flows would be reduced to approximately 110 cfs.

[53] In its August 29, 2005, comments on the draft EA, the USFWS proffered an alternative flow regime of: 115 cfs from 11/1 to 3/31, 200 cfs from 4/1 to 6/30, 115 cfs from 7/1 to 8/31, and 200 cfs from 9/1 to 10/31.

Figure 20. Habitat types and location of study reaches and transects in Eel Weir bypassed reach. (Source: Kleinschmidt, 2002)

Public Access for figure 20 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

The MDIFW's current management objectives for the bypassed reach are: (1) to continue intensively managing the Eel Weir bypassed reach for primarily brook trout and secondarily landlocked salmon to provide a quality, year-round, high-use recreational coldwater fishery;[54] (2) to maintain an average catch rate of two legal salmonids per angler trip; and (3) to maintain an average length of at least 12 inches for trout and 14 inches for salmon. According to angler use data collected by the MDIFW during the 1990s, the management objectives for catch rate and fish size are not being obtained.

To address concerns related to the issue of flows in the Eel Weir bypassed reach, S.D. Warren, along with a team of fisheries biologists from the MDIFW, the USFWS, and the MASC, conducted an instream flow study in 2001. The objectives of the study were to: (1) estimate the amount of habitat for lifestages of brook trout, Atlantic salmon, smallmouth bass; and a macroinvertebrate species in the bypassed reach; (2) determine the effects of instream flows on thermal refugia created by coldwater seeps in the bypassed reach; and (3) determine the effects of flows on angling opportunity in the bypassed reach. The study methodology is summarized below, but the study's details can be found in Kleinschmidt (2002).

Aquatic habitat in the Eel Weir bypassed reach was evaluated using the Instream Flow Incremental Methodology (IFIM: Bovee, 1982; 1998). The Physical Habitat Simulation Model (PHABSIM) was used to quantify flow versus habitat relationships in riffle and run habitat types in the bypassed reach. The flow range modeled was from 25 cfs to 440 cfs (equivalent to the Aquatic Base Flow for fall/winter spawning flows). Habitat-discharge information was not collected for deadwater areas in the bypassed reach. However, bathymetric data from two deadwater areas was obtained. Habitat – discharge relationships in braided channel areas were computed for field-measured calibration flows, with no interpolation of estimated habitat at other flows. A total of 11 transects were established in representative riffle and run habitats in four reaches of the bypassed reach (figure 20).

Habitat availability in the bypassed reach was evaluated for brook trout (juvenile and adult), landlocked Atlantic salmon (juvenile and adult), anadromous Atlantic salmon (spawning/egg incubation and juvenile), smallmouth bass (juvenile and adult), and a macroinvertebrate species (*Stenonema species*). Habitat suitability index (HSI) curves were collaboratively developed by previous instream flow study groups for use in instream flow studies in Maine and elsewhere in New England. The amount of habitat

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[54] During the September 22, 2005, section 10(j) meeting in Augusta, Maine, the USFWS and the MDIFW stated that the presence of smallmouth bass in the Eel Weir bypassed reach should not be given much weight in flow management decisions, as the agencies do not consider smallmouth bass a threat to trout management. This is a shift in position from earlier statements in the relicensing proceeding (S.D. Warren, 2002a).

for each species and life stage is expressed as total wetted area and Weighted Usable Area (WUA).[55]

To evaluate the cold water refugia in the bypassed reach, water temperatures were monitored at two coldwater seeps at flows of 79, 115, and 172 cfs in August 2001. Transects, spaced at about 10-foot intervals, were established immediately upstream within, and downstream of each cold water seep. The suitability of angling in the bypassed reach under alternative flows was assessed in August 2001, using methods similar to those used in previous Delphi flow assessments conducted in Maine. A group of anglers observed four flows (79, 115, 172, and 310 cfs) and independently rated the suitability of each flow for angling.

We provide our analysis of the flow issue in the Eel Weir bypassed reach below. Our recommendation concerning flows in the bypassed reach, however, is found in section VII, *Comprehensive Development and Recommended Alternative*.

Hydraulic Data

Riffle-Run Habitat. A range of discharges from 25 to 440 cfs was simulated using PHABSIM for all riffle-run transects (Transects 1-9), based on data obtained in the field. Table 4.1 in Kleinschmidt (2002) summarizes the percentage of wetted area experiencing selected velocity and depth ranges for Transects 1-9. Table 28 (and *see* Figure 4.1 in Kleinschmidt, 2002) summarizes changes in wetted area at the same nine transects.

At flows of 25 cfs and 50 cfs, the majority of depths (83 and 72 percent, respectively) were less than 0.5 feet, and nearly all depths were less than 1.5 feet. At 75 cfs and 100 cfs, over 25 percent of all depths ranged from 0.6 to 1.5 feet. At discharges between 200 and 440 cfs, about 50 percent of all depths were greater than 0.5 feet. Areas with depths ≥ 3 feet were scarce at flows of 200 cfs and less, but increase gradually through 440 cfs.

At 25 cfs, 86 percent of all velocities were 0.5 fps or less, and 14 percent of the velocities ranged from 0.6 to 2.0 fps. At 50 and 75 cfs, about 75 percent of the velocities were 0.5 fps or less, and at least 25 percent ranged from 0.6 to 2.0 fps. The peak percentage of wetted cells experiencing velocities between 0.6 and 2.0 fps occurs at 100 cfs. At discharges between 200 and 440 cfs, velocities ranging from 0.6 to 2.0 fps decreased 7 percent, and velocities greater than 3.0 fps increased 13 percent.

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[55] WUA is an index of the capacity of a stream reach to support a particular species and life stage, and is expressed as the area or percentage of suitable habitat available per unit length of a stream at a given flow (ft^2 of WUA per 1,000 feet of reach).

Wetted area increased most rapidly between 25 and 50 cfs, with no distinct inflection point (table 28 and *see* Figure 4.1 in Kleinschmidt, 2002). At 100 cfs, total wetted area at the riffle/run transects was nearly 75 percent. Additional gains in wetted area continue to occur at a steady rate across the remainder of the range of flow modeled, reflecting inundation of riparian and floodplain areas flanking the thalweg at all transects.

Braided Channel Habitat. Empirical depth and velocity were obtained in braided channel habitat at discharges of 66, 131, and 185 cfs in the bypassed reach. Table 4.3 in Kleinschmidt (2002) summarizes the percentage of wetted area experiencing selected velocity and depth ranges for Transects 10 and 11. Table 28 (and *see* Figure 4.2 in Kleinschmidt, 2002) summarizes changes in wetted area at the same two transects.

At 66 cfs, 73 percent of all depths were less than 0.5 feet; 27 percent of the depths ranged from 0.6 to 3.0 feet. At 131 cfs, 64 percent of all depths were less than 0.5 feet and 36 percent were between 0.6 and 3.0 feet. At 185 cfs, slightly over half (51 percent) of all depths were greater than 0.5 feet. Areas with depths ≥ 3.0 feet were nonexistent at all measured discharges across the braided channel transects.

At 66 cfs, 82 percent of all velocities were 0.5 fps or less along the braided channel transects; 9 percent of the velocities were between 0.6 and 2.0 fps. Increasing discharge to 131 and 185 cfs increased the area with velocities ranging from 0.6 to 2.0 fps by 8 and 24 percent, respectively. Velocities greater than 3.0 fps, however, also rose steadily when discharge was increased to 131 and 185 cfs.

All channels along Transects 10 and 11 were at least partially wetted at 66 cfs (table 28 and *see* Figure 4-2 in Kleinschmidt, 2002). Wetted area increased linearly, however, at 131 and 185 cfs, with no apparent inflection point.

Habitat Data

Riffle-Run Habitat. Table 28 (and *see* Figures 4.3 and 4.4 in Kleinschmidt, 2002) presents the habitat-discharge relationships, and the relationship between wetted area and available habitat, for the species and lifestages evaluated for the riffle/run habitat.

Table 28. Wetted area, total weighted usable area (WUA), and percent of maximum calculated WUA in riffle-run and braided channel habitats occurring between 25 and 440 cfs in the Eel Weir bypassed reach for all modeled species and life stages. (Source: Staff, as modified from Kleinschmidt, 2002)

RIFFLE-RUN HABITAT

	Wetted	Brook Trout – Adult		Brook Trout -- Juvenile		Landlocked Atlantic Salmon – Adult		Landlocked/Sea-run Atlantic Salmon – Juvenile		Sea-run Atlantic Salmon – Spawning		Smallmouth Bass – Adult		Smallmouth Bass – Juvenile		Stenonema	
Discharge (cfs)	Area (ft^2)	WUA	% Max WUA	WUA	% Max WUE	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA
25	173,197	47,889	41	58,760	50	4,801	10	44,561	59	605	4	4,837	25	31,196	55	47,430	52
50	208,337	67,464	57	78,422	66	9,487	20	58,231	77	5,166	36	7,605	39	41,425	73	67,624	75
75	228,546	80,811	69	90,241	76	14,027	30	66,679	88	8,838	61	10,191	53	47,039	82	79,027	87
100	243,425	89,936	77	97,681	82	18,224	38	72,347	96	12,064	84	12,227	63	51,099	90	86,091	95
125	256,250	95,052	81	100,816	85	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	87,840	97
200	282,576	108,694	93	111,542	94	31,016	65	75,624	100	14,415	100	17,849	92	54,099	95	90,557	100
300	299,964	114,479	98	113,378	96	39,703	84	71,917	95	7,918	55	19,244	100	54,546	96	87,754	97
440	327,115	117,348	100	118,607	100	47,536	100	72,073	95	3,838	27	19,307	100	57,049	100	83,126	92

BRAIDED CHANNEL HABITAT

	Wetted	Brook Trout – Adult		Brook Trout -- Juvenile		Landlocked Atlantic Salmon – Adult		Landlocked/Sea-run Atlantic Salmon – Juvenile		Sea-run Atlantic Salmon – Spawning		Smallmouth Bass – Adult		Smallmouth Bass – Juvenile		Stenonema	
Discharge (cfs)	Area (ft^2)	WUA	% Max WUA	WUA	% Max WUE	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA
66	62,174	14,906	48	16,350	58	906	17	12,888	54	1,911	37	723	23	9,136	49	12,030	42
75	63,750	15,755	51	16,517	59	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12,839	45
125	73,800	19,772	64	18,730	67	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17,689	62
131	75,426	19,990	65	19,086	68	2,368	45	17,670	74	3,450	67	904	29	9,089	49	17,950	63
185	84,653	30,893	100	27,955	100	5,205	100	23,794	100	5,168	100	3,169	100	18,508	100	28,530	100

Although the various lifestages achieved maximum habitat quantity at differing discharge increments, habitat for all lifestages increased rapidly between 25 and 100 cfs in the riffle/run habitat (table 28 and *see* Figure 4.3 in Kleinschmidt, 2002). At discharges greater than 100 cfs, wetted area increased at a higher rate than did habitat for the species and lifestages evaluated (*see* Figure 4.4 in Kleinschmidt, 2002). Both wetted area and WUA experience an inflection point at about 100 cfs in the riffle/run habitat types. At 100 cfs, all species of management importance in the bypassed reach, except adult landlocked salmon achieve 77 percent or greater of the maximum calculated WUA. Doubling the discharge to 200 cfs results in less than a 16 percent increase in WUA for all species and lifestages, except adult landlocked salmon.

Species and lifestages, except *Stenenoma*, sea-run Atlantic salmon spawning, and juvenile Atlantic salmon (sea-run and landlocked) experience optimal habitat suitability at 440 cfs. At 440 cfs, habitat typically declines in the main channel areas of the riffles and runs due to unsuitably high velocities; however, wetted area increases thereby creating more suitable habitat for most species and lifestages in stream margins and near object cover.[56] Optimal habitat suitability for *Stenenoma*, sea-run salmon spawning, juvenile salmon occurs at 200 cfs.

Braided Channel Habitat. Table 28 (and *see* Figures 4.13 and 4.14 and Kleinschmidt, 2002) presents the habitat-discharge relationships, as well as the relationship between wetted area and available habitat, for the species and lifestages evaluated for the braided channel habitat.

WUA in braided channel habitat increased steadily for all species and lifestages with discharges increasing from 66 to 131 cfs (table 28 and see Figure 4.13 in Kleinschmidt, 2002). This increase in WUA generally reflected the increase in wetted area in the braided channels (*see* Figure 4.14 in Kleinschmidt, 2002). Increasing discharge from 131 to 185 cfs, however, resulted in a sharp increase in WUA for nearly all evaluation species and lifestages. Although wetted area continued to steadily increase at 185 cfs, the sharp increase in WUA is due to more suitable depth conditions.[57]

DISCUSSION – S.D. Warren currently provides continuous minimum flows in the Eel Weir bypassed reach that vary seasonally from 25 to 75 cfs. The existing 25-cfs

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[56] Velocities ranging from 0.5 to 1.5 fps are rated optimal by the HSI curves for most species in the flow study; velocities < 0.5 fps and > 2 fps are not rated as highly. At flows > 100 cfs, velocities exceeding 2.0 fps become more prevalent in riffle/run habitats.

[57] Depths < 0.5 feet are mostly unsuitable for the evaluation species and lifestages. Increasing discharge to 185 cfs reduced the amount of area with depths < 0.5 feet by nearly 20 percent and increased areas with depths > 0.5 feet by 13 percent.

minimum flow provides between 10 (adult landlocked salmon) and 59 percent (juvenile salmon) of the maximum calculated habitat. The 50-cfs minimum flow provides between 20 (juvenile salmon) and 75 percent (*Stenonema*) of the maximum calculated habitat. Except for adult salmon, the 75-cfs minimum flow typically provides 70 to 90 percent of the maximum calculated habitat for species of management importance. In the braided channel areas of the upper-bypassed reach, existing minimum flows provide less than 60 percent of the maximum calculated habitat.

The PHABSIM results obtained from S.D. Warren's flow study show that while no single flow optimizes habitat for all species and lifestages, a range of flows exist that may provide reasonably high habitat suitability for most species and lifestages (Kleinschmidt, 2002). An instream flow recommendation, though, should consider the species and lifestages of interest and their management priority (Bovee et al., 1998). In the case of the Eel Weir bypassed reach; brook trout is the key management species.

The results of S.D. Warren's flow study show that the bypassed reach provides more habitat for juvenile and adult brook trout across the flow range of interest than any other species or lifestage (Kleinschmidt, 2002). Habitat for brook trout increased rapidly between 25 and 100 cfs in the riffle/run habitat, with a moderate increase beyond 100 cfs. At 75 cfs, maximum computed WUA was 69 and 76 percent for adult and juvenile brook trout, respectively, while maximum WUA was 77 and 82 percent for adult and juvenile trout at 100 cfs. A flow of 125 cfs provides about 81 and 85 percent of the maximum calculated WUA for adult and juvenile trout, respectively.

Interior's and the MDIFW's recommended flow of 115 cfs would provide approximately 80 percent of the maximum computed WUA for adult and juvenile brook trout, while their recommended flow of 200 cfs would provide nearly 95 percent of the maximum computed WUA for brook trout. Doubling the flow from 100 to 200 cfs results in about a 15 percent increase in habitat for brook trout, and quadrupling the flow from 100 to 440 cfs increases, by 18 and 23 percent, juvenile and adult brook trout habitat, respectively. The seasonal flow regime of 200 cfs during the spring, summer, and fall would significantly improve habitat for coldwater fish species during the active growing season and enhance angling opportunities in the bypassed reach, but potentially affect coldwater refugia in the bypassed reach, as discussed below. A flow of 115 cfs during the winter would substantially improve over-winter habitat in the reach.

The alternative flow regime proffered by the USFWS in its comments on the draft EA is designed to address various seasonal needs in the bypassed reach. A flow of 200 cfs would substantially improve habitat during seasons when coldwater fish species are most active (*e.g.*, for spawning, hatching, winter holdover preparation). These seasons (spring and fall) also represent periods of high angler use of the bypassed reach. A flow of 115 cfs provides a substantial portion of the habitat available at 200 cfs, and maintains the integrity of coldwater refugia (*see* analysis in following section) during the critical summer high temperature period.[58] In the winter, there is considerable angler activity in the bypassed reach. A flow of 115 cfs during the winter would increase available holding habitat for coldwater species in the bypassed reach.

Approximately 75 percent of the habitat calculated for *Stenonoma*, which is an important macroinvertebrate forage species for trout and other fish, was achieved at 50 cfs in the riffle/run habitat. Minimum flows of 100 cfs and up provide 95 percent or more of the maximum calculated WUA for this species in the riffle/run habitat. Total wetted area in the riffle/run areas is nearly 75 percent at 100 cfs and about 78 percent at 125 cfs.[59]

In the braided channels, habitat for brook trout increased rapidly from 66 to 185 cfs, with a more modest increase for *Stenonema* over the same flow range (Kleinschmidt, 2002). S.D. Warren notes that braided channel habitat represents a small percentage of the coldwater/macroinvertebrate habitat in the bypassed reach. Therefore, S.D. Warren argues that any instream flow recommendation for the bypassed reach should focus primarily on the protection of habitat in the riffle/run areas. While we do not dispute the study's findings, we note that the braided channels likely provide important habitat for brook trout and *Stenonema*, as well as angling opportunities, in the bypassed reach. Therefore, we consider both riffle/run and braided channel habitats in determining an appropriate bypass flow regime.

Optimal habitat for adult Atlantic salmon is limited in the bypassed reach, since depth remains relatively unsuitable across the entire flow range of interest (Kleinschmidt, 2002). Except for adult and spawning Atlantic salmon and adult smallmouth bass, a 75-cfs flow provides around 70 percent of the maximum computed WUA. A flow of 125 cfs provides 80 percent or more of the maximum WUA for all species and lifestages evaluated, except adult landlocked salmon. A flow of 200 cfs provides over 90 percent of the maximum computed WUA for all species and life stages evaluated, except adult landlocked salmon.

Anadromous Atlantic salmon do not presently occupy the bypassed reach, but were included in the study because there is potential in the future that salmon

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[58] The USFWS's flow recommendation would offer limited protection of the coldwater refugia in early summer (June) and late summer (September), when water temperatures can often be high.

[59] The MDEP estimates that 75 percent wetted conditions (which is the criteria normally recommended by the MDEP) occur in the bypassed reach at a flow of 80 cfs (S.D. Warren, 2002a). We estimate that a flow of 80 cfs would provide between 70 and 75 percent wetted area.

management in the Presumpscot River may result in the bypassed reach being used as spawning and/or rearing habitat for either wild or hatchery origin salmon. Across the flow range of interest, the bypassed reach provides relatively little spawning habitat for salmon, but does provide abundant habitat for juvenile salmon, second only to brook trout. Habitat for juvenile salmon (expressed as WUA) increased rapidly between 25 and 75 cfs in the riffle/run areas; ranging from 59 to 88 percent of the computed maximum habitat. A flow of 100 cfs provides about 96 percent of the maximum calculated WUA, while 200 cfs provides 100 percent of the juvenile riffle/run habitat in the bypassed reach.

Maximum computed WUA for adult smallmouth bass in the bypassed reach occurs at about 275 cfs. At 200 cfs, over 90 percent of the WUA in the bypassed reach is available to juvenile and adult bass, while at 125 cfs over 90 and about 75 percent of the maximum calculated WUA is available for juvenile and adult bass, respectively. At flows between 75 and 100 cfs, adult bass habitat ranges from 53 to 63 percent of the maximum calculated WUA, while juvenile habitat remains at over 80 percent of the maximum computed WUA. At flows less than 75 cfs, habitat for adult and juvenile smallmouth bass declines to less than 50 and 80 percent of the maximum computed WUA, respectively. Thus, data from the flow study shows that lower flows in the bypassed reach reduce the suitability of the reach for smallmouth bass.

The MDIFW raised concerns regarding infrequent, but unnecessary high flows in the bypassed and the effects that such flows have on angling opportunities during peak angling periods in the bypassed reach. The MDIFW states that the high-flow (or spillage) events exceed the fishable flows, and that the flows occur during peak, high-use periods in the spring and late fall when there is a high demand for stream fishing. To address the issue, the MDIFW requested that S.D. Warren assess the feasibility of increasing discharge capacity of the canal. S.D. Warren undertook such an assessment and concluded that it was not prudent to increase the canal's discharge capacity beyond the current 1,000 cfs.

It is within the context of S.D. Warren's conclusion that we evaluate the potential effects of spill flows in the bypassed reach on fish populations and angling in the reach. S.D. Warren infrequently spills water in the bypassed reach when lake levels in Sebago Lake are outside the target range established by the LLMP. Spillage events with flows of 200 cfs and greater in the bypassed reach occurred less than 6 percent of the time in 2000 and 2001 (S.D. Warren, 2002a). It is reasonable to assume that such spillage events are likely to continue in the future.

Habitat-discharge relationships developed using PHABSIM are of little use to assess the effects of infrequent high flow events, because the habitat model does not account for behavioral responses of fish to occasional high flows (Kleinschmidt, 2002). To this end, Elwood and Waters (1969) and Seegrist and Gard (1972) found that fish are able to withstand occasional high flows by moving to areas providing refuge from high velocities. Large boulders provide abundant cover throughout the Eel Weir bypassed reach. In addition, large deadwater areas also could serve to provide velocity refuge from occasional high flows in the bypassed reach. Given the findings in the literature, as well as the abundant object cover and other refuge areas that exist in the Eel Weir bypassed reach, we do not expect infrequent high flow events to have any long-lasting or significant effects to aquatic habitat in the bypassed reach. While infrequent, high-flow events may present a short-term inconvenience to anglers using the bypassed reach, we do not expect there to be any long-term effects to angling opportunities.

Cold Water Refugia

Two coldwater seeps in the Eel Weir bypassed reach were identified by the MDIFW for evaluation. Both of the seeps are located upstream of the Route 35 bridge (figure 20), and are referred to as coldwater seeps “A” and “B.” These coldwater seeps provide thermal refugia from unsuitable warm summer water temperatures (June to August) for coldwater species, including brook trout, landlocked Atlantic salmon, and brown trout.

Optimal water temperatures for brook trout range from 51.8-60.8º F, with a temperature of 75.2º F being the upper limit suitable, but only for short periods of time (Raleigh, 1982). Optimal water temperatures for brown trout range from 53.6 - 66.2º F, with a temperature of 80.6º F being the upper limit suitable, but for only short periods of time (Raleigh, 1986). Stanley and Trial (1995) report optimal water temperatures for the freshwater stages of Atlantic salmon as ranging from 57.2 - 64.4º F. Based upon this information, thermal refuge for coldwater species would occur where ambient temperatures are less than about 68º F.

The area of coldwater thermal refuge provided by coldwater seep A at 79 cfs (59º F) is about 120 ft^2. Increasing discharge to 115 cfs increased water temperatures upstream, within, and downstream of the coldwater seep slightly (typically less than 3.6º F; figure 21). At 172 cfs, water temperatures at seep A increased to above 68º F; thereby almost completely eliminating the thermal refuge provided by the seep.

At 79 cfs, a thermal refuge area (temperatures less than 68º F) of about 250 ft^2 exists at coldwater seep B. Increasing discharge to 115 and 172 cfs adjusts temperatures upward to above 68º F throughout seep B (figure 22).

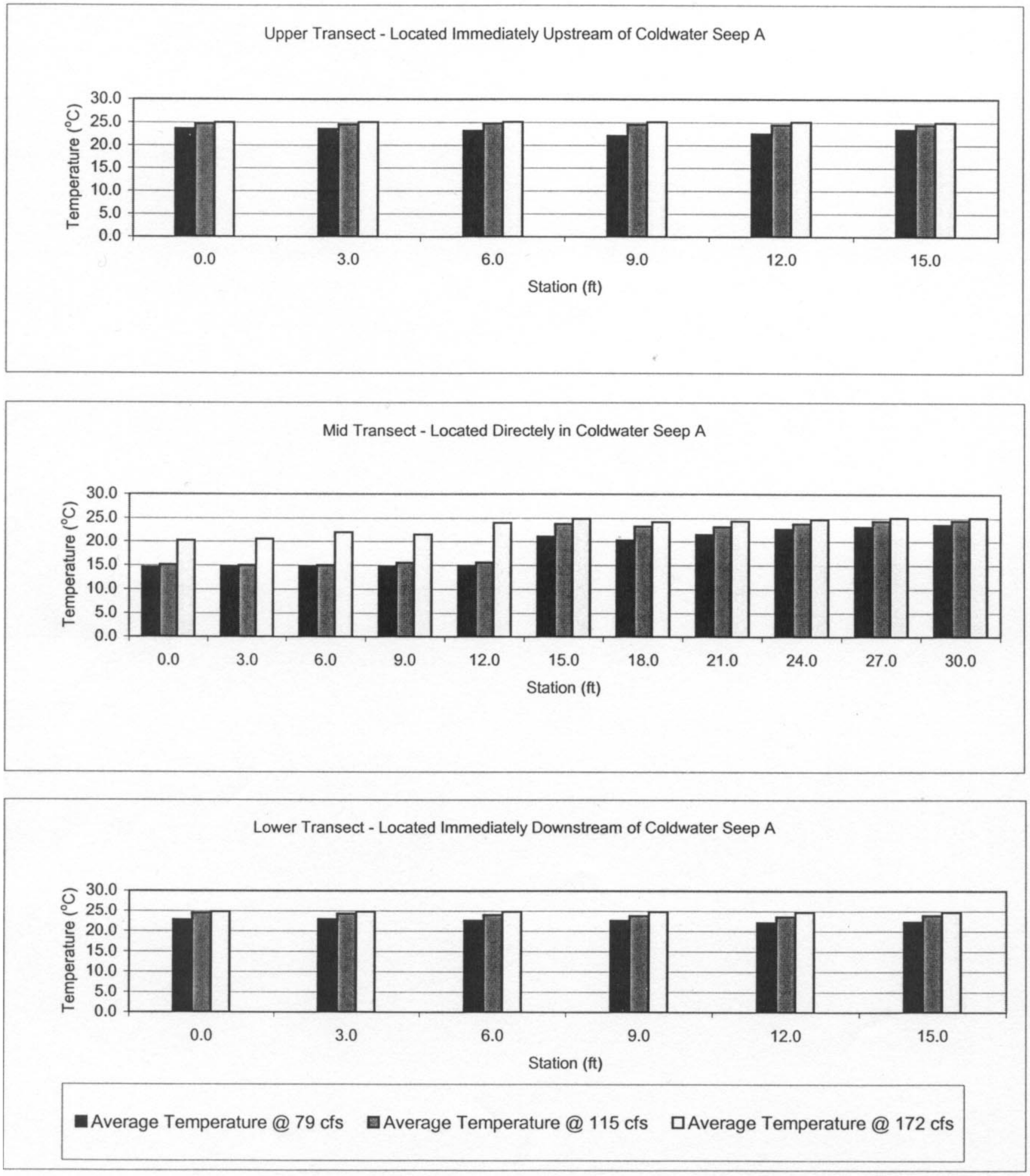

Figure 21. Summary of temperature monitoring results along transects located in coldwater seep A at flows of 79, 115, and 172 cfs. (Source: Kleinschmidt, 2002)

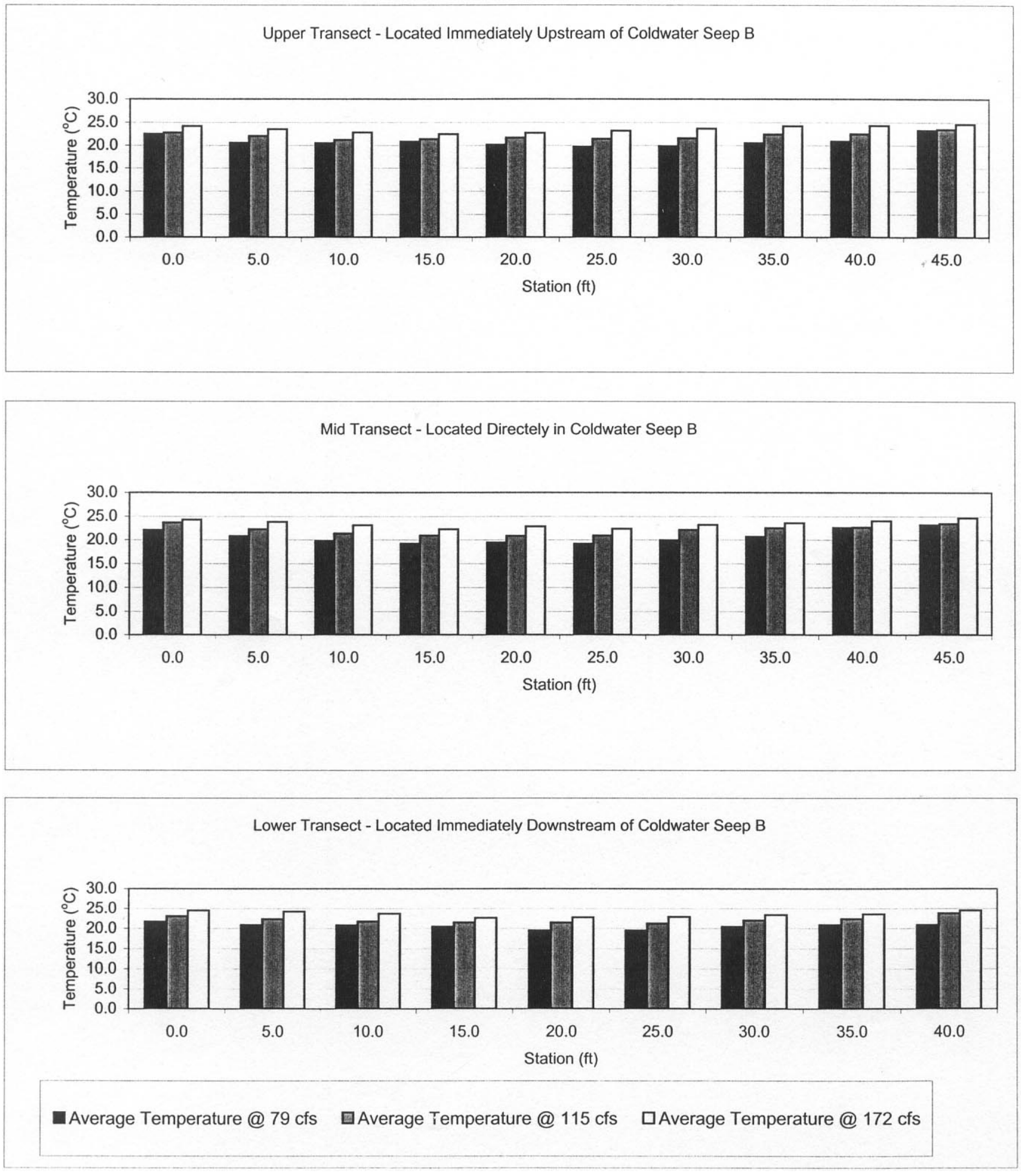

Figure 22. Summary of temperature monitoring results along transects located in coldwater seep B at flows of 79, 115, and 172 cfs. (Source: Kleinschmidt, 2002)

Based on the aforementioned data, we conclude that flows of 75 cfs or less would protect the coldwater seeps in the bypassed reach. Flows between 75 and 100 cfs also would likely protect the integrity and functionality of the coldwater seeps. However, protracted periods of higher flows during summer (flows exceeding 115 cfs) may reduce or eliminate holdover trout and salmon in the bypassed reach. This may preclude any natural recruitment to the fishery. Therefore, water temperature in these seeps is an important variable to consider as part of the flow analysis for the bypassed reach.

The MDIFW expressed concern that an increase in minimum flows above 115 cfs could lead to increased water temperature and a reduction in coldwater refugia during the summer period, unless minor instream work is done to deflect flows around the coldwater seeps. During the September 22, 2004, section 10(j) meeting in Augusta, Maine, the USFWS and the MDIFW stated that their recommended flows and the continued viability of the coldwater refugia are not mutually exclusive. The agencies also stated that the configuration and location of the seeps are such that realigning some instream boulders can readily protect them. Interior, as part of its terms and conditions, recommends that the Commission require post-licensing monitoring of water temperature in the bypassed reach be conducted in consultation with the MDIFW and the USFWS.

At the September 22, 2005, section 10(j) meeting, staff requested information from the USFWS and the MDIFW on the nature of any channel maintenance work that could be implemented to protect the coldwater seeps at higher flows. On October 13 and 14, 2005, the MDIFW filed the requested information. The basic elements of the potential habitat enhancement work are summarized below.

The MDIFW's filings identify the two seeps as upper and lower springs.[60] According to the MDIFW, the lower spring is located in a protected backwater area not influenced by river flows except when flows are high enough to enter a small side channel that conveys flows directly to the spring. The entrance to this side channel is about 6 feet wide and 1.5 feet deep. The MDIFW's plan calls for "plugging" the channel entrance with rock from the surrounding area. Smaller aggregate material would be used to fill the voids. The upper spring originates as a first order stream in the adjacent riparian corridor. The stream empties into a back watered area adjacent to, and partially separated from, the river's influence by a natural vegetated boulder jetty.[61] The upper spring is also affected by flow from a side channel, which is about 10 to 12 feet wide at

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[60] Kleinschmidt (2002) does not identify the location of the two evaluated seeps, but simply refers to the refugia as seeps A and B. The information in the record does not allow us to reconcile Kleinschmidt's and the MDIFW's seep designations.

[61] The boulder jetty limits inflow from the main river channel during low flows.

its entrance and a 1 foot or less in depth. The MDIFW would protect this seep by (a) plugging the side channel entrance, and (b) augmenting the existing natural rock jetty with additional large rock aggregate to better isolate the spring and backwater area. The work would be performed with either a tracked backhoe or manual labor.

Study data indicates that flows in excess of 115 cfs are likely to affect the ability of the existing coldwater seeps to function as important thermal refugia for salmonids in the bypassed reach, primarily from June through August. The instream channel work recommended by the agencies is rather simple in design, and could help protect the thermal refugia in the bypassed reach at flows higher than 115 cfs. However, the agencies' recommended measures raise more questions than provide answers.

The intent of the recommended measures is to protect the integrity of coldwater seeps under higher flow releases to the bypassed reach. We agree with the need to protect these important habitats. However, implementing the measures being considered by the agencies could result in unintended and unanticipated adverse effects on other aquatic resources and riparian habitats within the bypassed reach. For examples, side channels serve important environmental functions. These areas provide food resources for fish and wildlife, as well as habitat used by aquatic organisms on a seasonal basis. Eliminating flow to these side channel areas could disrupt and significantly affect these natural processes. Moreover, stream habitat alterations could lead to channel down-cutting or other forms of erosion along the stream bank. Also, depending on the design, high spill flows (*e.g.*, flood release flows) could destroy or damage the structures, resulting in on-going maintenance issues. These concerns are supported by Rosgen (1996), which states that physical habitat enhancement measures must match the natural, stable characteristics of a particular river. If decisions regarding habitat enhancements do not address channel morphology and the corresponding stable dimension, pattern and profile, the effectiveness of the enhancement would be diminished.

The MDIFW's October filings provide little insight into how the principles of river morphology were factored into the development of the recommended habitat enhancement, nor do the filings address the implications to other natural processes. Consequently, our analysis is incomplete and speculative at best.[62] As an alternative to the instream habitat work, Interior's recommended post-licensing water temperature monitoring in the bypassed reach, as discussed more fully in section V.C.2, *Water Resources*, would provide valuable information and guidance to S.D. Warren and the resource agencies regarding the adequacy of any new flow regime established for the bypassed reach, and the need for changes to the flow regime or other measures.

[62] In addition, we assume that instream channel work would require a Maine Waterway Development and Conservation Act permit from the MDEP. It is not clear, based on MDIFW's filings that the MDEP would issue a permit for this work.

FOSL notes that the MDIFW's concerns regarding higher minimum flows are an artifact of MDIFW's refusal to restore passage for native brook trout and salmon at the Eel Weir dam. FOSL states that any effect of higher flows on "spring holes" in the Eel Weir bypassed reach would be fully compensated by the ability of adult brook trout and salmon to migrate into Sebago Lake during periods of higher water temperatures. We do not address this comment here. Rather, passage needs for trout and salmon at the Eel Weir dam are discussed in a subsequent section of this document.

Angler Suitability

At 79 cfs, several angling suitability rating categories were strongly rated as "good" or "excellent," including the ability to walk the shoreline, wadeability, effectiveness of fly presentation, and aesthetic quality (*see* Figure 4.19 in Kleinschmidt, 2002). The number of quality fishing areas and overall suitability were rated as "fair" or "good" at 79 cfs. The ability to cast to desirable areas in the bypassed reach received mixed ratings. At 115 cfs, nearly all angling suitability rating categories were strongly rated as "good" or "excellent," while 172 cfs appears to slightly reduce the overall angling suitability in the bypassed reach (*see* Figures 4.20 and 4.21 in Kleinschmidt, 2002). At 310 cfs, the bypassed reach was rated strongly as "unacceptable" or "poor" (*see* Figure 4.22 in Kleinschmidt, 2002).

The data show that at no single flow did anglers agree unanimously that conditions were optimal. However, the survey did show that favorable angling conditions exist in the bypassed reach at flows of 79, 115, and 172 cfs. Angling suitability in the bypassed reach was unanimously rated as poor or unacceptable at a flow of 310 cfs. However, no entity has recommended flows of this magnitude for the bypassed reach and high flow events are rare in the reach. Therefore, any potential effects to anglers resulting from operation of the project would be infrequent and short-lived.

The MDIFW and Interior recommend minimum flows of 200 cfs in the summer and 115 cfs in the winter, in part, to enhance angler wadeability/fishability. The MDIFW states that these flows would provide better angling conditions, thereby increasing the opportunity to catch fish. The MDIFW also states that the higher flows would enable more anglers to fish the bypassed reach, reducing the potential for crowding. While we do not dispute MDIFW's statements, we note that the MDIFW has presented no evidence to suggest the flows it recommends would be any better than lower flows. In fact, the angler survey suggests that lower flows provide high quality habitat and adequate wading conditions in the bypassed reach.

<u>American Eel Passage</u>

The American eel is a catadromous fish species that occurs in Sebago Lake and the Presumpscot River (S.D. Warren, 2002a). Catadromous species mature in freshwater, but must spawn in salt water to complete their life cycle. During the late summer and fall, adult silver eels migrate downstream in the Presumpscot River to spawn in the Sargasso Sea, located in the southwestern North Atlantic Ocean.

In gaining access to Sebago Lake, American eel surmount six other S.D. Warren-owned dams, the North Gorham dam, as well as the Eel Weir dam (letter from George D. Lapointe, Commissioner, MDMR, to Magalie R. Salas, Secretary, FERC, November 25, 2002). Fishermen with MDIFW permits have harvested adult eels at the outlet of Sebago Lake. In addition, MDIFW biologists commonly catch eels during surveys in water above Sebago Lake. Notwithstanding the presence of American eel in Sebago Lake, the Eel Weir Project may affect both upstream and downstream eel migrations. Because the project currently lacks upstream and downstream eel passage, it represents a potential barrier or delaying factor to upstream migration of elvers and young yellow-stage eels. The project also likely causes an undetermined level of turbine mortality of yellow-stage eels and downstream migrating silver eels.

The goals of the MDMR and the ASMFC are to (a) protect and enhance the abundance of American eel in inland and territorial waters, and (b) contribute to the viability of the spawning population, in part, by providing access to inland waters for juveniles and adequate escapement to the ocean of pre-spawning adults. To this end, the MDMR and Interior recommend that S.D. Warren: (1) install permanent upstream passage facilities for eel within 2 years of licensing;[63] (2) install permanent downstream passage facilities for eel within 120 days of licensing;[64] and (3) consult with the resource agencies on the design, location, and effectiveness testing of the upstream and downstream eel passage facilities. The MDIFW recommends that any downstream eel passage measures developed for the project minimize the number of resident fish and landlocked Atlantic salmon diverted from Panther Run, located at the north end of Jordan Bay; *see* figure A-1 in Appendix A) to the Eel Weir bypassed reach.

S.D. Warren agrees to provide upstream and downstream eel passage at the Eel Weir Project (letter from Nancy J. Skancke, GBRSE, to Magalie Roman Salas, Secretary,

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[63] Wippelhauser et al. (2001) calls for the construction of upstream eel passage facilities at the Eel Weir dam within 2 years after issuance of any new license.

[64] The facility would consist of opening a deep river gate at the spillway, as described in downstream passage option #3 (S.D. Warren, 2002a). The facility would be operational from August 15 to November 30, during the period from licensing until the completion of S.D. Warren's proposed 3-year study to assess the timing of peak downstream eel movement in the Presumpscot River is complete. Interior states that the facility should be operated 8 hours/day during this period. Based on the study results and consultation with the resource agencies, the operational period could be adjusted.

FERC, September 17, 2003). However, S.D. Warren does not agree that eel passage is warranted at the project at this time. Rather, S.D. Warren proposes to consult with the MDMR and the MDIFW concerning the need for eel passage at the project following installation/implementation of eel passage facilities or measures at all six of lower Presumpscot River projects, including North Gorham.

Our Analysis

Upstream Eel Passage

Research on American eel has been conducted for decades. However, there are little data available on the exact habitat requirements, behavior, and migratory patterns of this panmictic species.[65] In the last 10-15 years there has been increased focus on American eel for two main reasons: (1) significant declines in elver recruitment to the St. Lawrence and other rivers along the eastern United States (Castonguay et al., 1994a, 1994b; Lary et al., 1998; Haro et al., 2000; Geer, 2003); and (2) large increases in demand for all eel stages (except for the leptocephalus stage) as growout stock for aquaculture, food, or bait (Committee on American Eel Management in Maine [CAEMM], 1996). The factors most often cited for the decline in populations include anthropogenic effects such as loss of available habitat from the construction of dams, entrainment or impingement at hydroelectric facilities, water quality or toxicity issues, fishing pressure, commercial harvesting of sargassum (affects larval populations), oceanographic influences such as changes in Gulf Stream current patterns, or other climatic changes (EPRI, 1999; Verdon et al., 2003).

The data set available for eel collections or harvest on the Presumpscot River is insufficient to determine whether there have been significant decreases in glass eel and elver recruitment similar to those found by other researchers. There is, however, discernable evidence of upstream migration delays caused by hydroelectric dams (FERC, 2002). For example, results from the 1997 baseline fisheries survey on the lower Presumpscot River indicated that CPUE values for the Dundee impoundment were much lower than the next lowest CPUE (5.5 eels/hour in Dundee, compared to 15.3 eels/hour in the Gambo impoundment.

The success rate of upstream migration over or past dams without fish passage facilities is unknown (FERC, 2002). Factors such as dam height, roughness of the spillway material, angle of the spillway surface, flashboard height, flow levels and

[65] Panmictic species are widely distributed species in which random spawning occurs throughout the population, resulting in complete mixing of the gene pool.

potential pathways around the dam are all confounding factors in determining percent success rates for migrating elvers and yellow eels.

Several hundred eels were observed at the base of S.D. Warren's five lower Presumpscot River dams during an upstream eel migration study (Kleinschmidt, 2000). Nine of these eels were confirmed migrating over the Saccarappa dam, although it is unlikely that the investigators observed all possible passage routes at all the projects. A study of a pipe style upstream eel passage device by Mitchell (1985, as cited in Clay, 1995) found that 150 eels per hour were passing out of the pipe and over the dam. Intuitively, this suggests much higher success rates for eels using upstream eel passage compared to unaided eels. Other studies examining upstream passage efficiency variously describe upstream migration success as 57 percent (Dumont et al., 2000; Verdon et al., 2003) and 85 to 90 percent (Verdon, 1998). Review of these studies suggests that overlapping size class ranges between year classes and sexes, multiple year migrations, and extended residency times all complicate the process of estimating passage efficiency.

Based on the evidence presented in this case, we conclude that, although some eels are successfully migrating upstream over the Eel Weir dam into Sebago Lake and points upstream, the lack of upstream eel passage facilities at the dam is likely limiting the upstream movement of eels, at a time when the fishery management agencies are making significant commitments to protect and restore the species. Providing upstream passage at the Eel Weir dam would increase (and provide) access to important habitat in Sebago Lake and its tributary streams.

Notwithstanding the potential benefits provided by upstream passage, Haro et al. (2000) states that, in the case of hydroelectric dams, the benefit of upstream eel passage must be weighed against the cost of turbine mortality when eels later migrate downstream. Haro et al. (2000), however, further states that the increase in production by simply moving eels into underutilized habitats upstream of barriers may outweigh decreases in reproductive contribution caused by turbine mortality.

Interior and the MDMR recommend that upstream eel passage measures should be installed at the Eel Weir dam within 2 years of license issuance. S.D. Warren argues that installing eel passage at Eel Weir is premature, citing the lack of eel passage at downstream dams. We disagree that eel passage would be premature for the following reasons. First, as acknowledged by S.D. Warren, eel passage has been required at its five projects on the lower Presumpscot River.[66] These facilities would provide eel access to habitat in the river up to the North Gorham dam, which currently does not have eel

[66] 105 FERC ¶ 61,009 through 61,013 (2003).

passage. Second, the North Gorham dam does not appear to be a complete barrier to eel movement in the Presumpscot River, as eel occur in the Eel Weir bypassed reach and Sebago Lake. These eel would benefit, incrementally, from passage at the Eel Weir dam, independent of passage at the other dams on the Presumpscot River.

Although some eels would be lost to turbine entrainment, we conclude that installation of upstream eel passage at the Eel Weir dam would provide a net benefit to the American eel, due to the enhanced access to upstream habitats. We make our recommendation concerning upstream eel passage in section VII, *Comprehensive Development and Recommended Alternative*.

Downstream Eel Passage

Downstream movement of yellow-phase eels and passage of adult downstream migrant eels at hydroelectric projects and other barriers has become an issue of concern for resource agencies, due to recent population declines (Haro et al., 2000; as cited in Haro et al., 2003). Turbine-related mortality for eels has been estimated, in many cases, to > 25 percent, due to the large size of yellow and adult eels (EPRI, 1999). In the case of large eels (> 27 inches), mortality ranges from 40 to 100 percent (McGrath, 2000; ASMFC, 2000; Haro et al., 2000). In addition, rates of turbine-induced injuries can be as high as 50 percent for small eels (9-33 inches; Berg, 1986 as cited in Haro et al., 2003) and up to 100 percent for large eels (greater than 28 inches; Montén, 1985 as cited in Haro et al., 2003).

The Eel Weir Project is equipped with Hercules turbines and has a hydraulic head of 40 feet. These project characteristics would influence the project's overall effect on eel mortality. In addition, mortality rates would also depend on turbine size and runner speed, with smaller, faster turbines increasing the potential for blade strike on the adult eels. Another key feature of a hydropower project that would affect fish mortality rates is the presence of any fish exclusion devices. The Eel Weir Project is currently equipped with a ¾-inch bar rack at the power canal intake, which is sized to prevent the passage of most larger-sized fish (e.g., adult landlocked salmon, lake trout, and adult eel).[67] This feature is designed to minimize fish entrainment, and ultimately mortality at the project.

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[67] To determine appropriate protection measures (to avoid escapement), the primary size consideration is the girth width of the targeted species. The girth width for downstream migrating eel at Eel Weir is anticipated to be around 0.68- to 0.83 inches (memo from Jeff Murphy, Kleinschmidt Associates to Tom Howard, S.D. Warren Power Company, dated January 2002; cited in S.D. Warren [2002a]). Although the girth width may be less than 1 inch, the USFWS typically requires a maximum 1-inch clear spaced bar rack to exclude eels. The USFWS also indicates that eels elicit a searching behavior

Based on mortality data from other hydropower projects (FERC, 2002), the Eel Weir Project could exhibit mortality estimates in the range of 15 to 20 percent, or possibly higher for some larger eels. However, given the presence of the ¾-inch bar rack, we would expect the Eel Weir Project to exhibit a considerably lower mortality rate.

The long-term effects of turbine mortality on out-migrating eels from projects on the Presumpscot River are unknown. Some researchers have suggest that the American eel population is declining, although the cause for the decline in unknown (Castonguay et al., 1994a). Castonguay et al. (1994b) investigated oceanographic changes, commercial overfishing, chemical contamination, and habitat modifications (includes hydropower development) as potential causes of the eel decline, but their analysis was inconclusive. Nonetheless, Castonguay et al. (1994a) suggest that that increased eel passage survival at hydropower projects would aid in the recovery of the eel population.

The MDMR states that their management objective for American eel in the vicinity of the Eel Weir Project is to provide adequate downstream passage and escapement to the ocean of pre-spawning adult eels. To this end, the MDMR requested that S.D. Warren evaluate alternatives for downstream eel passage and protection measures at the project.

To date, no technology has emerged that has proven effective for downstream eel passage at hydropower projects. Resource agencies typically require additional features to conventional fish passage systems for anadromous fish species that may or may not promote eel passage. At the Eel Weir Project, downstream eel passage is unique in that the downstream escapement of non-targeted species must be minimized to meet the MDIFW's management objectives for Sebago Lake.

Despite the infancy of downstream eel passage technologies, S.D. Warren evaluated three potential alternatives for downstream American eel passage at the project. These alternatives included: (1) installing a barrier net or fence into the upstream most portion of the canal to guide eels to the bypassed reach; (2) installing a closed spaced bar rack system in place of a barrier net; and (3) using a lighting system to elicit an avoidance response to guide fish to the river gate closest to the power canal. S.D. Warren did not consider project shutdown as a viable downstream passage alternative.[68] Based on the

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when confronted with a barrier to movement and appear to be guided by devices angled to the main flow direction (S.D. Warren, 2002a; Richkus and Dixon, 2003).

[68] Project shutdown during eel migration periods provides 100 percent protection of migrants, but can be very costly because of lost power generation (Richkus and Dixon, 2003). We evaluated project shutdown in FERC (2002) and concluded that such a

current technologies available and eel movement characteristics, S.D. Warren concluded that eel passage via the existing river gates (option #3; memo from Jeff Murphy, Kleinschmidt Associates to Tom Howard, S.D. Warren Power Company, dated January 2002; cited in S.D. Warren [2002a]) would be the most cost-effective, efficient alternative for downstream eel passage at the project. The MDMR and Interior concur with S.D. Warren's proposed alternative.

We cannot quantify the effects of providing downstream eel passage at the Eel Weir Project. Nonetheless, it is reasonable to assume that offering a safe, efficient downstream passage route to out-migrating adult eel and yellow eel would be beneficial to the river's eel population. Therefore, we conclude that providing measures to facilitate downstream migration of eels at the Eel Weir Project would improve the survival rate of yellow eels and adults during their spawning migration. Depending on density-dependent effects and compensatory mechanisms experienced by eels during their time in the ocean, increased survival at the project also would likely increase the numbers of Presumpscot River eels contributing to the eel spawning population, and aid in the recovery of the eel population.

The MDMR and Interior recommend that any downstream eel passage facility be operated from August 15 through November 30 each year. The agencies also indicate that the facility should be operated 8 hours per day during the operational period. S.D. Warren's proposed operational parameters (annual and daily operational timing), however, are not consistent with the recommendations of the resource agencies.[69]

Current data on the migratory patterns of silver eels suggest that the downstream migratory period may encompass two or more months, from the end of August to the end of October (CAEMM, 1996). However, data from the St. Lawrence River show that 80 to 85 percent of all migrants were caught during 10 to 15 days in mid-October, even though the migration period occurred from mid-September to early-November. In addition, data from the MDMR for a number of sites in Maine indicate that the eel migration period ranges from 2 to 13 weeks, and averages 8 weeks, generally from late-

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measure was warranted. Thus, the licenses for S.D. Warren's five other projects on the river included a requirement for project shutdown during the fall out-migration periods.

[69] Once installed, S.D. Warren would operate the downstream eel passage facility in accordance with the schedule established for its five downstream hydropower projects (FERC, 2002); 4 hours per night for four, 7-day periods (28 days total) during the fall out-migration period (August 31 to October 30). The timing of operation would be determined based on a 3-year downstream eel movement study for its five downstream projects. Following the study, S.D. Warren would consult with the resource agencies to determine the appropriate timing to operate the downstream eel passage facility.

August into early-November. This same data also indicate that the migration is often "spotty," not necessarily occurring in consecutive weeks, or in the same weeks from year to year. The duration of the peak of the run (we define as ≥ 10 percent of the run occurring in one week), however, was generally only 3 to 4 weeks in duration.

The operational window recommended by the resource agencies at the Eel Weir Project is not consistent with the annual operational period set for the five hydropower projects on the lower Presumpscot River (i.e., end of August to end of October).[70] The agencies' expanded window would likely afford incrementally greater protection to out-migrating adult eels, since it essentially would capture the entire migratory season. However, the resource agencies have not provided any environmental or biological evidence that their recommended 14-week operational window would be any better than the established 8-week window for the five lower Presumpscot River projects, or is otherwise needed to adequately protect the eel population in the Presumpscot River. As noted elsewhere in this EA, American eel are relatively abundant in the Presumpscot River and are found throughout the basin, including Sebago Lake.

The resource agencies and S.D. Warren also do not agree on the daily operational schedule for the downstream eel passage facilities. S.D. Warren proposes a 4-hour-per-night operational schedule, while the resource agencies recommend an 8-hour-per-night operational schedule. In FERC (2002), we concluded that the 8-hour-per-night schedule for 8 weeks was excessive, in that the MDMR data showed that the peak of the out-migration season typically occurs over a much shorter time period. We also concluded that the 4-hour-per-night schedule for four, 7-day periods, along with monitoring, would be sufficient.[71] Notwithstanding our conclusions in FERC (2002), consistency among projects in the same basin, with regards to operational timing of fish passage facilities, would be important to the overall success and effectiveness of the protection measures.

Richkus and Dixon (2003) conclude that studies suggest that approaching or reaching sexual maturity is a necessary, but not the only condition for migration to occur, with water temperature, precipitation, and flow and moon phase triggering migration in most watersheds. Once migration is initiated, eels appear to move downstream at a rate consistent with flow velocity. Movement patterns are often significantly altered when

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[70] 105 FERC ¶ 61,009 through 61,013 (2003).

[71] S.D. Warren estimates, using the MDMR data, that its proposed operational schedule would protect an average of 87 percent of the run; the MDMR estimates that 43 to 47 percent of the run would be protected. In addition, Haro et al. (2003) found that suspending hydro operations on dates encompassing 25 to 75 percent of the cumulative eel catch (≈ 30 days; similar to S.D. Warren's proposed schedule) resulted in a reduction in eel mortality of ⅔ to ½, relative to normal operation.

obstacles (e.g., dams) are encountered. Downstream migrating silver eels appear not to use visual cues, but physically "bump into" barriers. Eels typically exhibit a "startle" response when encountering a barrier, as opposed to initiating search behavior. With regard to the window of operation for downstream eel passage facilities, Richkus and Dixon (2003) state that the accuracy of predicting when migration pulses will occur, based on statistical correlations, is generally low.

What our analysis suggests is that the time and duration of night-time migrations are not well understood. Nor do the experts agree on what type of eel passage facilities are needed to pass yellow eels and out-migrating adult eels and the timing of operation. The key to successful downstream eel passage would be whether the operations of eel passage facilities could be timed to coincide with peak eel movement, using "real-time" monitoring. S.D. Warren would need a monitoring program that could successfully detect when peak eel movement is occurring, or is about to occur. This movement depends on a number of environmental variables (river flow, water temperature, light levels, etc.), and predicting when peak movement would occur could be a difficult task. Thus, the 3-year monitoring study S.D. Warren proposes to conduct as part of the licenses for its other five Presumpscot River projects, as described in FERC (2002), would be an important part of any measures for protecting downstream eel passage.

During the September 22, 2005, section 10(j) meeting in Augusta, Maine, the MDMR modified its recommendation for eel passage effectiveness monitoring at the Eel Weir Project. Specifically, the MDMR notes that S.D. Warren is conducting a 3-year monitoring study of out-migrating eels at its five downstream hydropower projects, but that the Eel Weir Project is not included in the study.[72] Consequently, the MDMR recommends that an out-migration timing study be conducted at the Eel Weir Project, as well as an effectiveness study of the eel passage facilities.[73]

As previously noted, the 14-week operational window for downstream eel passage is not supported by information in the record. Nonetheless, differences in out-migration timing eels coming from Sebago Lake and those residing in the river may exist. The MDMR's recommended out-migration timing study would be a valuable tool in providing information to S.D. Warren and the resource agencies about eel migration in the Presumpscot River Basin. In addition, information from a study of this nature would

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[72] The MDMR contends that eel migrating from Sebago Lake need to be sampled, as the timing of out-migration may not be the same as for downstream, riverine eels. However, the MDMR provides no new information to support its contention.

[73] Alternatively, the MDMR states, and we concur, that a well designed study could include both timing and effectiveness components.

advance the agencies' goals and objectives for eel management (*i.e.*, protecting, enhancing, and restoring eel populations).

The MDIFW expresses concern, and recommends, that any downstream eel passage facilities installed at the Eel Weir dam minimize the potential loss of landlocked salmon to the Eel Weir bypassed reach. As proposed by S.D. Warren, eel passage flows would be provided through a modified leaf section that will replace one of the river gates. Passage would be provided for 4 hours per night for 28 days during the fall migration period. Atlantic salmon passage at hydropower projects has been documented to occur almost exclusively at night (Beland, et al., 2003). Therefore, limiting operation of the downstream eel passage to four late-night hours, instead of eight, as recommended by Interior and the MDMR, would minimize the chance that salmon would be passed to the bypassed reach.

In addition, Panther Run is the major tributary spawning area for landlocked salmon. The provision for eel passage at the Eel Weir dam is not expected to change this spawning behavior. Assuming the downstream flow provisions of the current LLMP remain in place, the total amount of flow exiting Sebago Lake would not change as a result of the installation and operation of any eel passage facilities at the project. As directed under the current LLMP, flows exiting Sebago Lake are capped at 1,000 cfs, unless the lake is above the target elevation and rising during the salmon spawning season of mid-October to mid-November. Flows of 1,000 cfs or less during the salmon spawning season do not divert salmon from Panther Run (FERC, 1997). Changes in the Lower Presumpscot River flow regime could affect salmon passage from Sebago Lake to the bypassed reach, either positively or negatively, depending on the changes in flow.

Interior and the MDMR recommend that downstream eel passage measures should be installed at the Eel Weir dam within 120 days of license issuance. S.D. Warren argues that installing downstream eel passage facilities at the dam would be pre-mature. As previously stated and for the same reasons described above for upstream eel passage, we disagree that installing eel passage facilities would be premature. Rather, we conclude that downstream eel passage at the Eel Weir dam would provide a significant benefit to downstream eel migrations, due to improved downstream passage and increased survival of silver eels (and some yellow eels) in the Presumpscot River. We make our recommendation concerning downstream eel passage in section VII, *Comprehensive Development and Recommended Alternative*.

<u>Fish Passage for Land-locked Atlantic Salmon</u>

The landlocked salmon is one of Maine's most highly prized sport fishes (MDIFW, 2004). In fact, a recent survey shows that more anglers fish for landlocked salmon than any other coldwater sportfish, except brook trout.

In eastern North America, landlocked salmon are native to lakes in Maine, New Brunswick, and Nova Scotia (MDIFW, 2004). Landlocked salmon are native to Sebago Lake, the Presumpscot River, and the Crooked River (Atkins and Foster, 1869; Kendall, 1935). Prior to 1868, landlocked salmon occurred in only four river drainages in Maine: the Penobscot (Sebec Lake); St. Croix (West Grand Lake); Union (Green Lake); and the Presumpscot (Sebago and Long Lakes). Attempts since that time were made to introduce landlocked salmon to virtually every state in the United States, and throughout the world. Outside Maine, fisheries for landlocked salmon currently exist in New Hampshire, Vermont, Massachusetts, and New York.

Prior to the construction of dams at the outlet of Sebago Lake, landlocked salmon traveled freely between Sebago Lake and the Presumpscot River, and used the upper Presumpscot River for spawning and nursery habitat (Atkins and Foster, 1869; Kendall, 1935). In fact, historic records indicate that Sebago Lake's landlocked salmon lived much like their sea-run cousins, spawning in the Crooked and Presumpscot Rivers and returning to Sebago Lake to feed and grow.[74] FOSL contends that the Eel Weir dam prevents the natural migration of Sebago salmon between Sebago Lake and the Presumpscot River.[75] In addition, FOSL states that artificial stocking of smelt and salmon to Sebago Lake and salmon and brook trout to the upper Presumpscot River is now required to replace the wild, self-sustaining populations which were formally abundant.

To restore free movement of land-locked salmon between Sebago Lake and the Presumpscot River, FOSL recommends that upstream and downstream fish passage be installed at the Eel Weir dam. FOSL states that installation of a simple fishway at the dam would allow sufficient wild reproduction of Sebago salmon in the upper Presumpscot River to eliminate the need for expensive, annual fish stocking of Sebago Lake.[76] The MDIFW and Interior do not support fish passage for salmon at the dam.

[74] Historically, landlocked salmon returned to Sebago Lake after spawning, which supported, and continues to support, a native population of rainbow smelt (the salmon's main prey species.

[75] Sebago salmon that migrate into the Presumpscot River from Sebago Lake, via the Eel Weir spillway, are unable to move back into Sebago Lake to complete their life cycle (Kendall, 1935).

[76] The MDIFW stocks Sebago Lake with hatchery salmon each year to make up for lost natural reproduction.

Our Analysis

In their comments, FOSL presents much information to support their position regarding the viability of landlocked salmon in Sebago Lake and the Presumpscot River, and for fish passage at the Eel Weir dam. For example, this information includes:

- life history requirements for landlocked salmon, including the need for access to suitable habitat for spawning and juvenile development (Decker, 1967; Everhart, 1976), as well as access to lakes with healthy populations of rainbow smelt (Havey and Warner, 1970);
- evidence documenting the historic presence of landlocked salmon in Sebago Lake and the use of the Presumpscot River by these salmon for spawning and rearing, as well as current evidence of salmon spawning and juvenile development in the Eel Weir bypassed reach;
- evidence documenting the effects of the Eel Weir Project on Sebago salmon, with regards to blocking migration and dewatering spawning and rearing habitat in the Eel Weir bypassed reach;
- a review of Maine's comprehensive fisheries management plans and how passage (or lack of passage) at the Eel Weir dam relates to the fishery goals identified in those plans;
- evidence documenting the inability of the Eel Weir bypassed reach (due to the lack of smelt forage and water temperatures) to support a viable, self-sustaining population of landlocked salmon that meets Maine's fishery goals (14-inch legal size limit), in the absence of passage at the Eel Weir dam;[77] and
- biological data (fish size) from the Jordan River (a tributary to Sebago Lake) that shows salmon having access to smelt consistently grow to a larger size (14 + inches) than those stocked in the Eel Weir bypassed reach where no smelt exists (Boland et al., 2003; Brautigam et al., 2004);

In addition to the landlocked salmon fishery in Sebago Lake, we reviewed information from Moosehead Lake, a storage reservoir in the headwaters of the Kennebec River in Maine (FOSL, 2005). Moosehead Lake, like Sebago Lake, is inhabited by a large population of landlocked salmon. However, unlike Sebago Lake, the outlet of Moosehead Lake is equipped with a working fish passage facility for salmon. This facility is operated by the MDIFW, specifically to allow adult landlocked salmon from Moosehead Lake to drop down into the Kennebec River to spawn, and to allow adult and juvenile salmon from the Kennebec River to move into Moosehead Lake.

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[77] Nearly 85 percent of the salmon caught in the Eel Weir bypassed reach are < 14 inches in length.

Studies conducted by MDIFW fishery biologists in the upper Kennebec River show that wild landlocked salmon from Moosehead Lake spawn in the river (FOSL, 2005). In addition, studies at the Moosehead Lake outlet show that nearly all adult salmon, which drop out of lake to spawn in the upper Kennebec River, return to the lake within a year after spawning. These fish provide angling opportunities, not only in Moosehead Lake but in the Kennebec River as well. Finally, studies also show that wild juvenile landlocked salmon ascend the fish passage facility to enter Moosehead Lake. These fish, which are 6 to 8 inches long, remain in the lake until they're ready to spawn.

Based on our review of the aforementioned information, we conclude that FOSL makes a compelling argument for fish passage at the Eel Weir dam. Fish passage at the project dam would restore access to historically significant spawning and rearing habitat in the upper Presumpscot River, as well as provide access to smelt forage in Sebago Lake. This likely would (a) improve the condition (length and weight) of Sebago Lake's landlocked salmon, and (b) enhance the landlocked salmon fishery in Sebago Lake. Nonetheless, we cannot dismiss the MDIFW's fishery management goals for Sebago Lake and the Presumpscot River. Neither the MDIFW, nor the USFWS, supports the installation of fish passage facilities (except those needed for American eel) at the Eel Weir dam as a way to achieve the fish management goals for Sebago Lake and the Presumpscot River (i.e., the Eel Weir bypassed reach).[78]

Our recommendation concerning fish passage for landlocked salmon at the Eel Weir dam is found in section VII, *Comprehensive Development and Recommended Alternative*.

c. Cumulative Effects

The Presumpscot River Basin has a rich history.[79] The river was settled early in Maine's history (the first dam was constructed at Smelt Hill in the early 1730's). The power and water supplied by the Presumpscot River was important to the early development of the area. Without the river there would have been no mills and little

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[78] The MDIFW states that allowing fish to migrate from the Eel Weir bypassed reach into Sebago Lake could jeopardize a popular year round fishery in the bypassed reach. In addition, the MDIFW states that fish passage facilities at the Eel Weir dam would permit ripe, lake-stocked landlocked salmon to drop out of the lake. The MDIFW argues that these fish would not be available as brood stock at their salmon egg collection facility on the Jordan River, which supplies salmon eggs for much of Maine's salmon hatchery program.

[79] Information on the settlement of the area was taken from *A Plan for the Future of the Presumpscot River*, August 18, 2003.

development in the area. The Presumpscot River was the site of Maine's first pulp mill, first hydroelectric project, only significant canal, and the largest gunpowder mill.

The effect of this development on the river has been significant. No other river in Maine has virtually all its hydraulic head captured behind dams. In the 1840's concerns with pollution in the river began to surface. In the 1850's, the paper industry was established on the river, as well as a number of other industries, that added to the pollution problems.

Industrial and municipal treatment plant discharges to the river have been dramatically reduced since the 1960's. However, nonpoint sources of contamination from development and other land uses in the watershed have increased. Certain other effects from development activities in the basin remain today. One of the most significant changes to the natural river (i.e., altered hydrology) resulted from controlling flows from Sebago Lake, and the development of dams and impoundments on the river. This changed both the flows and character of the river, and altered water levels on Sebago Lake. In addition to altered hydrology, development resulted in changes to the river's water quality and recreational opportunities, as well as affected estuarine resources and the local and regional economy. Fish resources in the basin have been affected by: (a) blockage of fish passage for anadromous fish and the American eel; (b) fragmentation of habitats; (c) a shift in aquatic habitat from fast moving coldwater riverine to a series of slower moving impounded areas; and (d) deterioration of water quality.

For purposes of our environmental analysis, we identified the anadromous and catadromous fisheries of the lower river, and the efforts to restore these fisheries, as resources that could be cumulatively affected by the operations of the Eel Weir Project. In our above analysis, we describe the potential effects of the current flow release regime on these fisheries, compared to the flow regime that occurred prior to implementation of the LLMP. We conclude that the current flow regime has had an overall positive effect on these fisheries (table 27). Regarding Maine's recommended operating parameters, we conclude that the effects of such flows cannot be predicted with certainty, but may be similar to current operations.

Since the overall effect of the current flow regime in the Presumpscot River on anadromous and catadromous species would be positive, there would also be a positive effect on the restoration efforts of these species. Maintenance of good or improved habitat suitability would enhance the potential for successful spawning of the anadromous species. Any negative effect of higher flows during the American eel upstream migration period (table 27) would be offset by the installation of eel passage facilities on, at least, five of the lower Presumpscot River dams. Thus, we conclude that licensing the Eel Weir Project with the requirement to maintain the current LLMP, with its associated flow releases, would have an overall beneficial cumulative effect on the lower anadromous and catadromous river fisheries, and efforts to restore those fisheries. Assuming all the alternative plans proffered by various interests would result in similar flows in the lower Presumpscot River, the overall effects would also be beneficial. Maine's recommended operating parameters, especially when flows are reduced to raise the lake levels, could be detrimental to the fisheries and fish restoration efforts in the basin (e.g., if low flows are released during migration seasons, spawning periods, etc.).

As we said in FERC (2002), dams on the Presumpscot River obstructed passage of migratory fishes for at least a century. We further stated that dams have had less affect on American eel than other anadromous fish species (e.g., Atlantic salmon, American shad, and river herring), because of the ability of the eel to "climb" obstructions such as dams. As a result, eel are well-distributed within the Presumpscot River watershed, including Sebago Lake.

In the past, neither S.D. Warren nor any other dam operator provided specific eel passage measures at dams on the Presumpscot River. This changed with the licensing of S.D. Warren's five lower Presumpscot River projects; the licenses for the projects included provisions for upstream and downstream eel passage measures. We concluded in FERC (2002) that such measures to facilitate effective eel migration would have an overall beneficial cumulative effect on eel in the river basin.

Although barriers to eel migration, and other potential sources of mortality would remain in the basin (e.g., Cumberland Mills dam and North Gorham dam), relicensing the Eel Weir Project with eel passage measures would incrementally improve migratory conditions for the eel. Migratory delays and mortality associated with passage at the project would be reduced, and distribution of eels within the basin would be enhanced. Survival of eels within the river would be improved. This would have a positive, but unmeasurable effect on the eel population.

The construction of dams, along with other factors such as water pollution and overfishing, eliminated anadromous species from most of the Presumpscot River Basin where they once occurred (FERC, 2002). Only a relatively small run of river herring and a remnant population of American shad remain in the lower river downstream of the Cumberland Mills dam. The sea-run Atlantic salmon no longer occurs in the basin, except for occasional reports of individuals whose origins are unknown.

Recent efforts to restore anadromous species to the river have included the construction of fish passage facilities at the outlet to Highland Lake and removal of the Smelt Hill dam. In addition, the licenses for S.D. Warren's five hydropower projects on the river included provisions to construct fish passage facilities at those projects in the future. In FERC (2002), we concluded that these projects, with the fish passage provisions included in their licenses, would not have any adverse cumulative effects on any fish restoration programs on the river.

The fishery resource agencies do not recommend fish passage at the Eel Weir dam at this time. Therefore, where it concerns fish passage for anadromous fish, the continued operation of the Eel Weir Project without such passage facilities would not have any negative adverse cumulative effects on any programs to restore anadromous fishes to the river.

d. Unavoidable Adverse Effects:

Operation of the Eel Weir Project under the current LLMP would result in unavoidable adverse effects to littoral areas and fish spawning success by affecting near shore aquatic habitat and macrophyte growth. Resident, shallow-water species would continue to be subjected to the lake level management regime, potentially affecting fish utilization of shallow, littoral-zone habitat. These effects are expected to be minimal in Sebago Lake. Changes to the LLMP which result in lower lake levels, particularly during the biologically productive season(s), would exacerbate these adverse effects. Changes to the LLMP that would increase lake levels during the growing season would enhance near-shore conditions.

Dams on the Presumpscot River, including the Eel Weir dam would continue to fragment aquatic habitat. However, the connectivity of aquatic habitat would be improved through implementing eel passage measures at the project. Unimpeded movement between Sebago Lake and the Eel Weir bypassed reach, for land-locked Atlantic salmon, would continue to be hindered in absence of appropriate fish passage facilities for that species.

Entrainment of resident species residing in Sebago Lake would continue to occur, at some level. The existing fish exclusion structure located at the entrance to the power canal would minimize the effects of entrainment. Consequently, we do not expect any adverse effects on the fish population in the lake. Similar effects would likely occur with the American eel. Although, compared to existing conditions with no provisions for eel passage, implementing appropriate passage measures at the project is expected to enhance eel passage through the project area.

4. Terrestrial Resources

a. Affected Environment:

Terrestrial Habitat and Wildlife

The Eel Weir Project is located in the Northern Hardwoods Ecoregion, and the predominate forest type is a mixed hardwoods and coniferous forest. Predominate land cover types in the project vicinity are Forested Uplands and Palustrine Wetlands (54 percent), residential (32 percent), roads (10 percent), Urban/Industrial and Commercial (4 percent), and agricultural (<1 percent).

The mixed hardwood coniferous forest is dominated by sugar and red maple, red oak, American beech, white and yellow birch, quaking aspen, white pine, and hemlock. However, the immediate project shoreline around Sebago Lake is primarily coniferous. The shoreline along the Presumpscot River (i.e., along the Eel Weir bypassed reach) is a good example of the second growth mixed hardwood-coniferous forest type. S.D. Warren owns 292 acres of this important terrestrial habitat.

The mixed hardwood-coniferous forest is characterized by several different height classes of vegetation in the understory and a mature overstory, with microhabitat features such as snags and dead-and-down wood with heavily vegetated forest floors. Therefore, wildlife species are varied and abundant, which include small mammals such as, mice chipmunks, and squirrels, and larger mammals such as fox snowshoe hare, black bear, and white-tailed deer. Bird populations of this forest type include red-eyed vireo, woodpeckers, warbles, northern water thrush, ruffed grouse, mourning dove, and hawks.

Wetlands

Wetlands are relatively limited on the Sebago Lake margin, because the shoreline is generally well defined and moderately sloping, transitioning abruptly from the normal high water level of the lake to well-drained soils. Many of the wetlands that do exist within the project area rely on periodic inundation during high lake levels and/or wicking of lake waters as the primary hydrologic inputs. There are other wetlands that are either located along tributary streams or are fed by runoff from the watershed, and, therefore, do not rely on lake water levels.

S.D. Warren conducted a wetlands inventory survey in 1998 around Sebago Lake (Normandeau, 1999). Surveys extended approximately 250 feet landward from the shoreline around Sebago Lake and in the area between the project dam and powerhouse. Surveys delineated 545 acres of terrestrial habitat wetlands and 418 acres of aquatic habitat wetlands (S.D. Warren, 2002b). Of these wetlands, approximately 46 percent of the terrestrial wetlands and about 80 percent of the aquatic wetlands are located within the project boundary. Terrestrial wetlands within the project boundary include 107 acres of palustrine emergent marsh, 81 acres of palustrine forested, and 63 acres of palustrine scrub shrub. In the Eel Weir bypassed reach, which was not included in the wetland survey area, there are approximately 7 acres of additional palustrine wetlands including 6 acres of scrub shrub, less than 1 acre forested, and less than 1 acre emergent.

The wetland survey found approximately 220 acres of aquatic beds within the project boundary. This is less than 1 percent of the total surface area of the lake. The aquatic beds that occur in Sebago Lake are in wind-protected coves and embayments where fine sediment has accumulated in the shallows, allowing for the growth of rooted vegetation (Normandeau, 1999). The largest aquatic beds are concentrated along the northern shores of the lake at Sebago Cove inlet, at the mouth and in the Songo River, in Kettle and Turtle Coves, and in the vicinity of Jones Beach.

Wetlands Monitoring and the LLMP

S.D. Warren conducted a wetlands inventory and monitoring program, in accordance with the 1997 FERC Order to monitor the effects of the LLMP on wetlands within or adjacent to Sebago Lake. The 1998 through 2002 monitoring program was conducted along five baseline transects that were to represent wetland conditions from all portions of the lake (Normandeau, 2003) (figure 23). Each transect was divided into segments, starting closest to, or within, the lake and extending landward. Vegetative quadrants were established at the midpoint of each segment and varied in size depending on the type of vegetation. For the herbaceous strata, one 86-square-foot quadrant was laid out, while two 172-square-foot quadrants were surveyed for shrubs. The tree strata had two 1,076-square-foot quadrants. The total length of the five transects, which may vary each year according to the type of vegetation surveyed, ranged in length from about 35 to 76 meters (115 to 250 feet). Results of the monitoring program are presented in Appendix C of this EA.

Figure 23. Wetland monitoring transects locations. (Source: Normandeau, 2003)

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Plant species composition and overall density in Transect 1, located in an oxbow area between the Songo River and the Sebago State Boat Launch (figure 23), changed very little throughout the five year study period (Normandeau, 2003). The minor changes that did take place were mostly observed in the herbaceous plots closest to the lake end of the transect line. Emergent vegetation density increased dramatically in Segment 1 (the emergent zone). Segments 2, 3, and 4 all showed a slight decrease in total plant density. The decrease in total dbh (in inches, used to measure species dominance/percent cover for the tree vegetative strata) measured in Segment 3 is the result of the elimination of a large tree located along the plot boundary that had been counted in the earlier years of the study.

Transect 2 is located on the northeast side of Raymond Neck, southwest of Jones Beach (figure 23). The plant species composition and overall density of the vegetation plots along Transect 2 varied only slightly throughout the five-year study period (Normandeau, 2003). As with Transect 1, most of the observed changes occurred within the herbaceous plots closest to the lake end of the transect line. The total herbaceous cover in Segment 1 varied from year to year. The width of this segment increased by 8.2 feet in 2002, meaning the amount of palustrine emergent marsh wetland increased in this location. Segment 2 decreased by 1 foot in 2002, with a decrease in herbaceous species diversity and total percentage cover in the shrub plot. Vegetation diversity in the herbaceous plot increased in Segment 3 during the later years of the study.

Transect 3 is located to the northwest of Jones Beach (figure 23). There was only a slight variation in plant species composition and overall density throughout the five-year study period (Normandeau, 2003). The open water zone of Segment 1 increased by approximately 6.6 feet and the total vegetation cover decreased slightly, resulting in a minor loss of emergent marsh vegetation in this location. The total vegetation cover increased substantially in Segment 2, along with an increase in species diversity. Segments 3 and 4 showed a gradual increase in estimated total cover in the shrub plots over the five-year study period. There was a dramatic increase in total cover in the shrub plots in Segments 5 and 6.

Transect 4 is in a large wetland system that drains into the lake from Rich Pond, located in Stickey River Cove to the north of Smith Mill Road (figure 23). There was only minor variation in species composition and density throughout the five-year study period (Normandeau, 2003). The species diversity increased in Segment 1. There was a high degree of disturbance to the shrub layers in Segment 2 due to both animal and wetland survey activity. The shrub plots on Segment 2 had changes in total percentage cover and dominant species composition, with a general increase in cover and in the total number of dominant species. The total cover of the shrub plots in Segment 3 increased throughout the study, with a slight change in species composition.

Transect 5 is located to the south of Smith Mill Road (figure 23). Although plant species composition and overall density in the vegetation plots varied only slightly throughout the 5-year study period, there were some minor changes (Normandeau, 2003). The open water of Segment 1 became vegetated by year 5 of the study and merged with Segment 2. There was a decrease in percentage total cover in the herbaceous plot in Segment 2. Segment 3 showed a small but consistent increase in total percentage plant cover in most of the herbaceous, shrub, and tree plots.

Overall, the wetlands monitoring program showed only minor differences in the vegetation data collected over the five-year period. The most noticeable changes were generally observed in the herbaceous plots closest to the lake end of the transect line, where the width of the open water and/or emergent areas fluctuated, and total vegetation cover and diversity increased. The total cover within the tree and shrub plots was generally stable over the five years, with no decline in woody species observed (Normandeau, 2003).

b. Environmental Effects:

Effects of LLMP on Wetlands

S.D. Warren proposes only minimal changes to the operation of the Eel Weir Project that could affect wetlands. S.D. Warren proposes to continue operating the project in accordance with the existing LLMP with the exception of establishing a 3-inch tolerance range for the August 1 target level. This modification would allow slower lake level withdrawals when rain events occur in late July and early August. S.D. Warren also proposes to replace the existing wetlands monitoring program with a similar monitoring program, having a 5-year monitoring cycle. S.D. Warren contends that the reduction in monitoring frequency is warranted because the results of the existing monitoring program have shown, to date, no effects associated with the LLMP.

Interior did not make any specific recommendations relating to the LLMP's effects on wetlands. Interior, however, states that lake level fluctuations affect wetland habitat and that the lake should not be drawn down more than 2 feet during the growing season. The MDIFW, similarly, did not make any wetland specific recommendations or comments. However, the MDIFW recommendation to implement a fall/winter drawdown to reduce lake trout spawning success, would include a 5- to 8-foot drawdown beginning in late November and possibly extending into mid-winter.[80] Other entities made recommendations regarding changes to the LLMP for varying reasons. Most of these recommendations involve small modifications to the lake levels required by the existing LLMP. We summarize these recommendations in section III.D.

Maine recommends changes to the LLMP to better ensure that suitable water levels are achieved to appropriately balance the competing uses of the lake. Several entities filed comments on Maine's recommended changes to the LLMP, including S.D. Warren, FOSL, Stephen Kasprzak, and numerous private citizens. Nearly all the letters oppose at least some parts of Maine's plan, with the primary concern being the potential for increasing beach and shoreline erosion. S.D. Warren's indicates that if the State's recommended changes are adopted, further modifications to the LLMP are warranted.

[80] The MDIFW's recommendation for a late fall/winter drawdown would have little, if any, affect on wetlands, as it would be outside the growing season.

Our Analysis

The 1997 EIS analyzed the effects of lake level management on wetlands. At that time, we determined that the water levels specified in the LLMP mimicked the natural hydrograph, maintaining relatively stable water levels early in the growing season with a gradual decline through the remainder of the year (FERC, 1997a). The EIS concluded that the recommended alternative, which would set the standards for the LLMP, would minimize impacts to wetlands and associated fish and wildlife species by maintaining stable water levels during the optimum periods of fish and wildlife reproduction, and wetland plant development.

The EIS also concluded that the LLMP would not adversely affect wetlands because it would maintain water surface elevations above the MDIFW-recommended minimum lake elevation of 262.7 feet (Pierce and Eldridge, 1992), throughout the growing season (May 1 through September 15). In the five-year study period after LLMP implementation, Sebago Lake water levels were above 263.0 feet during all five growing seasons (Normandeau, 2003). The only year in which lake levels were below 263.5 feet during the growing season was 2001, an exceedingly dry year. In 2001, lake levels dropped below 263.5 feet around September 12, only a few days before the end of the growing season (S.D. Warren, 2003a).

The results of the wetlands monitoring study, in the five years after implementation of the LLMP, show minimal changes in the species composition and percent total cover of vegetation in the monitored wetlands (*see* Appendix C) (Normandeau, 2003). The most notable of the changes was an increase in the total percentage cover in many of the herbaceous quadrants. However, recorded percent of total cover, and even species composition, in wetland studies, can vary annually based upon a number of factors such as precipitation, temperature, animal activity, and individual differences in the surveyor's interpretation in the field, in addition to lake level variation.

Normandeau (2003) concluded that a definitive answer on the relative importance of water levels compared to other factors could not be determined using the limited data set of the study. During the study, there were two years of high lake levels (1998 and 2000), two years of low lake levels (1999 and 2001), and 1 year of moderate lake levels (2002). Fluctuating water levels may enhance the growth and expansion of emergent vegetation and result in greater plant diversity, which could at least partially explain the changes. However, the aforementioned non-lake level related factors also could be responsible for the variability in recorded wetland status. The wetland monitoring studies have not shown major wetland changes that would warrant modifying the LLMP at this time, and we are unable to definitely determine if or how the LLMP has contributed to the minor changes recorded thus far.

S.D. Warren's proposal includes only minor changes to the existing LLMP. As discussed in section V.C.2, *Water Resources*, the proposed 3-inch tolerance range for the August 1 target level is within the natural variation of the lake due to wind and wave action. As a result, this tolerance range would likely have no effect on wetlands.

Because only minor changes have occurred to the wetlands studied in the 5 years since implementation of the LLMP, and no changes are proposed to the LLMP that would affect wetlands, it is unlikely that relicensing this project, as proposed by S.D. Warren would have any effects on wetlands. Although the 5-year wetland monitoring study was unable to definitively conclude how much the lake level fluctuations caused the minor changes in herbaceous vegetation, the S.D. Warren-proposed wetlands monitoring program would continue to record any long-term changes in wetland cover and plant diversity. Any changes that may be observed through this monitoring could be addressed through the term of the license via continued agency consultations and license reopener provisions, if required.

Interior recommends that lake level fluctuations be limited to 2 feet from April 1 through December 15 to protect fishery and wetland resources. Although the LLMP allows an approximately 3.8-foot fluctuation, from 1987 to 2002 the average lake level fluctuation during the growing season (May 1 through September 15) was less than 2 feet. S.D. Warren's proposal would essentially retain the same fluctuation levels as the current LLMP. There is no indication, based on the 5-year wetland monitoring study, that existing lake level fluctuations have resulted in any substantial changes in wetland vegetation. Therefore, although Interior's recommendation would guarantee lake level fluctuations would be < 2 feet during the growing season, it is not likely to result in any additional benefits to wetlands.

Maine recommends changes to the LLMP to ensure that S.D. Warren could meet suitable water levels for several competing interests. Although these changes are designed mainly to appease local landowners and recreational users, they would result in a minor benefit to wetlands as well. Because of slight changes in the target dates, ranges, and outflows from the lake, Maine's recommendations make it more likely that S.D. Warren would meet the target water levels. When target ranges are above 262.7 feet throughout the growing season, as with the state's recommendation, complying with these targets means there is less risk of occasional low lake levels that could adversely affect wetland health. As long as the lake stays above elevation 262.7 feet throughout the growing season, minor changes in target window dates or tolerance ranges would be unlikely to affect wetlands, because the variations would be within those expected under natural lake conditions.

Additionally, the state recommends moving the periodic (2 out of 9 years) low winter drawdown target date to December 1 (from November 1). This would eliminate the need for occasionally lowering the lake level below the recommended minimum elevation for wetland health at the end of the growing season. To achieve 261.0 feet on November 1 in 2 out of 9 years, as the current LLMP mandates, the water level periodically dips below 262.7 feet prior to the September 15 end of the growing season, unless S.D. Warren passes large amounts of water through the bypassed reach to quickly draw down the lake, which would adversely affect recreational fishing in the bypassed reach. This drawdown (to elevation 261.0 feet) could result in difficulty refilling the lake to meet spring targets in dry years. Maine's recommended revision to the LLMP that would ensure the spring target elevations are met every year could result in a minor benefit to wetlands. There would be little risk the lake level would be below the recommended minimum elevation for wetland health early in the growing season.

S.D. Warren's suggested changes to the LLMP, in response to Maine's recommended revisions, would have minimal effects on wetlands. An alteration in the winter target level from long-term median levels to 262.0 feet would have no effect on wetlands because it is outside the growing season. A provision to allow S.D. Warren to temporarily alter downstream flow releases in the case of flooding conditions, resulting in lake levels temporarily and infrequently rising above the spillway elevation by up to 6 inches, would not be a substantial change from existing conditions. Currently, the LLMP allows for the same conditions, with levels being above the spillway for approximately two weeks during the growing season in both 1998 and 2000. From 1910 to 2004, the lake level has been above the spillway elevation approximately 5 percent of the time. As a result, no adverse effects to wetlands are expected.

Both FOSL and Stephen Kasprzak recommend LLMPs that would have more frequent and greater winter lake level drawdowns than currently exist. In order to meet FOSL's and Kasprzak's recommendations of a November 1 drawdown to 261.0 feet every other year, 260.0 feet every 4 years, and 259.0 feet every 10 years, the lake level would need to be dropped below 262.7 feet prior to September 15, considerably more often and to a greater degree than with the existing 2 out of every 9 year drawdown to 261.0 feet, to allow time for the lake to be gradually drawn down to meet the target levels. As a result, these recommendations would likely result in adverse effects on wetlands as more of the wetlands would be dewatered during at least a portion of the growing season.

The Sebago Lake Coalition's recommended changes to the LLMP would have no effect on wetlands. Their recommended lake levels during the growing season are within the range of the current LLMP levels, with the exception of slightly higher levels in September. The wetlands monitoring study did show a slight increase in the percent cover within the lakeward herbaceous quadrants (most likely classified as "weeds"), but it is unlikely that the LLMP has caused this growth. Although the Coalition is concerned that lower water levels have caused increased growth of "weeds," the Sebago Lake water levels since the implementation of the LLMP have actually been higher than historic lake levels within the growing season. The periodic fall/winter drawdown to elevation 261 feet is outside the growing season and thus should not affect weed growth.

Shoreline Management Plan

Interior recommends that a shoreline management plan (SMP), or similar conservation measures, be prepared in consultation with the USFWS, the MDIFW, the Maine Department of Conservation (MDOC), and the MDMR, to protect riparian resources in the project area. Interior further states that the highly developed nature of most of the Sebago Lake shoreline, as well as lake level fluctuations, affect wetland habitat and the associated high value fish and wildlife resources associated with the shoreline. The USFWS provides no further details for its recommended SMP.

In its response to Interior's recommendation for the development of a SMP, S.D. Warren disagrees that a plan is necessary. S.D. Warren argues that due to the limited amount of land they own around the project and within the project boundary, it would not be appropriate for S.D. Warren to prepare a SMP for all of Sebago Lake, where most of the shoreline is owned and controlled by others.

Our Analysis

S.D. Warren owns approximately 292 acres of land in the area around the project structures and the bypassed reach. Only 11.7 acres are within the project boundary, which runs along the project canal at 262.65 feet, between the dam and powerhouse (S.D. Warren, 2002b). The dam, powerhouse, and other project structures occupy most of these 11.7 acres (letter from Nancy J. Skancke, Attorney, GKRSE, to Magalie Salas, Secretary, FERC, January 2, 2003). S.D. Warren owns 0.5 percent of the total lands around Sebago Lake, whereas 94 percent of the total land ownership is private.

As described above, the vast majority of the Sebago Lake shoreline is owned by a multitude of private landowners who are not required to abide by any license conditions imposed on S.D. Warren. However, S.D. Warren is responsible for the lands and waters within the project boundary that encompasses Sebago Lake within the 267.0-foot contour line. Responsibilities associated with overseeing the management of resources within the project boundary include supervising and controlling all non-project uses and occupancies of project lands and waters for the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. Temporary docks, seasonal water supply lines, marinas, dredging, sea-walls, rip-rap or any other developments within the project boundary are all activities that S.D. Warren is responsible for managing that could affect sensitive habitat such as wetlands.

The land that is owned by S.D. Warren in the project boundary is primarily occupied by project structures and is needed for project operations. However, it is possible that there are some undeveloped areas that would be suitable for protection, such as the wetlands located in the bay near the Songo River and Kettle Cove. Additionally, the bypassed reach, although not part of the project, contains second growth mixed hardwoods and coniferous forest and its associated wildlife, as well as several wetlands are on S.D. Warren-owned land. As discussed in section V.C.5, *Recreational Resources and Land Use*, S.D. Warren has considered putting the east side of the bypassed reach into a conservation easement with the town of Windham to maintain public access and recreation. The MDIFW would also like a perpetual easement for lands adjacent to the bypassed reach, so that the recreational availability of the lands and the bypassed reach would be preserved.

A SMP, as recommended by Interior, would help minimize adverse effects on sensitive wildlife habitat and wetlands from activities and temporary structures along the immediate shoreline. The SMP should include mapping efforts that identify these sensitive shoreline resources. S.D. Warren would then be able to manage and protect shoreline resources through a permit program, as discussed in V.C.5, *Recreational Resources and Land Use*, to ensure that private temporary docks, water supply lines, and other structures are installed properly and located in appropriate areas. In addition, protecting riparian and other sensitive habitat areas, on S.D. Warren-owned lands within 200 feet of the normal high water elevation, would enhance wildlife habitat, protect any wetland resources in those areas, protect valuable fish habitat, and minimize water quality effects. Because S.D. Warren owns little, if any, land around Sebago Lake, however, restricting the shoreline protection measures to lands owned by S.D. Warren would provide only limited protection to the riparian areas and other sensitive habitats. Under such conditions, additional lands, not presently owned by S.D. Warren or otherwise part of the project, may need to be identified for protection by the applicant. Finally, including the bypassed reach in the project boundary and within the SMP would ensure its protection from development and continued recreational value.

c. <u>Unavoidable Adverse Effects:</u>

None.

5. Recreational Resources and Land Use

a. <u>Affected Environment</u>

The lakes region of southern Maine offers an abundance of seasonal recreational opportunities. The region features Sebago Lake, the second largest lake in Maine with over 100 miles of shoreline encompassing a surface area of 28,771 acres. Sebago Lake is located within a 30-minute drive of Portland, making it a popular recreation destination. Recreation activities at Sebago Lake center on the lake and associated water-related activities such as fishing, boating, swimming, sun bathing, camping, walking, and enjoyment of the aesthetic beauty. Most of the recreational facilities operate from May through late September, and based on Sebago Lake State Park data, the majority of visitation occurs between Memorial Day and Labor Day. S.D. Warren does not own any recreational facilities or access points on Sebago Lake.

Public Recreational Facilities

Public recreational facilities surrounding Sebago Lake include Sebago Lake State Park, Tasseltop Beach (Halls Beach) and Songo Lock. The State Park, located on the north shore of the lake, hosts the majority of public beach sites on Sebago Lake. Tasseltop Beach, located on the eastern shore in the town of Raymond is the only other public beach on the lake. Facilities featured at these parks include three campgrounds with over 250 campsites, two day-use areas, boat ramps and a cabin rental. Songo Lock, near the State Park, provides access between Sebago Lake and Long Lake for small recreational boats and can carry anywhere from 1 to 15 boats at a time, depending on boat size and demand. In addition to the sites mentioned, there are 13 accessible boat launch sites located within both public and private recreation areas around Sebago Lake (figure 24).

Figure 24. Boat launch sites on Sebago Lake. (Source: FERC, 1997a)

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Private Recreational Facilities

Private recreational facilities around Sebago Lake include residents' private piers and beach front areas, private resorts, and private and commercial marinas. There is extensive summer home development along the Sebago Lake shore, which provides a substantial amount of private boat access and water based recreation. Figure 25 shows the location of the 14 private and commercial marinas located on Sebago Lake.

Figure 25. Location of commercial and private marinas on Sebago Lake. (Source: FERC, 1997a)

Public Access for figure 25 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

Recreational Use

Day Use

Day use includes participation in activities such as swimming, sunbathing, picnicking, and hiking. The State Park monitors and calculates monthly use figures at its day use facilities. The estimated number of daytime users at the State Park and commercial marinas has increased since the inception of the LLMP (table 29). Since 1997, day use at the State Park has generally increased, with an overall increase of 125 percent. Day use of marinas and commercial recreational facilities has fluctuated, with an overall increase of 27 percent since 1997. As reported in table 30, total visitation to these facilities peaked at 18,500 in 2001.

Table 29. Day use estimates at Sebago Lake. (Source: S.D. Warren, 2003b)

	Sebago Lake State Park		Estimated Marina and Recreational Facilities	
Year	**Visitors**	**% Change**	**Visitors**	**% Change**
1997	69,407	N/A	12,500	N/A
1998	113,211	63	14,000	11
1999	186,275	65	12,000	-17
2000	136,463	-27	13,000	8
2001	166,061	22	18,500	30
2002	162,465	2	17,600	-5
Average (Total % change)	138,980	125	14,600	27

Overnight Use

Table 30 presents the overnight camper data for Sebago Lake State Park and the commercial recreational facilities. The data show that camping at the State Park has increased in most years since 1997, with an overall increase of 65 percent. Overnight use at commercial recreation facilities exhibited a significant decline from 2000 to 2001, but had a small increase in 2002, with an overall decrease through the period of 130 percent.

Table 30. Overnight use at Sebago Lake. (Source: S.D. Warren, 2002a)

	State Park		Marinas and Commercial Recreation Facilities		Total Overnight Users	
Year	Overnight Users	% Change	Overnight Users	% Change	Combined	% Change
1997	76,913	N/A	89,087	N/A	166,000	N/A
1998	84,354	10	75,646	-18	160,000	-4
1999	92,243	9	81,757	7	174,000	9
2000	89,403	-3	90,597	10	180,000	3
2001	90,971	2	39,000	-132	129,971	-28
2002	133,944	47	40,000	3	173,944	34
Average (total % change)	94,638	65	69,348	-130	163,986	14

Boating Access

Boat access to Sebago Lake is provided by boat ramps at the State Park, commercial marinas, the Town of Standish at the Water District, and the Songo Lock. Table 31 presents the estimated number of boat launchings at Sebago Lake State Park and use of Songo Lock. Since 1997, there was a 33 percent decline in boat launches at Sebago Lake State Park, off from the 1998 high of over 3,300 launches. The Sebago Lake State Park opens in April after ice-out, but daily tracking of visitors does not begin until May and ends in August. S.D. Warren states that the majority of launches at the State Park occur in April and May, coinciding with the opening of fishing season (S.D Warren, 2003b). S.D. Warren reported boat launch data for the months of May thru September; however, the reporting period is not consistent across all counts.

Table 31. Sebago Lake and Songo Lock boat traffic data, 1997-2002. (Source: S.D. Warren, 2003b; as modified by staff)

	Sebago Lake State Park[a]		Songo Lock Boat Traffic[b]	
Year	Boat Launches	% Change	Boat Trips	% Change
1997	2,522	N/A	10,573	N/A
1998	3,320	32	9,209	-15
1999	2,406	-28	11,501	20
2000	1,527	-37	10,201	-13
2001	1,832	20	10,862	6
2002	1,463	-20	10,638	-2
Average (Total % Change)	2,178	-33	10,497	-4

[a] State Park starts daily tracking of use in May and ends in August, and estimates use in other months based on a percentage of traffic counts.
[b] The Maine Department of Transportation operates the Songo Lock and maintains daily counts, which we assume is for the entire boating year.

Almost 80 percent of the boat traffic using Songo Lock occurs in July and August, with 18 percent occurring in June and September. Overall, use of Songo Lock has not shown any clear annual trend, with average use around 10,500 boat trips per year since 1997 (table 31).

Additional boat launching facilities are provided at marinas and commercial recreational facilities. The estimated number of slips available for use at marinas and similar facilities has steadily increased from 1999 to 2002 (S.D. Warren, 2003b), having additional effects on socioeconomics (*see* section V.C.7, *Socioeconomics*). The data from these sites indicate a dramatic increase in the estimated number of launches from 1997 to 1998, followed by a just as dramatic decrease in 1999 (table 32). Subsequent years indicate a general upward trend in boat launches with almost 6,700 launches in 2002. In 1999 and 2001, boat traffic at the Sebago State Park boat launch and Songo Locks experienced above average use, even though lake levels were below the LLMP targets. Boat traffic at Songo Locks in September 2001 was the second highest month during the 5-year recreation study, even though the lake level was below the LLMP target for the entire month.

Table 32. Boat launch data from marinas and commercial recreational facilities. [Source: S.D. Warren, 2003b; as modified by staff)

Year	Number of Slips	% Change	Estimated Number of Launches	% Change
1997	N/A	N/A	3,769	N/A
1998	566	N/A	9,400	149
1999	541	-4	4,450	-53
2000	625	16	6,100	37
2001	785	26	6,411	5
2002	863	10	6,693	3
Average (Total % Change)	676	48	6,610	141

In addition to the state park and the marinas, the Water District and the town of Standish share responsibilities in providing a boat ramp along the southeastern end of the lake. The Water District records daily boat launch data at the Standish Boat Launch during the recreation season (Memorial Day through Labor Day), 8 hours a day, Monday through Wednesday, and 10 hours a day, Thursday through Sunday. Review of the data (table 33) indicates a dramatic increase in launches for the 1999 season; however a large decrease in use in 2002 strongly affects the overall trend, resulting in an overall decrease in use of the facility since 1997.

Table 33. Boat launch data from Portland Water District and the Town of Standish. (Source: S.D. Warren, 2003b)

	Portland Water District		Town of Standish Boat Launch Passes Sold			
Year	Estimated Number of Launches	% Change	Resident	% Change	Non-Resident	% Change
1996	N/A	N/A	323	N/A	1,476	N/A
1997	2,553	N/A	309	-5	1,975	25
1998	2,274	-11	314	2	1,588	-20
1999	3,084	36	311	-1	1,655	4
2000	2,877	-7	237	-24	1,173	-29
2001	3,235	12	207	-13	1,650	41
2002	1,682	-48	243	17	1,484	-10
Average (Total % Change)	2,618	-18	270	-19	1,587	-14

In addition to the Water District's monitoring, the town of Standish issues launch passes to residents and non-residents for use of the Standish boat launch on weekends and holidays between Memorial Day and Labor Day. The resident pass allows access to the launch throughout the entire season. The non-resident passes must be purchased for each individual launching. Table 33 indicates the recent boat launch history at the Standish boat launch. Sales of resident passes were fairly constant between 1996 and 1999, but sharply declined in the 2000 and 2001 seasons. Sales of non-resident passes fluctuated between 1996 and 2002 with an overall decrease of 14 percent over that time.

Navigation Safety

The MDIFW tracks the number of boating accidents on Sebago Lake each year through monthly wardens' reports. The total number of reports for recreation seasons between 1997 and 2002 varied from four in 1998 to 10 in 2001 (S.D. Warren, 2003b). The number of reports is assumed to represent the level of navigational safety encountered on the lake.

b. Environmental Effects:

As part of relicensing, S.D. Warren, the agencies, and other stakeholders propose measures to improve the recreational resources in the project area, which in this case involves Sebago Lake. Any proposed changes to project operations (e.g., changing the LLMP) could affect recreational resources on the lake. S.D. Warren proposes to modify the LLMP to establish a 3-inch tolerance range around the August 1 target of 265.17 feet. Although modifying the LLMP in such a manner would appear to be a minor change, there could be some effect on the recreational resources of Sebago Lake.

To address any such potential effects, Interior recommends that S.D. Warren develop a recreation plan that includes continued monitoring around Sebago Lake, as well as fluctuation limits to the summer and winter lake levels. Maine recommends certain changes to the existing LLMP, such as January and February minimum lake levels, a new maximum spring lake level, and operating procedures when fall lake levels reach a maximum (would include a minimum August 1 elevation of 265.17 feet, a September 1 maximum elevation of 265.0 feet, and a November 1 maximum elevation of 263.0 feet). S.D. Warren opposes some of Maine's recommended changes. The MDIFW recommends that S.D. Warren implement a fall/ early winter drawdown (5 to 8 feet) to reduce lake trout spawning success. While this is a fisheries measure, it could also affect recreational resources. Finally, the MDIFW recommends the licensee develop a new boat ramp in Sebago Basin for small water craft, and that the lands adjacent to the Eel Weir bypassed reach be placed in a conservation easement to protect public access to the recreational fishery within the reach.

Effects of Lake Levels on Recreational Use

Management of lake levels throughout the recreation season may affect the recreation resources within and surrounding Sebago Lake. Under the current LLMP, target lake elevations during the summer recreation season (May through September) decrease from full pond (266.65 feet) on, but not before, May 1 to the August 1 target of 265.17 feet, and continue to decrease to the November 1 target of 262.5 feet ±0.5 feet. Since the inception of the LLMP in 1997, lake levels have varied with climatic events and at times have been recorded below, within, and above the LLMP levels on specified target dates.

S.D. Warren proposes to adjust the LLMP to allow a 3-inch tolerance around the August 1 target. The proposal would provide the applicant with some leeway in managing the lake level, which could vary depending on the monthly and seasonal climatic conditions and required releases to meet downstream flow requirements. S.D. Warren does not propose any recreation enhancement measures.

Many private citizens and groups expressed concerns related to boating access, indicating that they could not access the lake during low, springtime levels that correspond with the start of the fishing season on April 1. Many of the citizens claim that the current practice of leaving the lake drawn down throughout the spring to accommodate the spring runoff results in lake levels that are too low for boating access, and compromises the recreational resources. Numerous other citizens claim that high spring levels in anticipation of meeting the full pool target elevation at the earliest date (May 1) has reduced the flood storage capacity necessary in the late spring to minimize risks to the shoreline associated with a full pool and strong storm events.

Our Analysis

Table 34 shows the difference between the measured lake elevation and the LLMP August 1 target elevation, and the lake level for each year is qualitatively characterized for that recreation season. Due to region wide droughts, the lake elevation was below the August 1 target level in 1999 and 2001 (6.6 and 3.72 inches, respectively) (S.D. Warren, 2002a). In addition to these lake levels not meeting the LLMP target, these levels were outside the range of the applicant's proposed 3-inch tolerance. Our examination of the measured lake levels throughout the recreation season, compared to the LLMP target elevations, indicates that the August 1 elevation is a good indicator of lake levels throughout most of the recreation season (*see* figures 7 through 9 in section V.C.2, *Water Resources*). As such, recreation usage observed during 1999 and 2001 may provide some insight into potential recreational use that may occur under future similar lower lake levels.

Table 34. Recorded lake water level in relation to August 1 target, 1997-2002. (Source: Staff)

Year	Aug. 1st Elevation (feet msl)	Aug 1st Target (feet msl)	Difference (Actual – Target)	Lake Water Level[a]
1997	265.11	265.17	-0.06 feet (-0.72 inches)	Medium
1998	265.35	265.17	0.18 feet (2.16 inches)	Medium
1999	264.62	265.17	-0.55 feet (-6.6 inches)	Low
2000	265.42	265.17	0.25 feet (3 inches)	Medium
2001	264.86	265.17	-0.31 feet (-3.72 inches)	Low
2002	265.04	265.17	-0.13 feet (-1.56 inches)	Medium

[a] Staff reviewed the lake levels during the recreation season and found that the August 1 level was indicative of the entire recreation season levels. Ratings for lake level:
- -Low – did not meet LLMP most months; below the proposed 3" tolerance on August 1.
- -Medium – within the LLMP majority of months; within proposed 3" tolerance on August 1.

Table 35 summarizes the visitation to Sebago Lake day use areas and boat access sites, and characterizes navigation hazards (through accident reports) in relation to the lake levels between 1997 and 2002. During the two "low lake elevation" years, day use levels at the State Park reached the highest numbers recorded since the LLMP was implemented, while day use figures from the marinas spanned the highest and lowest levels of visits during the same years. Lower lake levels produce wider beaches at the state park (FERC, 1997a), which could accommodate more beach goers and possibly account for the higher usage figures. However, lake levels above elevation 263.5 feet (the minimum level considered adequate for boating) would likely have little effect on boating resources. Furthermore, S.D. Warren reported that good weather maybe an even better predictor, as both 1999 and 2001 had the highest ration of good weather days (temperature above 70° F and no precipitation) to weekend days during the 6 years of study (S.D. Warren, 2003b). As such, there is no clear relationship between lake level and number of day users at Sebago Lake. Overall, summer lake levels have been both above and below the accepted range of the LLMP, while the number of day use visitors using the State Park has shown a general upward trend. This could be a direct result of aggressive population growth (12 percent from 1995-2000) in the communities surrounding Sebago Lake (*see* section V.C.7, *Socioeconomics*), in turn affecting day use recreation at the lake.

Table 35. Summary of recreational use in relation to lake level data. (Source: S.D. Warren, 2003b)

Year	Lake Level	State Park Day Use	Marina Day Use	State Park Boat Use	Marina Boat Use	Standish Boat Launch[a]	Songo Lock Boat Trips	MDIFW Boat Incident/Accident Reports
1997	Medium	69,407	12,500	2,522	3,769	2,553	2,553	5
1998	Medium	113,211	14,000	3,320	9,400	2,274	2,274	4
1999	Low	186,275	12,000	2,406	4,450	3,084	3,084	6
2000	Medium	136,463	13,000	1,527	6,100	2,877	2,877	8
2001	Low	166,061	18,500	1,832	6,411	3,235	3,235	10
2002	Medium	162,465	17,600	1,463	6,693	1,682	1,682	7
Median		149,464	13,500	2,119	6,256	2,715	2,715	7

[a] Portland Water District monitored daily launches at the town boat ramp between Memorial Day and Labor Day.

The greatest number of boat launches at the Town of Standish boat ramp and the highest volume of traffic through the Songo Locks occurred during the "low lake elevation" years 1999 and 2001. This information is counterintuitive to any notions that lower lake levels result in increased shallows and underwater hazards leading to less boating. During the same years, the number of boat launches from the State Park and the commercial marinas was closer to the median number of launches, indicating that regardless of lake levels, including the proposed 3-inch tolerance range, recreational boating would likely continue to occur at high levels on Sebago Lake. This indicates that demand for boating access to Sebago Lake is probably high; however, user demand surveys have not been performed.

Comparison of the MDIFW Boat Incident/Accident Reports with the lake levels indicates the greatest number of accidents/reports occurred during the 2001 "low lake elevation," while the 1999 "low lake elevation" year ranked fourth in number of accidents. Both 1999 and 2001 were years when relatively high boating use occurred, suggesting that accidents maybe more related to the number of boats on the lake rather than the lake level. Given the small number of years data have been recorded, however, comparison of the MDIFW accident data with the estimated number of marina users or boat launch statistics provides no observable trend.

Lake levels were 0.25 feet (3 inches) above the August 1 target in 2000, and moderate levels of use were recorded at all facilities summarized in table 35. This lake level would be within the tolerance proposed by the applicant; however, the data do not suggest a clear relationship between lake levels and visitor use at Sebago Lake.

Recreational use at Sebago Lake has fluctuated over the past 6 years since the implementation of the LLMP and does not appear to be related to the level of the lake. Because there is no clear link between the lake levels, the amount of day users, the number of people using boat ramps, and navigational safety, the continued use of the LLMP with the proposed 3-inch tolerance around the August 1 target elevation would not result in any adverse effects to the level of recreation or the recreational resources of Sebago Lake. Overall, the recreational usage of Sebago Lake is more likely correlated with other variables considered outside the scope of this analysis, such as the presence/ absence of favorable weather for swimming and boating, and/or the economic conditions and population growth around the lake, in Cumberland County, and in the Portland Metropolitan Statistical Area (MSA; also considered a Labor Market Area). We discuss the socioeconomics of the area in section V.C.7.

Effects of State of Maine Recommended LLMP

After a collaborative review and consideration of concerns expressed by stakeholders regarding the existing LLMP, Maine recommends that the lake level plan be revised. The goal of the revisions would be to better ensure that suitable water levels are achieved to appropriately balance the competing uses of the lake. Maine recommends five changes that may have an effect on recreational resources. We evaluate, below, the potential effects of these changes on recreation.

Increase winter water levels

Adequate boating access at the start of the fishing season (April 1, if waters are ice free) is the single recreational issue identified that may be affected by early spring lake level management strategies. Maine recommends a revision to the LLMP that would require, beginning on January 1 and continuing until March 1, that flows from the lake be reduced to achieve and maintain lake levels at or above the long term (1910-1986) median levels for this period (generally above 262.3 feet). Thereafter, lake levels would be managed as deemed appropriate by S.D. Warren based on precipitation, snow pack, energy needs and other considerations, with the goal of reaching 266.65 feet on, but not before, May 1. Whenever possible, water levels would be managed during this period to be no higher than elevation of 263.5 feet on January 1 to 266.65 feet on May 1. The state's intent in providing a minimum lake level from January to March 1 is to ensure that lake levels reach the minimum elevation levels necessary for boating by the start of the fishing season, in case there is a dry fill period, which could compromise spring boating.

S.D. Warren, commenting on Maine's proposed plan, agrees with the state in setting a minimum over-winter lake elevation, but would prefer to use a set elevation (262.0 feet) in the LLMP, rather than the "long-term median" value as suggested by Maine. This would result in a standard minimum lake elevation rather than the long-term median value, which may vary from day to day, and from year to year. Consequently, although this recommendation would result in potentially higher lake levels in the winter and early-spring, if levels do not reach 263.5 feet by the open-water season, boaters might not be able to access the lake during the start of fishing season, and possibly through May during springs with low precipitation and runoff.

FERC (1997a) cites that the minimum lake level for decent boating access at marinas on Sebago Lake is 263.5 feet. Between 1997 and 2002, S.D. Warren's management of the lake resulted in one time that lake levels that were not conducive to boating on April 1 or after ice out which resulted in delaying boat access during the early part of the fishing season. Table 36 summarizes whether ice cover or lake levels compromised boat access at the start of fishing season on Sebago Lake for the years 1997 to 2002. During the 6 years, ice cover prevented boating access on April 1 for 2 years, the lake was too low for 1 year, while lake levels were above the boating threshold for 3 years. During the year boating access was delayed due to low lake levels (2002), the lake had been drawn down to the 2-in-9 deep drawdown of 261 feet the preceding November 1, which was followed by extremely low inflow in January, February, and March (at about the 95 percent exceedance level).

Table 36. Boat accessibility at the start of fishing season between 1997 and 2002. (Source: USGS, 2004a and annual ice out information, as modified by staff)

Year	Ice Out Date (lake elevation at ice out)	April 1 Lake Level (feet)	Lake Level or Ice Cover Limiting on April 1[a]
1997	April 14 (264.23 feet)	263.25	Ice Cover
1998	No complete ice cover	265.09	neither
1999	No complete ice cover	264.37	neither
2000	March 29 (263 feet)	263.6	neither
2001	April 24 (263.6 feet)	261.4	Ice Cover
2002	No complete ice cover	261.76	Lake Level[b]

a. Assumes the minimum lake level to launch a boat is 263.5 feet.
b. Year following a 2-in-9 deep drawdown below 261 feet in November 2001.

Table 37 compares the amount of inflow required to reach the boating threshold under various lake elevations and hydrological conditions. Most importantly, table 37 shows that even if lake levels are below 261.0 feet at the beginning of January, they could reach levels that support boating by the start of fishing season in moderately dry winters (75 percent exceedance flows),[81] and shortly after April 1 in extreme dry winters (90 percent exceedance flows), assuming the lake is ice free. Table 37 also helps to illustrate the 2002 scenario, when lake levels were between 260.5 and 261.0 feet between January 1 and March 1, but reached elevation 263.5 feet by the third week of April, after receiving 95 percent exceedance inflows during the refill period. This type of scenario could be addressed by adopting Maine's recommended change to the LLMP (higher winter lake levels), but as table 37 shows, it would be unnecessary in all but the most extreme years, and may only be warranted in years following a 2-in-9 drawdown to elevation 261.0 feet, such as in 2002.

[81] This information is similar to that shown earlier in table 4. It is conservative and for genral reference only. For a more detailed discussion on the assumptions used to calculate this information see section V.C.2, *Water Resources*.

Table 37. Summary of the inflow [a] needed to reach minimum boating levels by April 1 after a November 1 drawdown. (Sources: USGS, 2004a; data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004; USGS, 2004b)

		Mean inflow (January 1-April 1)		75% Exceedance inflow (January 1-April 1)		90% Exceedance inflow (January 1-April 1)	
January 1 Lake Elevation (feet)	Million cubic feet required to reach 263.5 feet	Total (mcf)	% of inflow required	Total (mcf)	% of inflow required	Total (mcf)	% of inflow required
260.6	3330	5,181	64%	3,604	92%	2,854	117%
261	2919	5,181	56%	3,604	81%	2,854	102%
262	1869	5,181	36%	3,604	52%	2,854	65%
263	524	5,181	10%	3,604	15%	2,854	18%

[a] Based on flows shown in table 8 for water years 1987-2004.

To ensure boating access at the start of fishing season, any future LLMP should consider the balance between the start of fishing season (April 1 or ice-out) and the proper lake elevation necessary to launch a boat (263.5 feet). Maine's recommendation comes close to meeting both these requirements by addressing the issues raised by the community and S.D. Warren. However, as illustrated in table 37, a higher minimum lake level in January and February may be unnecessary in all but the most extreme cases. In addition, even if lake levels are suitable for boating on April 1, boat access could still be compromised because ice cover could be present in early April. An alternative that would promote adequate boating lake levels at the start of fishing season would be a minimum lake elevation of 263.5 feet on April 1. Unfortunately, this alternative could pose additional risk to the beaches, the shoreline and shoreline residents, should Sebago Lake have substantial ice cover or should the watershed experience high precipitation resulting in flooding. As such, it would be more appropriate to adopt a strategy that lake levels be maintained at, or above, the long-term (1910-86) median in January and February following deep drawdowns below 261.0 feet, as a way to protect the boating resources from extreme low-flow conditions. This would be a minor change to the existing LLMP, which currently does not require a minimum elevation between November 1 and May 1.

Eliminate the target range above full pond

The beaches and shorelines of Sebago Lake are most susceptible to sand loss and erosion at higher lake levels (FERC, 1997a). The goal of this modification to the LLMP would be to reduce the susceptibility of beaches to erosion and the loss of sand, as a result of high water levels. This recommendation would be beneficial to the lake's beaches, if less erosion occurs, resulting in a positive effect on recreational usage of the beaches. To achieve this goal, this recommendation may involve higher flow releases from the lake to prevent the lake from exceeding the full pond level. This could result in higher flows in the bypassed reach, since the maximum flow that can pass down the power canal is limited to 1,000 cfs. If higher flows are released to the bypassed reach, these flows could hinder the recreational fishing that occurs within that reach during May/June, compromising the popular and intense sport fishery in the reach, by reducing the "fishability" of the reach.

Typically, S.D. Warren manages flows out of Sebago Lake in March and April to accommodate the hydrological conditions of the season, while at the same time managing lake levels to fill by the earliest allowable date, May 1. This strategy results in a nearly full lake in late April, which coincides with the end of the "storm season." Although maybe not the sole intent, the state's recommendation addresses this issue by lowering the maximum fill target below the spillway crest. An alternative that would enhance flood control capacity would be to delay the earliest date of maximum pool to May 15. This alternative would continue to meet the boating lake level thresholds while providing additional benefits to the competing resources around the lake. This alternative may require S.D. Warren to pass more water to the bypassed reach during wet springs to manage the lake elevation to meet the target range; however, it would also provide benefits by making it easier to achieve a full pool after a deep drawdown or a dry winter. We discuss the effects of this alternative, in relation to bypass flows, in section V.C.2, *Water Resources,* and in section V.C.3, *Fisheries and Aquatic Resources.*

Expand the summer/fall target range

Various stakeholders have commented on the management of Sebago Lake during the late summer and early fall. Numerous individuals state the lake is too low during the summer, and S.D. Warren proposes to add a three-inch tolerance around the August 1 lake elevation target. Maine recommends an additional expansion of the lake elevation target range between July and November, with the goal of protecting boating and marina interests throughout the summer and into the fall, from exposure to low lake levels and possibly reducing the recreational experience for boaters and reducing marina usage. In comments responding to Maine's recommended plan, S.D. Warren recommends lowering the November 1 minimum lake elevation from 263.0 to 262.0 feet, which has been agreed to by the Maine DEP. This lower lake elevation, however, could compromise late-season boating access, should the lake levels need to drop (in order to reach the proposed target) below 263.5 feet during late September/early October, when some boating may still occur. As previously reported in the 1997 EIS, though, boating numbers drop significantly after Labor Day.

Expansion of the summer/fall target range would allow S.D. Warren more leeway in managing the lake's elevation. Higher lake elevations in the summer (specifically above 263.5 feet) would ensure a longer boating season on the lake. Although, as discussed above, recreational use is not directly correlated to lake levels, providing higher lake elevations throughout the late summer and early fall would reduce any effects of lower lake levels associated with the existing LLMP. Under the state's recommended lake level range for the fall months, lake levels above the boating threshold of 263.5 feet would be present into the second half of September till about the middle of October.[82]

Maintain periodic (2 in 9 yrs.) low water levels in the fall

The state of Maine recommends that the current, 2-in-9 year, drawdown of the lake be modified by changing the target date from November 1 to December 1, and lake levels would only be maintained at this level during the month of December. S.D. Warren recommends eliminating the 2-in-9 year drawdown from the plan.

The goal of the periodic low water level is to promote the accretion of sand to the beaches, which would benefit recreation users who use the beaches, and help to maintain private beaches and shoreline. Changes to beaches would have the greatest effects on users at the State Park and shoreline property owners. The existing LLMP calls for a similar drawdown in November and December. Maine's recommended change to the timing would not have any effects on fall season boaters, as access to the lake becomes compromised at elevations below 263.5 feet, which typically are reached by mid-October.

Because the late-fall/early-winter drawdown to 261.0 feet has only occurred once during the beach profile sampling program, it is difficult to make definitive statements on whether the 2-in-9 year drawdown builds beaches. S.D. Warren (Framatome, 2003b) reported numerous small berms had developed by April following the low drawdown from November 2001 to March 2002 (lake elevations below 261.0 feet). Many of these profiles also showed overall stability throughout the entire year, which S.D. Warren attributes to the lack of strong winds or storms during the 2000-2002 period. Over the term of a new license, the net benefit of this drawdown to the recreational resources is difficult to predict, since the beaches would likely continue to be in a constant state of flux between accretion and loss, from year to year. The limited data on the record related

[82] The middle of October is generally when the boating season ends.

to how beach profiles respond after periodic low water levels in the fall/winter does not warrant denying this alternative as a possible method to restore beaches and in turn enhance recreational use of those beaches.

Regardless, the accretion and erosion of sand from Sebago Lake beaches are dynamic processes, and it may be too early to know if the drawdowns contribute to the building of beaches. As such, the long-term effects of this recommendation on recreational resources cannot be predicted with certainty until longer-term monitoring of the drawdowns, or lack thereof, has occurred.

Reduce summer minimum flows

S.D. Warren is able to influence lake elevations during the summer/fall by adjusting the rate water is released to the Presumpscot River. Currently, the applicant is obligated to meet certain minimum flow requirements to protect aquatic resources in the bypassed reach and in the lower Presumpscot River. In order for S.D. Warren to maintain higher lake elevations during the summer and fall, the state plan calls for the reduction of minimum flow releases from the lake. Reducing summer minimum flows would assist S.D. Warren in maintaining target lake levels throughout the summer, but could affect downstream water temperatures and quality (*see* section V.C.2, *Water Resources*). This recommendation could negatively affect the recreational fishery in the lower Presumpscot River if reduced flows result in water temperatures higher than under the current LLMP. Warmer stream temperatures typically result in lower success rates (in fishing for coldwater species) when compared to cooler May/June conditions. Minimum flows in the bypassed reach, however, would still be maintained as required by any new license, so the effect on the fishery in the reach would be negligible.

CONCLUSIONS – Maine's plan would provide for lake levels slightly higher than the 1910-1986 median in January and February, eliminate the spring target range above full reservoir, expand the late-summer/fall target range, maintain the periodic late-fall drawdown of the lake, and reduce minimum flows downstream of the project. Overall, these recommendations would have very little effect on existing recreational boating access. Eliminating the target range above full pond, which would provide various benefits to shoreline resources, could require higher downstream flow releases and adversely affect angler usage of the bypassed reach during the releases. The deep drawdowns in the fall every 2 in 9 years, although reduced to one month, could benefit recreational resources if successful in maintaining beach sizes. However, the latter two recommendations are strongly dependent on weather conditions, and there is no way to predict with certainty the extent of effects that would occur. Although Maine's plan attempts to balance competing uses and the various concerns regarding lake levels, our analysis of summer recreational use data indicates that use may not be correlated with lake elevations.

MDIFW Drawdowns to Control Lake Trout Spawning

The MDIFW recommends that a fall/early-winter deep drawdown to reduce lake trout spawning success, be considered. This would include a 5 to 8-foot drawdown beginning in late November, or possibly occurring into the winter months, with associated effectiveness monitoring.

The MDIFW's recommendation would affect lake levels in November, December, and possibly into the spring period (contingent upon seasonal precipitation and the ability of the lake to refill), potentially affecting recreational use of the lake in the driest of years. This would lower the lake level well below the recommended level for boating access (perhaps as low as 257.0 feet; *see* section V.C.3, *Fisheries and Aquatic Resources*). However, because the drawdown would be planned for late November or later, it is unlikely that many boaters would be directly affected during the actual period of drawdown. The primary adverse effects on recreation may occur the following spring, should seasonal precipitation be low, when preferred lake levels for boat access would likely be delayed beyond April. Because the recommendation targets lake trout, recreational fishing could also be affected, if the drawdowns are successful in reducing lake trout spawning success. However, because of the MDIFW's management priorities for Sebago Lake, we would not consider any such effects to be detrimental. The potential effects on fishery resources are further discussed in section V.C.3, *Fisheries and Aquatic Resources*.

Interior's Recommended Changes to LLMP

Interior recommends that lake fluctuations be limited during the ice free and ice-cover seasons, to protect fish and wildlife resources. Interior states that operation of the project, as described in the license application, results in impoundment fluctuations of 4.15 to 6.15 feet, compromising the existing fishery resources. Interior recommends that the lake not be drawn down more than 2 feet from April - December 15, and no more than 3 feet for the remainder of the year. Establishing this lake level regime could affect fishery resources as well as recreation on the lake.

As previously discussed, recreational use numbers do not appear to be related to lake levels. Nonetheless, lake levels could affect boaters who use access ramps to launch their boats. As recommended by Interior, the lake would likely fill during the spring, but as the summer progresses, the lake could only be drawn down 2 feet to about 264.65 feet, until mid-December. Because this drawdown limit would result in a lake level above the recommended minimum for boating access of 263.5 feet, Interior's recommendation would enhance boating conditions, particularly at access ramps, throughout the fall. Since no boating occurs on the lake during the winter months, a 3-foot drawdown would have little effect on recreational resources. Ice fishing on the lake should not be affected by a 3-foot drawdown, and in fact the lake level would remain higher with Interior's recommendation than under most other recommended LLMPs.

FOSL's Recommended LLMP

FOSL, through two separate filings, made recommendations and observations pertaining to management of Sebago Lake levels. FOSL recommends changes to the LLMP that would lower the spring target level to 265.65 feet and change the fall target levels by increasing the frequency and magnitude of significant fall drawdowns. FOSL also opposes many aspects of Maine's plan, but does not make alternative recommendations.

FOSL's recommended LLMP targets fall and spring lake elevations. The recommended maximum spring lake level is not significantly different than the current plan (about 1 foot lower), and probably would have little effect on recreational resources.

Deep drawdowns of the lake during the fall are intended to promote conditions that would assist in beach accretion via natural processes. The current LLMP contains a similar management tool (drawdowns to 261.0 feet in 2 of every 9 years); although the body of evidence is small, it does suggest the current technique promotes a small amount of sand accretion. However, because the shoreline is subject to higher lake levels throughout the remainder of the year, this results in a shoreline constantly in flux. Current recreational use of the lake during this late-fall/early-winter period is likely light, so deeper drawdowns as recommended by FOSL, probably would not have a major effect on recreational usage during the drawdowns. However, to ensure these lake levels are reached, S.D. Warren may have to release a significant amount of water downstream, beginning earlier in the fall, which could adversely affect recreational opportunities for anglers in the bypassed reach.

Charles M. Frechette Recommended LLMP

Mr. Frechette's recommended changes to the LLMP would maintain the spring minimum lake level at 266.0 feet from May 1 to July 7 and maintain an absolute minimum level of 263.5 feet.

Mr. Frechette's recommendations would ensure that Sebago Lake has more water during the early recreation season of May, June and the first week of July, as well as a year round minimum lake level. The suggested minimum lake level is consistent with the recommended minimum level necessary to utilize boat ramps around the lake. If, however, reduced flow releases from the lake are required to maintain these levels, this could adversely affect recreational activities, as well as resources, in the bypassed reach and lower Presumpscot River. This alternative could also affect other resources around the lake and in the lower river, should flood control storage be reduced as discussed in V.C.2, *Water Resources*.

Stephan P. Kasprzak Recommended LLMP

Mr. Kasprzak's recommended changes to the LLMP are similar to those recommended by FOSL. He recommends a spring target level of 265.65 feet (with a range of +1.0 and -0.5 foot), and a fall drawdown schedule equal to the one recommended by FOSL. Mr. Kasprzak's recommended LLMP would have the same effects on recreation resources as FOSL's recommended LLMP, as discussed above. A lower spring target level of 265.65 feet, along with the recommended range, would not affect recreation resources.

Sebago Lake Coalition Recommended LLMP

The Sebago Lake Coalition recommends higher lake elevations in late summer and into September and October, designed to lengthen the recreational boating season. The Sebago Lake Coalition's recommended LLMP would result in lake levels above 264.0 feet from May 1 to October 1.

Various entities have suggested that higher lake levels lengthen the recreation season at Sebago Lake, since boat access to the lake becomes compromised as the lake is drawn down into the fall. A higher lake elevation would allow suitable boat access onto Sebago Lake throughout the summer and fall, when the weather is most agreeable. Conversely, however, high lake levels in the fall may pose a risk to the lake's beaches, as fall storms can have the largest effect on beach erosion (*see* section V.C.1, *Geology and Soils*). Reducing flow releases from Sebago Lake to meet the recommended higher lake levels, may also adversely affect recreation in the lower Presumpscot River.

Our recommendation concerning lake level management in Sebago Lake is found in section VII, *Comprehensive Development and Recommended Alternative*.

Recreational Monitoring

Sebago Lake is a popular destination for water based activities and is heavily utilized for fishing, boating and other forms of outdoor recreation. Interior recommends that S.D. Warren monitor the recreational use of the project area to assess the long-term adequacy of existing access facilities.

S.D. Warren disagrees with Interior, stating that it does not own or operate recreation facilities around Sebago Lake, and thus has little control over recreational usage on the lake. S.D. Warren states that the 5 years of recreational monitoring since the implementation of the LLMP in 1997 indicate that operations do not have any effect on recreational use of Sebago Lake, and that facilities are currently meeting demand. S.D. Warren would continue to be required to file with the Commission, under any new license, the FERC Form 80 recreational monitoring report every 6 years.

Our Analysis

In general, demand for day use facilities is expected to increase over the term of the license, as population growth in the greater Portland area (*see* section V.C.7, *Socioeconomics*) puts pressure on the region's recreational resources at Sebago Lake. As such, facilities would experience crowding and increased wear and tear, ultimately diminishing the recreational resources and quality of experience sought after by people visiting Sebago Lake.

Recreational use monitoring would provide a mechanism to assess recreational use levels in the project area, as well as the opportunity to adjust, as needed, recreational facility development and management over the term of a new license. Interior's recommendation would require S.D. Warren to conduct yearly monitoring of the facilities, and submit a report to the Commission every 6 years. However, Interior does not explain why additional recreational monitoring, above and beyond the FERC Form 80 requirements, is warranted in this instance.

The FERC Form 80 is a form that requires licensees to collect data on recreational facilities at their projects. The Form 80, which is filed with the Commission every 6 years, requires a licensee to provide the total of daytime and nighttime recreation visits at the project, and also requires the licensee to assess the capacity at each recreation facility to determine if the facility is overused, underused, or at the ideal use. We, as Commission staff, then review the Form 80, and, if recreation facilities are being overused, we can require the licensee to provide additional recreation facilities to meet the needs of the recreationists. The FERC Form 80 would provide the mechanism for monitoring recreation use that Interior is recommending for the project.

Our recommendation concerning recreation monitoring is found in section VII, *Comprehensive Development and Recommended Alternative*.

<u>Sebago Basin Boat Launch</u>

The MDIFW states that there are only three low- or no-cost public boat access points on Sebago Lake (Sebago Lake State Park, town of Standish Boat Launch, and Songo Lock), and that there is a growing need for additional low/no-cost public boat access to Sebago Lake. Thus, the MDIFW recommends that S.D. Warren develop a shallow water boat launch facility on S.D. Warren-owned land upstream of the Eel Weir dam (on Sebago Basin), which would provide public access to that portion of Sebago Lake for smaller watercraft. S.D. Warren disagrees with the MDIFW that additional boat access is needed, and claims the basin is neither a suitable, nor safe location for boat access, or for angling from watercraft that have no or low-powered motors. S.D. Warren further states that maintenance and security of the boat launch would cost users up to $29/launch.

Our Analysis

Development of a boating access point within the basin area would provide boating access for small watercraft to an area of Sebago Lake that currently requires the use of commercial marinas. The basin area of Sebago Lake is characterized as a shallow, narrow bay where exposed rocks and stumps are not uncommon. Bathymetry indicates that the maximum water depth within the basin is 14 feet, roughly 2,000 feet upstream of the project dam. Richardson's Boat Yard and Marina is the closest boating access point to the recommended boat ramp, located just outside the entrance to the basin (*see* figure 25). The Jordan Bay and Panther Run marinas in the town of Raymond also provide boating access within 5 miles of the recommended boat ramp.

The town of Raymond states that, although visitor use statistics are not kept, the town boat ramp (located on Jordan Bay) is utilized far beyond design capacity, on the order of 300 percent on good weather weekends and about 50-100 percent on rainy weekdays. During heavy use days, parking overflows onto the Route 302 corridor (e-mail correspondence from Don Willard, Town Manager, town of Raymond, to Maureen Winters, Senior Licensing Coordinator for Kleinschmidt, contractor for S.D. Warren; *in* S.D. Warren, 2003a). The MDIFW cites overflow parking on Route 302 during seasonal peak usage at the Raymond Beach Launch as additional evidence that facilities near the basin are at or above capacity (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Maureen Winters, Senior Licensing Coordinator for Kleinschmidt, contractor for S.D. Warren; *in* S.D. Warren 2003a).

Development of a boat ramp in the basin would provide access primarily for small watercraft that could navigate the shallow depths of the basin. S.D. Warren states that the best location for any boat ramp would be on the east shore, approximately 500 feet upstream from the dam (S.D. Warren, 2003a). With adequate safety devices (signage and boat barrier), this distance should be more than adequate to protect the public from any hazards associated with operation of the dam, canal and spillway.

The bathymetry in the vicinity of the proposed boat ramp was not mapped due to poor access conditions at the time of the survey, when the lake level was below the minimum elevation considered for good boat access (263.5 feet). Assuming, however, that the potential location of the boat ramp would have similar navigability as the marinas on Sebago Lake, with good boat access at levels above 263.5 feet, the identified access location should be accessible throughout the recreation season when the lake is held at higher elevations (typically higher than 264.0 feet). Based on boat usage figures from recent years, which indicate continued strong demand for boating on Sebago Lake, providing another public boat launch site (albeit for smaller watercraft) would be a valuable recreational enhancement for this part of Sebago Lake.

S.D. Warren states that the potential boat launch site would have limited use because the proposed boat launch would be located in a very shallow portion of the basin. However, the potential boat launch site was identified by S.D. Warren based on the criteria that it must be located on S.D. Warren owned lands, not pose a safety risk (*e.g.*, located close to the dam), and not located in known wetlands (S.D. Warren, 2003a). Following these criteria, we find that there is some flexibility as to where the potential boat launch could be located. Along the eastern side of the basin, there are two locations that fit the above criteria. One potential location is at the end of Basin Road, approximately 250 feet north of S.D. Warren's proposed boat launch site, while the other potential location is approximately 1,250 feet north of S.D. Warren's proposed boat launch site, and also accessible by Basin Road.[83] The two tracts of land are owned by S.D. Warren, are not located near wetlands, and are located adjacent to deeper water in the basin. Thus, boaters could potentially access the basin more frequently than via the site proposed S.D. Warren. Also, the potential sites are located between 1,000 to 2,000 feet from the dam, thus reducing the possibility of the watercraft drifting towards the dam during certain flow and wave/wind conditions.

S.D. Warren also objects to the development of a boat launch because its estimates the annual road maintenance for an access road to a boat launch would be as high as $25,000. Basin Road is a public road from Route 35 until the intersection of Hackett Road, but past the intersection of Hackett Road, Basin Road becomes a private road. However, the town of Windham has an easement that allows the town to maintain the privately owned portion of the road year-round (personal communication between Janet Hutzel, Federal Energy Regulatory Commission, Washington, DC, with Jay Dwelley, Public Works Deputy Director for the town of Windham, ME on October 25, 2005). The two boat launch sites that we proposed are accessible by Basin Road, S.D. Warren would not be responsible for any additional road maintenance costs since the town of Windham currently maintains the road and has no plans to discontinue maintenance service.

If our alternative boat launch sites are ultimately determined to be unsuitable, S.D. Warren could still use Basin Road to provide access to their proposed boat launch site. Since S.D. Warren owns the land from the end of Basin Road to their proposed boat launch site, they could extend access from Basin Road rather than develop a 2,000-foot-long access road, as described in S.D. Warren (2003a). The length of access road needed

[83] Basin Road is a no-outlet road that parallels the shoreline for over 1,000 feet.

would be approximately 1,000 feet shorter than was originally proposed by S.D. Warren and the maintenance cost for an access road would be reduced.

S.D. Warren also assumes that the proposed site would require on site security personnel for 16 hours a day, 7 days a week for 32 weeks to assure seasonal residents that the neighborhood is adequately policed. Given lake elevation requirements for boating, and the typical boating season (June, July, August), it is highly unlikely that the boatable recreation season would last 32 weeks (about 8 months) at this location. In addition, most boat recreation occurs during daylight hours, which, during early-spring and late-fall, would be less than 16 hours a day, and as stated in the 1997 EIS (FERC, 1997a) drops off significantly after Labor Day. A more likely scenario for security would be to have a gated access road, signage, and agreements with local police to share in whatever security requirements were to arise. Given the flexibility in location and design of the proposed launch, as described above, and the lack of supporting evidence that a strong police presence would be required, the Sebago Basin boat launch would be the lowest cost launch site in this area of the lake.

Our recommendation pertaining to a boat launch in Sebago Basin is found in section VII, *Comprehensive Development and Recommended Alternative*.

Conservation Easement on Lands adjacent to Eel Weir Bypassed Reach

S.D. Warren proposes to initiate discussions with the town of Windham on developing a conservation easement on the east side of the Eel Weir bypassed reach as part of Lands for Maine's Future, once a license is issued.[84] The town of Windham made no formal recommendation regarding conservation easements. The MDIFW, however, recommends that S.D. Warren grant it a perpetual easement for lands adjacent to the bypassed reach, so that the recreational availability of the lands and access to the bypassed reach would be preserved. The MDIFW cites recent sales of S.D. Warren-owned land as a concern regarding future access to the bypassed reach fishery and associated parking. The MDIFW considers the bypassed reach a significant recreational resource for southern Maine. S.D. Warren's proposal is contingent upon reaching a mutually acceptable agreement regarding conservation easements for S.D. Warren-owned lands in the vicinity of the Eel Weir bypassed reach.

[84] In commenting on the Initial Consultation Document of the Eel Weir Project, the town of Windham requested that that S.D. Warren consider a land grant and/or easement to the town to provide recreational opportunities to Windham residents.

Our Analysis

S.D. Warren owns approximately 292 acres of land adjacent to the Eel Weir bypassed reach. Of this total, 12 acres are located within the project boundary. The remaining 280 acres are currently outside, but adjacent to, the project boundary. According to S.D. Warren, the land situated within the project boundary is needed for project purposes, and, therefore, would be excluded from any conservation easement.

The MDIFW indicates that the Eel Weir bypassed reach is one of the most popular fisheries of its kind in the state. The Eel Weir bypassed reach is open to fishing year round. In 1998, the reach received 6,205 angler days. We agree that protecting public access to this reach would be critical to maintaining the success of the fishery. In addition, S.D. Warren's proposal to grant conservation easements on its land surrounding the Eel Weir bypassed reach would be consistent with the intent of several town of Windham plans.[85]

While S.D. Warren concurs with the concept of placing land it owns along the Eel Weir bypassed reach in a conservation easement, there are substantial questions that remain unanswered (S.D. Warren, 2003a). For example, S.D. Warren has not determined the type of conservation easement that would be established or what types of land uses or restrictions the easement holder might impose. In addition, while S.D. Warren would prefer to incorporate the conservation easement into the town of Windham's Lands for Maine's Future Program, there has been no resolution as to the MDIFW's request to be granted the conservation easement. Rather, S.D. Warren stated that it would address these questions after receiving a new license for the project. Therefore, we cannot say, with any certainty, just how S.D. Warren's proposal for conservation easements would be implemented and who would be granted the conservation easements. Nonetheless, the protection of lands adjacent to the Eel Weir bypassed reach for public access, including pedestrian and angling uses, would ensure recreation resources in this area are protected in perpetuity.

The land proposed for inclusion in a conservation easement would be located outside of the current project boundary. S.D. Warren proposes that this land remain outside of the project boundary under any new license issued for the project. S.D. Warren's proposed conservation easement, should it be implemented, would help ensure

[85] The town of Windham's 1985 Comprehensive Plan, 1988 Open Space and Recreational Needs Analysis, and the 1992 Comprehensive Plan all emphasize a desire to preserve property around Sebago Lake. The plans also identify significant deficiencies in public open space, recreation trails, lake and beach access, car-top and trailered boat access, and picnic areas for the general public.

long-term public access to the Eel Weir bypassed reach and fishery. However, the Commission would not have jurisdiction over this land, since it would be located outside the project boundary, and would not have the means to ensure public recreational access along the bypassed reach. This situation is particularly troublesome since we do not know who the easement holder would be or what type of land uses would be permitted.[86] Given this uncertainty, inclusion of this land within the project boundary may be warranted.

Our recommendation concerning conservation easements is found in section VII, *Comprehensive Development and Recommended Alternative*.

Shoreline Management Plan

Interior recommends that a SMP, or similar conservation measures, be developed in consultation with the USFWS, the MDIFW, the Maine DOC, and the MDMR to protect resources in the project area. S.D. Warren disagrees that a plan is necessary and argues that because S.D. Warren has limited property under ownership around Sebago Lake and within the project boundary, it would be inappropriate to prepare a plan for all of Sebago Lake, where most of the shoreline is owned and controlled by others.

Project boundaries are used to delineate the geographic extent of the Commission's regulatory jurisdiction for a licensed hydropower project, and to define the area the project licensee must own or control to serve the project's purposes. As such, S.D. Warren is responsible for the lands and waters within the project boundary that encompasses Sebago Lake within the elevation 267.0-foot contour line. Responsibilities associated with overseeing the management of resources within the project boundary include supervising and controlling all non-project uses and occupancies of project lands and waters for the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. Temporary docks, the installation of seasonal water supply lines, marinas, dredging, sea-walls, rip-rap or any other developments within the project boundary would be managed under the recommended SMP.

Our Analysis

Sebago Lake is one of the premier recreation destinations in Maine, and is surrounded by a growing number of year-round homes along a highly developed shoreline. Numerous shoreline property owners have capitalized on the waterfront

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[86] Notwithstanding the uncertainties, we expect the goal of any conservation easement would be to leave the land in its current undeveloped state and that existing public access would be maintained.

location and have developed permanent and temporary docks, piers, or marinas to enhance their lake side experience. The operation of temporary docks or the installation of seasonal water supply lines, and the uses stemming from them could disturb the shoreline resources that contribute to making Sebago Lake a recreational destination.

Development of a SMP, as recommended by Interior, would help ensure that docks, water supply lines, marinas, piers, or other structures within the project boundary do not adversely affect environmental resources, become obstacles to navigation, or a threat to the safe operation of the dam and power plant. The SMP should include mapping efforts that identify sensitive shoreline resources (e.g., wetlands, cultural sites, key aesthetic resources, signature beach resources, steep slopes, heads of coves, areas of important woody debris, etc.). S.D. Warren would then be able to manage and protect shoreline resources within the project boundary through a permit program to ensure that private temporary docks, piers, water supply lines, and other facilities are installed properly and located in appropriate areas. Overall, the SMP, as described herein, would provide benefits to the recreational resources of the project by protecting the environmental resources that comprise the overall recreation experience.

Our recommendation concerning a shoreline management plan is found in section VII, *Comprehensive Development and Recommended Alternative*.

c. Unavoidable Adverse Effects:

None.

6. Archeological and Historic Resources

a. Affected Environment

The proposed undertaking's area of potential effects (APE) is co-terminus with the project boundary (i.e., it consists of the lands around Sebago Lake and its tributaries to an elevation of 267.0 feet, the 6,700-foot-long bypassed reach, and the properties occupied by the project works. Historic Properties within this APE include both prehistoric archaeological sites and the project itself. The project encompasses lands in the towns of Raymond, Casco, Naples, Sebago, Frye Island, Windham, and Standish. Archeological survey work and other data collection efforts indicate that the Sebago Lake region was a hub of activity through prehistory, from about 11,000 years ago to the time when Maine Indian tribes came into contact with Europeans, between 1500 and 1676 A.D.

The applicant retained Deborah B. Wilson, Archaeological Consultant, Timothy S. Dinsmore, Historical Archaeologist, and Janet E. Roberts, Historic Preservation Consultant, to study cultural resources in the APE. These consultants produced the following three reports.

- *Phase 0 Archaeological Survey Report, Eel Weir Project (FERC No. 2984)*. January 28, 2002 (Wilson, 2002).

- *Phase 0 Historic Archaeological Survey Report, Eel Weir Project (FERC No. 2984)*. January 14, 2002 (Dinsmore, 2002).

- *Eel Weir Project (FERC No. 2984) National Register Nomination Form*. May 17, 2001 (Roberts, 2001).

We note that these reports reference "phase 0" surveys. There are four phases of archaeological study, the respective goals of which are defined by the Maine Historic Preservation Commission (Maine Preservation Commission). Phase 0 studies consist of background analyses aimed at developing an understanding of cultural resources in a project area using information on known sites from Maine Preservation Commission files and local artifact collectors; project area geology, soils, and human resources; and historical impacts within the project area. A limited amount of fieldwork is conducted to prove the results of the background research. On the basis of this work, the project area shoreline is rated for archaeological potential and a scope of work is proposed for subsequent investigations.

<u>Archaeological Survey</u>

Known Archaeological Sites

Wilson's efforts included: (a) background research aimed at providing information on the natural and cultural contexts of prehistoric settlement in the project area; (b) a review of known sites potentially affected by project operations; and (c) an assessment of the project area shoreline for prehistoric archaeological potential. This research revealed that 67 known sites are located in the project area. Most of these sites were identified over a period of more than 100 years from artifacts recovered along the shoreline. Of the 67 sites, 47 are, or may be, eligible for listing on the National Register. A review of the 67 known sites, according to Wilson (2002), disclosed the following.

- Phase One archaeological study is warranted at 44 sites where extant deposits may remain. Phase One study has as its goal to "locate all sites in the impact zone, or to adopt a sampling strategy that will present a true picture of site distribution."

- Phase Two archaeological study is warranted at two sites. Phase Two study has the double goal of defining site boundary and of determining a site's significance or National Register eligibility. The boundary is discovered by testing the perimeter of a site until cultural material can no longer be found. Significance is determined in accordance with significance criteria determined for each period of prehistory and set forth in the State Plan for Prehistoric Archaeology. When a site dating to a particular period is located, the site is judged by the integrity and nature of the cultural deposits and in the context of defined research significance themes.

- Phase Three archaeological study is warranted at one site that is deemed to be National Register eligible. Phase Three has as its goal mitigation for the loss of an archaeological site as an alternative to preservation in place. It occurs at sites that both are eligible for inclusion in the National Register and are demonstrably affected by project operation. In Maine, particularly at hydropower projects, this usually involves data recovery through systematic excavation and production of a report in substantially publishable form.

- 15 sites have been totally eroded, completely affected by construction activities, or found to be insignificant, while another 5 sites are unaffected by the project and are in no need of being evaluated for National Register eligibility.

Archaeologically-Sensitive Shoreline Segments

Most known archaeological sites in Maine are located near the shore of a body of water, either the marine shore of the margin of a lake, river, or stream. Around Sebago Lake, known sites are frequently located close to a river or stream inlet or to the lake outlet. Although many sites are adjacent to the current lake shore, many were situated on a tributary slightly removed from the lake shore at the pre-dam lake level. This pattern is consistent with settlement associated with fish capture using weirs or nets, and with site selection off the main lake shore in places where inhabitants were protected from the wind or concealed from travelers on the lake.

Based on the known width of most archaeological sites in Maine, land within fifty meters of the pre-dam shoreline, both on the lake and along tributary streams, should be rated higher in archaeological potential than land more than fifty meters away from the pre-dam shoreline. In the assessment of the archaeological potential of the project area shoreline, Wilson (2002) divided 104 miles (173.16 kilometers) of shoreline into 401 segments on the basis of attributes relevant to archaeological potential (i.e., proximity to water; slope of the ground surface; soils; association with an outlet; and such contraindicative attributes as erosion and inundation, and historic construction). The 401 shoreline segments included the known sites, as well as all the remaining shoreline, and were characterized as follows:

- 44 of the 401 shoreline segments (including known archaeological sites), totaling 5.7 miles (9.14 kilometers), or about 5 percent of the shoreline, were rated high in archaeological potential;
- 129 segments (including known archaeological sites), representing 18.4 miles (29.67 kilometers), or about 17 percent of the shoreline, were rated moderate in archaeological potential;

- 113 segments (including known archaeological sites), encompassing 36.4 miles (58.58 kilometers), or about 33 percent of the shoreline, were rated low in archaeological potential; and
- 115 segments (including known archaeological sites), totaling 47.1 miles (75.77 kilometers, or about 45 percent of the shoreline, are considered to have no archaeological potential.

Maine's Archaeological Context

Archaeological sites located in the APE are interpreted within a context provided by the results of previous archaeological work conducted in Maine during the past century – careful study of artifact styles, settlement and subsistence patterns. Based on this work, the prehistoric sequence is divided into three major periods; Paleoindian, Archaic, and Ceramic periods. Each of these is further divided into early, middle, and late stages. The entire Paleoindian period is dated from about 9000 to about 6500 B.C., the Archaic from about 8000 to about 1200 B.C., and the Ceramic from about 1000 B.C. to about 1600 A.D.

According to Wilson (2002), Paleoindian and late Paleoindian materials are "surprisingly abundant" around the Sebago Lake, compared to most places in Maine, where they are exceedingly rare, probably because of the massive deltaic sands of the project area. Also, Archaic period artifacts are "exceptionally numerous," and Middle Archaic sites are "particularly abundance and may represent the most intense period of prehistoric settlement on Sebago Lake." Late Archaic artifacts are "common" in the APE, while Ceramic sites are "numerous."

Historic Archaeological Survey

There are no historic archaeological sites in the project's APE. Combining a detailed literature search with limited field work, Dinsmore (2002) found that historic settlement in the region largely occurred away from the project area. Dinsmore (2002) recommends no further work of this kind for the project. Although the Cumberland and Oxford Canal located west and parallel to the Presumpscot River in the Town of Standish is included in the National Register, the 1 mile segment located within the APE was completely compromised by the 1903 construction of the project. In constructing the project canal, the original C & O Canal was widened and deepened destroying all elements of the original canal including the tow path.

Eel Weir Hydropower Historic District

The project, including the dam, canal, forebay, powerhouse, and tailrace, is eligible for inclusion on the National Register of Historic Places as an historic district, as the Eel Weir Hydropower Historic District.[87] It qualifies for National Register eligibility because it, in the context of industry and engineering, is associated with events that have made a significant contribution to the broad patterns of our history. Moreover, the project works embodies the distinctive characteristics of a type, period, and method of construction, and represents a significant and distinguishable entity whose components may lack individual distinction.

Significant as a representative example of early 20th century hydroelectric engineering, the Eel Weir Project possesses certain notable features typical of early power stations. Among these are the original horizontal turbines and generators and the blue marble switching panel. The station retains a fairly high degree of integrity in terms of its historic exterior appearance, a substantial amount of original equipment, and has had continuous use as a power generating facility.

According to Roberts (2001), the dams at the headworks and the canal are significant because they represent a physical record of the progression of uses of Presumpscot river water power: hydro-mechanical, transportation (Cumberland & Oxford Canal), and hydroelectric. They retain a moderate amount of integrity. Portions have been modernized. However, the canal, original gates, and dam sections that remain testify to the success of a substantial engineering project of a century ago. Finally, according to Roberts (2001), the project is also significant because it was built before power project design and construction was standardized. The project also illustrates attempts to discover the most efficient way to re-use existing forms and configurations for a new technology.

b. Environmental Effects

The archaeological sites and shoreline segments reported above are, to varying degrees, endangered by on-going erosion, construction, and vandalism that could be attributable to the existing project and to its current mode of operation. The proposed relicensing, however, which is the undertaking in this proceeding, poses no effect to these archaeological sites. Nevertheless, while Section 106 does not require consideration of

[87] According to 36 C.F.R. 60.3(d), a district is a geographically definable area , urban or rural, possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development.

on-going effects attributable to baseline conditions, we are committed to implementing reasonable measures for enhancing the physical relationship between the archaeological sites in the project's APE and the existing project (including its existing mode of operation). The PA requires that such measures be included in the HPMP developed for the project.

Ordinarily, the continued operation of a National Register eligible hydropower project is considered to be a beneficial effect. Furthermore, the S.D. Warren, in its application for a new license, proposes no alterations to the project that would substantially (and negatively) affect its National Register qualifying characteristics.

Nonetheless, in the Commission's experience, applicant's may (and sometimes do) alter the National Register qualifying characteristics of an eligible project without incurring the necessity of amending their licenses, and for otherwise commendable reasons. In such cases, where there is no PA or other provision in the license to afford reasonable protection to the National Register eligible hydropower project, there is no opportunity for the Commission to assess the potential effect on Historic Properties, consider prudent and reasonable alternatives to an adverse effect, consult with the SHPO, or afford the Advisory Council a reasonable opportunity to comment. With the executed PA, such alternatives can be identified, considered, and adopted that would avoid, mitigate, or lessen adverse effects.

c. Unavoidable adverse effects:

Adverse effects may arise in the course of any licensing term that proves unavoidable. Such effects would be confined to the historic district, the only Historic Property to which the undertaking poses an adverse effect. As noted above, however, such unavoidable adverse effects can be taken into account as they arise using the procedures set out in the executed PA.

7. Socioeconomic Resources

a. Affected Environment:

The study area for the socioeconomic analysis for the Eel Weir Project includes the towns of Baldwin, Casco, Gorham, Naples, Raymond, Sebago, Standish, and Windham, all within Cumberland County, Maine. Sebago Lake is a popular summer recreation destination, and many of the businesses surrounding the lake cater to this market. The project is about 20 miles north of Portland, Maine and easily accessible via U.S. Route 302. As a result of this proximity to Portland, the area around Sebago Lake, particularly along its southern and eastern shores, has grown rapidly in recent years, and year-round residents have moved in, many of them retaining their jobs in Portland. Five of the eight towns (Casco, Gorham, Raymond, Standish, and Windham) are within the Portland MSA, the largest MSA in the state.

Population, Employment, and Income Trends

Population

The 2000 U.S. Census reports that Cumberland County had the largest population in the state and the greatest population growth rate from 1990-2000 (9.2 percent). Comparatively, the statewide population grew by 3.8 percent from 1990-2000 (U.S. Census, 2000a, 2000b, 2000c). The MSPO estimates that the population of Cumberland County has steadily increased since 1995 (table 38). Since the inception of the 1997 LLMP for Sebago Lake, the county's population had increased 13 percent, or 31,639 people, by 2002. The population in Cumberland County has increased by 0.8 percent over the 2001 population, from fewer than 267,000 to just over 283,000 people.

Table 38. U.S. Census Bureau population estimates for Cumberland County, Maine. (Source: U.S. Census, 2000a & 2000b)

Year	Population[a]	Annual Percent Change
1995	247,307	N/A
1996	249,561	0.9%
1997	251,368	0.7%
1998	253,582	0.9%
1999	259,325	2.3%
2000[b]	265,612	2.4%
2001	266,988	0.5%
2002[c]	283,007	0.8%

[a] Census population estimates (Source: U.S. Census, 2000a).
[b] Census 2000 population total (Source: U.S. Census, 2000b).
[c] Census 2002 population estimate based on MSPO projected 0.8% increase.

In 2000, the populations of the towns within the study area ranged from 14,904 persons in the Town of Windham to only 1,433 persons in the Town of Sebago (table 39). Overall, population estimates for the 8 communities bordering Sebago Lake increased by 12 percent, from 1995 to 2000 (table 39), compared to the growth rates of Cumberland County (13 percent) and the state (2.6 percent). Over the same time period, five of the eight towns grew by 10 percent or more, with Raymond experiencing 23 percent growth.

Table 39. U.S. Census Bureau population estimates for towns surrounding Sebago Lake.[a] (Source: U.S. Census, 2000c)

Town	1995	1996	1997	1998	1999	2000	Percent Change 1995-2000	Projected % Change 2000-2005[a]
Baldwin	1,280	1,298	1,312	1,323	1,330	1,290	1	1
Casco	3,148	3,181	3,202	3,221	3,231	3,469	10	6
Gorham	12,541	12,820	13,000	13,296	13,741	14,141	13	8
Naples	3,076	3,108	3,129	3,149	3,187	3,274	6	5
Raymond	3,497	3,534	3,567	3,609	3,751	4,299	23	11
Sebago	1,244	1,248	1,252	1,257	1,252	1,433	15	10
Standish	8,067	8,227	8,360	8,519	8,611	9,285	15	9
Windham	13,660	13,864	14,062	14,249	14,767	14,904	9	6%
Totals	46,513	47,280	47,884	48,623	49,870	52,095	12%	7%

[a] Source: Maine State Planning Office (2003).

Employment

The Maine Department of Labor (Maine Labor) reports that the average unemployment rate in Cumberland County, from 1997 to 2002, was 2.4 percent, compared to a statewide average of 4.5 percent. This is indicative of the strong economic development, relative to the rest of Maine, which has been occurring in the Portland MSA and surrounding communities within Cumberland County.

The 2002 average annual labor force in Cumberland County was 147,432 persons (Maine Labor, 2004a). Maine Labor's 2002 labor estimates for the eight towns show labor forces ranging from 690 persons in the Town of Sebago to 8,142 persons in the Town of Windham. The total average annual labor force in the eight towns represented 20 percent of the total labor force in Cumberland County.

In 2000, Cumberland County's employment was concentrated in four sectors: services; retail; government; and finance, insurance, and real estate (FIRE), which accounted for 70 percent of total employment (Maine Labor, 2004a). Concentrations in these sectors are typical for a county that is both dependent on the tourism sector (i.e., high employment in the retail and services sector) and located in an MSA (i.e., high employment in government, services, and FIRE occupations). In comparison to the state-wide figures, Cumberland County had lower proportions of its employment in the manufacturing, construction, and transportation sectors (30 percent for Maine to 26 percent for Cumberland County) (Maine Labor, 2004b).

Income

Census data for Maine indicates that Cumberland County has the highest per capita income in the state at $44,048. This median income level is above Maine's average of $37,240.

Recreation Visitor Expenditures (statewide) and Local Fiscal Conditions (sales tax and gas)

S.D Warren reported sales tax revenue and gasoline sales information from marinas and commercial recreation facilities on Sebago Lake (table 40). Between 1998 and 2002, revenues generated from the sales tax at these facilities increased from approximately $612,000 to just over $892,000. Similarly, gasoline sales exhibited an upward trend from 150,000 gallons sold in 1997 to over 253,000 gallons in 2002. Since the implementation of the LLMP, revenues from the sales tax at local marinas has increased 41 percent, and the total volume of gasoline sold at local marinas has increased 74 percent.

Table 40. Recreation use indicator data from marinas and commercial recreation facilities. (Source: S.D. Warren, 2002a; as modified by staff)

Year	Sales Tax[a] ($)	% Change from previous year	Annual Gas Sales (gal.)	% Change from previous year
1997	N/A	N/A	150,865	N/A
1998	612,341	N/A	151,140	0%
1999	742,333	21%	135,510	-10%
2000	748,484	1%	241,619	78%
2001	858,987	15%	225,180	-7%
2002	892,256	4%	253,359	13%

[a] One new marina was added in the 2000 season

b. <u>Environmental Effects:</u>

The only issue pertaining to socioeconomic resources identified during the scoping process was the effect of the LLMP (or changes to it) on the socioeconomic resources in the vicinity of Sebago Lake. These resources would be affected by any changes in the level of recreational activity and recreational spending by visitors to Sebago Lake. Higher levels of recreational activity would result in a corresponding increase in local recreational spending, which in turn, would produce a permanent increase in total local employment and income through a positive increase in the local economy.

Our Analysis

Our review of Sebago Lake recreational resources indicates that there is no direct relationship between recreational use of Sebago Lake and lake levels. Since the implementation of the LLMP, recreation levels have fluctuated, and this fluctuation appears to be independent of lake levels (*see* section V.C.5, *Recreational Resources and Land Use*). The fluctuation in recreation levels is also reflected in the sales tax revenues and gasoline sales shown in table 40, which exhibit an overall increase since 1997, with some year-to-year variation.

Most of the LLMP alternatives recommended by the stakeholders require relatively similar lake levels (generally within about 6 inches) during the open-water season, when most boating and economic activity occurs on the lake. Thus, depending on the alternative ultimately selected, there could be a difference in elevation of up to about 6 inches from existing lake levels. However, lake levels may vary somewhat from year to year, depending on weather patterns. Such a variance would likely go unnoticed to most users of the lake. The effects of wind and wave action may be more noticeable than any variance from existing lake levels. Since the above data indicate that socioeconomic resources are independent of the current LLMP, any proposed minor changes in lake levels would also have little, if any, effect on recreational use and in turn socioeconomic resources.

The recommendations that call for higher lake levels in the early spring and in the summer/fall (State of Maine, Mr. Frechette, and Sebago Lake Coalition) may enhance boating conditions in Sebago Lake slightly. Alternatively, recommendations that call for lower spring lake levels may delay preferred boating levels until later in the season. However, our recreation analysis did not find any relationship between lake levels and the amount of boating use on the lake.

The demographic characteristics of Cumberland County reflect the presence of the Portland MSA in a state that is largely rural. Based on the proximity to Portland and the associated population growth, higher than average income levels and employment characteristics, the Sebago Lake socioeconomic landscape is expanding for reasons other than management of the lake.

c. Unavoidable Adverse Effects:

None

D. No-Action Alternative

Erosion – The current LLMP would remain in place. Shoreline and beach erosion would continue to occur at near present levels, as the shores of Sebago Lake respond to the existing water levels of Sebago Lake. Periodic storms may increase shoreline erosion, and additional shoreline development and increased boat traffic on the lake may increase erosion somewhat. The on-going cycle of material loss and replacement should continue to maintain beach profile equilibrium.

Water Quantity and Quality – The Water District is expected to continue using Sebago Lake as a source of drinking water for the greater Portland area. Over time, the amount of water withdrawn may increase. Water quality conditions in Sebago Lake should remain similar to current conditions, essentially remaining an oligrotrophic lake for the foreseeable future. The Eel Weir bypassed reach should continue to meet state water quality standards for temperature and DO. The coldwater fishery, however, would continue to be limited by elevated temperatures during the summer.

Fisheries – The project would continue to operate under the current LLMP, which has generally benefited fishery resources in both Sebago Lake and in the Presumpscot River. Water level fluctuations and any associated effects would remain essentially unchanged from existing conditions. This alternative would preclude potential benefits that may be realized from any of the alternative LLMPs. Entrainment of young-of-the-year and other smaller-sized resident fish from Sebago Lake, which is an expected occurrence, would continue to occur at present levels. The popular Eel Weir bypass fishery would continue to experience high levels of angler use, with increased use likely in the future as demand increases. Additional enhancement to this fishery would not occur. American eel and land-locked salmon passage and movement through the project area would continue to be impeded.

Terrestrial – Existing patterns of lake level fluctuations would occur. Wetlands would continue to respond to the seasonal changes in water levels in a manner similar to what occurs currently. Natural succession is expected to occur, and expansion of existing wetlands may occur, as sediments accrete in shallow-water areas after major storms.

Recreation – Lake levels would continue to be regulated by the current LLMP. Recreational usage would continue to fluctuate from year to year, as has been demonstrated in recent years, likely without influence from the lake levels. No additional recreational enhancement measures would be implemented. The project would have the same amount of recreational opportunity and effect on the recreational environment as it currently does, though recreational usage would likely continue to increase.

Cultural – With no changes to the existing environment or other enhancements (i.e., PA) there would be the continued threat of damage, due to erosion of important archaeological and cultural sites around Sebago Lake. In addition, the no-action alternative could potentially result in new disturbance to previously recorded sites and to sites not previously identified, as shoreline erosion and development activities continue.

Socioeconomics – S.D. Warren would continue to operate under the existing LLMP. The socioeconomic profile of the area would be identical to what it is currently. The population of the lake area is expected to continue to increase, as people move into the area. Similarly, development would likely continue to grow. This development, with increasing recreation and tourism, is expected to bring more revenue to the area.

VI. DEVELOPMENTAL ANALYSIS

In this section, we estimate the economic benefits of the Eel Weir hydroelectric project and the cost of various environmental protection and enhancement measures and the effects of these measures on project economics.

A. Power and Economic Benefits of the Project

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power, with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest, with respect to a proposed license.

For our economic analysis of alternatives for the Eel Weir Project, we used the assumptions, values, and sources shown in table 41.

Table 41. Staff assumptions for the economic analysis of the Eel Weir Project. (Source: Staff)

Assumption	Value
Energy rate (2005)[a]	43.15 mills/kilowatt-hours (kWh)
Capacity rate (2005)[b]	$10.80/kilowatt-year
Period of analysis	30 years
Cost of capital[c]	10 percent
Discount rate[d]	10 percent
Federal tax rate[e]	34 percent
Local tax rate[f]	3.0 percent
Insurance rate	0.25 percent
Term of financing	20 years
Escalation rate after 2005	0 percent
O&M costs (2005$)[e]	$106,630
Net investment (2005$)[f]	$131,910

[a] The energy rate for 2005 was derived from fuel cost process developed by the Energy Information Administration in their 2005 Annual Energy Outlook.

[b] S.D. Warren stated that the capacity value as of February 2003 would be $0.90/kw-month ($10.80/kW-yr) with an equivalent dependable capacity of 0.38 MW in their December 4, 2002 AIR response #17.

[c] S.D. Warren stated that they use a value of 10 percent for their interest for borrowed funds and funds that they would borrow to fulfill any future license commitments in their December 4, 2002 AIR response.

[d] Staff used a discount rate equal to the cost of capital (see footnote c above).

[e] S.D. Warren provided a base annual O&M cost of $72,210 (average for six hydro stations), annual administrative and overhead costs of $23,691, and annual FERC fees of $4,288. All of these values were provide for Fiscal Year 2002 in their December 4, 2002 AIR response. Staff escalated the total of these costs to 2005.

[f] Based on information provided by S.D. Warren in their December 4, 2002 AIR response (Item 17), Staff estimated a depreciated net investment value of $131,910 as of 12/31/05.

B. Power and Economic Benefits of the No-Action Alternative

Under the no-action alternative, the Eel Weir Project generates an average of 12,300 MWh of electricity annually, has an annual power value of $534,850 (43.48 mills/kWh), and total annual costs of $126,380 (10.27 mills/kWh), resulting in a net annual benefit of $408,470 (33.21 mills/kWh). The no-action alternative assumes that the project would continue to operate under the terms of the existing license, in effect at the time of relicensing, with no additional measures or changes to project operations.

C. Cost of Environmental Measures

Table 42 shows the effect on costs and power values of individual measures proposed by S.D. Warren and recommended by staff and others, including the additional or alternative measures that staff has adopted.

Table 42. Summary of capital and one-time costs, annual costs, annual energy costs, and total annualized costs for environmental measures proposed by the applicant and recommended by staff and others for the Eel Weir Project. (Source: Staff).

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
		Water Resources			
1. Establish a 3-inch tolerance range for the August 1st target date	S. D. Warren	$0	$0 (no change from existing)	$0	Yes
2. Modify the existing LLMP in accordance with recommendations from the State of Maine	State of Maine	$0	-$8,320[a] (gain of 193 MWh)	-$8,320	No
3. Limit lake level fluctuations to no more than 2 feet from 4/1 to 12/15 and 3 feet from 12/15 to 3/31	Interior	$0	$20,930[a] (loss of 485 MWh)	$20,930	No
4. Implement State of Maine's LLMP with a fall/ early winter drawdown of 5 to 8 feet	MDIFW	$0	$169,620[a] (loss of 3,931 MWh)	$169,620	No

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
5. Lower the spring target level to 265.65 feet on 5/1 and change the fall target levels as follows: (a) 261 feet by 11/1 (1 in 2 years); (b) 260 feet by 11/1(1 in 4 years); and (c) 259 feet by 11/1 (1 in 10 years)	FOSL	$0	$49,100[a] (loss of 1,138 MWh)	$49,100	No
6. Maintain target lake levels at, or above, 266.0 feet from 5/1 to 7/7, and maintain an absolute minimum level of 263.5 feet the rest of the year	C. M. Frechette	$0	-$8,200[a] (gain of 190 MWh)	-$8,200	No
7. (a) lower the spring target level by 1 foot to 265.65 feet, with an operating band of +1.0 foot and -0.5 foot; (b) lower the lake to 261.0 feet (1 in 2 years), 260.0 feet (1 in 4 years), and 259.0 feet (1 in 10 years).	S. P. Kasprzak	$0	$25,720[a] (loss of 596 MWh)	$25,720	No

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
8. Maintain lake levels as follows: (a) 266.0 to 266.5 feet on 6/1; (b) 266.0 to 265.8 feet on 7/1; (c) 265.8 to 265.4 feet on 8/1; (d) 265.4 to 264.9 feet on 9/1; and (e) 264.5 to 264.0 feet on 10/1	Sebago Lake Coalition	$0	$50,530[a] (loss of 1,171 MWh)	$50,530	No
9. Lower the spring target` elevation to 266.15 feet, with a 6-inch (±) operating band, & spring target date of no sooner than May 15.	Staff	$0	-$1,940[a] (gain of 45 MWh)	-$1,940	Yes
10. Continue to operate the project in a store-and-release mode, in accordance with the existing LLMP, as amended and proposed	S. D. Warren	$0	$0 (no change)	$0	Yes
11. Continue operating the new lake level gage	S. D. Warren	$0	$0 (no change)	$0	Yes
12. Continue to coordinate with upstream pond	S. D. Warren	$0	$0 (no change)	$0	Yes

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
owners to manage flood flows					
13. Discharge up to 1,000 cfs through the project's power canal during high flow events	S. D. Warren	$0	$0	$0	Yes
14. Continue to release current minimum flows to the bypassed reach	S. D. Warren, State of Maine, C.M. Frechette, S.P. Kasprzak, Sebago Lake Coalition	$0	$0 (no change)	$0	No
15. Release 200 cfs to the bypassed reach from 4/1 to 10/31 and 115 cfs from 11/1 to 3/31,[88] which would require changes to three gates	Interior	$100,000	$114,950[a] (loss of 2,664 MWh)	$129,920	No
16. Release 200 cfs to the bypassed reach from 5/1 to 10/31 and 115 cfs from	MDIFW	$102,320	$107,490[a] (loss of 2,491 MWh)	$122,810	No

[88] The USFWS recommends an alternative flow regime consisting of (a) 115 cfs from 11/1 to 3/31, (b) 200 cfs from 4/1 to 6/30, (c) 115 cfs from 7/1 to 8/31, and (d) 200 cfs from 9/1 to 10(31). This recommendation would result in an annual loss of 2,702 MWh, costing $116,590. Three gates would require modification at an estimated cost of $100,000. The total annual cost the USFWS's recommendation would be $131,560.

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
11/1 to 4/30, requiring changes to three gates and instream channel modifications					
17. If coldwater refugia can not be protected, release 100 cfs to the bypass reach from 5/1 to 10/31, and 115 cfs from 11/1 to 4/31, requiring changes to two gates	MDIFW	$50,000	$37,500[a] (loss of 869 MWh)	$44,980	No
18. Release at least 100 cfs to the bypassed reach, requiring changes to at least one gate	FOSL	$30,000	$43,280[a] (loss of 1,003 MWh)	$47,770	No
19. Release flows to the bypassed reach of 75 cfs from 11/1 to 3/31 and 125 cfs from 4/1 to 10/31, requiring changes to two gates	Staff	$50,000	$54,240[a] (loss of 1,257 MWh)	$61,730	Yes
20. Develop and implement a plan to monitor instream flows	Interior	$10,640[a]	$0	$1,500	No

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
21. Develop and implement a project operations and flow monitoring plan, including temp. monitoring in bypassed reach	Staff	$14,000[a]	$1,500	$3,600	Yes
Aquatic Resources					
22. Consult with resource agencies regarding the need for upstream and downstream American eel passage	S. D. Warren	$0	$0	$0	No
23. Install upstream passage facilities for American eel	MDMR, MDIFW	$106,430[b]	$1,060[b]	$17,000	Yes
24. Install downstream passage facilities for American eel	MDMR	$159,650[b]	$2,130[b]	$26,030	Yes
25. Consult with the resource agencies on the design, location, and effectiveness testing of the eel passage facilities	MDMR	$0	$0	$0	Yes
26. Install upstream and downstream fish	FOSL	$1,000,000[a] (500,000 for u/s and	$65,000[a] ($35,000 + about	$214,730	No

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
passage for land-locked Atlantic salmon		$500,000 for d/s)	$30,000/ year in lost energy)		
27. Section 18 Reservation Authority	Staff	$0	$0	$0	Yes
28. Mitigate for smelt migration barriers on Sebago Lake	MDIFW	$10,000[a]	$0	$1,500	No
29. Conduct a warmwater fishery assessment for Sebago Lake	MDIFW	$50,000[a] (1 year study in yr 1)	$0	$7,490	No
		Terrestrial Resources			
30. Replace existing wetlands monitoring plan with a similar monitoring program that will be undertaken every 5 years	S. D. Warren	$0	$1,790[b] ($10,640 every 5 years)	$1,790	Yes
31. Establish a conservation easement on lands around the bypassed reach	S. D. Warren	$0	$0	$0	Yes
32. Plan any changes to current land use(s) to be consistent with	S. D. Warren	$0	$0	$0	Yes

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
the aesthetic character of the project area					
33. Develop of a SMP	Interior	$10,500[a]	$0	$1,570	No
34. Develop a SMP, to include shoreline mapping and permitting program	Staff	$65,000[a]	$0	$9,730	Yes
Recreational Resources					
35. Conduct FERC Form 80 recreation monitoring	S. D. Warren	$0	$720[b] ($5,320 every 6 years)	$720	Yes
36. Monitor recreation use at the project	Interior	$4,500[a]	$0	$670	Yes[c]
37. Develop a plan for a shallow-water boat launch	MDIFW	$40,000[a]	$2,000[a]	$7,990	Yes
38. Grant MDIFW a perpetual easement for angler foot access on lands adjacent to and underlying the Eel Weir bypassed reach	MDIFW	$0	$0	$0	No
39. Investigate	MDIFW	$0	$0	$0	No

Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)	Adopted by staff?
the feasibility of increasing the power canal discharge					
		Cultural Resources			
40. Protect and mitigate project-related effects to archaeological sites and protect project structures that have been determined to meet National Register of Historic Places criteria	S. D. Warren	$220,000[a]	$0	$32,940	No
41. Execute a PA to implement an HPMP	Staff	$220,000[a]	$0	$32,940	Yes

[a] Cost estimate provided by staff.
[b] Cost estimate provided by S.D. Warren in its AIR response dated December 4, 2002 (AIR 17).
[c] Based on our review, it appears that Interior's recommendation for recreation monitoring would be consistent with the requirements of FERC Form 80.

D. Power and Economic Benefits of the Applicant's Proposed Project

As proposed by S. D. Warren, the Eel Weir Project would generate an average of 12,300 MWh of electricity annually, have an annual power value of $534,850 (43.48 mills/kWh), and total annual costs of $161,830 (13.16 mills/kWh), resulting in a net annual benefit of $373,020 (30.33 mills/kWh).

E. Power and Economic Benefits of the Proposed Action with Additional Staff-Recommended Measures

Resource agencies and NGOs recommended the implementation of a variety of measures at the project. We reviewed each recommendation and determined the measures that were most appropriate for implementation. In section VII, *Comprehensive Development and Recommended Alternatives*, we discuss our reasons for recommending the staff alternative and why we believe the environmental benefits are worth these costs. As recommended by staff, the Eel Weir Project would generate an average of 11,868 MWh of electricity annually, have an annual power value of $482,550 (43.52 mills/kWh), and total annual costs of $233,660 (21.07 mills/kWh), resulting in a net annual benefit of $248,890 (22.45 mills/kWh).

F. Economic Comparison of the Alternatives

Table 43 compares the power value, annual costs, and net benefits for S.D. Warren's proposed measures, S.D. Warren's proposed measures with additional or alternative staff-recommended measures for the project, and the no-action alternative.

Table 43. Summary of the annual net benefits for the applicant's proposed action, applicant's proposed action with additional or alternative staff-adopted measures, compared to the no-action (baseline) alternative, for the Eel Weir Project. (Source: Staff)

	Applicant's proposed action	Applicant's proposed action with additional or alternative staff-adopted measures	No action
Installed capacity (MW)[a]	1.8	1.8	1.8
Annual generation (MWh)[b]	12,300	11,088	12,300
Annual power value ($ and mills/kWh)	$534,850 43.48	$482,550 43.52	$534,850 43.48
Annual cost ($ and mills/kWh)	$161,830 13.16	$233,660 21.07	$126,380 10.27
Annual net benefit ($ and mills/kWh)	$373,020 30.33	$248,890 22.45	$408,470 33.21

[a] The existing installed capacity of the project is 1.8 MW. S. D. Warren reports the dependable capacity of the project is 0.38 MW. The dependable capacity is based on the current lake level management plan, which defines the emergency low flow (the lowest outflow from Sebago Lake when the lake level is more than 1 foot below the

target levels and range) from Sebago Lake as being 15,000 cubic feet per minute. (AIR response dated 12/4/02).

[b] The estimated baseline average annual generation for the project of 12,300 MWh as stated in the license application.

G. Pollution Abatement

The Eel Weir Project would produce about 11,088 MWh of electricity annually. The amount of hydropower generation, when contrasted with the generation of an equal amount of energy by a fossil-fueled facility, avoids the emission of atmospheric pollutants. Assuming that the 11,088 MWh of hydropower generation would be replaced by an equal amount of natural gas-fired generation, generating electrical power equivalent to what would be produced at the Eel Weir Project would require combustion of about 114.4 mcf of natural gas annually. Removal of pollutants (NOx and SOx) from the emissions produced by burning fossil fuels to those levels presently achievable by state-of-the-art technology would cost about $6,350 ($2005) annually.

VII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require that the Commission give equal consideration to all uses of the waterway on which the project is located. When we review a proposed project, we consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Accordingly, any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

A. Recommended Alternative

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives (including changes to the current LLMP), we selected the proposed project, with staff-recommended modifications, as the preferred option. We recommend this option because: (1) issuance of a new hydropower license by the Commission would allow S.D. Warren to operate the project as a economically beneficial and dependable source of electric energy; (2) the 1.8-MW project would eliminate the need for an equivalent amount of fossil-fuel derived energy and capacity, which helps conserve these non-renewable resources and limits atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would improve water quality, protect and enhance fish and terrestrial resources, protect public use of recreational facilities and resources, and protect and maintain historic and archaeological resources within the area affected by project operation.

The following summarizes the environmental measures we recommend be included in any license the Commission issues for the Eel Weir Project:

Measures proposed by S.D. Warren

- continue to operate the project in a store-and-release mode, in accordance with the existing Commission-approved LLMP and a 3-inch tolerance range for the August 1 target date (265.17 feet ± 3 inches);
- continue to operate the existing lake level gage;
- continue to cooperate and coordinate with upstream pond owners to manage flood flows;
- discharge up to 1,000 cfs through the power canal during high flow events;
- replace the wetlands monitoring program required as part of the 1997 Commission Order with a similar program that would be undertaken every 5 years;
- conduct recreation monitoring consistent with the Commission's FERC Form 80 program;
- evaluate opportunities for establishing a conservation easement on lands around the Eel Weir bypassed reach;
- plan any changes to current land use(s) to be consistent with the aesthetic character of the project area.

Additional Measures Recommended by Staff

- implement S.D. Warren's proposed LLMP, with the following additional changes:
  (i) manage the lake during spring fill-up to reach a target level of 266.15 feet on (or after), but not before, May 15, with an allowable target range of ± 0.5 foot;
  (ii) lake levels may be at the spring target level any time between May 15 and June 21 (for any 3-week period), with levels exceeding the spillway crest (elevation 266.65 feet) triggering increased flows (as described in the State of Maine's operating parameters); and
  (iii) beginning January 1, and continuing until March 1, manage flows from the project to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching elevation 266.15 feet by May 15.
- release minimum flows to the bypassed reach, consisting of 75 cfs from November 1 to March 31 and 125 from April 1 to October 31;
- develop and implement a project operations and flow monitoring plan, which would include, at a minimum, measures proposed by S.D. Warren, as well as flow and temperature monitoring in the bypassed reach;

- develop and implement an American eel passage plan, consisting of installing an upstream eel ladder, implementing measures for downstream eel passage, and effectiveness and out-migration monitoring;
- reserve Commission authority to require fish passage facilities, as may be prescribed by Interior, pursuant to Section 18;
- develop and implement a SMP, which would include conservation easements, buffer zones, mapping of the shoreline, a permitting process, and other shoreline protection measures; and
- implement the PA, executed on September 14, 2005, which requires the development of an HPMP.

The following is a discussion of the basis for the staff-recommended measures, as well as our basis for not recommending measures recommended by other entities.

Lake Level Management

Nearly all entities that commented on the license application for the Eel Weir Project raised issues with the current LLMP. A number of entities provided varying recommendations for changes to the current LLMP. In this EA, we reviewed the information in the record. Based on this review, we recommend changes to the LLMP that we conclude would balance the numerous interests and be in the public interest.

Sebago Lake Coalition, FOSL, Mr. Charles Frechette, and Mr. Stephen Kasperzak recommend revisions to the LLMP that were considered by the Commission and other stakeholders in developing the current LLMP. All these recommendations focus on maintaining lake levels to protect shoreline resources, including beaches, as well as preserving recreational opportunities on Sebago Lake.

Our analysis in this EA shows that the current LLMP has resulted in higher lake levels in Sebago Lake. In fact, the current LLMP provides, on average, about 60 percent of the lake's historical storage capability. Even with the higher lake levels, Johnston (2002) concludes that Sebago Lake beaches have shown normal sand movement and stability since monitoring began around 1990. Although certain beaches, at points in time, show short-term changes, generally the beaches show long-term stability interrupted at times by changes due to storms that occur during high water periods. This conclusion is consistent with the 5 years of beach profile studies conducted by S.D. Warren, which found that, while seasonal erosion and accretion do occur along all surveyed areas, there is an on-going cycle of material loss and replacement which maintains beach profile equilibrium. Notwithstanding these findings, we stated in section V.C.1, *Geology and Soils*, that shoreline erosion occurs around Sebago Lake. The evidence in the record suggests that the higher lake levels are partially responsible for some of the erosion.

Based on our analysis, we find no compelling evidence to support making major revisions to the current LLMP. However, we recommend a few minor modifications to the LLMP.

May to Late June

In the draft EA, we recommended changes to the LLMP for the May/June period that would limit some of S.D. Warren's flexibility in managing lake levels in Sebago Lake by establishing a May 1 elevation of 266.65 feet, with a reduced operating band. In its comments on the draft EA, S.D. Warren did not agree with this recommendation, because of the reduction in flexibility. Other commenting entities expressed concern about potentially higher lake levels for a longer period in the spring, resulting in a higher potential for beach erosion. We have re-assessed this issue based on these comments, and we now recommend that the spring target level be reduced by 6 inches to elevation 266.15 feet, but that a ± 6-inch operating band be established around the target elevation. We also now recommend that the target elevation be maintained for a 3-week period between May 15 and June 21.

Limiting the spring target elevation to 266.15 feet and shifting the date to May 15 would lower the average lake level during the May/June Period, when compared to the existing LLMP. This reduction would reduce the susceptibility of beaches and the shoreline to erosion, and the loss of sand that result from high water levels and storm events. Lower lake levels would afford more protection to water quality and archaeological sites, and would provide some additional storage capabilities for flood control during the period. This change is expected to have little, if any, effect on other lake resources (*e.g.*, fisheries, wetlands, and recreation), and would provide S.D. Warren operational flexibility in the event of unusual or unexpected weather events. Maintaining a 3-week period for the spring target level would be the same as the existing LLMP, and as recommended by Maine in its revised plan. We estimate that modifying the spring target elevation (to 266.15 feet) and moving the target date (to May 15) would result in a small gain in energy generation (45 MWh), worth $1,940.

The current LLMP does not require that water be spilled at the dam, except as necessary to keep the lake from exceeding S.D. Warren's flowage easements (267.15 feet) or to keep the lake level from being above the spillway for more than 3 weeks in any given year. To address the issue of lake levels and spillway flows, we recommend that flows be released from the project so that lake levels do not exceed the spillway crest elevation of 266.65 feet, in accordance with operating parameters outlined by Maine. This provision would reduce the possibility of S.D. Warren exceeding their flowage easements during May and June, and potentially enhance the lower river fishery by providing higher flows into the lower river during the spring/early-summer period, and in turn increasing available aquatic habitat. However, spilling high volumes of water at the

Eel Weir dam could adversely affect, on a short-term basis, fishing opportunities in the bypassed reach.

S.D. Warren objects to the provisions that limit its flexibility to manage lake levels in Sebago Lake. We share the same concerns, particularly where it pertains to flood control. Therefore, we recommend that any new license issued for the project include a provision that would allow S.D. Warren, in consultation with appropriate entities, to temporarily modify normal operations under the LLMP to address emergency conditions. Any such modification of operations, however, should be reported to the Commission.

August 1 target elevation

S.D. Warren proposes to add a ± 3-inch operational band around the August 1 lake level target of 265.17 feet. We recommend adopting S.D. Warren's proposal. This change would provide S.D. Warren some operational flexibility around the August 1 target elevation, and it is not expected to affect environmental resources, erosion, recreation (*e.g.*, marina and boating interests), or archaeological sites in and around Sebago Lake. Any such effects, if they were to occur, would be negligible.

Winter water levels

The current LLMP does not establish any lower limit requirements for the January through April period. Rather, the plan relies on S.D. Warren's management to achieve the May 1 target level. However, various entities express concern that the lake is not being managed to achieve the target level May 1 (under the current LLMP). In addition, S.D. Warren's generating equipment has sustained damage with the reduced flows during this period. Maine recommends that, beginning January 1, and continuing until March 1, flows from the project be reduced to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching the spillway crest target level on, or anytime after, May 1.

Our analysis indicates that Sebago Lake would reach the spring target level in the majority of years, should the winter lake level drop below the 1910-1986 median levels, except in the most extreme dry years (when flows are at or lower than the 95 percent exceedence level). However, maintaining the lake at or above the long-term median during the winter months would assure that the lake refills by the spring (May) target date, and would address the aforementioned concerns. In their comments on the draft EA, Maine Geology is concerned that this would limit low lake levels and be less beneficial to the beach-building process, and S.D. Warren recommends that if this was to become a requirement of the LLMP that a specific minimum target elevation (262.0 feet) be established, instead of a long-term median value that could change on a daily basis.

We recommend that the current LLMP be modified to incorporate the Maine's recommended changes for a minimum lake level from January 1 to March 1. As described in sections V.C.1, 2, and 5 (*Geology and Soils, Water Resources, and Recreation Resources and Land Use*), this provision would enhance S.D. Warren's ability to reach the May 15 target elevation, particularly in dry years. In addition, the higher water levels from January 1 through March 1 would offer some limited protection to aquatic resources and wetlands during that time. Winter ice fishing could also be enhanced by the maintenance of higher lake levels during ice cover. To address Maine Geology and other parties' concerns about maintaining lower winter water levels for beach-building, we continue to recommend the current LLMP provision to lower the lake to elevation 261.0 feet (November 1 to January 1) in 2 out of every 9 years. While promoting beach accretion, this provision would reduce the potential for beach erosion by maintaining lower lake levels during the fall period when significant storm events occur. We also agree with Maine that a minimum target elevation should be established for the January 1 to March 1 period, based on the long-term (1910-1986) median levels.

Although we estimate that adopting a minimum winter water level would have no measurable effects on project generation or costs, these changes are not without risk. If the lake is maintained at higher levels in the winter, there would be less storage available in Sebago Lake for spring runoff. If mismanaged by S.D. Warren, this loss of storage could have a significant effect on flows in the lower Presumpscot River. We share S.D. Warren's concerns regarding this loss of storage. Therefore, we recommend that any new license issued for the project include a provision that would allow S.D. Warren, in consultation with appropriate entities, to temporarily modify normal operations under the LLMP to address emergency conditions. Any such modification of operations, however, should reflect balancing flooding along Sebago Lake and downstream along the Presumpscot River, and be reported to the Commission within 10 days of any incident.

Other Stakeholder Recommendations

Most of the other recommendations regarding the LLMP reflect options that would benefit Sebago Lake in some manner. However, these options are not without problems.

The USFWS, through Interior, recommends a lake level management regime that would allow S.D. Warren to fluctuate lake levels up to 2 feet during the summer period and 3 feet the remainder of the year. If a full 2-foot drawdown was to occur during the May/June time period, fish spawning could be disrupted, and rearing habitat dewatered. Higher water levels the remainder of the year, however, would benefit wetlands and aquatic resources. This option would also significantly reduce the project's flood control capabilities and likely result in substantial flooding downstream. We estimate the cost of this recommendation to be $20,930 annually, and we do not recommend this option.

Maine's recommended LLMP and our recommended alternative are similar in many respects. Maine's plan would increase generation by 193 MWh annually ($8,320 net benefit), while our recommended option would increase generation by 45 MWh annually ($1,940 net benefit). In addition, the option presented by Charles Frechette would increase generation by 190 MWh annually ($8,200 net benefit). However, Maine's and Mr. Frechette's plans would likely increase summer/early fall lake levels. While this would be good for recreation and other environmental resources, these higher elevations could result in beach and shoreline erosion, if storms were to occur during this period. Maine's plan would also decrease flows in the Presumpscot River, which, as we state in section V.C.3 (*Fisheries and Aquatic Resources*), we do not support because of the potential for (a) adverse affects on water temperatures and quality, and (b) a reduction in the availability and suitability of downstream aquatic habitat. For these reasons, we do not recommend the full plan recommended by Maine, or Mr. Frechett's plan.

Sebago Lake Coalition's recommended plan, along with the option outlined by Charles Frechette, would most likely provide the greatest benefit to recreation, with some overall benefits to wetlands and aquatic resources. However, these plans, like that of Maine, could result in beach and shoreline erosion. Finally, the changes proffered by FOSL and Stephen Kasprzak would provide some of the lowest lake levels of any of the options, and likely the greatest benefit to beach-building, while reducing shoreline erosion. These plans would also provide the greatest amount of flood control storage in Sebago Lake and benefit downstream areas through the reduction of flood damages. However, these plans would have the lowest probability of lake re-fill by May 15, with potential adverse effects on boating and other recreational activities on the lake, and would have varying effects to wetlands and aquatic resources. The plans recommended by Sebago Lake Coalition, FOSL, and S. Kasprzak would reduce generation and have substantial costs (ranging from $25,720 to $50,530). Therefore, we do not recommend adopting any of these alternatives.

The MDIFW recommends a late fall/winter drawdown to control lake trout spawning. Our analysis indicates that such a drawdown would have substantial adverse consequences to not only macroinvertebrates, fish populations, and wetlands, but potentially to recreation if the lake is not able to refill by the following spring. The potential adverse affects, along with the significant cost of nearly $170,000 annually, outweigh the potential benefits. Therefore, we do not recommend adopting this measure.

<u>Sebago Lake Fisheries Measures</u>

The MDIFW recommends that S.D. Warren mitigate for smelt migration barriers resulting from project operation. Our analysis in section V.C.3 (*Fisheries and Aquatic Resources*) shows that neither the project, nor its operations, appears to be affecting access to smelt spawning habitat. Therefore, this measure, which we conservatively estimate would cost $1,500 per year, does not appear warranted, and we do not recommend adopting it.

The MDIFW recommends that S.D. Warren conduct a warmwater fishery assessment for Sebago Lake. S.D. Warren previously addressed issues related to shoreline spawning and rearing, as well as stranding, for warmwater fish as part of the study, *Seasonal Lake Level Assessment*. This assessment addressed potential effects of the existing LLMP on numerous shallow-water species, including black bass. We used information from this assessment in our analysis of the lake level management issue. We consider the previous assessment to be sufficient to assess LLMP effects and, therefore, do not recommend adopting this measure. The survey would cost $7,490 annually.

Eel Weir Bypass Minimum Flows

S.D. Warren currently provides minimum flows in the Eel Weir bypassed reach that vary seasonally from 25 to 75 cfs. According to Maine's fishery management plans, the existing flow regime was developed as a way to establish a self-sustaining landlocked Atlantic salmon fishery in the Eel Weir bypassed reach. Secondarily, the flow regime was designed to enhance the fisheries for other cold and warmwater fish species. As we stated in section V.C.3 (*Fisheries and Aquatic Resources*), the effort to establish a self-sustaining salmon fishery in the bypassed reach has not been successful. Therefore, the reach is currently managed principally as a brook trout fishery, with stocking of catchable-size adults.

The result of S.D. Warren's instream flow study suggests that, while no single flow optimizes habitat for all species and lifestages, a range of flows exist that may provide reasonably high habitat suitability for most species and lifestages. However, as protocol dictates, we primarily consider the habitat needs of brook trout in recommending a flow regime for the bypassed reach.

In the draft EA we recommended that S.D. Warren provide seasonally-adjusted minimum flows to the bypassed reach. The flows consisted of: (1) 50 cfs from November 1 to March 31; (2) 100 cfs from April 1 to June 30; (3) 75 cfs from July 1 to August 31; and (4) 100 cfs from September 1 to October 31. These flows were 25-cfs higher than current flows, on a seasonal basis. S.D. Warren objected to the higher flows, stating that existing flows are sufficient to meet agency management goals for the coldwater fishery. The USFWS, the MDIFW, and FOSL all support even higher flows. The resource agencies state that smallmouth bass (which are favored by the higher flows) is of little concern to trout management, and that channel modifications would protect the coldwater refugia under a higher minimum flow regime.

We have re-assessed this issue based on the aforementioned comments and now recommend a flow regime of: (1) 75 cfs from November 1 to March 31; and (2) 125 cfs from April 1 October 31. We recommend this flow regime for the following reasons:

- Priority management objectives for the Eel Weir bypassed reach include: (1) providing a year-round (including summer) fishery for brook trout; and (2) maximizing angler opportunity. Secondarily, the Eel Weir bypassed reach is managed to provide a fishery for landlocked Atlantic salmon.
- The results of the flow study show that the bypassed reach provides more aquatic habitat for juvenile and adult brook trout across the flow range of interest than any other species or lifestage evaluated. Habitat for brook trout increased rapidly between 25 and 100 cfs in the riffle/run areas, with moderate increases beyond 100 cfs. In the braided channel areas, habitat for brook trout increased rapidly from 66 to 185 cfs.
- Substantial gains in habitat for brook trout would be realized with our recommended flows over existing conditions, while there would be modest improvement in landlocked Atlantic salmon habitat (*see* table 28 in section V.C.3).
- Total wetted area in the riffle/run habitat would range from 70 to 78 percent of the calculated maximum at 75 and 125 cfs, respectively, while total wetted area in the braided channels would exceed 75 percent. Habitat for *Stenonema*, an important forage species for trout and other fish, would be substantially enhanced (*see* table 28 in section V.C.3).
- The flow regime we recommend would enhance aquatic habitat during the biologically important spring-summer-fall seasons (when reproduction, growth, and winter hold-over preparation occurs). In addition, our recommended over-winter flow would retain a significant amount of the habitat available at 125 cfs and maintain sufficient habitat for over-wintering salmonids.
- Favorable angling conditions in the bypassed reach would be maintained, with a modest enhancement.

Overall, our recommended flow regime would further the resource agencies' fishery management goals for the Eel Weir bypassed reach. As previously stated, the bypassed reach currently supports a valuable coldwater fishery (estimated to be worth $100,000 annually; *in* FERC, 2002). In contrast, we estimate the annual cost for our recommended flows to be about $61,730. While we recognize the current flow regime has resulted in a popular, heavily utilized fishery, we do not recommend S.D. Warren's proposal to continue those flows as part of any new license issued. The existing flows do not address the agencies' current management goals for the Eel Weir bypassed reach (focus on brook trout), nor would they address future angling demand in the bypassed reach, which is likely to increase along with the growing population in the Portland area.

The USFWS and the MDIFW recommend substantially higher flows for the bypassed reach. These flows would provide significant habitat enhancements (*see* section V.C.3.b, *Fisheries and Aquatic Resources – Environmental Analysis*), but at considerable cost. We estimate that the annual cost to provide the agencies' flows would be in excess of $105,000, unless flows are reduced during the summer period to protect the coldwater refugia. We conclude that the incremental benefit to the habitat and fishery with the agencies' flows do not outweigh the substantial cost in lost generation to S.D. Warren, and, therefore, do not recommend adopting such flows.

FOSL recommends a flow of, at least, 100 cfs for the bypassed reach. Though FOSL's flow recommendation would cost less than our recommended flow regime ($47,770), we do not recommending adopting it. Our recommended flow of 125 cfs from April 1 to October 31 would be consistent with FOSL's flow recommendation. However, we do not recommend the higher flows from November 1 to March 31 (over-winter), as biological needs of the aquatic community would be less during this period. The 75-cfs flow we recommend represents a significant increase for flows during the winter, which would provide substantial hold-over habitat for trout and other resident fish using the bypassed reach.

The seasonal flows we recommend would likely compromise the integrity of the coldwater refugia in the bypassed reach, primarily from June to August. Therefore, we support Interior's recommendation for temperature monitoring in the bypassed reach, and recommend, consistent with Interior's recommendation, that water temperatures in the bypassed reach be monitored as part of a project operations and flow monitoring plan (*see* discussion below).

American Eel Passage

The MDMR and the USFWS recommend that S.D. Warren provide appropriate upstream and downstream fish passage for American eel at the Eel Weir dam. S.D. Warren agrees to provide such facilities, but proposes to consult with the resource agencies regarding the timing of implementation. We conclude that providing such facilities, as recommended by the agencies, would have immediate benefits to the American eel population in the Presumpscot River.

The American eel is a species of concern to both state and federal fishery agencies, because of the apparent decline in the population along the Atlantic coast of North America. Because eel presently occur in Sebago Lake, providing upstream eel passage at the Eel Weir dam would be a significant enhancement to eels ascending the Presumpscot River. Providing upstream passage at Eel Weir would enhance access to important habitat in Sebago Lake and its tributaries. This enhancement could be implemented at a relatively low to modest cost. We estimate the annual cost of this measure to be about $17,000.

Downstream movement of yellow-phase eels (juveniles) and passage of adult downstream migrant eels at hydropower projects and other barriers is an issue of concern for fishery resource agencies, due to recent population declines. The MDMR, in addressing this concern, states that their management objective for American eel in the vicinity of the Eel Weir Project is to provide adequate downstream passage and escapement to the ocean for pre-spawning adult eels. We conclude in section V.C.3 (*Fisheries and Aquatic Resources*) that offering a safe, efficient downstream passage route to out-migrating adult eel and yellow eel would enhance survival at the project and increase the number of Presumpscot River eels contributing to the eel spawning population. Thus, implementing downstream eel passage measures would further the long-term goal of species recovery. We estimate the annual cost of this measure to be about $26,030.

We conclude that upstream and downstream eel passage are in the public interest, and recommend that S.D. Warren design and implement appropriate eel passage facilities at the Eel Weir Project. At a minimum, the eel passage plan should include provisions to: (1) install an upstream eel ladder at the Eel Weir dam; (2) develop downstream eel passage facilities consistent with Option #3, as described in sections III.C (*Proposed* Action) and V.C.3 (*Fisheries and Aquatic Resources*); and (3) monitor the effectiveness of the upstream and downstream passage facilities and, as appropriate, the out-migration timing of adult American eel.[89] In addition, we recommend the plan include provisions for operating the eel passage facilities at Eel Weir, consistent with the timing of annual and daily operation of the eel passage facilities at S.D. Warren's five recently-licensed projects on the lower Presumpscot River.[90] Finally, the eel passage plan should be developed in consultation with the USFWS, the MDMR, the MDIFW, and the MDEP, and filed for Commission approval within 6 months after the issuance of any new license for the project.

Land-locked Salmon Fish Passage

FOSL recommends that S.D. Warren provide fish passage at the Eel Weir dam for Sebago Lake's land-locked Atlantic salmon. In section V.C.3, *Fisheries and Aquatic Resources*, we analyzed the merits of the recommendation and concluded that FOSL

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[89] The cost for downstream eel passage at Eel Weir includes the cost for effectiveness monitoring. Adding an out-migration timing component to this plan is not expected to substantially change the overall annual cost ($26,030) previously identified in the draft EA.

[90] The eel passage plan should include a provision to modify the operational timing of the downstream eel passage facilities (annual and daily) based on new information obtained from on-going or required monitoring studies.

makes a compelling argument for fish passage at the project dam. However, as we stated in section V.C.3, neither the MDIFW, nor the USFWS, supports the installation of fish passage facilities for landlocked salmon at the Eel Weir dam as a way to achieve the fish management goals for Sebago Lake and the Presumpscot River. Given the agencies' position and our estimated cost for the measure ($214,730 annually), we conclude that the providing passage for landlocked salmon at Eel Weir is not in the public interest at this time. Therefore, we do not recommend this measure be included in any new license issued for the project. We do, however, recommend that the license include a condition reserving the Commission's authority to require such fish passage facilities as may be prescribed by Interior, pursuant to Section 18.

Project Operation/Compliance Monitoring

S.D. Warren currently monitors and maintains records of bypass flows and lake levels, and proposes to continue operating the existing lake level gage. However, as we stated in section V.C.2 (*Water Resources*), it is not clear what protocols and mechanisms S.D. Warren uses to monitor and maintain records of bypass flows and lake levels, aside from the lake level gage. In addition, our recommended bypass flows could compromise the integrity of coldwater refugia in the bypassed reach (section V.C.3, *Fisheries and Aquatic Resources*). Therefore, we recommend that S.D. Warren develop and implement a project operations and flow monitoring plan that includes temperature monitoring in the bypassed reach. This plan would enable the Commission to ensure compliance with operational license conditions, as well as monitor the effects of bypass flows on coldwater refugia.

The monitoring plan should define the criteria by which compliance with the recommended LLMP and bypass flows would be measured, specify the type and location of all existing (and any new) instrumentation that would be used to monitor bypass flows and headpond elevations, and identify the data collection intervals and reporting procedures. In addition, the plan should include a provision to monitor water temperatures in the two identified coldwater refugia for 3 years. The monitoring plan should be developed in consultation with the USFWS, the USGS, the MDIFW, and the MDEP, and filed for Commission approval within 6 months of issuance of any new project license. We estimate that the annual cost of this monitoring plan would be $3,600.

In addition, S.D. Warren proposes to: (1) continue to cooperate and coordinate with upstream pond owners to manage flood flows; and (2) discharge up to 1,000 cfs through the power canal during high flow events. These measures cost S.D. Warren little, if anything, to implement, but would have substantial flood control and recreational (bypass angling) benefit. Therefore, we recommend that the monitoring plan specify the protocols for communicating with the upstream pond owners to manage flood flows, as well as operating the project so as to minimize excess spill in the bypassed reach.

Wetlands Monitoring

S.D. Warren proposes to replace the existing wetlands monitoring program with a similar monitoring program, having a 5-year monitoring cycle. Our analysis in section V.C.4 (*Terrestrial Resources*) shows that, in the 5 years after implementation of the 1997 LLMP, wetlands have changed little. In addition, we do not expect our recommended changes to the LLMP to have any significant effects on wetlands. Thus, continuing to monitor wetlands annually is unnecessary. Therefore, we recommend that S.D. Warren monitor wetlands around Sebago Lake consistent with the program required for the 1997 LLMP, but on a 5-year cycle. This monitoring program would afford S.D. Warren the opportunity to document any long-term changes in wetland cover and plant diversity. We estimate this measure would cost $1,790 annually.

Conservation Easements, Shoreline Protection Measures, and Aesthetics

As we stated in sections V.C.4 and V.C.5 (*Terrestrial Resources and Recreational Resources and Land Use*), the vast majority of land around Sebago Lake is in private ownership, with a substantial amount of development. S.D. Warren owns 292 acres of land around the project structures and Eel Weir bypassed reach. S.D. Warren owns little land surrounding Sebago Lake. To address its concerns related to the on-going development around the lake, the USFWS, through Interior, recommends that S.D. Warren develop a SMP to protect riparian resources in the project area.

The placement of temporary docks or the installation of seasonal water supply lines, and the uses stemming from them, could disturb the shoreline areas of Sebago Lake. Therefore, we conclude that protection of riparian and other sensitive habitats in the project area is warranted. Our analysis shows that protecting such areas would enhance wildlife habitat, protect any wetlands in those areas, as well as protect water quality and valuable fish habitat. Therefore, we recommend that S.D. Warren develop, in consultation with the USFWS, the MDIFW, the MDOC, the MDEP, and the towns of Standish and Windham, a SMP that includes: (1) mapping of Sebago Lake's shoreline to identify sensitive areas (*e.g.*, wetlands, cultural sites, key aesthetic resources, signature beaches, steep slopes, heads of coves, areas of important woody debris, etc.); and (2) a permit program to ensure that temporary docks, piers, water supply lines, and other facilities are installed properly and placed in appropriate areas. In addition, as stated in section V.C.4, *Terrestrial Resources*, restricting the SMP to S.D. Warren-owned lands within 200 feet of the normal high water elevation likely would provide only limited protection to riparian areas and other sensitive habitats. Therefore, we also recommend that S.D. Warren, as part of the SMP, identify other lands within 200 feet of the high water elevation around Sebago Lake that may warrant protection.[91]

An SMP, as outlined above, would assist S.D. Warren in meeting its responsibility of managing recreational opportunities at the project and preserving other resources and beneficial uses of the project's shorelines in a manner consistent with project purposes. We estimate the annual cost of this measure to be $9,730.

S.D. Warren proposes to initiate discussions with the town of Windham on developing a conservation easement on certain lands it owns along the Eel Weir bypassed reach. Similarly, the MDIFW recommends that S.D. Warren grant it a perpetual easement for angler foot access on lands adjacent to and underlying the bypassed reach. We state in section V.C.5 (*Recreational Resources and Land Use*) that such a conservation easement would help ensure long-term public access to the Eel Weir bypassed reach and fishery. Therefore, we recommend that S.D. Warren pursue a conservation easement on lands it owns adjacent to, and underlying, the bypassed reach. We recommend this measure be a component of the aforementioned SMP. We also recommend that the lands placed within a conservation easement be included in the project boundary.[92] This requirement would give the Commission the necessary jurisdiction over the land to ensure public access along the bypassed reach.

S.D. Warren proposes to plan any changes to current land use(s) to be consistent with the aesthetic character of the project area. This proposal would ensure that facilities required as part of any new license issued for the project are constructed in a way that would be environmentally unobtrusive. In addition, this measure can be implemented at little, or no, cost. Therefore, we recommend that S.D. Warren consider the aesthetic character of the project area in developing the plans for eel passage, the Sebago basin boat launch, and any other plan that requires construction of facilities.

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[91] The Commission's policy is to require no more than a 200-foot shoreline buffer for SMP's, unless additional lands are deemed necessary for project purposes. A 200-foot buffer zone for Sebago Lake would protect wetland habitats, aesthetic resources, and recreational opportunities. In addition, these lands would provide additional buffering capacity against adjacent land disturbances in ecologically sensitive areas and would help protect riparian corridors.

[92] Though the lands adjacent to, and underlying, the bypassed reach do not have project-related facilities, the Commission requires that these lands be included within the project boundary when a licensee proposes to grant conservation easements to qualified governmental agencies or NGOs. See *New England Power Co*., 79 FERC ¶ 61,006.

Public Access and Recreation Monitoring

The MDIFW states that there is a growing need for additional no- or low-cost public boat access to Sebago Lake. To this end, the MDIFW recommends that S.D. Warren develop a shallow water boat launch facility on S.D. Warren-owned land upstream of the Eel Weir dam (Sebago basin). Our analysis in section V.C.5, *Recreational Resources and Land Use*, suggests that additional boat access to Sebago Lake is warranted. For example, the town of Raymond boat launch is used far beyond capacity on good weather weekends and at somewhere between 50 to 100 percent of capacity on rainy weekends.

To address the growing need for public access at Sebago Lake, we recommend that S.D. Warren develop a shallow-water boat launch on Sebago basin, as recommended by the MDIFW. S.D. Warren should develop a plan, in consultation with the MDIFW, the MDOC, and the MDEP, to construct the shallow-water boat launch facility. The plan should include, at a minimum: (1) the location and design drawings of the boat launch facility and access road; (2) any safety considerations and reasonable measures that could be implemented to address concerns related to the facility's use and the type and size of boats using the facility; (3) measures for soil erosion and sedimentation control during the construction of the recreation facility; (4) provisions to manage the facilities over the term of any new license issued; (5) a discussion of how the needs of the disabled were considered in the planning and design of the facility; and (6) a schedule for constructing the facility. The plan should be filed with the Commission within 12 months after issuance of any new license for the project. We estimate the annual cost of this boat launch to be $7,990, but recognize this cost could be somewhat higher depending on the nature of the access road.

As we previously stated, Sebago Lake is a popular destination for water based activities and is heavily utilized for fishing, boating, and other forms of outdoor recreation. To address on-going and future recreation needs, the USFWS, through Interior, recommends that S.D. Warren assess the long-term adequacy of existing public access facilities to identify any additional facilities that may be needed.

We agree that on-going recreation monitoring is appropriate. We note that angling, boating use, and other forms of recreation is expected to increase in the future. Under these circumstances, it is appropriate that recreation use be monitored. Therefore, we recommend that S.D. Warren monitor recreation use at the Eel Weir Project consistent with the Commission's FERC Form 80 Program.[93] This level of monitoring

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[93] Based on our review of Interior's recommendation for recreation monitoring at the project, it appears that Interior's recommendation would be consistent with the Commission's FERC Form 80 monitoring requirements.

would be sufficient to address the adequacy of existing public access facilities and the need for additional facilities in the future. We estimate monitoring of this caliber would cost $720 annually.

Measures to Protect Historical Resources

As part of any new license issued for the Eel Weir Project, we are recommending changes to project facilities (e.g., installation of eel passage facilities). In addition, we are recommending changes to the existing LLMP. These measures have the potential to adversely affect archaeological and other historic sites. To ensure that adverse effects on known and potential historic properties, and to any as-yet unidentified archaeological resources, are satisfactorily resolved over the term of the new license, the Commission on September 14, 2005, executed a PA with the Maine SHPO. The PA requires S.D. Warren to prepare a HPMP, in consultation with the Maine SHPO. The HPMP would contain the principles and procedures to address the proposed continued use, and protection of, historic properties; mitigation of unavoidable adverse effects; compliance with laws and regulations governing human remains; and discovery of previously unidentified resources. We estimate the annual cost of the executed PA and our recommended HPMP to be $32,940.

B. Conclusion

From our evaluation of the environmental effects and public benefits of the project, we conclude that licensing the Eel Weir Project, with our recommended environmental protection measures, would best adapt the project to a comprehensive plan for the waterway. The proposed project, with staff-recommended modifications and additional measures, would generate an average of 11,088 MWh of electricity annually, which has a net annual benefit of about $248,890.

VIII. CONSISTENCY WITH FISH AND WILDLIFE RECOMMENDATIONS

Section 10(j) of the FPA[94] requires the Commission to include license conditions, in each hydroelectric license issued, based on recommendations provided by the state and federal fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. Moreover, Section 10(j) states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

[94] 16 U.S.C. § 803(j)(1).

If the Commission still does not adopt a recommendation, it must explain how the recommendation is inconsistent with Part I of the FPA or other applicable law and how the conditions imposed by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife resources.

In response to the Commission's REA notice, Interior, on behalf of the USFWS, and the MSPO,[95] on August 1 and August 5, 2004, respectively, filed letters providing comments, as well as terms and conditions, for the Eel Weir Project, pursuant to Section 10(j). Table 44 lists the agencies' recommendations subject to Section 10(j). Table 44 also summarizes our analysis of those recommendations, including whether the recommendations are adopted under the staff alternative. Recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA.

Table 44. Analysis of fish and wildlife recommendations for the Eel Weir Project. (Source: Staff)

Recommendation	Agency	Within scope of Section 10(j)	Total annualized cost (2004$)	Staff recommend adoption?
1. Release 200 cfs to the bypassed reach 4/1 to 10/31, and 115 cfs from 11/1 to 3/31.[96]	USFWS	Yes	$129,920	No

[95] The MSPO filed Section 10(j) terms and conditions for the Eel Weir Project, on behalf of the MDIFW and the MDMR. However, by Executive Order of the Governor of the State of Maine, the terms and conditions contained in Maine's 401 WQC, when issued, would represent the state's official recommendations on all issues regarding the license application, including fish and wildlife, and would supercede all preliminary recommendations by individual state agencies. Nonetheless, in this section, we deal with the 10(j) recommendations submitted by Interior, the MDIFW, and the MDMR.

[96] The USFWS, in commenting on the draft EA, recommends an alternative flow regime consisting of: (1) 115 cfs from 11/1 to 3/31; (2) 200 cfs from 4/1 to 6/30; (3) 115 cfs from 7/1 to 8/31; and (4) 200 cfs from 9/1 to 10/31. We estimate this recommendation would cost $131,560 annually, and don't recommending adopting it.

Recommendation	Agency	Within scope of Section 10(j)	Total annualized cost (2004$)	Staff recommend adoption?
2. Limit Sebago Lake fluctuation to no more than 2 feet from 4/1 to 12/15, and no more than 3 feet from 12/16 to 3/31.	USFWS	Yes	$20,930	No
3. Develop and implement a plan to monitor instream flows and impoundment water levels	USFWS	Yes	$1,500	Yes[97]
4. Monitor recreation use at the project and file a report with the Commission	USFWS	No, not a specific measure to protect fish and wildlife	$670	Yes. We recommend monitoring consistent with FERC Form 80 requirements
5. Develop a shoreline management plan to protect riparian resources in the project area	USFWS	Yes	$1,570	Yes[98]
6. Install permanent upstream passage facilities for American eel	MDMR	Yes	$17,000	Yes
7. Install permanent downstream passage facilities for American eel; and that minimizes the loss of adult land-locked Atlantic salmon to the bypassed reach	MDMR MDIFW	Yes	$26,030	Yes

[97] We recommend the project operation and flow monitoring plan include temperature monitoring. We estimate our recommendation would cost $3,600 annually.

[98] We recommend the SMP include: (1) conservation easements; (2) buffer zones; (3) Sebago Lake shoreline mapping, and a permitting program. We estimate this measure would cost about $9,730 annually.

Recommendation	Agency	Within scope of Section 10(j)	Total annualized cost (2004$)	Staff recommend adoption?
8. Consult with the resource agencies on the design, location, and effectiveness testing of the upstream and downstream eel passage facilities	MDMR	No, not a specific measure to protect fish and wildlife	$0	Yes
9. Modify the 1997 Lake Level Management Plan to suppress lake trout spawning	MDIFW	Yes	$169,620	No
10. Release 200 cfs to the bypassed reach 5/1 to 10/31, and 115 cfs from 11/1 to 4/30	MDIFW	Yes	$122,460	No
11. Release 100 cfs to the bypassed reach 5/1 to 10/31, and 115 cfs from 11/1 to 4/30 if coldwater refugia areas can not be adequately protected	MDIFW	Yes	$44,980	No
12. Develop plans for a shallow-water boat launch facility on licensee-owned lands	MDIFW	No, not a specific measure to protect fish and wildlife	$7,990	Yes
13. Grant the MDIFW a perpetual easement for angler foot access on lands adjacent to and underlying the Eel Weir bypassed reach	MDIFW	No, not a specific measure to protect fish and wildlife	$0	Yes, in part. We recommend S.D. Warren establish conservation easements on land around the bypassed reach
14. Conduct a warmwater fishery assessment for Sebago Lake to determine effects of existing LLMP.	MDIFW	No, represents a study that could have been pre-filing	$7,490	No

Recommendation	Agency	Within scope of Section 10(j)	Total annualized cost (2004$)	Staff recommend adoption?
15. Mitigate for smelt migration barriers resulting from project operation	MDIFW	Yes	$1,500	No
16. Investigate the feasibility of increasing the power canal discharge capacity to minimize lost angling opportunities in the bypassed reach	MDIFW	No, not a specific measure to protect fish and wildlife	$0	No

A. Recommendations pursuant to Section 10(j) of the FPA

Under Section 10(j) of the FPA, we determined that the USFWS submitted four recommendations for the Eel Weir Project that fall within the scope of section 10(j); the MDMR submitted two such recommendations and the MDIFW submitted four such recommendations. We recommend adopting measures consistent with a number of these recommendations, including (1) developing and implementing a plan to monitor instream flows and impoundment water levels (USFWS); (2) installing and evaluating upstream and downstream American eel passage (MDMR); (3) developing downstream eel passage that minimizes loss of adult land-locked Atlantic salmon to the Eel Weir bypassed reach (MDIFW); and (4) developing and implementing a SMP (Interior).

Recommendations in the draft EA

We did not recommend adopting the USFWS's recommendation that S.D. Warren release 200 cfs (4/1 to 10/31) and 115 cfs (11/1 to 3/31) to the Eel Weir bypassed reach. Nor did we recommend adopting the MDIFW's recommendation that S.D. Warren release 200 cfs (5/1 to 10/31) and 115 cfs (11/1 to 4/30) to the bypassed reach; ≈ 110 cfs would be released in the summer if coldwater refugia can not be adequately protected with 200 cfs. For the reasons discussed below, we found that these recommendations were inconsistent with the public interest standard of Section 4(e) and the comprehensive planning standard of Section 10(a) of the FPA.

Our analysis in the draft EA showed that these flows would improve aquatic habitat in the Eel Weir bypassed reach for the fish species of management importance. However, we found that the agencies' recommended flows would: (1) provide relatively small/modest incremental gains in fish habitat, but cost from $107,490 to $114,950 annually ($84,490 to $91,950 more than the staff-recommended flow regime); (2)

enhance habitat for smallmouth bass, which we believed was an non- desirable species; and (3) eliminate the coldwater refugia that currently exist in the reach. As described in sections V.C.3, *Fisheries and Aquatic Resources* and V.II.A, *Comprehensive Development* of the draft EA, our recommended flow regime, while differing from the resource agencies, would seasonally improve overall aquatic habitat in the bypassed reach for the fish species of interest, and limit habitat for smallmouth bass. In addition, our recommended flow regime would have ensured that the colder seeps remained viable as refugia during the summer months.

We did not recommend adopting the USFWS's recommendation that S.D. Warren limit Sebago Lake fluctuations to no more than 2 feet (4/1 to 12/15) and 3 feet (12/16 to 3/31). Nor did we recommend the MDIFW's recommendation that S.D. Warren manage Sebago Lake water levels to suppress lake trout spawning. In the draft EA, we found Interior's and the MDIFW's recommendations inconsistent with the public interest and comprehensive planning standards of Sections 4(e) and 10(a) of the FPA.

Interior's recommendation to restrict Sebago Lake fluctuations would have resulted in higher water levels throughout the year, and cost $20,930 annually. These higher lake levels could have enhanced littoral zone habitat and thereby benefited shallow water fish species and wetlands. Recreation use also would have been enhanced. However, we found that higher water levels, particularly in the fall and winter likely would have increased shoreline erosion, with associated (and commensurate) effects on water quality and fisheries. With regards to the MDIFW's recommendation, our analysis showed that a winter drawdown of 5 to 8 feet would have substantial adverse consequences to not only fish populations and wetlands, but also the winter ice fishery and macroinvertebrates. The MDIFW's recommendation would cost $169,620 annually.

Our analysis of the lake level issue on Sebago Lake showed that wholesale changes in the current LLMP were not warranted. Therefore, we recommended only minor changes to the LLMP. We found that maintaining the spring target elevation (266.65 feet) through the end of the 3rd week of June would benefit spring spawning fishes, as well as enhance nursery habitat. We also found that the 3-inch tolerance range around the August 1 target (265.17 feet) could benefit warmwater fish species that use littoral zone habitats for spawning and rearing. Finally, our analysis showed that slightly higher water levels in the winter would afford some protection to littoral zone habitat.

We did not recommend adopting the MDIFW's recommendation that S.D. Warren mitigate for smelt migration barriers resulting from project operation. Our analysis showed that smelt could access spawning habitat in all but two tributaries assessed for migration barriers at 266.65 feet. Maintaining winter/early spring water levels at somewhat higher levels, as we recommended, could further enhance access. Spawning habitat in two tributaries would not be accessible at the spring target level of 266.65 feet. In fact, the barriers, which are the result of road culverts, are at elevations of 267.5 and

268.0 feet, well above the crest elevation of the Eel Weir dam. Thus, we found that neither the project, nor its operation, appeared to be affecting access to smelt spawning habitat. We estimated the cost of this measure to be $1,500 annually; but recognized that it could be higher depending on measures implemented. We concluded the MDIFW's recommendation lacked substantial evidence and was inconsistent with the public interest and comprehensive planning standards of Sections 4(e) and 10(a) of the FPA.

Section 10(j) Meeting and Issue Resolution

To resolve the inconsistencies between the agencies' recommendations and the purposes and requirements of the FPA or other applicable law, Commission staff met with representatives from the USFWS, the MDIFW, the MDMR, and the MDEP in Augusta, Maine on September 22, 2005. The recommendations discussed included: (1) minimum flows in the bypassed reach; (2) the SMP for the project; (3) monitoring downstream eel passage; (4) the lake drawdown to suppress lake trout spawning; (5) lake level fluctuations; and (6) mitigation for smelt migration barriers.

BYPASS MINIMUM FLOWS – The discussion of minimum flows centered on the agencies' flow recommendation and the rationale supporting the recommendation. The agencies explained that staff's analysis in the draft EA mischaracterized the agencies' fishery management priorities.

At the 10(j) meeting, the agencies outlined their rationale for higher flows. First, the agencies stated that the draft EA misuses the term "maximum WUA," in that the highest flows modeled (440 and 185 cfs in the riffle/run and braided channel habitats, respectively) do not represent maximum WUA. Rather, these flows are the maximum flows modeled. Second, the agencies stated that the presence of smallmouth bass in the bypassed reach should not carry much weight in flow management decisions, as this species is not considered a threat to trout management. Third, the agencies stated that higher flows and the continued viability of coldwater refugia are not mutually exclusive. Fourth, the USFWS contends that flow management in the bypassed reach should consider the outstanding water quality and habitat available in the reach. Lastly, the agencies stated that the current flow regime does not reflect the existing management program for the bypassed reach.

Staff reiterated the draft EA's conclusions regarding the agencies' recommended flows. Notwithstanding its position, staff agreed to revisit the issue of minimum flows in preparing the final EA, considering not only the information provided by the agencies relative to management priorities, but also the information the MDIFW agreed to file regarding measures to protect the coldwater refugia in the bypassed reach.

As a compromise, the USFWS, in its August 29, 2005, letter commenting on the draft EA, provided an alternative flow recommendation for the bypassed reach. We analyzed this recommendation in the final EA, in section V.C.3.b, *Fisheries and Aquatic Resources – Environmental Analysis*. We conclude that the USFWS's alternative flow recommendation would have a variety of seasonal benefits to the fish populations, as well as angling opportunities in the bypassed reach. However, we estimate that this flow recommendation would cost $131,560 annually, and, thus, do not recommend adopting it.

Based on the information provided by the agencies at the 10(j) meeting, and the additional information provided by the MDIFW, we modified our flow recommendation by increasing flows to 125 cfs from April 1 to October 31 and to 75 cfs from November 1 to March 31. These flows would provide substantial enhancements to aquatic habitat and the coldwater fish community (including *Stenonoma*); as well as angling opportunities, in the bypassed reach, but cost about $62,000 annually. These modified flows, however, differ from the flows recommended by the agencies. We find that the agencies' flow recommendations for the Eel Weir bypassed reach, including the USFWS's alternative flow recommendation, are inconsistent with the public interest standard of Section 4(e) and the comprehensive planning standard of Section 10(a) of the FPA.

Our recommended flows would likely compromise the integrity of the two known coldwater refugia in the bypassed reach. Thus, we now support the USFWS's recommendation for temperature monitoring in the bypassed reach, and recommend that water temperatures be monitored for 3 years as part of our recommended project operations and flow monitoring plan. Based on our review of what would be required, we do not expect temperature monitoring to alter of cost of the monitoring plan ($1,500 annually).

SHORELINE MANAGEMENT PLAN – In the draft EA, we recommended that S.D. Warren develop a SMP similar in design to that required in the licenses for the downstream Dundee (P-2942) and Gambo (P-2931) projects. In its August 29, 2005, comments on the draft EA, the USFWS agreed with staff's recommendations for conservation easements, shoreline protection measures, and aesthetics. The USFWS requested, only, that it be consulted during the development of the SMP.

At the section 10(j) meeting, the USFWS discussed the need for a SMP at the project, or some other appropriate fish and wildlife protection measures. The USFWS stated the following: (1) the SMP should identify critical habitats around Sebago Lake, as well as other important areas (*e.g.*, super-canopy trees used by bald eagles and loon nesting locales); (2) the Commission should exert authority over unregulated activities with the project boundary (*e.g.*, temporary docks, seasonal water lines, etc.);[99] and (3) the SMP should involve some form of monitoring. At the section 10(j) meeting, staff stated

[99] The term "temporary" means in place for 7 months or less.

that it anticipated recommending a SMP for Sebago Lake in the final EA, but did not agree with the USFWS on the nature and scope of the SMP.

In considering the information provided by the participants at the meeting, including reviewing the license for the Moosehead Project (P-2671), we modified our recommendation for a SMP at the Eel Weir Project. We now recommend a SMP for the project that would include conservation easements, buffer zones, mapping Sebago Lake's shoreline, and a permitting program for unregulated activities. We estimate our recommended SMP would cost about $9,730 annually.

DOWNSTREAM EEL PASSAGE – In the draft EA, staff recommended adopting the MDMR's recommendations regarding upstream and downstream eel passage at the project, including the need for effectiveness monitoring. Staff did not adopt the MDMR's operational timing window, but, rather, recommended the downstream facility be operated consistent with those of S.D. Warren's five downstream projects.

The MDMR did not filed comments on the draft EA, not did it comment on staff's eel passage recommendations, including the operational timing provision. However, at the section 10(j) meeting, the MDMR reiterated its recommendation that the sluice gate at the Eel Weir dam be operated from August 15 through November 15, until studies are completed. The MDMR stated that the out-migration timing of eels from Sebago Lake may be different from out-migration timing for downstream, riverine eels. Consequently, the MDMR recommends that a timing study be conducted at the Eel Weir Project,[100] as well as an effectiveness study of the eel passage facilities.

At the section 10(j) meeting, staff agreed to consider the need for an out-migration study at Eel Weir. In the final EA, we continue to recommend a narrower, 8-week, operational window for the downstream eel passage. However, based on the discussions at the section 10(j) meeting and the analysis in section V.C.3.b, *Fisheries and Aquatic Resources – Environmental Analysis*, we are modifying our recommendation for downstream eel passage to include an out-migration timing evaluation. This modification is consistent with the MDMR's out-migration timing recommendation. Because the timing component can be integrated into our existing monitoring requirement, we do not anticipate that the annual cost for downstream eel passage ($26,030), as identified in the draft EA, would change.

[100] Based on our review of the MDMR's 10(j) recommendations, the agency's request for an out-migration study appears to be a modification of its original recommendation.

The USFWS stated that it is satisfied with the EA's treatment of eel passage, but is unclear about the monitoring provisions and the operational timing for the downstream eel passage facility. The MDIFW expressed concern about passage of landlocked salmon through the downstream eel passage facility. We have clarified the monitoring provisions and operational timing aspect of the downstream eel passage recommendation in the final EA. With regard to MDIFW's concern, we encourage the agencies and S.D. Warren to consider downstream salmon passage in our recommended monitoring study.

DRAWDOWN FOR LAKE TROUT SPAWNING – At the section 10(j) meeting, the MDIFW stated that it did not disagree with staff's finding regarding the lake trout drawdown (*i.e.*, inconsistency resolved), but stated that staff's rationale in the draft EA was inaccurate. To assist staff in revising this section of the EA, the MDIFW provided information on: (1) lake trout spawning characteristics in Maine; (2) the timing and magnitude of the drawdown; (3) potential effects on the winter fishery and smelt spawning in the spring; (4) consistency with the USFWS's lake level recommendation; and (5) the status of Sebago Lake's fishery. In addition, S.D. Warren provided information regarding the drawdown's effect on generation and the ability to reach full pond the next spring. At the meeting, staff agreed to consider the information provided in preparing the final EA; thereby, resolving the MDIFW's concerns.

LAKE LEVEL FLUCTUATIONS – At the section 10(j) meeting the USFWS stated that it did not disagree with staff's recommended LLMP, but indicated that staff's discussion of the 2-foot drawdown was mischaracterized. The USFWS stated that it does not recommend a 2-foot drawdown, but rather considers the 2-foot fluctuation an operating band. The USFWS recommended striking this discussion from the EA. The USFWS also recommended that, if its water level recommendation is not adopted, measures to protect shoreline and riparian areas be included in a SMP. Staff agreed to clarify the USFWS's water level management recommendation in the final EA. This inconsistency has been resolved.

SMELT MIGRATION BARRIERS – At the section 10(j) meeting, the MDIFW stated that it did not disagree with the conclusion in the draft EA, but sought clarification regarding the link between the migration barriers and project operation. Staff explained that the two tributaries in question were the result of road culverts located well above the operating lake level of Sebago Lake. The MDIFW accepted this explanation. As a result of the comments filed on the draft EA, we reevaluated lake level management on Sebago Lake. We now recommend a spring full pond elevation of 266.15 feet (± 0.5 foot), which is 0.5-foot lower than the elevation we recommended in the draft EA. The same two tributaries would be impassable at the lower elevation for the same reasons.[101] This inconsistency has been resolved.

B. Recommendations under Section 10(a) of the FPA

Section 10(a) of the FPA[102] requires that any project for which the Commission issues a license shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce; for the improvement and utilization of waterpower development; for the adequate protection, mitigation, and enhancement of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, recreation, and other purposes.

The USFWS made one recommendation that is outside the scope of section 10(j). In addition, the MDMR and the MDIFW filed one and four recommendations, respectively that are outside the scope of 10(j). We consider these recommendations under the broad public interest standard of FPA section 10(a)(1). We considered these recommendations to be outside the scope of section 10(j), because we do not consider such recommendations to be specific measures to protect fish and wildlife.

We recommend that S.D. Warren monitor recreation use at the project on an on-going basis. The Eel Weir Project is subject to the Commission's FERC Form 80 requirements, which requires that S.D. Warren file a recreation report with the Commission every 6 years. Such monitoring, which we conclude to be consistent with the recreation monitoring recommended by Interior, would be sufficient to address the adequacy of recreation facilities and the need for additional facilities to meet future demand.

We recommend adopting the MDMR's recommendation that S.D. Warren consult with the resource agencies on the design, location, and effectiveness testing of American eel passage facilities. We recommend this be a component of our recommended American eel passage plan.

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[101] A third tributary [Trickey Pond outlet, a relatively small (0.35-cfs) stream] would be passable at an elevation of 266.65 feet but may not be passable at 266.15 feet (*see* table 23). The barrier in question is a shallow riffle between elevation 263.2 and 266.7 feet. The elevation of 266.15 feet is a target. Our recommendation includes an operating band of ±0.5 foot. Therefore, we conclude that, except in dry years, Trickey Pond outlet would most likely be passable at our recommended full pond elevation of 266.15 feet.

[102] 16 U.S.C. § 803(a)(1).

We recommend adopting the MDIFW's recommendation that S.D. Warren develop plans for a shallow-water boat launch on S.D. Warren-owned lands. A boat ramp in the Sebago basin would provide access to an area of Sebago Lake that currently requires the use of commercial marinas, primarily for small watercraft that could navigate the shallow depths of the basin.

We recommend adopting, in part, the MDIFW's recommendation that S.D. Warren grant the MDIFW a perpetual easement for angler foot access on lands adjacent to and underlying the Eel Weir bypassed reach. We agree that protecting public access to the bypassed reach would be essential to maintaining the success of the bypass fishery. However, there remain questions regarding the type of conservation easement to be established, the holder of such an easement, and what types of restrictions the easement holder might impose. Thus, we recommend that the lands adjacent to, and underlying, the bypassed reach be placed in a conservation easement. However, at this time, we do not recommend that the easement be granted to the MDIFW.

We do not recommend adopting the MDIFW's recommendation that S.D. Warren conduct a warmwater fishery assessment for Sebago Lake, to determine the effects of the LLMP. The evidence in the record does not support the MDIFW's contention that warmwater fish populations in Sebago Lake have declined since implementation of the LLMP. Moreover, our analysis shows that the current LLMP has little, if any, adverse affect on the warmwater fish populations in Sebago Lake.

We do not recommend adopting the MDIFW's recommendation that S.D. Warren investigate the feasibility of increasing the power canal discharge capacity to minimize lost angling opportunities in the bypassed reach. In section V.C.3, *Fisheries and Aquatic Resources*, we indicated that S.D. Warren undertook such an assessment and concluded that it was not prudent to increase the canal's discharge capacity beyond the current 1,000 cfs. We further concluded that infrequent high-flow events may present a short-term inconvenience to anglers using the bypassed reach. However, we do not expect there to be any long-term effects to angling opportunities.

IX. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving , developing, and conserving waterways affected by a project. Under section 10(a)(2), federal and state agencies filed a total of 19 qualifying plans that address various resources in Maine.[103] We have identified eight federal and five state plans as being relevant to relicensing the Eel Weir Project.[104]

We recommend specific operational and environmental measures that would protect and enhance the environmental quality and integrity of Sebago Lake and the Presumpscot River system. Accordingly, we conclude that the issuance of a new license for the Eel Weir Project, with our recommended measures, would be consistent with the objectives of the comprehensive plans reviewed in this proceeding.

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[103] In addition to the Commission-approved comprehensive plans, we also reviewed, and considered the objectives of, the *Draft Fisheries Management Plan for the Presumpscot River Drainage* (Wippelhauser, G.S., et al., 2001).

[104] (1) Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American Waterfowl Management Plan. U.S. Department of the Interior. May 1986. 19 pp.; (2) Fish and Wildlife Service. 1989. Final Environmental Impact Statement – Restoration of Atlantic salmon to New England Rivers. U.S. Department of the Interior. Newton Corner, Massachusetts. May 1989. 88 pp. and appendices; (3) National Marine Fisheries Service. Atlantic salmon (*Salmo salar*) – Amendment 1 to the New England Fishery Management Council's Fish Management Plan on Atlantic Salmon. October 1998; (4) National Marine Fisheries Service. 2000. Fishery Management Report No. 36 of the Atlantic States Marine Fisheries Commission: Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). April 2000. 78 pp.; (5) National Marine Fisheries Service. 1999. Fishery Management Report No. 35 of the Atlantic states Marine Fisheries Commission: Shad and river herring – Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. April 1999. 77 pp.; (6) National Marine Fisheries Service. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 2000. 6 pp.; (7) Fish and Wildlife Service. Undated. Fisheries USA: The Recreatinal Fisheries Policy of the U.S. Fish and Wildlife Service. Washington, D.C. 11 pp.; (8) National Park Service. 1982. The Nationwide Rivers Inventory. U.S. Department of the Interior. Washington, D.C. January 1982. 432 pp.; (9) Maine Atlantic Sea-Run Salmon Commission. 1984. Strategic Plan for Management of Atlantic salmon in the State of Maine. Augusta, Maine. July 1984. 52 pp. and appendices; (10) Maine Department of Conservation. 1993. Maine State Comprehensive Outdoor Recreation Plan, Volume 1. Augusta, Maine. December 1993. 193 pp.; (11) Maine Department of conservation. 1982. Maine Rivers Study – Final Report. Augusta, Maine. May 1982. 181 pp.; (12) Maine State Planning Office. 1987. State of Maine Comprehensive Rivers Management Plan. Augusta, Maine. May 1987. Three volumes.; and (13) Maine State Planning Office. 1992. Maine Comprehensive Rivers Management Plan. Volume 4. Augusta, Maine. December 1992.

X. FINDING OF NO SIGNIFICANT IMPACT

We prepared this draft EA for the Eel Weir Project pursuant to NEPA requirements. Implementing the protection measures described in this environmental assessment would ensure that the environmental effects of the project would remain insignificant. There would be no significant unavoidable adverse effects.

On the basis of this independent analysis, we conclude that issuance of a new license for the project would not constitute a major federal action significantly affecting the quality of the human environment. With the applicant's proposed action and our recommended measures, the resources we analyzed in this draft EA would be enhanced and/or protected.

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Appendix A – Figures

Project Area & Facilities Maps

Figure 1. Location of Eel Weir Project (FERC No. 2984) within the Presumpscot River Basin. (Source: FERC, 1997a)

Figure 2. Eel Weir Site Location. (Source: FERC, 1997a)

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Appendix B – Maine's LLMP Proposal

STATE OF MAINE
PROPOSED SEBAGO LAKE LEVEL MANAGEMENT PLAN
April 2004

- Whenever possible, the lake shall be managed during spring fill-up to reach a target level of 266.65 feet (spillway crest) on but not before May 1. The allowable target range on May 1 is from 266.65 feet to 266.0 feet.

- Lake levels may be at spillway crest any time between May 1 and the third week in June. Water levels above spillway crest shall trigger increased flows according to the attached operating parameters to move the lake back below spillway crest level.

- After spring fill-up, the lake shall be managed to achieve a minimum target level of 265.17 feet (~1.5 feet below spillway crest) on August 1, which coincides with the short term (1967-1986) median level for that date.

- After August 1, water levels shall be managed to reach a target level on November 1 of 262.5 feet, plus or minus 6 inches, whenever possible, with a maximum level during this period of 265.0 feet on September 1.

- Water levels above a line drawn from 266.65 feet at the end of the third week of June to 265.0 feet on September 1, and thence to 263.0 feet on November 1, shall trigger increased flows according to the attached operating parameters to move the lake level back within the target range.

- Lake levels below a line drawn from 266.0 feet on May 1 to 265.17 feet on August 1, and thence to 262.0 feet on November 1, shall trigger minimum flow according to the attached operating parameters to move the lake back within the target range.

- After November 1, water levels will be managed to achieve a target level of 261.0 feet on or about December 1 in two out of every nine years, starting from the FERC's April 21, 1997 approval of the Compromise plan. The lake level will then be managed to stay within 6 inches of the December 1 target level until January 1. S.D. Warren and the State will jointly determine the years in which to manage for the 261.0 target level based on water levels and precipitation over the previous six months.

- During the mid-October to mid-November salmon spawning season, flows will be capped at 60,000 CFM (1,000 cfs) unless the lake level is above the target range and is rising.

- Beginning on January 1, and continuing until March 1, flows shall be reduced to achieve and maintain lake levels at or above the long term (1910-1986) median levels for this period as soon as practical, without causing damage to S.D. Warren's generating equipment. Thereafter, lake levels shall be managed as deem appropriate by S.D. Warren based on precipitation, snow pack, energy needs and other considerations, with the goal of reaching the spillway crest target level by May 1. Whenever possible, water levels shall be managed to be non higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1 and from 263.5 feet on January 1 to 266.65 feet on May 1.

STATE OF MAINE
OPERATING PARAMETERS FOR
PROPOSED SEBAGO LAKE LEVEL MANAGEMENT PLAN
April 2004

TARGET LEVEL. A target level is a specific lake level that is the goal of the plan on a specific date.

TARGET RANGE. The target range is the range of water levels (identified by color on the attached graph) from May 1 to November 1 within which normal flows are released in an attempt to achieve the specific target levels.

NORMAL FLOWS. Normal flows are the flows released from the lake when lake levels are within the target range between May 1 and November 1. Normal flows may vary between 20,000 CFM (333 cfs) and 60,000 CFM (1,000 cfs) and shall be adjusted to move the lake level toward the next target level at all times, except in emergency situations, as described below. Except for emergency situations, normal flows shall be adjusted as necessary no more than once per week.

ABNORMAL FLOWS. Abnormal flows are the increased or decreased flows released from the lake when the lake levels are outside the target range between May 1 and November 1. Abnormal flows shall be adjusted in stages to move the lake level toward the next target level at all times, except in emergency situations, as described below.

STAGE 1 FLOWS. Prior to adjusting to Stage 1 flows, flows shall be at the normal minimum (20,000 CFM) or maximum (60,000 CFM) for more than five business days and the lake level shall be outside the target range, except that flows shall be increased immediately whenever the lake level rises above spillway creast (266.65 FT MSL).

Minimum Flow. For lake levels below the target range, flows shall be reduced to the minimum flow required to maintain mandatory water quality standards in the lower Presumpscot River, as determined by DEP. This flow is currently 15,000 CFM (250 cfs) and may be adjusted downward in the future based on a additional modeling analysis.

Maximum Flow. For lake levels above the target range, flows shall be increased up to a maximum of 100,000 CFM (1,667 cfs) or such higher flow as necessary to prevent water levels from reaching 267.15 MT MSL (6 inches above spillway crest).

STAGE 2 FLOWS. Prior to adjusting to Stage 2 flows, Stage 1 flows must be maintained for no more than one week and the lake level shall not be moving toward the target range.

Minimum Flow. For lake levels below the target range, flows shall be the same as Stage 1 minimum flows.

Maximum Flow. For lake levels above the target range, flows shall be increased up to 160,000 CFM (2,667 cfs) or such higher flow as necessary to prevent water levels from reaching 267.15 FT MSL (6 inches above spillway crest).

STAGE 3 FLOWS. Prior to adjusting to Stage 3 flows, Stage 2 flows must be maintained for no more than one week and the lake level shall not be moving toward the target range.

Minimum Flow. For lake levels below the target range, flows shall be the same as Stage 1 flows.

Maximum Flow. For lake levels above the target range, flows shall be increased up to 210,000 CFM (3,500 cfs) or such higher flows as necessary to prevent water levels from reaching 267.15 FT MSL (6 inches above spillway crest).

MONITORING. Lake levels shall be monitored using an approved U.S.G.S. gage to be read remotely at least once a day, with the readings published by the U.S.G.S. Whenever the U.S.G.S. gage is inoperable, a manual reading of the lake level will be made and will be provided to the U.S.G.S. For the purpose of confirming compliance with this plan, U.S.G.S., s provisional average daily reading of the lake level shall be used.

BYPASS FLOWS. Due to the fishery in the bypass channel below the Sebago Lake (Eel Weir) Dam, all efforts consistent with this plan shall be made to minimize the duration fo flows in the bypass above the minimum bypass flow required by the FERC license during the April 1 to July 1 and September 1 to November 1 fishing periods.

COMPLIANCE. Where lake levels are above or below the target range, or are above or below a stated target level, S.D. Warren shall be in compliance with the plan as long as flows have been increased or decreased in accordance with the plan and the lake level is being managed in an attempt to return to the target range and to achieve the next specified target level. The flows implemented in Stage 1 or 2 or 3 may be adjusted at any time that the lake level is moving toward the target range, but the lake level must continue to move toward the target range.

REPORTING. The State and S.D. Warren agree that a report is required to be filed with FERC only when the lake level is more than six inches above or below the established target range. S.D. Warren shall provide weekly flow schedules to the agencies by regular mail, or by other agreed-upon means, which will indicate what flow is anticipated for the next week and any changes in flows for the previous week.

LAKE LEVEL COORDINATION. If the level of Sebago Lake is above the target range any time during the October 15 to November 15 salmon spawning season, every effort will be made by the Department of Conservation to delay or reduce drawdown flows from Brandy Pond/Long Lake through the State-owned Songo Lock and Dam. S.D. Warren shall respond under the provisions and operating parameters of the plan to any increased lake level as a result of the drawdown of Brandy Pond/Long Lake.

261.0 TARGET LEVEL. Subject to discussion and agreement between the State and S.D. Warren, flows may be increased above the flows otherwise required by this plan in an effort to lower the lake to achieve the target level of 261.0 ft on or about December 1 in two out of every nine years, and S.D. Warren shall not be constrained by the target range nor the November 1 target level. If S.D. Warren is unable to achieve the 261.0 ft level in two out of every nine years despite decisions by S.D. Warren and the State to increase flows, then an attempt to achieve the 261.0 ft level shall be made in the next year(s) until the two-in-nine year requirement is met. Such action by Warren shall be considered to be in compliance with this plan. Once the 261.0 ft target level is reached, the lake will be managed so as to stay within 6 inches of that target level until January 1.

EMERGENCY SITUATIONS. Flows may be temporarily adjusted outside the range of flows required above in the event of equipment failure, approved maintenance activities, power supply emergencies, downstream flooding, public safety considerations, existing or predicted extreme meteorological events, or by order of local, state or federal authorities.

Appendix C – LLMP Wetlands Monitoring Survey Results

Results of LLMP wetland monitoring surveys, by transect, 1999 to 2002. (Source: Staff; Normandeau, 2000; Normandeau, 2001b; Normandeau, 2002; Normandeau, 2003)

	1999 [a]		2000		2001		2002	
	# of Dominant Species [b]	Total Percent Cover or dbh [c]	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh
Transect 1								
Segment 1								
Herbaceous	1	20	2	28	1	120	1	110
Segment 2								
Herbaceous	3	125	2	90	3	92	2	97
Right side shrub	1	30	1	30	1	25	1	25
Left side shrub	1	25	1	25	1	25	1	25
Segment 3								
Herbaceous	1	7	1	15	0	N/A	0	N/A
Right side shrub	1	90	1	90	1	80	1	100
Left side shrub	2	75	1	85	2	100	2	100
Right side tree [d]	1	77	1	27.5	1	30	1	32
Segment 4								
Herbaceous	2	17	0	N/A	0	N/A	0	N/A
Right side shrub	2	80	2	80	1	75	1	75
Left side shrub	2	95	2	95	2	100	2	131
Right side tree	1	11	1	12	1	12	1	12
Left side tree	2	74.5	2	78	2	78	2	84
Transect 2								
Segment 1								
Herbaceous	2	90	2	85	1	115	3	86
Segment 2								
Herbaceous	4	85	2	95	1	47	1	60

	1999 [a]		2000		2001		2002	
	# of Dominant Species [b]	Total Percent Cover or dbh [c]	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh
Right side shrub	2	35	2	50	1	20	1	20
Left side shrub	2	40	1	53	1	25	1	36
<u>Segment 3</u>								
Herbaceous	4	30	0	N/A	0	N/A	5	38
Right side shrub	3	65	2	65	2	60	2	60
Left side shrub	1	30	1	40	1	26	1	26
Right side tree	1	5	1	6	1	11	1	11
Left side tree	1	17	1	18	1	13	1	13
<u>Segment 4</u>								
Herbaceous	2	12	0	N/A	0	N/A	0	N/A
Right side shrub	2	85	2	95	2	81	2	87
Left side shrub	2	60	2	52	1	51	1	51
Right side tree	2	14	2	14	2	15	2	20.5
Left side tree	3	32	2	32	1	40	1	41
Transect 3								
<u>Segment 1</u>								
Herbaceous	0	N/A	0	N/A	1	55	2	30
<u>Segment 2</u>								
Herbaceous	2	70	3	105	3	90	4	92
<u>Segment 3</u>								
Herbaceous	1	15	0	N/A	0	N/A	0	N/A
Right side shrub	2	90	1	100	1	105	1	110
Left side shrub	1	100	1	100	1	112	1	116
<u>Segment 4</u>								

	1999 [a]		2000		2001		2002	
	# of Dominant Species [b]	Total Percent Cover or dbh [c]	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh
Herbaceous	1	100	2	100	2	96	2	100
Right side shrub [d]	3	22	2	60	2	85	2	75
Segment 5								
Herbaceous	1	35	0	N/A	2	35	2	35
Right side shrub	2	50	3	95	2	110	2	110
Left side shrub	2	60	2	85	2	85	2	92
Right side tree	1	14	1	15	1	15.5	1	10
Left side tree	1	24.5	1	33	1	33	1	59.5
Segment 6								
Herbaceous	2	25	1	30	1	28	1	28
Right side shrub	1	60	2	80	1	111	1	111
Left side shrub	2	15	2	15	1	37	1	37
Right side tree	2	51.5	2	54.5	2	55	2	55
Left side tree	1	31.5	2	37	2	43	2	45
Transect 4								
Segment 1								
Herbaceous	1	98	2	70	3	90	3	95
Segment 2								
Herbaceous	1	31	1	25	1	50	1	20
Right side shrub	2	70	2	65	2	70	2	68
Left side shrub	2	55	2	80	2	85	5	85
Right side tree [e]	1	77	1	77	1	138	0	N/A
Segment 3								

	1999 [a]		2000		2001		2002	
	# of Dominant Species [b]	Total Percent Cover or dbh [c]	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh
Herbaceous	2	41	1	30	1	55	1	30
Shrub [f]	1	29	2	50	1	65	2	83
Tree [f]	1	187	1	187	1	207.5	1	207.5
Transect 5								
Segment 1								
Herbaceous	0	N/A	0	N/A	0	N/A	0	N/A
Segment 2								
Herbaceous	2	95	3	95	3	85	2	88
Segment 3								
Herbaceous	3	15	2	30	0	N/A	0	N/A
Right side shrub	1	100	1	100	2	115	2	115
Left side shrub	2	60	2	60	2	70	2	75
Left side tree [g]	0	N/A	1	56.5	1	56.5	1	59
Segment 4								
Herbaceous	3	25	3	30	2	47	2	35
Right side shrub	2	25	0	N/A	3	40	2	38
Left side shrub	2	25	2	25	1	27	1	30
Right side tree	2	80.5	3	91.5	2	98	2	91.5
Left side tree	3	72	3	65.5	2	77	2	83

[a] Data from 1998 were not included in this table due to different sampling methods.
[b] The number of dominant species is a measure of diversity.
[c] Trees are measured (diameter) at breast height (dbh, in inches) as opposed to % cover.
[d] There were no shrubs on the left side of the transect.
[e] There were no trees on the left side of the transect.
[f] Single quadrant on right side of transect due to plant community configuration.
[g] There were no trees on the right side of the transect.

Appendix D – Staff Responses to Comments on Draft EA

APPENDIX A
STAFF RESPONSES TO COMMENTS ON THE DRAFT EA

The Commission staff issued its draft environmental assessment (EA) for the proposed relicensing of the Eel Weir Project on July 11, 2005. Staff requested comments on the draft EA be filed within 45 days from the issuance date, or by August 25, 2005, which was subsequently extended until September 9, 2005. The following entities and individuals filed comments pertaining to the draft EA.

Commenting Entity	Date Filed
Carol L. Steiman	August 22, 2005
Portland Water District	August 24, 2005
S.D. Warren Company (S.D. Warren)	August 25, 2005[105]
Conservation Law Foundation (Conservation Law)	August 25, 2005
Sebago Lake Landowners & Users Coalition (Sebago Coalition)	August 25, 2005
Sebago Lake Marina (Sebago Marina)	August 25, 2005
Sebago Pines Property Owners Association (Sebago Pines)	August 26, 2005
U.S. Fish and Wildlife Service (USFWS)	August 29, 2005
U.S. Geological Survey (USGS)	August 29, 2005
Maine Department of Inland Fisheries and Wildlife (MDIFW)	August 30, 2005
Friends of Sebago Lake (FOSL)	September 7, 2005 September 8, 2005
Maine Geological Survey (Maine Geology)	September 9, 2005
Town of Naples, Maine	September 13, 2005
Ted Davis	August 25, 2005
Ben R. Chapman	August 30, 2005
Theodore Tibbals	August 30, 2005
Charles E. Bragdon, Jr.	August 30, 2005
Stephen M. Kasprzak	August 31, 2005 September 7,2005[106] September 12, 2005
Sebago Harbor Association (Sebago Harbor)	September 1, 2005
Philip & Pearl White	September 8, 2005
Timothy A. Toomey	September 15, 2005
Daniel & Jeanne Boland	September 15, 2005
Maine Public Employees for Environmental Responsibility (Maine PEER)	September 15, 2005

[105] S.D. Warren filed additional comments on October 17, 2005, responding to many of the comments filed by the agencies and non-governmental organizations.

[106] Includes letters dated August 24 and 31, 2005.

33 Property Owners | August 8, 2005 to October 24, 2005

Below, we summarize the substantive comments, provide responses to those comments, and explain how we modified the text of the draft EA, as appropriate, to address the comments. Changes addressing editorial comments were made to the final EA, but are not described below. The comments are grouped by topic for convenience.

Procedural and General

Comment: Mr. Stephen Kasprzak, along with numerous other citizens and shoreline residents recommend the Commission require a monetary penalty for future trespasses of S.D. Warren's flowage easements.

Response: For license violation, the Commission has comprehensive and exclusive civil enforcement authority under the FPA, based on sections 31, 314, 315, and 316 of the FPA. The FPA does not authorize the Commission to impose liquidated damages, or otherwise include a damages provision in a project license. *See*, e.g., Consumers Power Company, 68 FERC ¶ 61,077 at 61,378-80 (1994). Moreover, under section 10(c) of the FPA, licensees are liable for all damages to the property of others resulting from project construction or operation. Any actions for damages, such as those, resulting from trespasses of flowage easement are matters left for review by state courts.

Hydrology, Lake Level Management, Flood Control, and Associated Issues

Comment: S.D. Warren states that the existing tolerance above 266.65 ft to 267.17 ft for May-June should not be removed because this could compromise their ability to achieve full pond in May-June and meet the August 1 target. S.D. Warren states that capping the lake level at full pond would force it to manage the lake level to stay below the spillway at all times to avoid claims of non-compliance. S.D. Warren further states that a more appropriate solution is to add a provision dictating certain actions (*e.g.*, specified increases in outflows) be taken if the lake level reaches the 266.65 ft. level.

Response: Based on the many numerous comments received on the LLMP, we now recommend a full pond target elevation of 266.15 feet ± 0.5 foot, and moving the earliest date for reaching that target to May 15. These measures should assist S.D. Warren in refilling the lake in the spring. We also recommend that water be spilled should lake levels exceed the crest elevation of 266.65 feet.

Comment: S.D. Warren objects to the provision to reduce lake levels for 2-in- 9 years, citing potential difficulties in achieving a full pond the following May-June. S.D. Warren, however, does state that it is willing to seek to achieve low lake levels in 2 out of 9 years if: (i) the LLMP is modified to extend the period in which to achieve that low lake level through February; and (ii) the LLMP is modified to acknowledge the effect of the low lake level on its ability to fill the lake by waiving the need to achieve full pond the following year (*i.e.*, the spring following the low water level event).

Response: We have reviewed the record and conclude that the information is inconclusive where it concerns eliminating the 2-in-9-year drawdown. Therefore, we recommend retaining the 2-in-9-year drawdown to 261.0 feet as an option for restoring sand to beaches and, otherwise, maintaining beach profile stability. Our hydrologic analysis shows that in all, but extreme dry years, the lake can be refilled. In addition, we now recommend a full pond target elevation of 266.15 feet ± 0.5 foot, and moving the earliest date for reaching that target to May 15. These measures should assist S.D. Warren in refilling the lake in the spring. Should a situation arise where S.D. Warren anticipates being unable to refill the lake, it can seek a temporary variance from the requirements of the LLMP.

Comment: S.D. Warren concurs with staff's recommendation that the LLMP should be amended to allow for temporary variances. S.D. Warrens, however, asks staff to clearly define the process for obtaining concurrence for the variance, the agencies to be consulted, and schedule for a timely final decision. In addition, S.D. Warren requests that its obligation to file a report under the revised LLMP be limited to circumstances when the lake level is outside of the plan target ranges or target levels continuously for 2 weeks.

Response: As is our practice in operational articles, we include provisions allowing licensee's to modify operational requirements based on mutual agreement between the licensee and pertinent agencies, as well as under emergency conditions. We would expect that the increased flexibility provided with our recommended changes to the LLMP should reduce the need to file reports. Therefore, we do not recommend any special provisions to address S.D. Warren's reporting concerns.

Comment: S.D. Warren raises concerns that the analysis of the LLMP relies on average water levels, while such an average does not happen every year in practice. S.D. Warren comments that the final EA should acknowledge that even though the analysis utilizing average and normal conditions yields a reasonable expectation that the LLMP can be complied with, there is no assurance or expectation that the LLMP can be complied with under all conditions.

Response: Our hydrologic analysis indicates that, except in the most extreme dry years, S.D. Warren would be able to refill Sebago Lake. In addition, our recommended changes to the LLMP should give S.D. Warren more flexibility in maintaining lake levels and compliance with the LLMP. We cannot offer S.D. Warren any guarantees that it will not be held accountable if violations to the LLMP occur. Allegations of non-compliance will be addressed at the time relevant events occur.

Comment: S.D. Warren does not agree with staff's adoption of the state's proposal to require a minimum lake level from January 1 to March 1 equal to the long-term (1910-86) median level, which is always above 262 ft, citing year-to-year precipitation variability and it's inability to manage the lake level to meet the May 1 target without going over in high snow pack years. S.D. Warren states that this proposal seems geared toward filling the Lake during low or drought years, but raises an issue with above average precipitation years. S.D. Warren requests that, should staff adopt the recommendation, it not be considered a violation of the LLMP if the lake levels exceed the 266.65-ft. level before or after May 1 if the lake is above median levels at the time. Furthermore, S.D. Warren asks that staff acknowledge in the final EA that this January to March minimum requirement increases the probability of the lake level exceeding 266.65 ft., and increases the probability of flooding downstream.

Response: We offer S.D. Warren no guarantees that it will not be held accountable should violations in the LLMP occur. We have revised our analysis in the final EA to acknowledge the increased probability of flooding, particularly downstream. We revised our recommendation to lower the spring target to an elevation of 266.15 feet ± 0.5 foot and move the target date to May 15. We also recommend that water be spilled when lake levels reach 266.65 feet. These changes should provide S.D. Warren with flexibility to manage lake levels during the spring to reach full pond and minimize flooding risks along Sebago Lake and downstream along the Presumpscot River.

Comment: S.D. Warren requests that staff reconsider its earlier (July 2004 filing) requests to amplify the intent of the LLMP, as well as changes to the reporting requirements. S.D. Warren states that staff should expressly acknowledge in the final EA that the intent of the LLMP is to be a reactive plan, focused on S.D. Warren responding to the level of the lake pursuant to the parameters stated in the LLMP, and that the plan should not be subject to annual attempts by constituents to seek changes.

Response: The purpose of the LLMP should be to manage lake levels in Sebago Lake within prescribed targets and limits. While it is important to react to conditions as they occur and unfold, it is equally important to take proactive steps in managing lake levels and flows downstream in the Presumpscot River, as well. While annual attempts to change the LLMP are excessive and likely not appropriate, we cannot guarantee that future changes in the LLMP won't occur.

Comment: S.D. Warren recommends that rather than accepting the state's recommendation to categorically reduce the minimum flow under Stage 1, the LLMP Operating Parameters be modified to provide for a reduction to 15,000 cubic feet per minute (cfm) only during abnormal flow conditions when the water temperature is below 22 ºC.

Response: There is a lack of information to address changes to the flows that are part of the LLMP Operating Parameters (*i.e.*, the MDEP has not yet updated its water quality model for the Presumpscot River). Consequently, we do not recommend making any changes to the flow protocol included as part of the existing LLMP at this time.

Comment: USFWS noted an inconsistency within the draft EA, where it stated that a full 2-foot drawdown during the May/June fish spawning period could disrupt spawning and dewater habitat. The USFWS states that based on data in the DEA, a drawdown of this magnitude rarely, if ever occurred, since 1910.

Response: We maintain that if a 2-foot drawdown did occur during the May/June fish-spawning period, there could be adverse effects on fish spawning. Figure 7 of the draft EA and final EA indicates that drawdowns of 2 feet or greater have occurred during this period. The 90 percent exceedence level for the lake during this period is about elevation 262.5 feet (about a 4-foot drawdown), which indicates that this level occurred about 10 percent of the time from 1910-1986. Notwithstanding the aforementioned information, we have expanded our discussion of the recommended 2-foot drawdown to mention the probability of such a drawdown in an effort to clarify the context of the recommendation and potential effects.

Comment: During the section 10(j) meeting, the USFWS indicated that the draft EA may have misstated its recommendation regarding lake drawdowns during the spring. The USFWS is not advocating a 2-foot drawdown during the spring, but only that drawdowns may occur in a 2-foot operating band.

Response: We have revised the final EA to clarify the USFWS's recommendation.

Comment: The Maine Geology comments that too much emphasis has been placed on May 1 as the full pond date and reiterates that the acceptable range for full pond is May 1-June 15, and that the target level be 266.65 to 266.0 ft.

Response: We reviewed the hydrologic record and recommend an alternative full pond target date of May 15, and a target elevation 0.5-foot lower than the current full pond target, in an attempt to reduce the risk of flooding associated with the combination of strong, late season storms (April-early May) and a full lake. Requiring these measures would help minimize "trespass" of the flowage easements, and protect beaches from the large waves known to produce significant erosion.

Comment: Maine Geology comments that the 10-year beach profile record demonstrates that lake waves must be capable of moving sand outside of storm events and that Maine Geology reports (Dickson and Johnston, 1994; Johnston and Mixon, 1998) show the nearly seasonal cycle of beach profile adjustment, most of which happens during periods of insignificant storms. Maine Geology further states that its profile work shows that major storms do not "cancel out major changes in profiles," but rather are the sources for significant long-term changes to the profiles.

Response: We have revised the final EA to reflect this information.

Comment: Maine Geology comments on certain misconceptions that exist regarding the 2-in-9-year low lake level. Specifically, Maine Geology states that this measure defines a process that will likely require many cycles to show significant long-term improvement, and that a March 2002 accretion event is encouraging. Maine Geology also states that the 2-in-9-year low water level is the only measure in the LLMP aimed at improving beaches rather than just maintaining the status quo.

Response: We have reviewed the record and conclude that there is not enough information to support eliminating the 2-in-9-year drawdowns. Therefore, we recommend retaining the 2-in-9-year drawdown to 261.0 feet as an option for maintaining beach profile stability.

Comment: Maine Geology raises an issue with bullet (b) on page 29 of the draft EA that reads, "…following a drawdown to 261.0 feet, S.D. Warren can not guarantee that Sebago Lake will refill the next year, due to hydrological issues;" by submitting statistical analysis that shows spring lake levels depend strongly on winter/spring precipitation and hardly at all on fall lake level.

Response: In reference to hydrological requirements to refill the lake following a drawdown to 261.0 feet, we have expanded our analysis to include the volume of flow required to fill the lake from various drawdowns in both the *Water Resources* and *Recreational Resources and Land Use* sections. The analysis indicates that in all but the most severe droughts (low flows below the 75 percent exceedence levels) the lake would fill to the LLMP full target level. To ensure that lake levels reach the full pond target range in most years, we now recommend moving the earliest target date for full pond to May 15, and the target elevation to a maximum of 266.15 feet. This would assist S.D. Warren in filling the lake after a drawdown to 261.0 ft. the preceeding winter.

Comment: Maine Geology states that it would be best to have a period of at least 2 weeks at 261.0 ft. to allow sand to be acted upon by waves and ice, and suggests that the period for achieving 261.0 ft. could be extended to mid-winter which would address S.D. Warrens concerns regarding operating head, excessive spilling of large volumes of water, and other resource issues.

Response: We acknowledge that operations during the winter are dependent on various hydrological factors of the season (*e.g.*, snow pack, precipitation, etc.) and attaining a 261.0-foot elevation requires certain flexibility in management strategy. Drawdowns to 261.0 feet could last 2 weeks or more, depending on the hydrological variables S.D.

Warren uses when assessing lake levels for the upcoming season. Therefore, after reviewing the record in this proceeding, we conclude that no changes to the timing or magnitude of the 2-in-9-year drawdown are warranted at this time.

Comment: Maine Geology points out a contradiction in the analysis on page 35 of the draft EA, under the subsection 'increase water levels.' Maine Geology states that the summary statement contradicts earlier statements that periodic lowering of the lake shows no benefit to beach profiles.

Response: We have revised the final EA to correct this apparent discrepancy.

Comment: Maine Geology states that there is too much emphasis on the line from Jan. 1 to April 30 as a recommended maximum level. Maine Geology also states that S.D. Warren should manage lake levels in a way that incorporates knowledge of year-to-date precipitation, snow pack conditions, and short- and long-term forecasts to help the lake reach full pond after April 30, at levels that mimic the long-term median when possible.

Response: We agree that S.D. Warren should be allowed to manage lake levels according to on-going hydrological conditions. Based on the historical record, we have every reason to believe that S.D. Warren would continue to manage lake levels appropriately; however, high lake levels during the spring months is not without consequence. We are aware of the potential risks associated with increasing lake levels during seasons in which strong storms are known to occur, and, as such, recommend the earliest fill date be pushed back to May 15, and that the target level be reduced 0.5 foot, to retain some flood storage capability and protect other resources around Sebago Lake.

Comment: Maine Geology questions the reference to a USGS erosion study on page 36 of the draft EA, suggesting that the text should read "Maine Geological Survey beach erosion studies" rather than USGS.

Response: This reference has been corrected in the final EA.

Comment: Sebago Marina expressed concerns that the draft EA does not do a sufficient job of analyzing potential effects of the 2-in-9-year drawdown proposal under drought conditions, as compared to the 250-year flood conditions. Sebago Marina comments that there is no analysis on the potential effects associated with a low drawdown followed by a small snow pack, low precipitation (drought condition) spring.

Response: This information is presented in table 4 of the *Geology and Soils* section of both the draft EA and final EA, and is discussed in the context of potential effects on recreational resources in the final EA.

Comment: Sebago Marina raises concerns that the 2-in-9-year drawdown provision would eliminate the prime habitat for American eels, which would conflict with the recommendation that S.D. Warren provide passage to improve eel abundance.

Response: There is no information in the record to indicate where the prime habitat for American eel is in Sebago Lake, nor the seasonal distribution. The 2-in-9-year drawdown would only occur during the winter months, when most fish species (including the eel) are not likely occur in the shallow-water areas of the lake most susceptible to detwatering. This drawdown would also approximate the long-term average winter water levels, so adverse effects on the eel are unlikely due to this drawdown.

Comment: Sebago Marina recommends that the final EA adopt the state's recommended LLMP, without the 2-in-9-year drawdown. It cites the fact that there are no benefits going to 261.0 ft, while every inch above 262.0 ft. is a benefit to wetlands and shallow areas of the lake.

Response: We have reviewed the record and conclude that the information is inconclusive where it concerns eliminating the 2-in-9-year drawdown. Therefore, we recommend retaining the 2-in-9-year drawdown to 261.0 feet as an option for restoring sand to the beaches and otherwise maintaining beach profile stability.

Comment: Sebago Marina contends that the August 1 target level of 265.0 ft is low. Sebago Marina states that this elevation gave certain shoreline residences false hope and misdirection that allows owners to think they can build at safe elevations, which will cause more problems in the future.

Response: The August 1 target level under the existing, and our recommended, LLMP is elevation 265.17 feet. We are recommending a ± 3-inch operating band around the target elevation. Based on our analysis, we conclude that this elevation and operating band is appropriate for this time of year. The Commission has authority over developmental activities within the project boundary, to the extent of the licensee's interest in lands and waters within the project boundary. The Commission, however, cannot control development around Sebago Lake, outside the project boundary. This is a decision left to developers, property owners, and others, after weighing the risks of building along the shoreline.

Comment: Sebago Marina contends that the May 1 target range of 266.65 - 266.15 ft. would affect spawning fish and nesting birds, and create higher releases in the Presumpscot, wasting water that could be used to mitigate low flows in the summer, and reduce storage for generation.

Response: A targeted lake level of 266.15 feet, with an upward range to 266.65 feet, is essentially "full pond" and would provide the maximum amount of fish spawning habitat along the shoreline of Sebago Lake. This would benefit shoreline-spawning resident species by providing good spawning habitat and good early-rearing conditions, as the lake would remain relatively high during the early-summer period. It is possible that if heavy rains were to occur during a period of higher lake levels that water would have to be spilled from the lake to prevent lake levels from exceeding the licensed maximum. Furthermore, we recommend lowering the target level to 266.15 feet ± 6 inches. This 1-foot operating band is not expected to have any significant effects on resident fish populations in Sebago Lake. A 1-foot fluctuation restriction is common at hydropower projects in the Northeast, and is designed to minimize effects on spawning and rearing habitat.

Comment: Sebago Marina questions staff's recommendation to lower the lake 2-in-9 years, citing negative effects to boating (known to occur below 263.0 ft.), and the fact that S.D. Warren can not fill the lake the following spring while simultaneously draining thousands of acres of shallow areas.

Response: We considered the amount of inflow required after a drawdown to elevation 260.0 and 261.0 feet in the final EA. Our analysis shows that only in the most extreme dry winter/spring runoffs (flows exceeded less than 95 percent of the time) would the lake fail to reach 263.5 feet (the level necessary for boat launching) by April 1. For example, the spring of 2002, a year after a drawdown to 261.0 feet, was followed by 95 percent exceedence flows, and the lake was boatable (above 263.5 feet) by mid-April.

Comment: Sebago Marina states that staff ignored MDIFW's comments regarding fish populations in the Songo River. According to Sebago Marina, the MDIFW commented that, based on electrofishing, fish populations in the Songo River were low compared to the quality and quantity of habitat available. Sebago Marina states that the MDIFW attributes this finding to the 2-in-9-year drawdown.

Response: We considered the comments of the MDIFW regarding recent electrofishing results in Sebago Lake and some of its tributaries and coves (*i.e.*, Songo and Muddy Rivers, the mouth of the Songo River, and Kettle Cove). We find this information unpersuasive. First, aside from the MDIFW's conclusory statements, there is no corroborating information (*e.g.*, population statistics) in the license application or other filings documenting reduced populations of resident fish in the lake or other sampled areas. Second, although the MDIFW expressed some concern about the effects of winter drawdowns on resident fish, it, at the same time, recommended deep winter drawdowns to control lake trout spawning. Finally, electrofishing results may be influenced by a number of factors (water conductivity, weather, light level, efficiency of electrofishing equipment, etc.).

Comment: Sebago Marina agrees with the recreation analysis that concludes boating resources are negatively affected at elevations below 263.0 ft., but suggests that the analysis should be expanded to address potential effects to recreation when the lake is drawn down to 261.0 ft and followed by drought conditions the following spring and summer. Under such conditions, Sebago Marina states that the lake level may not recover to the 263.0-ft. elevation.

Response: We have added additional analysis of this issue to our discussion of potential effects on recreation boating resources in the final EA. See section V.C.5.b, *Recreational Resources and Land Use – Environmental Effects*.

Comment: FOSL and Mr. Stephen Kasprzak contend that the final EA must include an in-depth analysis and comparison of the Commission's 1997 LLMP with other LLMPs proffered in this proceeding. FOSL and Mr. Kasprzak cite staff analysis in the 1997 LLMP record rejecting the state's proposed lake levels because it would result in annual average water levels well above the historic annual mean as a reason to add the analysis. Furthermore, FOSL and Mr. Kasprzak question why the current LLMP is being analyzed as part of this proceeding when it was already rejected in the 1997 FEIS.

Response: We previously analyzed the lake level management issues for Sebago Lake in the 1997 EIS. This analysis speaks for itself, and we see no reason to repeat that analysis in this final EA. Our analysis of the lake level management issue in the final EA builds upon the analysis in the 1997 EIS. In this final EA, we reference the analysis and conclusions from the 1997 EIS, as necessary. This approach is consistent with CEQ's regulations governing preparation of an EA or EIS.

Comment: FOSL and Mr. Kasprzak comment that the draft EA does not cite any demonstrable benefits accruing from the May 1 full pond requirement and that historically the Lake would not achieve this elevation typically until May 31 or later. FOSL contends that the 9-day trespass this past spring (2005) is strong evidence to reevaluate the May 1 target elevation.

Response: Based on comments filed on the draft EA and our hydrologic analysis in the final EA, we now recommend that the target date for reaching full pond (266.15 feet ± 0.5 foot) be moved to May 15.

Comment: FOSL comments that the statement on page 39 of the DEA "in fact we would expect some level of erosion to occur regardless of how the lake level in Sebago Lake is managed" leads a reader to believe that beach erosion and accretion are independent of lake levels which is contradictory to the scientific literature, including that cited in the Commission's 1997 FEIS that shows that beach erosion and accretion are the physical expression of water levels acting upon a lake's shoreline. FOSL also states that the consequences of using the statement in question builds arguments in the document that cannot be said are based upon accepted and published research on beach erosion so that any conclusions or recommendations would be arbitrary and capricious.

Response: We have revised the sentence in question to clarify the relationship between lake levels and shoreline/beach erosion.

Comment: FOSL raises an issue with a statement on page 39 of the draft EA which states, "maintaining higher lake levels, particularly during the fall and early winter, would exacerbate the ongoing erosion problem," by noting that the statement (1) conflicts with the a statement mentioned in the above comment, and (2) continues to imply that erosion occurs by some unnamed force as opposed to high water levels (which the scientific record identifies as the principal cause of ongoing erosion). FOSL states that by not identifying lake levels as the primary cause, the analysis in the current draft EA rejects the scientific rationale used by Commission staff in the 1997 FEIS.

Response: We agree that erosion results from a combination of factors, including lake level. Therefore, we have revised the language in this section to be consistent with the 1997 EIS and other statements and/or analysis presented in the final EA.

Comment: FOSL comments that the existing discussion in the draft EA that relies on specific beach profile studies should be expanded to give the reader the context of the study results. FOSL states that the studies, and the draft EA discussion that relies on the study's findings, began in 1990 after years of beach erosion had already occurred. Thus, the findings summarized on page 204 of the draft EA are incomplete and misleading compared to the historical erosion that occurred in the years leading up to the start of the study. Thus, FOSL contends that beach erosion could not be documented in the beach profile monitoring studies because it had already occurred.

Response: The purpose of the study, as outlined in the study report, was to monitor beach profiles to evaluate beach dynamics under the LLMP. Severe beach erosion is documented in the reports filed with the Commission, specifically the 1996 beach erosion report by Maine Geology.

Comment: FOSL questions the statement on page 204 that states "Although certain beaches, at points in time, show short-term changes, generally the beaches show long-tern stability interrupted at times by changes due to storms that occur during high water periods." FOSL requests that the final EA clarify the statements in this sentence, particularly the phrases "long-term stability," because as FOSL points out, beach profile studies only cover a period of less than 15 years and did not begin until 1990. Clarification of this statement and other conclusory statements in the draft EA should be reviewed to eliminate conditional language that dilutes the meanings and conclusions like the phrase above.

Response: We have revised our analysis in section V.C.1, *Geology and Soils*, to more accurately reflect the history of lake level management on Sebago Lake. Based on the analysis in the final EA, we find that the existing LLMP has accelerated the historical rate of erosion around Sebago Lake. We recognize, however, that based on S.D. Warren's and Maine Geology's monitoring studies, the beach profiles show stability, where beach erosion and accretion occurs based on environmental events. We note that our recommended changes to the existing LLMP should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding, but maintain appropriate levels to protect wetlands and recreational boating opportunities.

Comment: FOSL requests that staff revise sentences in the draft EA such as the one on page 204 that begins with "Notwithstanding these findings, we stated in V.C.1. Geology and Soils, … ." to eliminate or clearly define all the conditional language embedded in the conclusion statements. FOSL contends that such language invites the Commission staff to make arbitrary and capricious decisions.

Response: We have revised our analysis in the final EA to make more definitive statements regarding our conclusions, where possible to do so. However, our environmental analysis is often based on imperfect data and information. Moreover, the natural environment does not always react to human-induced influences, as we would expect. Therefore, we cannot always make definitive statements, but rather reach conclusions based on our best knowledge and judgment of the available information, as well as professional opinion.

Comment: FOSL presents excerpts from a memo from Robert Marvinney, State Geologist of Maine and Director of Maine Geological Survey that contains beach profile information gathered since 2002. Based on Mr. Marvinney's beach profile surveys and findings, FOSL contends that the state's 1997 "compromise" LLMP is politically driven and not based on objective science. FOSL submits this information in hopes that the final EA will be based on objective truths and not politics.

Response: We make recommendations for changes to the existing LLMP based on the scientific data and information filed in this proceeding. We have no basis to conclude that development of the current LLMP was politically motivated.

Comment: FOSL contends that since the Commission's approval of the state's 1997 "compromise" LLMP over staff's LLMP was based solely on a fragile (an later fractured) consensus in August 1996, the Commission's rational for supporting the "compromise" LLMP is now inoperative. FOSL states that if staff refuses to revert to the conclusions of its own analysis in the 1997 final EIS, then the final EA should explain in detail (with references to the scientific literature) how the conclusions in 1997 are incorrect and not supported in the record or this proceeding. Mr. Kasprzak states that the current LLMP is not a compromise plan because (1) FOSL withdrew it acceptance on September 1998, and (2) the Maine Bureau of Parks and Recreation refrained from participating in the lake level debate and of commenting on lake levels at Sebago Lake.

Response: The current LLMP was based on facts evident at the time it was adopted in 1997. Those facts and the Commission's rationale relative to the 1997 LLMP have no bearing on our analysis in this final EA. In the final EA, we recommend changes to the existing LLMP that should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding, but maintain appropriate levels to protect wetlands and recreational boating opportunities.

Comment: FOSL states that stage damage curves studies need to be carried out to assess the relationship of water level height and degree of damage from storms. In addition, FOSL states: (1) the comments and analysis of Steve Kasprzak, regarding accretion, need to be read and analyzed; (2) the final EA should analyze the relationship of lake regulation to the proliferation of invasive species, especially variable milfoil; and (3) staff should obtain information from Maine and other agencies, regarding erosion damage on Sebago Lake and permits issued by Maine.

Response: We question the value of stage damage curves, particularly since it would be difficult and costly to calculate meaningful curves on a large lake the size of Sebago Lake, with a non-heterogeneous shoreline. We are recommending a lower maximum target level of 0.5 feet below the spillway crest, which should help limit damage from high water levels. In addition, we have reviewed all the comments filed in response to the draft EA. In response to item (3), agencies and individuals were asked to submit relevant materials for the record during the scoping process. Thus, we assume that all relevant information from the agencies has been filed. With regards to item (2) above, there is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such a variable milfoil. Nonetheless, invasive species (*e.g.*, variable milfoil) appear to be present in Sebago Lake. Assuming higher water levels have played a part in the establishment of milfoil in the lake, our recommendation to reduce the full pond target by 6 inches, and to move the full pond date to May 15 would reduce problems associated with this invasive species.

Comment: FOSL contends that the lake level changes approved by the Commission since 1987 add up to this license being a major federal action with significant adverse effects.

Response: In 1997, Commission staff prepared an EIS that specifically addressed the issue of lake level management on Sebago Lake. This EIS supported the Commission's decision in approving the current LLMP. Under CEQ regulations, we are not required to prepare an EIS to readdress the same issue. According to those regulations the analysis can be a "tiered" analysis. Thus, we can prepare an EA that considers the analysis, statements, and conclusions of the prior NEPA document, but focuses on new information developed since the earlier NEPA analysis. The final EA does just that.

Comment: Mr. Kasprzak requests that evidence justifying the May 1 target elevation date and the additional week in June when the lake could be at full pond be discussed in greater detail in the final EA. Furthermore, he seeks clarification on: (1) what resources are considered in determining the May 1 date for reaching full pond, as opposed to May 31; (2) what resources require that lake levels be kept near full pond from May 1 to June 22; and (3) what are the economic and recreational benefits derived from the higher lake levels.

Response: Based on the many comments received on the LLMP, we now recommend a full pond target elevation of 266.15 feet ± 0.5 foot, and moving the earliest date for reaching that target to May 15. We also recommend that water be spilled should lake levels exceed the crest elevation of 266.65 feet. We modified our analysis in the final EA to address these changes to the LLMP.

Comment: Mr. Kasprzak makes 10 recommendations for changes to the existing LLMP, one of which accepts the 3-inch tolerance around the August 1 target elevation. As recommended, the lake could be 3 inches higher, which would flood an additional 18 acres of beach. In response to this potential effect, Mr. Kasprzak recommends that the target should be 264.67, with a range up to 265.67 and down to 264.17.

Response: We have analyzed the potential effects associated with adding a 3-inch tolerance range around the August 1 lake level target and conclude that an additional 3 inches above the existing target would have minimal, if any, effects to the various resources around Sebago Lake.

Comment: Mr. Kasprzak raises an issue with staff's recommendation in the draft EA to replace the current target of hitting full pond sometime between May 1 and June 15 with "manage the lake during spring fill-up to reach a target level of 266.65 feet on but not before May 1." Mr. Kasprzak states that this reduces flood capacity during spring months, resulting in a greater likelihood of trespasses of flowage easements and increasing spillage.

Response: As noted in previous responses, we recommend changes to the existing LLMP that would reduce the maximum lake level and shorten the time the lake is at the maximum level. Our recommended changes to the existing LLMP should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding, but maintain appropriate levels to protect wetlands and recreational boating opportunities.

Comment: Thirty-six property owners filed comments stating that lake levels have exceeded the flowage easements, causing flooding and increased erosion. The property owners contend that staff's recommended target for full pond on May 1 would raise lake levels 20 inches higher than the historical average for this date. The property owners argue that allowing lake elevations at or near full pond for 8 weeks, and raising lake levels by as much as 20 inches above the historical average in May and up to 15 inches in the summer would flood beaches and accelerate the historic rate of erosion. In addition, the property owners argue that, if the LLMP is not amended to mimic the historical average, they should be compensated for (1) the lost use of the beaches, (2) accelerated shoreline erosion, and (3) the cost of stabilizing beaches.

Response: Based on the many comments received on the LLMP, we now recommend a full pond target elevation of 266.15 feet ± 0.5 foot, and moving the earliest date for reaching that target to May 15. We also recommend that water be spilled should lake levels exceed the crest elevation of 266.65 feet. Our recommended changes should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding. In regards to compensation for damages, the FPA does not authorize the Commission to impose liquidated damages, or otherwise include a damages provision in a project license. Any actions for damages resulting from trespasses of flowage easement are matters left for review by state courts.

Comment: Mr. Theodore Tibbals, Mr. Ben Chapman and other property owners state that when full pond is achieved early in the rainy season, there is no storage capacity in the lake to prevent flooding. These citizens recommend that the spring target elevation should be lowered to prevent flooding.

Response: We now recommend a maximum lake elevation (266.15 feet), or 0.5-foot below the spillway crest elevation, to be reached no sooner than May 15. These changes are expected to increase flood control capability and storage in the rainy season.

Comment: Mr. Charles Bragdon, Jr. and another property owner contend that the draft EA incorrectly refers to "concerning camp owners losing a few feet of beach." They state that no beach remains. Also, Mr. Bragdon states that the "loophole" or vague language from pages 206 and 207 of the draft EA that allows S.D. Warren to modify their operations under emergency conditions is unacceptable. Mr. Bragdon states that this provision would allow continued flooding and violation of flowage easements. Such confusing language should be corrected and revised in all sections of the final EA.

Response: Beach profile studies indicate that beaches do exist along the shoreline of Sebago Lake, albeit at reduced widths compared to their historical sizes. Also, it is standard Commission practice to include language in license articles that allow changes to normal operation under two situations: (1) for planned events when agreed to by the resource agencies and other relevant entities; and (2) for emergency conditions beyond the control of the licensee.

Comment: Mr. Tibbals states that staff's conclusions relative to lakeshore front beaches showing long term stability and no appreciable erosion (page 205 of draft EA) are incorrect. Mr. Tibbals contends that S.D. Warren's analysis of beach profile data is flawed and does not explain the loss of many sand beaches around the lake.

Response: The purpose of the shoreline beach profile study was to document what effect, if any, the current LLMP has on beach erosion or accretion rates. We have revised the language to be consistent with the context and results presented in S.D. Warren's beach profile study.

Comment: Mr. Tibbals contends that staff failed to consider the possibility of increased erosion by having the lake at full pond for 7 weeks. Mr. Tibbals states that erosion is as likely to result from moderate winds as from big storm events. According to Mr. Tibbals, there is a danger of more flooding if a heavy rain event occurs at or near full pond; which leads to downstream flooding when the river flows are increased to relieve flooding of the lake.

Response: Our analysis did consider the relationship between lake levels, erosion/ accretion, and flood control storage. In fact, based on our analysis, we are now recommending that the target date for the maximum lake elevation be moved to May 15, and that the new maximum elevation be lowered to 0.5 feet below the spillway crest.

Comment: Mr. Tibbals contends that the Commission has not addressed the issue of wasting water with flows above the maximum required for hydropower generation. He states that increased flows would occur more frequently with the lake at full pond and a significant rainfall occurs.

Response: Issues related to higher flows (spillage) in the bypassed reach, should lower lake elevations be required, are addressed in every resource section of the final EA, including the *Developmental Analysis* section.

Comment: Mr. Tibbals requests that any revised LLMP include a number of changes. First, the target for full pond be amended from 266.65 to 260.65 ft. msl (or less), with increased flowage through the dam gates required whenever heavy rains are predicted. Second, full pond should be restricted to a time interval from May 31 to June 6, which is the historical time span. Third, the LLMP should not increase the August 1 target by 3 inches, rather reduce it to match the long term historical average. Finally, the Commission should require S.D. Warren to develop a plan to restore the Sebago Lake's beaches.

Response: We are now recommending that the full pond elevation be lowered 0.5 foot below the spillway crest elevation and that the period at full pond be reduced by beginning the full pool period on May 15, and maintaining it for no more than 3 weeks. We are also continuing to recommend the 2-in-9-year winter drawdown provision of the LLMP, as a measure to restore the beaches.

Comment: Phillip and Pearl White contend that lowering the water level by 3 feet, as recommended, would negatively affect bait and game fish and the quality of fishing in

Sebago Lake. Sebago Harbor comments on low lake levels (*i.e.*, 261.0 feet reached in 2 in 9 years) and its effect on boating access, water milfoil growth and wildlife. Sebago Harbor recommends that lake levels should never drop below 263.5 feet.

Response: Sebago Lake level data back to 1910 (figure 7 in the draft and final EA) indicate that the lake typically has a seasonal drawdown of about 4 feet (and as high as 6 feet about 10 percent of the time). There is no information in the record to indicate that these drawdowns have negatively affected the boating, fish populations in Sebago Lake, or other wildlife. Our recommended LLMP would continue this seasonal drawdown, which would remain within the range that occurred historically. With regards to invasive species, there is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such as Eurasian water milfoil.

Comment: Mr. Ted Davis comments on the history of lake level management on Sebago Lake. Mr. Davis states that Sebago Lake does not owe S.D. Warren water to make paper or power, does not owe the marinas and boaters water, nor does it owe property owners a beach. Mr. Davis also states that sea walls and riprap deprives the lake from its source sediment and sand. Finally, Mr. Davis states that Sebago Lake is clean, and that not lowering the lake level has hurt the fishing. Daniel and Jeanne Boland comment on high water levels, stating that high lake levels, when coupled with severe storms, results in the destruction of sea walls, flooding, property damage (*e.g.*, homes, septic systems, and well contamination). Consequently, Mr. and Mrs. Boland recommend that staff consider lowering the maximum high water level (by 5 to 10 feet).

Response: We have considered the comments and information provided by Mr. Davis in preparing the final EA. We have revised our discussion and analysis of the LLMP to more accurately reflect the history of lake level management on Sebago Lake. Figure 9 of the final EA shows that the average elevation of Sebago Lake has increased since implementing the current LLMP. Based on comments received on the draft EA and our analysis in the final EA, we are recommending changes to the LLMP that would lower the average water level on Sebago Lake. Our recommendations would reduce shoreline erosion and reduce the risk of flooding around Sebago Lake, but protect wetlands and maintain recreational boating opportunities.

Comment: Sebago Coalition comments on various aspects of the low-water/high water debate, including the effects of sea-wall construction and major storm events on beach dynamics, historic water levels, state politics, and effects of boating. Sebago Coalition recommends the LLMP be modified as follows: (1) eliminate the 2-in-9-years portion of the LLMP because the lake may not recover from these excessive low levels; (2) move the August 1 target level to 265.5 msl, instead of the present 265.17 and add a 3-inch buffer on each side of the new level so S.D. Warren can better control the lake to a range; and, (3) move the 265.17 msl level to September 1, instead of August 1 to ensure adequate water for late summer/early fall use of the lake without having any adverse effects on recreation.

Response: We have reviewed the record and conclude that the information is inconclusive where it concerns eliminating the 2-in-9-year drawdown and, therefore, recommend retaining this provision. Our hydrologic analysis shows that in all, but extreme dry years, the lake can be refilled. In addition, based on our revised analysis, we now recommend a full pond target elevation of 266.15 feet ± 0.5 foot, and moving the earliest date for reaching that target to May 15. We also recommend adding a ± 3-inch operating band around the August 1 target level, but do not recommend changing the target elevation. Nor do we recommend moving the current August 1 target to September 1. Sebago Coalition's recommendation would increase the potential for shoreline erosion and damage if the area experiences late summer/early fall storms. Our recommended changes would reduce shoreline erosion and reduce the risk of flooding around Sebago Lake, but protect wetlands and maintain recreational boating opportunities.

Comment: The USGS indicates that page 36, Section V.C.1, *Geological and Soil Resources*, first full paragraph, second sentence in incorrect. The USGS states that it has not conducted beach erosion studies on Sebago Lake, and recommends that the Johnston citation be corrected to refer to the Maine Geological Survey.

Response: We have corrected this sentence accordingly.

Comment: The USGS states that Table 17 on page 67 of the draft EA should be clarified. The USGS states that the peak flow values reported as the referenced USGS streamflow gaging station are an instantaneous value, and are not directly comparable to the average daily discharge.

Response: We agree. However, the text utilizes this information to highlight the fact that Sebago Lake typically has available storage during peak flows downstream at the Westbrook gage, which shows that S.D. Warren was able to decrease the outflow of Sebago Lake for at least a day.

Comment: The Portland Water District commented on the LLMP, stating that it was in general agreement with the conclusions of the draft EA and staff's recommendations. However, the Portland Water District recommends that the LLMP be modified as follows: (1) manage the lake during spring fill-up to be within an allowable target range of 266.65 to 266.15 feet between May 1 and the third week in June. The Water District states that this would give S.D. Warren more flexibility in managing the lake and would allow the lake to handle spring storms without exceeding maximum elevations. Mr. Timothy Toomey comments on the need for a responsible management plan for Sebago Lake that considers citizens and results in less flooding. Mr. Toomey states that the current management of the lake has lead to the decline in fishing quality. Mr. Toomey contends that the current LLMP and the recommendations of the draft EA are inconsistent with sound science and environmental responsibility. Mr. Toomey recommends that lake levels never exceed 265.6 feet.

Response: Based on comments filed on the draft EA and our revised analysis in the final EA, we now recommend reducing the spring target elevation to 266.15 feet ± 0.5 foot, and moving the earliest date for reaching the spring target to May 15. We also recommend releasing water if elevations exceed 266.65 feet. Our recommended changes would provide S.D. Warren substantial flexibility in managing lake levels, while reducing the risk of shoreline erosion, flooding, and exceeding its easements.

Comment: The Portland Water District recommends that S.D. Warren be required to develop a hydrologic model of Sebago Lake and install a USGS real-time stream gauge on the Crooked River to better predict lake level changes.

Response: We question the feasibility and value of a hydrologic model. In order for this type of model to be useful in predicting and managing Sebago Lake levels, real-time data would have be available from several sources (besides the Crooked River), to accurately monitor inflow and outflow from the lake. The model would need the ability to input real-time precipitation and snowmelt data from throughout the drainage area, and most of this type of information is currently unavailable. Development of such a model would require that real-time monitoring stations be established throughout the basin, and several years may be required to accurately calibrate the model. Although S.D. Warren uses the outflow from the lake for the Eel Weir Project, it has no control over other major factors affecting the lake level. Development of any such model should not be the sole responsibility of S.D. Warren, but, rather, should be a joint effort by both governmental and non-governmental entities.

Water Resources

Comment: S.D. Warren states that measures already in place permit verification of compliance without unnecessary cost, and without the additional risk of vandalism. Consequently, S.D. Warren contends that no additional measures or plans are needed or appropriate to provide documentation of compliance with required bypass flows.

Response: The Commission must ensure that a licensed project is operated in accordance with the operational parameters set forth in the license. A project operations and flow monitoring plan (or compliance plan) is the vehicle by which the Commission ensures compliance. Based on our analysis in section V.C.2.b, *Water Resources – Environmental Analysis*, we conclude that such a plan is necessary for project purposes.

Comment: S.D. Warren opposes the USFWS recommendation for temperature monitoring to evaluate whether higher minimum flows jeopardize coldwater refugia in the bypassed reach. S.D. Warren states that the flow study shows that the cold water seeps in the bypassed reach become compromised when flows reach 115 cfs, which is higher than Commission staff's recommended flows. According to S.D. Warren, water temperature monitoring at higher flows would only prove that high summer flows further compromise the conditions that support the coldwater fishery. S.D. Warren further states that if it is required to monitor water temperatures during the summer, it should be with the stated purpose of adjusting bypass flows downward (back to the current range of 25 to 75 cfs) should the monitoring document that the seeps are adversely affected by flows.

Response: We recognize that monitoring performed for relicensing indicates that flows above 115 cfs would likely compromise the viability of the coldwater refugia. However, this monitoring represents a snapshot in time, and may not sufficiently define the temporal extent of effects (within and among years). Therefore, we recommend that water temperatures in the coldwater refugia, be monitored for a 3-year period during the critical summer period (June through September). To address S.D. Warren's concerns regarding the purpose of temperature monitoring, we recommend that the 3-year monitoring report (a) include monitoring data, (b) describe the status of the fishery and the use of the coldwater refugia by trout and salmon, and (c) include an assessment of any further operational and/or structural measures needed to manage flows, and advance the agencies' fishery management goals, in the bypassed reach.

Comment: The USFWS concurs with staff's recommendation regarding compliance monitoring at the project.

Response: We continue to recommend that S.D. Warren develop and implement and project operations and monitoring plan.

Comment: Ms. Carol Steiman comments on high water levels, beach erosion, and damage to her dock. In addition, Ms. Steiman contends that high water levels have negatively affected water quality in Sebago Lake. She states that there is now algae growth, a profusion of Eurasian water milfoil, and more weed growth.

Response: There is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such a water milfoil. Nonetheless, water milfoil appears to be present in Sebago Lake. Assuming higher water levels have played a part in the establishment of milfoil in the lake, our recommendation to reduce the full pond target by 6 inches, and to move the full pond date to May 15 would reduce problems associated with this invasive species.

Fishery and Aquatic Resources

Comment: S.D. Warren states that the record does not contain substantial evidence supporting the need for additional minimum flows and the Commission should not impose any change to the existing minimum flow requirements of the Eel Weir bypass reach. Furthermore, S.D. Warren does not agree that staff's recommended flows are needed to support fisheries management objectives for the bypassed reach.

Response: The existing flow regime in the Eel Weir bypassed reach was designed to support a viable fishery for landlocked salmon, brook trout, and other species of warmwater sport fishes. The MDIFW currently manages the bypassed reach as a brook trout fishery. Based on this information, it is clear that fishery management objectives for the bypassed reach have changed since the existing flows were implemented, and, thus, supports a change in the flow regime in the bypassed reach. In addition, our analysis in section V.C.3, *Fisheries and Aquatic Resources*, indicates that the MDIFW's current fishery management objectives for the Eel Weir bypassed reach are not being met. For example, angler use data collected by the MDIFW indicates that objectives for catch rate and fish size are not being met.

Comment: S.D. Warren does not agree with the habitat/flow analysis in the draft EA. S.D. Warren states that the incremental gain of 6-8 percent habitat for an increase from 75 cfs to 100 cfs is marginal and does not justify the increased minimum bypass flows. Furthermore, S.D. Warren states that minimum bypass flows above 75 cfs are contrary to the goal of limiting the smallmouth bass population, that flows over 79 cfs would adversely affect thermal refugia in the bypassed reach, and that flows of about 75 cfs provide favorable angler conditions (*i.e.*, wadeability) throughout most of the reach..

Response: As the result of the section 10(j) negotiations, and other information provided in comments on the draft EA, we reevaluated the minimum flow issue. Based on our analysis we have modified our flow recommendation by increasing the flows to 125 cfs from April 1 to October 31 and to 75 cfs from November 1 through March 31. An increase from 75 to 125 cfs would result in an incremental gain in habitat for juvenile and adult brook trout of 9-12 percent during the spring and fall, while the incremental gain would be even greater during the summer months (19-24 percent). In the winter, an increase from 25 to 75 cfs would result in an incremental gain of 24-28 percent. We consider these modest incremental gains worth the cost, as these flows would further the agencies' goals of managing flows in the bypassed reach to promote the brook trout fishery. We find S.D. Warren's other arguments unpersuasive. First, based on information presented at the section 10(j) meeting, smallmouth bass no longer appears to be a consideration in flow management decisions for the bypassed reach. Second, we recommend temperature monitoring in coldwater refugia to determine any potential effects of higher flows and identify any measures needed to further protect those habitats. Finally, based on the wadeability study, our recommended flows would enhance angling opportunities in the bypassed reach.

Comment: S.D. Warren points out that the draft EA, on page 210, incorrectly reports that "aquatic macroinvertebrate habitat would be improved under staff's recommended flow regime, with total wetted area in the riffle/run areas being nearly 75 percent of the maximum at 100 cfs. Total wetted area in the braided channel habitats would exceed 80 percent." S.D. Warren states that the draft EA, page 130, shows that 75 percent of the maximum macroinvertebrate habitat is provided at 50 cfs in the riffle/run habitat.

Response: We have corrected section VII, *Comprehensive Development*, in accordance with our modified flow recommendation.

Comment: S.D. Warren agrees to provide upstream and downstream eel passage at the Eel Weir Project, and to the development of an eel passage plan with most of staff's recommended provisions. However, it does not agree with the timing of installation, as recommended by the resource agencies and staff, and the need for effectiveness testing. S.D. Warren states that no eel passage, or plans for eel passage, exists for the downstream North Gorham Project (P-2591), and that eels currently pass the Eel Weir dam without formal passage facilities. In addition, S.D. Warren states that information from a 3-year monitoring study, as well as project features (*i.e.*, trash rack and new eel passage gate) makes it unclear what the goals of the effectiveness study would be or what additional actions would be required based upon the results of any testing.

Response: In section V.C.3.a, *Fisheries and Aquatic Resources – Affected Environment*, we summarized the results of fishery surveys in the Presumpscot River and Sebago Lake. We described the species of fish present in the project area, including the bypassed reach and Sebago Lake. We found that American eels are present throughout the basin. Based on our review in section V.C.3.b, *Fisheries and Aquatic Resources – Environmental Analysis*, we conclude that American eels, despite other downstream hindrances, would benefit from the immediate installation of upstream and downstream eel passage at Eel Weir. As for our recommendation for an effectiveness study, we continue to support such a measure. We recognize that upstream eel passage technology is well established; however, important behavioral characteristics remain unknown. With regard to downstream eel passage, eel mortality can be quite high when passed through turbines. While much has been learned about downstream eel passage, there is no proven downstream passage technology. Therefore, we conclude that effectiveness and out-migration timing monitoring is warranted.

Comment: The USFWS states that the upper modeled limit of 440 cfs (for the instream flow study) is equivalent to the Aquatic Base Flow for fall/winter spawning flows, and does not represent the upper range of flows than can occur or could be delivered to the bypassed reach. The USFWS also states that weighted useable area (WUA) values for many of the targeted species continued to increase up to, and including, the upper cut-off of 440 cfs, and would likely continue to increase at flows above 440 cfs. Thus, the USFWS contends that 440 cfs for the riffle/run habitat does not represent the "maximum" WUA as stated in the draft EA, nor does 185 cfs represent the "maximum" WUA for the braided channel habitats.

Response: We do not dispute that 440 cfs is the Aquatic Base Flow for fall/winter spawning flows, nor do we dispute the USFWS's claim that the 440- and 185-cfs flows do not represent the upper range of flows that occurred historically in the bypassed reach. However, the modeled flows represent the range of flows for which we can reasonably make flow management decisions for the Eel Weir bypassed reach. To make decisions based on higher flows, flows not modeled, would be speculative, at best, and would be arbitrary and capricious.

Comment: The USFWS contends that staff's recommended minimum flow regime of 50 cfs (11/1-3/31), 100 cfs (4/1-6/30), 75 cfs (7/1-8/31), and 100 cfs (9/1-10/31) is not supported by the results of the instream flow study, and is inconsistent with the agencies' recommended flows. After reviewing the record, the USFWS recommends the following flow regime as an acceptable alternative to staff's flow alternative: 115 cfs from November 1 to March 31, 200 cfs from April 1 to June 30, 115 cfs from July 1 to August 31, and 200 cfs from September 1 to October 31.

Response: As the result of the section 10(j) negotiations, and other information provided in comments on the draft EA, we reevaluated the minimum flow issue. Based on our analysis we have modified our flow recommendation by increasing the flows to 125 cfs from April 1 to October 31 and to 75 cfs from November 1 through March 31. We consider the modest incremental gains in aquatic habitat with these flows over the existing flows worth the cost to S.D. Warren. In addition, our recommended flows, as modified in the final EA, would further the agencies' goal of managing flows in the bypassed reach for brook trout. While the USFWS's alternative flow recommendation would provide incremental gains in habitat over our recommended flows, it would cost over $130,000 annually. The relatively small incremental gains do not justify the significant added cost.

Comment: The USFWS does not agree with staff's rationale for not recommending the agencies' higher minimum flows. First, the USFWS contends that the resource agencies have not identified any need to reduce flows to discourage smallmouth bass in the bypassed reach, as stated in the draft EA. Second, the USFWS states that higher flows would (a) expand habitat for trout and salmon in the bypassed reach, (b) result in more and healthier fish, and (c) provide additional fishing opportunities. This is inconsistent with staff's "radical departure" logic. Third, the USFWS supports temperature monitoring in the coldwater refugia as a way to address the effects of higher minimum flows on this habitat. Finally, the USFWS contends that staff's economic analysis does not account for the cumulative effects of hydro development on the coldwater riverine resources in the Presumpscot River.

Response: We revised our minimum flow analysis based on discussions at the section 10(j) meeting and the USFWS's comments on the draft EA. In addition, because we recommend flows that could affect the coldwater refugia, we now recommend temperature monitoring in that important coldwater habitat. Finally, the USFWS comment regarding our economic analysis appears to suggest that the Commission should mitigate for past hydropower development on the Presumpscot River. The Commission is not required to mitigate for past effects. Our recommended flows represent an appropriate balance among competing uses and are in the public interest.

Comment: The MDIFW is concerned about the lack of suitable instream flow releases recommended for the Eel Weir bypassed reach.

Response: We have reassessed our instream flow recommendation for the bypassed reach, and now recommend a minimum flow of 125 cfs from April 1 to October 31, and 75 cfs from November 1 to March 31. This recommended flow represents a balancing of instream flow needs for the fishery and costs to the project in the form of foregone energy production.

Comment: At the section 10(j) meeting, the MDIFW stated that it did not disagree with staff's finding regarding its recommendation for a fall/winter drawdown to control lake trout spawning, but stated that staff's rationale in the draft EA was inaccurate. The MDIFW provided additional information on typical lake trout spawning depth and substrate in Maine lakes, and recommended that staff consider a drawdown later into the winter that would be 6 to 8 feet lower than whatever the elevation reached on November 1. The MDIFW indicated that it is not concerned about lower lake levels in the spring, as it relates to smelt spawning, because most smelt spawning now occurs along the lake shore, not in the tributaries. The USFWS indicated that it does not oppose a 6- to 8-foot winter drawdown to control lake trout spawning.

Response: We have modified our analysis of this issue in the final EA to reflect the information provided by the MDIFW and the USFWS.

Comment: The USFWS concurs with the draft EA's conclusion regarding landlocked Atlantic salmon passage. FOSL states that opposing higher minimum flows in the Eel Weir bypassed reach, due to an alleged effect on coldwater refugia, is not supported in the scientific record and the MDIFW's scientific research over the past 40 years. FOSL states that brook trout and salmon existed in the Presumpscot River, in the absence of the Eel Weir dam, and that these fish would survive and successfully reproduce if the artificial migration barrier at the project dam is made passable.

Response: Staff continues to support the agencies' position regarding fish passage for landlocked salmon (and brook trout) at the Eel Weir dam. Also, as noted previously, we reanalyzed the issue of minimum flows, based on new information presented at the September 22, 2005, section 10(j) meeting and in comments on the draft EA. We now recommend higher flows for the Eel Weir bypassed reach: 75 cfs from November 1 to March 31 and 125 cfs from April 1 to October 31.

Comment: The USFWS states that the fish screens (3/4-inch clear space) at the entrance to the power canal effectively prevent entrainment of migratory adult and juvenile yellow American eel, and that the fish screens should remain in place during the duration of the downstream eel migration period. This measure, in combination with a plunge pool at the exit of the river gate, as described in Option #3 (*see* section III.C, *Proposed Action*), should preclude the need for turbine shutdowns to protect migrating eel.

Response: S.D. Warren proposes, and we recommend, that the existing fish screens with ¾-inch bar spacing be maintained as part of the licensed project, including during the eel out-migration period. Regarding the plunge pool, information provided by S.D. Warren, including photo documentation, indicates that the plunge pool recommended by the USFWS may be unwarranted (*see* S.D. Warren reply comments on draft EA, filed October 17, 2005). The information provided by S.D. Warren shows that the gate(s) to be used for downstream eel passage is located near the elevation of the bypass channel. In addition, there appears to be an existing pool at the base of the dam. These features, when combined with the flows discharged for passage, would seem adequate to safely pass eels. Nonetheless, this is a detail that can be worked out during consultation to develop the downstream eel passage plan. In addition, we expect alternative measures for downstream eel passage (*e.g.*, project shutdown), if found to be necessary, would be jointly developed based on the results of effectiveness monitoring.

Comment: FOSL states that their recommendation for a small fishway and fish collection facility at the project for Atlantic salmon would eliminate any justification for the "salmon spawning limitation" in the LLMP, which now impedes the ability of S.D. Warren to lower the lake during the autumn months to protect the lake shoreline from storms and promote beach accretion. FOSL requests that staff reevaluate the need for salmon passage and collection, because the existing analysis in the draft EA relies solely on the USFWS and the MDIFW letters that lack credible facts or evidence to justify denial of such a measure. FOSL argues that, because no facts or scientific evidence has been entered into the record to refute its request for salmon passage facilities, staff must accept the request. To do anything otherwise would be arbitrary and capricious.

Response: The Commission does not establish specific fishery management policies (a resource agency function), but, rather, considers the information in the record in identifying appropriate license conditions that further the goals and objectives of existing management programs. Within this framework, we note that the state and federal agencies responsible for management of the Sebago Lake fishery are not recommending installation of a fishway at the project, nor do the agencies support passage for landlocked salmon at the project. Thus, requiring fish passage at the project, at this time, would not further existing fishery management goals for Sebago Lake or the Eel Weir bypassed reach. Even if a fishway were installed at the project, the requirement to maintain lake levels in the fall to provide for salmon spawning would not be eliminated. Maintaining wild salmon spawning is a primary goal of the MDIFW, and lower water levels during the fall spawning period could affect salmon movement into the spawning tributaries.

<u>*Comment*</u>: Conservation Law states that, on July 6, 2005, two days prior to release of the July 8, 2005 EA, the USFWS issued a finding in the Federal Register concluding that listing of the American eel may be warranted under the ESA and initiated a one year status review. Conservation Law notes that the draft EA did not mention this finding, which raises questions regarding staff's analysis and conclusions related to the eel and about the sufficiency of the data contained in the draft EA. Conservation requests that staff reanalyze effects on the eel and recommendations in light of this finding.

<u>*Response*</u>: We have revised section V.C.3.a, *Fisheries and Aquatic Resources – Affected Environment*, of the final EA to include information relative to the USFWS's July 6, 2005, finding in the Federal Register. To the extent necessary, we reanalyzed the issue of eel passage based on this finding. However, this new information does not change our recommendations regarding eel passage at the Eel Weir Project.

<u>*Comment*</u>: Conservation Law contends that, under the FPA, the USFWS and the MDMR eel passage recommendations must be accepted as written and may not discard or modify them. Conservation Law states that data from agency reports provide enough data to justify the longer downstream passage window. Conservation Law also comments on other reasons for accepting the agencies' recommendations.

<u>*Response*</u>: First, the Commission is only required to accept, without modification, measures prescribed under Section 18 of the FPA. The USFWS has not filed any such prescription. The Commission is not required to accept, without modification, section 10(j) recommendations. Rather, section 10(j) of the FPA requires the Commission to include license conditions based on recommendations provided by state and federal resource agencies if such recommendations are supported by substantial evidence and are not inconsistent with the purposes and requirements of the FPA or other applicable law. Second, as we stated in section V.C.3.b, *Fisheries and Aquatic Resources – Environmental Analysis*, the record does not support the 14-week operational window for downstream eel passage at Eel Weir. To address this issue, we recommend that a timing component be added to the effectiveness monitoring study. Alternatively, out-migration timing at the Eel Weir Project could be incorporated into S.D. Warren's on-going 3-year monitoring study.

<u>*Comment*</u>: Conservation Law questions whether the Commission has sufficient evidence to continue using its conclusions from 2002, because eel passage provisions are relatively new and untested. Conservation Law contends that longer operational periods are necessary (8 hours vs. 4 hours), and that full-scale and comprehensive monitoring studies should be undertaken by the MDMR and funded by S.D. Warren.

Response: Though we disagree with the longer operational periods of 8 hours, as described in FERC (2002) and in the draft EA for Eel Weir, we ultimately recommend that the facilities be operated for 8 hours per night. The final EA for Eel Weir includes a similar recommendation. With regard to the monitoring study, we typically require that a licensee evaluate the effectiveness of installed facilities (*e.g.*, fish passage and recreation facilities). We cannot compel a third party (in this case the MDMR) to conduct a study required of a licensee. However, a licensee and a resource agency may reach agreement on such an arrangement. Ultimately, though, the Commission holds the licensee responsible for the operation of the facilities, as well as any required monitoring.

Comment: Conservation Law states that re-opener clauses should be included in the license, which would mandate that S.D. Warren take any additional actions deemed necessary by state or federal agencies in order to protect eel populations or to correct a violation of state water quality standards. In addition, Conservation Law states that in the event eels are listed under the ESA, the license should automatically be re-opened and any changes needed to avoid illegal take be undertaken.

Response: We find no basis to recommend the inclusion of separate re-opener clauses in any license issued for the Eel Weir Project. We recommend, instead, that the effectiveness monitoring plan for eel passage include a provision to identify any additional measures that may be warranted based on the outcome of the monitoring. Furthermore, we would recommend that the Commission reserve its authority to require changes to project facilities and/or operation based on the outcome of the monitoring study. Finally, because American eel have not been listed under the ESA, it is pre-mature to recommend measures be included in the license to address ESA matters.

Wildlife and Terrestrial Resources

Comment: S.D. Warren contends that a SMP is unnecessary and inappropriate for the Eel Weir Project, with respect to the lands that it owns within the project boundary.

Response: The SMP under consideration in the final EA would cover more than the lands that S.D. Warren owns within the project boundary. The purpose of any SMP is to manage the development along the shoreline to ensure the protection and enhancement of the project's recreational, environmental, cultural, and scenic resources, as well as the project's primary function (which is to produce electricity). To address S.D. Warren's concerns regarding the SMP, we have expanded our discussion in sections V.C. 4 (*Terrestrial Resources*) and V.C.5 (*Recreational Resources and Land Use*) of the final EA to clarify the intent of the SMP and any potential effects it would have on the various resources.

Comment: The USFWS concurs with staff's recommendations regarding conservation easements and aesthetic measures. The USFWS does not fully supports staff's recommendation for shoreline protection measures, requesting that staff's recommended SMP include mitigation for the effects to wetlands and aquatic resources resulting from project operation associated with staff's recommended LLMP. The USFWS also requests that it be consulted during the development of the SMP.

Response: The results of the wetland monitoring studies, as described in section V.C.4.b, *Terrestrial Resources – Environmental Effects*, showed only minimal changes in wetland species composition and percent total cover of wetlands since the implementation of the LLMP, with no loss of wetlands. In addition, the changes to the LLMP we recommend in the final EA would have no effects on wetlands. As a result, it is not appropriate to include mitigation for effects on wetlands in the SMP.

Comment: The USFWS concurs with staff's recommendation for wetlands monitoring.

Response: We continue to recommend wetlands monitoring in the final EA.

Comment: Sebago Pines objects to the target level of 261.0 feet or lower 2 times in 9 years, because it dewaters wetlands, increases Eurasion water milfoil, and negatively affects wildlife (including frogs and turtles), fish, and healthy lake vegetation.

Response: As discussed in section V.C.4.b, *Terrestrial Resources – Environmental Effects*, a drawdown to 261.0 feet in 2 out of 9 years are outside of the growing season and, thus, would not adversely affect wetlands. A drawdown of this nature occurred historically, so it is unlikely that such a drawdown would negatively affect wildlife, fish, or other lake resources. With regard to invasive species, there is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such as Eurasian water milfoil. Also, our recommended LLMP would continue the seasonal drawdown, which would remain within the range that occurred historically.

Recreation and Land Use

Comment: S.D. Warren contends that no additional boat access is needed on Sebago Lake. S.D. Warren states that locating such a facility in Sebago Basin is inappropriate and potentially unsafe (*e.g.*, the facility is not likely to see significant use and is in close proximity to the project dam). To recover costs associated with operating such a site, S.D. Warren states that it would charge users ($19 to $29/launch), and these cost estimates should be factored into the economic analysis.

Response: Currently, the general public does not have free or inexpensive boating access to Sebago Lake. The development of the recommended boat launch could remedy this situation. To address S.D. Warren's concerns we have added a discussion of usage, safety, and a cost analysis, as presented by S.D. Warren, in section V.C.5.b, *Recreational*

Resources and Land Use – Environmental Effects, of the final EA in an attempt to clarify S.D. Warren's expectations and responsibilities.

Comment: S.D. Warren contends that lands recommended for placement in a conservation easement with the town of Windham should not be included in the project boundary. S.D. Warren states that, only lands necessary to operate the project, and nothing more, should be included within the project boundary.

Response: S.D. Warren did not propose any changes to the project boundary in the license application and, as such, no alternative configurations were analyzed in the final EA. However, in order that the recreational resources associated with the bypassed reach remain available to the public, inclusion with the project boundary ensures their status forward as part of S.D. Warren's project responsibility.

Comment: The USFWS concurs with staff's recommendation for public access and recreation monitoring. The USFWS requests that it be consulted during the development of the SMP recommended in the EA.

Response: We continue to recommend measures for public access and recreation monitoring in the final EA. With regards to consultation, S.D. Warren would be required to consult with the USFWS during the development of the SMP.

Comment: FOSL states that the statement in the draft EA that, "our recreation analysis did not find any relationship between lake levels and the amount of boating use on the lake" affirms the factual basis of the Commission's decision in the 1997 FEIS to reject the state's LLMP, and that all recommendations in the final EA must be consistent with this statement. According to FOSL, this statement shows there is no factual justification based on recreational uses to keep Sebago Lake higher than historic levels.

Response: Commission staff concluded in the 1997 EIS that both the "compromise" plan and the staff LLMP would provide lake elevations conducive for recreation during the active recreation season, while minimizing shoreline erosion potential. We agree that the recreation data does not show a relationship with lake levels (those above boating thresholds). However, we expanded the discussion in section V.C.5.b, *Recreational Resources and Land Use – Environmental Effects*, of the final EA to clarify the dates boating use numbers were collected, which corresponds to times of year when lake levels would be above the boating threshold. Furthermore, the various lake levels proposed in the final EA could affect resources other than recreation, and the final EA makes every attempt to identify the effects to those resources.

Comment: Sebago Pines comments on boating and fishing on Sebago Lake. Sebago Pines states that Sebago Lake must be maintained at 264.0 ft. to achieve safe boating. Sebago Pines objects to taking the lake down to 261.0 ft. or lower 2 times in 9 years, as it results in a complete drawdown of Muddy River. Sebago Pines recommends that the lake level remain above 263.5 ft. at all times, and recommends the August 1 target level be 265.5 ft. ± 3 inches. In addition, the town of Naples comments on lake level and its effects on Muddy River.

Response: The Commission's record in this proceeding, through numerous filings, shows that the minimum lake level suitable for boating is 263.5 feet. Our recommended changes to the LLMP would maintain sufficient lake levels during the boating season to provide safe boating opportunities. In addition, our analyses show that lake levels in Sebago Lake are not so much correlated to the fall lake level (even the 2-in-9-year drawdown to 261.0 feet), as to over-winter and spring precipitation. Only in the most extreme dry years would we expect potential problems in reaching a lake level that may limit boating opportunities.

Socioeconomic Resources

Comment: Maine PEER supports the comments made by Stephen Kasprzak and FOSL. Maine PEER requests that the Commission recognize the significant ecological and economical value that Sebago Lake's beaches represent, and recommend measures that protect the lake and shoreline for the long-term health of the lake and not for the short-term desire of increasing development. In addition, FOSL states that the negative effect on the economic value and importance of the rare inland beaches on Sebago Lake due to erosion needs to be assessed.

Response: We have discussed the potential effects of lake level management on beach erosion, but a detailed valuation and economic analysis of the beaches is beyond the scope of issues identified during the scoping process for this EA.

Developmental Analysis

Comment: S.D. Warren states that replacing a 25-cfs minimum flow gates with a 50-cfs minimum flow gate, to meet the 100-cfs total flow would cost $30,000.

Response: We used S.D. Warren's estimate of $30,000 to determine the appropriate capital cost of upgrading the existing minimum flow release structure for the various recommended minimum flow regimes. Table 42 in the final EA was updated to reflect our estimate for replacing existing minimum flow gates, as appropriate. Our economic analysis of the recommended alternatives reflects this capital cost, in addition to the annual cost of lost generation.

Comment: S.D. Warren raises concerns that changes to the LLMP will continue to diminish its ability to obtain power benefits from the project, and requests that, in the final EA, staff include a detailed and complete analysis of the economic costs of the license requirements as part of the balancing of the regulatory obligations imposed on the project, including the cost of implementing the revised LLMP and the foregone generation, as well as the cost of lost generation due to the increases in minimum bypass flows.

Response: Our developmental analysis (section VI of the final EA) includes an economic analysis of the costs to S.D. Warren of continuing to operate the project under various new license requirements, including alternative LLMPs.

Comment: The USFWS states that staff should clarify the estimate for downstream eel passage mitigation costs. The USFWS states that once the facilities are installed, operational costs would consist of opening and closing the downstream passage gate, and spillage of water through the gate, which may partially or entirely be offset by reciprocal reductions in minimum flow discharge during downstream passage operation. S.D. Warren states that the economic analysis should not discount generation losses associated with the downstream eel passage because those flows can not necessarily be deducted from the minimum flows for the bypassed reach.

Response: S.D. Warren addressed this concern in its filing of October 17, 2005. We reviewed S.D. Warren's filing and concur that, at times, the eel passage releases can not be used as a substitute for minimum flow releases due to the need to prevent loss of landlocked salmon to the bypassed reach. However, for purposes of our analysis, we used S.D. Warren's cost and lost energy estimates, which indicates that there is no increase in costs (over the minimum flow release) because the water would be spilled either by the downstream eel passage facility (at least partially) or through the minimum flow gate (*i.e.*, the loss in generation is accounted for once as part of the minimum flow release). We acknowledge that there may be some cost difference in operating one gate over the other (or having to occasionally operate both the gate and downstream eel passage facility at the same time). However, we assume any such cost would be negligible. To assume otherwise would be speculative at best.

Comment: FOSL questions the economic analysis in the draft EA that estimates the cost of salmon fish passage, but does not account for the value of the salmon fishery and cost to the salmon population in Sebago Lake. FOSL questions the economic analysis related to American eel passage on the same grounds. FOSL contends that if the Commission has no consistent dollar accounting method for fisheries enhancements, then the Commission's decision is arbitrary and capricious.

Response: Our economic analysis analyzes the costs to S.D. Warren of the project under any new license conditions. However, our analysis is not able to analyze the value of the salmon or eel fisheries because there are no reliable economic data available for these fisheries in the record.

Comment: Mr. Kasprzak cites a July 21, 2005, newspaper article quoting the current price of electricity of $0.083/kwh, and requests that the final EA update the Developmental Analysis to reflect this current market rate of electricity.

Response: The rate cited by Mr. Kasprzak reflects the retail rate charged to commercial and industrial customers. The energy rate used in the EA reflects equivalent wholesale replacement energy costs to produce the energy generated by the project. Retail rates include the wholesale energy costs plus the cost of transmitting power produced by the project to a distribution substation and the cost of then distributing the energy to the customer.

Comment: Mr. Kasprzak comments that the developmental analysis section of the draft EA does not (and the final EA should) evaluate: (1) lost hydropower due to increased spillage; (2) the cost of rip rapping the shoreline to protect it from erosion; (3) the loss of public beach access due to flooding of beaches; and (4) the effect higher water has on beach users. In addition, Mr. Theodore Tibbals contends that staff's economic analysis left out the value of shoreline and beaches lost, the cost to property owners to stabilize their shore fronts, the value of wasted water dumped that could be otherwise used for hydropower generation, the cost of electricity that will have to be generated from fossil fuels, the losses suffered by land owners who are flooded downstream, and the loss in aesthetic value of Sebago Lake.

Response: The draft and final EA estimates the value of water that could otherwise be used for hydropower generation and pollution abatement in section VI, *Developmental Analysis*. The cost for property owners to stabilize their shore-fronts is not a cost item attributable to S.D. Warren, nor was it identified during scoping as an issue to analyze. As noted above, a detailed valuation and economic analysis of Sebago Lake's beaches is beyond the scope of issues identified during the scoping process for this EA.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

S.D. Warren Company   Project No. 2984-042

NOTICE OF AVAILABILITY OF FINAL ENVIRONMENTAL ASSESSMENT

(November 29, 2005)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Office of Energy Projects' staff has reviewed the application for new license for the Eel Weir Project, located at the outlet of Sebago Lake, and has prepared a final Environmental Assessment (EA) for the project. In the final EA, Commission staff analyzed the potential environmental effects of relicensing the project and concludes that issuing a new license for the project, with appropriate environmental measures, would not constitute a major federal action that would significantly affect the quality of the human environment.

A copy of the final EA is available for review in the Public Reference Room or may be viewed on the Commission's website at http://www.ferc.gov using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll-free at 1-866-208-3676, or for TTY, (202) 502-8659.
You may also register online at http://www.fer.gov/docs-filing/esubscription.asp to be notified via e-mail of new filings and issuances related to this or any other pending projects. For assistance, contact FERC Online Support.

Magalie R. Salas
Secretary

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PUBLIC

FINAL ENVIRONMENTAL ASSESSMENT
S.D. Warren Company
Eel Weir Hydroelectric Project
Docket No. P-2984-042

FINAL ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Eel Weir Hydroelectric Project
FERC Project No. 2984-042

Maine

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20426

November 29, 2005

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ACRONYMS AND ABBREVIATIONS

APE	Area of potential effect
ASMFC	Atlantic States Marine Fisheries Commission
CEQ	Council for Environmental Quality
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CPUE	catch per unit effort
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dbh	diameter at breast height
DO	dissolved oxygen
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
F	Fahrenheit
FERC	Federal Energy Regulatory Commission
FIRE	finance, insurance, and real estate
FOPR	Friends of the Presumpscot River
FOSL	Friends of Sebago Lake
FPA	Federal Power Act
fps	feet per second
HPMP	Historic Properties Management Plan
HIS	habitat suitability index
IFIM	Intream Flow Incremental Methodology
Interior	U.S. Department of the Interior
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
LLMP	Lake Level Management Plan
Maine	Maine, State of
Maine Geology	Maine Geological Survey
Maine Labor	Maine Department of Labor
Maine Salmon	Maine Council - Atlantic Salmon Federation
Maine SHPO	Maine Historic Preservation Office
MASC	Maine Atlantic Salmon Commission
mcf	million cubic feet
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
MDOC	Maine Department of Conservation
mi2	square miles
mg/l	milligrams per liter
mg/m2	milligrams per square meter
ml	milliliter
msl	mean sea level
MSPO	Maine State Planning Office
MW	megawatt
MWh	megawatt-hour
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NHPA	National Historic Preservation Act
NPCC	Northeast Power Coordinating Council
NGO	non-governmental organization
PA	Programmatic Agreement
PHABSIM	Physical Habitat Simulation
SD1	Scoping Document 1
SD2	Scoping Document 2
S.D. Warren	S.D. Warren Company
Sebago Lake Coalition	Sebago Lake Landowners/Users Coalition
ug/l	micrograms per liter
USEPA	Environmental Protection Agency
USFWS	United State Fish and Wildlife Service
USGS	United States Geological Survey
Water District	Portland Water District
WQC	water quality certification
WUA	weighted usable area
YOY	young-of-the-year

SUMMARY

S.D. Warren Company (S.D. Warren) filed an application on March 29, 2002, for the continued operation of the 1.8-megawatt (MW) Eel Weir Hydroelectric Project (FERC No. 2984). The project is located at the outlet of Sebago Lake on the Presumpscot River, with facilities in the towns of Standish and Windham, Cumberland County, Maine. The project currently operates in a store-and-release mode, to the extent permitted under a Commission-approved Lake Level Management Plan (LLMP) and a 1992 Order requiring the release of flows to the Eel Weir bypassed reach. All of the power generated by the project is used by S.D. Warren's paper

mill in Westbrook, Maine. The project does not occupy any lands of the United States.

S.D. Warren proposes to continue operating its project in accordance with certain operational and environmental measures. This final environmental assessment (EA) analyzes the effects of: (1) S.D. Warren's proposed action; (2) S.D. Warren's proposed action with staff modifications; and (3) no-action. This final EA also evaluates numerous changes to the current LLMP, as recommended by various parties.

Based on our analysis, we recommend licensing the project as proposed by S.D. Warren, with some staff modifications and additional measures. The recommended staff modifications and additional measures include, or are based in part on, recommendations made by federal and state agencies and other entities that have an interest in the resources potentially affected by continued project operation. We recommend the following measures:

* Operate the project in a store-and-release mode, in accordance with the existing LLMP, with the following changes:
  - (i) manage the lake during spring fill-up to reach a target level of 266.15 feet on (or after), but not before, May 15, with an allowable target range of * 0.5 feet;
  - (ii) lake levels may be at the spring target level any time between May 15 and June 21 (for any 3-week period), with levels exceeding the spillway crest (elevation 266.65 feet) triggering increased flows (as described in the State of Maine's operating parameters);
  - (iii) establish a 3-inch tolerance range for the August 1 target date (265.17 feet * 3 inches); and
  - (iv) beginning January 1, and continuing until March 1, manage flows from the project to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching elevation 266.15 feet by May 15.
* Develop and implement a project operations and flow monitoring plan, which would include, at a minimum, the following measures:
  - (i) continue to operate the existing lake level gage;
  - (ii) continue to cooperate and coordinate with upstream pond owners to manage flood flows;
  - (iii) discharge the maximum flow (1,000 cubic feet per second; cfs) through the power canal during high flow events; and
  - (iv) flow and temperature monitoring in the Eel Weir bypassed reach.
* Release minimum flows to the bypassed reach, consisting of 75 cfs from November 1 to March 31 and 125 cfs from April 1 to October 31;
* Develop and implement an American eel passage plan, consisting of installing an upstream eel ladder, implementing measures for downstream eel passage, and effectiveness and out-migration monitoring;
* Reserve Commission authority to require fish passage facilities, as may be prescribed by Interior, pursuant to Section 18;
* Replace the existing wetlands monitoring program with a similar wetlands monitoring program that would be undertaken every 5 years;
* Develop and implement a shoreline management plan, which would include conservation easements, buffer zones, mapping of the shoreline, a permitting process, and other shoreline protection measures;
* Develop and implement a plan to construct a shallow-water boat launch in Sebago basin;
* Conduct recreation monitoring consistent with the Commission's FERC Form 80 program;
* Plan any changes to current land use(s) to be consistent with the aesthetic character of the project area; and
* Implement the Programmatic Agreement, executed on September 14, 2005, which requires the development of an Historic Properties Management Plan.

Overall, these measures, along with the standard articles provided in any license issued for the project, would reduce or minimize shoreline erosion and protect/enhance water quality, fisheries, wetlands, recreation, and historical resources, within the project area. In addition, the electricity generating by the project would be beneficial, because it would continue to reduce the use of fossil-fueled, electric generating plants; conserve non-renewable energy resources; and continue to reduce atmospheric pollution.

In section VI of this final EA, we estimate the annual net benefits of operating and maintaining the project under the three alternatives identified above. Our analysis shows that the annual net benefit would be $408,470 for the no-action alternative, $373,020 for S.D. Warren's proposed project, and $248,890 for S.D. Warren's proposed project with staff's recommended changes and additional measures.

On the basis of our independent analysis, we conclude that issuing a new license for the project, with the environmental measures that we recommend, would not be a major federal action significantly affecting the quality of the human environment.

FINAL ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing

EEL WEIR HYDROELECTRIC PROJECT
FERC NO. 2984-042, MAINE

I. APPLICATION

The Eel Weir Project (FERC Project No. 2984) is a 1.8-megawatt (MW) hydroelectric project located at the outlet of Sebago Lake on the Presumpscot River, with facilities in the towns of Standish and Windham, Cumberland County, Maine (figure A-1 in Appendix A). The project does not occupy any federal lands.

The project was initially licensed by the Federal Energy Regulatory Commission (Commission or FERC) on March 16, 1984 for a period of 20 years, with an expiration date of March 31, 2004.
26 FERC * 62,241.

[1]
On March 29, 2002, S.D. Warren Company (S.D. Warren or applicant) filed an application for a new license, under Part I of the Federal Power Act (FPA), to continue operating the project.

II. PURPOSE AND NEED FOR ACTION

A. Purpose of Action

The Commission, under the authority of the FPA,
16 U.S.C. **791(a)-825(r), as amended by the Electric Consumers Protection Act of 1986, Public Law 99-495 (1986) and the Energy Policy Act of 1992, Public Law 102-846.

[2]
may issue licenses for up to 50 years for the construction, operation, and maintenance of non-federal hydroelectric projects. With the filing of a license application by S.D. Warren for the Eel Weir Project, the Commission is now considering whether to relicense the project and what, if any, conditions should be placed in any license issued. A new license would allow S.D. Warren to generate electricity from the project for the term of the new license, as well as provide other developmental (e.g., flood control and water supply) and a variety of environmental (e.g., fish, wildlife, and recreation) benefits.

As part of its licensing decision, the Commission must determine that a project would be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the purposes of energy conservation; the protection, mitigation or damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

This environmental assessment (EA), prepared in accordance with the National Environmental Policy Act of 1969 (NEPA),
Public Law 91-190, 42 U.S.C. *4341 (January 1, 1970), as

amended by Public Law 94-52 (July 3, 1995) and Public Law 94-83 (August 9, 1975).

[3]
analyzes the site-specific and cumulative effects associated with the continued operation of the Eel Weir Project. This EA evaluates the effects associated with relicensing the project as proposed and considers alternatives to the proposed action, and makes recommendations to the Commission on whether to issue a new license, and if so, what conditions to include in any new license issued.

B. Need for Power

To assess the need for power, we reviewed the needs in the operating area in which the project is located - New England Area of the Northeast Power Coordinating Council (NPCC) region, within the North American Electric Reliability Council (NERC). NERC annually forecasts electrical supply and demand in the nation and the region for a 10-year period. NERC's most recent report (2005) on annual supply and demand projections indicates that, for the period 2005-2014, the demand for electric energy in the New England Area will grow at an average rate of 1.5 percent annually, while the reserve margin will decrease from 19.4 in 2005 to 8.5 percent in 2014.

The average annual generation of the Eel Weir Project is 12,300 megawatt-hours (MWh). All of the power generated by the project is used by S.D. Warren's paper mill in Westbrook, Maine. The project provides base load power to the mill and cold start capability in the event of a mill shutdown. This results in significant cost savings for mill operations.

If the project power were not available, the power for the paper mill would have to come from other sources (i.e., from the applicant's 50-MW cogeneration plant) that would be less economical than the project power. The fuel source for this replacement energy is coal and biomass, which are not environmentally friendly. The project displaces existing and planned non-renewable fossil-fueled generation, which contributes to the production of nitrogen oxides, sulfur dioxides, and carbon dioxide.

We conclude that present and future use of the power from the project, with its displacement of non-renewable fossil-fueled generation, low cost, and its contribution to a diversified generation mix, support a finding that the power from the project would help meet a need for inexpensive and reliable power from renewable fuel sources in Southern Maine, in the short and long term.

III. PROPOSED ACTION AND ALTERNATIVES

A. Description of Existing Project Facilities

The Eel Weir Project includes the following existing facilities (figure A-2 in Appendix A): (1) a 1,350-foot-long dam, consisting of (a) a 900-foot-long non-overflow concrete retaining wall and earth-fill east embankment that varies in height from a few inches to 20 feet, (b) a 115-foot-long, 22-foot-high stone masonry and concrete spillway, (c) a 35-foot-long, 17-foot-wide stone masonry and concrete river gatehouse with five 6.4-foot-high by 4.8-foot-wide wooden gates, and (d) a 260-foot-long stone masonry and earth-fill west embankment with variable height, incorporating a 40-foot-long by 12-foot-wide canal intake gatehouse with four 8.8-foot-high by 7-foot-wide wooden intake gates; (2) a 90-foot-long fish screen with 3/4-inch spacing located immediately upstream of the canal intake gatehouse; (3) a 4,820-foot-long, 15-foot-deep earthen power canal, developing a 40-foot gross head at the powerhouse; (4) a 40-foot-long, 19-foot-high canal waste gate structure with three 17-foot-wide, 11-foot-high steel slide gates each incorporating small minimum flow gates discharging up to 25 cubic feet per second (cfs); (5) a 12-mile-long impoundment (Sebago Lake) with a surface area of 28,771 acres at a normal pond elevation of 266.65 feet mean sea level (msl) and a 330,000 acre-feet gross storage and 177,120 acre-feet usable storage; (6) a 6,700-foot-long bypassed reach; (7) a 69-foot-wide, 32-foot-long powerhouse containing three turbine-generator units, each rated at 600 kilowatts (kW), with a total installed station capacity of 1,800 kW; (8) a 200-foot-long, 32-foot-wide tailrace; (9) a 3.5-mile-long, 11-kilovolt (kV) transmission line leading to the applicant's Dundee Project (P-2942); and (10) appurtenant facilities.

The existing project boundary encompasses: (a) Sebago Lake within the 267.0- foot contour; (b) the Eel Weir dam and associated facilities; (c) the power canal within the 262.65-foot contour; (d) the Eel Weir powerhouse; and (e) a 20-foot wide corridor for the transmission line that runs from Eel Weir to the Dundee Project.

B. Description of Existing Project Operation

Current Operation

S.D. Warren operates the project in a store-and-release mode, in accordance with the Commission-approved Lake Level Management Plan (LLMP)

79 FERC * 61,064 (1997), rehearing 80 FERC * 61,207 (1997), and as amended in 92 FERC * 62,180 (2000), rehearing 94 FERC * 61,034 (2001).

[4]
and a 1992 Order requiring minimum flows in the Eel Weir bypassed reach.

58 FERC * 62,006 (1992).

[5]
The power station is operated 24 hours a day, and is manually controlled. S.D. Warren's hydro operations personnel visit the site daily and make necessary adjustments to the unit settings based on the flow at the project. Flows from Sebago Lake are typically set weekly, although adjustments may be made more frequently, if necessary.

The project has an estimated maximum hydraulic capacity of 822 cfs. Each of the three turbines can release from between 100 and 274 cfs. Pursuant to the LLMP, lake levels are monitored by the applicant on a daily basis using average daily lake level data generated by a U.S. Geological Survey (USGS) real time water level gage (No. 01063995), located near North Windham, Maine. The applicant paid for the installation, and currently funds the operation and maintenance, of this gage.

The Maine Department of Inland Fisheries and Wildlife (MDIFW) annually stocks the Eel Weir bypassed reach with brook trout and land-locked Atlantic salmon, and periodically with brown trout. As part of the current license, the applicant is required to release seasonally-adjusted minimum flows (as described below) to the bypassed reach. During maintenance operations, canal headgates are closed to provide access to project structures. S.D. Warren releases the appropriate minimum flow, as stipulated in the LLMP, downstream of the project via spillage into the bypassed reach. This ensures protection of aquatic habitat and water quality in the Presumpscot River. Any required maintenance of project structures at the upstream side of the dam or canal are done in the wet, using divers if necessary.

Proposed Operation

S.D. Warren proposes to continue operating the project as outlined above, except as described in the following section.

C. Proposed Action

S.D. Warren proposes to continue operating its project in accordance with the following measures:

Operational Measures

* modify the existing Commission-approved LLMP to establish a 3-inch tolerance range for the August 1 target date;

Environmental Measures

* continue to operate the project in a store-and-release mode, in accordance with the existing Commission-approved LLMP, as amended and proposed herein;

* continue operating the existing lake level gage;

* continue cooperation and coordination with upstream pond owners to manage flood flows;

* discharge flow through the project's power canal up to its maximum capacity of 1,000 cubic feet per second (cfs) during high flow events to reduce bypassed reach flows, except in the event of emergency and maintenance situations;

* continue to release Commission-approved minimum flows to the Eel Weir bypassed reach, including 25 cfs from November 1 - March 31, 75 cfs from April 1 - June 30, 50 cfs from July 1 - August 31, and 75 cfs from September 1 - October 31 each year;

* consult with resource agencies regarding the need for upstream and downstream American eel passage at Eel Weir following installation of upstream and downstream eel passage, and monitoring results demonstrate that eels use the passage facilities, at all downstream projects on the Presumpscot River;

S.D. Warren's preferred option for any installed downstream eel passage at the project is via the river gates at the dam (see Option #3, as discussed herein and in Appendix D-10 of the license application). The downstream fish passage facility would be operated for 4 hours per night for 4 weeks during the peak downstream movement period for American eel. The timing of downstream passage operation at Eel Weir would be determined based upon a 3-year downstream eel movement study conducted as required by the existing licenses for S.D. Warren's five downstream hydropower projects.

[6]

* replace the wetlands monitoring program required as part of the 1997 Commission Order with a similar wetlands monitoring program that would be undertaken every 5 years;

* after consultation with the Maine Historic Preservation Office (Maine SHPO), (1) protect and mitigate project-related effects to archeological sites, if any are identified during on-going studies, and (2) protect project structures that have been determined to meet National Register of Historic Places criteria;

* conduct FERC Form 80 recreation monitoring program;

* upon license issuance, evaluate opportunities for establishing a conservation easement on lands around the bypassed reach with the town of Windham or Land for Maine's Future; and

* plan any changes to current land use(s) to be consistent with the aesthetic character of the project area.

D. Proposed Action with Additional Environmental Measures

1. Agency- and Interested Party-Recommended Changes to the LLMP

Several entities, including state and federal agencies, non-governmental organizations (NGO), and individuals, recommend changes to the current LLMP. We generally characterize these measures as follows.

State of Maine (Maine)

* The lake would reach a target level of 266.65 feet (spillway crest) on, but not before, May 1. The target range on May 1 would be 266.65 to 266.0 feet.

* Lake levels may be at spillway crest any time between May 1 and the 3rd week in June,

Lake levels this time of year shall not be maintained at the top of the spillway crest for more than 3 weeks during any year.

[7]

with higher lake levels triggering increased flows, as described in the operating parameters attached as Appendix B to this EA.

* Lake levels would be managed to achieve a minimum target level of 265.17 feet (~ 1.5 feet below spillway crest) on August 1.

* The target lake level would be 262.5 feet on November 1, * 6 inches, with a maximum level of 265.0 feet on September 1.

* Water levels above a line drawn from 266.65 feet at the end of the 3rd week of June to 265.0 feet on September 1, then 263.0 feet on November 1, would trigger increased flows according to the operating parameters outlined in Appendix B.

* Lake levels below a line drawn from 266.0 feet on May 1 to 265.17 feet on August 1, then 262.0 feet on November 1 would trigger minimum flows according to the operating parameters outlined in Appendix B.

* The target lake level on or about December 1 would be 261.0 feet in 2 out of every 9 years, and would be managed to stay within 6 inches of the December 1 target level until January 1.

* From mid-October to mid-November, flows would be capped at 1,000 cfs, unless the lake level is above the target range and rising.

* From January 1 to March 1, flows would be reduced to achieve and maintain lake levels at or above the long-term (1910-1986) median levels (between 262.0 and 262.5 feet) for the period, as soon as practical. Water levels would be managed to be no higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1, and from 263.5 feet on January 1 to 266.65 feet on May 1.

The aforementioned provisions of Maine's proposed changes to the LLMP are shown in figure 1.

Figure 1.Maine's recommended changes to the LLMP for Sebago Lake Maine. (Source: State of Maine, letter dated April 26, 2004, and filed May 13, 2004)

U.S. Department of the Interior (Interior)

* Limit lake level fluctuations in Sebago Lake to no more than 2 feet during the open water season (April 1 - December 15) and no more than 3 feet during the winter ice-on season (December 16 - March 31).

Interior also recommends measures pertaining to: (a) bypassed minimum flows; (b) lake level and flow monitoring; (c) recreation use monitoring; and (d) development of a shoreline management plan.

[8]

MDIFW

* Implement a fall/early winter drawdown to reduce lake trout spawning success, which would include a 5 to 8-foot drawdown beginning in late November, and associated effectiveness monitoring.

The MDIFW also recommends measures related to: (a) bypass minimum flows; (b) downstream American eel passage; (c) boat access on Sebago Lake; (d) angler foot access along the Eel Weir bypassed reach; (e) study of the lake's warmwater fishery; (f) American smelt migration barriers resulting from project operations; and (g) lost angling opportunities in the Eel Weir bypassed reach. The Maine Department of Marine Resources (MDMR) recommends measures related to upstream and downstream eel passage.

[9]

Friends of Sebago Lake (FOSL)

* Lower the spring target level to 265.65 feet and change the fall target levels as follows: (a) in 1 of every 2 years, lower the lake to 261 feet by November 1; (b) in 1 of every 4 years, lower the lake to 260 feet by November 1; and (c) in 1 of every 10 years, lower the lake to 259 feet by November 1.

FOSL also recommends measures for: (a) upstream and downstream fish passage for Atlantic salmon; and (b) increased minimum flows in the Eel Weir bypassed reach.

[10]

Charles M. Frechette

* Maintain target lake levels in Sebago Lake at, or above, 266.0 feet from May 1 to July 7, and maintain an absolute minimum level of 263.5 feet.

Stephen P. Kasprzak

In a letter filed August 24, 2004, Mr. Kasprzak provided alternative LLMP recommendations. The recommendations are unclear, however. For example, Mr. Kasprzak recommends a maximum target elevation of 265.4 feet for the spring, with a tolerance of * 1 foot. In the same letter, Mr. Kasprzak subsequently recommends that that the spring target elevation be raised to 266.0 feet, with a tolerance range of * 1 foot. Because of what appears to be independent, yet conflicting, recommendations, we evaluate Mr. Kasprzak's originally-filed recommendations, and ask that Mr. Kasprzak clarify his recommendations for a LLMP in any comments filed on the draft EA.

[11]

* Lower the spring target level by 1 foot to 265.65 feet, with an operating band of +1.0 foot and -0.5 foot;

* Lower the lake to 261.0 feet in 1 out of every 2 years, to 260.0 feet once every 4 years, and to 259.0 feet once every 10 years; and

* Evaluate the LLMP recommended by Commission staff in the 1997 EIS.

Sebago Lake Landowners/Users Coalition (Sebago Lake Coalition)

In a letter filed September 1, 2004, the Sebago Lake Coalition requests that we consider certain changes to the existing LLMP. These changes are different from their originally-filed recommendations. Because we are not clear as to what lake levels the Sebago Lake Coalition recommends, we evaluate the Coalition's originally-filed recommendations. We ask that the Coalition clarify its recommendations for a LLMP in any comments filed on the draft EA.

[12]

* Maintain lake levels as follows: (a) between 266.0 and 266.5 feet on June 1; (b) between 266.0 and 265.8 feet on July 1; (c) between 265.8 and 265.4 feet on August 1; (d) between 265.4 and 264.9 feet on September 1; and (e) between 264.5 and 264.0 feet on October 1.

2. Additional Staff-Recommended Measures

We considered what, if any, additional enhancement measures would be beneficial to those resources affected by the project and its operation. We recommend the following changes and additions to S.D. Warren's proposed project operations and environmental measures:

* operate the project in a store-and-release mode, in accordance with S.D. Warren's proposed LLMP, with the following changes:
  (i) manage the lake during spring fill-up to reach a target level of 266.15 feet on (or after), but not before, May 15, with an allowable target range of * 0.5 feet;
  (ii) lake levels may be at the spring target level any time between May 15 and June 21 (for any 3-week period), with

levels exceeding the spillway crest (elevation 266.65 feet) triggering increased flows (as described in the State of Maine's operating parameters; and
(iii)beginning January 1, and continuing until March 1, manage flows from the project to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching elevation 266.15 feet by May 15.

* release minimum flows to the bypassed reach, consisting of 75 cfs from November 1 to March 31 and 125 cfs from April 1 to October 31;

* develop and implement a project operations and flow monitoring plan, which would include, at a minimum, certain measures proposed by S.D. Warren, as well as flow and temperature monitoring in the bypassed reach;

* develop and implement an American eel passage plan, consisting of installing an upstream eel ladder, implementing measures for downstream eel passage, and effectiveness and out-migration monitoring;

* reserve Commission authority to require fish passage facilities, as may be prescribed by Interior, pursuant to Section 18;

* develop and implement a shoreline management plan, which would include conservation easements, buffer zones, mapping of the shoreline, a permitting process, and other shoreline protection measures;

* develop and implement a plan to construct a shallow-water boat launch in Sebago basin, on S.D. Warren-owned land; and

* implement the Programmatic Agreement (PA), executed on September 14, 2005, which requires the development of an Historic Properties Management Plan (HPMP).

E. No-Action

Under the no-action alternative, the project would continue to operate as required by the original project license. The no-action alternative would result in no change to the existing environmental setting in the project area. If the project operates as in the past, there would be continued energy production, with no enhancement of existing natural resource values. We use the no-action alternative to establish baseline environmental conditions for comparison with other alternatives.

F. Alternatives Considered but Eliminated from Detailed Study

We considered several other alternatives to S.D. Warren's relicensing proposal, but eliminated them from detailed study, because they are not reasonable in the circumstances of this proceeding. These alternatives are: (1) federal takeover and operation; (2) issuance of a non-power license; and (3) project decommissioning.

Federal Takeover - In accordance with *16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric project with a license that is subject to Sections 14 and 15 of the FPA.
16 U.S.C. ** 791(a)-825(r).

[13]
Federal takeover of the project would require Congressional approval. While that fact along would not preclude further consideration of this alternative, there is currently no evidence showing that a federal takeover should be recommended to Congress. No entity, to date, has suggested that federal takeover would be a reasonable or appropriate alternative, nor has any federal agency expressed an interest in operating the project. Thus, we do not, in this case, consider federal takeover to be a reasonable alternative.

Non-power License - A non-power license is a temporary license which the Commission would terminate whenever it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. Hence, issuing a non-power license for the project would not provide a long-term solution to the issues presented. To date, no entity has sought a non-power license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, a non-power license is not a reasonable alternative to some form of new license with enhancement measures.

Project Decommissioning - The project decommissioning alternative would involve: (1) denial of the license application for the Eel Weir Project; and (2) ceasing power generation at the project. At a minimum, project decommissioning would have the following effects: (1) the energy currently generated by the project would be lost [about 12,300 megawatt-hours (MWh) annually]; and (2) there would be significant costs associated with decommissioning the project powerhouse, power canal, and appurtenant facilities. Accordingly, in the circumstances of this case, we do not consider project decommissioning a viable alternative.

IV. AGENCY CONSULTATION AND COMPLIANCE

A. Agency Consultation

The Commission's regulations (18 CFR ** 4.38 and 16.8) require that applicants consult with appropriate resource agencies and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be completed and documented, according to the Commission's regulations, before the Commission can accept an application for a license. In addition to the pre-filing consultation process, public comment periods are provided as part of the Commission's processing of a license application, which we describe below.

1. Scoping

Before preparing this EA, we conducted scoping for the Eel Weir Project to determine what issues and alternatives should be addressed. We issued Scoping Document 1 (SD1) on September 27, 2002, to invite appropriate resource agencies, Native American tribes, NGOs, and other interested entities to participate in, and contribute to, the scoping process. We also conducted two scoping meetings associated with the Eel Weir Project on October 22 and 23, 2002, in Windham and Portland, Maine, respectively, and held a site visit to the project on October 22, 2002.

The scoping meetings and site visit were announced in local newspapers and in the Federal Register. Numerous individuals provided oral testimony at the scoping meetings. In addition to these comments, the following entities provided written comments pertaining to the scope of issues for the Eel Weir Project:

Commenting Entity	Filing Date
Stephen N. Wiener	October 21, 2002
Phil M. Perry	October 23, 2002
Harvey L. Dutil	October 25, 2002
Edward and May Himelrick	October 28, 2002
Stephen M. Kasprzak	October 29, 2002
	November 6, 2002
	November 12, 2002
	November 15, 2002
	November 25, 2002
Robert P. Hennick	October 29, 2002
James A. Storer	October 29, 2002
Robert H. Jones	November 4, 2002
Carl J. Canzanelli	November 4, 2002
Lake Sebago Estates Homeowners Association	November 7, 2002
Carol L. Steiman & Neil H. Garston	November 12, 2002
Debra L. Nelson	November 14, 2002
S.D. Warren Company	November 19, 2002
	January 2, 2003
Sebago Harbor Association	November 24, 2002
P. Albert Arsenian	November 25, 2002
Portland Water District	November 25, 2002
Charles M. Frechette, Sebago Lake Marina	November 25, 2002
Friends of Sebago Lake	November 25, 2002
	December 16, 2002
Maine Department of Marine Resources	November 25, 2002

Sebago Lake Landowners/Users Coalition	November 26 & 27, 2002
U.S. Fish and Wildlife Service	December 2, 2002
Maine Dept. of Inland Fisheries and Wildlife	December 17, 2002
	February 6, 2003
Maine Dept. of Environmental Protection	December 18, 2002

After careful consideration of all scoping input, we revised SD1 and issued Scoping Document 2 (SD2) on January 30, 2003. SD2 identifies issues to be addressed in this EA, including potential effects on: (1) geology and soils; (2) water use and quality; (3) fish and aquatic resources; (4) terrestrial resources, including wetlands and shoreline vegetation; (5) recreation resources and land use; (6) cultural resources; and (7) socioeconomic resources. The scoping process did not reveal substantive issues related to threatened and endangered species. Therefore, we do not include threatened and endangered species in our detailed analysis. We address all remaining comments and concerns raised during the scoping process in this EA.

2. Interventions

On August 2, 2002, the Commission issued a notice accepting the application for new license for the Eel Weir Project, and soliciting protests and motions to intervene. This notice set October 2, 2002, as the deadline for filing protests and motions to intervene. In response to the public notice, the following entities intervened in the relicensing proceeding:

Interveners	Filing Date
American Rivers & Friends of the Presumpscot River	June 25, 2002
Friends of Sebago Lake	August 21, 2002
Stephen Kasprzak	August 29, 2002
Sebago Lake Marina	September 3, 2002
Town of Frey, Maine	September 4, 2002
Sebago Lake Landowners/Users Coalition	September 5, 2002
Douglas C. Fray and Northwest Shores Association	September 9, 2002
Sebago Pines Property Owners and Road Users Association	September 9, 2002
Kettle Cove Marina	September 9, 2002
U.S. Department of the Interior	September 26, 2002
Maine State Planning Office	September 27, 2002
Sebago Harbor Association	September 30, 2002
Maine Public Employees for Environ. Responsibility	October 1, 2002
Maine Representative Janice E. Labrecque	October 14, 2002

Sebago Lake Marina, Sebago Pines Property Owners and Road Users Association, Douglas C. Gray, and Northwest Shores Association filed interventions protesting the relicensing of the Eel Weir Project. We address intervener and other concerns in section V.C (Environmental Analysis) of this EA.

3. Comments on the Application

[14] In addition to the comments and recommendations listed herein, a "Say No To Low" postcard campaign resulted in 60 + postcards from individuals recommending that lake levels not be drawn down.

On June 5, 2003, the Commission issued a public notice indicating that the license application for the Eel Weir Project was ready for environmental analysis, and soliciting comments, recommendations, terms and conditions, and prescriptions within 60 days. In response to this notice, the following entities filed comments:

Commenting Entity	Filing Date
U.S. Department of the Interior[15]	August 1, 2003
Stephen M. Kasprzak	August 1, 2003
Maine Department of Environmental Protection	August 4, 2003

[15] Interior filed comments on behalf of the U.S. Fish and Wildlife Service (USFWS).

Friends of Sebago Lake August 4, 2003
Charles M. Frechette August 4, 2003
Maine State Planning Office
The Maine State Planning Office (MSPO) filed comments on behalf of the MDMR and the MDIFW.

[16]
August 5, 2003
Sebago Lake Landowners/Users Coalition August 11, 2003

S.D. Warren filed reply comments on September 17, 2003. We address these comments and recommendations in section V.C (Environmental Analysis) of this EA.

4. Comments on the Draft Environmental Assessment

On July 11, 2005, we issued a draft EA for the relicensing of the Eel Weir Project. We requested comments be filed within 60 days from the issuance date (August 25, 2005).

The Commission extended the deadline for filing comments on the draft EA to September 9, 2005.

[17]
A public meeting was held to receive comments on the draft EA on August 18, 2005. In addition to the verbal comments received during the public meeting, 62 letters, representing 14 entities and 42 individuals commenting on the draft EA, were filed with the Commission. S.D. Warren filed its response to the draft EA comments on October 17, 2005. We modified the text of the draft EA, as necessary, in response to these comments. Appendix D summarizes the comments that were filed and our responses to the comments.

B. Compliance with Mandatory Requirements

1. Water Quality Certification

Section 401(a)(1) of the Clean Water Act (CWA) and Commission regulations require that license applicants obtain either: (1) state certification that any discharge from the project would comply with applicable provisions of the CWA; or (2) a waiver of certification by the appropriate agency. On March 19, 2002, S.D. Warren applied to the Maine Department of Environmental Protection (MDEP) for water quality certification (WQC) for the Eel Weir Project. S.D. Warren subsequently withdrew and refiled its application for WQC on February 21, 2003, February 18, 2004, and again on February 16, 2005. Action on the application is pending.

2. Section 18 Fishway Prescription

Section 18 of the FPA provides that the Commission must require a licensee to construct, operate, and maintain such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce, as appropriate. Interior did not prescribe any fishways for the Eel Weir Project, but by its letter filed August 1, 2003, reserved its authority to prescribe the construction, operation, and maintenance of fishways at the project during the term of any new license.

Interior does not specifically prescribe fishways, but rather recommends that S.D. Warren implement downstream eel passage measures at the project, consistent with Option #3 outlined in the license application but with a longer operating period.

[18]

We recognize that future fish passage needs and management objectives cannot always be predicted at the time of license issuance. Under these circumstances, and upon receiving a specific request from either Interior or the U.S. Department of Commerce, we recommend that the Commission follow its practice of reserving the Commission's authority to require such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce.

3. Coastal Zone Management Act

Section 307(c)(3) of the Coastal Zone Management Act (CZMA)

requires that all federally licensed and permitted activities be consistent with approved state Coastal Zone Management Programs.
16 U.S.C. * 1456(c)(3)(A).

[19]
If a project is located within a coastal zone boundary or if a project affects a resource located in the boundaries of the designated coastal zone, the applicant must certify that the project is consistent with the state Coastal Zone Management Program.

The Eel Weir Project is subject to Maine's jurisdiction under Section 307 of the CZMA. Although the project is located outside of the geographic boundary of the Maine Coastal Program, the project may affect diadromous fishery resources of the coastal zone,
The boundary of Maine's designated coastal zone is at head-of-tide on the Presumpscot River, which is about 25 miles downstream from the Eel Weir Project (S.D. Warren, 2002b).

[20]
including the American eel. By letter dated September 20, 2002, S.D. Warren requested a coastal zone consistency determination from the MSPO, the CZMA certifying agency in the State of Maine (see response to AIR #16; S.D. Warren, 2002b). To date, the MSPO has not responded to S.D. Warren's request.

4. Endangered Species Act

Section 7 of the ESA, 16 U.S.C. * 1536(a), requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of threatened or endangered species, or result in the destruction or adverse modification of any designated critical habitat of such species. Federal agencies are required to consult with the USFWS when a proposed action may adversely affect listed species.

The federally listed bald eagle (Haliaeetus leucocephalus) and small whorled pogonia (Isotria medeoloides) are listed for Cumberland County, Maine (USFWS, 2004).
There are no documented bald eagle nests in the project area, though there are known nesting eagles located within a 14- to 35-mile radius of the Eel Weir Project (Woodlot Alternatives, 2002). No primary roost trees (e.g., trees habitually used on a daily basis) have been documented in the project area. However, potential secondary roost trees (e.g., large live or dead white pine used for short periods during active feeding) occur along the shoreline throughout the project area. The small whorled pogonia occurs in the vicinity of S.D. Warren's Dundee Project (FERC No. 2942) located downstream in North Gorham, Maine. However, the small whorled pogonia has not been documented in the Eel Weir Project area.

[21]
Both the bald eagle and the small whorled pogonia are federally listed as threatened. There is no designated critical habitat for either species in the project area.

Interior, by letter dated November 19, 2002, indicates that, based on currently available information, no federally listed species under the jurisdiction of the USFWS are known to occur in the project area, with the exception of occasional, transient bald eagles. Interior concludes that no further action (or consultation) is required under Section 7 of the ESA, unless new information reveals effects not previously considered, the action is modified in a manner not previously considered, or a new species is listed.

5. Section 106 Consultation

Relicensing is considered an undertaking within the meaning of Section 106 of the NHPA of 1966, as amended.
Public Law 89-665; 16 U.S.C. 470.

[22]
Section 106 requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register.

As described in section V.C.6 (Archeological and Historic Resources), to meet the requirements of Section 106, the Commission, on September 14, 2005, executed a PA for the protection of historic properties from the effects of the continued operation of the Eel Weir Project. The terms of the PA would ensure that S.D. Warren addresses and treats all historic properties identified within the project area through a HPMP. The HPMP entails on-going consultation involving historic properties for the term for the license.

V. AFFECTED ENVIRONMENT AND ENVIRONMENTAL ANALYSIS

In this section, we address, in detail, only those resources affected by the operation of the Eel Weir Project, and include analysis of comments by interested parties on the project's proposed operation. Unless otherwise indicated, the sources of our information include the license application (S.D. Warren, 2002a), S.D. Warren's additional information submittal (S.D. Warren, 2002b; 2003), the final Environmental Impact Statement for the Presumpscot River Projects (FERC, 2002), and supplemental filings made by the applicant and other entities.

A. General Description of the Locale

The Eel Weir Project is located at the outlet of Sebago Lake in the Presumpscot River Basin in southern Maine. The Sebago Lake sub-watershed stretches from Bethel, Maine in the north to Standish, Maine in the south, a distance of 47 miles, and is approximately 10 miles wide. Sebago Lake and the Presumpscot River are part of the Casco Bay watershed (Sebago Lake Association, 2004).

Sebago Lake is the second largest lake in the state of Maine, and is considered a significant regional recreational resource. The watershed for Sebago Lake is about 436 square miles (mi2), and is primarily drained by the Crooked and Songo Rivers. Land use within the Sebago Lake watershed is approximately 74 percent forested, 14 percent water surface, 6 percent developed, and the remaining 6 percent is primarily farmland and open space. Sebago Lake serves as the public water supply source for residents in the greater Portland area, as well as many lake residents.

The Presumpscot River originates at the outlet of Sebago Lake. The river flows in a southeasterly direction for about 25 miles, through Gorham, Windham, Westbrook, Portland, and Falmouth, eventually emptying into the Atlantic Ocean at Casco Bay. Flow in the river is highly regulated by the Eel Weir Project, which controls nearly 70 percent of the river's drainage area.

In addition to Sebago Lake, seven tributaries feed the Presumpscot River between Sebago Lake and the Saccarappa Project in Westbrook (FERC, 2002).

The topography of the area is gently rolling and hummocky, with a few isolated hills. Elevations range from lows of about 80 feet msl on the Presumpscot River in the vicinity of the Saccarappa Project to 188 feet between Sebago and Little Sebago Lakes. The general geology of the area is typical of southern and central Maine. Igneous rocks and highly deformed metamorphic rocks underlie Wisconsin glacial sediments of variable composition and thickness, some of which area good sources of groundwater.

The climate in southern Maine is a continental climate, highly influenced by the proximity of the North Atlantic Ocean. Average temperatures range from 22 degrees Fahrenheit (oF) in the winter to 69o F in the summer. Peak temperatures normally occur in July. During a very warm summer, temperatures may reach 90o F for up to 25 days. Winters are generally cold, but it is rare that there are prolonged cold spells. Precipitation in the area averages around 43 inches annually, with about 15-30 thunderstorms per year. There are approximately 80 to 120 clear days per year. Average snowfall is about 60-90 inches (Maine Tourism Association, 2004).

The project facilities are located in the cities of Standish and Windham, in Cumberland County. Cumberland County has a total population of 266,284 with 9,285 people living in Standish and 16,142 people living in Windham (Cumberland County, 2004). The predominant land use within the Sebago Lake watershed is undeveloped vegetation, comprising 86 percent of the land area. Approximately 6.9 percent is residential. Timber operations account for 2.5 percent, agriculture accounts for 2.2 percent, and only 0.2 percent is commercial and retail. The remaining 2.2 percent of the land area has other uses (Sebago Lake Association, 2004). The land bordering the Presumpscot River is primarily undeveloped in the upper reaches of the watershed (100 persons/mi2), and becomes more developed and industrial downstream (3,000 persons/mi2).

Sebago Lake is used for many purposes. The main uses for the lake water are recreation (e.g., fishing, boating, swimming) and drinking water. The Portland Water District (Water District) prohibits recreational use within 3,000 feet of the intakes in order to protect the drinking water supply. In addition to the above uses, Sebago Lake water is used by S.D. Warren to produce hydropower. The Presumpscot River is used for hydroelectric power generation, process water for S.D. Warren's paper mill in Westbrook, Maine, municipal and industrial wastewater treatment, and recreation. There are no consumptive uses or wastewater discharges in the project area.

There are seven hydroelectric developments along the length of the Presumpscot River (FERC, 2002).
Historically, an eighth hydro facility operated on the Presumpscot River. The Smelt Hill dam, the lowermost dam on the river, was removed in October 2002.

[24]
The Eel Weir Project is the most upstream development (Table 1). Of the six downstream projects, five are owned by S.D. Warren (i.e., Dundee, Gambo, Little Falls, Mallison Falls, and Saccarappa Projects) and one is owned by FPL Energy Maine Hydro (i.e., North Gorham Project). In addition to these hydroelectric developments, S.D. Warren owns the non-jurisdictional Cumberland Mills dam, which is located immediately below its Saccarappa Project. The Cumberland Mills dam provides process water for the applicant's paper mill.

Table 1. Hydroelectric projects on the Presumpscot River (Source: FERC, 2002a).

Project Name	FERC No.	Installed Capacity (kW)	Drainage area (mi2)	Surface area (acres)	Approx. RM
Eel Weira	2984	1,800	436	29,184	25
North Gorhamb	2519	2,250	436	98	23.6
Dundeea	2942	2,400	445	197	21.9
Gamboa	2931	1,900	493	151	18.6
Little Fallsa	2941	1,000	500	29	16.9
Mallison Fallsa	2932	800	501	8	16.4
Saccarappaa	2897	1,350	567	87	11.3

a Owned and operated by S.D. Warren.
b Owned and operated by FPL Energy Maine Hydro LLC.

B. Cumulative Effects Analysis

According to the Council for Environmental Quality (CEQ) regulations for implementing NEPA (*1508.7), an action may cause cumulative effects on the environment if its effects overlap in space and/or time with the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant actions, taking place over a period of time. Such actions can include hydropower, as well as other land and water development activities.

We evaluated the cumulative effects of the proposed action and alternatives with regard to other existing and foreseeable hydroelectric development and non-hydroelectric activities in the Presumpscot River Basin upstream and downstream from the project. Based on the information in the license application, agency comments, other filings in the proceeding, and our staff analysis, we have identified water quantity and quality and aquatic resources (specifically American eel and anadromous fish) as having the greatest potential to experience cumulative effects associated with the proposed action or action alternatives.

1. Geographic Scope

Our geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources; and (2) contributing effects from other hydropower and non-hydropower activities within the Presumpscot River Basin.

The Presumpscot River originates at the outlet of Sebago Lake. The river flows in a southeasterly direction for about 25 miles through Gorham, Windham, Westbrook, Portland, and Falmouth, eventually emptying into the Atlantic Ocean at Casco Bay. Flow in the river is highly regulated by the Eel Weir Project, which controls nearly 70 percent of the river's drainage area. The land bordering the river is primarily undeveloped in the upper reaches of the watershed, and becomes more developed and industrial downstream.

Based on our review of the record, the scope of analysis for cumulative effects on the aforementioned resources includes Sebago Lake and the full length of the Presumpscot River down to Casco Bay. To the extent necessary, we include the tributaries to the Presumpscot River, as well. We chose this geographic area for evaluation of cumulative effects because on-going activities throughout the Presumpscot River Basin (e.g., dams and hydropower development, agriculture, recreation, industrial and residential development, and wastewater discharges) could potentially cumulatively affect water quantity/quality and aquatic resources in the basin.

2. Temporal Scope

The temporal scope of our cumulative effects analysis in the EA includes a discussion of past, present, and future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of a new license, the temporal scope looks 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each resource.

C. Environmental Analysis

1. Geological and Soil Resources

a. Affected Environment:

Sebago Lake lies along the boundary between two physiographic provinces: the New England Coastal Lowlands and the New England Central Highlands. The New England Coastal Lowland province is characterized by low rocky ridges and hills separated by broad valleys with a maximum topographic relief of 300 feet. North of the lake is the central highlands province with small mountains and more rugged hills. The maximum topographical relief in the central highlands province ranges from 1,000 feet near the northern portion of the lake to nearly 4,000 feet in the headwaters of the watershed.

Geology in the Sebago Lake area consists of unconsolidated Quaternary (1.5 million to 10,000 years old) glacial deposits overlying igneous and metamorphic bedrock. Under the northern two-thirds of the lake is the Sebago batholith, an intrusion of granitic rock referred to as Sebago Granite. Glacial deposits typically covered most of the bedrock in the area, with scattered outcroppings. Around the southern one-third of the lake, the bedrock consists of metamorphosed sandstones and mudstones.

Glaciation occurred in the region many times during the Pleistocene Epoch (3 million to 10,000 years ago) with the most recent glaciation occurring approximately 30,000 to 12,000 years ago. After the retreat of the glaciers, which had depressed the land surface due to their weight, the ocean shoreline was located near the southern end of the lake which allowed for the deposition of marine clays known as the Presumpscot Formation. Following the rebound of the land, the ocean shoreline retreated to its present location.

Typical surficial geologic materials found along the shoreline of Sebago Lake consists of marine clay, glacial till and glacial outwash. Glacial till, which typically consists of sand, silt, clay and gravel, is found along Frye Island and points north. Glacial outwash, which is general composed of looser sands and gravels with a much lower percentage of clay and silt, is found along the shoreline at Sebago Lake State Park, the western shore at Long Beach and at Tasseltop Beach on the eastern shoreline. Since the last ice age, the reworking of glacial deposits by fluvial and lacustrine processes is responsible for the sandy beaches along the shoreline. Additional sand, silt and clay is brought into the lake by rivers and tributaries. The Songo River has brought in large amounts of sediment and has a formed a delta where the beach at the Sebago State Park is located.

The 1997 EIS (FERC, 1997a) summarized the two soil associations along the shoreline of Sebago Lake; the Hermon-Peru-Paxton Association and the Windsor-Hinckley-Deerfield Association. Figure 2 shows the location of the different soil associations along Sebago Lake. In addition, figure 2 shows the location of 15 different beach profiles monitored by S.D. Warren.

S.D. Warren initiated, on September 17, 1997, as part of the requirements of the 1997 FERC-ordered lake level management plan, a 5-year monitoring program for beach erosion and accretion along Sebago Lake. The results of this monitoring are described in more detail in section b, Environmental Effects and Recommendations.

[25]

The 15 beach profile monitoring sites shown in figure 2 are named according to the names of nearby residences or other nearby landmarks. Many of these sites have also been monitored since before the recent S.D. Warren studies, and the dates shown in figure 2 indicate when monitoring was initiated. For example, the Songo Beach profiles were started in 1990 by the Maine Geological Survey (Maine Geology). FOSL started the Marathon Street and Ossipee Street profiles, as well as the Sunningdale and Thompson profiles in 1993. FOSL and Maine Geology started the Barton, Banks and Straw #2 profiles in 1993, while the Water District began the Standish and Rockwall profiles in 1993.

Figure 2. Beach profile monitoring sites and soil association locations. (Source: Framatone, 2003a; FERC, 1997a)

Public Access for figure 2 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

Shoreline Erosion

Shoreline erosion is typically governed by the following factors (Normandeau, 1994):

* shoreline surficial geology (bedrock, sand, clay, gravel, till, etc.);
* wave climate (shoreland exposure to wave direction, fetch, prevailing winds, nearshore bathymetry, nearshore currents, etc.);
* lake water levels (extreme high and low, mean, variability);
* ice;
* lakeward water supply (groundwater seeps, surface water runoff, rivers, streams);
* shoreline vegetation; and
* man-made structures (retaining walls, piers, jetties, boat houses, etc).

Shoreline erosion is a complex process that involves all of the processes listed above. Similar to ocean beaches, the major erosion processes occurs during storm wave events. Along ocean beaches, the gentler waves and swells during non-storm events are instrumental in rebuilding the beaches. Important beach rebuilding processes for beaches associated with a lake are typically: (1) transport by ice `bulldozing,' typically along windward shores of the lake during ice freeze-up periods; (2) replenishment by erosion of upper beach structures; (3) sand transport along the shore from nearby areas; and (4) tributary re-supply.

Based on wind rose data provided in the Commission's 1997 EIS (FERC, 1997a) and in NOAA (2004), the strongest, most prevalent winds are from the southwest, west, northwest and north, from November through the end of February. During April through the end of September, wind direction is relatively variable and light, with the strongest winds out of the south. March and October are clearly transitional months, with winds out of most directions other than the east.

Sandy beaches are not common on most lakes due to the required combination of amount and size suitability of available sand, wave climate, and shore and near shore slope requirements. Along steep, bluff like shorelines, waves during higher than normal water levels often cause significant erosion since they tend to affect the toe of the bluff and cause bank failure. Lower water levels along similar shorelines typically result in the waves affecting the gentler sloping shelf below the toe, which limits bluff erosion.

Table 2 shows the percentage of different shoreline classifications along Sebago Lake.

Table 2. Sebago Lake shoreline classification. (Source: Johnston and Mixon, 1997)

Shoreline Classification	Percent of Total
Marsh	4.1%
Sand beach	14.8%
Seawall behind beach	4.8%
Groins with sand in between	2.7%
Bluff behind sand beach	4.3%
Sand beach with boulders	2.2%
Glacial till (sand, silt and clay)	57.4%
Artificial fill	5.8%

Bedrock	3.9%

The characteristics of the major beaches along Sebago Lake are summarized in table 3. All of these beaches were estimated to have a typical slope of approximately 1:10. Figure 3 shows the location of these beaches.

Table 3. Summary of Sebago Lake major beaches. (Source: Maine Geology, 1998)

Beach location	Beach length (feet)	Average sand size	Fetch direction	Fetch length (miles)
Frye Island	1370	coarse sand	S	4.2
Halls Beach	1510	very coarse sand	SSW	7.1
Harmon Beach	2840	medium and coarse sand	ENE	3.1
Long Point Beach	3175	very coarse sand	NE	6.2
Rockwall Beach	530	very coarse sand	NW	9.1
Sandbar Beach	1895	coarse sand	NE	4.4
Songo Beach	3935	coarse sand	S	6
Standish Boat Launch	3555	coarse sand	N	4.2

Figure 3. Location of major beaches on Sebago Lake. (Source: Maine Geology, 1998)

Public Access for figure 3 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

b. Environmental Effects:

Shoreline and Beach Erosion

Many organizations have recommended changes to the LLMP, other than the change proposed by S.D. Warren. These recommendations can be generally grouped into two categories, those that believe that high lake levels are increasing the amount of shoreline and beach erosion, and those that believe high lake levels do not increase erosion, but that higher lake levels are needed for other uses of Sebago Lake.

S.D. Warren's proposed change to the LLMP would be to establish a 0.25-foot tolerance range around the August 1 target elevation for Sebago Lake. This is a slight change from the current LLMP, which specifies the target level without variance. S.D. Warren does not support the changes in the LLMP recommended by Interior, the MDIFW, Sebago Lake Coalition, FOSL, Mr. Frechette, or Mr. Kasprzak. S.D. Warren states:

(1) The reports by Maine Geology, and the 5 years of beach profiling conducted by S.D. Warren show normal sand movement and stability since 1990.

(2) Although certain beaches, at points in time, show short-term changes, the beaches show long-term stability interrupted at times by changes due to storms that occur during high water periods.

(3) While seasonal erosion and accretion does occur along all surveyed areas, there is an ongoing cycle of material loss and replacement, which maintains beach profile equilibrium.

(4) The dynamics of erosion and accretion through wind and wave action result in a shifting of materials, but subsequent storm events cancel out any major change in profiles.

The Maine Geological Survey (Maine Geology) commented that the beach profiles on record do not support item 4 above, and states that in fact storm events do not "cancel out any major change in profiles, but are the sources for significant long-term changes to the profiles." The powerful storm events of October/November 1996 produced significant erosion in the upper profiles of many Sebago Lake beaches that were evident for many years thereafter.

S.D. Warren also commented on Maine's recommended revisions to the LLMP, by letter filed July 15, 2004. S.D. Warren states that:

(1) For the January to March 1 period, the target lake level should be a stated elevation of 262.0 feet, instead of the long term (1910-86) median level. The LLMP should also include an expeditious process to allow S.D. Warren to obtain a temporary variance, such as approval from the MDEP, from maintaining 262.0 feet, or the 1910-86 median level, in recognition of high snowpack or watershed saturation.

(2) Maine's recommendation requires that flows be increased immediately whenever the lake level rises above the spillway crest, up to a maximum of 1,667 cfs or higher, if needed, to prevent the lake level from reaching 267.15 feet. The LLMP should include a provision to allow S.D. Warren to obtain a temporary variance from the flow release requirements into the Presumpscot River, in recognition of flood or other severe conditions on the river downstream of the project, such as obtaining concurrence with the MDEP.

(3) The November 1 lower limit should be elevation 262.0 feet instead of 263.0 feet.

S.D. Warren indicates that the MDEP concurs with this change.

[26]

(4) For the November 1 to January 1 time period, the 2 in every 9-year, low-level, drawdown to elevation 261.0 feet should be eliminated, because:

(a) the theory of beach accretion during a drawdown level of 261.0 feet is unsupported and not beneficial to the constituents of Sebago Lake as a whole;
(b) following a drawdown to 261.0 feet, S.D. Warren can not guarantee that Sebago Lake will refill the next year, due to hydrological issues;
(c) the project is not designed to pass large amounts of flow at low head, and maintaining the lake level within a 6-inch window near 261.0 feet is difficult; and
(d) significant flow releases might be required during the last two weeks in November, to meet the 261.0 feet target level, since flows from the lake are limited to 1,000 cfs from mid-October to mid-November due to salmon spawning requirements.

Maine's recommended LLMP is similar to the existing LLMP, but with some small differences. For example, there would be a minimum/maximum elevation of 266.0/266.65 feet on, but not before May 1. Lake levels may also be at the spillway crest, for no more than a 3-week period, anytime between May 1 and the 3rd week in June, but levels above the spillway would trigger flow releases to bring the lake level back down to the spillway crest elevation. After the spring fill-up, the lake would be managed to achieve a minimum target elevation of 265.17 feet on August 1. After August 1, water levels would be managed to reach a target level on November 1 of 262.5 feet plus or minus 0.5 feet. Water levels above a line drawn from 266.65 feet at the end of the 3rd week of June to 265.0 feet on September 1, then 263.0 feet on November 1, would trigger increased flows according to the operating parameters outlined in Appendix B. During 2 in every 9 years, with the exact years to be determined by Maine and S.D. Warren, the lake level would be managed to achieve a level of 261.0 feet on or about December 1. From January 1 through March 1, the lake levels would be maintained above the 1910-1986 median level, which is approximately 262.25 feet. Between March 1 and May 1, S.D. Warren would manage the lake levels so that the spillway crest elevation is reached by May 1.
The water level would not be higher than a straight line between 263.5 feet on January 1 to 266.65 feet on May 1.

[27]
Maine says that its revisions would:

(1) increase winter water levels to improve the likelihood that the lake would hit the May 1 full pond target level;

(2) eliminate, as a normal operating range, the lake levels above full pond, to reduce damage to beaches and shoreline;

(3) expand the target range to allow higher water levels from July to November;

(4) maintain the current periodic low water level in the fall (with a few adjustments) to promote accretion of sand to beaches; and

(5) reduce summer minimum flows to better maintain lake levels without threatening downstream water quality attainment.

Maine contends that the aforementioned changes would appropriately balance the competing uses of the lake, and would be more workable than the current plan.

Mr. Frechette recommends a water surface elevation of 266.0 feet or above from May 1 until July 7, with a limit on the lower water surface elevation of 263.5 feet during other times of the year. Mr Frechette contends that other stakeholders are more concerned about beaches than boating and other users on the lake, and elevations below 263.5 feet harm the Sebago Lake wetlands.

Interior recommends that drawdowns in Sebago Lake not exceed 2 feet from April 1 through December 15, and no more than 3 feet from December 16 through March 31. Additional discussion of Interior's recommendation is included in section V.C.3, Fisheries and Aquatic Resources.

The MDIFW indicates that lake level changes would be useful to reduce lake trout spawning success. The MDIFW recommends that a delayed drawdown beginning in late November, resulting in a 5 to 8-foot drop in water level, would realize the highest level of egg mortality. This is discussed in greater detail in section V.C.3, Fisheries and Aquatic Resources.

FOSL recommends that the spring target elevation be lowered to 265.65 feet. In addition, it recommends that in 1 of every 2 years, the water surface elevation should reach 261.0 feet by November 1, in 1 of every 4 years lower the lake to elevation 260.0 feet by November 1, and in 1 in every 10 years lower the lake to 259.0 feet by November 1. FOSL states that this range of drawdown by November 1 would mimic the 50, 20 and 10 percentile water surface elevations for the period of 1910 to 1980. FOSL also states that this lake level regime would:

(1) return Sebago Lake to the levels and range of fluctuation typical of historic conditions (1910-1980) to help preserve the size, character and stability of Sebago Lake's natural beaches and shoreline; and

(2) return a greater magnitude to the range of lake level fluctuations than what currently exists to mimic the more natural lake level regime that existed prior to 1987.

Mr. Kasprzak recommends that the spring target water level be lowered to elevation 265.65 feet, with an acceptable range between 265.15 and 266.65 feet, and the same lake drawdown regime for November 1 as recommended by FOSL. Mr. Kasprzak states that this lake level regime would:

(1) facilitate the rebuilding of the upper profile of Sebago Lake's beaches, by minimizing the opportunity for both beach and upland erosion during periods of high energy wave events when the lake is at full pond;

(2) not reduce S.D. Warren's maximum generation capacity, but would significantly increase storage capacity and mitigate flooding along the lakeshore and downstream during periods of above-normal events, including the 10 and 25-year storm events; and

(3) allow for acceleration of sand accretion on the beaches during low water levels.

Sebago Lake Coalition states that the levels in Sebago Lake are too low and recommends that the levels be between 266.0 and 266.5 feet on June 1, 265.8 and 266.0 feet on July 1, 265.4 and 265.8 feet on August 1, 264.9 and 265.4 feet on September 1, and 264.0 and 264.5 feet on October 1. Sebago Lake Coalition states that this regime would allow for greater use of Sebago Lake. The Coalition also states that:

(1) lower lake levels do not enhance sand accretion on the beaches;

(2) retaining walls along the lake shore are the cause of sand loss in several locations;

(3) the report by Maine Geology does not show a correlation between high water level and sand loss, or low water levels and sand accretion;

(4) recent personal observations indicate more sand has been lost during low water level years than during high water levels; and

(5) erosion has and will always occur no matter what the water level of the lake.

Our Analysis

Shoreline erosion is due to a complex interaction of variables such as water level, wind strength, wind direction, fetch distance, shoreline materials, shoreline configuration, ice cover and other factors.

Several shoreline erosion reports were completed for Sebago Lake during the 1990s. The 1994 Maine Geology report "Sebago Lake State Park Beach Dynamics" concluded that the beach profiles were not experiencing any permanent shifts in the positions of the beaches (Dickson and Johnston, 1994). The 1997 Maine Geology report "Summary of Sebago Lake Shoreline Change Studies, 1990-1997," included a summary of beach profiles and concluded that the beaches are stable, but susceptible to storm-event driven erosion when lake levels are high (Johnston and Mixon, 1997). The 1998 Maine Geology report "Beach Dynamics of Sebago Lake; A Report on the Results of Beach Profiling" summarized the shoreline processes, beach sites and materials, and analysis of the beach profiles (Johnston and Mixon, 1998). Johnston and Mixon (1998) also concluded that the beaches were stable over the study period, with the exception of erosion attributable to a fall 1996 storm event.

In addition to the aforementioned erosion monitoring efforts, S.D. Warren initiated, in 1997, a 5-year program to monitor beach erosion and accretion along Sebago Lake. The Duke Engineering and Services report (Duke, 2001) contains profile data from 1997, 1998, 1999 and 2000. This study monitored 15 different beach profiles, as shown in figure 2.

The 1997 and 1998 Maine Geology reports indicate the following:

(1) A fall 1996 storm event caused catastrophic changes to the beach profiles, particularly to the sites having an exposure to southerly winds.

The fall 1996 storm event referenced herein was started by an extreme rainfall event on October 20-22, over coastal Maine, of about 10 to 12 inches over the southern and eastern section of Sebago Lake, and lesser amounts upstream within the Sebago Lake watershed. During the period that the lake level was much higher than normal (November), an intense low pressure system moved north of the Sebago Lake area along the Gulf of St. Lawrence and produced a long period of strong southerly winds. The resultant wave action in November caused most of the erosion that was noted in Johnston and Mixon (1997).

[28]

The damage described was focused on the upper portion of the beach shoreline, due to the high water levels in Sebago Lake during the storm.

(2) The 1997 profiles showed that minor accretion of the shoreline occurred on an on-going basis during the summer and fall of 1997.

Figure 4 shows the average Sebago Lake water levels for various lake management periods (1910-1986; 1987-May 2004; and 1997-May 2004), and includes 2 years with documented erosion related to high lake levels and storm events (1996 and 1999). Figure 5 shows the average monthly lake level for the 1997 to May 2004 period.

The 1998 Sebago Lake beach profile study report (Duke, 2001) concludes that: (a) the beach profiles are relatively stable, though they exhibit seasonal shifting of the materials in response to wave action from climatic events of varying intensities and orientations during varying water levels; (2) seasonal changes can involve the erosion and accretion of up to one foot of material; and (3) generally, material eroded is later deposited by a different climatic event, resulting in "relative stability."

Figure 4. Sebago Lake water levels for 1997 to May 2004, with long- and short-term averages and fall high lake elevation years. (Source: Water District, 2004)

Figure 5. Sebago Lake water levels for 1997 to May 2004. (Source: Water District, 2004)

The 1999 Sebago Lake beach profile study report (Duke, 2001) concludes that: (1) nine out of the 15 sites exhibited some erosion compared to the 1997 and 1998 data; (2) the erosion that did occur may be attributable to fall 1999 storms that occurred at elevated, fairly-constant water levels, when wind driven waves were able to effect the same elevation on the beach over a longer duration of time; (3) 1999 had a greater frequency of higher winds as compared to 1998; and (4) the erosion noted is generally in mid-profile, which is the area experiencing the greatest seasonal fluctuation in profile elevation, and it is unlikely that this erosion would be permanent.

The 2000 Sebago Lake beach profile study report (Duke, 2001) concludes that: (1) seven of the 15 sites were generally stable, similar to the 1997 and 1998 data; (2) due to lower water levels, 2000 data showed erosion to the lower profile, and accretion in the upper-mid profile is apparent when compared to the 1999 data; and (3) the data demonstrate an overall stability through the years for most of the profiles. The 2001 Sebago Lake beach profile study report (Framatone, 2003a) concludes that: (1) the data show only minor changes from the previous year's data and were insufficient to indicate whether the accretion trends are permanent; (2) the minor changes are near or at the shoreline due to wave action, and these areas are much farther out along the profiles due to extended low water conditions; and (3) the exception to this stabilizing trend is the erosion along the Songo profile No. 7, where the entire profile is shown to be retreating consistently over the five years of the study, with only minor accretion at the mid-profile when comparing 2001 to 2000.

Finally, the 2002 Sebago Lake beach profile study report (Framatone, 2003b) concludes that: (1) accretion patterns at a number of sites, particularly at Thompson, showed a stabilization of the erosion patterns at the Songo Nos. 4, 5 and 7 sites; (2) the exception to this stabilization trend is the erosion along the upper and mid-profile of Songo profile No. 7, where the entire upper and mid-profile is shown to be retreating consistently over the five years of the study with only minor accretion at the bottom profile; and (3) there were no major storms or wind events from 2000 through 2002 to account for any substantial accretion or erosion, which is most likely the reason for an indication of overall stability at most of the profiles.

The following discussion centers on various options to the LLMP that have been proffered by the stakeholders, and how each alternative may affect the erosion potential.

Increase winter water levels

Shoreline and beach erosion is relatively uncommon during the winter months, since Sebago Lake is typically frozen over during most of January, February and March. During wind driven ice break-up and to a lesser extent during freeze-up periods, however, accretion of sand to the beaches from ice scour does occur. During this type of accretion event, sand is moved from areas below the water/ice level to areas higher on the beach profile.

The LLMP recommended by Maine would require that, beginning on January 1, and continuing until March 1, the lake levels would be at or above the long term (1910-1986) median level of about 262.25 feet. In its July 15, 2004, S.D. Warren states that the target lake elevation for this period should be 262.0 feet. Under Maine's plan, after March 1, hydrological conditions and operational considerations determined by S.D. Warren would govern lake levels with the goal of reaching 266.65 feet on, but not before, May 1. The maximum water level during this time period would be a line drawn from elevation 263.5 feet on January 1 to 266.65 feet on May 1. This line could result in a maximum water level of approximately 265.7 feet on April 1, and is identical to the current LLMP.

The average lake surface elevation on March 1 is approximately 262.21 feet for the 1910-1986 period, which is slightly lower than the average for the 1997-May 2004 periods (262.4). Currently, S.D. Warren manages the lake based on hydrological considerations with the goal to reach the May 1 - June 15 spillway crest target elevation. There is no evidence to suggest that S.D. Warren would make attempts to allow the lake level to reach the state's maximum allowed levels during March and April, especially in light of flood storage requirements.

Several community organizations and residents indicate that regular deep drawdowns are required for the maintenance of beaches along Sebago Lake. The beach erosion studies by Maine Geology, and S.D. Warren's later profile studies, show that profiles from 1997 and 2000, years with winter water levels above the 1910-1986 median (similar to the state's proposal) had new sand berms on the shore, which in more than one case was attributed to "ice push"(Johnston and Mixon, 1998; Framatone, 2001). These berms were later eroded down as the year went on, which supports the reports' conclusions that over the course of the year the profiles were stable. These results indicate that lake levels above the 1910-1986 median for January and February, as recommended by the state, would have little effect on beach dynamics. Figure 5 shows that the average water level for January through March for the 1910-1986 and 1997-May 2004 periods is within 0.2 feet for all three months. Implementing Maine's recommended revisions to the LLMP would likely have little effect on beach erosion during the winter months. However, it could jeopardize soils by increasing the risk associated with decreasing the available storage for possible flood events during April and May, as discussed in more detail in section V.C.2, Water Resources.

Eliminate the allowable lake level range above full pond

All parties appear to agree that beach and shoreline erosion potential is highest when the lake level is above the spillway crest elevation. However, the single most destructive shoreline and beach erosion event in recent memory occurred in November of 1996 during a combination of a high water level of 266.4 feet and a sustained high wind event.

Local wind data from the Portland, Maine weather station shows that sustained high wind events during May and June, when Sebago Lake is normally near its spillway crest, are much less frequent than during the fall, winter and early spring, when the lake is commonly either substantially lower and/or ice covered. After ice out (typically April 9), the lake is managed with the intent to meet the target elevation of 266.65, on or after May 1 (until June 15), which happens to coincide with a time of year that can experience strong, seasonal storms. Lowering the spring maximum water level could reduce the potential for shoreline and beach erosion in the event of a late-spring storm with high winds, similar to the conditions leading up to the flooding of April and May 2005. Moving the earliest maximum pool target to May 15, and reducing this target elevation to 266.15 feet (0.5 foot below spillway crest) would also minimize the risks associated with filling the lake during times when seasonal storms have a greater probability of affecting the area. A later fill date at a lower lake elevation could reduce the level of effects from combinations that contributed to the flooding of 2005, which would have a positive effect on the shoreline and beaches. This, however, could result in more water being released to the bypassed reach and loss of generation capacity for S.D. Warren, if additional water is released to maintain the lower lake level.

During the 1910 to May 2004 period, the weekly Sebago Lake water elevation was above the spillway crest approximately 6.5 percent of the time or slightly over 3 weeks per year. Based on lake elevation data and beach profiling data, there is the potential for some erosion to occur in the late spring as lake levels rise, so limiting the allowable lake level range above full pond would help to limit this erosion.

S.D. Warren, in its July 15, 2004, letter, states that the LLMP should include a provision to obtain a temporary variance from the downstream flow requirement to release higher flows to prevent higher lake levels, under circumstances such as flooding on the Presumpscot River downstream of the Eel Weir Project. S.D. Warren suggests that agreement with the MDEP could be a requirement for the flow variance. Issues related to increased flows in the bypassed reach and their effects on fishery resources and recreation are discussed in sections V.C.3, Fisheries and Aquatic Resources, and V.C.5, Recreational Resources. Issues related to downstream flooding are discussed in section V.C.2, Water Resources. An option to allow temporary exceedence of the prescribed lake elevation, to above the spillway crest, could be considered to reduce any adverse effects of high discharges on downstream resources. However, any such decision to grant a flow variance must consider the effects of flooding, both around Sebago Lake and along the lower Presumpscot River.

Expand the August 1 target

S.D. Warren's proposed change to the LLMP includes a 3-inch tolerance range for the August 1 target elevation. Lake levels could fluctuate between 264.92 and 265.42 feet, instead of exactly hitting 265.17 feet. Since 1997, as figure 6 shows, S.D. Warren has not met the precise target, and in fact, the August 1 readings have not been within the proposed target range in 3 out of the last 7 years.

Allowing a range, as proposed by S.D. Warren and Maine, would give the lake managers a slightly broader target and capability to avoid non-compliance reporting for uncontrollable climatic factors. At times when the lake is near the high end of the range, lake levels may remain higher during the summer months, which could appease some of the stakeholders that are recommending higher levels. Since recent lake levels have already shown significant variation around the existing target (figure 6), adopting the proposed target range, within what has already occurred since 1997, should have little, if any, effects on shoreline and beach erosion. A 3-inch target range would be reasonable, due to the variable hydrological parameters that affect the lake level, and that are beyond the control of S.D. Warren.

Late summer/fall lake levels

Maine recommends a maximum lake level from August 1 to November 1 each year. Specifically, water levels above a line drawn from 266.65 feet at the end of the 3rd week of June to 265.0 feet on September 1, and then to 263.0 feet on November 1, would trigger increased flows according to the operating parameters outlined in Appendix B. This recommendation would lower the October 1 maximum lake elevation from 265.0 feet in the current LLMP to approximately 263.2 feet. Mr. Frechette recommends an absolute minimum level of 263.5 feet, and the Sebago Lake Coalition recommends the following: (a) between 265.8 and 265.4 feet on August 1; (b) between 265.4 and 264.9 on September 1; and (c) between 264.5 and 264.0 feet on October 1.

The average lake surface elevation on September 1 is 264.0 feet for the 1997-May 2004 period, which is 0.62 feet above the 1910-1986 period median of 263.38 feet. The 1997-May 2004 median lake levels have been within the state's recommended range; however, maintaining these fall lake elevations on an annual basis is not without consequence, as the 1997 EIS (FERC, 1997a) concludes in its analysis of critical erosion hazard periods.

Beach profile studies (Framatome, 2001; 2003a; and 2003b; Johnston and Mixon, 1998) and the 1997 EIS (FERC, 1997a) clearly demonstrate that significant erosion has taken place during the fall months, and that the months of September, October, and November are times of significantly high wave energies, and consequently have the highest potential for upper beach erosion resulting from the combination of high lake levels and high waves generated from storms in the area. Figure 4, Sebago Lake water levels, shows that in 1996 and 1999 fall lake levels were considerably higher than the long term and LLMP medians. These were also years of large storms, which resulted in significant shoreline erosion (Johnston and Mixon, 1998; Framatome, 2003b).

Implementing the state's operating parameters could help manage lake levels somewhat, if lake levels rise above their suggested maximum. However, as our flood analysis in section V.C.2, Water Resources, indicates, the high lake levels of late October 1996 resulted from utilization of the flood storage capacity of Sebago Lake, to help reduce the effects of the 250-year flooding event on the lower Presumpscot River. Lower lake elevation targets and ranges in September, October and November would reduce the potential for having high lake levels during known high wave energy months, and would provide additional flood storage capacity as discussed in the 1997 EIS. A lake level below 263.5 feet, however, while providing the benefits of reduced erosion potential and additional flood storage capacity, could negatively affect the boating community. Potential effects of this proposal on boating accessibility and use numbers is discussed in section V.C.5, Recreational Resources and Land Use.

Maintain periodic (2 in 9 yrs.) low water levels in the fall/winter

Maine recommends a 1-month drawdown (December 1 to January 1) to elevation 261.0 feet, to provide for a period of beach sand accretion. FOSL and Mr. Kasprzak recommend a deeper fall drawdown, lasting up to 2 months. FOSL states that additional low water levels during the fall would better promote sand accretion to the beaches. The MDIFW recommends a 5 to 8-foot drawdown in late-November and possibly into mid-winter, to help control lake trout spawning. In contrast, S.D. Warren suggests that the periodic (2 in 9 years) low fall drawdown be eliminated from the LLMP, because there is no evidence that it has resulted in sand accretion to the beaches.

Figure 6. Sebago Lake water levels on August 1 for 1997 to 2003. (Source: Water District, 2004)

The drawdown to a lake elevation of 259.0 feet once every 10 years (by November 1), as recommended by FOSL and Mr. Kasprzak, would result in water levels that have not been reached since October 1965. FOSL and Mr. Kasprzak also recommend a drawdown to elevation 260.0 feet once every 4 years. Elevation 260.0 feet has not been reached since February 1966. Finally, FOSL and Mr. Kasprzak recommend a drawdown to elevation 261.0 feet once every 2 years. Elevation 261.0 feet has been reached more frequently (e.g., four times since 1966).

According to the beach profile reports published by Maine Geology, Duke and Framatone ANP, beach accretion may be enhanced by low water levels in the fall, but this is not as clear of a relationship as that of higher water levels near or above the spillway elevation increasing the potential for beach and shoreline erosion. In addition, historical beach stability was examined in the 1997 EIS (FERC, 1997a) and is argued by many to exist even today, with the exception of a few years where high water and high wind events caused a large amount of the erosion on the beaches and shoreline of Sebago Lake.

Lowering Sebago Lake in November, to the extent recommended by FOSL, the MDIFW and Mr. Kasprzak, would limit the ability, during some years, to refill the lake by May 1. However, should the maximum lake level be lowered to 266.15 feet and the earliest fill date moved to May 15 (as supported by staff), S.D. Warren would be able to achieve the LLMP targets in all but the driest years. Table 4 provides the approximate amount of inflow that would be required to refill Sebago Lake to the spillway crest elevation on May 15, after a November 1 drawdown to elevations of 260.0 and 261.0 feet. The MDIFW recommended 5- to 8-foot drawdown for late-November into mid-winter would result in drawdowns to elevations below 260.0 feet, and would require even more inflow to refill the lake by spring. Additional discussion of MDIFW's recommendation and its effects on fishery resources and related water resources is included in section V.C.3, Fisheries and Aquatic Resources.

The data in table 4 are for general reference and are conservative, since they do not consider outflow from Sebago Lake. These data illustrate that a moderate percentage of the inflow (at extreme low flows) would be required to completely refill the lake after these drawdowns, even the drawdown to 261.0 feet. Lake drawdowns, to the extent recommended by FOSL, Mr. Kasprzak, and the MDIFW would limit the ability to refill the lake during moderate to extreme dry periods, to meet the May 15 target levels, and would likely limit downstream flow releases during many years.

Table 4. Summary of the flowa needed to refill Sebago Lake after a November 1 drawdown. (Sources: USGS, 2004a; data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004; USGS, 2004b)

		Mean inflow (November 1 - May 15)		75% Exceedence inflow (November 1 - May 15)		90% Exceedence inflow (November 1 - May 15)	
Elevation	Million	Total	% of	Total	% of	Total	% of

(feet)	cubic feet required for refill[b]	(mcf)	inflow required	(mcf)	inflow required	(mcf)	inflow required
260.0	7,200	11,700	62%	7,200	100%	5,700	126%
261.0	6,200	11,700	53%	7,200	86%	5,700	109%

a Based on flows shown in table 8 for water years 1987-2004.
b Refill means reaching a target elevation of 266.15 feet on, or anytime after May 15.

Based on this information, there appears to be little basis for changing the current LLMP provision that requires a 2-in-9-year drawdown to elevation 261.0 feet, for a 2-month period (November 1 to January 1). This would continue to provide a 2-month "window" for sand accretion to the beaches, and would also keep lake levels low during the fall period to reduce the potential for erosion associated with fall storms (the drawdown would need to begin in October to reach the November 1 target level). Maine's recommendation to limit this drawdown to 1 month (December 1 to January 1) would result in higher lake levels during October and November, which could benefit any late-season boating, but this would increase the potential for erosion and reduce the period for sand accretion to the beaches.

Our recommendations regarding lake level management is in section VII, Comprehensive Development and Recommended Alternative.

c. Unavoidable Adverse Effects:

Operation of the project, as proposed by S.D. Warren, would continue to contribute to localized erosion along the shorelines of Sebago Lake. Maintaining higher lake levels, particularly during the fall and early winter, would exacerbate on-going erosion of the upper shore profile. Maintaining lower levels during the same period would reduce the effects of storm events on the shoreline, with a commensurate reduction in erosion and an increase in accretion.

2. Water Resources

a. Affected Environment:

Water Quantity and Use

Sebago Lake

The Eel Weir Project is in southern Maine at the outlet of Sebago Lake, which is the beginning of the Presumpscot River. The Sebago Lake watershed drains 436 mi2 and includes 75 mi2 of lakes and ponds. The headwaters of the Presumpscot River are near Bethel, Maine, approximately 50 miles north of the project site. The Presumpscot River discharges into the Atlantic Ocean via Casco Bay near Portland, Maine. In general, the Presumpscot River is bordered by the Androscoggin River watershed to the north and east and the Saco River watershed to the west.

The main tributary to Sebago Lake is the Songo River, with a drainage area of 275 mi2. The Songo River drainage includes the 154-mi2 Crooked River Basin. The Crooked River watershed is largely unregulated, but the rest of the Songo River watershed has many regulated lakes and ponds including Long Lake, just upstream of Sebago Lake. Long Lake is separated from Sebago Lake by the Songo lock system, a manually operated facility within the Sebago Lake State Park. Long Lake has a useable storage capacity of 29,844 acre-feet (or 1,300 million cubic feet; mcf), with a usable drawdown of approximately 5 feet. During the fall, Long Lake is typically drawn down to prevent ice damage to shoreline property. The fall drawdown of Long Lake therefore supplies significant inflow to Sebago Lake.

Limited information is available on the inflow to Sebago Lake since only two USGS stream gages have measured the inflow to Sebago Lake. Neither gage has a continuous, long-term record.

Table 5 provides information on these gages.

Table 5. Summary of USGS streamflow gages upstream of Sebago Lake. (Source: USGS, 2004b).

Gage Number	Gage Name	Period of Record	Drainage Area (mi2)
01063310	Stony Brook at East Sebago	10/1/1995 to 9/30/2003	0.81
01063100	Crooked River near Naples	5/24/1975 to 9/30/1977 10/1/1995 to 9/30/2000	150

Dudley et al. (2001) estimated that the yearly inflow to Sebago Lake was 935 cfs for water years 1996 to 1999. This estimate is based on the streamflow records for the gages shown in table 6, as well as regression analyses and other methods for the remaining ungaged drainage areas to Sebago Lake. For the same period, Dudley et al. (2001) estimated the outflow to be 780 cfs. The difference between outflow and inflow was attributed largely to evaporation and withdrawals by the Water District. The Water District estimated that yearly withdrawals for the 1996 to 1999 water years were 1,130 mcf, or about 36 cfs.

According to the Water District, Sebago Lake has a shoreline length of 105 miles and a surface area of 47 square miles. The Water District also estimates that Sebago Lake has a maximum depth of 316 feet, a mean depth of 101 feet, a total storage volume of 995 billion gallons of water or 3.05 million acre-feet, and a residence time of 5.1 years. In addition to being a drinking water source, Sebago Lake is heavily used for recreational activities such as fishing, boating and swimming. The Water District prohibits recreational use within 3,000 feet of the water supply intakes to protect the water quality.

According to digitized aerial photographs (Water District, 2004), 86 percent of the watershed consists of undeveloped vegetated areas such as forests and fallow fields, 6.9 percent is residential, 2.5 percent is timber operation, 2.2 percent is agricultural, 0.2 percent commercial/retail, and 2.2 percent other uses. Southern Maine has a humid continental climate with warm summers and cold winters. The average temperature in January is 22o F and is 69o F in July, the coldest and warmest months. Precipitation is relatively consistent through the year, and the watershed averages about 44 inches per year. On average, according to the Maine Tourism Association (Maine Tourism, 2004), there are approximately 15 to 30 thunderstorms per year and 80 to 120 clear days per year. Yearly snowfall averages approximately 80 inches per year. During the winter, Sebago Lake is completely ice covered in most years, with only 11 years since 1940 in which it did not completely freeze over. According to Hodgkins and James (2002), the average ice-out date for the Big Bay portion of Sebago Lake is April 9.

Sebago Lake is a natural lake, and human regulation of the water levels started with the construction of the first dam at the lake's outlet in 1830. Normandeau (1994) states that prior to regulation:

> During a typical year, January water levels would probably be at or near absolute minimum levels (perhaps near elevation 257 or 258) and remain there until the beginning of spring melt. Water levels would reach a maximum during late spring early summer and then quickly fall to near minimum levels, probably by the end of July. For the remainder of the year, water levels would fluctuate slightly about the minimum, responding only to climatic events. The height of spring maximum would depend entirely on the amount of spring precipitation/snowmelt, but it is probably safe to say that typical maximums would have been considerable lower than today. This is because winter minimums today are often held artificially high to better insure near `full pond' conditions beginning each summer. It is probably even safer to say that without regulation, water levels would be at or near minimum levels for perhaps 7-8 months per year.

The lake level of Sebago Lake is managed to be within the target levels set by the LLMP (FERC, 1997b; S.D. Warren, 2002a). From May 1 to November 1, target level maximums and minimums are defined by the line segments connecting consecutive values on particular dates. S.D. Warren is not proposing any changes to the current LLMP, except the establishment of a 3-inch tolerance band around the August 1 target elevation. After November 1, water levels are managed to achieve a target level of 261.0 feet or lower in two out of every nine years, sometime between November 1 and January 1. Furthermore, from November 1 to May 1, lake levels are managed, as appropriate, by S.D. Warren based on precipitation, snow pack, energy needs, and other considerations, with the goal of reaching the spillway crest target level (266.65 feet, +/-0.5 foot) no sooner than May 1 and no later than the second week in June. Whenever possible, water levels are managed to be no higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1, and from 263.5 feet on January 1 to 266.65 feet on May 1.

Figures 7 and 8 provide graphical representation of these values as well as the historical lake elevations from 1910 to 1986 and 1987 until 2002. Prior to 1986, the licensee did not actively manage lake levels with regard to daily or weekly target elevations. Instead, the lake levels generally approached full pool (266.65 feet) during May and June and then decreased throughout the summer and early fall. Historical lake elevations were generally stable during the winter period and were followed by a typically rapid refill period during the spring snowmelt. In 1986, the licensee changed the management of the lake, to produce greater amounts of electricity during the winter period by keeping the water level at a higher level longer into the fall. As figure 9 shows, the lake elevations have averaged higher in the 1987-2002 period, as compared to the 1910 to 1986 period.

Figure 7. Sebago Lake elevation data, 1910 to 1986, in relation to the LLMP elevations. (Source: S.D. Warren, 2003a)

Figure 8. Sebago Lake elevation data, 1987 to 2002, in relation to the LLMP elevations. (Source: S.D. Warren, 2003a)

Figure 9. Sebago Lake elevations for the 1986 to 2002 period and 1910 to 1986 period. (Source: S.D. Warren, 2003a)

Presumpscot River

The Presumpscot River starts at the outlet of Sebago Lake and is regulated at the Eel Weir Project. Table 6 shows the minimum required flows at the outlet of Sebago Lake as governed by the LLMP.

Table 6. Required minimum Lake Sebago outflows. (Source: Letter from Dana Murch, Dams & Hydro Supervisor, Maine DEP, to Maureen Winters, Kleinschmidt Associates, Pittsfield, ME, September 4, 2002)

Month	Required minimum daily flows (cfs) in bypassed reach	Required minimum daily flows (cfs) below the project when Sebago Lake is within the specified target level
January	25	270

February	25	270
March	25	270
April	75	270
May	75	333
June	75	333
July	50	333
August	50	333
September	75	333
October	75	333
November	25	270
December	25	270

The MDEP estimates that the 7-day average low flow with a 1 in 10 year recurrence interval (7Q10 flow) at the project is 250 cfs. This flow was established by the MDEP based on the LLMP, which states that the minimum release from Sebago Lake is 250 cfs under "emergency low lake level conditions." Emergency low lake conditions are defined as when the level of Sebago Lake is 1 foot or more below the established target range, and flows from the lake have been greater than 270 cfs for at least 4 consecutive weeks. The MDEP has used the 250-cfs value for effluent dilution modeling, in its July 2, 2002, renewal and modification of the Maine Pollutant Discharge Elimination System Permit and Waste Discharge License for the discharge of waste waters from S.D. Warren's Westbrook paper mill. As discussed below, S.D Warren also follows a flow release plan, based on water temperature, to help ensure adequate DO levels in the Presumpscot River downstream of Sebago Lake.

A USGS gaging station is located at the outlet of Sebago Lake at the Eel Weir dam (USGS gage #01064000), and was operational from October 1, 1901, until September 30, 2000. S.D. Warren, however, continues to record flow data from this gage. Table 7 provides the monthly flow duration data for this gage for water years 1902 to 1986, and table 8 includes water years 1987 to 2004 excluding data past May 3, 2004. Table 9 shows the changes in the monthly flow duration data between the two time periods.

Table 7.Flow duration data (cfs) for the USGS gage 01064000, Sebago Lake outlet, water years 1902 through 1986. (Source: USGS, 2004a)

Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	835	835	839	1,000	1,040	988	2,550	1,803	1,281	842	837	838
10%	822	821	831	840	894	841	1,481	1,386	984	836	832	832
15%	802	798	818	828	834	835	995	1,100	848	831	827	819
20%	766	759	772	815	828	824	836	962	837	819	818	796
25%	740	728	736	796	818	810	828	851	833	795	792	765
30%	717	696	700	750	803	767	794	836	831	755	758	734
35%	687	675	677	712	761	726	732	831	819	731	737	704
40%	670	667	667	677	715	680	667	817	805	687	699	670
45%	655	652	650	661	676	655	638	741	745	667	671	660
50%	635	618	614	632	662	621	584	685	700	647	667	655
55%	600	586	575	594	620	571	550	660	670	610	655	624
60%	571	549	549	561	582	539	529	599	636	557	610	596
65%	538	528	508	535	548	512	504	554	588	538	583	554
70%	503	490	446	508	517	446	471	533	554	500	548	505
75%	458	428	418	469	460	402	423	497	529	414	514	480

80%	416	415	400	415	414	350	354	427	485	339	438	422
85%	350	357	326	343	346	338	312	350	371	267	350	340
90%	294	259	256	273	328	267	263	305	333	175	306	268
95%	216	182	175	195	254	191	178	190	211	42	215	175
99%	121	77	0	88	134	48	0	8	21	0	106	0
Mean	591	582	577	618	652	614	781	775	728	587	618	601
Max	1,590	1,400	2,040	1,850	2,460	3,420	7,000	3,560	3,620	3,290	1,060	2,730
Min	0	0	0	0	0	0	0	0	0	0	0	0

Table 8. Flow duration data (cfs) for the USGS gage 01064000, Sebago Lake outlet, water years 1987 through 2004, excluding data past May 3, 2004. (Source: USGS, 2004a; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	1,000	2,001	2,080	1,590	985	1,000	1,320	1,830	1,490	1,273	1,273	819
10%	969	1,000	1,183	992	856	844	1,000	1,580	998	829	829	667
15%	835	995	1,000	846	844	833	861	1,042	831	663	663	507
20%	823	985	998	844	831	831	845	996	675	546	546	423
25%	670	903	989	819	831	819	833	984	666	502	502	417
30%	651	846	843	772	819	819	670	845	662	497	497	350
35%	498	833	831	686	702	670	667	831	415	423	423	350
40%	350	819	831	671	670	668	593	819	340	410	410	340
45%	350	686	819	670	670	667	350	670	340	400	400	338
50%	340	660	670	667	667	665	350	665	338	376	376	338
55%	340	625	667	667	667	554	340	350	334	372	372	338
60%	336	500	667	667	546	501	339	348	333	352	352	334
65%	333	500	665	647	546	500	338	295	304	350	350	333
70%	298	350	619	568	501	349	334	277	298	340	340	333
75%	293	350	579	554	500	340	333	254	292	327	327	331
80%	277	340	554	508	348	333	277	250	277	325	325	300
85%	258	335	500	500	331	332	250	250	272	300	300	283
90%	254	327	500	499	325	273	175	167	167	292	292	277
95%	233	302	497	292	250	250	133	133	50	270	270	275
99%	75	233	292	250	250	133	133	57	50	250	250	250
Mean	495	736	845	743	627	610	553	722	560	516		

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Max	2,000	2,400	2,490	2,560	998	1,520	1,650	3,310	3,760	3,490	1,330	1,320
Min	75	25	292	250	250	91	0*	50	37	250	50	231

* 2nd lowest =133

Table 9.Differences in flow duration (cfs) for the USGS gage 01064000, Sebago Lake outlet, between water years 1987 through 2004 and water years 1902 through 1986. (Source: USGS, 2004a; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	165	1,166	1,241	590	-55	12	-1,230	27	209	431	436	-19
10%	147	179	352	152	-38	3	-481	194	14	-7	-3	-165
15%	33	197	182	18	10	-2	-134	-58	-17	-168	-164	-312
20%	57	226	226	29	3	7	9	34	-162	-273	-272	-373
25%	-70	175	253	23	13	9	5	133	-167	-294	-291	-348
30%	-66	150	143	22	16	52	-124	9	-169	-258	-261	-384
35%	-189	158	154	-26	-59	-56	-65	0	-404	-308	-314	-354
40%	-320	152	164	-6	-45	-12	-74	2	-465	-277	-289	-330
45%	-305	34	169	9	-6	12	-288	-71	-405	-267	-271	-322
50%	-295	42	56	35	5	44	-234	-20	-362	-271	-291	-317
55%	-260	39	92	73	47	-17	-210	-310	-336	-238	-283	-286
60%	-235	-49	118	106	-36	-38	-190	-251	-303	-205	-258	-262
65%	-205	-28	157	112	-2	-12	-166	-259	-284	-188	-233	-221
70%	-205	-140	173	60	-16	-97	-137	-256	-256	-160	-208	-172
75%	-165	-78	161	85	40	-62	-90	-243	-237	-87	-187	-149
80%	-139	-75	154	93	-66	-17	-77	-177	-208	-14	-113	-122
85%	-92	-22	174	157	-15	-6	-62	-100	-99	33	-50	-57
90%	-40	68	244	226	-3	6	-88	-138	-166	117	-14	9
95%	17	120	322	97	-4	59	-45	-57	-161	228	55	100
99%	-46	156	292	162	116	85	133	49	29	250	144	250

The average daily flow at this gage for the 1902 to 2000 period of record is 642 cfs. According to USGS (2004b), Sebago Lake has a usable storage capacity of roughly 222,681 acre-feet (or 9,700 mcf) between 259.0 and 266.65 feet (figure 10). Sebago Lake has a retention time of 0.48 years, based on the usable storage capacity and average annual outflow. Between 262.0 and 266.65 feet, Sebago Lake contains approximately 5,800 mcf. This amount of storage has a significant influence on the peak flood events downstream of the project along the Presumpscot River.

Figure 10.Sebago Lake storage information. (Source: USGS, 2004b)

Table 10 shows the estimated peak flow and maximum recorded flows for both the USGS gage at the outlet of Sebago Lake, as well as the USGS gage at Westbrook, approximately 20 miles downstream on the Presumpscot River. Among more recent flow events (not shown in the table), the third highest daily flow rate at the outlet of Sebago Lake (3,760 cfs) occurred on June 17, 1998.

Table 10. Peak flow information for the USGS gages at Sebago Lake and at Westbrook. (Sources: Hodgkins, 1999; USGS, 2004b; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

	USGS gage 01064000 Presumpscot River at outlet of Sebago Lake	USGS gage 01064118 Presumpscot River at Westbrook
Highest known peak and date.	7,000 cfs: April 7, 1902	23,300 cfs1: October 22, 1996
Second highest known peak and date.	3,790 cfs: April 3, 1936	13,900 cfs: August 20, 1991
Period of known peak flows	1886-2004	1895-19962
Recurrence interval (years)		
2	1,278 cfs	5,295 cfs
5	2,090 cfs	7,837 cfs
10	2,785 cfs	9,884 cfs
25	3,883 cfs	12,990 cfs
50	4,871 cfs	15,744 cfs
100	6,072 cfs	18,850 cfs
500	9,637 cfs	27,958 cfs
Drainage area (mi2)	441	577

1 Flow estimated by the USGS at the I-95 Bridge in Falmouth and adjusted to Westbrook using a drainage area correction.
2 Streamflow records ended at this gage on September 30, 1995. Stream gage height data exist for most of the 1996 to 2004 water years.

As detailed in the USGS publication, Flood of October 1996 in Southern Maine (Hodgkins and Stewart, 1997), the lower Presumpscot River had what was estimated to be a 250-year flood event. This report states that the outflow from Sebago Lake did not contribute a significant amount of water to the flooding downstream due to the storage capability of Sebago Lake. At the beginning of this rainfall event on October 20 and 21, the water level within Sebago Lake was approximately 262.8 feet and rose to about 265.7 feet by October 30. Discharge from Sebago Lake was 257 cfs on October 20, but was decreased by S.D. Warren to 175 cfs on October 21 and to 75 cfs on October 22, to help limit the flooding along the lower Presumpscot River. The flood discharge reached 23,300 cfs in the lower Presumpscot River at the Westbrook gage on October 22, 1996, almost all from the drainage area downstream of Sebago Lake.

Water Usage

The Water District estimates that they withdraw approximately 24 million gallons per day or 36 cfs from Sebago Lake, which is equal to 26,800 acre-feet, on a yearly basis. Evaporation estimates for Sebago Lake are 22 inches per year, or approximately 76 cfs.

The waters of the Presumpscot River, downstream of the project, are used for hydroelectric generation, millworks, municipal and industrial wastewater treatment facilities, and recreation. S.D. Warren's paper mill in Westbrook, downstream of the project, is the largest daily consumptive user of Presumpscot River water, withdrawing up to an estimated 28 cfs for process water. There are numerous seasonal homes along the upper section of the river that also draw water for domestic use. However, there are no consumptive uses associated with the Eel Weir Project area.

Water Quality

Sebago Lake

Sebago Lake is classified as Class GPA, which is the sole classification of great ponds, natural ponds and lakes under the Maine Water Classification Program. The standards for GPA waters as stated in the Maine State Statures (Maine, 2004) under Title 38 Section 465-A are provided below:

* Class GPA waters must be of such quality that they are suitable for the designated uses of drinking water after disinfection, recreation in and on the water, fishing, agriculture, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other aquatic life. The habitat must be characterized as natural.
* Class GPA waters shall be described by their trophic state based on measures of the chlorophyll "a" content, Secchi disk transparency, total phosphorus content and other appropriate criteria. Class GPA waters shall have a stable or decreasing trophic state, subject only to natural fluctuations and shall be free of culturally induced algal blooms which impair their use and enjoyment. The number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 29 per 100 milliliters or an instantaneous level of 194 per 100 milliliters.
* There may be no new direct discharge of pollutants into Class GPA waters. Aquatic pesticide treatments or chemical treatments for the purpose of restoring water quality approved by the department and storm water discharges that are in compliance with state and local requirements are exempt from the no discharge provision. Discharges into these waters licensed prior to January 1, 1986, are allowed to continue only until practical alternatives exist. No materials may be placed on or removed from the shores or banks of a Class GPA water body in such a manner that materials may fall or be washed into the water or that contaminated drainage therefrom may flow or leach into those waters, except as permitted pursuant to section 480-C. No change of land use in the watershed of a Class GPA water body may, by itself or in combination with other activities, cause water quality degradation that would impair the characteristics and designated uses of downstream GPA waters or cause an increase in the trophic state of those GPA waters.

In general, the water quality of Sebago Lake ranges from good to excellent based on transparency, total phosphorous, dissolved oxygen (DO) and algae. It is classified as oligotrophic, with clear, cold water, and is relatively free of algae and other plant life. The Water District has more than twenty years of water quality data for Sebago Lake.

The United States Environmental Protection Agency (USEPA) Ambient Water Quality Criteria (USEPA, 1986) suggest that to control nuisance aquatic growth and cultural or accelerated eutrophication, total phosphorus should not exceed 25 micrograms per liter (ug/l) in lakes and impoundments. The Water District has monitored total phosphorus levels at three locations around Sebago Lake (Lower Bay, Big Bay, and Jordan Bay). Monitoring has been conducted in Lower Bay since 1979. Total phosphorus concentrations within Lower Bay have not established any distinct trends, as average phosphorous concentrations have fluctuated within a range of 4.0 ug/l (3.0 ug/l to 7.0 ug/l). Phosphorus levels within Jordan Bay and Big Bay have been monitored since 1993, and average phosphorus concentrations exhibit a similar stable pattern, fluctuating no more than 3.0 ug/l at each station.

Chlorophyll a testing has been included in the Water District's monitoring program at three locations around Sebago Lake (Lower Bay, Big Bay, and Jordan Bay). Monitoring has been conducted in Lower Bay since 1979. Chlorophyll a concentrations within Lower Bay have not established any distinct trends, as average concentrations have ranged from 0.93 ug/l to 3.52 ug/l. Chlorophyll a levels within Jordan Bay and Big Bay have been monitored by the Water District since 1993, and average concentrations exhibit a similar, stable pattern, fluctuating no more than 1.6 ug/l at either station. There is no state standard for chlorophyll a. However, the levels documented by the Water District are indicative of oligotrophic waters.

The Water District has measured transparency using Secchi disk readings at three locations in Sebago Lake (Lower Bay, Big Bay, and Jordan Bay). Monitoring has been conducted in Lower Bay since 1976, and the average Secchi disk depth is 32.7 feet. Figure 11 shows the low, mean, high and 5-year mean Secchi depths in the Lower Bay portion of Sebago Lake.

Figure 11.Sebago Lake Secchi disk depths in Lower Bay, 1976-2003. (Source: Water District, 2004; as modified by Staff]

In compliance with FERC (1997b), S.D. Warren conducted annual near shore water quality studies. Data collected during 1998-2000 indicate that water quality in Sebago Lake is well within the standards established by the MDEP for lakes and ponds. In terms of overall lake classification, Sebago Lake fits into the oligotrophic category as an unproductive lake, with low ambient levels of phosphorus and nitrogen. A comparison of 1998-2000 data to historic data (1977) shows no substantial change in total phosphorus, conductivity, or turbidity; although turbidity and total phosphorous are lower in 2000 than earlier dates (table 11).

Table 11.Sebago Lake water quality results. (Source: Normandeau, 2001a)

		Specific Conductance (mmhos)		Turbidity (NTU)		Total Phosphorous (ug/l)	
Year	Sampling Months	Mean	Range	Mean	Range	Mean	Range
1977	July - September	36	32-60	0.42	0.24 - 1.20	7.79	1.0 - 27.0
1998-1999	June, November	--a	--a	0.42	0.08 - 2.70	5.26	2.6 - 15.2
2000	June, July, September	44	40 - 58	0.17	0.01 - 0.75	4.27	1.0 - 20.5

a No data due to faulty meter

Periphyton biomass and composition were also monitored as part of the annual near shore water quality studies. The impact of water level, shoreline housing density and degree of shoreline erosion on periphyton biomass and composition was analyzed. Monitoring results show little difference between stations for either Chlorophyll a or total biomass of attached benthic algae. Chlorophyll a typically ranges from 0-6 mg/m2, significantly below the normal range for oligotrophic waters (<100 mg/m2). Normal seasonal variations in the periphyton community were documented, with lower Chlorophyll a concentrations at low lake levels in the fall (October levels were 0.5-1.3 mg/m2), and slightly higher concentrations during early summer high lake levels (July levels were 1.7-6.1 mg/m2). Periphyton productivity is related to solar radiation and can vary seasonally. Algal blooms have not been reported in Sebago Lake.

Dissolved oxygen levels within the epilimnion in 1998, 1999 and 2000 were generally above 7.0 milligrams per liter (mg/l) and often in the 8 to 9 mg/l range during mid summer.

Presumpscot River

The Presumpscot River from the outlet of Sebago Lake to its confluence with the Pleasant River is classified as Class A, a distance of approximately 6 miles. Between the Pleasant River confluence and the Saccarappa Project, a distance of roughly 8 miles, the river is classified as Class B waters. The reach below the Saccarappa Project (Route 202) to tidewater is classified as Class C waters.

Class A waters, according to Maine statutes (Maine, 2004), must have DO concentrations at or above 7.0 mg/l or 75 percent saturation, whichever is higher, and may be used for such purposes as water supply after treatment and disinfection, fishing, water-based recreation, industrial process and cooling supply, hydropower, navigation, and fish and aquatic life habitat. The DO content of Class B waters must be above 7.0 mg/l or 75% of saturation, whichever is higher. For the period from October 1 to May 14, in order to ensure spawning and egg incubation of indigenous fish species, the 7-day mean DO concentration shall not be less than 9.5 mg/l, and the 1-day minimum DO concentration shall not be less than 8.0 mg/l in identified fish spawning areas. The DO content of Class C water must be above 5 mg/l or 60% of saturation, whichever is higher. In identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, water quality sufficient for these purposes must be maintained.

S.D. Warren conducted ambient water quality monitoring in the Eel Weir
bypassed reach in the summer of 2000 and found that average DO concentrations ranged from 7.2 to 8.0 mg/l in the morning; and 9.0 to 9.4 mg/l in the evening. The water column was not stratified in this riverine reach. Secchi disk transparency measurements indicated that bottom substrates were visible at all sample locations on all sample dates. Tables 12 and 13 show the results of the 2002 DO sampling from the Presumpscot River Watch.

Table 12. Presumpscot River DO sampling results, 2002. (Source: Presumpscot River Watch, 2004)

Class	Location	Average (mg/l)	Lowest (mg/l)	Average (% sat)	Lowest (% sat)	Number of sampling dates
A	Near outlet of Sebago Lake	7.92	7.88	80.29	72.19	2
A	Below North Gorham Impoundment	7.56	4.32	82.55	49.88	7
A	Within Dundee impoundment	7.61	6.86	84.18	75.77	7
A	Hurricane Road	7.22	6.08	80.23	65.88	7
B	Route 202	7.69	7.10	81.37	75.58	8
C	L. Presumpscot River (7 stations)	7.40	6.45	80	62.86	50

Table 13. Presumpscot River DO sampling results, 2003. (Source: Presumpscot River Watch, 2004)

Class	Location	Average (mg/l)	Lowest (mg/l)	Average (% sat)	Lowest (% sat)	Number of sampling dates
A	Near outlet of Sebago Lake	7.97	7.08	80.29	72.19	7
A	Below North	8.12	6.30	82.55	49.88	7

	Gorham Impoundment					
A	Within Dundee impoundment	8.24	7.38	84.18	75.77	7
A	Hurricane Road	7.85	6.82	80.23	65.88	7
B	Route 202	7.92	7.22	81.37	75.58	7
C	L. Presumpscot River (7 stations)	7.84	6.30	81.72	67.86	52

The water quality criteria also have maximum concentration standards for E. coli bacteria. Class A waters may not reach E. coli concentrations above what would naturally occur. Class GPA waters may not exceed a geometric mean of 29 MPN

MPN=Most Probable Number
[29]
per 100 milliliters (ml) or an instantaneous value of 194 MPN per 100 ml. Class B waters may not exceed a geometric mean of 64 MPN per 100 ml or an instantaneous value of 427 MPN per 100 ml. Class C waters may not exceed a geometric mean of 142 MPN per 100 ml or an instantaneous value of 949 MPN per 100 ml. Samping by the Presumpscot River Watch in 2002 and 2003 (Presumpscot River Watch, 2004) indicates the river meets the standards for E. coli.

Total phosphorus concentrations in the river reaches above Saccarappa dam were within suggested EPA Ambient Water Quality Criteria guidelines, below 25 ug/l. The total suspended solids concentrations monitored during the studies by Presumpscot River Watch were low, ranging from 0.64 to 1.43 mg/l (Greater Portland Council of Governments, 1993).

S.D. Warren also conducted a study of the benthic macroinvertebrate community in the Eel Weir bypassed reach during 2000 (Lotic, 2002). Although this reach is designated Class A, the benthic macroinvertebrate community exhibits characteristics that are typical of natural lake outlet situations, where oligotrophic lake waters typically do not support the species diversity of Class A streams in Maine, and/or exhibit hyperdominance of filter feeding organisms because of the lake discharge. Nonetheless, in a letter dated February 14, 2002, the MDEP concludes that the bypassed reach supports a Class A macroinvertebrate community, because it is representative of the natural environment.

S.D. Warren manages flows in the Presumpscot River to meet state water quality standards. In the past, S.D. Warren voluntarily provided minimum flow releases from Sebago Lake that increased as a function of water temperature, to maintain adequate DO levels in the river below the Westbrook Mill. The temperature-based summer flow release plan, which is designed to help regulate the water temperature downstream of the project, was subsequently incorporated into the amended LLMP in 2001 and is provided in figure 12.

Figure 12.Sebago Lake flow release curve. (Source: FERC, 2002)

Sebago Lake Tributaries

With the exception of portions of the Crooked River, which are Class AA, and Stevens Brook and Mile Brook, which are Class B, all other tributaries entering Sebago Lake are Class A waters. The Surface Water Treatment Rule of the Federal Safe Drinking Water Act requires that any public water supply not filtering its source water demonstrate that it is controlling activities in its watershed that may be detrimental to the quality of its source waters. The Water District fulfills this requirement by maintaining a rigorous watershed protection program. As part of the Water District's watershed protection program, several tributary streams are annually monitored for turbidity, total phosphorus, filtered phosphorus, fecal coliform, E. coli, and stream flow.

Water samples collected in 2000 near tributary inflow locations had higher turbidity and total phosphorous concentrations and slightly higher specific conductance values than sampling sites away from tributary inflow points (table 14).

Table 14. Sebago Lake water quality in the vicinity of and away from tributaries. (Source: Normandeau, 2001a)

	Near Tributaries		Away from Tributaries	
Parameter	Mean	# of sites	Mean	# of sites
Turbidity (NTU)	0.35	20	0.12	75
Specific conductance (umhos)	46.2	20	43.15	74
Total phosphorus (ug/l)	7.15	20	3.51	76

Installation of septic systems on property located within 200 feet of the high water mark of Sebago Lake requires written approval of the Water District. The Water District's jurisdiction also extends up some of the Sebago Lake's tributaries (including, for example, the area around Sebago Cove in Naples and along the Crooked River to Route 302). The approval process is based on the Maine State Plumbing Code [CMR 144A Part 241] (Water District, 2004), and, therefore, is similar to that required by the municipality in which the property is located.

b. Environmental Effects:

Sebago Lake Storage and Effects of Alternative LLMP on Flood Control

Sebago Lake, due to its large storage capacity affects both the downstream Presumpscot River flow regime and the shoreline areas of Sebago Lake. During and after substantial rainfall/runoff events, the amount of flow released from Sebago Lake is influenced by the storage capacity of the lake, which is directly related to the water surface elevation, as well as the operations of the Eel Weir Project by S.D. Warren.

Some aspects of the various LLMP alternatives have the potential to affect the flood storage capability within Sebago Lake, and the related Presumpscot River flow regime. None of the stakeholders, other than Stephen Kasprzak and FOSL, made specific recommendations for lake levels related to flooding effects or flood control. However, S.D. Warren proposes that it be granted the flexibility to modify the operation of the Eel Weir Project to reduce flooding effects downstream, in the event of higher river flows or storm events. Because Sebago Lake storage capacity may have a major effect on the Presumpscot River flows, we discuss the potential effects of the various LLMP alternatives on flooding potential.

Our Analysis

Hydrology and flood storage potential

There are substantial differences other than just area, between the 436-mi2 Sebago Lake drainage basin and the 136-mi2 Presumpscot River drainage basin below Sebago Lake, including:

* Climatic and snowpack differences - the drainage area above Sebago Lake typically has a deeper and more stable snowpack, due to its generally higher elevation, more snowfall and colder climate. The drainage area above Sebago Lake also releases runoff later in the spring than the warmer coastal drainage area below Sebago Lake.

* Watershed characteristics - the drainage area above Sebago Lake has a higher percentage of lakes and ponds, and is less developed. This generally leads to a delayed and a slower to rise and slower to decrease hydrograph from runoff events, than what is typical of the drainage area below Sebago Lake.

Figure 13 illustrates the difference in the timing of peak flows between the USGS gage on the Presumpscot River at Westbrook (about 20 miles downstream of Sebago Lake) and the USGS gage on the Crooked River near Naples, one of the major tributaries to Sebago Lake. This figure, based on data from 1976 (when both gages were active), indicates that the peak inflow, at least from the Crooked river is often a day or two later than the peak flow at Westbrook. Figure 14 is the snowpack water content map for Maine in mid March, 2004, which is considered "typical." This figure shows the sharp difference in snowpack between coastal Maine and inland areas.

Figure 13. Presumpscot River at Westbrook and Crooked River at Naples flow timing comparison, April through November, 1976. (Source: USGS, 2004b; Water District, 2004) [Note: the flow for the Crooked River gage was prorated by a factor of 2.94 for purely graphical reasons and is not an attempt to show that this gage is representative of all of the inflow to Sebago Lake]

Figure 14. Snowpack water content map for March 15-16, 2004. (Source: Maine Snow Survey, 2004)

The amount of flood storage available in Sebago Lake varies by season and by lake level, as illustrated in figure 15, which shows the stage/storage relationship, in mcf . Figure 15 shows the amount of storage available below the spillway elevation of 266.65 feet, for the following scenarios:

* the average water level for the 1910 to 1986 time period (historic data);
* the maximum water level allowed in the current LLMP;
* the maximum water level allowed by the LLMP recommended by Maine;
* the maximum water level allowed by the alternative LLMP recommended by S.D. Warren.

Figure 15.Approximate storage (mcf) within Sebago Lake under different LLMP scenarios. (Source: FERC, 1997b, S.D. Warren, 2002a; USGS, 2004b)

Table 15 summarizes the storage available under the different alternatives, for the first of the month water surface elevations allowed under each alternative, or as recorded during the 1910 to 1986 period.

Table 15. Approximate monthly Sebago Lake storage (mcf) under different LLMP scenarios. (Source: FERC, 1997b; S.D. Warren, 2002a; USGS, 2004a)

Date	1910 - 1986 average	Current LLMP maximum	State LLMP maximum	S.D. Warren LLMP maximum
1-Oct	5,050	3,428	3,220	3,428
1-Nov	5,611	4,452	4,452	4,452
1-Dec	5,623	4,160	4,160	4,160
1-Jan	5,477	3,842	3,842	3,842
1-Feb	5,477	2,708	2,867	2,708
1-Mar	5,428	1,647	1,939	1,647
1-Apr	4,391	500	964	500
1-May	2,623	-	-	-
1-Jun	1,744	-	-	-
1-Jul	2,000	585	280	439
1-Aug	2,842	1,805	1,147	1,500
1-Sep	3,989	2,013	2,013	2,013
Avg.	4,188	2,514	2,488	2,469

Another way to describe the Sebago Lake storage capability is to estimate the amount of runoff, in inches, that could be stored within the lake. Based on a watershed of 441 mi2 at the outlet of Sebago Lake, table 16 shows the amount of runoff that could be stored within Sebago Lake under the different LLMPs.

Table 16. Approximate Sebago Lake storage (inches of runoff) available on the first of the month at the alternative LLMPs. (Source: FERC, 1997b; S.D. Warren, 2002a; USGS, 2004a)

Date	1910 - 1986 Average	Current LLMP maximum	State LLMP maximum	S.D. Warren LLMP maximum
1-Oct	4.9	3.4	3.2	3.4
1-Nov	5.5	4.4	4.4	4.4
1-Dec	5.5	4.1	4.1	4.1
1-Jan	5.3	3.8	3.8	3.8
1-Feb	5.3	2.7	2.8	2.7
1-Mar	5.3	1.6	1.9	1.6
1-Apr	4.3	0.5	0.9	0.5
1-May	2.6	0.0	0.0	0.0
1-Jun	1.7	0.0	0.0	0.0
1-Jul	2.0	0.6	0.3	0.4
1-Aug	2.8	1.8	1.1	1.5
1-Sep	3.9	2.0	2.0	2.0
Avg.	4.1	2.5	2.4	2.4

Data in tables 15 and 16, and in figure 15, indicate that historically more flood storage was available in Sebago Lake, because lower lake levels existed, thus providing more storage for runoff. The current and two proposed alternative LLMPs provide, on average, about 60 percent of the storage capability, because lake levels would be maintained at higher levels. Of the three alternatives shown, Maine's and S.D. Warren's plans would provide slightly less storage than the current LLMP.

Sebago Lake effects on peak flow events

Figure 16 provides a summary of the dates of the peak flow events at the Westbrook USGS gage and the USGS gage at the outlet of Sebago Lake, for water years 1976 to 2004. Peak flow events occurred on the same dates at both gages only in 1989 and 2003, with 1989 being the higher flow event representing approximately a 10-year flood event. In 1989, the Sebago Lake outflow gage accounted for 36 percent of the daily flow at the Westbrook gage and in 2003, the percentage was 30 percent.

Figure 16 shows that there are two basic time periods for peak flow events for the Presumpscot River:

* The most frequent are in winter and spring due to rainfall, snowmelt or a combination of the two, usually in the months of March and April.

* Late summer and fall events are less common but are usually the result of hurricanes or remains of hurricanes, as in August 1991, October 1996 and September 1999.

Figure 16.Peak annual flow dates at the Westbrook and Sebago Lake outflow gages. (Source: USGS, 2004b; emails from Gregory J. Stewart, Data Section Chief, USGS, Augusta, ME, September 7, 2004)

Table 17 provides a much more detailed view of the influence of the Sebago Lake outflow on the annual peak flow of the Presumpscot River at the Westbrook USGS gage. These data indicate that the contribution of Sebago Lake outflow was mostly limited, other than on May 12, 1989, when Sebago Lake was above the spillway elevation. In addition, it is clear that S.D. Warren limited the outflow from Sebago Lake on days of peak flow at Westbrook, as for water years 1977, 1983, 1987, 1991, and 1996. During these five peak flow events on the lower Presumpscot River, sufficient lake storage capacity was available to allow S.D. Warren to decrease the outflow of Sebago Lake for at least a day.

Table 18 is basically a continuation of table 17 and provides data on Sebago Lake, both outflows and peak water surface elevations within 2 weeks after the peak at Westbrook. This information helps to show that for most years, the peak flow from Sebago Lake in the 2-week period after the peak at the Westbrook gage remained relatively low and did not approach a substantial contribution to the flow in the Presumpscot River.

Table 17.Presumpscot River at Westbrook, USGS gage 01064118 peak flow summary, compared to Sebago Lake outflow. (Source: USGS, 2004b; emails from Gregory J. Stewart, Data Section Chief, USGS, Augusta, ME, September 7, 2004 ; Water District, 2004)

Water Year	Date of peak flow at	Stream Gage Height	Peak flow (cfs)	Sebago Lake elevation	Sebago Lake 1910-1986	Sebago Lake daily discharge	Approximate % of flow at Westbrook

		Westbrook (feet)		(feet) on date of Westbrook peak	average elevation on Westbrook gage peak datea	(cfs) on date of Westbrook peak	from Sebago Lake
1976	Apr. 02, 1976	NA	3,600	264.8	263.11	583	16.2%
1977	Mar. 14, 1977	NA	11,250	262.6	262.29	35	0.3%
1978	Jan. 09, 1978	NA	5,470	265.5	262.18	889	16.3%
1979	Apr. 28, 1979	NA	4,910	266.4	264.38	676	13.8%
1980	Apr. 11, 1980	NA	5,710	262.8	263.90	263	4.6%
1981	Feb. 25, 1981	NA	6,960	262.8	262.18	131	1.9%
1982	Jun. 02, 1982	NA	4,070	266.2	265.23	670	16.5%
1983	Mar. 20, 1983	NA	7,240	265.4	262.52	63	0.9%
1984	Apr. 06, 1984	NA	8,020	265.4	263.33	340	4.2%
1985	Mar. 12, 1985	14.26	3,920	262.2	262.27	350	8.9%
1986	Jan. 27, 1986	19.11	6,400	263.8	262.17	350	5.5%
1987	Apr. 01, 1987	20.83	7,360	262.4	263.06	0	0.0%
1988	Apr. 29, 1988	14.02	3,810	264.0	264.42	254	6.7%
1989	May 12, 1989	22.26	9,200	266.7	265.04	3,310	36.0%
1990	Apr. 04, 1990	13.04	3,350	264.3	263.22	350	10.4%
1991	Aug. 20, 1991	NA	13,900	264.7	263.73	50	0.4%
1992	Mar. 11, 1992	12.89	3,280	262.5	262.27	546	16.6%
1993	Apr. 11, 1993	16.1	5,080	262.9	263.60	352	6.9%
1994	Dec. 22, 1993	14.85	3,720	263.6	262.14	856	23.0%
1995	Dec. 25, 1994	15.07	3,790	262.8	262.15	579	15.3%
1996	Jan. 28, 1996	15.82	4,700 b	263.3	262.17	856	roughly 20%
1997	Oct. 22, 1996	34.1	23,300	264.8	262.08	75	0.3%
1998	No data						
1999	Sep. 17, 1999	18.32	6,000 b	263.6	262.84	300	roughly 5%

2000	Apr. 23, 2000	13.47	3,600 b	265.7	264.16	991	roughly 30%
2001	Dec. 18, 2000	14.04	3,800 b	262.4	262.13	667	roughly 20%
2002	May 14, 2002	10.8	<3,000 b	265.1	265.13	133	roughly 5%
2003	Mar. 21, 2003	10.43	<3,000 b	261.7	262.56	833	roughly 30%
2004	Apr. 2, 2004	15.52	4,600 b	263.5	263.11	250	roughly 5%

a For dates after 1986, the elevation shown is the average lake elevation on the month and day of the peak event at Westbrook, from the 1910-1986 period.

b Flow estimated from stage flow relationship in prior years, accuracy is limited.

Table 18.Westbrook peak flow summary continuation. (Sources: USGS, 2004b; emails from Gregory J. Stewart, Data Section Chief, USGS, Augusta, ME, September 7, 2004 ; Water District, 2004; USGS, 2004a)

Water Year	Date	Westbrook flow (cfs)	Lake elevation (feet) on date of Westbrook peak	Daily lake discharge (cfs) on date of Westbrook peak	Peak lake discharge (cfs) within 2 weeks	Date of peak lake discharge	Elevation (feet) on date of peak lake discharge or within 2 weeks of Westbrook gage peak
1976	Apr. 02, 1976	3,600	264.8	583	1,080	14-Apr	266.3
1977	Mar. 14, 1977	11,250	262.6	35	831	18-Mar	264.6
1978	Jan. 09, 1978	5,470	265.5	889	1,000	11-Jan	266.1
1979	Apr. 28, 1979	4,910	266.4	676	2,160	2-May	267.0
1980	Apr. 11, 1980	5,710	262.8	263	263	multiple	264.2
1981	Feb. 25, 1981	6,960	262.8	131	831	3-Mar	263.9
1982	Jun. 02, 1982	4,070	266.2	670	685	9-Jun	266.4
1983	Mar.	7,240	265.4	63	2,320	26-Mar	

	20, 1983						266.8
1984	Apr. 06, 1984	8,020	265.4	340	3,400	9-Apr	266.3
1985	Mar. 12, 1985	3,920	262.2	350	350	multiple	262.7
1986	Jan. 27, 1986	6,400	263.8	350	833	7-Feb	264.8
1987	Apr. 01, 1987	7,360	262.4	0	860	12-Apr	265.9
1988	Apr. 29, 1988	3,810	264.0	254	254	multiple	265.0
1989	May 12, 1989	9,200	266.7	3,310	3,310	multiple	267.2
1990	Apr. 04, 1990	3,350	264.3	350	350	multiple	265.7
1991	Aug. 20, 1991	13,900	264.7	50	1,330	27-Aug	264.7
1992	Mar. 11, 1992	3,280	262.5	546	554	12-Mar	263.1
1993	Apr. 11, 1993	5,080	262.9	352	841	22-Apr	265.9
1994	Dec. 22, 1993	3,720	263.6	856	998	23-Dec	263.6
1995	Dec. 25, 1994	3,790	262.8	579	1,000	29-Dec	262.9
1996	Jan. 28, 1996	4,700a	263.3	856	856	multiple	263.7
1997	Oct. 22, 1996	23,300	264.8	75	592	4-Nov	266.2
1998	No data						
1999	Sep. 17, 1999	6,000 a	263.6	300	838	29-Sep	265.0
2000	Apr. 23, 2000	3,600 a	265.7	991	1090	5-May	266.6
2001	Dec. 18, 2000	3,800 a	262.4	667	667	multiple	262.6
2002	May 14, 2002	<3,000 a	265.1	133	275	20-May	265.8
2003	Mar. 21, 2003	<3,000 a	261.7	833	833	multiple	262.5

2004	Apr. 2, 2004	4,600 a	263.5	250	250	multiple	264.7

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a Flow estimates from stage flow relationship in prior years, accuracy is limited.
`Multiple' indicates that this flow value was recorded on multiple days within the 2 week period.

Effects of Alternative LLMPs on Flood Control

As we described above, three primary LLMP alternatives have been either proposed or recommended by stakeholders. In addition, alternatives have been recommended that are similar in some ways to the three primary alternatives. We discuss below how the various provisions of these alternatives would affect flooding potential.

Increase winter water levels. Maine's alternative would maintain higher winter water levels, compared to the current LLMP, which does not specify a minimum lake level. Maine recommends that S.D. Warren maintain the lake level from January 1 to March 1 at or above the long term (1910-1986) median levels, then resume normal refilling from March 1 to May 1 (on or after) to achieve the target elevation. Maine also recommends that the water levels should be managed based on precipitation, snowpack, energy needs and downstream flow requirements, with the goal of the lake level reaching the spillway crest elevation on, or anytime after, May 1. Maine also recommends that whenever possible, the maximum lake level be no higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1, and to 266.65 feet on May 1.

The long-term (1910-1986) winter drawdown was to about 262.0 feet, where it would remain for about two months. If Maine's plan is implemented, winter lake levels could range between elevation 262.0 feet and the maximum level on January 1 of elevation 263.5 feet. During the remainder of the winter the maximum level could rise to above 264.0 feet in February and above 265.0 feet in March. If the lake is allowed to reach these higher levels during the winter months, there would be significantly less storage available for spring runoff, as shown in tables 15 and 16 and figure 15. The loss of this storage could have a significant effect on flows in the Presumpscot River. To illustrate this effect, we provide an example of how storage within Sebago Lake decreased the Presumpscot River flow in the early spring (April) of 1987.

According to historical records, February and March 1987 were relatively dry, but at the end of March many areas in Maine had a remaining snowpack with a water equivalent of over 5 inches. On March 31 and April 1, 5 to 7 inches of rainfall occurred over most of the region above and below Sebago Lake. Prior to the start of the storm, the water level in Sebago Lake was lower than normal at 261.42 feet, approximately 1.4 feet below the 1910 to 1986 mean for that date, and roughly 4.5 feet below the current and proposed LLMP maximums. Due to the low lake level, S.D. Warren had the ability to basically stop the outflow from Sebago Lake on April 1, the date of the peak flow (7,360 cfs) at the downstream Westbrook gage. Other nearby rivers in Maine such as the Saco and the Androscoggin, which do not have the advantage of a large storage lake such as Sebago Lake, suffered substantial flooding due to this storm.

By calculating the change in storage, using water surface elevations on April 2 and April 9, approximately 4,000 cfs would have been released daily during this 7-day period, if Sebago Lake did not have available storage capacity below the spillway crest. Without this storage, the peak water surface for Sebago Lake during this event or soon after would have likely exceeded 266.65 feet. This would have resulted in uncontrolled spillage out of Sebago Lake. The precise effects of this, in terms of additional flow in the Presumpscot River at the Westbrook gage on the April 1 peak flow, are difficult to determine because of several factors, such as:

* the timing delay of the peak inflow reaching the Sebago Lake outlet, compared to the peak for the drainage area below

Sebago Lake reaching the Westbrook gage;
* effects of any available storage, however limited, within Sebago Lake at even the higher lake levels; and
* rainfall intensity and distribution differences between the two watersheds for this storm event.

One possible result would have been a peak not much higher than recorded on April 1, 1987, but a much longer period of flow above 5,000 cfs at the Westbrook gage. Based on figure 15 and table 15, the approximately 4,400 mcf of storage (at 263.0 feet) remaining in Sebago Lake on April 1 under historical operations would substantially limit the possible effects of this type of an event, as compared to the current, S.D. Warren proposed or Maine recommended LLMPs. Maine's plan would maintain higher winter and early spring water levels, compared to the other alternatives and, therefore, would have the potential to cause the highest amount of downstream flooding, if a high runoff event was to occur in early spring.

Eliminate the springtime range above full pond. All parties appear to agree that water levels above the spillway crest should be limited or eliminated to the extent possible. The current LLMP allows a +/- 0.5-foot range on either side of the spillway crest elevation of 266.65 feet, up to 267.15 feet, on, or after, May 1 through June 15.

In its comments, Maine recommends that: (1) the fluctuation above the spillway crest be eliminated; and (2) flow releases be increased whenever the lake rises above the spillway to present the lake from reaching 267.15 feet. S.D. Warren responded to Maine's plan, in a letter dated July 15, 2004, stating the following: (1) the current LLMP recognizes that some leeway above the spillway crest, up to the limits of the flow easements (267.15 feet), is necessary to achieve full pond, and some leeway is needed if the spillway level is the target elevation; (2) increased flow releases whenever the lake level has the potential to exceed the spillway elevation would have the potential to cause or contribute to flooding downstream of the project; and (3) if the requirement to release flows when the lake has the potential to exceed the spillway elevation is adopted, a provision should be included to allow S.D. Warren to obtain a temporary variance of the flow requirement, under circumstances such as flooding on the Presumpscot River downstream of the Eel Weir Project.

Stephen Kasprzak and FOSL state that Sebago Lake has reached full pond only 38 years in the 1910 to 2004 time period, and recommend a maximum target elevation of 265.65 feet. Mr. Kasprzak also recommends a tolerance range of from +1 foot to -0.5 foot. The Sebago Lake Coalition recommends a full pond target of 266.0 to 266.5 feet occurring as early as May 1, and that the full pond target can be reached between May 1 and late-June. They also recommend that the full pond not stay at or above the spillway for more than 3 weeks, followed by a slow decline through the summer, and state that a high lake level is important to fisheries, wildlife, wetlands, and the boating economy.

Stephen Kasprzak's and FOSL's recommendation would provide approximately 1,220 mcf or 28,000 acre-feet of storage below the spillway crest at an elevation of 265.65 feet. This volume of water is equal to approximately 2,000 cfs discharging over a 7-day period. However, since Kasprzak's recommendation has a tolerance of +1 foot, the maximum elevation would be 266.65 feet, which is equal to full pond proposed and recommended by S.D. Warren and Maine.

Peak annual elevations and dates of the occurrences, since 1910, are shown in figure 17. This figure shows that the lowest peak elevations occurred from 1910 to 1986 and may have influenced the historic mean of approximately 265.4 feet for that period. For example, if the five lowest peak values, which occurred in 1911, 1941, 1948, 1957 and 1965, are removed, the mean value for the 1910 to 1986 period becomes approximately 266.0 feet. The median elevation for the 1910 to 1986 period is 266.5 feet.

The median value is often used in hydrological analyses to indicate the value that is most likely to occur, because it limits the influence of peaks and valleys associated with floods or droughts.

[30]
This compares to a mean of 266.2 feet and a median of 266.3 feet for the 1987-2004 period.

Figure 17. Date of the peak annual water surface elevation for Sebago Lake since 1910. (Sources: Water District, 2004; USGS, 2004b)

The major remaining difference between the alternative LLMPs for the spring period, is that Maine's recommendation includes the provision that flow must be released any time that the lake has the potential to exceed the spillway crest elevation. S.D. Warren has a history of attempting to reduce the discharge rate from Sebago Lake, to help limit the effect of lake discharge during or prior to flooding conditions along the downstream Presumpscot River. Maine's recommended change would reduce the short time delay for the peak outflow from Sebago Lake that has been possible by using the approximately 600 mcf (or 6,900 cfs for 1 day) of storage between 266.65 and 267.15 feet.

Figure 18 shows an example of S.D. Warren's ability to manage the outflow of Sebago Lake to help decrease the peak flow downstream on the Presumpscot River. Beginning in late-March 1983, there was limited storage available, between elevation 266.5 and 267.0 feet. This figure shows that the flow on April 25 would have approached 8,000 cfs, instead of the recorded peak slightly over 6,000 cfs, without the temporary decrease in outflow from Sebago Lake. A flow of 8,000 cfs is approximately the 5-year flood event for the Presumpscot River as indicated in table 10. Figure 18 also shows another instance, in March 1983, when outflow from Sebago Lake was reduced by S.D. Warren to limit higher flows downstream from the lake. In mid-March, however, there was substantial additional storage available in the lake because the lake had not yet reached the spillway crest elevation.

Figure 18. Relationship between the Westbrook gage, Sebago Lake outflow, and Sebago Lake water surface elevation during March, April and May 1983. (Source: USGS, 2004b; Water District, 2004)

Expand the summer/fall target range. S.D. Warren proposes to implement a 3-inch tolerance range for the August 1 target level (265.17 feet), between elevation 264.92 and 265.42 feet. Maine's recommended plan would expand the summer/fall target range by approximately 0.5 foot, based on their revised rule curve, creating a minimum target elevation of 265.17 feet and a maximum elevation of 265.7 feet on August 1. Maine also recommends an upper target level of 265.0 feet on September 1 and a target of elevation 262.0 feet on November 1.
Maine initially recommended an elevation of 263.0 feet on November 1, but has since changed its recommendation.

[31]
In its July 15, 2004, letter, S.D. Warren concurred with these recommendations.

The Sebago Lake Coalition, in its August 15, 2004, letter, agreed with Maine's recommendations for this time period. Stephen Kasprzak states, in his August 18, 2004, letter, that setting the August 1 target level at 265.17 feet, which is 1.0 foot above the historic norm for August 1: (1) reduces S.D. Warren's ability to maximize power generation during this time period; and (2) increases the potential for the lake level to exceed S.D. Warren's flow easement of 267.15 feet during high runoff events.

As shown in figure 16, only three peak annual flood events occurred at the Westbrook gage during the months of July through November, from 1976 to 2004. These three events, including two of the highest ever recorded, based on records extending back to 1895, were the results of rainfall associated with: (1) Hurricane Bob on August 20, 1991 (13,900 cfs); (2) a complex northeaster that entrained substantial moisture from Hurricane

Lili on October 22, 1996 (23,300 cfs); and (3) Hurricane Floyd on September 17, 1999 (approximately 6,000 cfs).

Tropical systems such as those mentioned above are usually the cause of substantial flooding events during the summer/fall period, since they provide the large spatial distribution of heavy rainfall. At this time of the year, other heavy rainfall events common in Maine are thunderstorms associated with frontal systems, which normally lack the widespread distribution of heavy rainfall capable of producing heavy runoff to entire river systems such as the Presumpscot, on the scale of the flooding events in 1991, 1996 and 1999.

In 1996, from the afternoon of October 20 until the morning of October 22, 17.62 inches of rainfall fell at Westbrook, Maine. Rainfall estimates at the outlet of Sebago Lake were in the 12 to 14-inch range, with 10 or less inches in most of the watershed to Sebago Lake. This flood event produced a flood of record, estimated at 23,300 cfs on October 22 at the Westbrook USGS gage. Figure 19 shows that the outflow of Sebago Lake was approximately 75 cfs on October 22, and that the lake level was relatively low, but steadily rose during and after this event.

Sebago Lake was at elevation 262.76 feet prior to this event, approximately 0.5 feet above the average level for 1910 to 1986 and approximately 0.6 feet below the existing, proposed and state recommended LLMPs. Due to the capacity for Sebago Lake to store and delay most of the rainfall from the October 1996 event, flooding was likely reduced downstream in the Presumpscot River. Lake levels proposed by the different alternatives for this late-fall period, as shown in figure 19, would still provide a similar level of flood protection (although somewhat less) as occurred in 1996.

Figure 19.Relationship between the Westbrook gage, Sebago Lake outflow, and
Sebago Lake water surface elevation during October and November 1996.
(Source: USGS, 2004b; Water District, 2004; Hodgkins, 1997)

Maintain periodic low water levels in the fall. S.D. Warren proposes no changes to the periodic low drawdowns in the fall. However, in its July 15, 2004, letter responding to Maine's recommended LLMP revisions, S.D. Warren suggests that the periodic low level requirement of the existing and several of the alternative LLMPs be totally removed from the LLMP because:

(1) there may be difficulties reaching the May 1 target level after the lake is drawn down to 261.0 feet or below, as called for in many of the alternative plans;

(2) lowering upstream water bodies (e.g., Long Lake and Brandy Pond) could send an additional 8 inches of water to Sebago Lake during the required drawdown period, possibly requiring S.D. Warren to release even higher volumes of flow downstream;

(3) due to the design of the Eel Weir Project, there is an inability to pass large amounts of water at reduced head;

(4) leaves are an impediment to flow passage through the project at this time of the year, and opening of the river gates is sometimes necessary to avoid clogging the fish screens and tripping the generators off-line; and

(5) the combination of November being one of the wettest months of the year and dormant vegetation results in a high rate of runoff from the watershed, making it difficult for S.D. warren to maintain the lower water levels.

Maine recommends a target level of 261.0 feet on or about December 1 in two out of every nine years, with the requirement to stay within 6 inches of the target level until January 1. FOSL and Stephen Kasprzak recommend a November 1 target level of 261.0 feet in 1 of every 2 years, 260.0 feet in 1 of every 4 years, and 259.0 feet in 1 of every 10 years. These drawdowns would last up to two months and, according to FOSL and Mr.

Kasprzak, enhance sand accretion to the beaches. These recommendations are discussed in greater detail in sections V.C.1, Geology and Soils and V.C.5, Recreational Resources and Land Use.

The MDIFW recommends that a 5 to 8-foot drawdown be considered for late-November into mid-winter, as a measure to reduce the spawning success of lake trout. Interior recommends that the lake not be drawn down more than 2 feet (to 264.65 feet) from April 1 to December 15, and not more than 3 feet (to 263.65 feet) from December 16 through March 31. The MDIFW and Interior recommendations are primarily related to fishery resources, which are discussed in greater detail in section V.C.3, Fisheries and Aquatic Resources.

Possible flooding effects to downstream and shoreline areas, due to the periodic low level drawdowns in the fall, are somewhat similar to the summer and early fall adjustment in the LLMP target. Flood events that would be worsened by the outflow from Sebago Lake are unlikely to occur due to the large amount of storage that would be available within the lake with the current and all alternative LLMPs. Maine's recommendation to maintain the 2-in-9-year drawdown for only 1 month (December 1 to January 1) would result in some reduction in flood storage capacity during the late-fall period, when storms occur.

The ability to refill Sebago Lake after the periodic low-level fall drawdown is discussed in Section V.C.1, Geology and Soils, and with respect to boating in section V.C.5, Recreational Resources and Land Use. In general, however, we found that at extreme dry, over-winter flows and lake drawdowns as low as elevation 260.0 or 261.0 feet, it is unlikely that the lake would reach 266.15 feet by May 15 (see table 4). At higher inflows, however, the lake would likely refill, while also providing some flood control storage benefits. The additional 8 inches of water from other lakes in the basin, of concern to S.D. Warren, if "deposited" on the 75-mi2 surface area of Sebago Lake, would be approximately 1,400 mcf or, if released from the lake would result in a flow of approximately 2,300 cfs for 1 week. Thus, the operational concerns identified by S.D. Warren are reasonable and would, under some situations, cause Sebago Lake to rise above the low-level target(s) for a period of time. Operational allowances for these types of events should be taken into account if the periodic low level drawdowns are continued.

CONCLUSIONS - Sebago Lake levels have the potential for significantly affecting flood levels in the lower Presumpscot River. If lake levels are low during a major rainfall/runoff event, there is significant flood control storage available, which would reduce downstream flooding. Similarly, if lake levels are high during such an event, little storage would be available and there would be the potential for Sebago Lake to exceed the upper limit of the current LLMP of 267.15 feet, resulting in possible encroachment above the flowage easement and uncontrolled spillage into the Presumpscot River.

The LLMP alternatives recommended by Stephen Kasprzak and FOSL have the lowest range of winter water levels for Sebago Lake, and therefore would provide the most available storage for potential late-winter or early-spring flooding events. However, there are many competing stakeholders that recommend higher lake levels for the benefit of other resources. Whatever LLMP is adopted, S.D. Warren's request for a provision to allow for temporary variances from the LLMP levels, for flooding or other severe conditions would be appropriate.

Project Operations and Flow Monitoring Plan

S.D. Warren proposes to continue operating the Eel Weir Project as a store-and-release facility. Sebago Lake would be regulated in accordance with the existing LLMP, except that the LLMP would be modified to establish a 3-inch range for the August 1 target date. In addition, minimum flow releases to the bypassed reach would continue to be regulated in accordance with the LLMP and the 1992 Commission Order. To monitor compliance with project operations, S.D. Warren proposes to continue operating an existing lake level gage on Sebago Lake. S.D. Warren proposes no other measures to monitor compliance with project operation, including the bypass flow.

Interior recommends that the Commission require S.D. Warren to seasonally limit lake level fluctuations and provide certain minimum flows to the Eel Weir bypassed reach. Interior also recommends that the licensee prepare a plan, in consultation with the USFWS, the USGS, the MDEP, the MDMR, and the MDIFW, to monitor instream flows and impoundment water levels at the project. The monitoring plan would include temperature monitoring in the bypassed reach. While various entities recommended changes in the LLMP, no other entity recommended measures to monitor compliance with project operation.

In its September 17, 2003, letter responding to the agencies' and other entities' terms and conditions, S.D. Warren commented on Interior's recommendation for a compliance monitoring plan. S.D. Warren states that it already monitors and maintains records of flows in the bypassed reach and lake levels. S.D. Warren further contends that temperature monitoring in the bypassed reach is unnecessary.

Our Analysis

The proposed continued operation of the project as a store-and-release facility, with only a slight change to the current LLMP, would maintain existing hydraulic conditions at the project and in the lower Presumpscot River. In addition, S.D. Warren's proposal to continue providing flows to the bypassed reach would maintain the existing ecosystem stability in the reach.

To address environmental concerns related to the existing LLMP and flow management in the bypassed reach, several entities proffered proposals and recommendations that would affect lake level management at Sebago Lake. Certain of these entities also recommend alternative flows for the bypassed reach. If implemented, changes to the LLMP and the flow regime in the bypassed reach could, depending on the magnitude of the changes, substantially alter the hydraulic conditions at the project and in the lower Presumpscot River. Such effects are discussed in relevant resource sections of this EA.

Erosion, the suitability of aquatic habitat in Sebago Lake and the Presumpscot River, fish passage, recreation, aesthetics, and historic resources could be affected by inconsistent water levels in Sebago Lake, as well as flow releases in the bypassed reach and further downstream in the Presumpscot River. Thus, compliance with any recommended LLMP and bypass flow releases should be monitored.

S.D. Warren proposes to maintain the existing lake level gage on Sebago Lake. S.D. Warren also states that instrumentation to monitor bypass flows is already in place, though does not provide details of its bypass flow monitoring program or propose any other specific measures for monitoring the bypass flow releases. Thus, it is not clear what other mechanisms the applicant currently uses to monitor and maintain records of bypass reach flows and lake levels, aside from the existing lake level gage. Therefore, we agree with Interior's recommendation for a project operations and flow monitoring plan. Such a measure is necessary to ensure compliance with any recommended LLMP and bypass minimum flow requirement. Moreover, implementing such a measure would afford interested parties a greater understanding of project operations and allow them to independently verify compliance.

Interior recommends that any approved monitoring plan include water temperature monitoring in the bypassed reach. S.D. Warren contends that such monitoring is unnecessary with its proposed minimum flow regime for the bypassed reach. As described below, monitoring water temperature may have some merit under certain flow conditions.

In its letter dated July 28, 2003, the MDIFW indicates that the existing flow regime supports a substantial coldwater fishery in the bypassed reach (described further in section V.C.3, Fisheries and Aquatic Resources). The MDIFW also indicates that higher year-round flows, other than those currently released to the bypassed reach, significantly increases the habitat suitability for the managed coldwater fishery. Notwithstanding this increase in overall physical habitat suitability, flows higher than 115 cfs adversely affects coldwater refugia in the bypassed reach (Kleinschmidt, 2002).

There are no significant tributaries that enter the Eel Weir bypassed reach. However, areas with coldwater seeps are present in the reach. During summer months, these coldwater seeps provide thermal refuge from warm water temperatures for brook trout and landlocked Atlantic salmon.

[32]
Thus, as discussed further in section V.C.3, implementing flows in the range recommended by the resource agencies could affect the MDIFW's coldwater fishery management goals for the bypassed reach. Monitoring water temperature under such flow conditions would provide valuable information and guidance to S.D. Warren and the resource agencies regarding the adequacy of the higher flows, and the need for changes to the flow regime or other measures, to achieve the agencies goal of a year-round coldwater fishery, supported, in part, through natural recruitment.

Developing and implementing a project operation and flow monitoring plan would affect project economics. Thus, we address the costs of such a plan in section VI, Developmental Analysis, and make our final recommendation in section VII.B, Comprehensive Development and Recommended Alternative.

Flow Management in Eel Weir Bypassed Reach

S.D. Warren proposes to continue operating the Eel Weir Project as a store-and-release facility, as well as provide seasonally adjusted minimum flows to the Eel Weir bypassed reach. S.D. Warren proposes no further measures to protect or enhance water quality in the bypassed reach. Nor do the resource agencies or any other entity recommend specific measures to protect or enhance water quality in the bypassed reach.

Our Analysis

The Presumpscot River downstream from the Eel Weir Project, including the Eel Weir bypassed reach, is designated as Class A waters to the confluence of the Pleasant River (excluding Dundee Pond).
The Pleasant River is a tributary to the Presumpscot River, whose confluence is located within the Gambo impoundment.

[33]
Class A waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection, fishing, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation, navigation, and as habitat for fish and other aquatic life. The habitat shall be characterized as natural. The state standard for DO is no less than 75 percent saturation or 7.0 mg/l.

The results of S.D. Warren's 2000 water quality survey shows that water quality conditions in the Eel Weir bypassed reach attained or exceeded Class A standards for DO, even during the critical, low-flow/high temperature summer period. During the 2000 water quality study, average DO concentrations ranged from 7.2 to 9.0 mg/l during morning hours and 8.0 to 9.4 mg/l during the evening (Woodard and Curran, 2002). The monitoring data show no stratification of the riverine waters. Diurnal fluctuations were documented at most monitoring stations, with morning DO levels slightly lower than afternoon levels, due to overnight photosynthetic depletion.

In addition to the water quality survey, a benthic macroinvertebrate survey was conducted in the Eel Weir bypassed reach in 2000 (Lotic, 2002). The results of the survey indicated that the Eel Weir bypassed reach was achieving Class B water quality standards. The authors state that this attainment is due primarily to habitat conditions and is not an indication of water quality.
As cited in Lotic (2002), lakes often stabilize flows and temperatures in the habitat below them, along with discharging a higher load of suspended organic matter than would normally be found. Macroinvertebrate samples collected downstream from a lake contain higher numbers of organisms and are dominated by filter feeding invertebrates.

[34]
In a letter dated February 14, 2002, the MDEP concurred and determined that the Eel Weir bypassed reach is supporting a Class A macroinvertebrate community.

As outlined above, the water quality surveys performed by

S.D. Warren in the Eel Weir bypassed reach document compliance with Maine's DO standards. Because S.D. Warren does not propose any changes to the existing seasonal minimum flow regime, we would anticipate little, if any, change in the reach's water quality. DO levels would remain within the acceptable range for supporting a coldwater fishery in the bypassed reach and in the lower Presumpscot River. In addition, S.D. Warren's proposed flow regime would continue to provide (a) continuity of flows, (b) mixing and aeration of river water, and (c) effectively protect the water quality in the bypassed reach.

As discussed further in section V.C.3., Fisheries and Aquatic Resources, the resource management goals for the Eel Weir bypassed reach include, among other things, managing the Eel Weir bypassed reach for brook trout and landlocked salmon to provide a quality, year-round recreational fishery for trout and salmon. DO levels (and water temperature) would be important to achieving this goal. The DO and macroinvertebrate data collected during the water quality surveys meet the Maine's Class A standards.

Interior and the MDIFW recommend a minimum flow of 200 cfs during the open water fishing season and a flow of 115 cfs during the winter months. The MDIFW also recommends that the flow in the summer be reduced to 100 cfs if coldwater refugia cannot be adequately protected. These flows are substantially higher than the existing, and applicant-proposed, minimum flows. Although the benefits have not been quantified, additional flow, above that proposed by S.D. Warren, would incrementally improve DO levels in the bypassed reach.

Water Quality in the Lake's Littoral Zone

Water quality in the littoral zone of Sebago Lake has the potential to be influenced by variable water levels, changes in the erosion rates, exposure of different shoreline materials, changes in the functioning of nearby septic fields, and changes in growth potential of algae and other aquatic vegetation.

S.D. Warren proposes to continue its sampling program of near-shore water quality. A number of stakeholders, such as Sebago Lake Coalition, Mr. Frechette, and Mr. Himmelman state that the current LLMP affects water quality and weed growth in the lake's littoral zone. Mr. Himmelman states that the lake level is too low and if higher water levels affect near shore septic systems, the septic systems should be upgraded.

Our Analysis

Water quality sampling programs, such as that summarized in the 2000 Sebago Lake Near-shore Water Quality report (Normandeau, 2001a), as well as earlier studies conducted in 1998 and 1999, attempted to determine the possible correlation between water levels and its effects on turbidity, specific conductance or total phosphorous. Table 19 shows data from water quality sampling conducted in June and July, 2000, when the water levels were at an approximate elevation of 266.0 feet, and in September when the water levels were lower, slightly above 264.0 feet.

Table 19. Near-shore water quality sampling comparison between high and low water levels in 2000. (Source: Normandeau, 2001a)

	High Water Level			Low Water Level		
Parameter	Mean	Standard Error	No. of Sites	Mean	Standard Error	No. of Sites
Turbidity (NTU)	0.19	0.02	48	0.15	0.03	47
Specific conductance (umhos)	43.77	0.35	48	43.83	0.44	46
Total phosphorus (ug/l)	4.65	0.49	48	3.89	0.31	48

These results show no correlation between water levels and turbidity, specific conductance, and total phosphorus. Results of the 1998/1999 study showed higher turbidity values during the higher lake level (summer 1999) sampling period than during the lower lake level (fall 1998) sampling period. However, this could be the result of: (1) variation in the wind speed, wind direction, rainfall and runoff; (2) higher algal concentrations in the summer period; and/or (3) higher recreational use in the summer, resulting in increased wave action.

Near-shore water quality samples were also collected from sites that were judged to have high, moderate and low erosion potentials (Normandeau, 2001a). Based on the data collected (table 20), no direct or expected correlation, such as higher turbidity at `high' erosion potential sites, was evident.

Table 20. Near-shore water quality sampling comparison between near-shore areas with different erosion potentials. (Source: Normandeau, 2001a)

	High			Moderate			Low		
Parameter	Mean	Standard Error	# of Sites	Mean	Standard Error	# of Sites	Mean	Standard Error	# of Sites
Turbidity (NTU)	0.14	0.03	12	0.2	0.03	32	0.16	0.02	52
Specific conductance (umhos)	42.75	0.22	12	44.71	0.77	31	43.49	0.16	51
Total phosphorus (ug/l)	3.22	0.47	12	4.09	0.34	32	4.62	0.49	52

Normandeau also conducted a study on the relationship between turbidity, specific conductance and total phosphorous, and the proximity to Sebago Lake tributaries. As shown in table 21, turbidity and total phosphorus averaged higher in sampling locations near tributaries, but specific conductance was only slightly higher near tributaries.

Table 21. Near-shore water quality sampling comparison between areas with differences in tributary proximity. (Source: Normandeau, 2001a)

	Tributary Present			Tributary Absent		
Parameter	Mean	Standard Error	No. of Sites	Mean	Standard Error	No. of Sites
Turbidity (NTU)	0.35	0.05	20	0.12	0.01	75
Specific conductance (umhos)	46.2	1.08	20	43.15	0.12	74
Total phosphorus (ug/l)	7.15	0.65	20	3.51	0.27	76

Sampling to determine possible influence of shoreline erosion potential and water level on chlorophyll a and species composition of the periphyton communities were also conducted (Normandeau, 2001a). However, Normandeau concludes that the differences in chlorophyll a and periphyton concentrations at different water levels were probably the result of seasonal variability of nutrients and solar radiation. We concur that these seasonal variations likely overpower any direct influence that water levels may have on chlorophyll a and periphyton.

Regarding potential effects on the growth of aquatic vegetation, parameters that may affect the extent of aquatic vegetation in Sebago Lake include substrate, water temperature, clarity, and nutrients. As previously noted, lake levels appear to have little effect on water clarity and nutrients, but there may be a minor effect on water temperature. During low lake levels, normal circulation into some of the bays and inlet areas might be restricted, which could cause a slight increase in the water temperature. Substrate is not expected to be affected significantly by lake levels, although there would be normal erosion and accretion in certain areas of the lake (see section V.C.1, Geology and Soils). As discussed in the section on wetlands (see section V.C.4, Terrestrial Resources), lake water levels have little effect on aquatic vegetation.

Depending on the subsurface characteristics, vertical and horizontal separation and other factors, the lake level of Sebago Lake has the potential to effect the functioning of septic systems surrounding Sebago Lake. Currently the Water District has a formal approval process, based on the Maine State Plumbing Code, for any installation or replacement of septic systems within 200 feet of the high water mark of Sebago Lake. The Water District's jurisdictional area extends upstream to include portions of some of the tributaries, such as the Crooked River to Route 302. In the immediate shoreline areas, the lake level typically controls the groundwater level. If higher water levels were to occur during the spring and early summer, it would negatively influence some septic systems that were constructed in highly sensitive areas. However, increases in the lake levels are not proposed for the spring period by any of the alternative lake level plans, and lower lake levels that would occur the remainder of the year would help alleviate any potential septic system problems that are directly related to lake levels.

CONCLUSIONS - Current information indicates that the water quality of Sebago Lake is excellent. Based on the results of recent water quality monitoring, we conclude that there may be a slight relationship between certain lake levels and minor changes in water quality (water temperature and turbidity) in the littoral zones. This relationship, however, is not fully documented and may more likely be the result of normal seasonal changes.

Effects of Alternative LLMPs on Water Quality

Various revisions to the LLMP have been proposed or recommended by the stakeholders, as described in section III.D (Proposed Action with Additional Environmental Measures). Some aspects of the revisions may affect near-shore water quality, and each of those aspects is discussed herein.

Our Analysis

Increase winter water levels

Maine's recommends a revision to maintain higher winter water levels, compared to the current LLMP. Water quality changes due to possible increases in water levels during the winter are unlikely. Sebago Lake is typically frozen over during most of January, February and March, and any water quality changes due to different elevations of the shoreline being exposed to ice breakup and ice dune formation are expected to be negligible. The only possible effect of higher winter water levels would be the possible risk of slightly higher beach and shoreline erosion rates, and a temporary increase in turbidity, during storm events immediately after ice-out. By the typical ice-out date (mid-April), however, the lake would have already reached higher springtime levels that may have little to do with the previous winter's levels (Marvinney, 2002).

Eliminate the springtime target range above full pond

All parties appear to agree that beach and shoreline erosion potential is highest when the lake level is at, or above, the spillway crest elevation. Therefore, limiting the full pond target range to no higher than the spillway crest elevation would reduce the potential of shoreline and beach erosion and limit the possible short-term increase in near-shore turbidity associated with these erosion events. Limiting the full pond target level to the spillway crest elevation would also help alleviate the potential effect to near-shore septic systems, which may be adversely affected during high lake levels.

In its July 15, 2004, letter, S.D. Warren, assuming the Commission were to adopt the Maine's recommended May 1 target range, requests that a provision be included in any new license issued that would permit it to obtain a temporary variance from the downstream flow release requirement under circumstances such as flooding on the Presumpscot River downstream of the Eel Weir Project. We conclude that such an allowance, designed specifically to prevent or reduce flooding downstream, would be reasonable for any modified LLMP. Since this variance would only occur during high flow conditions, we expect there to be limited, if any, effect on water quality or water temperatures in the Presumpscot River.

Expand the summer/fall target range

S.D. Warren's proposed action includes the addition of a 3-inch tolerance range for the August 1 target level (265.17 feet), between 264.92 and 265.42 feet. This possible change would have a limited, if any, effect on the water quality of near-shore areas, since this tolerance range is within the variation recorded for August 1 since the implementation of the LLMP in 1997. In addition, since there has been no correlation observed between water levels and near-shore water quality, this small amount of variance would hardly be detectable.

Maine also recommends expansion of the summer/fall (August 1) target range by approximately 0.5 foot, based on their revised rule curve. This would result in water levels slightly higher than the range proposed by S.D. Warren, but S.D. Warren agrees with Maine's plan to maintain the somewhat higher summer lake level. This 6-inch higher level would unlikely have any significant effect on water quality in near-shore areas. If anything, there could be some slight improvement in conditions, because shallow areas would be deeper and less likely to experience increased warming and large swings in dissolved oxygen levels, resulting from increased photosynthesis during the day and high respiration at night.

Maintain periodic low water levels in the fall

FOSL and Stephen Kasprzak recommend a deeper and more frequent fall drawdown (than the current or other proposed LLMPs), lasting up to two months, for enhancing sand accretion to the beaches. Maine recommends reducing the time period for the periodic, deep-water drawdown from 2 months to 1 month (December 1 to January 1). These recommendations are discussed in greater detail in section V.C.1 (Geology and Soils), but should not affect near-shore water quality. In addition, since the proposed drawdowns are in the late-fall/early-winter, when biological activities are reduced, the potential for any effects are also reduced. The only potential effect could be some increase in turbidity levels in localized areas, if areas of sediment not normally exposed to wave action and erosion are exposed to such forces.

The MDIFW recommends a 5 to 8-foot drawdown in late-November or into mid-winter, as a measure to reduce the spawning success of lake trout. This proposal should have little effect on water quality. The MDIFW's recommendation would be similar to the other recommended late-fall deep drawdowns, with some potential for increased sedimentation due to wave action on newly exposed areas. Additional discussion of the effects of such a drawdown on fishery resources are included in section V.C.3, Fisheries and Aquatic Resources.

Interior proposal

Interior recommends that the lake not be fluctuated more than 2 feet (to 264.65 feet) from April 1 to December 15, and not more than 3 feet (to 263.65 feet) from December 16 through March 31. This recommendation would result in somewhat higher lake levels during the fall, compared to the existing LLMP and Maine's revised plan, which allow the lake to be drawn down to below 264.65 feet in late-summer and fall. This recommendation would also result in higher water levels during the winter months, compared to the existing LLMP and Maine's plan. Higher summer-time lake levels could result in minor water quality improvements, as noted above, but higher winter levels could increase the potential for shoreline erosion, if winter storms were to occur during periods when the lake is not frozen over. If higher erosion rates did occur, that could result in higher turbidity levels in localized areas, but overall lake water quality should not be affected.

CONCLUSIONS - Because lake levels and near-shore water quality have not been shown to be correlated, other resource considerations associated with recreation, beach erosion, and fisheries should probably determine which alternative LLMP should be adopted. None of the alternative LLMPs has an advantage, when considering only near-shore water quality. Septic system functioning, the one near-shore water quality issue that may be affected by higher lake levels at or above the spillway crest elevation, would essentially be the same among most of the alternatives, which call for spring target levels at or slightly below the spillway crest elevation.

c. Cumulative Effects:

Sebago Lake controls about 70 percent of the flow in the Presumpscot River. Thus, any changes to the LLMP and the requisite flow releases to maintain lake levels have the potential to affect water quality in the lower Presumpscot River. The majority of the LLMP alternatives analyzed in this EA would not result in changes to the flow release schedule. However, Maine's recommended LLMP plan could potentially lead to a reduction in flow to the lower river, if the lake level is below its target level. This situation, if it occurs during the low-flow summer months could, when coupled with the slack water areas downstream, lead to an increase in water temperature and detrimentally affect DO levels through the lower Presumpscot River.

S.D. Warren's Gambo and Dundee Projects are required to release reaeration flows to improve DO levels in the river as part of their respective water quality certifications. These flows represent 37 and 18 percent of the flow available for generation at the projects, respectively. If the minimum flow under the LLMP were reduced to 250 cfs, as recommended by Maine, S.D. Warren would likely lose generation due to the reduction at all its stations with the reduced flows. In addition, S.D. Warren may need to increase the reareation flows (with a commensurate loss of generation) to compensate for the reduced minimum flow.

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We would expect incremental improvements to water quality in the Eel Weir bypassed reach with higher minimum flows, when compared with the existing flow release schedule. This could have the affect of improving DO levels and lowering water temperature throughout the lower Presumpscot River, particularly in the river directly downstream from the project.

d. Unavoidable Adverse Effects:

Sebago Lake and the operation of the Eel Weir Project provide some level of flood control and protection to communities situated along the lower Presumpscot River. Regardless of any changes made to the current LLMP, flooding downriver is likely to continue to occur on some level and at some frequency. We would expect the same level of flood control benefits under the proposed action as currently occurs. Revisions to the LLMP that increase storage volume in Sebago Lake, during critical times of the year, would enhance the project's flood control capabilities. Likewise, higher lake levels result in less storage and reduced flood control capabilities.

3. Fisheries and Aquatic Resources

a. Affected Environment:

Sebago Lake

The project reservoir, Sebago Lake, is the second largest lake in Maine, with an area of 28,771 acres (45 mi2), and a shoreline of about 105 miles. Sebago Lake is a natural lake that was raised by the construction of the project dam on the lake outlet in the 1800's. The lake has an average depth of 101 feet and a maximum depth of 316 feet. About half of the shoreline has been developed for seasonal and year-round homes, marinas, and other recreational facilities, with the remaining shoreline mostly forested. The water quality of the lake is considered good to excellent, and is classified as an oligotrophic lake. Major tributaries to the lake include the Crooked River, Northwest River, and Jordan River, although at least 15 tributaries are considered "significant." The Crooked River is the largest tributary and has the highest inflow to the lake.

Sebago Lake supports a nationally recognized fishery for landlocked Atlantic salmon and lake trout. The MDIFW's management objectives are to maintain and improve the salmon fishery (increase the catch rate and average size), while also maintaining a self-sustaining lake trout fishery. Landlocked salmon are native to the lake, while lake trout were first introduced in 1972. Lake trout, however, are now self-sustaining and have not been stocked since 1982.

Since the early 1990's the salmon fishery has been in decline, with catch rates, average length, weight, and condition factor all decreasing. The MDIFW believes that this may be the result of the increasing lake trout population, which is competing with the salmon for the major forage species for both salmonids, the rainbow smelt, which has also shown a decline in recent years. The MDIFW has recently liberalized fishing regulations for lake trout, in an attempt to increase the catch rate for lake trout. Anglers are now allowed to keep 6 lake trout per day during the open-water season, with a minimum length of 14 inches, although only one fish over 23 inches may be kept. Ice-fishing regulations also now allow for up to 5 lines per angler, to increase lake trout harvest (Boland et al., 2003). Recent angling statistics indicate that the lake trout catch now is more than double the catch of salmon in some years (MDIFW, 2002a). The MDIFW has also decreased the number of salmon that it stocks annually in the lake, to reduce the feeding pressure on the remaining smelt population. In 2003, only 1,000 salmon were stocked in the lake, compared to 8,000 that were stocked in 1993 (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003).

A recent report by the MDIFW (Boland et al., 2003) indicates that there has been a slow improvement in the condition of salmon in Sebago Lake, based on the capture of spawning adult salmon in the Jordan River fish collection facility in fall 2003. The fall 2003 catch was 152 adult salmon, about 30 percent larger than in 2002. The length, weight, and condition factor were higher than in 2002 and 2001, although still significantly lower than the optimal growth rates seen in 1988. Boland et al. (2003), however, noted that production of wild salmon in tributaries to the lake remains low, based on the index of young-of- the-year (YOY) and parr at three index sites. The authors speculate that the reasons for the continued low production may be a combination of several years of drought and the presence of several beaver dams on some of the tributaries, which prevent full utilization of the tributary habitat. More recent information from the MDIFW indicates that salmon growth has continued to improve, although spawning of wild salmon remains low. Lake trout recruitment has also declined, but growth is good (information provided by Francis Brautigam, Fishery Biologist, MDIFW, at the section 10(j) meeting, Augusta, Maine, September 22, 2005).

Sebago Lake also supports an excellent warmwater fishery for smallmouth and largemouth bass, and fisheries for other coldwater, coolwater, and warmwater species. Based on unpublished data from fishing tournaments, good size quality bass are common in the lake. Other game species present include brook trout, burbot, lake whitefish, chain pickerel, white perch, yellow perch, black crappie, redbreast sunfish, pumpkinseed, and brown bullhead. Non-game species include rainbow smelt, white sucker, longnose sucker, fallfish, creek chub, common shiner, blacknose dace, golden shiner, three-spined stickleback, nine-spined stickleback, banded killifish, and slimy sculpin. The catadromous American eel is also common in the lake. In all, a total of 28 species has been reported from Sebago Lake.

Eel Weir Bypassed Reach

The Eel weir bypassed reach is a 6,700-foot-long reach of the Presumpscot River that is bypassed by the 4,820-foot-long power canal, which supplies water to the project powerhouse. The upper end of the bypassed reach begins at the project dam, and ends at the head of the impoundment for the North Gorham Hydroelectric Project (see figure A-2 in Appendix A). Based on MDIFW and S.D. Warren surveys, about half of the reach (3,000 feet) is riffle/run habitat with a substrate of gravel, cobble, and boulders. The remainder of the reach is pool or "deadwater" habitat with a substrate of sand and silt. There are several spring seeps along the reach that provide coldwater inflow important for trout refugia during the summer months. As described in section III.C (Proposed Action), S.D. Warren provides continuous minimum flows to the bypassed reach.

The bypassed reach supports an important fishery for brook trout, landlocked salmon, and brown trout, although the primary management objective of the MDIFW is to provide a high-quality brook trout fishery, maintained by stocking. The MDIFW indicates that the bypassed reach is a highly popular fishery and one of the most heavily fished stream reaches in southern Maine (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003). Regulations allow the harvest of one brook trout daily, and require the release (alive) of all landlocked salmon. The bypassed reach is open to fly fishing only, year-round. Angler usage was reported to be 2,811 angler days in 1993 and 6,826 angler days in 1995, with catch rates ranging from 1.17 to 1.36 legal trout per trip, and 0.08 to 0.27 salmon per trip. Anglers occasionally catch smallmouth bass and other species, but the primary focus of anglers fishing the reach is for trout and salmon.

Lower Presumpscot River

The Presumpscot River is about 25 miles long, extending from the outlet of Sebago Lake to Casco Bay. With an average gradient of more than 10 feet per mile, seven dams are located on the river, with an eighth dam, Smelt Hill, removed in fall 2002. The North Gorham Project is located immediately downstream of Eel Weir, and the Eel Weir powerhouse discharges directly into the North Gorham reservoir. Downstream of North Gorham are five hydroelectric projects owned by S.D. Warren (Dundee, Gambo, Little Falls, Mallison Falls, and Saccarappa, all recently relicensed in October 2003), and one non-hydro dam (Cumberland Mills dam), used by S.D. Warren to supply process water for its Westbrook paper mill.

With the removal of Smelt Hill dam (RM 3), the Cumberland Mills dam is now the lowermost dam on the Presumpscot River (about RM 10). Because of the several dams, the aquatic habitat of the Presumpscot River upstream of Cumberland Mills can be generally characterized as a series of relatively shallow run-of-river impoundments separated by short riverine reaches, including bypassed reaches immediately below all of the dams. The river downstream of Cumberland Mills dam is now free-flowing, with a range of habitat from riffles/runs/rapids to slow-moving pools.

The fish community of the Presumpscot River can be characterized as primarily a warmwater/coolwater assemblage, with some stocking of coldwater species (trout) by the MDIFW. Based on sampling in the reservoirs, tailwaters, and bypassed reaches of the applicant's five lower-river hydroelectric projects, smallmouth bass is the most common game species in the lower river, with smaller numbers of brook and brown trout, pumpkinseed, yellow perch, and bullhead collected.

Anadromous species such as American shad and river herring (alewife and blueback herring) also occur in the lower river downstream of Cumberland Mills dam. Based on fish lift counts (1994 to 1996) at the former Smelt Hill dam, the river herring run numbers in the thousands of fish, while only small numbers of shad (dozens of fish) have been documented. Highland Lake, the outlet of which enters the river downstream of Cumberland Mills dam, is believed to be the primary spawning area for alewife in the lower river (FERC, 2002). Sea-run Atlantic salmon do not currently occur in the Presumpscot River, although historical accounts indicate that sea-run salmon occurred in the river prior to the construction of dams, and entered the tributaries to Sebago Lake for spawning.

The catadromous American eel was commonly collected throughout the lower Presumpscot River during recent fisheries surveys (FERC, 2002). The total number of eel collected during sampling ranged from 13 in the Dundee impoundment to 60 in the Saccarappa impoundment. Catch per unit effort (CPUE) during boat electrofishing ranged from 42.7 fish/hour in the Mallison Falls impoundment to 5.5 fish/hour in the Dundee impoundment. American eel typically constituted a substantial portion of the overall catch, ranging from 5 percent at Dundee to nearly 35 percent at Mallison Falls. In addition to the lower Presumpscot River, American eels are known to occur in Sebago Lake (S.D. Warren, 2002a).

Fisheries Management Goals for the Presumpscot River

The state and federal agencies do not have a finalized fishery management plan for the Presumpscot River, but in December 2001, the MDMR, MDIFW, and Maine Atlantic Salmon Commission (MASC) issued a "Draft Fishery Management Plan for the Presumpscot River Drainage" (Wippelhauser et al., 2001). The objective of the plan was "...to guide future decisions on fisheries management in the Presumpscot River...," with the goals reflecting "...a balance between the disparate missions of the three agencies." Although two of the Maine agencies (MDIFW and MASC) have some concerns about potential management conflicts, the three agencies support the plan, with the understanding that any future management conflicts would be mutually resolved, with regular meetings among the agencies.

The management goals for the Presumpscot River and connected water bodies, as outlined in the plan, include:

* provide migratory routes, spawning, and rearing habitat for restoration of anadromous species including alewife, blueback herring, American shad, striped bass, and Atlantic salmon, and possibly Atlantic sturgeon, rainbow smelt, sea-run brook trout, sea-run brown trout, and tomcod;
* provide migratory routes and habitat suitable for the catadromous American eel;
* sustain the production of existing riverine species and targeted anadromous and catadromous species, consistent with habitat capabilities;
* manage the fisheries in accordance with interstate fishery management plans (e.g., Atlantic States Marine Fisheries Commission's [ASMFC] Interstate Fisheries Management Plan for American Eel);
* promote the existing and potential commercial and sport fisheries for both diadromous and resident species;

In Sebago Lake, this includes providing a quality recreational fishery for an indigenous population of landlocked salmon and an introduced population of lake trout, and a quality warmwater fishery consisting mainly of smallmouth and largemouth bass.

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* continue to intensively manage the Eel Weir bypassed reach for brook trout and landlocked salmon (to provide a quality, year-round, high-use recreational fishery for trout and salmon), and establish a recreational fishery for stocked trout in the mainstem of the lower Presumpscot River; and
* manage specific tributaries for the production of wild brook trout.

The overall management goals are designed for two phases. Phase I would restore anadromous fishes up to the base of Gambo dam, and Phase II would restore anadromous fishes up to the base of Eel Weir dam. Phase II, however, would not proceed until the three fisheries agencies have evaluated the results of Phase I, and agree to continue with Phase II. The Presumpscot River is also divided into eight reaches (with Sebago Lake being the ninth reach), with specific management measures tailored to each reach.

The primary measures proposed to accomplish the plan's objectives include:

* removal of the Smelt Hill dam (it was removed in October 2002);
* immediate installation/implementation of upstream and downstream eel passage facilities at the dams on the river;

American eel would be managed in accordance with ASMFC's Interstate Fisheries Management Plan for American Eel, including implementing all regulations, assessment and reporting requirements found in ASMFC's management plan.

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* construction of fish passage facilities for anadromous species in a phased approach, consistent with Interior's Final Fishway Prescription (for the relicensing of S.D. Warren's five lower river projects);
* establish suitable year-round minimum flows below specific dams, including in the Eel Weir bypassed reach downstream from the Eel Weir dam;
* stocking of hatchery trout in specific reaches of the mainstem river (including continued stocking of the Eel Weir bypassed reach), and in specific tributaries;
* maintenance/enhancement of MDIFW access for stocking, and adequate public access for fishing;
* promulgation of appropriate supporting regulations;
* habitat mapping and population monitoring studies, as required, and as funding allows; and
* implement measures to restore the rainbow smelt population in Sebago Lake.

The December 2001 plan also includes order of magnitude estimates for the anadromous fish production potential, for existing habitat in the Presumpscot River Basin that would be made available to these species if the plan were fully implemented. The total potential run sizes given in the plan are as follows: (1) 73,900 American shad; (2) 450,200 blueback herring; (3) 147,700 alewife; and (4) 386 Atlantic salmon.

Reach 8, which includes the Eel Weir bypassed reach, could support an estimated annual production of 2,178 Atlantic salmon smolts and 53 adult salmon.

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The plan further states that American shad and blueback herring would be restored up to the base of North Gorham dam, alewife up to the base of Cumberland dam, and Atlantic salmon up to the base of Eel Weir dam.

Although the plan appears to focus more on the restoration of anadromous species, resident species management is a component of the plan. This is directed primarily at providing fisheries for stocked and native trout in the basin (such as in the Eel Weir bypassed reach), although the plan states that angling for other resident warmwater and coolwater species should be promoted. The plan, however, provides few specifics on stocking levels for trout, or other measures for enhancement of the resident fishery.

The American eel is a species of considerable interest to state and federal agencies because of the commercial importance of the species, and its apparent decline in recent years.

On July 6, 2005, the USFWS issued a finding in the Federal Register concluding that listing of the American eel may be warranted under the Endangered Species Act and initiated a 1-year status review (70 Fed. Reg. 38849-61). Depending on the outcome of the status review and any future listing, current efforts to manage the population of American eel, described herein, may change.

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A multi-state/federal effort is currently underway to protect and restore the species to its former range and abundance (MDIFW and MDMR, 1996; ASMFC, 2000). As previously described, the American eel is distributed throughout the Presumpscot River drainage. The species provides for a commercial fishery in the lower portion of the river. State and regional management plans call for maintaining or enhancing eel abundance in the Presumpscot and other rivers through the protection or restoration of habitat and improved passage at all barriers.

The ASMFC published the Interstate Fishery Management Plan for American Eel in April 2000, and cited Maine as the leading state in modernizing its elver/eel fishery regulations. The goals of the plan are to "protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic states and jurisdictions and contribute to the viability of the American eel spawning population; and provide for sustainable commercial, subsistence, and recreational fisheries by preventing overharvest of any eel life stage." The primary objectives of the plan are:

* improve knowledge of eel utilization at all life stages through mandatory reporting of harvest and effort by commercial fishers and dealers, and enhanced recreational fisheries monitoring;
* increase understanding of factors affecting eel population dynamics and life history through increased research and monitoring;
* protect and enhance American eel abundance in all watersheds where eel now occur;
* where practical, restore American eel to those waters where they had historical abundance but may now be absent, by providing access to inland waters for glass eel, elvers, and yellow eel and adequate escapement to the ocean for pre-spawning adult eel; and
* investigate the abundance of eel at the various life stages necessary to provide adequate forage for natural predators and support ecosystem health and food chain structure.

The MDIFW and the MDMR prepared an American eel species management plan in November 1996 (MDIFW and MDMR, 1996). This state plan is a working document that describes what is known about the species, its current status, and goals and objectives for long-term management. The goals of this plan are to: (1) maintain and enhance the abundance of American eels in inland and coastal waters of Maine, and to contribute to the viability of the American eel spawning population; and (2) provide for sustainable recreational and commercial fisheries for American eels. The plan lists five objectives:

* maintain, or enhance, American eel abundance in all watersheds where eels now occur;
* restore American eels to all waters where they had historical presence, but may now be absent;
* provide a sustainable harvest of glass eels and elvers, resident yellow eels, and migrating silver eels;
* provide adequate upstream passage and escapement to inland waters for elvers and eels, and adequate downstream passage and escapement to the ocean for pre-spawning adult eels; and
* maintain or enhance inland and coastal water quality in order to maintain the health of Maine's eel population, and maintain the health of all consumers of eels.

Threatened or Endangered Species

No federally listed endangered or threatened fish species were encountered during the relicensing studies for the Eel Weir Project or during the studies for the relicensing of the five lower river projects, and none are believed to occur in Sebago Lake or the Presumpscot River. The federally listed endangered sea-run Atlantic salmon and the shortnose sturgeon occur in other rivers in Maine, but none have been documented in the Presumpscot River.

The Atlantic salmon has been listed as endangered in eight rivers in Maine that are considered to have remnant wild populations; the Presumpscot is not one of those rivers. Adult Atlantic salmon have occasionally been reported in the lower Presumpscot River, but may be strays from other rivers (the nearby Saco River has an active salmon restoration program using stocking of hatchery smolt).

[40]

b. Environmental Effects:

Effects of current, proposed and recommended LLMPs on lake fish populations

S.D. Warren proposes a minor change to the current LLMP, a 3-inch tolerance range around the August 1 target elevation for Sebago Lake. None of the commenting entities made specific recommendations for changes in the LLMP related to the lake fishery. The MDIFW, however, states that winter drawdowns have adversely affected warmwater fish populations, and lower lake levels in the spring have impeded smelt access into spawning tributaries. The MDIFW recommends that a study be conducted on the warmwater fishery in Sebago Lake, and that mitigation be considered for any effects of lake level management on warmwater species and on smelt spawning.

Other commenting entities made recommendations regarding changes to the LLMP for other reasons (beach erosion, recreational boating, etc.), and most of these recommendations involve minor changes to the LLMP, and are summarized in section III.D, Proposed Action with Additional Environmental Measures. Such recommendations were made by FOSL, Charles M. Frechette, Stephen P. Kasprzak, and the Sebago Lake Coalition.

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In addition, Maine recommends certain changes to the current LLMP to accommodate the various competing uses of Sebago Lake. This plan is also summarized in section III.D. According to Maine, its plan would:

* increase winter water levels to improve the likelihood that the lake will achieve the May 1 full pond target level;
* eliminate the target range above full pond to reduce damage to beaches and shoreline;
* expand the target range to allow higher water levels from July to November;
  * maintain the current periodic low water level in the fall (with a few adjustments) to promote accretion of sand to beaches; and
  * reduce summer minimum flows from the lake outlet to better maintain lake levels without threatening downstream water quality attainment.

Maine states that its recommended revisions to the current LLMP should improve S.D. Warren's ability to meet the target levels established in the plan. Maine recommends that the proposed plan be adopted as the preferred alternative for the future management of Sebago Lake.

Several letters of comment were filed in response to Maine's revised plan, including letters from S.D. Warren, FOSL, Stephen Kasprzak, and numerous private citizens. Nearly all the letters, except from one private citizen, oppose at least some parts of Maine's plan, with the primary concern being the potential for increasing beach and shoreline erosion. S.D. Warren's comments include recommendations to modify the existing LLMP, with changes not previously proposed. None of the comments specifically address the lake fishery, although FOSL states that Maine failed to consider the effects of the recommended plan on fish and wildlife resources in the lake.

Our Analysis

The MDIFW did not provide specific data that show decreases in the warmwater fish populations in Sebago Lake, but note that catches in ongoing lake surveys have been lower in recent years. There is also no information in the license application to verify the MDIFW's statements regarding decreases in the warmwater fish populations. In response to agency recommendations during the pre-application period, S.D. Warren conducted a lake level study that examined littoral zone habitat and the potential effects of lake level management on that habitat (Duke, 2002). The applicant also funded two studies that assessed the potential effects of lake level drawdowns on smelt access to spawning tributaries (IA, 2002a; 2002b).

Effects on lake-dwelling species

For lake-dwelling species, lake drawdowns or lake-level fluctuations are primary factors that may adversely affect these species. Slow lake drawdowns over several months (as occurs in Sebago Lake and in many natural lakes) may affect fish species by reducing or eliminating certain types of habitat or habitat area during the period of lowest drawdown. If that drawdown occurs during an important life history stage for a particular species, that species may be adversely affected (e.g., reduced spawning success, reduced survival of juveniles, slower growth, etc.).

More rapid lake-level fluctuations typically have more immediate effects, related primarily to drawdowns. Rapid drawdowns may result in stranding and mortality of non-motile life stages such as eggs, larvae, or even juveniles of shoreline-dwelling or spawning species. Rapid drawdowns, however, do not occur on Sebago Lake. According to Duke (2002), the average water level change during the summer months (when the lake level is typically dropping) is only 0.25 inch per day. Thus, for Sebago Lake, our analysis focuses on the effects of the seasonal drawdown and refill of the lake.

The seasonal pattern for Sebago Lake has been that of highest levels occurring during the spring months (May to early-June), steadily decreasing levels during the summer and fall months, reaching the lowest levels during the November through February period, and increasing levels from March to May. Median levels since 1910 have ranged between a high of 266.65 feet to a low of about 262.0 feet, a range of about 4.5 feet. Higher and lower elevations have been recorded, but the median levels reflect the overall seasonal pattern changes. The current LLMP and all the proposed alternatives would follow the overall seasonal pattern, with some variances from this pattern.

Duke (2002) estimated the area of wetlands and aquatic habitat that would be dewatered by a lake drawdown to 261.0 feet (from 266.65 feet). This drawdown is slightly deeper than the long-term median drawdown (262.0 feet), but is equal to the maximum winter drawdown called for by both the current LLMP and Maine's recommended plan. Duke (2002) estimated that about 227 acres of aquatic beds and 2,480 acres of unvegetated habitat (total of 2,707 acres) would be dewatered at a drawdown to 261.0 feet. Since Sebago Lake has a total area of 28,771 acres, this would represent about 9.4 percent of the area of the lake. This would represent the maximum effect of drawdowns associated with the existing LLMP and that recommended by Maine. The area that would be dewatered at smaller drawdowns would be less, but was not estimated.

Duke (2002) selected five lake-dwelling species to assess the effects of seasonal drawdowns, including chain pickerel, golden shiner, smallmouth bass, white perch, and lake trout. Four of these are warmwater/coolwater species and one (lake trout) is a coldwater species. Duke (2002) concluded that any effects of lake drawdowns would be limited to primarily those species that use shallow, vegetated, littoral zone habitat, particularly during the reproductive life stages (spawning, eggs, and early fry), which have limited ability to move with receding water levels. For four of the species evaluated (other than lake trout), spawning occurs in the spring during the period of rising or maximum water levels, so it is unlikely that reproduction would be affected for these species. For lake trout, which spawn in the fall (October) during a period of receding water levels, spawning could be affected. However, the MDIFW is recommending control of lake trout spawning, to reduce the numbers of lake trout in Sebago Lake, so any effects to control lake trout spawning would be beneficial. Other more mobile life stages of these species, which may also use a wider range of habitat, including deepwater habitat, are not likely to be affected by seasonal lake drawdowns.

We generally agree with the assessment of the effects of seasonal drawdowns, as presented in Duke (2002). Since many entities recommended changes to the existing LLMP, we assess any additional effects associated with those lake level alternatives.

State of Maine

Maine's recommended changes to the LLMP are not significantly different from the existing LLMP, but would have some benefits to fishery resources. The current spring maximum lake level would be maintained, although it would be maintained from May 1 through the 3rd week in June, and would not be allowed to exceed the spillway crest elevation (266.65 feet), if at all possible. This would benefit spring-spawning species, particularly warmwater species that utilize the shoreline littoral zone, by maintaining maximum habitat area in the littoral zone for nearly two months. This would likely cover the spawning and egg incubation periods for game species such as smallmouth bass and other centrarchids, as well as many of the forage species (golden shiner and other minnows).

Through the summer, lake levels would be similar to the current LLMP, but slightly higher levels would be allowed, particularly for the August 1 target level, which could range up to about 0.5 foot higher.

This would also be in line with the S.D. Warren's proposal to have a tolerance range of +/- 3 inches around the August 1 target level.

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This could benefit warmwater species (both juveniles and adults) that use the littoral zone for summer rearing, if the lake is higher and more of the littoral zone is wetted.

During the fall months, water levels would be slightly lower than the current LLMP, allowing for a drawdown of about 4 feet by November 1. This would result in some reduction in the amount of littoral zone habitat in the late-fall, but warmwater fish usage of the littoral zone would also be decreasing in late-fall as lake water temperatures cool.

Maine's plan differs from the current LLMP, for the 2-in-9-year drawdown to 261.0 feet, in that Maine's plan would maintain that drawdown only for the month of December, while the current LLMP maintains the drawdown for November and December. This could alleviate some of the concerns of the MDIFW, who believe that recent winter drawdowns may have affected the warmwater fishery. Maine's plan would allow for water levels up to a foot higher in early-November, during years that the drawdown to elevation 261.0 feet occurs, which could benefit any fish that may still be using the littoral zone during the late-fall.

During the winter to spring lake refill period, Maine recommends that the minimum elevation be equal to or greater than the 1910-1986 median levels from January 1 to March 1, with normal refilling from March 1 to May 1. The existing LLMP does not specify a minimum lake level during the January to March period, so Maine's plan does offer some additional protection of littoral zone habitat during the winter months, compared to the existing LLMP.

Maine's recommended plan also includes "operating parameters" for governing flow releases from the lake, which it claims would maintain downstream water quality but also allow maintenance of the lake levels within the target range. We further discuss these operating parameters below.

S.D. Warren's July 15 Comments on Maine's Recommended LLMP

In response to Maine's recommended changes to the LLMP, S.D. Warren describes additional changes to the LLMP that may be warranted, which it had not previously recommended.

It is not clear whether S.D. Warren has formally changed its proposed action, so as we noted in Section III.D for other stakeholders' proposals, we assume that S.D. Warren's original proposal remains the proposed action.

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These include:

* If the Commission were to adopt Maine's plan, the minimum lake level for the January 1 to May 1 period should be set at 262.0 feet, with provisions to go below that level if it appears that spring runoff will be high.

S.D. Warren would seek concurrence from MDEP to provide flood storage for the runoff.

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* For the May 1 to late-June period, S.D. Warren prefers the language of the existing LLMP, for meeting the May 1 full lake level, and recommends that it be able to apply for a variance from the requirement to release more than 1,667 cfs from the lake if it would result in flooding conditions downstream.
* The target for November 1 should be 262.0 feet, instead of 262.5 +/- 0.5 feet.

* S.D. Warren recommends that the 2-in-9-year requirement to lower the lake to 261.0 feet in the late-fall be eliminated from the LLMP. If, however, the Commission retains that provision, the applicant proposes that it be relieved of the refill requirement the following spring after a drawdown to 261.0 feet. S.D. Warren objects to Maine's plan to maintain the deep drawdown for a one-month period (December), because it would require the release of large volumes of water from the lake in late-November, and would require S.D. Warren to hold the lake at the same level for 31 days, which would be difficult to do because they have no control over the larger Sebago Lake watershed.

The effects associated with the changes outlined by S.D. Warren in response to Maine's recommended plan on the lake fishery would be minor. Setting a minimum lake level at 262.0 feet during the winter months could result in slightly higher lake levels during the winter, but because this is the period of minimal biological activity, little in the way of environmental effects are likely, other than some additional protection of littoral zone habitat from freezing.

For the May 1 to late-June period, S.D. Warren proposes to maintain the current wording of the LLMP, which allows a range of +/- 0.5 foot around the spillway crest elevation, compared to Maine's plan that eliminates the 0.5-foot range above the spillway crest elevation. The lake could be slightly higher under S.D. Warren's plan, potentially wetting somewhat more littoral zone habitat. The overall effect on shoreline habitat, however, should not be substantially different than Maine's plan, which could still result in some exceedances of the spillway crest elevation, despite the best efforts of S.D. Warren to maintain the lower lake level.

Maintaining slightly higher lake levels during the June to November period, as recommended by Maine, would act to wet more littoral zone habitat, compared to the existing LLMP, potentially benefiting shoreline-dwelling species. Lowering the November 1 target level by 0.5 foot, as S.D. Warren proposes and Maine recommends, would result in the exposure of some additional shoreline habitat, but by November many of the shoreline-dwelling species would have vacated shallower habitat.

S.D. Warren's suggestion to eliminate the 2-in-9-year late-fall drawdown would result in less exposure of shoreline habitat, which could benefit some species. We do not expect any such benefits to be significant, since the deeper drawdown would occur during the late-fall period of reduced biological activity, and only twice in every 9 years. If the deeper drawdowns were to continue and in turn result in failure to refill the lake by May 1, as stated by S.D. Warren, more serious effects could occur, if springtime shoreline spawners were unable to fully utilize the shoreline habitat.

MDIFW

The MDIFW, aside from the recommended changes filed by Maine, recommends that a 5 to 8-foot drawdown be considered for late-November, as a measure to reduce the spawning success of lake trout.

During the September 22, 2005, section 10(j) meeting in Augusta, Maine, the MDIFW modified its recommendation, suggesting that the full drawdown could be delayed until later into the winter period (January/February), and that the lake should be drawn down 6 to 8 feet from the lake level that occurs in early-November, just after completion of lake trout spawning. The MDIFW is not concerned about the effects of a deep lake drawdown on the winter ice fishery, because that fishery is limited, generally only lasting for about 6 weeks.

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The MDIFW contends that lake trout are adversely affecting the native landlocked salmon population. We discuss MDIFW's recommended measure more fully below, and conclude that such a deep drawdown (to 257.0 feet or below) could kill lake trout eggs, but there could be other adverse effects related to exposing more littoral zone habitat to freezing conditions. Such a deep winter drawdown would also appear contrary to the MDIFW's concern about the effects of deep winter drawdowns on warmwater species (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003).

Interior

Interior does not comment specifically on the LLMP but recommends that an operational band be established so that the lake is not drawn down more than 2 feet (to 264.65 feet) from April 1 to December 15, and not more than 3 feet (to 263.65 feet) from December 16 through March 31. Interior's recommendation would not conflict with the existing LLMP during much of the open-water season, although lake levels would typically fall below 264.65 feet during the month of September, and into October, November, and December. Interior's recommended minimum level for December through March (263.65 feet) would be about the same as the minimum target level called for in the existing LLMP for this period.

There would be some minor fisheries benefits associated with Interior's plan during the fall months, as lake levels would be higher than under the current LLMP, potentially allowing fish to use the littoral zone habitat longer into the fall. There could, however, also be adverse effects on the lower Presumpscot River, if flow releases from the lake are significantly reduced, to maintain the lake at a level not usually achieved during the fall. The same scenario could occur during the winter months, in that, although 263.65 feet is about the same as the LLMP target for these months, historical lake level data indicate that the lake is typically below that elevation from November through late-March/early-April. Maintaining a higher winter lake level, however, may offer some additional protection for littoral zone habitat.

FOSL

FOSL's recommendation is essentially the same as the existing LLMP, except that it calls for a spring peak lake level 1 foot lower, and expands the late-fall/early-winter (November/December) drawdown by requiring a drawdown to 261.0 feet every other year, a drawdown to 260.0 feet in 1 out of 4 years, and a drawdown to 259.0 feet in 1 out of 10 years.

The lower spring maximum water level would result in less littoral zone habitat being available for spring spawners, and could affect S.D. Warren's ability to maintain required water levels later in the summer and fall. The lake would have about 28,000 acre-feet less storage available at the start of the summer drawdown period, and lower summer water levels would expose more littoral zone habitat, making it unavailable for fish rearing. If flow releases from the lake are later reduced to maintain summer lake levels, this could adversely affect fisheries in the lower Presumpscot River.

The more frequent and deeper early-winter drawdowns could have some, although probably limited, benefit in reducing lake trout spawning success, by dewatering parts of the spawning shoals and killing any eggs in the dewatered areas. At the same time, these drawdowns would expose more of the littoral zone habitat that could be used by warmwater species, although since these drawdowns would occur in November/ December, warmwater fish usage of this habitat would be limited by then. The deeper drawdowns to 259.0 feet could also affect the ability of the lake to refill during the early spring, if lower than normal precipitation or runoff occurs during the refill period.

Charles Frechette

Mr. Frechette recommends that the maximum lake level be held at 266.0 feet from May 1 through July 7, and that the minimum lake level the remainder of the year be 263.5 feet. Maintaining the maximum spring lake level through July 7, compared to the second week in June for the existing LLMP, could have some fisheries benefits by maintaining a higher level of littoral zone habitat throughout the spawning, incubation, and early rearing period for spring spawners. This maximum level, however, would be 0.65 foot lower than the existing LLMP maximum spring level, so less habitat would initially be available.

As with FOSL's recommendation, lower spring levels could also affect the ability to maintain lake levels later in the summer and fall, in turn affecting fish usage of the littoral zone. At this maximum spring level, about 18,000 acre-feet less storage would be available in the lake. If flow releases from the lake are reduced to maintain summer lake levels, this could adversely affect downstream fisheries on the lower river.

As discussed for Interior's recommendation, limiting the drawdown to 263.5 feet the remainder of the year could have some fisheries benefits by maintaining littoral zone habitat, but it may be difficult to maintain this level from mid-September through mid-March, based on historical lake level data. If flow releases from the lake are reduced to maintain lake levels, this could adversely affect fisheries on the lower river. This period, however, would correspond with the period of the year that usage of the littoral zone by warmwater fishes would be less, so there would be limited direct fisheries benefit to maintaining higher lake levels during the winter period, though it would afford additional protection to littoral zone habitat.

Stephen Kasprzak

Mr. Kasprzak recommends a maximum spring lake level of 265.65 feet, with a range of +1 foot and -0.5 foot around the target. He also recommends the same deep drawdowns in November/December as FOSL. His proposal for the spring maximum level, which would allow a range from 265.15 to 266.65 feet, would not necessarily be much different from the existing LLMP, if the higher range of level is maintained. If, however, the lower range is maintained, water levels could be about 1.5 feet lower, and this would result in the lower availability of spawning and rearing habitat for spring-spawning species in the littoral zone. The deep November/December drawdowns would have the same effects as discussed for FOSL, with possibly some benefits in reducing lake trout spawning success, but at the same time dewatering more littoral zone habitat, albeit during a period of the year when fish usage of that habitat may be reduced.

Sebago Lake Coalition

The Sebago Lake Coalition recommends a lake level regime that would peak on June 1,

Staff supports a spring target elevation of 266.15 feet (* 0.5 foot), and date of May 15. The lower spring maximum water level would result in less littoral zone habitat being available spawning and rearing, and delaying full pool for two weeks could affect fish spawning by reducing the amount of habitat initially available in early May.

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and would be reduced about 0.5 foot per month from then until October 1, to maintain higher lake levels during the boating season. They do not recommend specific levels for the remainder of the year. This proposal would have a peak spring level slightly lower than the existing LLMP, but would maintain lake levels slightly higher than the existing LLMP during the summer months. This could have some benefit for fishes rearing in the littoral zone during the summer months, but as noted for some of the other proposals, if flow releases from the lake are reduced to maintain these higher lake levels, this could have adverse effects on the lower Presumpscot River fisheries.

CONCLUSIONS - The recommended changes to the existing LLMP made by Maine would protect and enhance the existing lake fishery, while also protecting the downstream fishery in the lower Presumpscot River, by establishing criteria for flow releases from the lake. Although many of the other alternatives also have the potential for providing some fisheries benefits during parts of the year, most also have the potential for producing some adverse effects on either the lake fishery or the downstream Presumpscot River fishery. S.D. Warren's suggested revisions to Maine's plan would have minimal effects on the lake fishery. We make our recommendation regarding the LLMP in section VII, Comprehensive Development and Recommended Alternative.

Smelt access into spawning tributaries

IA (2002a) investigated 15 major tributaries to Sebago Lake during October 2000, at a lower lake level (263.2 feet), to identify potential barriers to upstream smelt movement during the spawning season. Smelt spawn in the early spring, just after ice-out, but observing the tributaries during a low fall lake level allowed investigators to easily observe tributary channel characteristics and possible obstructions. Zone of passage criteria were determined from the literature and from consultations with other biologists familiar with smelt migrations. A barrier to migration was judged to exist if: (1) a vertical barrier was present that was greater than 3 to 4 inches high; (2) the depth was less than 0.1 foot; or (3) velocity exceeded 2 to 4 feet per second (fps).

Table 22 summarizes the results of the IA study and provides our assessment of whether the identified barriers may be passable at typical spring lake levels.

Table 22. Results of the survey of 15 potential smelt spawning tributaries to Sebago Lake. (Source: IA, 2002a)

Tributary name	Stream discharge (cfs)	Presence of migration barrier?	Location/description	Passable at typical spring lake levels?
Sticky River	0.24	No	--	--
Rich Mill Pond outlet	10.3	No	--	--
Long Beach tributary	0.12	Yes	Boulder field with narrow passages, elev. 263.2-265.8	Probably
Northwest River	8.9	No	--	--
Nason Brook	0.25	Yes (2)	- Downstream lip of concrete box culvert - 1 ft high barrier at elev. 264.9 - Sill of concrete weir - 0.7 ft high at elev. 267.5	- Probably - No
Bachelder Brook	0.68	No	--	--
River Rd. tributary	0.3	Yes (2)	- Snag/debris dam 1.5 ft high at elev.	- Probably

			264.4 - Log 0.7 ft high at elev. 264.6	- Probably
Leavitt Brook	0.29	Yes (2)	- Snag/debris dam 1.5 ft high at elev. 264.1 - Alluvial gravel/cobble fan, depth < 0.1 ft, at elev. 264.8	- Probably - Probably
Muddy River	3.34	No	--	--
Trickey Pond outlet	0.35	Yes	Shallow riffle depth < 0.2 ft and < 0.1 ft, at elev. 263.2-266.7	No, at same flow
Thompson Point tributary	0.1	Yes (2)	- Sand bar 2.3 ft high at elev. 263.2 - Riffles/sand bar with depth < 0.1 ft, at elev. 265.4	- Probably - No, at same flow
Crooked/Songo River	132.1	No	--	--
Kettle Cove tributary	0.43	Yes	Snag/debris dam 0.7 ft high, at elev. 264.7	Probably
Thomas Pond outlet	0.89	Yes	Culvert lip 0.75 ft high, at elev. 268.0	No
Jordan River	40.5	No	--	--

This survey indicated that the five larger tributaries to Sebago Lake (flows * 3 cfs) and two smaller tributaries did not have any barriers to smelt upstream movement. Four other tributaries that did have probable migration barriers at the time of the survey probably would be accessible at the lake levels typically achieved by mid to late April (266.0 feet). If, however, spring lake levels were lower, then some of those barriers would remain. Two tributaries that had probable barriers because of shallow depths probably would still be impassable in the spring, unless higher flows were present to increase water depth. Only two tributaries, Nason Brook and Thomas Pond outlet, had barriers (culverts) that would remain barriers to upstream movement, regardless of the lake level or instream flow. Both of these tributaries, however, were small, with flows less than 1 cfs at the time of the surveys. Nason Brook also reportedly is known to have a smelt run (IA, 2002b), but it is not known how far upstream the fish move. The identified impassable barrier is about 140 feet upstream of the mouth.

Other tributaries reported by IA (2002b) to have known smelt runs are: Bachelder Brook, Thompson Point tributary, Crooked/Songo River, and Jordan River. Only Thompson Point tributary had potential migration barriers identified from the fall 2000 survey, but these barriers were judged to be passable at either higher lake levels or higher stream flows. The Crooked/Songo River and Jordan River are the two largest tributaries to Sebago Lake, and both were judged to have no barriers to upstream smelt movement.

IA (2002b) investigated the 10 other tributaries to the lake in spring 2001, to determine whether or not smelt use the tributaries for spawning. IA observed these tributaries over three days; about 1 week after ice-out and after smelt began to move into the tributaries. Lake elevations during the survey ranged from 264.29 to 264.38 feet, about 2 feet lower than what typically occurs around May 1.

Of the 10 tributaries surveyed, two (River Road tributary and Thomas Pond outlet) were observed to have potential migration barriers. Only one smelt was observed in one of the tributaries, Trickey Pond outlet, during the survey, so the survey was unable to establish which tributaries may or may not have smelt spawning runs. Smelt were also observed in Bachelder Brook (not a surveyed tributary), indicating that smelt were moving into at least some of the lake's tributaries. IA (2002b), however, reported that MDIFW personnel indicated that very few smelt were observed in spawning streams in spring 2001, but were observed spawning along the lake shore. The MDIFW verified, during the September 22, 2005, section 10(j) meeting, that it believes that most smelt spawning now occurs along the lake shore, and that smelt numbers have increased 5-fold in the past 3 years. The MDIFW states that lake shore spawning results in higher survival than tributary spawning, and may be partly responsible for the higher numbers.

Our Analysis

The potential effects of the various LLMP alternatives on smelt access into the spawning tributaries was assessed by comparing the lake level elevations called for by each of the alternatives for the May 1 date, and comparing that to the elevations of the various barriers to migration observed during the IA surveys. Smelt spawning in Sebago Lake is typically within about a week of ice-out, in late-April to early May. Nearly all of the alternative LLMPs call for the lake to be at or near maximum elevation by May 1; although Interior does not specify a May 1 elevation, it recommends that any drawdown be less than 2 feet during the spring, summer, and fall. The existing LLMP and the alternatives recommended by Maine, the MDIFW, Mr. Frechette, and the Sebago Lake Coalition call for a May 1 elevation of 266.0 feet (or higher), while FOSL and Mr. Kasprzak recommend an elevation of 265.65 feet (although Mr. Kasprzak would allow a range of +1.0 to -0.5 foot around the target).

Table 23 shows the elevations of the various migration barriers reported by IA (2002a), compared to the May 1 target elevations called for by the alternative LLMPs. The judgment as to whether or not a barrier may be passable was simply based on elevation, such that if the barrier is submerged or mostly submerged by the lake level, it was judged to be passable. However, there may be other factors involved with each barrier, such as the streamflow in each tributary, or the nature of the barrier. Logs, debris, or sand bars may change position over time, depending on flow and other factors, so the hydraulics and passability of that barrier may also change. These site-specific hydraulic conditions, however, cannot be predicted with certainty, so we are using the more simplistic analysis based only on elevation.

Table 23. Comparison of elevations of potential blockages to smelt movement in Sebago Lake tributaries, compared to May 1 lake elevations recommended by alternative LLMPs. (Source: Staff, based on information in IA, 2002a)

Tributary name	Elevation of barrier (ft)	Passable at 266.65?	Passable at 266.0?	Passable at 265.65?
Long Beach tributary	- 263.2-265.8	- Yes	- Probably	- Maybe not
Nason Brook	- 264.9 - 267.5	- Yes - No	- Yes - No	- Yes - No
River Rd. tributary	- 264.4 - 264.6	- Yes - Yes	- Yes - Yes	- Yes - Yes
Leavitt Brook	- 264.1 - 264.8	- Yes - Yes	- Yes - Yes	- Yes - Yes
Trickey Pond outlet	- 263.2-266.7	- Probably	- Maybe not	- No
Thompson Point tributary	- 263.2 - 265.4	- Yes - Yes	- Yes - Yes	- Yes - Probably
Kettle Cove tributary	- 264.7	- Yes	- Yes	- Yes
Thomas Pond outlet	- 268.0	- No	- No	- No

Based on the analysis in table 23, it appears that most of the eight tributaries with identified potential barriers, would be passable with nearly all the alternative LLMPs, although there does appear to be some benefit to maintaining the lake at the highest level, to provide the best passage conditions for smelt. There are two tributaries with barriers above even the highest lake level (Nason Brook and Thomas Pond outlet), but for the remaining six tributaries, all should be passable at 266.65 feet, but one may not be at 266.0 feet (or 266.15 feet) and two may not be at 265.65 feet.

Our analysis indicates that the LLMPs with the highest spring target levels would be the preferred alternatives, from the standpoint of smelt tributary spawning. Another advantage of these two alternatives, over the alternatives outlined by FOSL and Mr. Kasprzak, which call for deeper and more frequent winter drawdowns, is that the lake would be more likely to refill to the May 1 target level, because it would not be drawn down to lower levels in the winter. Maine's plan would have a slight advantage over the existing LLMP in that Maine's revisions calls for maintaining the lake somewhat higher during the winter months (*1910-1986 median), which would help to ensure refilling of the lake during the spring, and attainment of the May 1 target level. S.D. Warren's July 15, 2004, response to Maine's plan also calls for a higher winter lake level of 262.0 feet, which would also help ensure that the lake refills.

Based on our assessment of the potential effects of the alternative LLMPs on both lake-dwelling species and on smelt spawning access to tributary streams in early spring, we conclude that Maine's revisions to the existing LLMP would provide some fisheries benefits over the existing plan, and would overall have a greater potential for protection and enhancement of fisheries resources than any of the alternative plans proposed by other stakeholders.

Potential use of the LLMP to control the lake trout population

As we described above, the current lake trout population in Sebago Lake is self-sustaining and appears to be adversely affecting the landlocked salmon population, which has been the mainstay of the Sebago Lake fishery. Sebago Lake and the Presumpscot River Basin was one of the four river basins in Maine that held native populations of landlocked salmon (Warner and Havey, 1985). Competition between salmon and lake trout is primarily the result of the use of the same forage species, the rainbow smelt, although lake trout may also be direct predators on young salmon (Warner and Havey, 1985).

The MDIFW states that the "...burgeoning, introduced population of lake trout," with its effect on smelt and the native salmon population, is a "...fishery crisis." The MDIFW indicates that the various control measures attempted, such as liberalizing the fishing regulations for lake trout, have not been successful. The MDIFW is considering whether a lake drawdown in late-November or early-December, to expose and kill lake trout eggs deposited during fall spawning, would be a feasible control measure. The MDIFW requests that the Commission assess the feasibility of such a measure for Sebago Lake. The MDIFW initially suggested that lake levels be maintained higher in the fall, to encourage lake trout spawning on shoals at as high an elevation as possible, to be followed by a drawdown of from 5 to 8 feet in late-November or early-December. As noted above, the MDIFW has since modified its recommendation, now stating that the lake should be drawn down 6 to 8 feet from the lake level that occurs in early-November, and that this drawdown could occur later into the winter (January/February).

Interior does not recommend such a drawdown to control lake trout spawning. Rather, Interior recommends that the Sebago Lake winter drawdown be no more than 3 feet, and that the open-water season drawdown be no more than 2 feet. However, the USFWS, during the September 22, 2005, section 10(j) meeting, stated that it was not opposed to a deeper drawdown to control lake trout spawning.

FOSL and Stephen Kasprzak do not recommend drawdowns for fisheries purposes. Both FOSL and Mr. Kasprzak, however, recommend that the lake be drawn down to 261.0 feet (by November 1) in 1 out of every 2 years, to 260.0 feet in 1 out of every 4 years, and to 259.0 feet in 1 out of every 10 years. This recommendation is for maintenance and enhancement of the natural beaches in the lake. Charles Frechette and other landowners around Sebago Lake recommend that the lake not be drawn down below 263.5 feet at any time during the year, to protect fish and wildlife resources, wetlands, and recreation.

S.D. Warren is opposed to a winter drawdown to assist in the control of the lake trout population, and is also opposed to the 2-in-9-year drawdown recommended by many stakeholders for accretion of beach sands (letter from Nancy J. Skancke, Counsel for S.D. Warren Company, to Magalie Salas, Secretary, FERC, July 15, 2004).

Our Analysis

Information provided by the MDIFW in this proceeding and from Boland et al. (2003), MDIFW (2002a), and Warner and Havey (1985) indicate that some control of the introduced lake trout population would be appropriate to protect the native landlocked salmon fishery. To assess whether a lake drawdown as proposed by the MDIFW would be feasible, we reviewed the spawning requirements for lake trout (particularly depth of spawning), estimated the drawdown depth that would be required to effectively kill lake trout eggs on the spawning shoals in Sebago Lake, and estimated the lake level manipulations that would be necessary (particularly flow releases) to meet the drawdown requirements.

Based on information in Scott and Crossman (1973) and MDIFW (2002b), lake trout spawn from mid-October to mid-November in Maine waters, with spawning occurring in October in northern Maine waters and as late as November in southern Maine waters. Spawning occurs over rocky/boulder shorelines and shoals at depths ranging from a few inches to over 30 feet. However, during the September 22, 2005, section 10(j) meeting, the MDIFW stated that most lake trout spawning in Maine lakes occurs at depths of 6 to 8 feet. Typically, the percent of fines increases with depth, and at depths greater than 8 feet, spawning substrate becomes less suitable. In Sebago Lake, limited post-spawning egg surveys along Frye Island found that lake trout eggs were deposited at depths of up to 16 feet, although the heaviest concentration of eggs was observed at a depth of 6 to 8 feet (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Magalie Salas, Secretary, FERC, July 28, 2003).

For our analysis, we assume that a 6-foot drawdown would be selected for lake trout "control" (deeper drawdowns might be more effective, but would be unpopular with many of the residents around Sebago Lake and other users of the lake), and this drawdown would be from the lake level occurring during the spawning period of mid-October to mid-November. According to the current LLMP, the maximum lake level on October 15 is 263.3 feet, and the target level for November 1 is 262.5 feet, +/- 0.5 feet. If the lake is at 263.0 feet on November 15 (end of lake trout spawning), then it would have to be lowered to 257.0 feet to achieve a 6-foot drawdown.

The MDIFW previously recommended that the lake be held higher during the lake trout spawning period, so we assume that the lake would be held at the "high end" of the range allowed by the LLMP in November.

[47]

Using the stage versus storage relationship for Sebago Lake (figure 10 in section V.C.2, Water Resources shows that relationship down to 260.0 feet, and we extended the relationship line to 257.0 feet), about 161,000 acre-feet would have to be released from the lake to reach a 6-foot drawdown. A volume of 161,000 acre-feet is equal to about 7,000 mcf. Assuming the maximum drawdown should be reached by February 1 (based on the MDIFW's modified recommendation), water would be released over a 2 1/2 month period, or about 11 weeks, to reach the required drawdown. This would require a continuous release from the lake of at least 1,052 cfs.

This analysis does not consider the inflow to the lake, which from November- January could average from 500 to 800 cfs. So any release from the lake to achieve this drawdown would more likely be in the range of 1,500 to 1,800 cfs.

[48]

Based on USGS flow data at the lake outlet, flow releases in the range of 1,500 to 1,800 cfs would be close to the maximum recorded flows for the lake outlet during the months of November thru January since 1902 (tables 7 and 8). A flow release in this range would approximate the maximum recorded flow for these months for the 1902-1986 period (table 7), and would be near the range of 5 percent exceedence flow for the 1987-2004 period (table 8). The maximum hydraulic capacity of the Eel Weir powerhouse is 822 cfs, so continuous spillage of about 700 to 1,000 cfs would be required over this 2 1/2-month period to release the required volume from Sebago Lake. Continuous spillage into the bypassed reach would have negative effects on the fall sport fishery in the reach, and higher spillage flows may also result in the downstream displacement of some fish from the reach, making them unavailable to the important sport fishery.

Once the lake drawdown is reached (257.0 feet), we assume that it would be held at this level for at least two weeks, to ensure that the lake trout eggs within the drawdown zone are killed. After the two-week drawdown (say from February 1 to 15), refilling the lake could be resumed. Beginning the lake refill at an elevation of 257.0 feet, however, may result in the lake not refilling by the May 1 target date, or may not reach the target elevation at any time during the spring/early summer, if the winter and spring periods have lower than normal precipitation. Our review of the historical lake level data indicates that Sebago Lake has not been as low as 257.0 feet since 1940, although it reached 258.82 feet in 1960. The most recent lowest recorded level of 260.60 feet was in 1993.

A large mid-winter drawdown could affect the winter ice fishery; in that ice cover may not be stable on the lake, particularly along the shoreline, with a continually rising lake level after February 15. The MDIFW, however, is not concerned about any such effects on the winter fishery. Other adverse effects could occur in the lake littoral zone habitat with a deep winter drawdown. Macroinvertebrates and shoreline aquatic vegetation, both emergent and submerged, could be killed and result in a decrease in cover and forage for juvenile fishes during the following spring and summer season, potentially affecting both forage and game species in the lake. If the lake has not refilled in time for the spring spawning period, tributary spawners such as smelt could have difficulty entering tributary streams because of blockages to upstream movement that would normally be inundated at higher lake levels. Shoreline spawners could also be affected if less spawning area is available due to the lower lake levels.

Providing a mid-winter drawdown of up to 6 feet would likely result in the mortality of lake trout eggs spawned with the drawdown zone, but the overall effect on the lake trout population can not be predicted with certainty. The lake trout is a long-lived species, with maturation occurring at ages 5 through 8, and ages of 20 to 25 years record in Maine waters (MDIFW, 2002b). Any effects of such a drawdown on the lake trout population would likely require several years to determine, but in the meantime the drawdowns would have many adverse consequences as described above.

Effects of Alternative LLMPs on the Lower Presumpscot River Fishery

Flow releases from Sebago Lake essentially control the flow of the Presumpscot River, except under unusual flow events. The lake typically acts to dampen high flow events, but helps to maintain higher river flows during the summer low-flow period. Both the resident fishery of the several downstream impoundments and bypassed reaches, and the diadromous fisheries of the lower river (shad and river herring downstream from the Cumberland Mills dam, and American eel throughout the river), have adapted to the pattern of flow regulation from Sebago Lake. If major changes in this flow regulation were to occur, it could affect the lower river fisheries.

S.D. Warren is not proposing any changes to the flow regulation of the Presumpscot River. The current minimum required flow releases from the lake are 270 cfs from November through April, and 333 cfs from May through October. These flows would continue if no changes in the LLMP are made. No other aspects of proposed project operations and regulation of Sebago Lake would affect downstream fisheries, except for potential changes in the minimum flow in the bypassed reach, which is discussed separately herein.

Neither Interior, the MDIFW, the MDMR, nor FOSL made recommendations regarding the regulation of Sebago Lake to benefit downstream river fisheries, other than minimum flows in the bypassed reach. Similarly, Stephen Kasprzak, Charles Frechette, the Sebago Lake Coalition, and the "Say No To Low" postcard campaign did not recommend any changes in the regulation of the lake to benefit downstream fisheries. In fact, many of these commenters recommended that the lake not be drawn down, for the benefit of downstream uses, but instead maintain lake levels to protect the lake fishery.

Maine recommends changes to the existing LLMP and the flow releases from Sebago Lake. Such changes are not specifically for fishery management purposes, but are to allow the attainment of the target lake levels outlined in the plan. Part of Maine's plan provides for "operating parameters" to govern flow releases from Sebago Lake for the May 1 to November 1 period, so that the lake is maintained within the bounds of the new LLMP (see Appendix B).

S.D. Warren, in commenting on Maine's plan, disagrees with the lower minimum flows from the lake under the "abnormal" flow scenario, because of potential effects on the needed reaeration flows at the downstream Dundee and Gambo projects, as required by the Water Quality Certifications for those projects.

Our Analysis

Since S.D. Warren is proposing to continue project operations in accordance with the current LLMP, and no party has made specific comments or recommendations regarding the lower river fishery, our analysis focuses on how flow releases from Sebago Lake may have changed since implementation of the LLMP in 1997. We qualitatively assess how the lower river fishery may have been, and continues to be, affected, based on the timing of flows in relation to the timing of important life history stages for the diadromous and resident species. We also assess how Maine's recommended operating parameters (Appendix B) may affect downstream flow releases and fisheries.

Effects of LLMP on lower river fishery

Tables 24 and 25 provide flow duration data for the Sebago Lake outlet for water years 1986 to 1996 (prior to implementation of the LLMP) and 1997 to 2004 (after implementation of the LLMP). Table 26 shows a comparison of flow statistics for the two periods. This comparison indicates that since implementation of the LLMP, the "open-water" season of April through November, when both resident and diadromous species are most active (spawning, rearing, migration), has had mostly higher mean flows from Sebago Lake (5 out of 7 months) and only slightly lower flows in 3 months (April, May, and August). Maximum flows, however, are lower in 3 out of 7 months, the same in 1 month (April), and much higher in 2 months (June and July). Minimum flows are higher in 4 out of 7 months, only slightly lower (13 cfs) in 2 months (June and July), and lower in 2 months (October and November). During the over-winter period of December through March, mean flows are higher in 2 months and lower in 2 months, maximum flows are lower in 3 out of 4 months, and minimum flows are lower in 3 out of 4 months.

Our analysis shows that both minimum and average flows in the Presumpscot River would generally be higher than, or about the same as, flows before the LLMP, while maximum flows would be lower nearly half the time, during the "open-water" season.
Our analysis assumes that the 7.5 years of flow data since implementation of the LLMP can be considered generally predictive of flow releases from Sebago Lake during the longer-term operation with the existing LLMP.

[49]
As noted below, this flow scenario would have mostly positive effects on the resident and anadromous fisheries of the lower river.

Higher minimum and mean flows, particularly during the warm summer months, should benefit water quality by (a) reducing maximum summer water temperatures in both the impounded and riverine reaches of the river, and (b) maintaining higher DO levels. Higher minimum and mean flows during the upstream migration and spawning periods for the anadromous clupeids (April, May, and June) would assist these species in their upstream migrations, by providing adequate depths and cues for migrations, and during spawning as more higher-quality habitat would be available. Higher flows during the summer rearing period would provide better water quality and more higher-quality habitat, while higher flows during the fall outmigration period would assist in the outmigration. Reducing maximum flows during the spawning and rearing periods would also benefit the anadromous clupeids by potentially reducing the incidence of high flow events during the critical egg and larval development periods, when such events can result in high mortality of eggs and larvae. Data in table 26 indicate that maximum flows during June and July would be significantly higher, but these higher flows would occur after the critical egg and larval development period for river herring, and toward the end of the egg and larval development period for shad.

Table 24. Flow duration data (cfs) for the USGS gage 01064000, water years 1986 through 1996. (Source: USGS, 2004a)

% Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	1330	985	2160	985	985	1510	1250	2240	1490	1200	807	819
10%	829	915	1150	856	985	844	865	1650	985	665	605	423
15%	670	827	998	844	856	844	852	1570	831	662	492	423
20%	418	819	856	834	856	831	845	1000	675	502	492	423
25%	350	671	831	831	844	831	830	998	675	501	423	350

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
30%	350	665	831	819	831	819	670	985	662	425	423	350
35%	350	615	831	772	831	819	668	845	508	423	423	350
40%	340	415	831	702	831	819	588	831	340	418	422	344
45%	340	350	819	680	819	695	352	831	340	400	400	340
50%	340	350	672	680	819	670	350	819	340	400	392	340
55%	338	350	667	670	702	668	350	670	338	375	383	338
60%	335	350	667	670	690	665	350	655	338	369	366	338
65%	298	340	665	667	670	658	340	350	338	350	350	338
70%	298	335	579	667	670	554	340	350	301	350	340	338
75%	290	332	579	562	670	546	338	340	298	343	340	333
80%	277	327	554	554	546	423	338	277	298	340	334	331
85%	254	306	554	531	546	365	300	254	277	340	334	301
90%	237	302	549	508	546	332	277	250	50	327	327	277
95%	233	254	499	408	325	325	250	250	50	313	327	268
99%	231	234	499	330	325	273	175	50	50	292	242	250
Mean	433	525	839	722	731	708	554	842	504	498	435	384
Max	1330	1500	2490	2490	998	1520	1650	3310	2650	1870	1330	1320
Min	212	231	437	330	325	91	0	50	50	263	50	231

Table 25. Flow duration data (cfs) for the USGS gage 01064000, water years 1997 through 2004, excluding data past May 3, 2004. (Source: USGS, 2004a; and data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004)

% Exceedence	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5%	1000	2351	1000	1000	844	1000	2351	1000	2351	1000	1000	2351
10%	994	2321	994	994	667	994	2321	994	2321	994	994	2321
15%	838	1093	838	838	667	838	1093	838	1093	838	838	1093
20%	835	1000	835	835	667	835	1000	835	1000	835	835	1000
25%	833	999	833	833	667	833	999	833	999	833	833	999
30%	828	991	828	828	667	828	991	828	991	828	828	991
35%	821	990	821	821	657	821	990	821	990	821	821	990
40%	667	939	667	667	501	667	939	667	939	667	667	939
45%	619	903	619	619	501	619	903	619	903	619	619	903
50%	500	846	500	500	500	500	846	500	846	500	500	846
55%	465	844	465	465	500	465	844	465	844	465	465	844
60%	373	833	373	373	495	373	833	373	833	373	373	833

65%	333	833	333	333	349	333	833	333	833	333	333	833
70%	333	700	333	333	333	333	700	333	700	333	333	700
75%	333	643	333	333	333	333	643	333	643	333	333	643
80%	275	625	275	275	301	275	625	275	625	275	275	625
85%	275	500	275	275	299	275	500	275	500	275	275	500
90%	258	500	258	258	250	258	500	258	500	258	258	500
95%	256	500	256	256	250	256	500	256	500	256	256	500
99%	75	176	75	75	250	75	176	75	176	75	75	176
Mean	609	1000	994	953	498	461	552	824	641	671	381	419
Max	2000	2400	2333	2560	846	1000	1650	2750	3760	3490	670	838
Min	75	25	292	250	250	133	133	133	37	250	250	275

Table 26.Comparison of flow statistics for USGS gage 01064000, prior to and after implementation of the LLMP. (Source: Staff)

Flow period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1986-1996												
Mean	433	525	839	722	731	708	554	842	504	498	435	384
Max	1330	1500	2490	2490	998	1520	1650	3310	2650	1870	1330	1320
Min	212	231	437	330	325	91	0	50	50	263	50	231
1997-2004												
Mean	609	1000	994	953	498	461	552	824	641	671	381	419
Max	2000	2400	2333	2560	846	1000	1650	2750	3760	3490	670	838
Min	75	25	292	250	250	133	133	133	37	250	250	275
Differencea												
Mean	176	475	155	231	-233	-247	-2	-18	137	173	-54	35
Max	670	900	-157	70	-152	-520	0	-560	1110	1620	-660	-482
Min	-137	-206	-145	-80	-75	42	133	83	-13	-13	200	44

a Difference is most recent period (with the LLMP) minus the earlier period (prior to the LLMP). Shaded cells indicate reductions in flow after implementation of the LLMP.

Anadromous species have been, and will continue to be, limited to the lower 10 miles of the Presumpscot River below the Cumberland Mills dam, until fish passage is provided at that dam. S.D. Warren is not proposing to install fish passage at Cumberland Mills, but the state and federal agencies have indicated that they will be pursuing fish passage at this non-jurisdictional dam.

[50]

Thus, any beneficial effects on anadromous species would be limited to this reach of the river. If, however, fish passage is eventually provided at Cumberland Mills, that will set in motion the provisions of the recently-issued licenses for the other S.D. Warren projects, which require the phased installation of fish passage facilities. As anadromous species gain access to more of the Presumpscot River Basin, any beneficial effects of the modified flow regime from Sebago Lake (as a result of the LLMP) would be realized over a greater portion of the basin.

The effects of this modified flow regime on the American eel, however, are less clear. The American eel occurs throughout the Presumpscot River, indicating that some numbers of eels are able to pass upstream over most of the dams on the river, without the aid of fish passage facilities. Eels have been observed passing over the Presumpscot River dams in areas with very small volumes of leakage, and eel fishway criteria indicate that eels prefer such areas for passage (Clay, 1995). Thus, if higher mean flows were to continue to occur during the primary upstream movement period for eels (May, June, July), resulting in higher spillage at some of the dams on the river, this may not enhance upstream passage conditions for eel. However, the new licenses for the five S.D. Warren projects also require the installation of fishways for upstream eel passage, so passage over the dam spillways may become less important as an upstream passage route, as eel fishways are eventually installed on the dams. Overall improvement in water quality and aquatic habitat conditions, as a result of higher mean flows, would benefit the eel, as it would any species in the river. Adult eel migrate downstream in late-summer and fall, so higher mean flows during that period should enhance the outmigration.

Sea-run Atlantic salmon currently do not occur in the Presumpscot River Basin, although the draft fishery management plan for the river includes restoration of salmon as a long-term objective for the basin (Wippelhauser et al., 2001). There are no ongoing restoration activities, and the only salmon that currently occur in the river are probably strays from other rivers. Thus, the flow regime that has been in place since implementation of the LLMP has had no effect on the Atlantic salmon. If salmon restoration efforts were to begin and result in the re-establishment of a salmon run in the river, higher minimum and mean flows during the open-water season should benefit salmon by improving habitat conditions during migration, spawning, and rearing.

If natural spawning of salmon was re-established in the river, however, the existing lower over-winter flows could affect egg incubation. Our flow analysis indicates that mean flows have been lower in February and March, and minimum flows lower in December, January, and February, since implementation of the LLMP. If this trend continued, incubating salmon eggs might not be sufficiently protected over the winter period. This potential effect, however, would not occur for many years, since there currently is no active salmon restoration program in the Presumpscot River. It would also only affect potential spawning areas in the mainstem river, which has limited spawning and rearing habitat for Atlantic salmon. Most of the salmon habitat in the Presumpscot River Basin is located in the tributary streams (FERC, 2002).

Resident species are likely benefiting from the improved water quality and better habitat conditions resulting from higher minimum and mean flows during the open-water season, when these species spawn and rear. However, because the Presumpscot River is mostly a series of shallow reservoirs and short riverine reaches (upstream of Cumberland Mills dam), the precise effects of these improvements cannot be predicted with certainty. The overall improvement in habitat suitability that has occurred since implementing the LLMP has likely enhanced populations of resident species, although the magnitude of enhancement may not be measurable. Reductions in the maximum flows during the open-water season are likely beneficial, particularly during the spring spawning season (May), where high-flow events may result in higher mortality of eggs and larvae. Lower flows during the over-winter period have likely had little effect on resident species, because this is a period of relative inactivity for most warmwater/coolwater species.

CONCLUSIONS - The potential effects of continued use of the LLMP and associated Sebago Lake flow releases on the lower river fishery would be mostly positive, but would vary by species and life stage. Table 27 summarizes these potential effects.

Table 27. Summary of potential effects of the current flow release regime from Sebago Lake on the fisheries of the lower Presumpscot River. (Source: Staff)

Species grouping	Species	Life stage	Potential effecta

Anadromous	American shad	Migration	+
		Spawning	+
		Rearing	+
	River herring	Migration	+
		Spawning	+
		Rearing	+
	Atlantic salmonb	Migration	+
		Spawning	+
		Egg incubation	-
		Rearing	+
Catadromous	American eel	Spring migration	-
		Rearing	+
		Fall migration	+
Resident	Warmwater/coolwater species	Spawning	+
		Rearing	+

a Overall positive effect is indicated by a "+" and a negative effect is indicated by a "-".
b Salmon do not currently occur in the Presumpscot River, but may be reintroduced.

Potential effects of Maine's recommended operating parameters

Under the proposed operating parameters, flow releases would remain essentially unchanged from current operations, unless Sebago Lake levels were to deviate from the target range required by the LLMP, for the May 1 to November 1 period. Thus, if the lake stays within the target range, there would be no changes in the flow releases from the lake, with the minimum flow remaining at 333 cfs and the maximum flow released as required to maintain the lake within the target range. Assuming similar meteorological conditions, the outflow from Sebago Lake should approximate the flow record illustrated in table 26 (as long as the lake remains within the target range), with effects on downstream fisheries as described above and summarized in table 27.

If, however, the lake level was to vary from the target levels, then the operating parameters would allow "abnormal flows" to be released. If abnormal flows were implemented, the minimum flow could drop to 250 cfs, and the maximum flow would vary, depending on stage, from 1,667 cfs to 3,500 cfs. The minimum flow would be implemented to bring the lake level up to a target level, and the maximum flow would be released if the lake level was high and had to be lowered to return to the target level. The maximum flow could also be higher than these volumes, if additional flow releases were required to prevent the lake level from reaching 267.15 feet, which is 6 inches above the spillway crest elevation.

Because flow releases from the lake would depend on the lake elevation, which in turn would depend on climatic conditions, it is difficult to predict with any confidence what the flow releases from the lake would actually be, under Maine's recommended operating parameters. Essentially, during dry weather patterns, flows from the lake would likely be reduced to the minimum flow of 250 cfs, while in wet weather patterns, higher flows would be released from the lake. This would be similar to the natural flow patterns that have occurred in past lake operations. Lower outflows from the lake during the open-water season (the minimum flow would be 83 cfs less than the current minimum flow) could affect water temperatures and water quality, and reduce the availability and suitability of downstream aquatic habitat. Higher outflows, although likely to improve water quality and increase the availability of aquatic habitat, could also adversely affect some species and life stages, if high flows were to occur during critical life stages, such as spawning or egg incubation. Because of the variability in weather patterns, however, these effects cannot be predicted with certainty. However, over time, Maine's recommended operating parameters could likely result in flow releases not significantly different from those that have occurred over the recent past.

Eel Weir Bypassed Reach Minimum Flow

In 1985, the MDIFW developed a strategic plan for fisheries management in the Eel Weir bypassed reach (MDIFW, 1985).
The MDIFW's formal management plans for the Eel Weir bypassed reach are presented in the 1985 Plan, the Presumpscot River Eel Weir Bypass Fishery - Cold Water Sport Fish Management (MDIFW, 1997), and the Draft Fishery Management Plan for the Presumpscot River Drainage (Wippelhauser et al., 2001).

[51]
The goal of the management plan was to establish a viable fishery for landlocked Atlantic salmon and other species of coldwater and warmwater sport fish in the Eel Weir bypassed reach. As a means of achieving this goal, the 1985 Plan recommended that an appropriate minimum flow be released into the bypassed reach to enhance landlocked Atlantic salmon habitat and fishing opportunities.

To address the goals set out in the 1985 Plan, a minimum flow study was conducted in 1985 by a study team comprised of representatives from S.D. Warren, the USFWS, and the MDIFW (Charles Ritzi, 1986). The existing minimum flow regime for the bypassed reach was developed based on the 1985 flow study. The existing flow regime consists of 25 cfs (11/1-3/31), 75 cfs (4/1-6/30), 50 cfs (7/1-8/31), and 75 cfs (9/1-10/31). S.D. Warren proposes to continue implementing this same flow regime. S.D. Warren argues that under the current minimum flow regime, the Eel Weir bypassed reach is achieving fisheries management objectives and provides sufficient protection to fish habitat and angling suitability.

The MDIFW indicates that the existing flow regime was developed as a way to establish a self-sustaining landlocked Atlantic salmon fishery in the Eel Weir bypassed reach. Secondarily, the flow regime was designed to enhance the fisheries for other species of coldwater and warmwater sport fish. The MDIFW states that the effort to establish a self-sustaining salmon fishery in the bypassed reach has not been successful. Consequently, the bypassed reach is currently managed principally for as a brook trout fishery, with stocking of catchable-size fish. Some salmon and brown trout are stocked to diversify angling opportunity.

At the request of the MDIFW and the USFWS, S.D. Warren conducted an instream flow study in the Eel Weir bypassed reach in 2001 (Kleinschmidt, 2002). Unlike the 1985 study, the 2001 study utilized state-of-the-art habitat modeling procedures to evaluate habitat-discharge relations in the bypassed reach. The 2001 study also evaluated the effects of instream flows on thermal refugia and angling opportunities in the bypassed reach.

Based on the 2001 instream flow study, the MDIFW, Interior (on behalf of the USFWS), and FOSL recommend minimum flows for the Eel Weir bypassed reach that differ from those proposed by S.D. Warren. The MDIFW recommends a non-winter flow (5/1-10/31) of 200 cfs
If the natural spring refugia can not be adequately protected, summer minimum flows would be reduced to approximately 110 cfs.

[52]
and a winter flow (11/1-4/30) of 115 cfs. Interior recommends a similar flow regime, 200 cfs from 4/1 to 10/31 and 115 cfs from 11/1 to 3/31.

In its August 29, 2005, comments on the draft EA, the USFWS proffered an alternative flow regime of: 115 cfs from 11/1 to 3/31, 200 cfs from 4/1 to 6/30, 115 cfs from 7/1 to 8/31, and 200 cfs from 9/1 to 10/31.

[53]
Interior also recommends that S.D. Warren monitor water temperatures in the bypassed reach to determine what, if any, effects increased minimum flows have on the cold-water refugia in the reach. FOSL recommends a year-round bypass minimum flow of at least 100 cfs.

Our Analysis

The Eel Weir bypassed reach extends from the toe of the Eel Weir dam downstream approximately 6,700 feet to the Eel Weir powerhouse (figure 20). The MDIFW mapped the habitat in the bypassed reach in 1985 (MDIFW, 1985). As described below, S.D. Warren updated the MDIFW habitat mapping data in May 2001.

The MDIFW and S.D. Warren surveys both indicate that nearly half of the Eel Weir bypassed reach (about 3,000 feet) is comprised of riffle and run habitat, with coarse (gravel, cobble, and boulder) substrates (figure 20). Approximately 500 feet of the upper bypassed reach, immediately downstream from the Eel Weir dam, consists of braided riffle areas. Boulders provide good instream cover for fish in the riffle/run areas. Narrow stream widths (less than 100 feet), forested land, and shoreline vegetation provide moderate shading in the riffle/run areas. Aquatic habitat in the remainder of the bypassed reach (some 3,500 feet) consists of deadwater areas with fine (sand and silt) substrates (figure 20). Depths in the deadwater areas are predominantly less than 5 feet and stream widths are typically greater than 100 feet. Little shading is available within the deadwater areas. Although there are no significant tributaries to the bypassed reach, areas with coldwater seeps are present, which provide important thermal refuge for trout and landlocked salmon during the warm summer months.

Figure 20. Habitat types and location of study reaches and transects in Eel Weir bypassed reach. (Source: Kleinschmidt, 2002)

Public Access for figure 20 is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

The MDIFW's current management objectives for the bypassed reach are: (1) to continue intensively managing the Eel Weir bypassed reach for primarily brook trout and secondarily landlocked salmon to provide a quality, year-round, high-use recreational coldwater fishery;

During the September 22, 2005, section 10(j) meeting in Augusta, Maine, the USFWS and the MDIFW stated that the presence of smallmouth bass in the Eel Weir bypassed reach should not be given much weight in flow management decisions, as the agencies do not consider smallmouth bass a threat to trout management. This is a shift in position from earlier statements in the relicensing proceeding (S.D. Warren, 2002a).

[54]
(2) to maintain an average catch rate of two legal salmonids per angler trip; and (3) to maintain an average length of at least 12 inches for trout and 14 inches for salmon. According to angler use data collected by the MDIFW during the 1990s, the management objectives for catch rate and fish size are not being obtained.

To address concerns related to the issue of flows in the Eel Weir bypassed reach, S.D. Warren, along with a team of fisheries biologists from the MDIFW, the USFWS, and the MASC, conducted an instream flow study in 2001. The objectives of the study were to: (1) estimate the amount of habitat for lifestages of brook trout, Atlantic salmon, smallmouth bass; and a macroinvertebrate species in the bypassed reach; (2) determine the effects of instream flows on thermal refugia created by coldwater seeps in the bypassed reach; and (3) determine the effects of flows on angling opportunity in the bypassed reach. The study methodology is summarized below, but the study's details can be found in Kleinschmidt (2002).

Aquatic habitat in the Eel Weir bypassed reach was evaluated using the Instream Flow Incremental Methodology (IFIM: Bovee, 1982; 1998). The Physical Habitat Simulation Model (PHABSIM) was used to quantify flow versus habitat relationships in riffle and run habitat types in the bypassed reach. The flow range modeled was from 25 cfs to 440 cfs (equivalent to the Aquatic Base Flow for fall/winter spawning flows). Habitat-discharge information was not collected for deadwater areas in the bypassed reach. However, bathymetric data from two deadwater areas was obtained. Habitat -discharge relationships in braided channel areas were computed for field-measured calibration flows, with no interpolation of estimated habitat at other flows. A total of 11 transects were established in representative riffle and run habitats in four reaches of the bypassed reach (figure 20).

Habitat availability in the bypassed reach was evaluated for brook trout (juvenile and adult), landlocked Atlantic salmon (juvenile and adult), anadromous Atlantic salmon (spawning/egg incubation and juvenile), smallmouth bass (juvenile and adult), and a macroinvertebrate species (Stenonema species). Habitat suitability index (HSI) curves were collaboratively developed by previous instream flow study groups for use in instream flow studies in Maine and elsewhere in New England. The amount of habitat for each species and life stage is expressed as total wetted area and Weighted Usable Area (WUA).

WUA is an index of the capacity of a stream reach to support a particular species and life stage, and is expressed as the area or percentage of suitable habitat available per unit length of a stream at a given flow (ft2 of WUA per 1,000 feet of reach).

[55]

To evaluate the cold water refugia in the bypassed reach, water temperatures were monitored at two coldwater seeps at flows of 79, 115, and 172 cfs in August 2001. Transects, spaced at about 10-foot intervals, were established immediately upstream within, and downstream of each cold water seep. The suitability of angling in the bypassed reach under alternative flows was assessed in August 2001, using methods similar to those used in previous Delphi flow assessments conducted in Maine. A group of anglers observed four flows (79, 115, 172, and 310 cfs) and independently rated the suitability of each flow for angling.

We provide our analysis of the flow issue in the Eel Weir bypassed reach below. Our recommendation concerning flows in the bypassed reach, however, is found in section VII, Comprehensive Development and Recommended Alternative.

Hydraulic Data

Riffle-Run Habitat. A range of discharges from 25 to 440 cfs was simulated using PHABSIM for all riffle-run transects (Transects 1-9), based on data obtained in the field. Table 4.1 in Kleinschmidt (2002) summarizes the percentage of wetted area experiencing selected velocity and depth ranges for Transects 1-9. Table 28 (and see Figure 4.1 in Kleinschmidt, 2002) summarizes changes in wetted area at the same nine transects.

At flows of 25 cfs and 50 cfs, the majority of depths (83 and 72 percent, respectively) were less than 0.5 feet, and nearly all depths were less than 1.5 feet. At 75 cfs and 100 cfs, over 25 percent of all depths ranged from 0.6 to 1.5 feet. At discharges between 200 and 440 cfs, about 50 percent of all depths were greater than 0.5 feet. Areas with depths * 3 feet were scarce at flows of 200 cfs and less, but increase gradually through 440 cfs.

At 25 cfs, 86 percent of all velocities were 0.5 fps or less, and 14 percent of the velocities ranged from 0.6 to 2.0 fps. At 50 and 75 cfs, about 75 percent of the velocities were 0.5 fps or less, and at least 25 percent ranged from 0.6 to 2.0 fps. The peak percentage of wetted cells experiencing velocities between 0.6 and 2.0 fps occurs at 100 cfs. At discharges between 200 and 440 cfs, velocities ranging from 0.6 to 2.0 fps decreased 7 percent, and velocities greater than 3.0 fps increased 13 percent.

Wetted area increased most rapidly between 25 and 50 cfs, with no distinct inflection point (table 28 and see Figure 4.1 in Kleinschmidt, 2002). At 100 cfs, total wetted area at the riffle/run transects was nearly 75 percent. Additional gains in wetted area continue to occur at a steady rate across the remainder of the range of flow modeled, reflecting inundation of riparian and floodplain areas flanking the thalweg at all transects.

Braided Channel Habitat. Empirical depth and velocity were obtained in braided channel habitat at discharges of 66, 131, and 185 cfs in the bypassed reach. Table 4.3 in Kleinschmidt (2002) summarizes the percentage of wetted area experiencing selected velocity and depth ranges for Transects 10 and 11. Table 28 (and see Figure 4.2 in Kleinschmidt, 2002) summarizes changes in wetted area at the same two transects.

At 66 cfs, 73 percent of all depths were less than 0.5 feet; 27 percent of the depths ranged from 0.6 to 3.0 feet. At 131 cfs, 64 percent of all depths were less than 0.5 feet and 36 percent were between 0.6 and 3.0 feet. At 185 cfs, slightly over half (51 percent) of all depths were greater than 0.5 feet. Areas with depths * 3.0 feet were nonexistent at all measured discharges across the braided channel transects.

At 66 cfs, 82 percent of all velocities were 0.5 fps or less along the braided channel transects; 9 percent of the velocities were between 0.6 and 2.0 fps. Increasing discharge to 131 and 185 cfs increased the area with velocities ranging from 0.6 to 2.0 fps by 8 and 24 percent, respectively. Velocities greater than 3.0 fps, however, also rose steadily when discharge was increased to 131 and 185 cfs.

All channels along Transects 10 and 11 were at least partially wetted at 66 cfs (table 28 and see Figure 4-2 in Kleinschmidt, 2002). Wetted area increased linearly, however, at 131 and 185 cfs, with no apparent inflection point.

Habitat Data

Riffle-Run Habitat. Table 28 (and see Figures 4.3 and 4.4 in Kleinschmidt, 2002) presents the habitat-discharge relationships, and the relationship between wetted area and available habitat, for the species and lifestages evaluated for the riffle/run habitat.

Table 28. Wetted area, total weighted usable area (WUA), and percent of maximum calculated WUA in riffle-run and braided channel habitats occurring between 25 and 440 cfs in the Eel Weir bypassed reach for all modeled species and life stages. (Source: Staff, as modified from Kleinschmidt, 2002)

RIFFLE-RUN HABITAT

Discharge (cfs)	Wetted Area (ft2)	Brook Trout - Adult WUA	Brook Trout - Adult % Max WUA	Brook Trout -- Juvenile WUA	Brook Trout -- Juvenile % Max WUE	Landlocked Atlantic Salmon - Adult WUA	Landlocked Atlantic Salmon - Adult % Max WUA	Landlocked/Sea-run Atlantic Salmon - Juvenile WUA	Landlocked/Sea-run Atlantic Salmon - Juvenile % Max WUA	Sea-run Atlantic Salmon - Spawning WUA	Sea-run Atlantic Salmon - Spawning % Max WUA	Smallmouth Bass - Adult WUA	Smallmouth Bass - Adult % Max WUA	Smallmouth Bass - Juvenile WUA	Smallmouth Bass - Juvenile % Max WUA	Stenonema WUA	Stenonema % Max WUA
25	173,197	47,889	41	58,760	50	4,801	10	44,561	59	605	4	4,837	25	31,196	55	47,430	52
50	208,337	67,464	57	78,422	66	9,487	20	58,231	77	5,166	36	7,605	39	41,425	73	67,624	75
75	228,546	80,811	69	90,241	76	14,027	30	66,679	88	8,838	61	10,191	53	47,039	82	79,027	87
100	243,425	89,936	77	97,681	82	18,224	38	72,347	96	12,064	84	12,227	63	51,099	90	86,091	95
125	256,250	95,052	81	100,816	85	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	87,840	97
200	282,576	108,694	93	111,542	94	31,016	65	75,624	100	14,415	100	17,849	92	54,099	95	90,557	100
300	299,964	114,479	98	113,378	96	39,703	84	71,917	95	7,918	55	19,244	100	54,546	96	87,754	97
440	327,115	117,348	100	118,607	100	47,536	100	72,073	95	3,838	27	19,307	100	57,049	100	83,126	92

BRAIDED CHANNEL HABITAT

Discharge (cfs)	Wetted Area (ft2)	Brook Trout - Adult	Brook Trout -- Juvenile	Landlocked Atlantic Salmon - Adult	Landlocked/Sea-run Atlantic Salmon - Juvenile	Sea-run Atlantic Salmon - Spawning	Smallmouth Bass - Adult	Smallmouth Bass - Juvenile	Stenonema

		WUA	% Max WUA	WUA	% Max WUE	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA	WUA	% Max WUA
66	62,174	14,906	48	16,350	58	906	17	12,888	54	1,911	37	723	23	9,136	49	12,030	42
75	63,750	15,755	51	16,517	59	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12,839	45
125	73,800	19,772	64	18,730	67	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17,689	62
131	75,426	19,990	65	19,086	68	2,368	45	17,670	74	3,450	67	904	29	9,089	49	17,950	63
185	84,653	30,893	100	27,955	100	5,205	100	23,794	100	5,168	100	3,169	100	18,508	100	28,530	100

Although the various lifestages achieved maximum habitat quantity at differing discharge increments, habitat for all lifestages increased rapidly between 25 and 100 cfs in the riffle/run habitat (table 28 and see Figure 4.3 in Kleinschmidt, 2002). At discharges greater than 100 cfs, wetted area increased at a higher rate than did habitat for the species and lifestages evaluated (see Figure 4.4 in Kleinschmidt, 2002). Both wetted area and WUA experience an inflection point at about 100 cfs in the riffle/run habitat types. At 100 cfs, all species of management importance in the bypassed reach, except adult landlocked salmon achieve 77 percent or greater of the maximum calculated WUA. Doubling the discharge to 200 cfs results in less than a 16 percent increase in WUA for all species and lifestages, except adult landlocked salmon.

Species and lifestages, except Stenenoma, sea-run Atlantic salmon spawning, and juvenile Atlantic salmon (sea-run and landlocked) experience optimal habitat suitability at 440 cfs. At 440 cfs, habitat typically declines in the main channel areas of the riffles and runs due to unsuitably high velocities; however, wetted area increases thereby creating more suitable habitat for most species and lifestages in stream margins and near object cover.

Velocities ranging from 0.5 to 1.5 fps are rated optimal by the HSI curves for most species in the flow study; velocities < 0.5 fps and > 2 fps are not rated as highly. At flows > 100 cfs, velocities exceeding 2.0 fps become more prevalent in riffle/run habitats.

[56]
Optimal habitat suitability for Stenenoma, sea-run salmon spawning, juvenile salmon occurs at 200 cfs.

Braided Channel Habitat. Table 28 (and see Figures 4.13 and 4.14 and Kleinschmidt, 2002) presents the habitat-discharge relationships, as well as the relationship between wetted area and available habitat, for the species and lifestages evaluated for the braided channel habitat.

WUA in braided channel habitat increased steadily for all species and lifestages with discharges increasing from 66 to 131 cfs (table 28 and see Figure 4.13 in Kleinschmidt, 2002). This increase in WUA generally reflected the increase in wetted area in the braided channels (see Figure 4.14 in Kleinschmidt, 2002). Increasing discharge from 131 to 185 cfs, however, resulted in a sharp increase in WUA for nearly all evaluation species and lifestages. Although wetted area continued to steadily increase at 185 cfs, the sharp increase in WUA is due to more suitable depth conditions.

Depths < 0.5 feet are mostly unsuitable for the evaluation species and lifestages. Increasing discharge to 185 cfs reduced the amount of area with depths < 0.5 feet by nearly 20 percent and increased areas with depths > 0.5 feet by 13 percent.

[57]

DISCUSSION - S.D. Warren currently provides continuous minimum flows in the Eel Weir bypassed reach that vary seasonally from 25 to 75 cfs. The existing 25-cfs minimum flow provides between 10 (adult landlocked salmon) and 59 percent (juvenile salmon) of the maximum calculated habitat. The 50-cfs minimum flow provides between 20 (juvenile salmon) and 75 percent (Stenonema) of the maximum calculated habitat. Except for adult salmon, the 75-cfs minimum flow typically provides 70 to 90 percent of the maximum calculated habitat for species of management importance. In the braided channel areas of the upper-bypassed reach, existing minimum flows provide less than 60 percent of the maximum calculated habitat.

The PHABSIM results obtained from S.D. Warren's flow study show that while no single flow optimizes habitat for all species and lifestages, a range of flows exist that may provide reasonably high habitat suitability for most species and lifestages (Kleinschmidt, 2002). An instream flow recommendation, though, should consider the species and lifestages of interest and their management priority (Bovee et al., 1998). In the case of the Eel Weir bypassed reach; brook trout is the key management species.

The results of S.D. Warren's flow study show that the bypassed reach provides more habitat for juvenile and adult brook trout across the flow range of interest than any other species or lifestage (Kleinschmidt, 2002). Habitat for brook trout increased rapidly between 25 and 100 cfs in the riffle/run habitat, with a moderate increase beyond 100 cfs. At 75 cfs, maximum computed WUA was 69 and 76 percent for adult and juvenile brook trout, respectively, while maximum WUA was 77 and 82 percent for adult and juvenile trout at 100 cfs. A flow of 125 cfs provides about 81 and 85 percent of the maximum calculated WUA for adult and juvenile trout, respectively.

Interior's and the MDIFW's recommended flow of 115 cfs would provide approximately 80 percent of the maximum computed WUA for adult and juvenile brook trout, while their recommended flow of 200 cfs would provide nearly 95 percent of the maximum computed WUA for brook trout. Doubling the flow from 100 to 200 cfs results in about a 15 percent increase in habitat for brook trout, and quadrupling the flow from 100 to 440 cfs increases, by 18 and 23 percent, juvenile and adult brook trout habitat, respectively. The seasonal flow regime of 200 cfs during the spring, summer, and fall would significantly improve habitat for coldwater fish species during the active growing season and enhance angling opportunities in the bypassed reach, but potentially affect coldwater refugia in the bypassed reach, as discussed below. A flow of 115 cfs during the winter would substantially improve over-winter habitat in the reach.

The alternative flow regime proffered by the USFWS in its comments on the draft EA is designed to address various seasonal needs in the bypassed reach. A flow of 200 cfs would substantially improve habitat during seasons when coldwater fish species are most active (e.g., for spawning, hatching, winter holdover preparation). These seasons (spring and fall) also represent periods of high angler use of the bypassed reach. A flow of 115 cfs provides a substantial portion of the habitat available at 200 cfs, and maintains the integrity of coldwater refugia (see analysis in following section) during the critical summer high temperature period.

The USFWS's flow recommendation would offer limited protection of the coldwater refugia in early summer (June) and late summer (September), when water temperatures can often be high.

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In the winter, there is considerable angler activity in the bypassed reach. A flow of 115 cfs during the winter would increase available holding habitat for coldwater species in the bypassed reach.

Approximately 75 percent of the habitat calculated for Stenonoma, which is an important macroinvertebrate forage species for trout and other fish, was achieved at 50 cfs in the riffle/run habitat. Minimum flows of 100 cfs and up provide 95 percent or more of the maximum calculated WUA for this species in the riffle/run habitat. Total wetted area in the riffle/run areas is nearly 75 percent at 100 cfs and about 78 percent at 125 cfs.

The MDEP estimates that 75 percent wetted conditions (which is the criteria normally recommended by the MDEP) occur in the bypassed reach at a flow of 80 cfs (S.D. Warren, 2002a). We estimate that a flow of 80 cfs would provide between 70 and 75 percent wetted area.

[59]

In the braided channels, habitat for brook trout increased rapidly from 66 to 185 cfs, with a more modest increase for Stenonema over the same flow range (Kleinschmidt, 2002). S.D. Warren notes that braided channel habitat represents a small percentage of the coldwater/macroinvertebrate habitat in the bypassed reach. Therefore, S.D. Warren argues that any instream flow recommendation for the bypassed reach should focus primarily on the protection of habitat in the riffle/run areas. While we do not dispute the study's findings, we note that the braided channels likely provide important habitat for brook trout and Stenonema, as well as angling opportunities, in the bypassed reach. Therefore, we consider both riffle/run and braided channel habitats in determining an appropriate bypass flow regime.

Optimal habitat for adult Atlantic salmon is limited in the bypassed reach, since depth remains relatively unsuitable across the entire flow range of interest (Kleinschmidt, 2002). Except for adult and spawning Atlantic salmon and adult smallmouth bass, a 75-cfs flow provides around 70 percent of the maximum computed WUA. A flow of 125 cfs provides 80 percent or more of the maximum WUA for all species and lifestages evaluated, except adult landlocked salmon. A flow of 200 cfs provides over 90 percent of the maximum computed WUA for all species and life stages evaluated, except adult landlocked salmon.

Anadromous Atlantic salmon do not presently occupy the bypassed reach, but were included in the study because there is potential in the future that salmon management in the Presumpscot River may result in the bypassed reach being used as spawning and/or rearing habitat for either wild or hatchery origin salmon. Across the flow range of interest, the bypassed reach provides relatively little spawning habitat for salmon, but does provide abundant habitat for juvenile salmon, second only to brook trout. Habitat for juvenile salmon (expressed as WUA) increased rapidly between 25 and 75 cfs in the riffle/run areas; ranging from 59 to 88 percent of the computed maximum habitat. A flow of 100 cfs provides about 96 percent of the maximum calculated WUA, while 200 cfs provides 100 percent of the juvenile riffle/run habitat in the bypassed reach.

Maximum computed WUA for adult smallmouth bass in the bypassed reach occurs at about 275 cfs. At 200 cfs, over 90 percent of the WUA in the bypassed reach is available to juvenile and adult bass, while at 125 cfs over 90 and about 75 percent of the maximum calculated WUA is available for juvenile and adult bass, respectively. At flows between 75 and 100 cfs, adult bass habitat ranges from 53 to 63 percent of the maximum calculated WUA, while juvenile habitat remains at over 80 percent of the maximum computed WUA. At flows less than 75 cfs, habitat for adult and juvenile smallmouth bass declines to less than 50 and 80 percent of the maximum computed WUA, respectively. Thus, data from the flow study shows that lower flows in the bypassed reach reduce the suitability of the reach for smallmouth bass.

The MDIFW raised concerns regarding infrequent, but unnecessary high flows in the bypassed and the effects that such flows have on angling opportunities during peak angling periods in the bypassed reach. The MDIFW states that the high-flow (or spillage) events exceed the fishable flows, and that the flows occur during peak, high-use periods in the spring and late fall when there is a high demand for stream fishing. To address the issue, the MDIFW requested that S.D. Warren assess the feasibility of increasing discharge capacity of the canal. S.D. Warren undertook such an assessment and concluded that it was not prudent to increase the canal's discharge capacity beyond the current 1,000 cfs.

It is within the context of S.D. Warren's conclusion that we evaluate the potential effects of spill flows in the bypassed reach on fish populations and angling in the reach. S.D. Warren infrequently spills water in the bypassed reach when lake levels in Sebago Lake are outside the target range established by the LLMP. Spillage events with flows of 200 cfs and greater in the bypassed reach occurred less than 6 percent of the time in 2000 and 2001 (S.D. Warren, 2002a). It is reasonable to assume that such spillage events are likely to continue in the future.

Habitat-discharge relationships developed using PHABSIM are of little use to assess the effects of infrequent high flow events, because the habitat model does not account for behavioral responses of fish to occasional high flows (Kleinschmidt, 2002). To this end, Elwood and Waters (1969) and Seegrist and Gard (1972) found that fish are able to withstand occasional high flows by moving to areas providing refuge from high velocities. Large boulders provide abundant cover throughout the Eel Weir bypassed reach. In addition, large deadwater areas also could serve to provide velocity refuge from occasional high flows in the bypassed reach. Given the findings in the literature, as well as the abundant object cover and other refuge areas that exist in the Eel Weir bypassed reach, we do not expect infrequent high flow events to have any long-lasting or significant effects to aquatic habitat in the bypassed reach. While infrequent, high-flow events may present a short-term inconvenience to anglers using the bypassed reach, we do not expect there to be any long-term effects to angling opportunities.

Cold Water Refugia

Two coldwater seeps in the Eel Weir bypassed reach were identified by the MDIFW for evaluation. Both of the seeps are located upstream of the Route 35 bridge (figure 20), and are referred to as coldwater seeps "A" and "B." These coldwater seeps provide thermal refugia from unsuitable warm summer water temperatures (June to August) for coldwater species, including brook trout, landlocked Atlantic salmon, and brown trout.

Optimal water temperatures for brook trout range from 51.8-60.8o F, with a temperature of 75.2o F being the upper limit suitable, but only for short periods of time (Raleigh, 1982). Optimal water temperatures for brown trout range from 53.6 - 66.2o F, with a temperature of 80.6o F being the upper limit suitable, but for only short periods of time (Raleigh, 1986). Stanley and Trial (1995) report optimal water temperatures for the freshwater stages of Atlantic salmon as ranging from 57.2 - 64.4o F. Based upon this information, thermal refuge for coldwater species would occur where ambient temperatures are less than about 68o F.

The area of coldwater thermal refuge provided by coldwater seep A at 79 cfs (59o F) is about 120 ft2. Increasing discharge to 115 cfs increased water temperatures upstream, within, and downstream of the coldwater seep slightly (typically less than 3.6o F; figure 21). At 172 cfs, water temperatures at seep A increased to above 68o F; thereby almost completely eliminating the thermal refuge provided by the seep.

At 79 cfs, a thermal refuge area (temperatures less than 68o F) of about 250 ft2 exists at coldwater seep B. Increasing discharge to 115 and 172 cfs adjusts temperatures upward to above 68o F throughout seep B (figure 22).

Figure 21. Summary of temperature monitoring results along transects located in coldwater seep A at flows of 79, 115, and 172 cfs. (Source: Kleinschmidt, 2002)

Figure 22. Summary of temperature monitoring results along

transects located in coldwater seep B at flows of 79, 115, and 172 cfs. (Source: Kleinschmidt, 2002)

Based on the aforementioned data, we conclude that flows of 75 cfs or less would protect the coldwater seeps in the bypassed reach. Flows between 75 and 100 cfs also would likely protect the integrity and functionality of the coldwater seeps. However, protracted periods of higher flows during summer (flows exceeding 115 cfs) may reduce or eliminate holdover trout and salmon in the bypassed reach. This may preclude any natural recruitment to the fishery. Therefore, water temperature in these seeps is an important variable to consider as part of the flow analysis for the bypassed reach.

The MDIFW expressed concern that an increase in minimum flows above 115 cfs could lead to increased water temperature and a reduction in coldwater refugia during the summer period, unless minor instream work is done to deflect flows around the coldwater seeps. During the September 22, 2004, section 10(j) meeting in Augusta, Maine, the USFWS and the MDIFW stated that their recommended flows and the continued viability of the coldwater refugia are not mutually exclusive. The agencies also stated that the configuration and location of the seeps are such that realigning some instream boulders can readily protect them. Interior, as part of its terms and conditions, recommends that the Commission require post-licensing monitoring of water temperature in the bypassed reach be conducted in consultation with the MDIFW and the USFWS.

At the September 22, 2005, section 10(j) meeting, staff requested information from the USFWS and the MDIFW on the nature of any channel maintenance work that could be implemented to protect the coldwater seeps at higher flows. On October 13 and 14, 2005, the MDIFW filed the requested information. The basic elements of the potential habitat enhancement work are summarized below.

The MDIFW's filings identify the two seeps as upper and lower springs.

Kleinschmidt (2002) does not identify the location of the two evaluated seeps, but simply refers to the refugia as seeps A and B. The information in the record does not allow us to reconcile Kleinschmidt's and the MDIFW's seep designations.

[60]
According to the MDIFW, the lower spring is located in a protected backwater area not influenced by river flows except when flows are high enough to enter a small side channel that conveys flows directly to the spring. The entrance to this side channel is about 6 feet wide and 1.5 feet deep. The MDIFW's plan calls for "plugging" the channel entrance with rock from the surrounding area. Smaller aggregate material would be used to fill the voids. The upper spring originates as a first order stream in the adjacent riparian corridor. The stream empties into a back watered area adjacent to, and partially separated from, the river's influence by a natural vegetated boulder jetty.

The boulder jetty limits inflow from the main river channel during low flows.

[61]
The upper spring is also affected by flow from a side channel, which is about 10 to 12 feet wide at its entrance and a 1 foot or less in depth. The MDIFW would protect this seep by (a) plugging the side channel entrance, and (b) augmenting the existing natural rock jetty with additional large rock aggregate to better isolate the spring and backwater area. The work would be performed with either a tracked backhoe or manual labor.

Study data indicates that flows in excess of 115 cfs are likely to affect the ability of the existing coldwater seeps to function as important thermal refugia for salmonids in the bypassed reach, primarily from June through August. The instream channel work recommended by the agencies is rather simple in design, and could help protect the thermal refugia in the bypassed reach at flows higher than 115 cfs. However, the agencies' recommended measures raise more questions than provide answers.

The intent of the recommended measures is to protect the integrity of coldwater seeps under higher flow releases to the bypassed reach. We agree with the need to protect these important habitats. However, implementing the measures being considered by the agencies could result in unintended and unanticipated adverse effects on other aquatic resources and riparian habitats within the bypassed reach. For examples, side channels serve important environmental functions. These areas provide food resources for fish and wildlife, as well as habitat used by aquatic organisms on a seasonal basis. Eliminating flow to these side channel areas could disrupt and significantly affect these natural processes. Moreover, stream habitat alterations could lead to channel down-cutting or other forms of erosion along the stream bank. Also, depending on the design, high spill flows (e.g., flood release flows) could destroy or damage the structures, resulting in on-going maintenance issues. These concerns are supported by Rosgen (1996), which states that physical habitat enhancement measures must match the natural, stable characteristics of a particular river. If decisions regarding habitat enhancements do not address channel morphology and the corresponding stable dimension, pattern and profile, the effectiveness of the enhancement would be diminished.

The MDIFW's October filings provide little insight into how the principles of river morphology were factored into the development of the recommended habitat enhancement, nor do the filings address the implications to other natural processes. Consequently, our analysis is incomplete and speculative at best.

In addition, we assume that instream channel work would require a Maine Waterway Development and Conservation Act permit from the MDEP. It is not clear, based on MDIFW's filings that the MDEP would issue a permit for this work.

[62]

As an alternative to the instream habitat work, Interior's recommended post-licensing water temperature monitoring in the bypassed reach, as discussed more fully in section V.C.2, Water Resources, would provide valuable information and guidance to S.D. Warren and the resource agencies regarding the adequacy of any new flow regime established for the bypassed reach, and the need for changes to the flow regime or other measures.

FOSL notes that the MDIFW's concerns regarding higher minimum flows are an artifact of MDIFW's refusal to restore passage for native brook trout and salmon at the Eel Weir dam. FOSL states that any effect of higher flows on "spring holes" in the Eel Weir bypassed reach would be fully compensated by the ability of adult brook trout and salmon to migrate into Sebago Lake during periods of higher water temperatures. We do not address this comment here. Rather, passage needs for trout and salmon at the Eel Weir dam are discussed in a subsequent section of this document.

Angler Suitability

At 79 cfs, several angling suitability rating categories were strongly rated as "good" or "excellent," including the ability to walk the shoreline, wadeability, effectiveness of fly presentation, and aesthetic quality (see Figure 4.19 in Kleinschmidt, 2002).

The number of quality fishing areas and overall suitability were rated as "fair" or "good" at 79 cfs. The ability to cast to desirable areas in the bypassed reach received mixed ratings. At 115 cfs, nearly all angling suitability rating categories were strongly rated as "good" or "excellent," while 172 cfs appears to slightly reduce the overall angling suitability in the bypassed reach (see Figures 4.20 and 4.21 in Kleinschmidt, 2002). At 310 cfs, the bypassed reach was rated strongly as "unacceptable" or "poor" (see Figure 4.22 in Kleinschmidt, 2002).

The data show that at no single flow did anglers agree unanimously that conditions were optimal. However, the survey did show that favorable angling conditions exist in the bypassed reach at flows of 79, 115, and 172 cfs. Angling suitability in the bypassed reach was unanimously rated as poor or unacceptable at a flow of 310 cfs. However, no entity has recommended flows of this magnitude for the bypassed reach and high flow events are rare in the reach. Therefore, any potential effects to anglers resulting from operation of the project would be infrequent and short-lived.

The MDIFW and Interior recommend minimum flows of 200 cfs in the summer and 115 cfs in the winter, in part, to enhance angler wadeability/fishability. The MDIFW states that these flows would provide better angling conditions, thereby increasing the opportunity to catch fish. The MDIFW also states that the higher flows would enable more anglers to fish the bypassed reach, reducing the potential for crowding. While we do not dispute MDIFW's statements, we note that the MDIFW has presented no evidence to suggest the flows it recommends would be any better than lower flows. In fact, the angler survey suggests that lower flows provide high quality habitat and adequate wading conditions in the bypassed reach.

American Eel Passage

The American eel is a catadromous fish species that occurs in Sebago Lake and the Presumpscot River (S.D. Warren, 2002a). Catadromous species mature in freshwater, but must spawn in salt water to complete their life cycle. During the late summer and fall, adult silver eels migrate downstream in the Presumpscot River to spawn in the Sargasso Sea, located in the southwestern North Atlantic Ocean.

In gaining access to Sebago Lake, American eel surmount six other S.D. Warren-owned dams, the North Gorham dam, as well as the Eel Weir dam (letter from George D. Lapointe, Commissioner, MDMR, to Magalie R. Salas, Secretary, FERC, November 25, 2002). Fishermen with MDIFW permits have harvested adult eels at the outlet of Sebago Lake. In addition, MDIFW biologists commonly catch eels during surveys in water above Sebago Lake. Notwithstanding the presence of American eel in Sebago Lake, the Eel Weir Project may affect both upstream and downstream eel migrations. Because the project currently lacks upstream and downstream eel passage, it represents a potential barrier or delaying factor to upstream migration of elvers and young yellow-stage eels. The project also likely causes an undetermined level of turbine mortality of yellow-stage eels and downstream migrating silver eels.

The goals of the MDMR and the ASMFC are to (a) protect and enhance the abundance of American eel in inland and territorial waters, and (b) contribute to the viability of the spawning population, in part, by providing access to inland waters for juveniles and adequate escapement to the ocean of pre-spawning adults. To this end, the MDMR and Interior recommend that S.D. Warren: (1) install permanent upstream passage facilities for eel within 2 years of licensing;

Wippelhauser et al. (2001) calls for the construction of upstream eel passage facilities at the Eel Weir dam within 2 years after issuance of any new license.

[63]

(2) install permanent downstream passage facilities for eel within 120 days of licensing;

The facility would consist of opening a deep river gate at the spillway, as described in downstream passage option #3 (S.D. Warren, 2002a). The facility would be operational from August 15 to November 30, during the period from licensing until the completion of S.D. Warren's proposed 3-year study to assess the timing of peak downstream eel movement in the Presumpscot River is complete. Interior states that the facility should be operated 8 hours/day during this period. Based on the study results and consultation with the resource agencies, the operational period could be adjusted.

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and (3) consult with the resource agencies on the design, location, and effectiveness testing of the upstream and downstream eel passage facilities. The MDIFW recommends that any downstream eel passage measures developed for the project minimize the number of resident fish and landlocked Atlantic salmon diverted from Panther Run, located at the north end of Jordan Bay; see figure A-1 in Appendix A) to the Eel Weir bypassed reach.

S.D. Warren agrees to provide upstream and downstream eel passage at the Eel Weir Project (letter from Nancy J. Skancke, GBRSE, to Magalie Roman Salas, Secretary, FERC, September 17, 2003). However, S.D. Warren does not agree that eel passage is warranted at the project at this time. Rather, S.D. Warren proposes to consult with the MDMR and the MDIFW concerning the need for eel passage at the project following installation/implementation of eel passage facilities or measures at all six of lower Presumpscot River projects, including North Gorham.

Our Analysis

Upstream Eel Passage

Research on American eel has been conducted for decades. However, there are little data available on the exact habitat requirements, behavior, and migratory patterns of this panmictic species.

Panmictic species are widely distributed species in which random spawning occurs throughout the population, resulting in complete mixing of the gene pool.

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In the last 10-15 years there has been increased focus on American eel for two main reasons: (1) significant declines in elver recruitment to the St. Lawrence and other rivers along the eastern United States (Castonguay et al., 1994a, 1994b; Lary et al., 1998; Haro et al., 2000; Geer, 2003); and (2) large increases in demand for all eel stages (except for the leptocephalus stage) as growout stock for aquaculture, food, or bait (Committee on American Eel Management in Maine [CAEMM], 1996). The factors most often cited for the decline in populations include anthropogenic effects such as loss of available habitat from the construction of dams, entrainment or impingement at hydroelectric facilities, water quality or toxicity issues, fishing pressure, commercial harvesting of sargassum (affects larval populations), oceanographic influences such as changes in Gulf Stream current patterns, or other climatic changes (EPRI, 1999; Verdon et al., 2003).

The data set available for eel collections or harvest on the Presumpscot River is insufficient to determine whether there have been significant decreases in glass eel and elver recruitment similar to those found by other researchers. There is, however, discernable evidence of upstream migration delays caused by hydroelectric dams (FERC, 2002). For example, results from the 1997 baseline fisheries survey on the lower Presumpscot River indicated that CPUE values for the Dundee impoundment were much lower than the next lowest CPUE (5.5 eels/hour in Dundee, compared to 15.3 eels/hour in the Gambo impoundment.

The success rate of upstream migration over or past dams without fish passage facilities is unknown (FERC, 2002). Factors such as dam height, roughness of the spillway material, angle of the spillway surface, flashboard height, flow levels and potential pathways around the dam are all confounding factors in determining percent success rates for migrating elvers and yellow eels.

Several hundred eels were observed at the base of S.D. Warren's five lower Presumpscot River dams during an upstream eel migration study (Kleinschmidt, 2000). Nine of these eels were confirmed migrating over the Saccarappa dam, although it is unlikely that the investigators observed all possible passage routes at all the projects. A study of a pipe style upstream eel passage device by Mitchell (1985, as cited in Clay, 1995) found that 150 eels per hour were passing out of the pipe and over the dam. Intuitively, this suggests much higher success rates for eels using upstream eel passage compared to unaided eels. Other studies examining upstream passage efficiency variously describe upstream migration success as 57 percent (Dumont et al., 2000; Verdon et al., 2003) and 85 to 90 percent (Verdon, 1998). Review of these studies suggests that overlapping size class ranges between year classes and sexes, multiple year migrations, and extended residency times all complicate the process of estimating passage efficiency.

Based on the evidence presented in this case, we conclude that, although some eels are successfully migrating upstream over the Eel Weir dam into Sebago Lake and points upstream, the lack of upstream eel passage facilities at the dam is likely limiting the upstream movement of eels, at a time when the fishery management agencies are making significant commitments to protect and restore the species. Providing upstream passage at the Eel Weir dam would increase (and provide) access to important habitat in Sebago Lake and its tributary streams.

Notwithstanding the potential benefits provided by upstream passage, Haro et al. (2000) states that, in the case of hydroelectric dams, the benefit of upstream eel passage must be weighed against the cost of turbine mortality when eels later migrate downstream. Haro et al. (2000), however, further states that the increase in production by simply moving eels into underutilized habitats upstream of barriers may outweigh decreases in reproductive contribution caused by turbine mortality.

Interior and the MDMR recommend that upstream eel passage measures should be installed at the Eel Weir dam within 2 years of license issuance. S.D. Warren argues that installing eel passage at Eel Weir is premature, citing the lack of eel passage at downstream dams. We disagree that eel passage would be premature for the following reasons. First, as acknowledged by S.D. Warren, eel passage has been required at its five projects on the lower Presumpscot River.
105 FERC * 61,009 through 61,013 (2003).

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These facilities would provide eel access to habitat in the river up to the North Gorham dam, which currently does not have eel passage. Second, the North Gorham dam does not appear to be a complete barrier to eel movement in the Presumpscot River, as eel occur in the Eel Weir bypassed reach and Sebago Lake. These eel would benefit, incrementally, from passage at the Eel Weir dam, independent of passage at the other dams on the Presumpscot River.

Although some eels would be lost to turbine entrainment, we conclude that installation of upstream eel passage at the Eel Weir dam would provide a net benefit to the American eel, due to the enhanced access to upstream habitats. We make our recommendation concerning upstream eel passage in section VII, Comprehensive Development and Recommended Alternative.

Downstream Eel Passage

Downstream movement of yellow-phase eels and passage of adult downstream migrant eels at hydroelectric projects and other barriers has become an issue of concern for resource agencies, due to recent population declines (Haro et al., 2000; as cited in Haro et al., 2003). Turbine-related mortality for eels has been estimated, in many cases, to > 25 percent, due to the large size of yellow and adult eels (EPRI, 1999). In the case of large eels (> 27 inches), mortality ranges from 40 to 100 percent (McGrath, 2000; ASMFC, 2000; Haro et al., 2000). In addition, rates of turbine-induced injuries can be as high as 50 percent for small eels (9-33 inches; Berg, 1986 as cited in Haro et al., 2003) and up to 100 percent for large eels (greater than 28 inches; Monten, 1985 as cited in Haro et al., 2003).

The Eel Weir Project is equipped with Hercules turbines and has a hydraulic head of 40 feet. These project characteristics would influence the project's overall effect on eel mortality. In addition, mortality rates would also depend on turbine size and runner speed, with smaller, faster turbines increasing the potential for blade strike on the adult eels. Another key feature of a hydropower project that would affect fish mortality rates is the presence of any fish exclusion devices. The Eel Weir Project is currently equipped with a 3/4-inch bar rack at the power canal intake, which is sized to prevent the passage of most larger-sized fish (e.g., adult landlocked salmon, lake trout, and adult eel).
To determine appropriate protection measures (to avoid escapement), the primary size consideration is the girth width of the targeted species. The girth width for downstream migrating eel at Eel Weir is anticipated to be around 0.68- to 0.83 inches (memo from Jeff Murphy, Kleinschmidt Associates to Tom Howard, S.D. Warren Power Company, dated January 2002; cited in S.D. Warren [2002a]). Although the girth width may be less than 1 inch, the USFWS typically requires a maximum 1-inch clear spaced bar rack to exclude eels. The USFWS also indicates that eels elicit a searching behavior when confronted with a barrier to movement and appear to be guided by devices angled to the main flow direction (S.D. Warren, 2002a; Richkus and Dixon, 2003).

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This feature is designed to minimize fish entrainment, and ultimately mortality at the project.

Based on mortality data from other hydropower projects (FERC, 2002), the Eel Weir Project could exhibit mortality estimates in the range of 15 to 20 percent, or possibly higher for some larger eels. However, given the presence of the 3/4-inch bar rack, we would expect the Eel Weir Project to exhibit a considerably lower mortality rate.

The long-term effects of turbine mortality on out-migrating eels from projects on the Presumpscot River are unknown. Some researchers have suggest that the American eel population is declining, although the cause for the decline in unknown (Castonguay et al., 1994a). Castonguay et al. (1994b) investigated oceanographic changes, commercial overfishing, chemical contamination, and habitat modifications (includes hydropower development) as potential causes of the eel decline, but their analysis was inconclusive. Nonetheless, Castonguay et al. (1994a) suggest that that increased eel passage survival at hydropower projects would aid in the recovery of the eel population.

The MDMR states that their management objective for American eel in the vicinity of the Eel Weir Project is to provide adequate downstream passage and escapement to the ocean of pre-spawning adult eels. To this end, the MDMR requested that S.D. Warren evaluate alternatives for downstream eel passage and protection measures at the project.

To date, no technology has emerged that has proven effective for downstream eel passage at hydropower projects. Resource agencies typically require additional features to conventional fish passage systems for anadromous fish species that may or may not promote eel passage. At the Eel Weir Project, downstream eel passage is unique in that the downstream escapement of non-targeted species must be minimized to meet the MDIFW's management objectives for Sebago Lake.

Despite the infancy of downstream eel passage technologies, S.D. Warren evaluated three potential alternatives for downstream American eel passage at the project. These alternatives included: (1) installing a barrier net or fence into the upstream most portion of the canal to guide eels to the bypassed reach; (2) installing a closed spaced bar rack system in place of a barrier net; and (3) using a lighting system to elicit an avoidance response to guide fish to the river gate closest to the power canal. S.D. Warren did not consider project shutdown as a viable downstream passage alternative.

Project shutdown during eel migration periods provides 100 percent protection of migrants, but can be very costly because of lost power generation (Richkus and Dixon, 2003). We evaluated project shutdown in FERC (2002) and concluded that such a measure was warranted. Thus, the licenses for S.D. Warren's five other projects on the river included a requirement for project shutdown during the fall out-migration periods.

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Based on the current technologies available and eel movement characteristics, S.D. Warren concluded that eel passage via the existing river gates (option #3; memo from Jeff Murphy, Kleinschmidt Associates to Tom Howard, S.D. Warren Power Company, dated January 2002; cited in S.D. Warren [2002a]) would be the most cost-effective, efficient alternative for downstream eel passage at the project. The MDMR and Interior concur with S.D. Warren's proposed alternative.

We cannot quantify the effects of providing downstream eel passage at the Eel Weir Project. Nonetheless, it is reasonable to assume that offering a safe, efficient downstream passage route to out-migrating adult eel and yellow eel would be beneficial to the river's eel population. Therefore, we conclude that providing measures to facilitate downstream migration of eels at the Eel Weir Project would improve the survival rate of yellow eels and adults during their spawning migration. Depending on density-dependent effects and compensatory mechanisms experienced by eels during their time in the ocean, increased survival at the project also would likely increase the numbers of Presumpscot River eels contributing to the eel spawning population, and aid in the recovery of the eel population.

The MDMR and Interior recommend that any downstream eel passage facility be operated from August 15 through November 30 each year. The agencies also indicate that the facility should be operated 8 hours per day during the operational period. S.D. Warren's proposed operational parameters (annual and daily operational timing), however, are not consistent with the recommendations of the resource agencies.

Once installed, S.D. Warren would operate the downstream eel passage facility in accordance with the schedule established for its five downstream hydropower projects (FERC, 2002); 4 hours per night for four, 7-day periods (28 days total) during the fall out-migration period (August 31 to October 30). The timing of operation would be determined based on a 3-year downstream eel movement study for its five downstream projects. Following the study, S.D. Warren would consult with the resource agencies to determine the appropriate timing to operate the downstream eel passage facility.

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Current data on the migratory patterns of silver eels suggest that the downstream migratory period may encompass two or more months, from the end of August to the end of October (CAEMM, 1996). However, data from the St. Lawrence River show that 80 to 85 percent of all migrants were caught during 10 to 15 days in mid-October, even though the migration period occurred from mid-September to early-November. In addition, data from the MDMR for a number of sites in Maine indicate that the eel migration period ranges from 2 to 13 weeks, and averages 8 weeks, generally from late-August into early-November. This same data also indicate that the migration is often "spotty," not necessarily occurring in consecutive weeks, or in the same weeks from year to year. The duration of the peak of the run (we define as * 10 percent of the run occurring in one week), however, was generally only 3 to 4 weeks in duration.

The operational window recommended by the resource agencies at the Eel Weir Project is not consistent with the annual operational period set for the five hydropower projects on the lower Presumpscot River (i.e., end of August to end of October). 105 FERC * 61,009 through 61,013 (2003).

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The agencies' expanded window would likely afford incrementally greater protection to out-migrating adult eels, since it essentially would capture the entire migratory season. However, the resource agencies have not provided any environmental or biological evidence that their recommended 14-week operational window would be any better than the established 8-week window for the five lower Presumpscot River projects, or is otherwise needed to adequately protect the eel population in the Presumpscot River. As noted elsewhere in this EA, American eel are relatively abundant in the Presumpscot River and are found throughout the basin, including Sebago Lake.

The resource agencies and S.D. Warren also do not agree on the daily operational schedule for the downstream eel passage facilities. S.D. Warren proposes a 4-hour-per-night operational schedule, while the resource agencies recommend an 8-hour-per-night operational schedule. In FERC (2002), we concluded that the 8-hour-per-night schedule for 8 weeks was excessive, in that the MDMR data showed that the peak of the out-migration season typically occurs over a much shorter time period. We also concluded that the 4-hour-per-night schedule for four, 7-day periods, along with monitoring, would be sufficient.

S.D. Warren estimates, using the MDMR data, that its proposed operational schedule would protect an average of 87 percent of the run; the MDMR estimates that 43 to 47 percent of the run would be protected. In addition, Haro et al. (2003) found that suspending hydro operations on dates encompassing 25 to 75 percent of the cumulative eel catch (* 30 days; similar to S.D. Warren's proposed schedule) resulted in a reduction in eel mortality of 2/3 to 1/2, relative to normal operation.

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Notwithstanding our conclusions in FERC (2002), consistency among projects in the same basin, with regards to operational timing of fish passage facilities, would be important to the overall success and effectiveness of the protection measures.

Richkus and Dixon (2003) conclude that studies suggest that approaching or reaching sexual maturity is a necessary, but not the only condition for migration to occur, with water temperature, precipitation, and flow and moon phase triggering migration in most watersheds. Once migration is initiated, eels appear to move downstream at a rate consistent with flow velocity. Movement patterns are often significantly altered when obstacles (e.g., dams) are encountered. Downstream migrating silver eels appear not to use visual cues, but physically "bump into" barriers. Eels typically exhibit a "startle" response when encountering a barrier, as opposed to initiating search behavior. With regard to the window of operation for downstream eel passage facilities, Richkus and Dixon (2003) state that the accuracy of predicting when migration pulses will occur, based on statistical correlations, is generally low.

What our analysis suggests is that the time and duration of night-time migrations are not well understood. Nor do the experts agree on what type of eel passage facilities are needed to pass yellow eels and out-migrating adult eels and the timing of operation. The key to successful downstream eel passage would be whether the operations of eel passage facilities could be timed to coincide with peak eel movement, using "real-time" monitoring. S.D. Warren would need a monitoring program that could successfully detect when peak eel movement is occurring, or is about to occur. This movement depends on a number of environmental variables (river flow, water temperature, light levels, etc.), and predicting when peak movement would occur could be a difficult task. Thus, the 3-year monitoring study S.D. Warren proposes to conduct as part of the licenses for its other five Presumpscot River projects, as described in FERC (2002), would be an important part of any measures for protecting downstream eel passage.

During the September 22, 2005, section 10(j) meeting in Augusta, Maine, the MDMR modified its recommendation for eel passage effectiveness monitoring at the Eel Weir Project. Specifically, the MDMR notes that S.D. Warren is conducting a 3-year monitoring study of out-migrating eels at its five downstream hydropower projects, but that the Eel Weir Project is not included in the study.

The MDMR contends that eel migrating from Sebago Lake need to be sampled, as the timing of out-migration may not be the same as for downstream, riverine eels. However, the MDMR provides no new information to support its contention.

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Consequently, the MDMR recommends that an out-migration timing study be conducted at the Eel Weir Project, as well as an effectiveness study of the eel passage facilities.

Alternatively, the MDMR states, and we concur, that a well designed study could include both timing and effectiveness components.

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As previously noted, the 14-week operational window for downstream eel passage is not supported by information in the record. Nonetheless, differences in out-migration timing eels coming from Sebago Lake and those residing in the river may exist. The MDMR's recommended out-migration timing study would be a valuable tool in providing information to S.D. Warren and the resource agencies about eel migration in the Presumpscot River Basin. In addition, information from a study of this nature would advance the agencies' goals and objectives for eel management (i.e., protecting, enhancing, and restoring eel populations).

The MDIFW expresses concern, and recommends, that any downstream eel passage facilities installed at the Eel Weir dam minimize the potential loss of landlocked salmon to the Eel Weir bypassed reach. As proposed by S.D. Warren, eel passage flows would be provided through a modified leaf section that will replace one of the river gates. Passage would be provided for 4 hours per night for 28 days during the fall migration period. Atlantic salmon passage at hydropower projects has been documented to occur almost exclusively at night (Beland, et al., 2003). Therefore, limiting operation of the downstream eel passage to four late-night hours, instead of eight, as recommended by Interior and the MDMR, would minimize the chance that salmon would be passed to the bypassed reach.

In addition, Panther Run is the major tributary spawning area for landlocked salmon. The provision for eel passage at the Eel Weir dam is not expected to change this spawning behavior. Assuming the downstream flow provisions of the current LLMP remain in place, the total amount of flow exiting Sebago Lake would not change as a result of the installation and operation of any eel passage facilities at the project. As directed under the current LLMP, flows exiting Sebago Lake are capped at 1,000 cfs, unless the lake is above the target elevation and rising during the salmon spawning season of mid-October to mid-November. Flows of 1,000 cfs or less during the salmon spawning season do not divert salmon from Panther Run (FERC, 1997). Changes in the Lower Presumpscot River flow regime could affect salmon passage from Sebago Lake to the bypassed reach, either positively or negatively, depending on the changes in flow.

Interior and the MDMR recommend that downstream eel passage measures should be installed at the Eel Weir dam within 120 days of license issuance. S.D. Warren argues that installing downstream eel passage facilities at the dam would be pre-mature. As previously stated and for the same reasons described above for upstream eel passage, we disagree that installing eel passage facilities would be premature. Rather, we conclude that downstream eel passage at the Eel Weir dam would provide a significant benefit to downstream eel migrations, due to improved downstream passage and increased survival of silver eels (and some yellow eels) in the Presumpscot River. We make our recommendation concerning downstream eel passage in section VII, Comprehensive Development and Recommended Alternative.

Fish Passage for Land-locked Atlantic Salmon

The landlocked salmon is one of Maine's most highly prized sport fishes (MDIFW, 2004). In fact, a recent survey shows that more anglers fish for landlocked salmon than any other coldwater sportfish, except brook trout.

In eastern North America, landlocked salmon are native to lakes in Maine, New Brunswick, and Nova Scotia (MDIFW, 2004). Landlocked salmon are native to Sebago Lake, the Presumpscot River, and the Crooked River (Atkins and Foster, 1869; Kendall, 1935). Prior to 1868, landlocked salmon occurred in only four river drainages in Maine: the Penobscot (Sebec Lake); St. Croix (West Grand Lake); Union (Green Lake); and the Presumpscot (Sebago and Long Lakes). Attempts since that time were made to introduce landlocked salmon to virtually every state in the United States, and throughout the world. Outside Maine, fisheries for landlocked salmon currently exist in New Hampshire, Vermont, Massachusetts, and New York.

Prior to the construction of dams at the outlet of Sebago Lake, landlocked salmon traveled freely between Sebago Lake and the Presumpscot River, and used the upper Presumpscot River for spawning and nursery habitat (Atkins and Foster, 1869; Kendall, 1935). In fact, historic records indicate that Sebago Lake's landlocked salmon lived much like their sea-run cousins, spawning in the Crooked and Presumpscot Rivers and returning to Sebago Lake to feed and grow.

Historically, landlocked salmon returned to Sebago Lake after spawning, which supported, and continues to support, a native population of rainbow smelt (the salmon's main prey species.

[74]

FOSL contends that the Eel Weir dam prevents the natural migration of Sebago salmon between Sebago Lake and the Presumpscot River.

Sebago salmon that migrate into the Presumpscot River from Sebago Lake, via the Eel Weir spillway, are unable to move back into Sebago Lake to complete their life cycle (Kendall, 1935).

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In addition, FOSL states that artificial stocking of smelt and salmon to Sebago Lake and salmon and brook trout to the upper Presumpscot River is now required to replace the wild, self-sustaining populations which were formally abundant.

To restore free movement of land-locked salmon between Sebago Lake and the Presumpscot River, FOSL recommends that upstream and downstream fish passage be installed at the Eel Weir dam. FOSL states that installation of a simple fishway at the dam would allow sufficient wild reproduction of Sebago salmon in the upper Presumpscot River to eliminate the need for expensive, annual fish stocking of Sebago Lake.

The MDIFW stocks Sebago Lake with hatchery salmon each year to make up for lost natural reproduction.

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The MDIFW and Interior do not support fish passage for salmon at the dam.

Our Analysis

In their comments, FOSL presents much information to support their position regarding the viability of landlocked salmon in Sebago Lake and the Presumpscot River, and for fish passage at the Eel Weir dam. For example, this information includes:

* life history requirements for landlocked salmon, including the need for access to suitable habitat for spawning and juvenile development (Decker, 1967; Everhart, 1976), as well as access to lakes with healthy populations of rainbow smelt (Havey and Warner, 1970);
* evidence documenting the historic presence of landlocked salmon in Sebago Lake and the use of the Presumpscot River by these salmon for spawning and rearing, as well as current evidence of salmon spawning and juvenile development in the Eel Weir bypassed reach;
* evidence documenting the effects of the Eel Weir Project on Sebago salmon, with regards to blocking migration and dewatering spawning and rearing habitat in the Eel Weir bypassed reach;
* a review of Maine's comprehensive fisheries management plans and how passage (or lack of passage) at the Eel Weir dam relates to the fishery goals identified in those plans;
* evidence documenting the inability of the Eel Weir bypassed reach (due to the lack of smelt forage and water temperatures) to support a viable, self-sustaining population of landlocked salmon that meets Maine's fishery goals (14-inch legal size limit), in the absence of passage at the Eel Weir dam;

Nearly 85 percent of the salmon caught in the Eel Weir bypassed reach are < 14 inches in length.

[77]

and

* biological data (fish size) from the Jordan River (a tributary to Sebago Lake) that shows salmon having access to smelt consistently grow to a larger size (14 + inches) than those stocked in the Eel Weir bypassed reach where no smelt exists (Boland et al., 2003; Brautigam et al., 2004);

In addition to the landlocked salmon fishery in Sebago Lake, we reviewed information from Moosehead Lake, a storage reservoir in the headwaters of the Kennebec River in Maine (FOSL, 2005). Moosehead Lake, like Sebago Lake, is inhabited by a large population of landlocked salmon. However, unlike Sebago Lake, the outlet of Moosehead Lake is equipped with a working fish passage facility for salmon. This facility is operated by the MDIFW, specifically to allow adult landlocked salmon from Moosehead Lake to drop down into the Kennebec River to spawn, and to allow adult and juvenile salmon from the Kennebec River to move into Moosehead Lake.

Studies conducted by MDIFW fishery biologists in the upper Kennebec River show that wild landlocked salmon from Moosehead Lake spawn in the river (FOSL, 2005). In addition, studies at the Moosehead Lake outlet show that nearly all adult salmon, which drop out of lake to spawn in the upper Kennebec River, return to the lake within a year after spawning. These fish provide angling opportunities, not only in Moosehead Lake but in the Kennebec River as well. Finally, studies also show that wild juvenile landlocked salmon ascend the fish passage facility to enter Moosehead Lake. These fish, which are 6 to 8 inches long, remain in the lake until they're ready to spawn.

Based on our review of the aforementioned information, we conclude that FOSL makes a compelling argument for fish passage at the Eel Weir dam. Fish passage at the project dam would restore access to historically significant spawning and rearing habitat in the upper Presumpscot River, as well as provide access to smelt forage in Sebago Lake. This likely would (a) improve the condition (length and weight) of Sebago Lake's landlocked salmon, and (b) enhance the landlocked salmon fishery in Sebago Lake. Nonetheless, we cannot dismiss the MDIFW's fishery management goals for Sebago Lake and the Presumpscot River. Neither the MDIFW, nor the USFWS, supports the installation of fish passage facilities (except those needed for American eel) at the Eel Weir dam as a way to achieve the fish management goals for Sebago Lake and the Presumpscot River (i.e., the Eel Weir bypassed reach).

The MDIFW states that allowing fish to migrate from the Eel Weir bypassed reach into Sebago Lake could jeopardize a popular year round fishery in the bypassed reach. In addition, the MDIFW states that fish passage facilities at the Eel Weir dam would permit ripe, lake-stocked landlocked salmon to drop out of the lake. The MDIFW argues that these fish would not be available as brood stock at their salmon egg collection facility on the Jordan River, which supplies salmon eggs for much of Maine's salmon hatchery program.

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Our recommendation concerning fish passage for landlocked salmon at the Eel Weir dam is found in section VII, Comprehensive Development and Recommended Alternative.

c. Cumulative Effects

The Presumpscot River Basin has a rich history.

Information on the settlement of the area was taken from A Plan for the Future of the Presumpscot River, August 18, 2003.

[79]

The river was settled early in Maine's history (the first dam was constructed at Smelt Hill in the early 1730's). The power and water supplied by the Presumpscot River was important to the early development of the area. Without the river there would have been no mills and little development in the area. The Presumpscot River was the site of Maine's first pulp mill, first hydroelectric project, only significant canal, and the largest gunpowder mill.

The effect of this development on the river has been significant. No other river in Maine has virtually all its hydraulic head captured behind dams. In the 1840's concerns with pollution in the river began to surface. In the 1850's, the paper industry was established on the river, as well as a number of other industries, that added to the pollution problems.

Industrial and municipal treatment plant discharges to the river have been dramatically reduced since the 1960's. However, nonpoint sources of contamination from development and other land uses in the watershed have increased. Certain other effects from development activities in the basin remain today. One of the most significant changes to the natural river (i.e., altered hydrology) resulted from controlling flows from Sebago Lake, and the development of dams and impoundments on the river. This changed both the flows and character of the river, and altered water levels on Sebago Lake. In addition to altered hydrology, development resulted in changes to the river's water quality and recreational opportunities, as well as affected estuarine resources and the local and regional economy. Fish resources in the basin have been affected by: (a) blockage of fish passage for anadromous fish and the American eel; (b) fragmentation of habitats; (c) a shift in aquatic habitat from fast moving coldwater riverine to a series of slower moving impounded areas; and (d) deterioration of water quality.

For purposes of our environmental analysis, we identified the anadromous and catadromous fisheries of the lower river, and the efforts to restore these fisheries, as resources that could be cumulatively affected by the operations of the Eel Weir Project. In our above analysis, we describe the potential effects of the current flow release regime on these fisheries, compared to the flow regime that occurred prior to implementation of the LLMP. We conclude that the current flow regime has had an overall positive effect on these fisheries (table 27). Regarding Maine's recommended operating parameters, we conclude that the effects of such flows cannot be predicted with certainty, but may be similar to current operations.

Since the overall effect of the current flow regime in the Presumpscot River on anadromous and catadromous species would be positive, there would also be a positive effect on the restoration efforts of these species. Maintenance of good or improved habitat suitability would enhance the potential for successful spawning of the anadromous species. Any negative effect of higher flows during the American eel upstream migration period (table 27) would be offset by the installation of eel passage facilities on, at least, five of the lower Presumpscot River dams. Thus, we conclude that licensing the Eel Weir Project with the requirement to maintain the current LLMP, with its associated flow releases, would have an overall beneficial cumulative effect on the lower anadromous and catadromous river fisheries, and efforts to restore those fisheries. Assuming all the alternative plans proffered by various interests would result in similar flows in the lower Presumpscot River, the overall effects would also be beneficial. Maine's recommended operating parameters, especially when flows are reduced to raise the lake levels, could be detrimental to the fisheries and fish restoration efforts in the basin (e.g., if low flows are released during migration seasons, spawning periods, etc.).

As we said in FERC (2002), dams on the Presumpscot River obstructed passage of migratory fishes for at least a century. We further stated that dams have had less affect on American eel than other anadromous fish species (e.g., Atlantic salmon, American shad, and river herring), because of the ability of the eel to "climb" obstructions such as dams. As a result, eel are well-distributed within the Presumpscot River watershed, including Sebago Lake.

In the past, neither S.D. Warren nor any other dam operator provided specific eel passage measures at dams on the Presumpscot River. This changed with the licensing of S.D. Warren's five lower Presumpscot River projects; the licenses for the projects included provisions for upstream and downstream eel passage measures. We concluded in FERC (2002) that such measures to facilitate effective eel migration would have an overall beneficial cumulative effect on eel in the river basin.

Although barriers to eel migration, and other potential sources of mortality would remain in the basin (e.g., Cumberland Mills dam and North Gorham dam), relicensing the Eel Weir Project with eel passage measures would incrementally improve migratory conditions for the eel. Migratory delays and mortality associated with passage at the project would be reduced, and distribution of eels within the basin would be enhanced. Survival of eels within the river would be improved. This would have a positive, but unmeasurable effect on the eel population.

The construction of dams, along with other factors such as water pollution and overfishing, eliminated anadromous species from most of the Presumpscot River Basin where they once occurred (FERC, 2002). Only a relatively small run of river herring and a remnant population of American shad remain in the lower river downstream of the Cumberland Mills dam. The sea-run Atlantic salmon no longer occurs in the basin, except for occasional reports of individuals whose origins are unknown.

Recent efforts to restore anadromous species to the river have included the construction of fish passage facilities at the outlet to Highland Lake and removal of the Smelt Hill dam. In addition, the licenses for S.D. Warren's five hydropower projects on the river included provisions to construct fish passage facilities at those projects in the future. In FERC (2002), we concluded that these projects, with the fish passage provisions included in their licenses, would not have any adverse cumulative effects on any fish restoration programs on the river.

The fishery resource agencies do not recommend fish passage at the Eel Weir dam at this time. Therefore, where it concerns fish passage for anadromous fish, the continued operation of the Eel Weir Project without such passage facilities would not have any negative adverse cumulative effects on any programs to restore anadromous fishes to the river.

d. Unavoidable Adverse Effects:

Operation of the Eel Weir Project under the current LLMP would result in unavoidable adverse effects to littoral areas and fish spawning success by affecting near shore aquatic habitat and macrophyte growth. Resident, shallow-water species would continue to be subjected to the lake level management regime, potentially affecting fish utilization of shallow, littoral-zone habitat. These effects are expected to be minimal in Sebago Lake. Changes to the LLMP which result in lower lake levels, particularly during the biologically productive season(s), would exacerbate these adverse effects. Changes to the LLMP that would increase lake levels during the growing season would enhance near-shore conditions.

Dams on the Presumpscot River, including the Eel Weir dam would continue to fragment aquatic habitat. However, the connectivity of aquatic habitat would be improved through implementing eel passage measures at the project. Unimpeded movement between Sebago Lake and the Eel Weir bypassed reach, for land-locked Atlantic salmon, would continue to be hindered in absence of appropriate fish passage facilities for that species.

Entrainment of resident species residing in Sebago Lake would continue to occur, at some level. The existing fish exclusion structure located at the entrance to the power canal would minimize the effects of entrainment. Consequently, we do not expect any adverse effects on the fish population in the lake. Similar effects would likely occur with the American eel. Although, compared to existing conditions with no provisions for eel passage, implementing appropriate passage measures at the project is expected to enhance eel passage through the project area.

4. Terrestrial Resources

a. Affected Environment:

Terrestrial Habitat and Wildlife

The Eel Weir Project is located in the Northern Hardwoods Ecoregion, and the predominate forest type is a mixed hardwoods and coniferous forest. Predominate land cover types in the project vicinity are Forested Uplands and Palustrine Wetlands (54 percent), residential (32 percent), roads (10 percent), Urban/Industrial and Commercial (4 percent), and agricultural (<1 percent).

The mixed hardwood coniferous forest is dominated by sugar and red maple, red oak, American beech, white and yellow birch, quaking aspen, white pine, and hemlock. However, the immediate project shoreline around Sebago Lake is primarily coniferous. The shoreline along the Presumpscot River (i.e., along the Eel Weir bypassed reach) is a good example of the second growth mixed hardwood-coniferous forest type. S.D. Warren owns 292 acres of this important terrestrial habitat.

The mixed hardwood-coniferous forest is characterized by several different height classes of vegetation in the understory and a mature overstory, with microhabitat features such as snags and dead-and-down wood with heavily vegetated forest floors. Therefore, wildlife species are varied and abundant, which include small mammals such as, mice chipmunks, and squirrels, and larger mammals such as fox snowshoe hare, black bear, and white-tailed deer. Bird populations of this forest type include red-eyed vireo, woodpeckers, warbles, northern water thrush, ruffed grouse, mourning dove, and hawks.

Wetlands

Wetlands are relatively limited on the Sebago Lake margin, because the shoreline is generally well defined and moderately sloping, transitioning abruptly from the normal high water level of the lake to well-drained soils. Many of the wetlands that do exist within the project area rely on periodic inundation during high lake levels and/or wicking of lake waters as the primary hydrologic inputs. There are other wetlands that are either located along tributary streams or are fed by runoff from the watershed, and, therefore, do not rely on lake water levels.

S.D. Warren conducted a wetlands inventory survey in 1998 around Sebago Lake (Normandeau, 1999). Surveys extended approximately 250 feet landward from the shoreline around Sebago Lake and in the area between the project dam and powerhouse. Surveys delineated 545 acres of terrestrial habitat wetlands and 418 acres of aquatic habitat wetlands (S.D. Warren, 2002b). Of these wetlands, approximately 46 percent of the terrestrial wetlands and about 80 percent of the aquatic wetlands are located within the project boundary. Terrestrial wetlands within the project boundary include 107 acres of palustrine emergent marsh, 81 acres of palustrine forested, and 63 acres of palustrine scrub shrub. In the Eel Weir bypassed reach, which was not included in the wetland survey area, there are approximately 7 acres of additional palustrine wetlands including 6 acres of scrub shrub, less than 1 acre forested, and less than 1 acre emergent.

The wetland survey found approximately 220 acres of aquatic beds within the project boundary. This is less than 1 percent of the total surface area of the lake. The aquatic beds that occur in Sebago Lake are in wind-protected coves and embayments where fine sediment has accumulated in the shallows, allowing for the growth of rooted vegetation (Normandeau, 1999). The largest aquatic beds are concentrated along the northern shores of the lake at Sebago Cove inlet, at the mouth and in the Songo River, in Kettle and Turtle Coves, and in the vicinity of Jones Beach.

Wetlands Monitoring and the LLMP

S.D. Warren conducted a wetlands inventory and monitoring program, in accordance with the 1997 FERC Order to monitor the effects of the LLMP on wetlands within or adjacent to Sebago Lake. The 1998 through 2002 monitoring program was conducted along five baseline transects that were to represent wetland conditions from all portions of the lake (Normandeau, 2003) (figure 23). Each transect was divided into segments, starting closest to, or within, the lake and extending landward. Vegetative quadrants were established at the midpoint of each segment and varied in size depending on the type of vegetation. For the herbaceous strata, one 86-square-foot quadrant was laid out, while two 172-square-foot quadrants were surveyed for shrubs. The tree strata had two 1,076-square-foot quadrants. The total length of the five transects, which may vary each year according to the type of vegetation surveyed, ranged in length from about 35 to 76 meters (115 to 250 feet). Results of the monitoring program are presented in Appendix C of this EA.

Figure 23.Wetland monitoring transects locations. (Source: Normandeau, 2003)

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Plant species composition and overall density in Transect 1, located in an oxbow area between the Songo River and the Sebago State Boat Launch (figure 23), changed very little throughout the five year study period (Normandeau, 2003). The minor changes that did take place were mostly observed in the herbaceous plots closest to the lake end of the transect line. Emergent vegetation density increased dramatically in Segment 1 (the emergent zone). Segments 2, 3, and 4 all showed a slight decrease in total plant density. The decrease in total dbh (in inches, used to measure species dominance/percent cover for the tree vegetative strata) measured in Segment 3 is the result of the elimination of a large tree located along the plot boundary that had been counted in the earlier years of the study.

Transect 2 is located on the northeast side of Raymond Neck, southwest of Jones Beach (figure 23). The plant species composition and overall density of the vegetation plots along Transect 2 varied only slightly throughout the five-year study period (Normandeau, 2003). As with Transect 1, most of the observed changes occurred within the herbaceous plots closest to the lake end of the transect line. The total herbaceous cover in Segment 1 varied from year to year. The width of this segment increased by 8.2 feet in 2002, meaning the amount of palustrine emergent marsh wetland increased in this location. Segment 2 decreased by 1 foot in 2002, with a decrease in herbaceous species diversity and total percentage cover in the shrub plot. Vegetation diversity in the herbaceous plot increased in Segment 3 during the later years of the study.

Transect 3 is located to the northwest of Jones Beach (figure 23). There was only a slight variation in plant species composition and overall density throughout the five-year study period (Normandeau, 2003). The open water zone of Segment 1 increased by approximately 6.6 feet and the total vegetation cover decreased slightly, resulting in a minor loss of emergent marsh vegetation in this location. The total vegetation cover increased substantially in Segment 2, along with an increase in species diversity. Segments 3 and 4 showed a gradual increase in estimated total cover in the shrub plots over the five-year study period. There was a dramatic increase in total cover in the shrub plots in Segments 5 and 6.

Transect 4 is in a large wetland system that drains into the lake from Rich Pond, located in Stickey River Cove to the north of Smith Mill Road (figure 23). There was only minor variation in species composition and density throughout the five-year study period (Normandeau, 2003). The species diversity increased in Segment 1. There was a high degree of disturbance to the shrub layers in Segment 2 due to both animal and wetland survey activity. The shrub plots on Segment 2 had changes in total percentage cover and dominant species composition, with a general increase in cover and in the total number of dominant species. The total cover of the shrub plots in Segment 3 increased throughout the study, with a slight change in species composition.

Transect 5 is located to the south of Smith Mill Road (figure 23). Although plant species composition and overall density in the vegetation plots varied only slightly throughout the 5-year study period, there were some minor changes (Normandeau, 2003). The open water of Segment 1 became vegetated by year 5 of the study and merged with Segment 2. There was a decrease in percentage total cover in the herbaceous plot in Segment 2. Segment 3 showed a small but consistent increase in total percentage plant cover in most of the herbaceous, shrub, and tree plots.

Overall, the wetlands monitoring program showed only minor differences in the vegetation data collected over the five-year period. The most noticeable changes were generally observed in the herbaceous plots closest to the lake end of the transect line, where the width of the open water and/or emergent areas fluctuated, and total vegetation cover and diversity increased. The total cover within the tree and shrub plots was generally stable over the five years, with no decline in woody species observed (Normandeau, 2003).

b. Environmental Effects:

Effects of LLMP on Wetlands

S.D. Warren proposes only minimal changes to the operation of the Eel Weir Project that could affect wetlands. S.D. Warren proposes to continue operating the project in accordance with the existing LLMP with the exception of establishing a 3-inch tolerance range for the August 1 target level. This modification would allow slower lake level withdrawals when rain events occur in late July and early August. S.D. Warren also proposes to replace the existing wetlands monitoring program with a similar monitoring program, having a 5-year monitoring cycle. S.D. Warren contends that the reduction in monitoring frequency is warranted because the results of the existing monitoring program have shown, to date, no effects associated with the LLMP.

Interior did not make any specific recommendations relating to the LLMP's effects on wetlands. Interior, however, states that lake level fluctuations affect wetland habitat and that the lake should not be drawn down more than 2 feet during the growing season. The MDIFW, similarly, did not make any wetland specific recommendations or comments. However, the MDIFW recommendation to implement a fall/winter drawdown to reduce lake trout spawning success, would include a 5- to 8-foot drawdown beginning in late November and possibly extending into mid-winter.

The MDIFW's recommendation for a late fall/winter drawdown would have little, if any, affect on wetlands, as it would be outside the growing season.

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Other entities made recommendations regarding changes to the LLMP for varying reasons. Most of these recommendations involve small modifications to the lake levels required by the existing LLMP. We summarize these recommendations in section III.D.

Maine recommends changes to the LLMP to better ensure that suitable water levels are achieved to appropriately balance the competing uses of the lake. Several entities filed comments on Maine's recommended changes to the LLMP, including S.D. Warren, FOSL, Stephen Kasprzak, and numerous private citizens. Nearly all the letters oppose at least some parts of Maine's plan, with the primary concern being the potential for increasing beach and shoreline erosion. S.D. Warren's indicates that if the State's recommended changes are adopted, further modifications to the LLMP are warranted.

Our Analysis

The 1997 EIS analyzed the effects of lake level management on wetlands. At that time, we determined that the water levels specified in the LLMP mimicked the natural hydrograph, maintaining relatively stable water levels early in the growing season with a gradual decline through the remainder of the year (FERC, 1997a). The EIS concluded that the recommended alternative, which would set the standards for the LLMP, would minimize impacts to wetlands and associated fish and wildlife species by maintaining stable water levels during the optimum periods of fish and wildlife reproduction, and wetland plant development.

The EIS also concluded that the LLMP would not adversely affect wetlands because it would maintain water surface elevations above the MDIFW-recommended minimum lake elevation of 262.7 feet (Pierce and Eldridge, 1992), throughout the growing season (May 1 through September 15). In the five-year study period after LLMP implementation, Sebago Lake water levels were above 263.0 feet during all five growing seasons (Normandeau, 2003). The only year in which lake levels were below 263.5 feet during the growing season was 2001, an exceedingly dry year. In 2001, lake levels dropped below 263.5 feet around September 12, only a few days before the end of the growing season (S.D. Warren, 2003a).

The results of the wetlands monitoring study, in the five years after implementation of the LLMP, show minimal changes in the species composition and percent total cover of vegetation in the monitored wetlands (see Appendix C) (Normandeau, 2003). The most notable of the changes was an increase in the total percentage cover in many of the herbaceous quadrants. However, recorded percent of total cover, and even species composition, in wetland studies, can vary annually based upon a number of factors such as precipitation, temperature, animal activity, and individual differences in the surveyor's interpretation in the field, in addition to lake level variation.

Normandeau (2003) concluded that a definitive answer on the relative importance of water levels compared to other factors could not be determined using the limited data set of the study. During the study, there were two years of high lake levels (1998 and 2000), two years of low lake levels (1999 and 2001), and 1 year of moderate lake levels (2002). Fluctuating water levels may enhance the growth and expansion of emergent vegetation and result in greater plant diversity, which could at least partially explain the changes. However, the aforementioned non-lake level related factors also could be responsible for the variability in recorded wetland status. The wetland monitoring studies have not shown major wetland changes that would warrant modifying the LLMP at this time, and we are unable to definitely determine if or how the LLMP has contributed to the minor changes recorded thus far.

S.D. Warren's proposal includes only minor changes to the existing LLMP. As discussed in section V.C.2, Water Resources, the proposed 3-inch tolerance range for the August 1 target level is within the natural variation of the lake due to wind and wave action. As a result, this tolerance range would likely have no effect on wetlands.

Because only minor changes have occurred to the wetlands studied in the 5 years since implementation of the LLMP, and no changes are proposed to the LLMP that would affect wetlands, it is unlikely that relicensing this project, as proposed by S.D. Warren would have any effects on wetlands. Although the 5-year wetland monitoring study was unable to definitively conclude how much the lake level fluctuations caused the minor changes in herbaceous vegetation, the S.D. Warren-proposed wetlands monitoring program would continue to record any long-term changes in wetland cover and plant diversity. Any changes that may be observed through this monitoring could be addressed through the term of the license via continued agency consultations and license reopener provisions, if required.

Interior recommends that lake level fluctuations be limited to 2 feet from April 1 through December 15 to protect fishery and wetland resources. Although the LLMP allows an approximately 3.8-foot fluctuation, from 1987 to 2002 the average lake level fluctuation during the growing season (May 1 through September 15) was less than 2 feet. S.D. Warren's proposal would essentially retain the same fluctuation levels as the current LLMP. There is no indication, based on the 5-year wetland monitoring study, that existing lake level fluctuations have resulted in any substantial changes in wetland vegetation. Therefore, although Interior's recommendation would guarantee lake level fluctuations would be < 2 feet during the growing season, it is not likely to result in any additional benefits to wetlands.

Maine recommends changes to the LLMP to ensure that S.D. Warren could meet suitable water levels for several competing interests. Although these changes are designed mainly to appease local landowners and recreational users, they would result in a minor benefit to wetlands as well. Because of slight changes in the target dates, ranges, and outflows from the lake, Maine's recommendations make it more likely that S.D. Warren would meet the target water levels. When target ranges are above 262.7 feet throughout the growing season, as with the state's recommendation, complying with these targets means there is less risk of occasional low lake levels that could adversely affect wetland health. As long as the lake stays above elevation 262.7 feet throughout the growing season, minor changes in target window dates or tolerance ranges would be unlikely to affect wetlands, because the variations would be within those expected under natural lake conditions.

Additionally, the state recommends moving the periodic (2 out of 9 years) low winter drawdown target date to December 1 (from November 1). This would eliminate the need for occasionally lowering the lake level below the recommended minimum elevation for wetland health at the end of the growing season. To achieve 261.0 feet on November 1 in 2 out of 9 years, as the current LLMP mandates, the water level periodically dips below 262.7 feet prior to the September 15 end of the growing season, unless S.D. Warren passes large amounts of water through the bypassed reach to quickly draw down the lake, which would adversely affect recreational fishing in the bypassed reach. This drawdown (to elevation 261.0 feet) could result in difficulty refilling the lake to meet spring targets in dry years. Maine's recommended revision to the LLMP that would ensure the spring target elevations are met every year could result in a minor benefit to wetlands. There would be little risk the lake level would be below the recommended minimum elevation for wetland health early in the growing season.

S.D. Warren's suggested changes to the LLMP, in response to Maine's recommended revisions, would have minimal effects on wetlands. An alteration in the winter target level from long-term median levels to 262.0 feet would have no effect on wetlands because it is outside the growing season. A provision to allow S.D. Warren to temporarily alter downstream flow releases in the case of flooding conditions, resulting in lake levels temporarily and infrequently rising above the spillway elevation by up to 6 inches, would not be a substantial change from existing conditions. Currently, the LLMP allows for the same conditions, with levels being above the spillway for approximately two weeks during the growing season in both 1998 and 2000. From 1910 to 2004, the lake level has been above the spillway elevation approximately 5 percent of the time. As a result, no adverse effects to wetlands are expected.

Both FOSL and Stephen Kasprzak recommend LLMPs that would have more frequent and greater winter lake level drawdowns than currently exist. In order to meet FOSL's and Kasprzak's recommendations of a November 1 drawdown to 261.0 feet every other year, 260.0 feet every 4 years, and 259.0 feet every 10 years, the lake level would need to be dropped below 262.7 feet prior to September 15, considerably more often and to a greater degree than with the existing 2 out of every 9 year drawdown to 261.0 feet, to allow time for the lake to be gradually drawn down to meet the target levels. As a result, these recommendations would likely result in adverse effects on wetlands as more of the wetlands would be dewatered during at least a portion of the growing season.

The Sebago Lake Coalition's recommended changes to the LLMP would have no effect on wetlands. Their recommended lake levels during the growing season are within the range of the current LLMP levels, with the exception of slightly higher levels in September. The wetlands monitoring study did show a slight increase in the percent cover within the lakeward herbaceous quadrants (most likely classified as "weeds"), but it is unlikely that the LLMP has caused this growth. Although the Coalition is concerned that lower water levels have caused increased growth of "weeds," the Sebago Lake water levels since the implementation of the LLMP have actually been higher than historic lake levels within the growing season. The periodic fall/winter drawdown to elevation 261 feet is outside the growing season and thus should not affect weed growth.

Shoreline Management Plan

Interior recommends that a shoreline management plan (SMP), or similar conservation measures, be prepared in consultation with the USFWS, the MDIFW, the Maine Department of Conservation (MDOC), and the MDMR, to protect riparian resources in the project area. Interior further states that the highly developed nature of most of the Sebago Lake shoreline, as well as lake level fluctuations, affect wetland habitat and the associated high value fish and wildlife resources associated with the shoreline. The USFWS provides no further details for its recommended SMP.

In its response to Interior's recommendation for the development of a SMP, S.D. Warren disagrees that a plan is necessary. S.D. Warren argues that due to the limited amount of land they own around the project and within the project boundary, it would not be appropriate for S.D. Warren to prepare a SMP for all of Sebago Lake, where most of the shoreline is owned and controlled by others.

Our Analysis

S.D. Warren owns approximately 292 acres of land in the area around the project structures and the bypassed reach. Only 11.7 acres are within the project boundary, which runs along the project canal at 262.65 feet, between the dam and powerhouse (S.D. Warren, 2002b). The dam, powerhouse, and other project structures occupy most of these 11.7 acres (letter from Nancy J. Skancke, Attorney, GKRSE, to Magalie Salas, Secretary, FERC, January 2, 2003). S.D. Warren owns 0.5 percent of the total lands around Sebago Lake, whereas 94 percent of the total land ownership is private.

As described above, the vast majority of the Sebago Lake shoreline is owned by a multitude of private landowners who are not required to abide by any license conditions imposed on S.D. Warren. However, S.D. Warren is responsible for the lands and waters within the project boundary that encompasses Sebago Lake within the 267.0-foot contour line. Responsibilities associated with overseeing the management of resources within the project boundary include supervising and controlling all non-project uses and occupancies of project lands and waters for the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. Temporary docks, seasonal water supply lines, marinas, dredging, sea-walls, rip-rap or any other developments within the project boundary are all activities that S.D. Warren is responsible for managing that could affect sensitive habitat such as wetlands.

The land that is owned by S.D. Warren in the project boundary is primarily occupied by project structures and is needed for project operations. However, it is possible that there are some undeveloped areas that would be suitable for protection, such as the wetlands located in the bay near the Songo River and Kettle Cove. Additionally, the bypassed reach, although not part of the project, contains second growth mixed hardwoods and coniferous forest and its associated wildlife, as well as several wetlands are on S.D. Warren-owned land. As discussed in section V.C.5, Recreational Resources and Land Use, S.D. Warren has considered putting the east side of the bypassed reach into a conservation easement with the town of Windham to maintain public access and recreation. The MDIFW would also like a perpetual easement for lands adjacent to the bypassed reach, so that the recreational availability of the lands and the bypassed reach would be preserved.

A SMP, as recommended by Interior, would help minimize adverse effects on sensitive wildlife habitat and wetlands from activities and temporary structures along the immediate shoreline. The SMP should include mapping efforts that identify these sensitive shoreline resources. S.D. Warren would then be able to manage and protect shoreline resources through a permit program, as discussed in V.C.5, Recreational Resources and Land Use, to ensure that private temporary docks, water supply lines, and other structures are installed properly and located in appropriate areas. In addition, protecting riparian and other sensitive habitat areas, on S.D. Warren-owned lands within 200 feet of the normal high water elevation, would enhance wildlife habitat, protect any wetland resources in those areas, protect valuable fish habitat, and minimize water quality effects. Because S.D. Warren owns little, if any, land around Sebago Lake, however, restricting the shoreline protection measures to lands owned by S.D. Warren would provide only limited protection to the riparian areas and other sensitive habitats. Under such conditions, additional lands, not presently owned by S.D. Warren or otherwise part of the project, may need to be identified for protection by the applicant. Finally, including the bypassed reach in the project boundary and within the SMP would ensure its protection from development and continued recreational value.

c. Unavoidable Adverse Effects:

None.

5. Recreational Resources and Land Use

a. Affected Environment

The lakes region of southern Maine offers an abundance of seasonal recreational opportunities. The region features Sebago Lake, the second largest lake in Maine with over 100 miles of shoreline encompassing a surface area of 28,771 acres. Sebago Lake is located within a 30-minute drive of Portland, making it a popular recreation destination. Recreation activities at Sebago Lake center on the lake and associated water-related activities such as fishing, boating, swimming, sun bathing, camping, walking, and enjoyment of the aesthetic beauty. Most of the recreational facilities operate from May through late September, and based on Sebago Lake State Park data, the majority of visitation occurs between Memorial Day and Labor Day. S.D. Warren does not own any recreational facilities or access points on Sebago Lake.

Public Recreational Facilities

Public recreational facilities surrounding Sebago Lake include Sebago Lake State Park, Tasseltop Beach (Halls Beach) and Songo Lock. The State Park, located on the north shore of the lake, hosts the majority of public beach sites on Sebago Lake. Tasseltop Beach, located on the eastern shore in the town of Raymond is the only other public beach on the lake. Facilities featured at these parks include three campgrounds with over 250 campsites, two day-use areas, boat ramps and a cabin rental. Songo Lock, near the State Park, provides access between Sebago Lake and Long Lake for small recreational boats and can carry anywhere from 1 to 15 boats at a time, depending on boat size and demand. In addition to the sites mentioned, there are 13 accessible boat launch sites located within both public and private recreation areas around Sebago Lake (figure 24).

Figure 24.Boat launch sites on Sebago Lake. (Source: FERC, 1997a)

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Private Recreational Facilities

Private recreational facilities around Sebago Lake include residents' private piers and beach front areas, private resorts, and private and commercial marinas. There is extensive summer home development along the Sebago Lake shore, which provides a substantial amount of private boat access and water based recreation. Figure 25 shows the location of the 14 private and commercial marinas located on Sebago Lake.

Figure 25. Location of commercial and private marinas on Sebago Lake. (Source: FERC, 1997a)

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Recreational Use

Day Use

Day use includes participation in activities such as swimming, sunbathing, picnicking, and hiking. The State Park monitors and calculates monthly use figures at its day use facilities. The estimated number of daytime users at the State Park and commercial marinas has increased since the inception of the LLMP (table 29). Since 1997, day use at the State Park has generally increased, with an overall increase of 125 percent. Day use of marinas and commercial recreational facilities has fluctuated, with an overall increase of 27 percent since 1997. As reported in table 30, total visitation to these facilities peaked at 18,500 in 2001.

Table 29. Day use estimates at Sebago Lake. (Source: S.D. Warren, 2003b)

Year	Sebago Lake State Park		Estimated Marina and Recreational Facilities	
	Visitors	% Change	Visitors	% Change
1997	69,407	N/A	12,500	N/A
1998	113,211	63	14,000	11
1999	186,275	65	12,000	-17
2000	136,463	-27	13,000	8
2001	166,061	22	18,500	30
2002	162,465	2	17,600	-5
Average (Total % change)	138,980	125	14,600	27

Overnight Use

Table 30 presents the overnight camper data for Sebago Lake State Park and the commercial recreational facilities. The data show that camping at the State Park has increased in most years since 1997, with an overall increase of 65 percent. Overnight use at commercial recreation facilities exhibited a significant decline from 2000 to 2001, but had a small increase in 2002, with an overall decrease through the period of 130 percent.

Table 30. Overnight use at Sebago Lake. (Source: S.D. Warren, 2002a)

Year	State Park		Marinas and Commercial Recreation Facilities		Total Overnight Users	
	Overnight Users	% Change	Overnight Users	% Change	Combined	% Change
1997	76,913	N/A	89,087	N/A	166,000	N/A
1998	84,354	10	75,646	-18	160,000	-4
1999	92,243	9	81,757	7	174,000	9
2000	89,403	-3	90,597	10	180,000	3
2001	90,971	2	39,000	-132	129,971	-28
2002	133,944	47	40,000	3	173,944	34
Average (total % change)	94,638	65	69,348	-130	163,986	14

Boating Access

Boat access to Sebago Lake is provided by boat ramps at the State Park, commercial marinas, the Town of Standish at the Water District, and the Songo Lock. Table 31 presents the estimated number of boat launchings at Sebago Lake State Park and use of Songo Lock. Since 1997, there was a 33 percent decline in boat launches at Sebago Lake State Park, off from the 1998 high of over 3,300 launches. The Sebago Lake State Park opens in April after ice-out, but daily tracking of visitors does not begin until May and ends in August. S.D. Warren states that the majority of launches at the State Park occur in April and May, coinciding with the opening of fishing season (S.D Warren, 2003b). S.D. Warren reported boat launch data for the months of May thru September; however, the reporting period is not consistent across all counts.

Table 31. Sebago Lake and Songo Lock boat traffic data, 1997-2002. (Source: S.D. Warren, 2003b; as modified by staff)

Year	Sebago Lake State Parka		Songo Lock Boat Trafficb	
	Boat Launches	% Change	Boat Trips	% Change
1997	2,522	N/A	10,573	N/A
1998	3,320	32	9,209	-15
1999	2,406	-28	11,501	20
2000	1,527	-37	10,201	-13
2001	1,832	20	10,862	6
2002	1,463	-20	10,638	-2
Average (Total % Change)	2,178	-33	10,497	-4

a State Park starts daily tracking of use in May and ends in August, and estimates use in other months based on a percentage of traffic counts.

b The Maine Department of Transportation operates the Songo Lock and maintains daily counts, which we assume is for the entire boating year.

Almost 80 percent of the boat traffic using Songo Lock occurs in July and August, with 18 percent occurring in June and September. Overall, use of Songo Lock has not shown any clear annual trend, with average use around 10,500 boat trips per year since 1997 (table 31).

Additional boat launching facilities are provided at marinas and commercial recreational facilities. The estimated number of slips available for use at marinas and similar facilities has steadily increased from 1999 to 2002 (S.D. Warren, 2003b), having additional effects on socioeconomics (see section V.C.7, Socioeconomics). The data from these sites indicate a dramatic increase in the estimated number of launches from 1997 to 1998, followed by a just as dramatic decrease in 1999 (table 32). Subsequent years indicate a general upward trend in boat launches with almost 6,700 launches in 2002. In 1999 and 2001, boat traffic at the Sebago State Park boat launch and Songo Locks experienced above average use, even though lake levels were below the LLMP targets. Boat traffic at Songo Locks in September 2001 was the second highest month during the 5-year recreation study, even though the lake level was below the LLMP target for the entire month.

Table 32. Boat launch data from marinas and commercial recreational facilities. [Source: S.D. Warren, 2003b; as modified by staff)

Year	Number of Slips	% Change	Estimated Number of Launches	% Change
1997	N/A	N/A	3,769	N/A
1998	566	N/A	9,400	149
1999	541	-4	4,450	-53
2000	625	16	6,100	37
2001	785	26	6,411	5
2002	863	10	6,693	3
Average (Total % Change)	676	48	6,610	141

In addition to the state park and the marinas, the Water District and the town of Standish share responsibilities in providing a boat ramp along the southeastern end of the lake. The Water District records daily boat launch data at the Standish Boat Launch during the recreation season (Memorial Day through Labor Day), 8 hours a day, Monday through Wednesday, and 10 hours a day, Thursday through Sunday. Review of the data (table 33) indicates a dramatic increase in launches for the 1999 season; however a large decrease in use in 2002 strongly affects the overall trend, resulting in an overall decrease in use of the facility since 1997.

Table 33. Boat launch data from Portland Water District and the Town of Standish. (Source: S.D. Warren, 2003b)

Year	Portland Water District		Town of Standish Boat Launch Passes Sold			
	Estimated Number of Launches	% Change	Resident	% Change	Non-Resident	% Change
1996	N/A	N/A	323	N/A	1,476	N/A
1997	2,553	N/A	309	-5	1,975	25
1998	2,274	-11	314	2	1,588	-20
1999	3,084	36	311	-1	1,655	4
2000	2,877	-7	237	-24	1,173	-29
2001	3,235	12	207	-13	1,650	41
2002	1,682	-48	243	17	1,484	-10
Average (Total	2,618	-18	270	-19	1,587	-14

% Change)						

In addition to the Water District's monitoring, the town of Standish issues launch passes to residents and non-residents for use of the Standish boat launch on weekends and holidays between Memorial Day and Labor Day. The resident pass allows access to the launch throughout the entire season. The non-resident passes must be purchased for each individual launching. Table 33 indicates the recent boat launch history at the Standish boat launch. Sales of resident passes were fairly constant between 1996 and 1999, but sharply declined in the 2000 and 2001 seasons. Sales of non-resident passes fluctuated between 1996 and 2002 with an overall decrease of 14 percent over that time.

Navigation Safety

The MDIFW tracks the number of boating accidents on Sebago Lake each year through monthly wardens' reports. The total number of reports for recreation seasons between 1997 and 2002 varied from four in 1998 to 10 in 2001 (S.D. Warren, 2003b). The number of reports is assumed to represent the level of navigational safety encountered on the lake.

b. Environmental Effects:

As part of relicensing, S.D. Warren, the agencies, and other stakeholders propose measures to improve the recreational resources in the project area, which in this case involves Sebago Lake. Any proposed changes to project operations (e.g., changing the LLMP) could affect recreational resources on the lake. S.D. Warren proposes to modify the LLMP to establish a 3-inch tolerance range around the August 1 target of 265.17 feet. Although modifying the LLMP in such a manner would appear to be a minor change, there could be some effect on the recreational resources of Sebago Lake.

To address any such potential effects, Interior recommends that S.D. Warren develop a recreation plan that includes continued monitoring around Sebago Lake, as well as fluctuation limits to the summer and winter lake levels. Maine recommends certain changes to the existing LLMP, such as January and February minimum lake levels, a new maximum spring lake level, and operating procedures when fall lake levels reach a maximum (would include a minimum August 1 elevation of 265.17 feet, a September 1 maximum elevation of 265.0 feet, and a November 1 maximum elevation of 263.0 feet). S.D. Warren opposes some of Maine's recommended changes. The MDIFW recommends that S.D. Warren implement a fall/ early winter drawdown (5 to 8 feet) to reduce lake trout spawning success. While this is a fisheries measure, it could also affect recreational resources. Finally, the MDIFW recommends the licensee develop a new boat ramp in Sebago Basin for small water craft, and that the lands adjacent to the Eel Weir bypassed reach be placed in a conservation easement to protect public access to the recreational fishery within the reach.

Effects of Lake Levels on Recreational Use

Management of lake levels throughout the recreation season may affect the recreation resources within and surrounding Sebago Lake. Under the current LLMP, target lake elevations during the summer recreation season (May through September) decrease from full pond (266.65 feet) on, but not before, May 1 to the August 1 target of 265.17 feet, and continue to decrease to the November 1 target of 262.5 feet *0.5 feet. Since the inception of the LLMP in 1997, lake levels have varied with climatic events and at times have been recorded below, within, and above the LLMP levels on specified target dates.

S.D. Warren proposes to adjust the LLMP to allow a 3-inch tolerance around the August 1 target. The proposal would provide the applicant with some leeway in managing the lake level, which could vary depending on the monthly and seasonal climatic conditions and required releases to meet downstream flow requirements. S.D. Warren does not propose any recreation enhancement measures.

Many private citizens and groups expressed concerns related to boating access, indicating that they could not access the lake during low, springtime levels that correspond with the start of the fishing season on April 1. Many of the citizens claim that the current practice of leaving the lake drawn down throughout the spring to accommodate the spring runoff results in lake levels that are too low for boating access, and compromises the recreational resources. Numerous other citizens claim that high spring levels in anticipation of meeting the full pool target elevation at the earliest date (May 1) has reduced the flood storage capacity necessary in the late spring to minimize risks to the shoreline associated with a full pool and strong storm events.

Our Analysis

Table 34 shows the difference between the measured lake elevation and the LLMP August 1 target elevation, and the lake level for each year is qualitatively characterized for that recreation season. Due to region wide droughts, the lake elevation was below the August 1 target level in 1999 and 2001 (6.6 and 3.72 inches, respectively) (S.D. Warren, 2002a). In addition to these lake levels not meeting the LLMP target, these levels were outside the range of the applicant's proposed 3-inch tolerance. Our examination of the measured lake levels throughout the recreation season, compared to the LLMP target elevations, indicates that the August 1 elevation is a good indicator of lake levels throughout most of the recreation season (see figures 7 through 9 in section V.C.2, Water Resources). As such, recreation usage observed during 1999 and 2001 may provide some insight into potential recreational use that may occur under future similar lower lake levels.

Table 34. Recorded lake water level in relation to August 1 target, 1997-2002. (Source: Staff)

Year	Aug. 1st Elevation (feet msl)	Aug 1st Target (feet msl)	Difference (Actual - Target)	Lake Water Levela
1997	265.11	265.17	-0.06 feet (-0.72 inches)	Medium
1998	265.35	265.17	0.18 feet (2.16 inches)	Medium
1999	264.62	265.17	-0.55 feet (-6.6 inches)	Low
2000	265.42	265.17	0.25 feet (3 inches)	Medium
2001	264.86	265.17	-0.31 feet (-3.72 inches)	Low
2002	265.04	265.17	-0.13 feet (-1.56 inches)	Medium

a Staff reviewed the lake levels during the recreation season and found that the August 1 level was indicative of the entire recreation season levels. Ratings for lake level:
- -Low - did not meet LLMP most months; below the proposed 3" tolerance on August 1.
- -Medium - within the LLMP majority of months; within proposed 3" tolerance on August 1.

Table 35 summarizes the visitation to Sebago Lake day use areas and boat access sites, and characterizes navigation hazards (through accident reports) in relation to the lake levels between 1997 and 2002. During the two "low lake elevation" years, day use levels at the State Park reached the highest numbers recorded since the LLMP was implemented, while day use figures from the marinas spanned the highest and lowest levels of visits during the same years. Lower lake levels produce wider beaches at the state park (FERC, 1997a), which could accommodate more beach goers and possibly account for the higher usage figures. However, lake levels above elevation 263.5 feet (the minimum level considered adequate for boating) would likely have little effect on boating resources. Furthermore, S.D. Warren reported that good weather maybe an even better predictor, as both 1999 and 2001 had the highest ration of good weather days (temperature above 70* F and no precipitation) to weekend days during the 6 years of study (S.D. Warren, 2003b). As such, there is no clear relationship between lake level and number of day users at Sebago Lake. Overall, summer lake levels have been both above and below the accepted range of the LLMP, while the number of day use visitors using the State Park has shown a general upward trend. This could be a direct result of aggressive population growth (12 percent from 1995-2000) in the communities surrounding Sebago Lake (see section V.C.7, Socioeconomics), in turn affecting day use recreation at the lake.

Table 35. Summary of recreational use in relation to lake level data. (Source: S.D. Warren, 2003b)

Year	Lake Level	State Park Day Use	Marina Day Use	State Park Boat Use	Marina Boat Use	Standish Boat Launcha	Songo Lock Boat Trips	MDIFW Boat Incident/Accident Reports
1997	Medium	69,407	12,500	2,522	3,769	2,553	2,553	5
1998	Medium	113,211	14,000	3,320	9,400	2,274	2,274	4
1999	Low	186,275	12,000	2,406	4,450	3,084	3,084	6
2000	Medium	136,463	13,000	1,527	6,100	2,877	2,877	8
2001	Low	166,061	18,500	1,832	6,411	3,235	3,235	10
2002	Medium	162,465	17,600	1,463	6,693	1,682	1,682	7
Median		149,464	13,500	2,119	6,256	2,715	2,715	7

a Portland Water District monitored daily launches at the town boat ramp between Memorial Day and Labor Day.

The greatest number of boat launches at the Town of Standish boat ramp and the highest volume of traffic through the Songo Locks occurred during the "low lake elevation" years 1999 and 2001. This information is counterintuitive to any notions that lower lake levels result in increased shallows and underwater hazards leading to less boating. During the same years, the number of boat launches from the State Park and the commercial marinas was closer to the median number of launches, indicating that regardless of lake levels, including the proposed 3-inch tolerance range, recreational boating would likely continue to occur at high levels on Sebago Lake. This indicates that demand for boating access to Sebago Lake is probably high; however, user demand surveys have not been performed.

Comparison of the MDIFW Boat Incident/Accident Reports with the lake levels indicates the greatest number of accidents/reports occurred during the 2001 "low lake elevation," while the 1999 "low lake elevation" year ranked fourth in number of accidents. Both 1999 and 2001 were years when relatively high boating use occurred, suggesting that accidents maybe more related to the number of boats on the lake rather than the lake level. Given the small number of years data have been recorded, however, comparison of the MDIFW accident data with the estimated number of marina users or boat launch statistics provides no observable trend.

Lake levels were 0.25 feet (3 inches) above the August 1 target in 2000, and moderate levels of use were recorded at all facilities summarized in table 35. This lake level would be within the tolerance proposed by the applicant; however, the data do not suggest a clear relationship between lake levels and visitor use at Sebago Lake.

Recreational use at Sebago Lake has fluctuated over the past 6 years since the implementation of the LLMP and does not appear to be related to the level of the lake. Because there is no clear link between the lake levels, the amount of day users, the number of people using boat ramps, and navigational safety, the continued use of the LLMP with the proposed 3-inch tolerance around the August 1 target elevation would not result in any adverse effects to the level of recreation or the recreational resources of Sebago Lake. Overall, the recreational usage of Sebago Lake is more likely correlated with other variables considered outside the scope of this analysis, such as the presence/ absence of favorable weather for swimming and boating, and/or the economic conditions and population growth around the lake, in Cumberland County, and in the Portland Metropolitan Statistical Area (MSA; also considered a Labor Market Area). We discuss the socioeconomics of the area in section V.C.7.

Effects of State of Maine Recommended LLMP

After a collaborative review and consideration of concerns expressed by stakeholders regarding the existing LLMP, Maine recommends that the lake level plan be revised. The goal of the revisions would be to better ensure that suitable water levels are achieved to appropriately balance the competing uses of the lake. Maine recommends five changes that may have an effect on recreational resources. We evaluate, below, the potential effects of these changes on recreation.

Increase winter water levels

Adequate boating access at the start of the fishing season (April 1, if waters are ice free) is the single recreational issue identified that may be affected by early spring lake level management strategies. Maine recommends a revision to the LLMP that would require, beginning on January 1 and continuing until March 1, that flows from the lake be reduced to achieve and maintain lake levels at or above the long term (1910-1986) median levels for this period (generally above 262.3 feet). Thereafter, lake levels would be managed as deemed appropriate by S.D. Warren based on precipitation, snow pack, energy needs and other considerations, with the goal of reaching 266.65 feet on, but not before, May 1. Whenever possible, water levels would be managed during this period to be no higher than elevation of 263.5 feet on January 1 to 266.65 feet on May 1. The state's intent in providing a minimum lake level from January to March 1 is to ensure that lake levels reach the minimum elevation levels necessary for boating by the start of the fishing season, in case there is a dry fill period, which could compromise spring boating.

S.D. Warren, commenting on Maine's proposed plan, agrees with the state in setting a minimum over-winter lake elevation, but would prefer to use a set elevation (262.0 feet) in the LLMP, rather than the "long-term median" value as suggested by Maine. This would result in a standard minimum lake elevation rather than the long-term median value, which may vary from day to day, and from year to year. Consequently, although this recommendation would result in potentially higher lake levels in the winter and early-spring, if levels do not reach 263.5 feet by the open-water season, boaters might not be able to access the lake during the start of fishing season, and possibly through May during springs with low precipitation and runoff.

FERC (1997a) cites that the minimum lake level for decent boating access at marinas on Sebago Lake is 263.5 feet. Between 1997 and 2002, S.D. Warren's management of the lake resulted in one time that lake levels that were not conducive to boating on April 1 or after ice out which resulted in delaying boat access during the early part of the fishing season. Table 36 summarizes whether ice cover or lake levels compromised boat access at the start of fishing season on Sebago Lake for the years 1997 to 2002. During the 6 years, ice cover prevented boating access on

April 1 for 2 years, the lake was too low for 1 year, while lake levels were above the boating threshold for 3 years. During the year boating access was delayed due to low lake levels (2002), the lake had been drawn down to the 2-in-9 deep drawdown of 261 feet the preceding November 1, which was followed by extremely low inflow in January, February, and March (at about the 95 percent exceedance level).

Table 36. Boat accessibility at the start of fishing season between 1997 and 2002. (Source: USGS, 2004a and annual ice out information, as modified by staff)

Year	Ice Out Date (lake elevation at ice out)	April 1 Lake Level (feet)	Lake Level or Ice Cover Limiting on April 1[a]
1997	April 14 (264.23 feet)	263.25	Ice Cover
1998	No complete ice cover	265.09	neither
1999	No complete ice cover	264.37	neither
2000	March 29 (263 feet)	263.6	neither
2001	April 24 (263.6 feet)	261.4	Ice Cover
2002	No complete ice cover	261.76	Lake Level[b]

a. Assumes the minimum lake level to launch a boat is 263.5 feet.
b. Year following a 2-in-9 deep drawdown below 261 feet in November 2001.

Table 37 compares the amount of inflow required to reach the boating threshold under various lake elevations and hydrological conditions. Most importantly, table 37 shows that even if lake levels are below 261.0 feet at the beginning of January, they could reach levels that support boating by the start of fishing season in moderately dry winters (75 percent exceedance flows),
This information is similar to that shown earlier in table 4. It is conservative and for genral reference only. For a more detailed discussion on the assumptions used to calculate this information see section V.C.2, Water Resources.

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and shortly after April 1 in extreme dry winters (90 percent exceedance flows), assuming the lake is ice free. Table 37 also helps to illustrate the 2002 scenario, when lake levels were between 260.5 and 261.0 feet between January 1 and March 1, but reached elevation 263.5 feet by the third week of April, after receiving 95 percent exceedance inflows during the refill period. This type of scenario could be addressed by adopting Maine's recommended change to the LLMP (higher winter lake levels), but as table 37 shows, it would be unnecessary in all but the most extreme years, and may only be warranted in years following a 2-in-9 drawdown to elevation 261.0 feet, such as in 2002.

Table 37. Summary of the inflow a needed to reach minimum boating levels by April 1 after a November 1 drawdown. (Sources: USGS, 2004a; data emailed from M. Winters, Devine Tarbell & Associates, Inc., Portland, ME, to J. Hart, Louis Berger, Needham, MA, May 6, 2004; USGS, 2004b)

		Mean inflow (January 1-April 1)		75% Exceedance inflow (January 1-April 1)		90% Exceedance inflow (January 1-April 1)	
January 1 Lake Elevation	Million cubic feet	Total (mcf)	% of inflow required	Total (mcf)	% of inflow required	Total (mcf)	% of inflow required

(feet)	required to reach 263.5 feet						
260.6	3330	5,181	64%	3,604	92%	2,854	117%
261	2919	5,181	56%	3,604	81%	2,854	102%
262	1869	5,181	36%	3,604	52%	2,854	65%
263	524	5,181	10%	3,604	15%	2,854	18%

a Based on flows shown in table 8 for water years 1987-2004.

To ensure boating access at the start of fishing season, any future LLMP should consider the balance between the start of fishing season (April 1 or ice-out) and the proper lake elevation necessary to launch a boat (263.5 feet). Maine's recommendation comes close to meeting both these requirements by addressing the issues raised by the community and S.D. Warren. However, as illustrated in table 37, a higher minimum lake level in January and February may be unnecessary in all but the most extreme cases. In addition, even if lake levels are suitable for boating on April 1, boat access could still be compromised because ice cover could be present in early April. An alternative that would promote adequate boating lake levels at the start of fishing season would be a minimum lake elevation of 263.5 feet on April 1. Unfortunately, this alternative could pose additional risk to the beaches, the shoreline and shoreline residents, should Sebago Lake have substantial ice cover or should the watershed experience high precipitation resulting in flooding. As such, it would be more appropriate to adopt a strategy that lake levels be maintained at, or above, the long-term (1910-86) median in January and February following deep drawdowns below 261.0 feet, as a way to protect the boating resources from extreme low-flow conditions. This would be a minor change to the existing LLMP, which currently does not require a minimum elevation between November 1 and May 1.

Eliminate the target range above full pond

The beaches and shorelines of Sebago Lake are most susceptible to sand loss and erosion at higher lake levels (FERC, 1997a). The goal of this modification to the LLMP would be to reduce the susceptibility of beaches to erosion and the loss of sand, as a result of high water levels. This recommendation would be beneficial to the lake's beaches, if less erosion occurs, resulting in a positive effect on recreational usage of the beaches. To achieve this goal, this recommendation may involve higher flow releases from the lake to prevent the lake from exceeding the full pond level. This could result in higher flows in the bypassed reach, since the maximum flow that can pass down the power canal is limited to 1,000 cfs. If higher flows are released to the bypassed reach, these flows could hinder the recreational fishing that occurs within that reach during May/June, compromising the popular and intense sport fishery in the reach, by reducing the "fishability" of the reach.

Typically, S.D. Warren manages flows out of Sebago Lake in March and April to accommodate the hydrological conditions of the season, while at the same time managing lake levels to fill by the earliest allowable date, May 1. This strategy results in a nearly full lake in late April, which coincides with the end of the "storm season." Although maybe not the sole intent, the state's recommendation addresses this issue by lowering the maximum fill target below the spillway crest. An alternative that would enhance flood control capacity would be to delay the earliest date of maximum pool to May 15. This alternative would continue to meet the boating lake level thresholds while providing additional benefits to the competing resources around the lake. This alternative may require S.D. Warren to pass more water to the bypassed reach during wet springs to manage the lake elevation to meet the target range; however, it would also provide benefits by making it easier to achieve a full pool after a deep drawdown or a dry winter. We discuss the effects of this alternative, in relation to bypass flows, in section V.C.2, Water Resources, and in section V.C.3, Fisheries and Aquatic Resources.

Expand the summer/fall target range

Various stakeholders have commented on the management of Sebago Lake during the late summer and early fall. Numerous individuals state the lake is too low during the summer, and S.D. Warren proposes to add a three-inch tolerance around the August 1 lake elevation target. Maine recommends an additional expansion of the lake elevation target range between July and November, with the goal of protecting boating and marina interests throughout the summer and into the fall, from exposure to low lake levels and possibly reducing the recreational experience for boaters and reducing marina usage. In comments responding to Maine's recommended plan, S.D. Warren recommends lowering the November 1 minimum lake elevation from 263.0 to 262.0 feet, which has been agreed to by the Maine DEP. This lower lake elevation, however, could compromise late-season boating access, should the lake levels need to drop (in order to reach the proposed target) below 263.5 feet during late September/early October, when some boating may still occur. As previously reported in the 1997 EIS, though, boating numbers drop significantly after Labor Day.

Expansion of the summer/fall target range would allow S.D. Warren more leeway in managing the lake's elevation. Higher lake elevations in the summer (specifically above 263.5 feet) would ensure a longer boating season on the lake. Although, as discussed above, recreational use is not directly correlated to lake levels, providing higher lake elevations throughout the late summer and early fall would reduce any effects of lower lake levels associated with the existing LLMP. Under the state's recommended lake level range for the fall months, lake levels above the boating threshold of 263.5 feet would be present into the second half of September till about the middle of October. The middle of October is generally when the boating season ends.

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Maintain periodic (2 in 9 yrs.) low water levels in the fall

The state of Maine recommends that the current, 2-in-9 year, drawdown of the lake be modified by changing the target date from November 1 to December 1, and lake levels would only be maintained at this level during the month of December. S.D. Warren recommends eliminating the 2-in-9 year drawdown from the plan.

The goal of the periodic low water level is to promote the accretion of sand to the beaches, which would benefit recreation users who use the beaches, and help to maintain private beaches and shoreline. Changes to beaches would have the greatest effects on users at the State Park and shoreline property owners. The existing LLMP calls for a similar drawdown in November and December. Maine's recommended change to the timing would not have any effects on fall season boaters, as access to the lake becomes compromised at elevations below 263.5 feet, which typically are reached by mid-October.

Because the late-fall/early-winter drawdown to 261.0 feet has only occurred once during the beach profile sampling program, it is difficult to make definitive statements on whether the 2-in-9 year drawdown builds beaches. S.D. Warren (Framatome, 2003b) reported numerous small berms had developed by April following the low drawdown from November 2001 to March 2002 (lake elevations below 261.0 feet). Many of these profiles also showed overall stability throughout the entire year, which S.D. Warren attributes to the lack of strong winds or storms during the 2000-2002 period. Over the term of a new license, the net benefit of this drawdown to the recreational resources is difficult to predict, since the beaches would likely continue to be in a constant state of flux between accretion and loss, from year to year. The limited data on the record related to how beach profiles respond after periodic low water levels in the fall/winter does not warrant denying this alternative as a possible method to restore beaches and in turn enhance recreational use of those beaches.

Regardless, the accretion and erosion of sand from Sebago Lake beaches are dynamic processes, and it may be too early to know if the drawdowns contribute to the building of beaches. As such, the long-term effects of this recommendation on recreational resources cannot be predicted with certainty until longer-term monitoring of the drawdowns, or lack thereof, has occurred.

Reduce summer minimum flows

S.D. Warren is able to influence lake elevations during the summer/fall by adjusting the rate water is released to the Presumpscot River. Currently, the applicant is obligated to meet certain minimum flow requirements to protect aquatic resources in the bypassed reach and in the lower Presumpscot River. In order for S.D. Warren to maintain higher lake elevations during the summer and fall, the state plan calls for the reduction of minimum flow releases from the lake. Reducing summer minimum flows would assist S.D. Warren in maintaining target lake levels throughout the summer, but could affect downstream water temperatures and quality (see section V.C.2, Water Resources). This recommendation could negatively affect the recreational fishery in the lower Presumpscot River if reduced flows result in water temperatures higher than under the current LLMP. Warmer stream temperatures typically result in lower success rates (in fishing for coldwater species) when compared to cooler May/June conditions. Minimum flows in the bypassed reach, however, would still be maintained as required by any new license, so the effect on the fishery in the reach would be negligible.

CONCLUSIONS - Maine's plan would provide for lake levels slightly higher than the 1910-1986 median in January and February, eliminate the spring target range above full reservoir, expand the late-summer/fall target range, maintain the periodic late-fall drawdown of the lake, and reduce minimum flows downstream of the project. Overall, these recommendations would have very little effect on existing recreational boating access. Eliminating the target range above full pond, which would provide various benefits to shoreline resources, could require higher downstream flow releases and adversely affect angler usage of the bypassed reach during the releases. The deep drawdowns in the fall every 2 in 9 years, although reduced to one month, could benefit recreational resources if successful in maintaining beach sizes. However, the latter two recommendations are strongly dependent on weather conditions, and there is no way to predict with certainty the extent of effects that would occur. Although Maine's plan attempts to balance competing uses and the various concerns regarding lake levels, our analysis of summer recreational use data indicates that use may not be correlated with lake elevations.

MDIFW Drawdowns to Control Lake Trout Spawning

The MDIFW recommends that a fall/early-winter deep drawdown to reduce lake trout spawning success, be considered. This would include a 5 to 8-foot drawdown beginning in late November, or possibly occurring into the winter months, with associated effectiveness monitoring.

The MDIFW's recommendation would affect lake levels in November, December, and possibly into the spring period (contingent upon seasonal precipitation and the ability of the lake to refill), potentially affecting recreational use of the lake in the driest of years. This would lower the lake level well below the recommended level for boating access (perhaps as low as 257.0 feet; see section V.C.3, Fisheries and Aquatic Resources). However, because the drawdown would be planned for late November or later, it is unlikely that many boaters would be directly affected during the actual period of drawdown. The primary adverse effects on recreation may occur the following spring, should seasonal precipitation be low, when preferred lake levels for boat access would likely be delayed beyond April. Because the recommendation targets lake trout, recreational fishing could also be affected, if the drawdowns are successful in reducing lake trout spawning success. However, because of the MDIFW's management priorities for Sebago Lake, we would not consider any such effects to be detrimental. The potential effects on fishery resources are further discussed in section V.C.3, Fisheries and Aquatic Resources.

Interior's Recommended Changes to LLMP

Interior recommends that lake fluctuations be limited during the ice free and ice-cover seasons, to protect fish and wildlife resources. Interior states that operation of the project, as described in the license application, results in impoundment fluctuations of 4.15 to 6.15 feet, compromising the existing fishery resources. Interior recommends that the lake not be drawn down more than 2 feet from April - December 15, and no more than 3 feet for the remainder of the year. Establishing this lake level regime could affect fishery resources as well as recreation on the lake.

As previously discussed, recreational use numbers do not appear to be related to lake levels. Nonetheless, lake levels could affect boaters who use access ramps to launch their boats. As recommended by Interior, the lake would likely fill during the spring, but as the summer progresses, the lake could only be drawn down 2 feet to about 264.65 feet, until mid-December. Because this drawdown limit would result in a lake level above the recommended minimum for boating access of 263.5 feet, Interior's recommendation would enhance boating conditions, particularly at access ramps, throughout the fall. Since no boating occurs on the lake during the winter months, a 3-foot drawdown would have little effect on recreational resources. Ice fishing on the lake should not be affected by a 3-foot drawdown, and in fact the lake level would remain higher with Interior's recommendation than under most other recommended LLMPs.

FOSL's Recommended LLMP

FOSL, through two separate filings, made recommendations and observations pertaining to management of Sebago Lake levels. FOSL recommends changes to the LLMP that would lower the spring target level to 265.65 feet and change the fall target levels by increasing the frequency and magnitude of significant fall drawdowns. FOSL also opposes many aspects of Maine's plan, but does not make alternative recommendations.

FOSL's recommended LLMP targets fall and spring lake elevations. The recommended maximum spring lake level is not significantly different than the current plan (about 1 foot lower), and probably would have little effect on recreational resources.

Deep drawdowns of the lake during the fall are intended to promote conditions that would assist in beach accretion via natural processes. The current LLMP contains a similar management tool (drawdowns to 261.0 feet in 2 of every 9 years); although the body of evidence is small, it does suggest the current technique promotes a small amount of sand accretion. However, because the shoreline is subject to higher lake levels throughout the remainder of the year, this results in a shoreline constantly in flux. Current recreational use of the lake during this late-fall/early-winter period is likely light, so deeper drawdowns as recommended by FOSL, probably would not have a major effect on recreational usage during the drawdowns. However, to ensure these lake levels are reached, S.D. Warren may have to release a significant amount of water downstream, beginning earlier in the fall, which could adversely affect recreational opportunities for anglers in the bypassed reach.

Charles M. Frechette Recommended LLMP

Mr. Frechette's recommended changes to the LLMP would maintain the spring minimum lake level at 266.0 feet from May 1 to July 7 and maintain an absolute minimum level of 263.5 feet.

Mr. Frechette's recommendations would ensure that Sebago Lake has more water during the early recreation season of May, June and the first week of July, as well as a year round minimum lake level. The suggested minimum lake level is consistent with the recommended minimum level necessary to utilize boat ramps around the lake. If, however, reduced flow releases from the lake are required to maintain these levels, this could adversely affect recreational activities, as well as resources, in the bypassed reach and lower Presumpscot River. This alternative could also affect other resources around the lake and in the lower river, should flood control storage be reduced as discussed in V.C.2, Water Resources.

Stephan P. Kasprzak Recommended LLMP

Mr. Kasprzak's recommended changes to the LLMP are similar to those recommended by FOSL. He recommends a spring target level of 265.65 feet (with a range of +1.0 and -0.5 foot), and a fall drawdown schedule equal to the one recommended by FOSL. Mr. Kasprzak's recommended LLMP would have the same effects on recreation resources as FOSL's recommended LLMP, as discussed above. A lower spring target level of 265.65 feet, along with the recommended range, would not affect recreation resources.

Sebago Lake Coalition Recommended LLMP

The Sebago Lake Coalition recommends higher lake elevations in late summer and into September and October, designed to lengthen the recreational boating season.
The Sebago Lake Coalition's recommended LLMP would result in lake levels above 264.0 feet from May 1 to October 1.

Various entities have suggested that higher lake levels lengthen the recreation season at Sebago Lake, since boat access to the lake becomes compromised as the lake is drawn down into the fall. A higher lake elevation would allow suitable boat access onto Sebago Lake throughout the summer and fall, when the weather is most agreeable. Conversely, however, high lake levels in the fall may pose a risk to the lake's beaches, as fall storms can have the largest effect on beach erosion (see section V.C.1, Geology and Soils). Reducing flow releases from Sebago Lake to meet the recommended higher lake levels, may also adversely affect recreation in the lower Presumpscot River.

Our recommendation concerning lake level management in Sebago Lake is found in section VII, Comprehensive Development and Recommended Alternative.

Recreational Monitoring

Sebago Lake is a popular destination for water based activities and is heavily utilized for fishing, boating and other forms of outdoor recreation. Interior recommends that S.D. Warren monitor the recreational use of the project area to assess the long-term adequacy of existing access facilities.

S.D. Warren disagrees with Interior, stating that it does not own or operate recreation facilities around Sebago Lake, and thus has little control over recreational usage on the lake. S.D. Warren states that the 5 years of recreational monitoring since the implementation of the LLMP in 1997 indicate that operations do not have any effect on recreational use of Sebago Lake, and that facilities are currently meeting demand. S.D. Warren would continue to be required to file with the Commission, under any new license, the FERC Form 80 recreational monitoring report every 6 years.

Our Analysis

In general, demand for day use facilities is expected to increase over the term of the license, as population growth in the greater Portland area (see section V.C.7, Socioeconomics) puts pressure on the region's recreational resources at Sebago Lake. As such, facilities would experience crowding and increased wear and tear, ultimately diminishing the recreational resources and quality of experience sought after by people visiting Sebago Lake.

Recreational use monitoring would provide a mechanism to assess recreational use levels in the project area, as well as the opportunity to adjust, as needed, recreational facility development and management over the term of a new license. Interior's recommendation would require S.D. Warren to conduct yearly monitoring of the facilities, and submit a report to the Commission every 6 years. However, Interior does not explain why additional recreational monitoring, above and beyond the FERC Form 80 requirements, is warranted in this instance.

The FERC Form 80 is a form that requires licensees to collect data on recreational facilities at their projects. The Form 80, which is filed with the Commission every 6 years, requires a licensee to provide the total of daytime and nighttime recreation visits at the project, and also requires the licensee to assess the capacity at each recreation facility to determine if the facility is overused, underused, or at the ideal use. We, as Commission staff, then review the Form 80, and, if recreation facilities are being overused, we can require the licensee to provide additional recreation facilities to meet the needs of the recreationists. The FERC Form 80 would provide the mechanism for monitoring recreation use that Interior is recommending for the project.

Our recommendation concerning recreation monitoring is found in section VII, Comprehensive Development and Recommended Alternative.

Sebago Basin Boat Launch

The MDIFW states that there are only three low- or no-cost public boat access points on Sebago Lake (Sebago Lake State Park, town of Standish Boat Launch, and Songo Lock), and that there is a growing need for additional low/no-cost public boat access to Sebago Lake. Thus, the MDIFW recommends that S.D. Warren develop a shallow water boat launch facility on S.D. Warren-owned land upstream of the Eel Weir dam (on Sebago Basin), which would provide public access to that portion of Sebago Lake for smaller watercraft. S.D. Warren disagrees with the MDIFW that additional boat access is needed, and claims the basin is neither a suitable, nor safe location for boat access, or for angling from watercraft that have no or low-powered motors. S.D. Warren further states that maintenance and security of the boat launch would cost users up to $29/launch.

Our Analysis

Development of a boating access point within the basin area would provide boating access for small watercraft to an area of Sebago Lake that currently requires the use of commercial marinas. The basin area of Sebago Lake is characterized as a shallow, narrow bay where exposed rocks and stumps are not uncommon. Bathymetry indicates that the maximum water depth within the basin is 14 feet, roughly 2,000 feet upstream of the project dam. Richardson's Boat Yard and Marina is the closest boating access point to the recommended boat ramp, located just outside the entrance to the basin (see figure 25). The Jordan Bay and Panther Run marinas in the town of Raymond also provide boating access within 5 miles of the recommended boat ramp.

The town of Raymond states that, although visitor use statistics are not kept, the town boat ramp (located on Jordan Bay) is utilized far beyond design capacity, on the order of 300 percent on good weather weekends and about 50-100 percent on rainy weekdays. During heavy use days, parking overflows onto the Route 302 corridor (e-mail correspondence from Don Willard, Town Manager, town of Raymond, to Maureen Winters, Senior Licensing Coordinator for Kleinschmidt, contractor for S.D. Warren; in S.D. Warren, 2003a). The MDIFW cites overflow parking on Route 302 during seasonal peak usage at the Raymond Beach Launch as additional evidence that facilities near the basin are at or above capacity (letter from Francis Brautigam, Fishery Biologist, MDIFW, to Maureen Winters, Senior Licensing Coordinator for Kleinschmidt, contractor for S.D. Warren; in S.D. Warren 2003a).

Development of a boat ramp in the basin would provide access primarily for small watercraft that could navigate the shallow depths of the basin. S.D. Warren states that the best location for any boat ramp would be on the east shore, approximately 500 feet upstream from the dam (S.D. Warren, 2003a). With adequate safety devices (signage and boat barrier), this distance should be more than adequate to protect the public from any hazards associated with operation of the dam, canal and spillway.

The bathymetry in the vicinity of the proposed boat ramp was not mapped due to poor access conditions at the time of the survey, when the lake level was below the minimum elevation considered for good boat access (263.5 feet). Assuming, however, that the potential location of the boat ramp would have similar navigability as the marinas on Sebago Lake, with good boat access at levels above 263.5 feet, the identified access location should be accessible throughout the recreation season when the lake is held at higher elevations (typically higher than 264.0 feet). Based on boat usage figures from recent years, which indicate continued strong demand for boating on Sebago Lake, providing another public boat launch site (albeit for smaller watercraft) would be a valuable recreational enhancement for this part of Sebago Lake.

S.D. Warren states that the potential boat launch site would have limited use because the proposed boat launch would be located in a very shallow portion of the basin. However, the potential boat launch site was identified by S.D. Warren based on the criteria that it must be located on S.D. Warren owned lands, not pose a safety risk (e.g., located close to the dam), and not located in known wetlands (S.D. Warren, 2003a). Following these criteria, we find that there is some flexibility as to where the potential boat launch could be located. Along the eastern side of the basin, there are two locations that fit the above criteria. One potential location is at the end of Basin Road, approximately 250 feet north of S.D. Warren's proposed boat launch site, while the other potential location is approximately 1,250 feet north of S.D. Warren's proposed boat launch site, and also accessible by Basin Road.

Basin Road is a no-outlet road that parallels the shoreline for over 1,000 feet.

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The two tracts of land are owned by S.D. Warren, are not located near wetlands, and are located adjacent to deeper water in the basin. Thus, boaters could potentially access the basin more frequently than via the site proposed S.D. Warren. Also, the potential sites are located between 1,000 to 2,000 feet from the dam, thus reducing the possibility of the watercraft drifting towards the dam during certain flow and wave/wind conditions.

S.D. Warren also objects to the development of a boat launch because its estimates the annual road maintenance for an access road to a boat launch would be as high as $25,000. Basin Road is a public road from Route 35 until the intersection of Hackett Road, but past the intersection of Hackett Road, Basin Road becomes a private road. However, the town of Windham has an easement that allows the town to maintain the privately owned portion of the road year-round (personal communication between Janet Hutzel, Federal Energy Regulatory Commission, Washington, DC, with Jay Dwelley, Public Works Deputy Director for the town of Windham, ME on October 25, 2005). The two boat launch sites that we proposed are accessible by Basin Road, S.D. Warren would not be responsible for any additional road maintenance costs since the town of Windham currently maintains the road and has no plans to discontinue maintenance service.

If our alternative boat launch sites are ultimately determined to be unsuitable, S.D. Warren could still use Basin Road to provide access to their proposed boat launch site. Since S.D. Warren owns the land from the end of Basin Road to their proposed boat launch site, they could extend access from Basin Road rather than develop a 2,000-foot-long access road, as described in S.D. Warren (2003a). The length of access road needed would be approximately 1,000 feet shorter than was originally proposed by S.D. Warren and the maintenance cost for an access road would be reduced.

S.D. Warren also assumes that the proposed site would require on site security personnel for 16 hours a day, 7 days a week for 32 weeks to assure seasonal residents that the neighborhood is adequately policed. Given lake elevation requirements for boating, and the typical boating season (June, July, August), it is highly unlikely that the boatable recreation season would last 32 weeks (about 8 months) at this location. In addition, most boat recreation occurs during daylight hours, which, during early-spring and late-fall, would be less than 16 hours a day, and as stated in the 1997 EIS (FERC, 1997a) drops off significantly after Labor Day. A more likely scenario for security would be to have a gated access road, signage, and agreements with local police to share in whatever security requirements were to arise. Given the flexibility in location and design of the proposed launch, as described above, and the lack of supporting evidence that a strong police presence would be required, the Sebago Basin boat launch would be the lowest cost launch site in this area of the lake.

Our recommendation pertaining to a boat launch in Sebago Basin is found in section VII, Comprehensive Development and Recommended Alternative.

Conservation Easement on Lands adjacent to Eel Weir Bypassed Reach

S.D. Warren proposes to initiate discussions with the town of Windham on developing a conservation easement on the east side of the Eel Weir bypassed reach as part of Lands for Maine's Future, once a license is issued.

In commenting on the Initial Consultation Document of the Eel Weir Project, the town of Windham requested that that S.D. Warren consider a land grant and/or easement to the town to provide recreational opportunities to Windham residents.

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The town of Windham made no formal recommendation regarding conservation easements. The MDIFW, however, recommends that S.D. Warren grant it a perpetual easement for lands adjacent to the bypassed reach, so that the recreational availability of the lands and access to the bypassed reach would be preserved. The MDIFW cites recent sales of S.D. Warren-owned land as a concern regarding future access to the bypassed reach fishery and associated parking. The MDIFW considers the bypassed reach a significant recreational resource for southern Maine. S.D. Warren's proposal is contingent upon reaching a mutually acceptable agreement regarding conservation easements for S.D. Warren-owned lands in the vicinity of the Eel Weir bypassed reach.

Our Analysis

S.D. Warren owns approximately 292 acres of land adjacent to the Eel Weir bypassed reach. Of this total, 12 acres are located within the project boundary. The remaining 280 acres are currently outside, but adjacent to, the project boundary. According to S.D. Warren, the land situated within the project boundary is needed for project purposes, and, therefore, would be excluded from any conservation easement.

The MDIFW indicates that the Eel Weir bypassed reach is one of the most popular fisheries of its kind in the state. The Eel Weir bypassed reach is open to fishing year round. In 1998, the reach received 6,205 angler days. We agree that protecting public access to this reach would be critical to maintaining the success of the fishery. In addition, S.D. Warren's proposal to grant conservation easements on its land surrounding the Eel Weir bypassed reach would be consistent with the intent of several town of Windham plans.

The town of Windham's 1985 Comprehensive Plan, 1988 Open Space and Recreational Needs Analysis, and the 1992 Comprehensive Plan all emphasize a desire to preserve property around Sebago Lake. The plans also identify significant deficiencies in public open space, recreation trails, lake and beach access, car-top and trailered boat access, and picnic areas for the general public.

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While S.D. Warren concurs with the concept of placing land it owns along the Eel Weir bypassed reach in a conservation easement, there are substantial questions that remain unanswered (S.D. Warren, 2003a). For example, S.D. Warren has not determined the type of conservation easement that would be established or what types of land uses or restrictions the easement holder might impose. In addition, while S.D. Warren would prefer to incorporate the conservation easement into the town of Windham's Lands for Maine's Future Program, there has been no resolution as to the MDIFW's request to be granted the conservation easement. Rather, S.D. Warren stated that it would address these questions after receiving a new license for the project. Therefore, we cannot say, with any certainty, just how S.D. Warren's proposal for conservation easements would be implemented and who would be granted the conservation easements. Nonetheless, the protection of lands adjacent to the Eel Weir bypassed reach for public access, including pedestrian and angling uses, would ensure recreation resources in this area are protected in perpetuity.

The land proposed for inclusion in a conservation easement would be located outside of the current project boundary. S.D. Warren proposes that this land remain outside of the project boundary under any new license issued for the project. S.D. Warren's proposed conservation easement, should it be implemented, would help ensure long-term public access to the Eel Weir bypassed reach and fishery. However, the Commission would not have jurisdiction over this land, since it would be located outside the project boundary, and would not have the means to ensure public recreational access along the bypassed reach. This situation is particularly troublesome since we do not know who the easement holder would be or what type of land uses would be permitted.

Notwithstanding the uncertainties, we expect the goal of any conservation easement would be to leave the land in its current undeveloped state and that existing public access would be maintained.

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Given this uncertainty, inclusion of this land within the project boundary may be warranted.

Our recommendation concerning conservation easements is found in section VII, Comprehensive Development and Recommended Alternative.

Shoreline Management Plan

Interior recommends that a SMP, or similar conservation measures, be developed in consultation with the USFWS, the MDIFW, the Maine DOC, and the MDMR to protect resources in the project area. S.D. Warren disagrees that a plan is necessary and argues that because S.D. Warren has limited property under ownership around Sebago Lake and within the project boundary, it would be inappropriate to prepare a plan for all of Sebago Lake, where most of the shoreline is owned and controlled by others.

Project boundaries are used to delineate the geographic extent of the Commission's regulatory jurisdiction for a licensed hydropower project, and to define the area the project licensee must own or control to serve the project's purposes. As such, S.D. Warren is responsible for the lands and waters within the project boundary that encompasses Sebago Lake within the elevation 267.0-foot contour line. Responsibilities associated with overseeing the management of resources within the project boundary include supervising and controlling all non-project uses and occupancies of project lands and waters for the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. Temporary docks, the installation of seasonal water supply lines, marinas, dredging, sea-walls, rip-rap or any other developments within the project boundary would be managed under the recommended SMP.

Our Analysis

Sebago Lake is one of the premier recreation destinations in Maine, and is surrounded by a growing number of year-round homes along a highly developed shoreline. Numerous shoreline property owners have capitalized on the waterfront location and have developed permanent and temporary docks, piers, or marinas to enhance their lake side experience. The operation of temporary docks or the installation of seasonal water supply lines, and the uses stemming from them could disturb the shoreline resources that contribute to making Sebago Lake a recreational destination.

Development of a SMP, as recommended by Interior, would help ensure that docks, water supply lines, marinas, piers, or other structures within the project boundary do not adversely affect environmental resources, become obstacles to navigation, or a threat to the safe operation of the dam and power plant. The SMP should include mapping efforts that identify sensitive shoreline resources (e.g., wetlands, cultural sites, key aesthetic resources, signature beach resources, steep slopes, heads of coves, areas of important woody debris, etc.). S.D. Warren would then be able to manage and protect shoreline resources within the project boundary through a permit program to ensure that private temporary docks, piers, water supply lines, and other facilities are installed properly and located in appropriate areas.
Overall, the SMP, as described herein, would provide benefits to the recreational resources of the project by protecting the environmental resources that comprise the overall recreation experience.

Our recommendation concerning a shoreline management plan is found in section VII, Comprehensive Development and Recommended Alternative.

c. Unavoidable Adverse Effects:

None.

6. Archeological and Historic Resources

a. Affected Environment

The proposed undertaking's area of potential effects (APE) is co-terminus with the project boundary (i.e., it consists of the lands around Sebago Lake and its tributaries to an elevation of 267.0 feet, the 6,700-foot-long bypassed reach, and the properties occupied by the project works. Historic Properties within this APE include both prehistoric archaeological sites and the project itself. The project encompasses lands in the towns of Raymond, Casco, Naples, Sebago, Frye Island, Windham, and Standish. Archeological survey work and other data collection efforts indicate that the Sebago Lake region was a hub of activity through prehistory, from about 11,000 years ago to the time when Maine Indian tribes came into contact with Europeans, between 1500 and 1676 A.D.

The applicant retained Deborah B. Wilson, Archaeological Consultant, Timothy S. Dinsmore, Historical Archaeologist, and Janet E. Roberts, Historic Preservation Consultant, to study cultural resources in the APE. These consultants produced the following three reports.

* Phase 0 Archaeological Survey Report, Eel Weir Project (FERC No. 2984). January 28, 2002 (Wilson, 2002).

* Phase 0 Historic Archaeological Survey Report, Eel Weir Project (FERC No. 2984). January 14, 2002 (Dinsmore, 2002).

* Eel Weir Project (FERC No. 2984) National Register Nomination Form. May 17, 2001 (Roberts, 2001).

We note that these reports reference "phase 0" surveys. There are four phases of archaeological study, the respective goals of which are defined by the Maine Historic Preservation Commission (Maine Preservation Commission). Phase 0 studies consist of background analyses aimed at developing an understanding of cultural resources in a project area using information on known sites from Maine Preservation Commission files and local artifact collectors; project area geology, soils, and human resources; and historical impacts within the project area. A limited amount of fieldwork is conducted to prove the results of the background research. On the basis of this work, the project area shoreline is rated for archaeological potential and a scope of work is proposed for subsequent investigations.

Archaeological Survey

Known Archaeological Sites

Wilson's efforts included: (a) background research aimed at providing information on the natural and cultural contexts of prehistoric settlement in the project area; (b) a review of known sites potentially affected by project operations; and (c) an assessment of the project area shoreline for prehistoric archaeological potential. This research revealed that 67 known sites are located in the project area. Most of these sites were identified over a period of more than 100 years from artifacts recovered along the shoreline. Of the 67 sites, 47 are, or may be, eligible for listing on the National Register. A review of the 67 known sites, according to Wilson (2002), disclosed the following.

* Phase One archaeological study is warranted at 44 sites where extant deposits may remain. Phase One study has as its goal to "locate all sites in the impact zone, or to adopt a sampling strategy that will present a true picture of site distribution."

* Phase Two archaeological study is warranted at two sites. Phase Two study has the double goal of defining site boundary and of determining a site's significance or National Register eligibility. The boundary is discovered by testing the perimeter of a site until cultural material can no longer be found. Significance is determined in accordance with significance criteria determined for each period of prehistory and set forth in the State Plan for Prehistoric Archaeology. When a site dating to a particular period is located, the site is judged by the integrity and

nature of the cultural deposits and in the context of defined research significance themes.

* Phase Three archaeological study is warranted at one site that is deemed to be National Register eligible. Phase Three has as its goal mitigation for the loss of an archaeological site as an alternative to preservation in place. It occurs at sites that both are eligible for inclusion in the National Register and are demonstrably affected by project operation. In Maine, particularly at hydropower projects, this usually involves data recovery through systematic excavation and production of a report in substantially publishable form.

* 15 sites have been totally eroded, completely affected by construction activities, or found to be insignificant, while another 5 sites are unaffected by the project and are in no need of being evaluated for National Register eligibility.

Archaeologically-Sensitive Shoreline Segments

Most known archaeological sites in Maine are located near the shore of a body of water, either the marine shore of the margin of a lake, river, or stream. Around Sebago Lake, known sites are frequently located close to a river or stream inlet or to the lake outlet. Although many sites are adjacent to the current lake shore, many were situated on a tributary slightly removed from the lake shore at the pre-dam lake level. This pattern is consistent with settlement associated with fish capture using weirs or nets, and with site selection off the main lake shore in places where inhabitants were protected from the wind or concealed from travelers on the lake.

Based on the known width of most archaeological sites in Maine, land within fifty meters of the pre-dam shoreline, both on the lake and along tributary streams, should be rated higher in archaeological potential than land more than fifty meters away from the pre-dam shoreline. In the assessment of the archaeological potential of the project area shoreline, Wilson (2002) divided 104 miles (173.16 kilometers) of shoreline into 401 segments on the basis of attributes relevant to archaeological potential (i.e., proximity to water; slope of the ground surface; soils; association with an outlet; and such contraindicative attributes as erosion and inundation, and historic construction). The 401 shoreline segments included the known sites, as well as all the remaining shoreline, and were characterized as follows:

* 44 of the 401 shoreline segments (including known archaeological sites), totaling 5.7 miles (9.14 kilometers), or about 5 percent of the shoreline, were rated high in archaeological potential;
* 129 segments (including known archaeological sites), representing 18.4 miles (29.67 kilometers), or about 17 percent of the shoreline, were rated moderate in archaeological potential;
* 113 segments (including known archaeological sites), encompassing 36.4 miles (58.58 kilometers), or about 33 percent of the shoreline, were rated low in archaeological potential; and
* 115 segments (including known archaeological sites), totaling 47.1 miles (75.77 kilometers, or about 45 percent of the shoreline, are considered to have no archaeological potential.

Maine's Archaeological Context

Archaeological sites located in the APE are interpreted within a context provided by the results of previous archaeological work conducted in Maine during the past century - careful study of artifact styles, settlement and subsistence patterns. Based on this work, the prehistoric sequence is divided into three major periods; Paleoindian, Archaic, and Ceramic periods. Each of these is further divided into early, middle, and late stages. The entire Paleoindian period is dated from about 9000 to about 6500 B.C., the Archaic from about 8000 to about 1200 B.C., and the Ceramic from about 1000 B.C. to about 1600 A.D.

According to Wilson (2002), Paleoindian and late Paleoindian materials are "surprisingly abundant" around the Sebago Lake, compared to most places in Maine, where they are exceedingly rare, probably because of the massive deltaic sands of the project area. Also, Archaic period artifacts are "exceptionally numerous," and Middle Archaic sites are "particularly abundance and may represent the most intense period of prehistoric settlement on Sebago Lake." Late Archaic artifacts are "common" in the APE, while Ceramic sites are "numerous."

Historic Archaeological Survey

There are no historic archaeological sites in the project's APE. Combining a detailed literature search with limited field work, Dinsmore (2002) found that historic settlement in the region largely occurred away from the project area. Dinsmore (2002) recommends no further work of this kind for the project. Although the Cumberland and Oxford Canal located west and parallel to the Presumpscot River in the Town of Standish is included in the National Register, the 1 mile segment located within the APE was completely compromised by the 1903 construction of the project. In constructing the project canal, the original C & O Canal was widened and deepened destroying all elements of the original canal including the tow path.

Eel Weir Hydropower Historic District

The project, including the dam, canal, forebay, powerhouse, and tailrace, is eligible for inclusion on the National Register of Historic Places as an historic district, as the Eel Weir Hydropower Historic District.

According to 36 C.F.R. 60.3(d), a district is a geographically definable area , urban or rural, possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development.

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It qualifies for National Register eligibility because it, in the context of industry and engineering, is associated with events that have made a significant contribution to the broad patterns of our history. Moreover, the project works embodies the distinctive characteristics of a type, period, and method of construction, and represents a significant and distinguishable entity whose components may lack individual distinction.

Significant as a representative example of early 20th century hydroelectric engineering, the Eel Weir Project possesses certain notable features typical of early power stations. Among these are the original horizontal turbines and generators and the blue marble switching panel. The station retains a fairly high degree of integrity in terms of its historic exterior appearance, a substantial amount of original equipment, and has had continuous use as a power generating facility.

According to Roberts (2001), the dams at the headworks and the canal are significant because they represent a physical record of the progression of uses of Presumpscot river water power: hydro-mechanical, transportation (Cumberland & Oxford Canal), and hydroelectric. They retain a moderate amount of integrity. Portions have been modernized. However, the canal, original gates, and dam sections that remain testify to the success of a substantial engineering project of a century ago. Finally, according to Roberts (2001), the project is also significant because it was built before power project design and construction was standardized. The project also illustrates attempts to discover the most efficient way to re-use existing forms and configurations for a new technology.

b. Environmental Effects

The archaeological sites and shoreline segments reported above are, to varying degrees, endangered by on-going erosion, construction, and vandalism that could be attributable to the existing project and to its current mode of operation. The proposed relicensing, however, which is the undertaking in this proceeding, poses no effect to these archaeological sites. Nevertheless, while Section 106 does not require consideration of on-going effects attributable to baseline conditions, we are committed to implementing reasonable measures for enhancing the physical relationship between the archaeological sites in the project's APE and the existing project (including its existing mode of operation). The PA requires that such measures be included in the HPMP developed for the project.

Ordinarily, the continued operation of a National Register eligible hydropower project is considered to be a beneficial effect. Furthermore, the S.D. Warren, in its application for a new license, proposes no alterations to the project that would substantially (and negatively) affect its National Register qualifying characteristics.

Nonetheless, in the Commission's experience, applicant's may (and sometimes do) alter the National Register qualifying characteristics of an eligible project without incurring the necessity of amending their licenses, and for otherwise commendable reasons. In such cases, where there is no PA or other provision in the license to afford reasonable protection to the National Register eligible hydropower project, there is no opportunity for the Commission to assess the potential effect on Historic Properties, consider prudent and reasonable alternatives to an adverse effect, consult with the SHPO, or afford the Advisory Council a reasonable opportunity to comment. With the executed PA, such alternatives can be identified, considered, and adopted that would avoid, mitigate, or lessen adverse effects.

c. Unavoidable adverse effects:

Adverse effects may arise in the course of any licensing term that proves unavoidable. Such effects would be confined to the historic district, the only Historic Property to which the undertaking poses an adverse effect. As noted above, however, such unavoidable adverse effects can be taken into account as they arise using the procedures set out in the executed PA.

7. Socioeconomic Resources

a. Affected Environment:

The study area for the socioeconomic analysis for the Eel Weir Project includes the towns of Baldwin, Casco, Gorham, Naples, Raymond, Sebago, Standish, and Windham, all within Cumberland County, Maine. Sebago Lake is a popular summer recreation destination, and many of the businesses surrounding the lake cater to this market. The project is about 20 miles north of Portland, Maine and easily accessible via U.S. Route 302. As a result of this proximity to Portland, the area around Sebago Lake, particularly along its southern and eastern shores, has grown rapidly in recent years, and year-round residents have moved in, many of them retaining their jobs in Portland. Five of the eight towns (Casco, Gorham, Raymond, Standish, and Windham) are within the Portland MSA, the largest MSA in the state.

Population, Employment, and Income Trends

Population

The 2000 U.S. Census reports that Cumberland County had the largest population in the state and the greatest population growth rate from 1990-2000 (9.2 percent). Comparatively, the statewide population grew by 3.8 percent from 1990-2000 (U.S. Census, 2000a, 2000b, 2000c). The MSPO estimates that the population of Cumberland County has steadily increased since 1995 (table 38). Since the inception of the 1997 LLMP for Sebago Lake, the county's population had increased 13 percent, or 31,639 people, by 2002. The population in Cumberland County has increased by 0.8 percent over the 2001 population, from fewer than 267,000 to just over 283,000 people.

Table 38. U.S. Census Bureau population estimates for Cumberland County, Maine. (Source: U.S. Census, 2000a & 2000b)

Year	Populationa	Annual Percent Change
1995	247,307	N/A
1996	249,561	0.9%
1997	251,368	0.7%

1998	253,582	0.9%
1999	259,325	2.3%
2000b	265,612	2.4%
2001	266,988	0.5%
2002c	283,007	0.8%

a Census population estimates (Source: U.S. Census, 2000a).
b Census 2000 population total (Source: U.S. Census, 2000b).
c Census 2002 population estimate based on MSPO projected 0.8% increase.

In 2000, the populations of the towns within the study area ranged from 14,904 persons in the Town of Windham to only 1,433 persons in the Town of Sebago (table 39). Overall, population estimates for the 8 communities bordering Sebago Lake increased by 12 percent, from 1995 to 2000 (table 39), compared to the growth rates of Cumberland County (13 percent) and the state (2.6 percent). Over the same time period, five of the eight towns grew by 10 percent or more, with Raymond experiencing 23 percent growth.

Table 39. U.S. Census Bureau population estimates for towns surrounding Sebago Lake.a (Source: U.S. Census, 2000c)

Town	1995	1996	1997	1998	1999	2000	Percent Change 1995-2000	% Projected Change 2000-2005a
Baldwin	1,280	1,298	1,312	1,323	1,330	1,290	1	1
Casco	3,148	3,181	3,202	3,221	3,231	3,469	10	6
Gorham	12,541	12,820	13,000	13,296	13,741	14,141	13	8
Naples	3,076	3,108	3,129	3,149	3,187	3,274	6	5
Raymond	3,497	3,534	3,567	3,609	3,751	4,299	23	11
Sebago	1,244	1,248	1,252	1,257	1,252	1,433	15	10
Standish	8,067	8,227	8,360	8,519	8,611	9,285	15	9
Windham	13,660	13,864	14,062	14,249	14,767	14,904	9	6%
Totals	46,513	47,280	47,884	48,623	49,870	52,095	12%	7%

a Source: Maine State Planning Office (2003).

Employment

The Maine Department of Labor (Maine Labor) reports that the average unemployment rate in Cumberland County, from 1997 to 2002, was 2.4 percent, compared to a statewide average of 4.5 percent. This is indicative of the strong economic development, relative to the rest of Maine, which has been occurring in the Portland MSA and surrounding communities within Cumberland County.

The 2002 average annual labor force in Cumberland County was 147,432 persons (Maine Labor, 2004a). Maine Labor's 2002 labor estimates for the eight towns show labor forces ranging from 690 persons in the Town of Sebago to 8,142 persons in the Town of Windham. The total average annual labor force in the eight towns represented 20 percent of the total labor force in Cumberland County.

In 2000, Cumberland County's employment was concentrated in four sectors: services; retail; government; and finance, insurance, and real estate (FIRE), which accounted for 70 percent of total employment (Maine Labor, 2004a). Concentrations in these sectors are typical for a county that is both dependent on the tourism sector (i.e., high employment in the retail and services sector) and located in an MSA (i.e., high employment in government, services, and FIRE occupations). In comparison to the state-wide figures, Cumberland County had lower proportions of its employment in the manufacturing, construction, and transportation sectors (30 percent for Maine to 26 percent for Cumberland County) (Maine Labor, 2004b).

Income

Census data for Maine indicates that Cumberland County has the highest per capita income in the state at $44,048. This median income level is above Maine's average of $37,240.

Recreation Visitor Expenditures (statewide) and Local Fiscal Conditions (sales tax and gas)

S.D Warren reported sales tax revenue and gasoline sales information from marinas and commercial recreation facilities on Sebago Lake (table 40). Between 1998 and 2002, revenues generated from the sales tax at these facilities increased from approximately $612,000 to just over $892,000. Similarly, gasoline sales exhibited an upward trend from 150,000 gallons sold in 1997 to over 253,000 gallons in 2002. Since the implementation of the LLMP, revenues from the sales tax at local marinas has increased 41 percent, and the total volume of gasoline sold at local marinas has increased 74 percent.

Table 40. Recreation use indicator data from marinas and commercial recreation facilities. (Source: S.D. Warren, 2002a; as modified by staff)

Year	Sales Taxa ($)	% Change from previous year	Annual Gas Sales (gal.)	% Change from previous year
1997	N/A	N/A	150,865	N/A
1998	612,341	N/A	151,140	0%
1999	742,333	21%	135,510	-10%
2000	748,484	1%	241,619	78%
2001	858,987	15%	225,180	-7%
2002	892,256	4%	253,359	13%

a One new marina was added in the 2000 season

b. Environmental Effects:

The only issue pertaining to socioeconomic resources identified during the scoping process was the effect of the LLMP (or changes to it) on the socioeconomic resources in the vicinity of Sebago Lake. These resources would be affected by any changes in the level of recreational activity and recreational spending by visitors to Sebago Lake. Higher levels of recreational activity would result in a corresponding increase in local recreational spending, which in turn, would produce a permanent increase in total local employment and income through a positive increase in the local economy.

Our Analysis

Our review of Sebago Lake recreational resources indicates that there is no direct relationship between recreational use of Sebago Lake and lake levels. Since the implementation of the LLMP, recreation levels have fluctuated, and this fluctuation appears to be independent of lake levels (see section V.C.5, Recreational Resources and Land Use). The fluctuation in recreation levels is also reflected in the sales tax revenues and gasoline sales shown in table 40, which exhibit an overall increase since 1997, with some year-to-year variation.

Most of the LLMP alternatives recommended by the stakeholders require relatively similar lake levels (generally within about 6 inches) during the open-water season, when most boating and economic activity occurs on the lake. Thus, depending on the alternative ultimately selected, there could be a difference in elevation of up to about 6 inches from existing lake levels. However, lake levels may vary somewhat from year to year, depending on weather patterns. Such a variance would likely go unnoticed to most users of the lake. The effects of wind and wave action may be more noticeable than any variance from existing lake levels. Since the above data indicate that socioeconomic resources are independent of the current LLMP, any proposed minor changes in lake levels would also have little, if any, effect on recreational use and in turn socioeconomic resources.

The recommendations that call for higher lake levels in the early spring and in the summer/fall (State of Maine, Mr. Frechette, and Sebago Lake Coalition) may enhance boating conditions in Sebago Lake slightly. Alternatively, recommendations that call for lower spring lake levels may delay preferred boating levels until later in the season. However, our recreation analysis did not find any relationship between lake levels and the amount of boating use on the lake.

The demographic characteristics of Cumberland County reflect the presence of the Portland MSA in a state that is largely rural. Based on the proximity to Portland and the associated population growth, higher than average income levels and employment characteristics, the Sebago Lake socioeconomic landscape is expanding for reasons other than management of the lake.

c. Unavoidable Adverse Effects:

None

D. No-Action Alternative

Erosion - The current LLMP would remain in place. Shoreline and beach erosion would continue to occur at near present levels, as the shores of Sebago Lake respond to the existing water levels of Sebago Lake. Periodic storms may increase shoreline erosion, and additional shoreline development and increased boat traffic on the lake may increase erosion somewhat. The on-going cycle of material loss and replacement should continue to maintain beach profile equilibrium.

Water Quantity and Quality - The Water District is expected to continue using Sebago Lake as a source of drinking water for the greater Portland area. Over time, the amount of water withdrawn may increase. Water quality conditions in Sebago Lake should remain similar to current conditions, essentially remaining an oligrotrophic lake for the foreseeable future. The Eel Weir bypassed reach should continue to meet state water quality standards for temperature and DO. The coldwater fishery, however, would continue to be limited by elevated temperatures during the summer.

Fisheries - The project would continue to operate under the current LLMP, which has generally benefited fishery resources in both Sebago Lake and in the Presumpscot River. Water level fluctuations and any associated effects would remain essentially unchanged from existing conditions. This alternative would preclude potential benefits that may be realized from any of the alternative LLMPs. Entrainment of young-of-the-year and other smaller-sized resident fish from Sebago Lake, which is an expected occurrence, would continue to occur at present levels. The popular Eel Weir bypass fishery would continue to experience high levels of angler use, with increased use likely in the future as demand increases. Additional enhancement to this fishery would not occur. American eel and land-locked salmon passage and movement through the project area would continue to be impeded.

Terrestrial - Existing patterns of lake level fluctuations would occur. Wetlands would continue to respond to the seasonal changes in water levels in a manner similar to what occurs currently. Natural succession is expected to occur, and expansion of existing wetlands may occur, as sediments accrete in shallow-water areas after major storms.

Recreation - Lake levels would continue to be regulated by the current LLMP. Recreational usage would continue to fluctuate from year to year, as has been demonstrated in recent years, likely without influence from the lake levels. No additional recreational enhancement measures would be implemented. The project would have the same amount of recreational opportunity and effect on the recreational environment as it currently does, though recreational usage would likely continue to increase.

Cultural - With no changes to the existing environment or other enhancements (i.e., PA) there would be the continued threat of damage, due to erosion of important archaeological and cultural sites around Sebago Lake. In addition, the no-action alternative could potentially result in new disturbance to previously recorded sites and to sites not previously identified, as shoreline erosion and development activities continue.

Socioeconomics - S.D. Warren would continue to operate under the existing LLMP. The socioeconomic profile of the area would be identical to what it is currently. The population of the lake area is expected to continue to increase, as people move into the area. Similarly, development would likely continue to grow. This development, with increasing recreation and tourism, is expected to bring more revenue to the area.

VI. DEVELOPMENTAL ANALYSIS

In this section, we estimate the economic benefits of the Eel Weir hydroelectric project and the cost of various environmental protection and enhancement measures and the effects of these measures on project economics.

A. Power and Economic Benefits of the Project

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC *61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power, with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest, with respect to a proposed license.

For our economic analysis of alternatives for the Eel Weir Project, we used the assumptions, values, and sources shown in table 41.

Table 41. Staff assumptions for the economic analysis of the Eel Weir Project. (Source: Staff)

Assumption	Value
Energy rate (2005)a	43.15 mills/kilowatt-hours (kWh)
Capacity rate (2005)b	$10.80/kilowatt-year
Period of analysis	30 years
Cost of capitalc	10 percent
Discount rated	10 percent
Federal tax ratee	34 percent
Local tax ratef	3.0 percent
Insurance rate	0.25 percent
Term of financing	20 years
Escalation rate after 2005	0 percent
O&M costs (2005$)e	$106,630
Net investment (2005$)f	$131,910

a The energy rate for 2005 was derived from fuel cost process developed by the Energy Information Administration in their 2005 Annual Energy Outlook.

b S.D. Warren stated that the capacity value as of February 2003 would be $0.90/kw-month ($10.80/kW-yr) with an equivalent dependable capacity of 0.38 MW in their December 4, 2002 AIR response #17.

c S.D. Warren stated that they use a value of 10 percent for their interest for borrowed funds and funds that they would borrow to fulfill any future license commitments in their December 4, 2002 AIR response.

d Staff used a discount rate equal to the cost of capital (see footnote c above).

e S.D. Warren provided a base annual O&M cost of $72,210 (average for six hydro stations), annual administrative and overhead costs of $23,691, and annual FERC fees of $4,288. All of these values were provide for Fiscal Year 2002 in their December 4, 2002 AIR response. Staff escalated the total of these costs to 2005.

f Based on information provided by S.D. Warren in their December 4, 2002 AIR response (Item 17), Staff estimated a depreciated net investment value of $131,910 as of 12/31/05.

B. Power and Economic Benefits of the No-Action Alternative

Under the no-action alternative, the Eel Weir Project generates an average of 12,300 MWh of electricity annually, has an annual power value of $534,850 (43.48 mills/kWh), and total annual costs of $126,380 (10.27 mills/kWh), resulting in a net annual benefit of $408,470 (33.21 mills/kWh). The no-action alternative assumes that the project would continue to operate under the terms of the existing license, in effect at the time of relicensing, with no additional measures or changes to project operations.

C. Cost of Environmental Measures

Table 42 shows the effect on costs and power values of individual measures proposed by S.D. Warren and recommended by staff and others, including the additional or alternative measures that staff has adopted.

Table 42. Summary of capital and one-time costs, annual costs, annual energy costs, and total annualized costs for environmental measures proposed by the applicant and recommended by staff and others for the Eel Weir Project. (Source: Staff).

The USFWS recommends an alternative flow regime consisting of (a) 115 cfs from 11/1 to 3/31, (b) 200 cfs from 4/1 to 6/30, (c) 115 cfs from 7/1 to 8/31, and (d) 200 cfs from 9/1 to 10(31). This recommendation would result in an annual loss of 2,702 MWh, costing $116,590. Three gates would require modification at an estimated cost of $100,000. The total annual cost the USFWS's recommendation would be $131,560.

Adopted by staff?	Environmental measures	Recommending entities	Capital and one-time costs (2005$)	Annual costs, including O&M (2005$)	Total annualized cost (2005$)
			Water Resources		
Yes	1. Establish a 3-inch tolerance range for the August 1st target date	S. D. Warren	$0	$0 (no change from existing)	$0
No	2. Modify the existing LLMP in accordance with recommendations from the State of Maine	State of Maine	$0	-$8,320a (gain of 193 MWh)	-$8,320
No	3. Limit lake level fluctuations to no more than 2 feet from 4/1 to 12/15 and 3 feet from 12/15 to 3/31	Interior	$0	$20,930a (loss of 485 MWh)	$20,930
No	4. Implement State of Maine's LLMP with a fall/ early winter drawdown of 5 to 8 feet	MDIFW	$0	$169,620a (loss of 3,931 MWh)	$169,620
No	5. Lower the spring target level to 265.65 feet on 5/1 and change the fall target levels as follows: (a) 261 feet by 11/1 (1 in 2 years); (b) 260 feet by 11/1(1 in 4 years); and (c) 259 feet by 11/1 (1 in 10 years)	FOSL	$0	$49,100a (loss of 1,138 MWh)	$49,100
No	6. Maintain target lake levels at, or above, 266.0 feet from 5/1 to 7/7, and maintain an absolute minimum level of 263.5 feet the rest of the year	C. M. Frechette	$0	-$8,200a (gain of 190 MWh)	-$8,200
	7. (a) lower	S. P.	$0	$25,720a	$25,720

the spring target level by 1 foot to 265.65 feet, with an operating band of +1.0 foot and -0.5 foot; (b) lower the lake to 261.0 feet (1 in 2 years), 260.0 feet (1 in 4 years), and 259.0 feet (1 in 10 years).	Kasprzak		(loss of 596 MWh)		No
8. Maintain lake levels as follows: (a) 266.0 to 266.5 feet on 6/1; (b) 266.0 to 265.8 feet on 7/1; (c) 265.8 to 265.4 feet on 8/1; (d) 265.4 to 264.9 feet on 9/1; and (e) 264.5 to 264.0 feet on 10/1	Sebago Lake Coalition	$0	$50,530a (loss of 1,171 MWh)	$50,530	No
9. Lower the spring target` elevation to 266.15 feet, with a 6-inch (*) operating band, & spring target date of no sooner than May 15.	Staff	$0	-$1,940a (gain of 45 MWh)	-$1,940	Yes
10. Continue to operate the project in a store-and-release mode, in accordance with the existing LLMP, as amended and proposed	S. D. Warren	$0	$0 (no change)	$0	Yes
11. Continue operating the new lake level gage	S. D. Warren	$0	$0 (no change)	$0	Yes
12. Continue to coordinate with upstream pond owners to manage flood flows	S. D. Warren	$0	$0 (no change)	$0	Yes
13. Discharge up to 1,000 cfs through the project's power canal during high flow events	S. D. Warren	$0	$0	$0	Yes
14. Continue to release current minimum flows to the bypassed reach	S. D. Warren, State of Maine, C.M. Frechette, S.P. Kasprzak, Sebago Lake Coalition	$0	$0 (no change)	$0	No
15. Release 200 cfs to the bypassed reach	Interior	$100,000	$114,950a (loss of 2,664 MWh)	$129,920	No

from 4/1 to 10/31 and 115 cfs from 11/1 to 3/31,[88] which would require changes to three gates					
16. Release 200 cfs to the bypassed reach from 5/1 to 10/31 and 115 cfs from 11/1 to 4/30, requiring changes to three gates and instream channel modifications	MDIFW	$102,320	$107,490a (loss of 2,491 MWh)	$122,810	No
17. If coldwater refugia can not be protected, release 100 cfs to the bypass reach from 5/1 to 10/31, and 115 cfs from 11/1 to 4/31, requiring changes to two gates	MDIFW	$50,000	$37,500a (loss of 869 MWh)	$44,980	No
18. Release at least 100 cfs to the bypassed reach, requiring changes to at least one gate	FOSL	$30,000	$43,280a (loss of 1,003 MWh)	$47,770	No
19. Release flows to the bypassed reach of 75 cfs from 11/1 to 3/31 and 125 cfs from 4/1 to 10/31, requiring changes to two gates	Staff	$50,000	$54,240a (loss of 1,257 MWh)	$61,730	Yes
20. Develop and implement a plan to monitor instream flows	Interior	$10,640a	$0	$1,500	No
21. Develop and implement a project operations and flow monitoring plan, including temp. monitoring in bypassed reach	Staff	$14,000a	$1,500	$3,600	Yes
		Aquatic Resources			
22. Consult with resource agencies regarding the need for upstream and downstream American eel passage	S. D. Warren	$0	$0	$0	No
23. Install	MDMR, MDIFW	$106,430b	$1,060b	$17,000	Yes

	upstream passage facilities for American eel				
Yes	24. Install downstream passage facilities for American eel	MDMR	$159,650b	$2,130b	$26,030
Yes	25. Consult with the resource agencies on the design, location, and effectiveness testing of the eel passage facilities	MDMR	$0	$0	$0
No	26. Install upstream and downstream fish passage for land-locked Atlantic salmon	FOSL	$1,000,000a (500,000 for u/s and $500,000 for d/s)	$65,000a ($35,000 + about $30,000/ year in lost energy)	$214,730
Yes	27. Section 18 Reservation Authority	Staff	$0	$0	$0
No	28. Mitigate for smelt migration barriers on Sebago Lake	MDIFW	$10,000a	$0	$1,500
No	29. Conduct a warmwater fishery assessment for Sebago Lake	MDIFW	$50,000a (1 year study in yr 1)	$0	$7,490

Terrestrial Resources

Yes	30. Replace existing wetlands monitoring plan with a similar monitoring program that will be undertaken every 5 years	S. D. Warren	$0	$1,790b ($10,640 every 5 years)	$1,790
Yes	31. Establish a conservation easement on lands around the bypassed reach	S. D. Warren	$0	$0	$0
Yes	32. Plan any changes to current land use(s) to be consistent with the aesthetic character of the project area	S. D. Warren	$0	$0	$0
No	33. Develop of a SMP	Interior	$10,500a	$0	$1,570
	34. Develop a	Staff	$65,000a	$0	$9,730

SMP, to include shoreline mapping and permitting program					Yes
Recreational Resources					
35. Conduct FERC Form 80 recreation monitoring	S. D. Warren	$0	$720b ($5,320 every 6 years)	$720	Yes
36. Monitor recreation use at the project	Interior	$4,500a	$0	$670	Yesc
37. Develop a plan for a shallow-water boat launch	MDIFW	$40,000a	$2,000a	$7,990	Yes
38. Grant MDIFW a perpetual easement for angler foot access on lands adjacent to and underlying the Eel Weir bypassed reach	MDIFW	$0	$0	$0	No
39. Investigate the feasibility of increasing the power canal discharge	MDIFW	$0	$0	$0	No
Cultural Resources					
40. Protect and mitigate project-related effects to archaeological sites and protect project structures that have been determined to meet National Register of Historic Places criteria	S. D. Warren	$220,000a	$0	$32,940	No
41. Execute a PA to implement an HPMP	Staff	$220,000a	$0	$32,940	Yes

a Cost estimate provided by staff.
b Cost estimate provided by S.D. Warren in its AIR response dated December 4, 2002 (AIR 17).
c Based on our review, it appears that Interior's recommendation for recreation monitoring would be consistent with the requirements of FERC Form 80.

D. Power and Economic Benefits of the Applicant's Proposed Project

As proposed by S. D. Warren, the Eel Weir Project would generate an average of 12,300 MWh of electricity annually, have an annual power value of $534,850 (43.48 mills/kWh), and total annual costs of $161,830 (13.16 mills/kWh), resulting in a net annual benefit of $373,020 (30.33 mills/kWh).

E. Power and Economic Benefits of the Proposed Action with Additional Staff-Recommended Measures

Resource agencies and NGOs recommended the implementation of a variety of measures at the project. We reviewed each recommendation and determined the measures that were most appropriate for implementation. In section VII, Comprehensive Development and Recommended Alternatives, we discuss our reasons for recommending the staff alternative and why we believe the environmental benefits are worth these costs.
As recommended by staff, the Eel Weir Project would generate an average of 11,868 MWh of electricity annually, have an annual power value of $482,550 (43.52 mills/kWh), and total annual costs of $233,660 (21.07 mills/kWh), resulting in a net annual benefit of $248,890 (22.45 mills/kWh).

F. Economic Comparison of the Alternatives

Table 43 compares the power value, annual costs, and net benefits for S.D. Warren's proposed measures, S.D. Warren's proposed measures with additional or alternative staff-recommended measures for the project, and the no-action alternative.

Table 43. Summary of the annual net benefits for the applicant's proposed action, applicant's proposed action with additional or alternative staff-adopted measures, compared to the no-action (baseline) alternative, for the Eel Weir Project. (Source: Staff)

	Applicant's proposed action	Applicant's proposed action with additional or alternative staff-adopted measures	No action
Installed capacity (MW)a	1.8	1.8	1.8
Annual generation (MWh)b	12,300	11,088	12,300
Annual power value ($ and mills/kWh)	$534,850 43.48	$482,550 43.52	$534,850 43.48
Annual cost ($ and mills/kWh)	$161,830 13.16	$233,660 21.07	$126,380 10.27
Annual net benefit ($ and mills/kWh)	$373,020 30.33	$248,890 22.45	$408,470 33.21

a The existing installed capacity of the project is 1.8 MW. S. D. Warren reports the dependable capacity of the project is 0.38 MW. The dependable capacity is based on the current lake level management plan, which defines the emergency low flow (the lowest outflow from Sebago Lake when the lake level is more than 1 foot below the target levels and range) from Sebago Lake as being 15,000 cubic feet per minute. (AIR response dated 12/4/02).

b The estimated baseline average annual generation for the project of 12,300 MWh as stated in the license application.

G. Pollution Abatement

The Eel Weir Project would produce about 11,088 MWh of electricity annually. The amount of hydropower generation, when contrasted with the generation of an equal amount of energy by a fossil-fueled facility, avoids the emission of atmospheric pollutants. Assuming that the 11,088 MWh of hydropower generation would be replaced by an equal amount of natural gas-fired generation, generating electrical power equivalent to what would be produced at the Eel Weir Project would require combustion of about 114.4 mcf of natural gas annually. Removal of pollutants (NO_x and SO_x) from the emissions produced by burning fossil fuels to those levels presently achievable by state-of-the-art technology would cost about $6,350 ($2005) annually.

VII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require that the Commission give equal consideration to all uses of the waterway on which the project is located. When we review a proposed project, we consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Accordingly, any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

A. Recommended Alternative

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives (including changes to the current LLMP), we selected the proposed project, with staff-recommended modifications, as the preferred option. We recommend this option because: (1) issuance of a new hydropower license by the Commission would allow S.D. Warren to operate the project as a economically beneficial and dependable source of electric energy; (2) the 1.8-MW project would eliminate the need for an equivalent amount of fossil-fuel derived energy and capacity, which helps conserve these non-renewable resources and limits atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would improve water quality, protect and enhance fish and terrestrial resources, protect public use of recreational facilities and resources, and protect and maintain historic and archaeological resources within the area affected by project operation.

The following summarizes the environmental measures we recommend be included in any license the Commission issues for the Eel Weir Project:

Measures proposed by S.D. Warren

* continue to operate the project in a store-and-release mode, in accordance with the existing Commission-approved LLMP and a 3-inch tolerance range for the August 1 target date (265.17 feet * 3 inches);
* continue to operate the existing lake level gage;
* continue to cooperate and coordinate with upstream pond owners to manage flood flows;
* discharge up to 1,000 cfs through the power canal during high flow events;
* replace the wetlands monitoring program required as part of the 1997 Commission Order with a similar program that would be undertaken every 5 years;
* conduct recreation monitoring consistent with the Commission's FERC Form 80 program;
* evaluate opportunities for establishing a conservation easement on lands around the Eel Weir bypassed reach;
* plan any changes to current land use(s) to be consistent with the aesthetic character of the project area.

Additional Measures Recommended by Staff

* implement S.D. Warren's proposed LLMP, with the following additional changes:
    (i) manage the lake during spring fill-up to reach a target level of 266.15 feet on (or after), but not before, May 15, with an allowable target range of * 0.5 foot;
    (ii) lake levels may be at the spring target level any time between May 15 and June 21 (for any 3-week period), with levels exceeding the spillway crest (elevation 266.65 feet) triggering increased flows (as described in the State of Maine's operating parameters); and
    (iii) beginning January 1, and continuing until March 1, manage flows from the project to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching elevation 266.15 feet by May 15.

* release minimum flows to the bypassed reach, consisting of 75 cfs from November 1 to March 31 and 125 from April 1 to October 31;
* develop and implement a project operations and flow monitoring plan, which would include, at a minimum, measures proposed by S.D. Warren, as well as flow and temperature monitoring in the bypassed reach;
* develop and implement an American eel passage plan, consisting of installing an upstream eel ladder, implementing measures for downstream eel passage, and effectiveness and out-migration monitoring;
* reserve Commission authority to require fish passage facilities, as may be prescribed by Interior, pursuant to Section 18;
* develop and implement a SMP, which would include conservation easements, buffer zones, mapping of the shoreline, a permitting process, and other shoreline protection measures; and
* implement the PA, executed on September 14, 2005, which requires the development of an HPMP.

The following is a discussion of the basis for the staff-recommended measures, as well as our basis for not recommending measures recommended by other entities.

Lake Level Management

Nearly all entities that commented on the license application for the Eel Weir Project raised issues with the current LLMP. A number of entities provided varying recommendations for changes to the current LLMP. In this EA, we reviewed the information in the record. Based on this review, we recommend changes to the LLMP that we conclude would balance the numerous interests and be in the public interest.

Sebago Lake Coalition, FOSL, Mr. Charles Frechette, and Mr. Stephen Kasperzak recommend revisions to the LLMP that were considered by the Commission and other stakeholders in developing the current LLMP. All these recommendations focus on maintaining lake levels to protect shoreline resources, including beaches, as well as preserving recreational opportunities on Sebago Lake.

Our analysis in this EA shows that the current LLMP has resulted in higher lake levels in Sebago Lake. In fact, the current LLMP provides, on average, about 60 percent of the lake's historical storage capability. Even with the higher lake levels, Johnston (2002) concludes that Sebago Lake beaches have shown normal sand movement and stability since monitoring began around 1990. Although certain beaches, at points in time, show short-term changes, generally the beaches show long-term stability interrupted at times by changes due to storms that occur during high water periods. This conclusion is consistent with the 5 years of beach profile studies conducted by S.D. Warren, which found that, while seasonal erosion and accretion do occur along all surveyed areas, there is an on-going cycle of material loss and replacement which maintains beach profile equilibrium. Notwithstanding these findings, we stated in section V.C.1, Geology and Soils, that shoreline erosion occurs around Sebago Lake. The evidence in the record suggests that the higher lake levels are partially responsible for some of the erosion.

Based on our analysis, we find no compelling evidence to support making major revisions to the current LLMP. However, we recommend a few minor modifications to the LLMP.

May to Late June

In the draft EA, we recommended changes to the LLMP for the May/June period that would limit some of S.D. Warren's flexibility in managing lake levels in Sebago Lake by establishing a May 1 elevation of 266.65 feet, with a reduced operating band. In its comments on the draft EA, S.D. Warren did not agree with this recommendation, because of the reduction in flexibility. Other commenting entities expressed concern about potentially higher lake levels for a longer period in the spring, resulting in a higher potential for beach erosion. We have re-assessed this issue based on these comments, and we now recommend that the spring target level be reduced by 6 inches to elevation 266.15 feet, but that a * 6-inch operating band be established around the target elevation. We also now recommend that the target elevation be maintained for a 3-week period between May 15 and June 21.

Limiting the spring target elevation to 266.15 feet and shifting the date to May 15 would lower the average lake level during the May/June Period, when compared to the existing LLMP. This reduction would reduce the susceptibility of beaches and the shoreline to erosion, and the loss of sand that result from high water levels and storm events. Lower lake levels would afford more protection to water quality and archaeological sites, and would provide some additional storage capabilities for flood control during the period. This change is expected to have little, if any, effect on other lake resources (e.g., fisheries, wetlands, and recreation), and would provide S.D. Warren operational flexibility in the event of unusual or unexpected weather events. Maintaining a 3-week period for the spring target level would be the same as the existing LLMP, and as recommended by Maine in its revised plan. We estimate that modifying the spring target elevation (to 266.15 feet) and moving the target date (to May 15) would result in a small gain in energy generation (45 MWh), worth $1,940.

The current LLMP does not require that water be spilled at the dam, except as necessary to keep the lake from exceeding S.D. Warren's flowage easements (267.15 feet) or to keep the lake level from being above the spillway for more than 3 weeks in any given year. To address the issue of lake levels and spillway flows, we recommend that flows be released from the project so that lake levels do not exceed the spillway crest elevation of 266.65 feet, in accordance with operating parameters outlined by Maine. This provision would reduce the possibility of S.D. Warren exceeding their flowage easements during May and June, and potentially enhance the lower river fishery by providing higher flows into the lower river during the spring/early-summer period, and in turn increasing available aquatic habitat. However, spilling high volumes of water at the Eel Weir dam could adversely affect, on a short-term basis, fishing opportunities in the bypassed reach.

S.D. Warren objects to the provisions that limit its flexibility to manage lake levels in Sebago Lake. We share the same concerns, particularly where it pertains to flood control. Therefore, we recommend that any new license issued for the project include a provision that would allow S.D. Warren, in consultation with appropriate entities, to temporarily modify normal operations under the LLMP to address emergency conditions. Any such modification of operations, however, should be reported to the Commission.

August 1 target elevation

S.D. Warren proposes to add a * 3-inch operational band around the August 1 lake level target of 265.17 feet. We recommend adopting S.D. Warren's proposal. This change would provide S.D. Warren some operational flexibility around the August 1 target elevation, and it is not expected to affect environmental resources, erosion, recreation (e.g., marina and boating interests), or archaeological sites in and around Sebago Lake. Any such effects, if they were to occur, would be negligible.

Winter water levels

The current LLMP does not establish any lower limit requirements for the January through April period. Rather, the plan relies on S.D. Warren's management to achieve the May 1 target level. However, various entities express concern that the lake is not being managed to achieve the target level May 1 (under the current LLMP). In addition, S.D. Warren's generating equipment has sustained damage with the reduced flows during this period. Maine recommends that, beginning January 1, and continuing until March 1, flows from the project be reduced to achieve and maintain lake levels at or above the long-term (1910-1986) median levels for this period, and thereafter manage flows with the goal of reaching the spillway crest target level on, or anytime after, May 1.

Our analysis indicates that Sebago Lake would reach the spring target level in the majority of years, should the winter lake level drop below the 1910-1986 median levels, except in the most extreme dry years (when flows are at or lower than the 95 percent exceedence level). However, maintaining the lake at or above the long-term median during the winter months would assure that the lake refills by the spring (May) target date, and would address the aforementioned concerns. In their comments on the draft EA, Maine Geology is concerned that this would limit low lake levels and be less beneficial to the beach-building process, and S.D. Warren recommends that if this was to become a requirement of the LLMP that a specific minimum target elevation (262.0 feet) be established, instead of a long-term median value that could change on a daily basis.

We recommend that the current LLMP be modified to incorporate the Maine's recommended changes for a minimum lake level from January 1 to March 1. As described in sections V.C.1, 2, and 5 (Geology and Soils, Water Resources, and Recreation Resources and Land Use), this provision would enhance S.D. Warren's ability to reach the May 15 target elevation, particularly in dry years. In addition, the higher water levels from January 1 through March 1 would offer some limited protection to aquatic resources and wetlands during that time. Winter ice fishing could also be enhanced by the maintenance of higher lake levels during ice cover. To address Maine Geology and other parties' concerns about maintaining lower winter water levels for beach-building, we continue to recommend the current LLMP provision to lower the lake to elevation 261.0 feet (November 1 to January 1) in 2 out of every 9 years. While promoting beach accretion, this provision would reduce the potential for beach erosion by maintaining lower lake levels during the fall period when significant storm events occur. We also agree with Maine that a minimum target elevation should be established for the January 1 to March 1 period, based on the long-term (1910-1986) median levels.

Although we estimate that adopting a minimum winter water level would have no measurable effects on project generation or costs, these changes are not without risk. If the lake is maintained at higher levels in the winter, there would be less storage available in Sebago Lake for spring runoff. If mismanaged by S.D. Warren, this loss of storage could have a significant effect on flows in the lower Presumpscot River. We share S.D. Warren's concerns regarding this loss of storage. Therefore, we recommend that any new license issued for the project include a provision that would allow S.D. Warren, in consultation with appropriate entities, to temporarily modify normal operations under the LLMP to address emergency conditions. Any such modification of operations, however, should reflect balancing flooding along Sebago Lake and downstream along the Presumpscot River, and be reported to the Commission within 10 days of any incident.

Other Stakeholder Recommendations

Most of the other recommendations regarding the LLMP reflect options that would benefit Sebago Lake in some manner. However, these options are not without problems.

The USFWS, through Interior, recommends a lake level management regime that would allow S.D. Warren to fluctuate lake levels up to 2 feet during the summer period and 3 feet the remainder of the year. If a full 2-foot drawdown was to occur during the May/June time period, fish spawning could be disrupted, and rearing habitat dewatered. Higher water levels the remainder of the year, however, would benefit wetlands and aquatic resources. This option would also significantly reduce the project's flood control capabilities and likely result in substantial flooding downstream. We estimate the cost of this recommendation to be $20,930 annually, and we do not recommend this option.

Maine's recommended LLMP and our recommended alternative are similar in many respects. Maine's plan would increase generation by 193 MWh annually ($8,320 net benefit), while our recommended option would increase generation by 45 MWh annually ($1,940 net benefit). In addition, the option presented by Charles Frechette would increase generation by 190 MWh annually ($8,200 net benefit). However, Maine's and Mr. Frechette's plans would likely increase summer/early fall lake levels. While this would be good for recreation and other environmental resources, these higher elevations could result in beach and shoreline erosion, if storms were to occur during this period. Maine's plan would also decrease flows in the Presumpscot River, which, as we state in section V.C.3 (Fisheries and Aquatic Resources), we do not support because of the potential for (a) adverse affects on water temperatures and quality, and (b) a reduction in the availability and suitability of downstream aquatic habitat. For these reasons, we do not recommend the full plan recommended by Maine, or Mr. Frechett's plan.

Sebago Lake Coalition's recommended plan, along with the option outlined by Charles Frechette, would most likely provide the greatest benefit to recreation, with some overall benefits to wetlands and aquatic resources. However, these plans, like that of Maine, could result in beach and shoreline erosion. Finally, the changes proffered by FOSL and Stephen Kasprzak would provide some of the lowest lake levels of any of the options, and likely the greatest benefit to beach-building, while reducing shoreline erosion. These plans would also provide the greatest amount of flood control storage in Sebago Lake and benefit downstream areas through the reduction of flood damages. However, these plans would have the lowest probability of lake re-fill by May 15, with potential adverse effects on boating and other recreational activities on the lake, and would have varying effects to wetlands and aquatic resources. The plans recommended by Sebago Lake Coalition, FOSL, and S. Kasprzak would reduce generation and have substantial costs (ranging from $25,720 to $50,530). Therefore, we do not recommend adopting any of these alternatives.

The MDIFW recommends a late fall/winter drawdown to control lake trout spawning. Our analysis indicates that such a drawdown would have substantial adverse consequences to not only macroinvertebrates, fish populations, and wetlands, but potentially to recreation if the lake is not able to refill by the following spring. The potential adverse affects, along with the significant cost of nearly $170,000 annually, outweigh the potential benefits. Therefore, we do not recommend adopting this measure.

Sebago Lake Fisheries Measures

The MDIFW recommends that S.D. Warren mitigate for smelt migration barriers resulting from project operation. Our analysis in section V.C.3 (Fisheries and Aquatic Resources) shows that neither the project, nor its operations, appears to be affecting access to smelt spawning habitat. Therefore, this measure, which we conservatively estimate would cost $1,500 per year, does not appear warranted, and we do not recommend adopting it.

The MDIFW recommends that S.D. Warren conduct a warmwater fishery assessment for Sebago Lake. S.D. Warren previously addressed issues related to shoreline spawning and rearing, as well as stranding, for warmwater fish as part of the study, Seasonal Lake Level Assessment. This assessment addressed potential effects of the existing LLMP on numerous shallow-water species, including black bass. We used information from this assessment in our analysis of the lake level management issue. We consider the previous assessment to be sufficient to assess LLMP effects and, therefore, do not recommend adopting this measure. The survey would cost $7,490 annually.

Eel Weir Bypass Minimum Flows

S.D. Warren currently provides minimum flows in the Eel Weir bypassed reach that vary seasonally from 25 to 75 cfs. According to Maine's fishery management plans, the existing flow regime was developed as a way to establish a self-sustaining landlocked Atlantic salmon fishery in the Eel Weir bypassed reach. Secondarily, the flow regime was designed to enhance the fisheries for other cold and warmwater fish species. As we stated in section V.C.3 (Fisheries and Aquatic Resources), the effort to establish a self-sustaining salmon fishery in the bypassed reach has not been successful. Therefore, the reach is currently managed principally as a brook trout fishery, with stocking of catchable-size adults.

The result of S.D. Warren's instream flow study suggests that, while no single flow optimizes habitat for all species and lifestages, a range of flows exist that may provide reasonably high habitat suitability for most species and lifestages. However, as protocol dictates, we primarily consider the habitat needs of brook trout in recommending a flow regime for the bypassed reach.

In the draft EA we recommended that S.D. Warren provide seasonally-adjusted minimum flows to the bypassed reach. The flows consisted of: (1) 50 cfs from November 1 to March 31; (2) 100 cfs from April 1 to June 30; (3) 75 cfs from July 1 to August 31; and (4) 100 cfs from September 1 to October 31. These flows were 25-cfs higher than current flows, on a seasonal basis. S.D. Warren objected to the higher flows, stating that existing flows are sufficient to meet agency management goals for the coldwater fishery. The USFWS, the MDIFW, and FOSL all support even higher flows. The resource agencies state that smallmouth bass (which are favored by the higher flows) is of little concern to trout management, and that channel modifications would protect the coldwater refugia under a higher minimum flow regime.

We have re-assessed this issue based on the aforementioned comments and now recommend a flow regime of: (1) 75 cfs from November 1 to March 31; and (2) 125 cfs from April 1 October 31. We recommend this flow regime for the following reasons:

* Priority management objectives for the Eel Weir bypassed reach include: (1) providing a year-round (including summer) fishery for brook trout; and (2) maximizing angler opportunity. Secondarily, the Eel Weir bypassed reach is managed to provide a fishery for landlocked Atlantic salmon.
* The results of the flow study show that the bypassed reach provides more aquatic habitat for juvenile and adult brook trout across the flow range of interest than any other species or lifestage evaluated. Habitat for brook trout increased rapidly between 25 and 100 cfs in the riffle/run areas, with moderate increases beyond 100 cfs. In the braided channel areas, habitat for brook trout increased rapidly from 66 to 185 cfs.
* Substantial gains in habitat for brook trout would be realized with our recommended flows over existing conditions, while there would be modest improvement in landlocked Atlantic salmon habitat (see table 28 in section V.C.3).
* Total wetted area in the riffle/run habitat would range from 70 to 78 percent of the calculated maximum at 75 and 125 cfs, respectively, while total wetted area in the braided channels would exceed 75 percent. Habitat for Stenonema, an important forage species for trout and other fish, would be substantially enhanced (see table 28 in section V.C.3).
* The flow regime we recommend would enhance aquatic habitat during the biologically important spring-summer-fall seasons (when reproduction, growth, and winter hold-over preparation occurs). In addition, our recommended over-winter flow would retain a significant amount of the habitat available at 125 cfs and maintain sufficient habitat for over-wintering salmonids.
* Favorable angling conditions in the bypassed reach would be maintained, with a modest enhancement.

Overall, our recommended flow regime would further the resource agencies' fishery management goals for the Eel Weir bypassed reach. As previously stated, the bypassed reach currently supports a valuable coldwater fishery (estimated to be worth $100,000 annually; in FERC, 2002). In contrast, we estimate the annual cost for our recommended flows to be about $61,730. While we recognize the current flow regime has resulted in a popular, heavily utilized fishery, we do not recommend S.D. Warren's proposal to continue those flows as part of any new license issued. The existing flows do not address the agencies' current management goals for the Eel Weir bypassed reach (focus on brook trout), nor would they address future angling demand in the bypassed reach, which is likely to increase along with the growing population in the Portland area.

The USFWS and the MDIFW recommend substantially higher flows for the bypassed reach. These flows would provide significant habitat enhancements (see section V.C.3.b, Fisheries and Aquatic Resources - Environmental Analysis), but at considerable cost. We estimate that the annual cost to provide the agencies' flows would be in excess of $105,000, unless flows are reduced during the summer period to protect the coldwater refugia. We conclude that the incremental benefit to the habitat and fishery with the agencies' flows do not outweigh the substantial cost in lost generation to S.D. Warren, and, therefore, do not recommend adopting such flows.

FOSL recommends a flow of, at least, 100 cfs for the bypassed reach. Though FOSL's flow recommendation would cost less than our recommended flow regime ($47,770), we do not recommending adopting it. Our recommended flow of 125 cfs from April 1 to October 31 would be consistent with FOSL's flow recommendation. However, we do not recommend the higher flows from November 1 to March 31 (over-winter), as biological needs of the aquatic community would be less during this period. The 75-cfs flow we recommend represents a significant increase for flows during the winter, which would provide substantial hold-over habitat for trout and other resident fish using the bypassed reach.

The seasonal flows we recommend would likely compromise the integrity of the coldwater refugia in the bypassed reach, primarily from June to August. Therefore, we support Interior's recommendation for temperature monitoring in the bypassed reach, and recommend, consistent with Interior's recommendation, that water temperatures in the bypassed reach be monitored as part of a project operations and flow monitoring plan (see discussion below).

American Eel Passage

The MDMR and the USFWS recommend that S.D. Warren provide appropriate upstream and downstream fish passage for American eel at the Eel Weir dam. S.D. Warren agrees to provide such facilities, but proposes to consult with the resource agencies regarding the timing of implementation. We conclude that providing such facilities, as recommended by the agencies, would have immediate benefits to the American eel population in the Presumpscot River.

The American eel is a species of concern to both state and federal fishery agencies, because of the apparent decline in the population along the Atlantic coast of North America. Because eel presently occur in Sebago Lake, providing upstream eel passage at the Eel Weir dam would be a significant enhancement to eels ascending the Presumpscot River. Providing upstream passage at Eel Weir would enhance access to important habitat in Sebago Lake and its tributaries. This enhancement could be implemented at a relatively low to modest cost. We estimate the annual cost of this measure to be about $17,000.

Downstream movement of yellow-phase eels (juveniles) and passage of adult downstream migrant eels at hydropower projects and other barriers is an issue of concern for fishery resource agencies, due to recent population declines. The MDMR, in addressing this concern, states that their management objective for American eel in the vicinity of the Eel Weir Project is to provide adequate downstream passage and escapement to the ocean for pre-spawning adult eels. We conclude in section V.C.3 (Fisheries and Aquatic Resources) that offering a safe, efficient downstream passage route to out-migrating adult eel and yellow eel would enhance survival at the project and increase the number of Presumpscot River eels contributing to the eel spawning population. Thus, implementing downstream eel passage measures would further the long-term goal of species recovery. We estimate the annual cost of this measure to be about $26,030.

We conclude that upstream and downstream eel passage are in the public interest, and recommend that S.D. Warren design and implement appropriate eel passage facilities at the Eel Weir Project. At a minimum, the eel passage plan should include provisions to: (1) install an upstream eel ladder at the Eel Weir dam; (2) develop downstream eel passage facilities consistent with Option #3, as described in sections III.C (Proposed Action) and V.C.3 (Fisheries and Aquatic Resources); and (3) monitor the effectiveness of the upstream and downstream passage facilities and, as appropriate, the out-migration timing of adult American eel.

The cost for downstream eel passage at Eel Weir includes the cost for effectiveness monitoring. Adding an out-migration timing component to this plan is not expected to substantially change the overall annual cost ($26,030) previously identified in the draft EA.

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In addition, we recommend the plan include provisions for operating the eel passage facilities at Eel Weir, consistent with the timing of annual and daily operation of the eel passage facilities at S.D. Warren's five recently-licensed projects on the lower Presumpscot River.

The eel passage plan should include a provision to modify the operational timing of the downstream eel passage facilities (annual and daily) based on new information obtained from on-going or required monitoring studies.

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Finally, the eel passage plan should be developed in consultation with the USFWS, the MDMR, the MDIFW, and the MDEP, and filed for Commission approval within 6 months after the issuance of any new license for the project.

Land-locked Salmon Fish Passage

FOSL recommends that S.D. Warren provide fish passage at the Eel Weir dam for Sebago Lake's land-locked Atlantic salmon. In section V.C.3, Fisheries and Aquatic Resources, we analyzed the merits of the recommendation and concluded that FOSL makes a compelling argument for fish passage at the project dam. However, as we stated in section V.C.3, neither the MDIFW, nor the USFWS, supports the installation of fish passage facilities for landlocked salmon at the Eel Weir dam as a way to achieve the fish management goals for Sebago Lake and the Presumpscot River. Given the agencies' position and our estimated cost for the measure ($214,730 annually), we conclude that the providing passage for landlocked salmon at Eel Weir is not in the public interest at this time. Therefore, we do not recommend this measure be included in any new license issued for the project. We do, however, recommend that the license include a condition reserving the Commission's authority to require such fish passage facilities as may be prescribed by Interior, pursuant to Section 18.

Project Operation/Compliance Monitoring

S.D. Warren currently monitors and maintains records of bypass flows and lake levels, and proposes to continue operating the existing lake level gage. However, as we stated in section V.C.2 (Water Resources), it is not clear what protocols and mechanisms S.D. Warren uses to monitor and maintain records of bypass flows and lake levels, aside from the lake level gage. In addition, our recommended bypass flows could compromise the integrity of coldwater refugia in the bypassed reach (section V.C.3, Fisheries and Aquatic Resources). Therefore, we recommend that S.D. Warren develop and implement a project operations and flow monitoring plan that includes temperature monitoring in the bypassed reach. This plan would enable the Commission to ensure compliance with operational license conditions, as well as monitor the effects of bypass flows on coldwater refugia.

The monitoring plan should define the criteria by which compliance with the recommended LLMP and bypass flows would be measured, specify the type and location of all existing (and any new) instrumentation that would be used to monitor bypass flows and headpond elevations, and identify the data collection intervals and reporting procedures. In addition, the plan should include a provision to monitor water temperatures in the two identified coldwater refugia for 3 years. The monitoring plan should be developed in consultation with the USFWS, the USGS, the MDIFW, and the MDEP, and filed for Commission approval within 6 months of issuance of any new project license. We estimate that the annual cost of this monitoring plan would be $3,600.

In addition, S.D. Warren proposes to: (1) continue to cooperate and coordinate with upstream pond owners to manage flood flows; and (2) discharge up to 1,000 cfs through the power canal during high flow events. These measures cost S.D. Warren little, if anything, to implement, but would have substantial flood control and recreational (bypass angling) benefit. Therefore, we recommend that the monitoring plan specify the protocols for communicating with the upstream pond owners to manage flood flows, as well as operating the project so as to minimize excess spill in the bypassed reach.

Wetlands Monitoring

S.D. Warren proposes to replace the existing wetlands monitoring program with a similar monitoring program, having a 5-year monitoring cycle. Our analysis in section V.C.4 (Terrestrial Resources) shows that, in the 5 years after implementation of the 1997 LLMP, wetlands have changed little. In addition, we do not expect our recommended changes to the LLMP to have any significant effects on wetlands. Thus, continuing to monitor wetlands annually is unnecessary. Therefore, we recommend that S.D. Warren monitor wetlands around Sebago Lake consistent with the program required for the 1997 LLMP, but on a 5-year cycle. This monitoring program would afford S.D. Warren the opportunity to document any long-term changes in wetland cover and plant diversity. We estimate this measure would cost $1,790 annually.

Conservation Easements, Shoreline Protection Measures, and Aesthetics

As we stated in sections V.C.4 and V.C.5 (Terrestrial Resources and Recreational Resources and Land Use), the vast majority of land around Sebago Lake is in private ownership, with a substantial amount of development. S.D. Warren owns 292 acres of land around the project structures and Eel Weir bypassed reach. S.D. Warren owns little land surrounding Sebago Lake. To address its concerns related to the on-going development around the lake, the USFWS, through Interior, recommends that S.D. Warren develop a SMP to protect riparian resources in the project area.

The placement of temporary docks or the installation of seasonal water supply lines, and the uses stemming from them, could disturb the shoreline areas of Sebago Lake. Therefore, we conclude that protection of riparian and other sensitive habitats in the project area is warranted. Our analysis shows that protecting such areas would enhance wildlife habitat, protect any wetlands in those areas, as well as protect water quality and valuable fish habitat. Therefore, we recommend that S.D. Warren develop, in consultation with the USFWS, the MDIFW, the MDOC, the MDEP, and the towns of Standish and Windham, a SMP that includes: (1) mapping of Sebago Lake's shoreline to identify sensitive areas (e.g., wetlands, cultural sites, key aesthetic resources, signature beaches, steep slopes, heads of coves, areas of important woody debris, etc.); and (2) a permit program to ensure that temporary docks, piers, water supply lines, and other facilities are installed properly and placed in appropriate areas. In addition, as stated in section V.C.4, Terrestrial Resources, restricting the SMP to S.D. Warren-owned lands within 200 feet of the normal high water elevation likely would provide only limited protection to riparian areas and other sensitive habitats. Therefore, we also recommend that S.D. Warren, as part of the SMP, identify other lands within 200 feet of the high water elevation around Sebago Lake that may warrant protection.

The Commission's policy is to require no more than a 200-foot shoreline buffer for SMP's, unless additional lands are deemed necessary for project purposes. A 200-foot buffer zone for Sebago Lake would protect wetland habitats, aesthetic resources, and recreational opportunities. In addition, these lands would provide additional buffering capacity against adjacent land disturbances in ecologically sensitive areas and would help protect riparian corridors.

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An SMP, as outlined above, would assist S.D. Warren in meeting its responsibility of managing recreational opportunities at the project and preserving other resources and beneficial uses of the project's shorelines in a manner consistent with project purposes. We estimate the annual cost of this measure to be $9,730.

S.D. Warren proposes to initiate discussions with the town of Windham on developing a conservation easement on certain lands it owns along the Eel Weir bypassed reach. Similarly, the MDIFW recommends that S.D. Warren grant it a perpetual easement for angler foot access on lands adjacent to and underlying the bypassed reach. We state in section V.C.5 (Recreational Resources and Land Use) that such a conservation easement would help ensure long-term public access to the Eel Weir bypassed reach and fishery. Therefore, we recommend that S.D. Warren pursue a conservation easement on lands it owns adjacent to, and underlying, the bypassed reach. We recommend this measure be a component of the aforementioned SMP. We also recommend that the lands placed within a conservation easement be included in the project boundary.

Though the lands adjacent to, and underlying, the bypassed reach do not have project-related facilities, the Commission requires that these lands be included within the project boundary when a licensee proposes to grant conservation easements to qualified governmental agencies or NGOs. See New England Power Co., 79 FERC * 61,006.

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This requirement would give the Commission the necessary jurisdiction over the land to ensure public access along the bypassed reach.

S.D. Warren proposes to plan any changes to current land use(s) to be consistent with the aesthetic character of the project area. This proposal would ensure that facilities required as part of any new license issued for the project are constructed in a way that would be environmentally unobtrusive. In addition, this measure can be implemented at little, or no, cost. Therefore, we recommend that S.D. Warren consider the aesthetic character of the project area in developing the plans for eel passage, the Sebago basin boat launch, and any other plan that requires construction of facilities.

Public Access and Recreation Monitoring

The MDIFW states that there is a growing need for additional no- or low-cost public boat access to Sebago Lake. To this end, the MDIFW recommends that S.D. Warren develop a shallow water boat launch facility on S.D. Warren-owned land upstream of the Eel Weir dam (Sebago basin). Our analysis in section V.C.5, Recreational Resources and Land Use, suggests that additional boat access to Sebago Lake is warranted. For example, the town of Raymond boat launch is used far beyond capacity on good weather weekends and at somewhere between 50 to 100 percent of capacity on rainy weekends.

To address the growing need for public access at Sebago Lake, we recommend that S.D. Warren develop a shallow-water boat launch on Sebago basin, as recommended by the MDIFW. S.D. Warren should develop a plan, in consultation with the MDIFW, the MDOC, and the MDEP, to construct the shallow-water boat launch facility. The plan should include, at a minimum: (1) the location and design drawings of the boat launch facility and access road; (2) any safety considerations and reasonable measures that could be implemented to address concerns related to the facility's use and the type and size of boats using the facility; (3) measures for soil erosion and sedimentation control during the construction of the recreation facility; (4) provisions to manage the facilities over the term of any new license issued; (5) a discussion of how the needs of the disabled were considered in the planning and design of the facility; and (6) a schedule for constructing the facility. The plan should be filed with the Commission within 12 months after issuance of any new license for the project. We estimate the annual cost of this boat launch to be $7,990, but recognize this cost could be somewhat higher depending on the nature of the access road.

As we previously stated, Sebago Lake is a popular destination for water based activities and is heavily utilized for fishing, boating, and other forms of outdoor recreation. To address on-going and future recreation needs, the USFWS, through Interior, recommends that S.D. Warren assess the long-term adequacy of existing public access facilities to identify any additional facilities that may be needed.

We agree that on-going recreation monitoring is appropriate. We note that angling, boating use, and other forms of recreation is expected to increase in the future. Under these circumstances, it is appropriate that recreation use be monitored. Therefore, we recommend that S.D. Warren monitor recreation use at the Eel Weir Project consistent with the Commission's FERC Form 80 Program.

Based on our review of Interior's recommendation for recreation monitoring at the project, it appears that Interior's recommendation would be consistent with the Commission's FERC Form 80 monitoring requirements.

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This level of monitoring would be sufficient to address the adequacy of existing public access facilities and the need

for additional facilities in the future. We estimate monitoring of this caliber would cost $720 annually.

Measures to Protect Historical Resources

As part of any new license issued for the Eel Weir Project, we are recommending changes to project facilities (e.g., installation of eel passage facilities). In addition, we are recommending changes to the existing LLMP. These measures have the potential to adversely affect archaeological and other historic sites. To ensure that adverse effects on known and potential historic properties, and to any as-yet unidentified archaeological resources, are satisfactorily resolved over the term of the new license, the Commission on September 14, 2005, executed a PA with the Maine SHPO. The PA requires S.D. Warren to prepare a HPMP, in consultation with the Maine SHPO. The HPMP would contain the principles and procedures to address the proposed continued use, and protection of, historic properties; mitigation of unavoidable adverse effects; compliance with laws and regulations governing human remains; and discovery of previously unidentified resources. We estimate the annual cost of the executed PA and our recommended HPMP to be $32,940.

B. Conclusion

From our evaluation of the environmental effects and public benefits of the project, we conclude that licensing the Eel Weir Project, with our recommended environmental protection measures, would best adapt the project to a comprehensive plan for the waterway. The proposed project, with staff-recommended modifications and additional measures, would generate an average of 11,088 MWh of electricity annually, which has a net annual benefit of about $248,890.

VIII. CONSISTENCY WITH FISH AND WILDLIFE RECOMMENDATIONS

Section 10(j) of the FPA
16 U.S.C. * 803(j)(1).

[94]
requires the Commission to include license conditions, in each hydroelectric license issued, based on recommendations provided by the state and federal fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. Moreover, Section 10(j) states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. If the Commission still does not adopt a recommendation, it must explain how the recommendation is inconsistent with Part I of the FPA or other applicable law and how the conditions imposed by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife resources.

In response to the Commission's REA notice, Interior, on behalf of the USFWS, and the MSPO,

The MSPO filed Section 10(j) terms and conditions for the Eel Weir Project, on behalf of the MDIFW and the MDMR. However, by Executive Order of the Governor of the State of Maine, the terms and conditions contained in Maine's 401 WQC, when issued, would represent the state's official recommendations on all issues regarding the license application, including fish and wildlife, and would supercede all preliminary recommendations by individual state agencies. Nonetheless, in this section, we deal with the 10(j) recommendations submitted by Interior, the MDIFW, and the MDMR.

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on August 1 and August 5, 2004, respectively, filed letters providing comments, as well as terms and conditions, for the Eel Weir Project, pursuant to Section 10(j). Table 44 lists the agencies' recommendations subject to Section 10(j). Table 44 also summarizes our analysis of those recommendations, including whether the recommendations are adopted under the staff alternative. Recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA.

Table 44. Analysis of fish and wildlife recommendations for the Eel Weir Project. (Source: Staff)

The USFWS, in commenting on the draft EA, recommends an alternative flow regime consisting of: (1) 115 cfs from 11/1 to 3/31; (2) 200 cfs from 4/1 to 6/30; (3) 115 cfs from 7/1 to 8/31; and (4) 200 cfs from 9/1 to 10/31. We estimate this recommendation would cost $131,560 annually, and don't recommending adopting it.

We recommend the project operation and flow monitoring plan include temperature monitoring. We estimate our recommendation would cost $3,600 annually.

We recommend the SMP include: (1) conservation easements; (2) buffer zones; (3) Sebago Lake shoreline mapping, and a permitting program. We estimate this measure would cost about $9,730 annually.

Recommendation	Agency	Within scope of Section 10(j)	Total annualized cost (2004$)	Staff recommend adoption?
1. Release 200 cfs to the bypassed reach 4/1 to 10/31, and 115 cfs from 11/1 to 3/31.[96]	USFWS	Yes	$129,920	No
2. Limit Sebago Lake fluctuation to no more than 2 feet from 4/1 to 12/15, and no more than 3 feet from 12/16 to 3/31.	USFWS	Yes	$20,930	No
3. Develop and implement a plan to monitor instream flows and impoundment water levels	USFWS	Yes	$1,500	Yes[97]
4. Monitor recreation use at the project and file a report with the Commission	USFWS	No, not a specific measure to protect fish and wildlife	$670	Yes. We recommend monitoring consistent with FERC Form 80 requirements
5. Develop a shoreline management plan to protect riparian resources in the project area	USFWS	Yes	$1,570	Yes[98]
6. Install permanent upstream passage facilities for American eel	MDMR	Yes	$17,000	Yes
7. Install permanent downstream passage facilities for American eel; and that minimizes the loss of adult land-locked Atlantic salmon to the bypassed reach	MDMR MDIFW	Yes	$26,030	Yes

8. Consult with the resource agencies on the design, location, and effectiveness testing of the upstream and downstream eel passage facilities	MDMR	No, not a specific measure to protect fish and wildlife	$0	Yes
9. Modify the 1997 Lake Level Management Plan to suppress lake trout spawning	MDIFW	Yes	$169,620	No
10. Release 200 cfs to the bypassed reach 5/1 to 10/31, and 115 cfs from 11/1 to 4/30	MDIFW	Yes	$122,460	No
11. Release 100 cfs to the bypassed reach 5/1 to 10/31, and 115 cfs from 11/1 to 4/30 if coldwater refugia areas can not be adequately protected	MDIFW	Yes	$44,980	No
12. Develop plans for a shallow-water boat launch facility on licensee-owned lands	MDIFW	No, not a specific measure to protect fish and wildlife	$7,990	Yes
13. Grant the MDIFW a perpetual easement for angler foot access on lands adjacent to and underlying the Eel Weir bypassed reach	MDIFW	No, not a specific measure to protect fish and wildlife	$0	Yes, in part. We recommend S.D. Warren establish conservation easements on land around the bypassed reach
14. Conduct a warmwater fishery assessment for Sebago Lake to determine effects of existing LLMP.	MDIFW	No, represents a study that could have been pre-filing	$7,490	No
15. Mitigate for smelt migration barriers resulting from project operation	MDIFW	Yes	$1,500	No
16. Investigate the feasibility of increasing the power canal discharge capacity to minimize lost angling opportunities in the bypassed reach	MDIFW	No, not a specific measure to protect fish and wildlife	$0	No

A. Recommendations pursuant to Section 10(j) of the FPA

Under Section 10(j) of the FPA, we determined that the USFWS submitted four recommendations for the Eel Weir Project that fall within the scope of section 10(j); the MDMR submitted two such recommendations and the MDIFW submitted four such recommendations. We recommend adopting measures consistent with a number of these recommendations, including (1) developing and implementing a plan to monitor instream flows and impoundment water levels (USFWS); (2) installing and evaluating upstream and downstream American eel passage (MDMR); (3) developing downstream eel passage that minimizes loss of adult land-locked Atlantic salmon to the Eel Weir bypassed reach (MDIFW); and (4) developing and implementing a SMP (Interior).

Recommendations in the draft EA

We did not recommend adopting the USFWS's recommendation that S.D. Warren release 200 cfs (4/1 to 10/31) and 115 cfs (11/1 to 3/31) to the Eel Weir bypassed reach. Nor did we recommend adopting the MDIFW's recommendation that S.D. Warren release 200 cfs (5/1 to 10/31) and 115 cfs (11/1 to 4/30) to the bypassed reach; * 110 cfs would be released in the summer if coldwater refugia can not be adequately protected with 200 cfs. For the reasons discussed below, we found that these recommendations were inconsistent with the public interest standard of Section 4(e) and the comprehensive planning standard of Section 10(a) of the FPA.

Our analysis in the draft EA showed that these flows would improve aquatic habitat in the Eel Weir bypassed reach for the fish species of management importance. However, we found that the agencies' recommended flows would: (1) provide relatively small/modest incremental gains in fish habitat, but cost from $107,490 to $114,950 annually ($84,490 to $91,950 more than the staff-recommended flow regime); (2) enhance habitat for smallmouth bass, which we believed was an non- desirable species; and (3) eliminate the coldwater refugia that currently exist in the reach. As described in sections V.C.3, Fisheries and Aquatic Resources and V.II.A, Comprehensive Development of the draft EA, our recommended flow regime, while differing from the resource agencies, would seasonally improve overall aquatic habitat in the bypassed reach for the fish species of interest, and limit habitat for smallmouth bass. In addition, our recommended flow regime would have ensured that the colder seeps remained viable as refugia during the summer months.

We did not recommend adopting the USFWS's recommendation that S.D. Warren limit Sebago Lake fluctuations to no more than 2 feet (4/1 to 12/15) and 3 feet (12/16 to 3/31). Nor did we recommend the MDIFW's recommendation that S.D. Warren manage Sebago Lake water levels to suppress lake trout spawning. In the draft EA, we found Interior's and the MDIFW's recommendations inconsistent with the public interest and comprehensive planning standards of Sections 4(e) and 10(a) of the FPA.

Interior's recommendation to restrict Sebago Lake fluctuations would have resulted in higher water levels throughout the year, and cost $20,930 annually. These higher lake levels could have enhanced littoral zone habitat and thereby benefited shallow water fish species and wetlands. Recreation use also would have been enhanced. However, we found that higher water levels, particularly in the fall and winter likely would have increased shoreline erosion, with associated (and commensurate) effects on water quality and fisheries. With regards to the MDIFW's recommendation, our analysis showed that a winter drawdown of 5 to 8 feet would have substantial adverse consequences to not only fish populations and wetlands, but also the winter ice fishery and macroinvertebrates. The MDIFW's recommendation would cost $169,620 annually.

Our analysis of the lake level issue on Sebago Lake showed that wholesale changes in the current LLMP were not warranted. Therefore, we recommended only minor changes to the LLMP. We found that maintaining the spring target elevation (266.65 feet) through the end of the 3rd week of June would benefit spring spawning fishes, as well as enhance nursery habitat. We also found that the 3-inch tolerance range around the August 1 target (265.17 feet) could benefit warmwater fish species that use littoral zone habitats for spawning and rearing. Finally, our analysis showed that slightly higher water levels in the winter would afford some protection to littoral zone habitat.

We did not recommend adopting the MDIFW's recommendation that S.D. Warren mitigate for smelt migration barriers resulting from project operation. Our analysis showed that smelt could access spawning habitat in all but two tributaries assessed for migration barriers at 266.65 feet. Maintaining winter/early spring water levels at somewhat higher levels, as we recommended, could further enhance access. Spawning habitat in two tributaries would not be accessible at the spring target level of 266.65 feet. In fact, the barriers, which are the result of road culverts, are at elevations of 267.5 and 268.0 feet, well above the crest elevation of the Eel Weir dam. Thus, we found that neither the project, nor its operation, appeared to be affecting access to smelt spawning habitat. We estimated the cost of this measure to be $1,500 annually; but recognized that it could be higher depending on measures implemented. We concluded the MDIFW's recommendation lacked substantial evidence and was inconsistent with the public interest and comprehensive planning standards of Sections 4(e) and 10(a) of the FPA.

Section 10(j) Meeting and Issue Resolution

To resolve the inconsistencies between the agencies' recommendations and the purposes and requirements of the FPA or other applicable law, Commission staff met with representatives from the USFWS, the MDIFW, the MDMR, and the MDEP in Augusta, Maine on September 22, 2005. The recommendations discussed included: (1) minimum flows in the bypassed reach; (2) the SMP for the project; (3) monitoring downstream eel passage; (4) the lake drawdown to suppress lake trout spawning; (5) lake level fluctuations; and (6) mitigation for smelt migration barriers.

BYPASS MINIMUM FLOWS - The discussion of minimum flows centered on the agencies' flow recommendation and the rationale supporting the recommendation. The agencies explained that staff's analysis in the draft EA mischaracterized the agencies' fishery management priorities.

At the 10(j) meeting, the agencies outlined their rationale for higher flows. First, the agencies stated that the draft EA misuses the term "maximum WUA," in that the highest flows modeled (440 and 185 cfs in the riffle/run and braided channel habitats, respectively) do not represent maximum WUA. Rather, these flows are the maximum flows modeled. Second, the agencies stated that the presence of smallmouth bass in the bypassed reach should not carry much weight in flow management decisions, as this species is not considered a threat to trout management. Third, the agencies stated that higher flows and the continued viability of coldwater refugia are not mutually exclusive. Fourth, the USFWS contends that flow management in the bypassed reach should consider the outstanding water quality and habitat available in the reach. Lastly, the agencies stated that the current flow regime does not reflect the existing management program for the bypassed reach.

Staff reiterated the draft EA's conclusions regarding the agencies' recommended flows. Notwithstanding its position, staff agreed to revisit the issue of minimum flows in preparing the final EA, considering not only the information provided by the agencies relative to management priorities, but also the information the MDIFW agreed to file regarding measures to protect the coldwater refugia in the bypassed reach.

As a compromise, the USFWS, in its August 29, 2005, letter commenting on the draft EA, provided an alternative flow recommendation for the bypassed reach. We analyzed this recommendation in the final EA, in section V.C.3.b, Fisheries and Aquatic Resources - Environmental Analysis. We conclude that the USFWS's alternative flow recommendation would have a variety of seasonal benefits to the fish populations, as well as angling opportunities in the bypassed reach. However, we estimate that this flow recommendation would cost $131,560 annually, and, thus, do not recommend adopting it.

Based on the information provided by the agencies at the 10(j) meeting, and the additional information provided by the MDIFW, we modified our flow recommendation by increasing flows to 125 cfs from April 1 to October 31 and to 75 cfs from November 1 to March 31. These flows would provide substantial enhancements to aquatic habitat and the coldwater fish community (including Stenonoma); as well as angling opportunities, in the bypassed reach, but cost about $62,000 annually. These modified flows, however, differ from the flows recommended by the agencies. We find that the agencies' flow recommendations for the Eel Weir bypassed reach, including the USFWS's alternative flow recommendation, are inconsistent with the public interest standard of Section 4(e) and the comprehensive planning standard of Section 10(a) of the FPA.

Our recommended flows would likely compromise the integrity of the two known coldwater refugia in the bypassed reach. Thus, we now support the USFWS's recommendation for temperature monitoring in the bypassed reach, and recommend that water temperatures be monitored for 3 years as part of our recommended project operations and flow monitoring plan. Based on our review of what would be required, we do not expect temperature monitoring to alter of cost of the monitoring plan ($1,500 annually).

SHORELINE MANAGEMENT PLAN - In the draft EA, we recommended that S.D. Warren develop a SMP similar in design to that required in the licenses for the downstream Dundee (P-2942) and Gambo (P-2931) projects. In its August 29, 2005, comments on the draft EA, the USFWS agreed with staff's recommendations for conservation easements, shoreline protection measures, and aesthetics. The USFWS requested, only, that it be consulted during the development of the SMP.

At the section 10(j) meeting, the USFWS discussed the need for a SMP at the project, or some other appropriate fish and wildlife protection measures. The USFWS stated the following: (1) the SMP should identify critical habitats around Sebago Lake, as well as other important areas (e.g., super-canopy trees used by bald eagles and loon nesting locales); (2) the Commission should exert authority over unregulated activities with the project boundary (e.g., temporary docks, seasonal water lines, etc.);

The term "temporary" means in place for 7 months or less.

[99]

and (3) the SMP should involve some form of monitoring. At the section 10(j) meeting, staff stated that it anticipated recommending a SMP for Sebago Lake in the final EA, but did not agree with the USFWS on the nature and scope of the SMP.

In considering the information provided by the participants at the meeting, including reviewing the license for the Moosehead Project (P-2671), we modified our recommendation for a SMP at the Eel Weir Project. We now recommend a SMP for the project that would include conservation easements, buffer zones, mapping Sebago Lake's shoreline, and a permitting program for unregulated activities. We estimate our recommended SMP would cost about $9,730 annually.

DOWNSTREAM EEL PASSAGE - In the draft EA, staff recommended adopting the MDMR's recommendations regarding upstream and downstream eel passage at the project, including the need for effectiveness monitoring. Staff did not adopt the MDMR's operational timing window, but, rather, recommended the downstream facility be operated consistent with those of S.D. Warren's five downstream projects.

The MDMR did not filed comments on the draft EA, not did it comment on staff's eel passage recommendations, including the operational timing provision. However, at the section 10(j) meeting, the MDMR reiterated its recommendation that the sluice gate at the Eel Weir dam be operated from August 15 through November 15, until studies are completed. The MDMR stated that the out-migration timing of eels from Sebago Lake may be different from out-migration timing for downstream, riverine eels. Consequently, the MDMR recommends that a timing study be conducted at the Eel Weir Project,

Based on our review of the MDMR's 10(j) recommendations, the agency's request for an out-migration study appears to be a modification of its original recommendation.

[100]

as well as an effectiveness study of the eel passage facilities.

At the section 10(j) meeting, staff agreed to consider the need for an out-migration study at Eel Weir. In the final EA, we continue to recommend a narrower, 8-week, operational window for the downstream eel passage. However, based on the discussions at the section 10(j) meeting and the analysis in section V.C.3.b, Fisheries and Aquatic Resources - Environmental Analysis, we are modifying our recommendation for downstream eel passage to include an out-migration timing evaluation. This modification is consistent with the MDMR's out-migration timing recommendation. Because the timing component can be integrated into our existing monitoring requirement, we do not anticipate that the annual cost for downstream eel passage ($26,030), as identified in the draft EA, would change.

The USFWS stated that it is satisfied with the EA's treatment of eel passage, but is unclear about the monitoring provisions and the operational timing for the downstream eel passage facility. The MDIFW expressed concern about passage of landlocked salmon through the downstream eel passage facility. We have clarified the monitoring provisions and operational timing aspect of the downstream eel passage recommendation in the final EA. With regard to MDIFW's concern, we encourage the agencies and S.D. Warren to consider downstream salmon passage in our recommended monitoring study.

DRAWDOWN FOR LAKE TROUT SPAWNING - At the section 10(j) meeting, the MDIFW stated that it did not disagree with staff's finding regarding the lake trout drawdown (i.e., inconsistency resolved), but stated that staff's rationale in the draft EA was inaccurate. To assist staff in revising this section of the EA, the MDIFW provided information on: (1) lake trout spawning characteristics in Maine; (2) the timing and magnitude of the drawdown; (3) potential effects on the winter fishery and smelt spawning in the spring; (4) consistency with the USFWS's lake level recommendation; and (5) the status of Sebago Lake's fishery. In addition, S.D. Warren provided information regarding the drawdown's effect on generation and the ability to reach full pond the next spring. At the meeting, staff agreed to consider the information provided in preparing the final EA; thereby, resolving the MDIFW's concerns.

LAKE LEVEL FLUCTUATIONS - At the section 10(j) meeting the USFWS stated that it did not disagree with staff's recommended LLMP, but indicated that staff's discussion of the 2-foot drawdown was mischaracterized. The USFWS stated that it does not recommend a 2-foot drawdown, but rather considers the 2-foot fluctuation an operating band. The USFWS recommended striking this discussion from the EA. The USFWS also recommended that, if its water level recommendation is not adopted, measures to protect shoreline and riparian areas be included in a SMP. Staff agreed to clarify the USFWS's water level management recommendation in the final EA. This inconsistency has been resolved.

SMELT MIGRATION BARRIERS - At the section 10(j) meeting, the MDIFW stated that it did not disagree with the conclusion in the draft EA, but sought clarification regarding the link between the migration barriers and project operation. Staff explained that the two tributaries in question were the result of road culverts located well above the operating lake level of Sebago Lake. The MDIFW accepted this explanation. As a result of the comments filed on the draft EA, we reevaluated lake level management on Sebago Lake. We now recommend a spring full pond elevation of 266.15 feet (* 0.5 foot), which is 0.5-foot lower than the elevation we recommended in the draft EA. The same two tributaries would be impassable at the lower elevation for the same reasons.

A third tributary [Trickey Pond outlet, a relatively small (0.35-cfs) stream] would be passable at an elevation of 266.65 feet but may not be passable at 266.15 feet (see table 23). The barrier in question is a shallow riffle between elevation 263.2 and 266.7 feet. The elevation of 266.15 feet is a target. Our recommendation includes an operating band of *0.5 foot. Therefore, we conclude that, except in dry years, Trickey Pond outlet would most likely be passable at our recommended full pond elevation of 266.15 feet.

[101]
This inconsistency has been resolved.

B. Recommendations under Section 10(a) of the FPA

Section 10(a) of the FPA
16 U.S.C. * 803(a)(1).

[102]

requires that any project for which the Commission issues a license shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce; for the improvement and utilization of waterpower development; for the adequate protection, mitigation, and enhancement of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, recreation, and other purposes.

The USFWS made one recommendation that is outside the scope of section 10(j). In addition, the MDMR and the MDIFW filed one and four recommendations, respectively that are outside the scope of 10(j). We consider these recommendations under the broad public interest standard of FPA section 10(a)(1). We considered these recommendations to be outside the scope of section 10(j), because we do not consider such recommendations to be specific measures to protect fish and wildlife.

We recommend that S.D. Warren monitor recreation use at the project on an on-going basis. The Eel Weir Project is subject to the Commission's FERC Form 80 requirements, which requires that S.D. Warren file a recreation report with the Commission every 6 years. Such monitoring, which we conclude to be consistent with the recreation monitoring recommended by Interior, would be sufficient to address the adequacy of recreation facilities and the need for additional facilities to meet future demand.

We recommend adopting the MDMR's recommendation that S.D. Warren consult with the resource agencies on the design, location, and effectiveness testing of American eel passage facilities. We recommend this be a component of our recommended American eel passage plan.

We recommend adopting the MDIFW's recommendation that S.D. Warren develop plans for a shallow-water boat launch on S.D. Warren-owned lands. A boat ramp in the Sebago basin would provide access to an area of Sebago Lake that currently requires the use of commercial marinas, primarily for small watercraft that could navigate the shallow depths of the basin.

We recommend adopting, in part, the MDIFW's recommendation that S.D. Warren grant the MDIFW a perpetual easement for angler foot access on lands adjacent to and underlying the Eel Weir bypassed reach. We agree that protecting public access to the bypassed reach would be essential to maintaining the success of the bypass fishery. However, there remain questions regarding the type of conservation easement to be established, the holder of such an easement, and what types of restrictions the easement holder might impose. Thus, we recommend that the lands adjacent to, and underlying, the bypassed reach be placed in a conservation easement. However, at this time, we do not recommend that the easement be granted to the MDIFW.

We do not recommend adopting the MDIFW's recommendation that S.D. Warren conduct a warmwater fishery assessment for Sebago Lake, to determine the effects of the LLMP. The evidence in the record does not support the MDIFW's contention that warmwater fish populations in Sebago Lake have declined since implementation of the LLMP. Moreover, our analysis shows that the current LLMP has little, if any, adverse affect on the warmwater fish populations in Sebago Lake.

We do not recommend adopting the MDIFW's recommendation that S.D. Warren investigate the feasibility of increasing the power canal discharge capacity to minimize lost angling opportunities in the bypassed reach. In section V.C.3, Fisheries and Aquatic Resources, we indicated that S.D. Warren undertook such an assessment and concluded that it was not prudent to increase the canal's discharge capacity beyond the current 1,000 cfs. We further concluded that infrequent high-flow events may present a short-term inconvenience to anglers using the bypassed reach. However, we do not expect there to be any long-term effects to angling opportunities.

IX. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving , developing, and conserving waterways affected by a project. Under section 10(a)(2), federal and state agencies filed a total of 19 qualifying plans that address various resources in Maine.

In addition to the Commission-approved comprehensive plans, we also reviewed, and considered the objectives of, the Draft Fisheries Management Plan for the Presumpscot River Drainage (Wippelhauser, G.S., et al., 2001).

[103]
We have identified eight federal and five state plans as being relevant to relicensing the Eel Weir Project.
(1) Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American Waterfowl Management Plan. U.S. Department of the Interior. May 1986. 19 pp.; (2) Fish and Wildlife Service. 1989. Final Environmental Impact Statement - Restoration of Atlantic salmon to New England Rivers. U.S. Department of the Interior. Newton Corner, Massachusetts. May 1989. 88 pp. and appendices; (3) National Marine Fisheries Service. Atlantic salmon (Salmo salar) - Amendment 1 to the New England Fishery Management Council's Fish Management Plan on Atlantic Salmon. October 1998; (4) National Marine Fisheries Service. 2000. Fishery Management Report No. 36 of the Atlantic States Marine Fisheries Commission: Interstate Fishery Management Plan for American eel (Anguilla rostrata). April 2000. 78 pp.; (5) National Marine Fisheries Service. 1999. Fishery Management Report No. 35 of the Atlantic states Marine Fisheries Commission: Shad and river herring - Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. April 1999. 77 pp.; (6) National Marine Fisheries Service. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 2000. 6 pp.; (7) Fish and Wildlife Service. Undated. Fisheries USA: The Recreatinal Fisheries Policy of the U.S. Fish and Wildlife Service. Washington, D.C. 11 pp.; (8) National Park Service. 1982. The Nationwide Rivers Inventory. U.S. Department of the Interior. Washington, D.C. January 1982. 432 pp.; (9) Maine Atlantic Sea-Run Salmon Commission. 1984. Strategic Plan for Management of Atlantic salmon in the State of Maine. Augusta, Maine. July 1984. 52 pp. and appendices; (10) Maine Department of Conservation. 1993. Maine State Comprehensive Outdoor Recreation Plan, Volume 1. Augusta, Maine. December 1993. 193 pp.; (11) Maine Department of conservation. 1982. Maine Rivers Study - Final Report. Augusta, Maine. May 1982. 181 pp.; (12) Maine State Planning Office. 1987. State of Maine Comprehensive Rivers Management Plan. Augusta, Maine. May 1987. Three volumes.; and (13) Maine State Planning Office. 1992. Maine Comprehensive Rivers Management Plan. Volume 4. Augusta, Maine. December 1992.

[104]

We recommend specific operational and environmental measures that would protect and enhance the environmental quality and integrity of Sebago Lake and the Presumpscot River system. Accordingly, we conclude that the issuance of a new license for the Eel Weir Project, with our recommended measures, would be consistent with the objectives of the comprehensive plans reviewed in this proceeding.

X. FINDING OF NO SIGNIFICANT IMPACT

We prepared this draft EA for the Eel Weir Project pursuant to NEPA requirements. Implementing the protection measures described in this environmental assessment would ensure that the environmental effects of the project would remain insignificant. There would be no significant unavoidable adverse effects.

On the basis of this independent analysis, we conclude that issuance of a new license for the project would not constitute a major federal action significantly affecting the quality of the human environment. With the applicant's proposed action and our recommended measures, the resources we analyzed in this draft EA would be enhanced and/or protected.

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Appendix A - Figures

Project Area & Facilities Maps

Figure 1. Location of Eel Weir Project (FERC No. 2984) within the Presumpscot River Basin. (Source: FERC, 1997a)

Figure 2. Eel Weir Site Location. (Source: FERC, 1997a)

Public Access for the above information is available only Through the Public Reference Room, or by e-mail at Public.referenceroom@ferc.gov

Appendix B - Maine's LLMP Proposal

STATE OF MAINE
PROPOSED SEBAGO LAKE LEVEL MANAGEMENT PLAN
April 2004

* Whenever possible, the lake shall be managed during spring fill-up to reach a target level of 266.65 feet (spillway crest) on but not before May 1. The allowable target range on May 1 is from 266.65 feet to 266.0 feet.

* Lake levels may be at spillway crest any time between May 1 and the third week in June. Water levels above spillway crest shall trigger increased flows according to the

attached operating parameters to move the lake back below spillway crest level.

* After spring fill-up, the lake shall be managed to achieve a minimum target level of 265.17 feet (~1.5 feet below spillway crest) on August 1, which coincides with the short term (1967-1986) median level for that date.

* After August 1, water levels shall be managed to reach a target level on November 1 of 262.5 feet, plus or minus 6 inches, whenever possible, with a maximum level during this period of 265.0 feet on September 1.

* Water levels above a line drawn from 266.65 feet at the end of the third week of June to 265.0 feet on September 1, and thence to 263.0 feet on November 1, shall trigger increased flows according to the attached operating parameters to move the lake level back within the target range.

* Lake levels below a line drawn from 266.0 feet on May 1 to 265.17 feet on August 1, and thence to 262.0 feet on November 1, shall trigger minimum flow according to the attached operating parameters to move the lake back within the target range.

* After November 1, water levels will be managed to achieve a target level of 261.0 feet on or about December 1 in two out of every nine years, starting from the FERC's April 21, 1997 approval of the Compromise plan. The lake level will then be managed to stay within 6 inches of the December 1 target level until January 1. S.D. Warren and the State will jointly determine the years in which to manage for the 261.0 target level based on water levels and precipitation over the previous six months.

* During the mid-October to mid-November salmon spawning season, flows will be capped at 60,000 CFM (1,000 cfs) unless the lake level is above the target range and is rising.

* Beginning on January 1, and continuing until March 1, flows shall be reduced to achieve and maintain lake levels at or above the long term (1910-1986) median levels for this period as soon as practical, without causing damage to S.D. Warren's generating equipment. Thereafter, lake levels shall be managed as deem appropriate by S.D. Warren based on precipitation, snow pack, energy needs and other considerations, with the goal of reaching the spillway crest target level by May 1. Whenever possible, water levels shall be managed to be non higher than a line drawn from 263.0 feet on November 1 to 263.5 feet on January 1 and from 263.5 feet on January 1 to 266.65 feet on May 1.

STATE OF MAINE
OPERATING PARAMETERS FOR
PROPOSED SEBAGO LAKE LEVEL MANAGEMENT PLAN
April 2004

TARGET LEVEL. A target level is a specific lake level that is the goal of the plan on a specific date.

TARGET RANGE. The target range is the range of water levels (identified by color on the attached graph) from May 1 to November 1 within which normal flows are released in an attempt to achieve the specific target levels.

NORMAL FLOWS. Normal flows are the flows released from the lake when lake levels are within the target range between May 1 and November 1. Normal flows may vary between 20,000 CFM (333 cfs) and 60,000 CFM (1,000 cfs) and shall be adjusted to move the lake level toward the next target level at all times, except in emergency situations, as described below. Except for emergency situations, normal flows shall be adjusted as necessary no more than once per week.

ABNORMAL FLOWS. Abnormal flows are the increased or decreased flows released from the lake when the lake levels are outside the target range between May 1 and November 1. Abnormal flows shall be adjusted in stages to move the lake level toward the next target level at all times, except in emergency situations, as described below.

STAGE 1 FLOWS. Prior to adjusting to Stage 1 flows, flows shall be at the normal minimum (20,000 CFM) or maximum (60,000 CFM) for more than five business days and the lake level shall be outside the target range, except that flows shall be increased immediately whenever the lake level rises above spillway creast (266.65 FT MSL).

Minimum Flow. For lake levels below the target range, flows shall be reduced to the minimum flow required to maintain mandatory water quality standards in the lower Presumpscot River, as determined by DEP. This flow is currently 15,000 CFM (250 cfs) and may be adjusted downward in the future based on a additional modeling analysis.

Maximum Flow. For lake levels above the target range, flows shall be increased up to a maximum of 100,000 CFM (1,667 cfs) or such higher flow as necessary to prevent water levels from reaching 267.15 MT MSL (6 inches above spillway crest).

STAGE 2 FLOWS. Prior to adjusting to Stage 2 flows, Stage 1 flows must be maintained for no more than one week and the lake level shall not be moving toward the target range.

Minimum Flow. For lake levels below the target range, flows shall be the same as Stage 1 minimum flows.

Maximum Flow. For lake levels above the target range, flows shall be increased up to 160,000 CFM (2,667 cfs) or such higher flow as necessary to prevent water levels from reaching 267.15 FT MSL (6 inches above spillway crest).

STAGE 3 FLOWS. Prior to adjusting to Stage 3 flows, Stage 2 flows must be maintained for no more than one week and the lake level shall not be moving toward the target range.

Minimum Flow. For lake levels below the target range, flows shall be the same as Stage 1 flows.

Maximum Flow. For lake levels above the target range, flows shall be increased up to 210,000 CFM (3,500 cfs) or such higher flows as necessary to prevent water levels from reaching 267.15 FT MSL (6 inches above spillway crest).

MONITORING. Lake levels shall be monitored using an approved U.S.G.S. gage to be read remotely at least once a day, with the readings published by the U.S.G.S. Whenever the U.S.G.S. gage is inoperable, a manual reading of the lake level will be made and will be provided to the U.S.G.S. For the purpose of confirming compliance with this plan, U.S.G.S., s provisional average daily reading of the lake level shall be used.

BYPASS FLOWS. Due to the fishery in the bypass channel below the Sebago Lake (Eel Weir) Dam, all efforts consistent with this plan shall be made to minimize the duration fo flows in the bypass above the minimum bypass flow required by the FERC license during the April 1 to July 1 and September 1 to November 1 fishing periods.

COMPLIANCE. Where lake levels are above or below the target range, or are above or below a stated target level, S.D. Warren shall be in compliance with the plan as long as flows have been increased or decreased in accordance with the plan and the lake level is being managed in an attempt to return to the target range and to achieve the next specified target level. The flows implemented in Stage 1 or 2 or 3 may be adjusted at any time that the lake level is moving toward the target range, but the lake level must continue to move toward the target range.

REPORTING. The State and S.D. Warren agree that a report is required to be filed with FERC only when the lake level is more than six inches above or below the established target range. S.D. Warren shall provide weekly flow schedules to the agencies by regular mail, or by other agreed-upon means, which will indicate what flow is anticipated for the next week and any changes in flows for the previous week.

LAKE LEVEL COORDINATION. If the level of Sebago Lake is above the target range any time during the October 15 to November 15 salmon spawning season, every effort will be made by the Department of Conservation to delay or reduce drawdown flows from Brandy Pond/Long Lake through the State-owned Songo Lock and Dam. S.D. Warren shall respond under the provisions and operating parameters of the plan to any increased lake level as a result of the drawdown of Brandy Pond/Long Lake.

261.0 TARGET LEVEL. Subject to discussion and agreement between the State and S.D. Warren, flows may be increased above the flows otherwise required by this plan in an effort to lower the lake to achieve the target level of 261.0 ft on or about December 1 in two out of every nine years, and S.D. Warren shall not be constrained by the target range nor the November 1 target level. If S.D. Warren is unable to achieve the 261.0 ft level in two out of every nine years despite decisions by S.D. Warren and the State to increase flows, then an attempt to achieve the 261.0 ft level shall be made in the next year(s) until the two-in-nine year requirement is met. Such action by Warren shall be considered to be in compliance with this plan. Once the 261.0 ft target level is reached, the lake will be managed so as to stay within 6 inches of that target level until January 1.

EMERGENCY SITUATIONS. Flows may be temporarily adjusted outside the range of flows required above in the event of equipment failure, approved maintenance activities, power supply emergencies, downstream flooding, public safety considerations, existing or predicted extreme meteorological events, or by order of local, state or federal authorities.

Appendix C - LLMP Wetlands Monitoring Survey Results

Results of LLMP wetland monitoring surveys, by transect, 1999 to 2002. (Source: Staff; Normandeau, 2000; Normandeau, 2001b; Normandeau, 2002; Normandeau, 2003)

	1999 a	2000	2001	2002

	# of Dominant Species b	Total Percent Cover or dbh c	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh	# of Dominant Species	Total Percent Cover or dbh
Transect 1								
Segment 1								
Herbaceous	1	20	2	28	1	120	1	110
Segment 2								
Herbaceous	3	125	2	90	3	92	2	97
Right side shrub	1	30	1	30	1	25	1	25
Left side shrub	1	25	1	25	1	25	1	25
Segment 3								
Herbaceous	1	7	1	15	0	N/A	0	N/A
Right side shrub	1	90	1	90	1	80	1	100
Left side shrub	2	75	1	85	2	100	2	100
Right side tree d	1	77	1	27.5	1	30	1	32

Segment 4								
Herbaceous	2	17	0	N/A	0	N/A	0	N/A
Right side shrub	2	80	2	80	1	75	1	75
Left side shrub	2	95	2	95	2	100	2	131
Right side tree	1	11	1	12	1	12	1	12
Left side tree	2	74.5	2	78	2	78	2	84
Transect 2								
Segment 1								
Herbaceous	2	90	2	85	1	115	3	86
Segment 2								
Herbaceous	4	85	2	95	1	47	1	60
Right side shrub	2	35	2	50	1	20	1	20
Left side shrub	2	40	1	53	1	25	1	36
Segment 3								

Herbaceous	4	30	0	N/A	0	N/A	5	38
Right side shrub	3	65	2	65	2	60	2	60
Left side shrub	1	30	1	40	1	26	1	26
Right side tree	1	5	1	6	1	11	1	11
Left side tree	1	17	1	18	1	13	1	13
Segment 4								
Herbaceous	2	12	0	N/A	0	N/A	0	N/A
Right side shrub	2	85	2	95	2	81	2	87
Left side shrub	2	60	2	52	1	51	1	51
Right side tree	2	14	2	14	2	15	2	20.5
Left side tree	3	32	2	32	1	40	1	41
Transect 3								

Segment 1								
Herbaceous	0	N/A	0	N/A	1	55	2	30
Segment 2								
Herbaceous	2	70	3	105	3	90	4	92
Segment 3								
Herbaceous	1	15	0	N/A	0	N/A	0	N/A
Right side shrub	2	90	1	100	1	105	1	110
Left side shrub	1	100	1	100	1	112	1	116
Segment 4								
Herbaceous	1	100	2	100	2	96	2	100
Right side shrub d	3	22	2	60	2	85	2	75
Segment 5								
Herbaceous	1	35	0	N/A	2	35	2	35
Right side shrub	2	50	3	95	2	110	2	110
Left side shrub	2	60	2	85	2	85	2	92

Right side tree	1	14	1	15	1	15.5	1	10
Left side tree	1	24.5	1	33	1	33	1	59.5
Segment 6								
Herbaceous	2	25	1	30	1	28	1	28
Right side shrub	1	60	2	80	1	111	1	111
Left side shrub	2	15	2	15	1	37	1	37
Right side tree	2	51.5	2	54.5	2	55	2	55
Left side tree	1	31.5	2	37	2	43	2	45
Transect 4								
Segment 1								
Herbaceous	1	98	2	70	3	90	3	95
Segment 2								
Herbaceous	1	31	1	25	1	50	1	20

Right side shrub	2	70	2	65	2	70	2	68
Left side shrub	2	55	2	80	2	85	5	85
Right side tree e	1	77	1	77	1	138	0	N/A
Segment 3								
Herbaceous	2	41	1	30	1	55	1	30
Shrub f	1	29	2	50	1	65	2	83
Tree f	1	187	1	187	1	207.5	1	207.5
Transect 5								
Segment 1								
Herbaceous	0	N/A	0	N/A	0	N/A	0	N/A
Segment 2								
Herbaceous	2	95	3	95	3	85	2	88
Segment 3								
Herbaceous	3	15	2	30	0	N/A	0	N/A
Right side	1	100	1	100	2			

shrub						115	2	115
Left side shrub	2	60	2	60	2	70	2	75
Left side tree g	0	N/A	1	56.5	1	56.5	1	59
Segment 4								
Herbaceous	3	25	3	30	2	47	2	35
Right side shrub	2	25	0	N/A	3	40	2	38
Left side shrub	2	25	2	25	1	27	1	30
Right side tree	2	80.5	3	91.5	2	98	2	91.5
Left side tree	3	72	3	65.5	2	77	2	83

a Data from 1998 were not included in this table due to different sampling methods.
b The number of dominant species is a measure of diversity.
c Trees are measured (diameter) at breast height (dbh, in inches) as opposed to % cover.
d There were no shrubs on the left side of the transect.
e There were no trees on the left side of the transect.
f Single quadrant on right side of transect due to plant community configuration.
g There were no trees on the right side of the transect.

Appendix D - Staff Responses to Comments on Draft EA

APPENDIX A

STAFF RESPONSES TO COMMENTS ON THE DRAFT EA

The Commission staff issued its draft environmental assessment (EA) for the proposed relicensing of the Eel Weir Project on July 11, 2005. Staff requested comments on the draft EA be filed within 45 days from the issuance date, or by August 25, 2005, which was subsequently extended until September 9, 2005. The following entities and individuals filed comments pertaining to the draft EA.

Commenting Entity	Date Filed
Carol L. Steiman	August 22, 2005
Portland Water District	August 24, 2005
S.D. Warren Company (S.D. Warren)	August 25, 2005[105]
Conservation Law Foundation (Conservation Law)	August 25, 2005
Sebago Lake Landowners & Users Coalition (Sebago Coalition)	August 25, 2005
Sebago Lake Marina (Sebago Marina)	August 25, 2005
Sebago Pines Property Owners Association (Sebago Pines)	August 26, 2005
U.S. Fish and Wildlife Service (USFWS)	August 29, 2005
U.S. Geological Survey (USGS)	August 29, 2005
Maine Department of Inland Fisheries and Wildlife (MDIFW)	August 30, 2005
Friends of Sebago Lake (FOSL)	September 7, 2005
	September 8, 2005
Maine Geological Survey (Maine Geology)	September 9, 2005
Town of Naples, Maine	September 13, 2005
Ted Davis	August 25, 2005
Ben R. Chapman	August 30, 2005
Theodore Tibbals	August 30, 2005
Charles E. Bragdon, Jr.	August 30, 2005
Stephen M. Kasprzak	August 31, 2005
	September 7,2005[106]
	September 12, 2005
Sebago Harbor Association (Sebago Harbor)	September 1, 2005
Philip & Pearl White	September 8, 2005
Timothy A. Toomey	September 15, 2005
Daniel & Jeanne Boland	September 15, 2005

Maine Public Employees for Environmental
Responsibility (Maine PEER)   September 15, 2005
33 Property Owners   August 8, 2005
to
October 24, 2005

Below, we summarize the substantive comments, provide responses to those comments, and explain how we modified the text of the draft EA, as appropriate, to address the comments. Changes addressing editorial comments were made to the final EA, but are not described below. The comments are grouped by topic for convenience.

Procedural and General

Comment: Mr. Stephen Kasprzak, along with numerous other citizens and shoreline residents recommend the Commission require a monetary penalty for future trespasses of S.D. Warren's flowage easements.

Response: For license violation, the Commission has comprehensive and exclusive civil enforcement authority under the FPA, based on sections 31, 314, 315, and 316 of the FPA. The FPA does not authorize the Commission to impose liquidated damages, or otherwise include a damages provision in a project license. See, e.g., Consumers Power Company, 68 FERC * 61,077 at 61,378-80 (1994). Moreover, under section 10(c) of the FPA, licensees are liable for all damages to the property of others resulting from project construction or operation. Any actions for damages, such as those, resulting from trespasses of flowage easement are matters left for review by state courts.

Hydrology, Lake Level Management, Flood Control, and Associated Issues

Comment: S.D. Warren states that the existing tolerance above 266.65 ft to 267.17 ft for May-June should not be removed because this could compromise their ability to achieve full pond in May-June and meet the August 1 target. S.D. Warren states that capping the lake level at full pond would force it to manage the lake level to stay below the spillway at all times to avoid claims of non-compliance. S.D. Warren further states that a more appropriate solution is to add a provision dictating certain actions (e.g., specified increases in outflows) be taken if the lake level reaches the 266.65 ft. level.

Response: Based on the many numerous comments received on the LLMP, we now recommend a full pond target elevation of 266.15 feet * 0.5 foot, and moving the earliest date for reaching that target to May 15. These measures should assist S.D. Warren in refilling the lake in the spring. We also recommend that water be spilled should lake levels exceed the crest elevation of 266.65 feet.

Comment: S.D. Warren objects to the provision to reduce lake levels for 2-in- 9 years, citing potential difficulties in achieving a full pond the following May-June. S.D. Warren, however, does state that it is willing to seek to achieve low lake levels in 2 out of 9 years if: (i) the LLMP is modified to extend the period in which to achieve that low lake level through February; and (ii) the LLMP is modified to acknowledge the effect of the low lake level on its ability to fill the lake by waiving the need to achieve full pond the following year (i.e., the spring following the low water level event).

Response: We have reviewed the record and conclude that the information is inconclusive where it concerns eliminating the 2-in-9-year drawdown. Therefore, we recommend retaining the 2-in-9-year drawdown to 261.0 feet as an option for restoring sand to beaches and, otherwise, maintaining beach profile stability. Our hydrologic analysis shows that in all, but extreme dry years, the lake can be refilled. In addition, we now recommend a full pond target elevation of 266.15 feet * 0.5 foot, and moving the earliest date for reaching that target to May 15. These measures should assist S.D. Warren in refilling the lake in the spring. Should a situation arise where S.D. Warren anticipates being unable to refill the lake, it can seek a temporary variance from the requirements of the LLMP.

Comment: S.D. Warren concurs with staff's recommendation that the LLMP should be amended to allow for temporary variances. S.D. Warrens, however, asks staff to clearly define the process for obtaining concurrence for the variance, the agencies to be consulted, and schedule for a timely final decision. In addition, S.D. Warren requests that its obligation to file a report under the revised LLMP be limited to circumstances when the lake level is outside of the plan target ranges or target levels continuously for 2 weeks.

Response: As is our practice in operational articles, we include provisions allowing licensee's to modify operational requirements based on mutual agreement between the licensee and pertinent agencies, as well as under emergency conditions. We would expect that the increased flexibility provided with our recommended changes to the LLMP should reduce the need to file reports. Therefore, we do not recommend any special provisions to address S.D. Warren's reporting concerns.

Comment: S.D. Warren raises concerns that the analysis of the LLMP relies on average water levels, while such an average does not happen every year in practice. S.D. Warren comments that the final EA should acknowledge that even though the analysis utilizing average and normal conditions yields a reasonable expectation that the LLMP can be complied with, there is no assurance or expectation that the LLMP can be complied with under all conditions.

Response: Our hydrologic analysis indicates that, except in the most extreme dry years, S.D. Warren would be able to refill Sebago Lake. In addition, our recommended changes to the LLMP should give S.D. Warren more flexibility in maintaining lake levels and compliance with the LLMP. We cannot offer S.D. Warren any guarantees that it will not be held accountable if violations to the LLMP occur. Allegations of non-compliance will be addressed at the time relevant events occur.
Comment: S.D. Warren does not agree with staff's adoption of the state's proposal to require a minimum lake level from January 1 to March 1 equal to the long-term (1910-86) median level, which is always above 262 ft, citing year-to-year precipitation variability and it's inability to manage the lake level to meet the May 1 target without going over in high snow pack years. S.D. Warren states that this proposal seems geared toward filling the Lake during low or drought years, but raises an issue with above average precipitation years. S.D. Warren requests that, should staff adopt the recommendation, it not be considered a violation of the LLMP if the lake levels exceed the 266.65-ft. level before or after May 1 if the lake is above median levels at the time. Furthermore, S.D. Warren asks that staff acknowledge in the final EA that this January to March minimum requirement increases the probability of the lake level exceeding 266.65 ft., and increases the probability of flooding downstream.

Response: We offer S.D. Warren no guarantees that it will not be held accountable should violations in the LLMP occur. We have revised our analysis in the final EA to acknowledge the increased probability of flooding, particularly downstream. We revised our recommendation to lower the spring target to an elevation of 266.15 feet * 0.5 foot and move the target date to May 15. We also recommend that water be spilled when lake levels reach 266.65 feet. These changes should provide S.D. Warren with flexibility to manage lake levels during the spring to reach full pond and minimize flooding risks along Sebago Lake and downstream along the Presumpscot River.

Comment: S.D. Warren requests that staff reconsider its earlier (July 2004 filing) requests to amplify the intent of the LLMP, as well as changes to the reporting requirements. S.D. Warren states that staff should expressly acknowledge in the final EA that the intent of the LLMP is to be a reactive plan, focused on S.D. Warren responding to the level of the lake pursuant to the parameters stated in the LLMP, and that the plan should not be subject to annual attempts by constituents to seek changes.

Response: The purpose of the LLMP should be to manage lake levels in Sebago Lake within prescribed targets and limits. While it is important to react to conditions as they occur and unfold, it is equally important to take proactive steps in managing lake levels and flows downstream in the Presumpscot River, as well. While annual attempts to change the LLMP are excessive and likely not appropriate, we cannot guarantee that future changes in the LLMP won't occur.

Comment: S.D. Warren recommends that rather than accepting the state's recommendation to categorically reduce the minimum flow under Stage 1, the LLMP Operating Parameters be modified to provide for a reduction to 15,000 cubic feet per minute (cfm) only during abnormal flow conditions when the water temperature is below 22 oC.

Response: There is a lack of information to address changes to the flows that are part of the LLMP Operating Parameters (i.e., the MDEP has not yet updated its water quality model for the Presumpscot River). Consequently, we do not recommend making any changes to the flow protocol included as part of the existing LLMP at this time.

Comment: USFWS noted an inconsistency within the draft EA, where it stated that a full 2-foot drawdown during the May/June fish spawning period could disrupt spawning and dewater habitat. The USFWS states that based on data in the DEA, a drawdown of this magnitude rarely, if ever occurred, since 1910.

Response: We maintain that if a 2-foot drawdown did occur during the May/June fish- spawning period, there could be adverse effects on fish spawning. Figure 7 of the draft EA and final EA indicates that drawdowns of 2 feet or greater have occurred during this period. The 90 percent exceedence level for the lake during this period is about elevation 262.5 feet (about a 4-foot drawdown), which indicates that this level occurred about 10 percent of the time from 1910-1986. Notwithstanding the aforementioned information, we have expanded our discussion of the recommended 2-foot drawdown to mention the probability of such a drawdown in an effort to clarify the context of the recommendation and potential effects.

Comment: During the section 10(j) meeting, the USFWS indicated that the draft EA may have misstated its recommendation regarding lake drawdowns during the spring. The USFWS is not advocating a 2-foot drawdown during the spring, but only that drawdowns may occur in a 2-foot operating band.

Response: We have revised the final EA to clarify the USFWS's recommendation.

Comment: The Maine Geology comments that too much emphasis has been placed on May 1 as the full pond date and reiterates that the acceptable range for full pond is May 1-June 15, and that the target level be 266.65 to 266.0 ft.

Response: We reviewed the hydrologic record and recommend an alternative full pond target date of May 15, and a target elevation 0.5-foot lower than the current full pond target, in an attempt to reduce the risk of flooding associated with the combination of strong, late season storms (April-early May) and a full lake. Requiring these measures would help minimize "trespass" of the flowage easements, and protect beaches from the large waves known to produce significant erosion.

Comment: Maine Geology comments that the 10-year beach profile record demonstrates that lake waves must be capable of moving sand outside of storm events and that Maine Geology reports (Dickson and Johnston, 1994; Johnston and Mixon, 1998) show the nearly seasonal cycle of beach profile adjustment, most of which happens during periods of insignificant storms. Maine Geology further states that its profile work shows that major storms do not "cancel out major changes in profiles," but rather are the sources for significant long-term changes to the profiles.

Response: We have revised the final EA to reflect this information.

Comment: Maine Geology comments on certain misconceptions that exist regarding the 2-in-9-year low lake level. Specifically, Maine Geology states that this measure defines a process that will likely require many cycles to show significant long-term improvement, and that a March 2002 accretion event is encouraging. Maine Geology also states that the 2-in-9-year low water level is the only measure in the LLMP aimed at improving beaches rather than just maintaining the status quo.

Response: We have reviewed the record and conclude that there is not enough information to support eliminating the 2-in-9-year drawdowns. Therefore, we recommend retaining the 2-in-9-year drawdown to 261.0 feet as an option for maintaining beach profile stability.

Comment: Maine Geology raises an issue with bullet (b) on page 29 of the draft EA that reads, "...following a drawdown to 261.0 feet, S.D. Warren can not guarantee that Sebago Lake will refill the next year, due to hydrological issues;" by submitting statistical analysis that shows spring lake levels depend strongly on winter/spring precipitation and hardly at all on fall lake level.

Response: In reference to hydrological requirements to refill the lake following a drawdown to 261.0 feet, we have expanded our analysis to include the volume of flow required to fill the lake from various drawdowns in both the Water Resources and Recreational Resources and Land Use sections. The analysis indicates that in all but the most severe droughts (low flows below the 75 percent exceedence levels) the lake would fill to the LLMP full target level. To ensure that lake levels reach the full pond target range in most years, we now recommend moving the earliest target date for full pond to May 15, and the target elevation to a maximum of 266.15 feet. This would assist S.D. Warren in filling the lake after a drawdown to 261.0 ft. the preceeding winter.

Comment: Maine Geology states that it would be best to have a period of at least 2 weeks at 261.0 ft. to allow sand to be acted upon by waves and ice, and suggests that the period for achieving 261.0 ft. could be extended to mid-winter which would address S.D. Warrens concerns regarding operating head, excessive spilling of large volumes of water, and other resource issues.

Response: We acknowledge that operations during the winter are dependent on various hydrological factors of the season (e.g., snow pack, precipitation, etc.) and attaining a 261.0-foot elevation requires certain flexibility in management strategy. Drawdowns to 261.0 feet could last 2 weeks or more, depending on the hydrological variables S.D. Warren uses when assessing lake levels for the upcoming season. Therefore, after reviewing the record in this proceeding, we conclude that no changes to the timing or magnitude of the 2-in-9-year drawdown are warranted at this time.

Comment: Maine Geology points out a contradiction in the analysis on page 35 of the draft EA, under the subsection 'increase water levels.' Maine Geology states that the summary statement contradicts earlier statements that periodic lowering of the lake shows no benefit to beach profiles.

Response: We have revised the final EA to correct this apparent discrepancy.

Comment: Maine Geology states that there is too much emphasis on the line from Jan. 1 to April 30 as a recommended maximum level. Maine Geology also states that S.D. Warren should manage lake levels in a way that incorporates knowledge of year-to-date precipitation, snow pack conditions, and short- and long-term forecasts to help the lake reach full pond after April 30, at levels that mimic the long-term median when possible.

Response: We agree that S.D. Warren should be allowed to manage lake levels according to on-going hydrological conditions. Based on the historical record, we have every reason to believe that S.D. Warren would continue to manage lake levels appropriately; however, high lake levels during the spring months is not without consequence. We are aware of the potential risks associated with increasing lake levels during seasons in which strong storms are known to occur, and, as such, recommend the earliest fill date be pushed back to May 15, and that the target level be reduced 0.5 foot, to retain some flood storage capability and protect other resources around Sebago Lake.

Comment: Maine Geology questions the reference to a USGS erosion study on page 36 of the draft EA, suggesting that the text should read "Maine Geological Survey beach erosion studies" rather than USGS.

Response: This reference has been corrected in the final EA.

Comment: Sebago Marina expressed concerns that the draft EA does not do a sufficient job of analyzing potential effects of the 2-in-9-year drawdown proposal under drought conditions, as compared to the 250-year flood conditions. Sebago Marina comments that there is no analysis on the potential effects associated with a low drawdown followed by a small snow pack, low precipitation (drought condition) spring.

Response: This information is presented in table 4 of the Geology and Soils section of both the draft EA and final EA, and is discussed in the context of potential effects on recreational resources in the final EA.

Comment: Sebago Marina raises concerns that the 2-in-9-year drawdown provision would eliminate the prime habitat for American eels, which would conflict with the recommendation that S.D. Warren provide passage to improve eel abundance.

Response: There is no information in the record to indicate where the prime habitat for American eel is in Sebago Lake, nor the seasonal distribution. The 2-in-9-year drawdown would only occur during the winter months, when most fish species (including the eel) are not likely occur in the shallow-water areas of the lake most susceptible to detwatering. This drawdown would also approximate the long-term average winter water levels, so adverse effects on the eel are unlikely due to this drawdown.

Comment: Sebago Marina recommends that the final EA adopt the state's recommended LLMP, without the 2-in-9-year drawdown. It cites the fact that there are no benefits going to 261.0 ft, while every inch above 262.0 ft. is a benefit to wetlands and shallow areas of the lake.

Response: We have reviewed the record and conclude that the information is inconclusive where it concerns eliminating the 2-in-9-year drawdown. Therefore, we recommend retaining the 2-in-9-year drawdown to 261.0 feet as an option for restoring sand to the beaches and otherwise maintaining beach profile stability.

Comment: Sebago Marina contends that the August 1 target level of 265.0 ft is low. Sebago Marina states that this elevation gave certain shoreline residences false hope and misdirection that allows owners to think they can build at safe elevations, which will cause more problems in the future.

Response: The August 1 target level under the existing, and our recommended, LLMP is elevation 265.17 feet. We are recommending a * 3-inch operating band around the target elevation. Based on our analysis, we conclude that this elevation and operating band is appropriate for this time of year. The Commission has authority over developmental activities within the project boundary, to the extent of the licensee's interest in lands and waters within the project boundary. The Commission, however, cannot control development around Sebago Lake, outside the project boundary. This is a decision left to developers, property owners, and others, after weighing the risks of building along the shoreline.

Comment: Sebago Marina contends that the May 1 target range of 266.65 - 266.15 ft. would affect spawning fish and nesting birds, and create higher releases in the Presumpscot, wasting water that could be used to mitigate low flows in the summer, and reduce storage for generation.

Response: A targeted lake level of 266.15 feet, with an upward range to 266.65 feet, is essentially "full pond" and would provide the maximum amount of fish spawning habitat along the shoreline of Sebago Lake. This would benefit shoreline-spawning resident species by providing good spawning habitat and good early-rearing conditions, as the lake would remain relatively high during the early-summer period. It is possible that if heavy rains were to occur during a period of higher lake levels that water would have to be spilled from the lake to prevent lake levels from exceeding the licensed maximum. Furthermore, we recommend lowering the target level to 266.15 feet * 6 inches. This 1-foot operating band is not expected to have any significant effects on resident fish populations in Sebago Lake. A 1-foot fluctuation restriction is common at hydropower projects in the Northeast, and is designed to minimize effects on spawning and rearing habitat.

Comment: Sebago Marina questions staff's recommendation to lower the lake 2-in-9 years, citing negative effects to boating (known to occur below 263.0 ft.), and the fact that S.D. Warren can not fill the lake the following spring while simultaneously draining thousands of acres of shallow areas.

Response: We considered the amount of inflow required after a drawdown to elevation 260.0 and 261.0 feet in the final EA. Our analysis shows that only in the most extreme dry winter/spring runoffs (flows exceeded less than 95 percent of the time) would the lake fail to reach 263.5 feet (the level necessary for boat launching) by April 1. For example, the spring of 2002, a year after a drawdown to 261.0 feet, was followed by 95 percent exceedence flows, and the lake was boatable (above 263.5 feet) by mid-April.

Comment: Sebago Marina states that staff ignored MDIFW's comments regarding fish populations in the Songo River. According to Sebago Marina, the MDIFW commented that, based on electrofishing, fish populations in the Songo River were low compared to the quality and quantity of habitat available. Sebago Marina states that the MDIFW attributes this finding to the 2-in-9-year drawdown.

Response: We considered the comments of the MDIFW regarding recent electrofishing results in Sebago Lake and some of its tributaries and coves (i.e., Songo and Muddy Rivers, the mouth of the Songo River, and Kettle Cove). We find this information unpersuasive. First, aside from the MDIFW's conclusory statements, there is no corroborating information (e.g., population statistics) in the license application or other filings documenting reduced populations of resident fish in the lake or other sampled areas. Second, although the MDIFW expressed some concern about the effects of winter drawdowns on resident fish, it, at the same time, recommended deep winter drawdowns to control lake trout spawning. Finally, electrofishing results may be influenced by a number of factors (water conductivity, weather, light level, efficiency of electrofishing equipment, etc.).

Comment: Sebago Marina agrees with the recreation analysis that concludes boating resources are negatively affected at elevations below 263.0 ft., but suggests that the analysis should be expanded to address potential effects to recreation when the lake is drawn down to 261.0 ft and followed by drought conditions the following spring and summer. Under such conditions, Sebago Marina states that the lake level may not recover to the 263.0-ft. elevation.

Response: We have added additional analysis of this issue to our discussion of potential effects on recreation boating resources in the final EA. See section V.C.5.b, Recreational Resources and Land Use - Environmental Effects.

Comment: FOSL and Mr. Stephen Kasprzak contend that the final EA must include an in-depth analysis and comparison of the Commission's 1997 LLMP with other LLMPs proffered in this proceeding. FOSL and Mr. Kasprzak cite staff analysis in the 1997 LLMP record rejecting the state's proposed lake levels because it would result in annual average water levels well above the historic annual mean as a reason to add the analysis. Furthermore, FOSL and Mr. Kasprzak question why the current LLMP is being analyzed as part of this proceeding when it was already rejected in the 1997 FEIS.

Response: We previously analyzed the lake level management issues for Sebago Lake in the 1997 EIS. This analysis speaks for itself, and we see no reason to repeat that analysis in this final EA. Our analysis of the lake level management issue in the final EA builds upon the analysis in the 1997 EIS. In this final EA, we reference the analysis and conclusions from the 1997 EIS, as necessary. This approach is consistent with CEQ's regulations governing preparation of an EA or EIS.

Comment: FOSL and Mr. Kasprzak comment that the draft EA does not cite any demonstrable benefits accruing from the May 1 full pond requirement and that historically the Lake would not achieve this elevation typically until May 31 or later. FOSL contends that the 9-day trespass this past spring (2005) is strong evidence to reevaluate the May 1 target elevation.

Response: Based on comments filed on the draft EA and our hydrologic analysis in the final EA, we now recommend that the target date for reaching full pond (266.15 feet * 0.5 foot) be moved to May 15.

Comment: FOSL comments that the statement on page 39 of the DEA "in fact we would expect some level of erosion to occur regardless of how the lake level in Sebago Lake is managed" leads a reader to believe that beach erosion and accretion are independent of lake levels which is contradictory to the scientific literature, including that cited in the Commission's 1997 FEIS that shows that beach erosion and accretion are the physical expression of water levels acting upon a lake's shoreline. FOSL also states that the consequences of using the statement in question builds arguments in the document that cannot be said are based upon accepted and published research on beach erosion so that any conclusions or recommendations would be arbitrary and capricious.
Response: We have revised the sentence in question to clarify the relationship between lake levels and shoreline/beach erosion.

Comment: FOSL raises an issue with a statement on page 39 of the draft EA which states, "maintaining higher lake levels, particularly during the fall and early winter, would exacerbate the ongoing erosion problem," by noting that the statement (1) conflicts with the a statement mentioned in the above comment, and (2) continues to imply that erosion occurs by some unnamed force as opposed to high water levels (which the scientific record identifies as the principal cause of ongoing erosion). FOSL states that by not identifying lake levels as the primary cause, the analysis in the current draft EA rejects the scientific rationale used by Commission staff in the 1997 FEIS.

Response: We agree that erosion results from a combination of factors, including lake level. Therefore, we have revised the language in this section to be consistent with the 1997 EIS and other statements and/or analysis presented in the final EA.

Comment: FOSL comments that the existing discussion in the draft EA that relies on specific beach profile studies should be expanded to give the reader the context of the study results. FOSL states that the studies, and the draft EA discussion that relies on the study's findings, began in 1990 after years of beach erosion had already occurred. Thus, the findings summarized on page 204 of the draft EA are incomplete and misleading compared to the historical erosion that occurred in the years leading up to the start of the study. Thus, FOSL contends that beach erosion could not be documented in the beach profile monitoring studies because it had already occurred.

Response: The purpose of the study, as outlined in the study report, was to monitor beach profiles to evaluate beach dynamics under the LLMP. Severe beach erosion is documented in the reports filed with the Commission, specifically the 1996 beach erosion report by Maine Geology.

Comment: FOSL questions the statement on page 204 that states "Although certain beaches, at points in time, show short-term changes, generally the beaches show long-tern stability interrupted at times by changes due to storms that occur during high water periods." FOSL requests that the final EA clarify the statements in this sentence, particularly the phrases "long-term stability," because as FOSL points out, beach profile studies only cover a period of less than 15 years and did not begin until 1990. Clarification of this statement and other conclusory statements in the draft EA should be reviewed to eliminate conditional language that dilutes the meanings and conclusions like the phrase above.

Response: We have revised our analysis in section V.C.1, Geology and Soils, to more accurately reflect the history of lake level management on Sebago Lake. Based on the analysis in the final EA, we find that the existing LLMP has accelerated the historical rate of erosion around Sebago Lake. We recognize, however, that based on S.D. Warren's and Maine Geology's monitoring studies, the beach profiles show stability, where beach erosion and accretion occurs based on environmental events. We note that our recommended changes to the existing LLMP should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding, but maintain appropriate levels to protect wetlands and recreational boating opportunities.

Comment: FOSL requests that staff revise sentences in the draft EA such as the one on page 204 that begins with "Notwithstanding these findings, we stated in V.C.1. Geology and Soils, ..." to eliminate or clearly define all the conditional language embedded in the conclusion statements. FOSL contends that such language invites the Commission staff to make arbitrary and capricious decisions.

Response: We have revised our analysis in the final EA to make more definitive statements regarding our conclusions, where possible to do so. However, our environmental analysis is often based on imperfect data and information. Moreover, the natural environment does not always react to human-induced influences, as we would expect. Therefore, we cannot always make definitive statements, but rather reach conclusions based on our best knowledge and judgment of the available information, as well as professional opinion.

Comment: FOSL presents excerpts from a memo from Robert Marvinney, State Geologist of Maine and Director of Maine Geological Survey that contains beach profile information gathered since 2002. Based on Mr. Marvinney's beach profile surveys and findings, FOSL contends that the state's 1997 "compromise" LLMP is politically driven and not based on objective science. FOSL submits this information in hopes that the final EA will be based on objective truths and not politics.

Response: We make recommendations for changes to the existing LLMP based on the scientific data and information filed in this proceeding. We have no basis to conclude that development of the current LLMP was politically motivated.

Comment: FOSL contends that since the Commission's approval of the state's 1997 "compromise" LLMP over staff's LLMP was based solely on a fragile (an later fractured) consensus in August 1996, the Commission's rational for supporting the "compromise" LLMP is now inoperative. FOSL states that if staff refuses to revert to the conclusions of its own analysis in the 1997 final EIS, then the final EA should explain in detail (with references to the scientific literature) how the conclusions in 1997 are incorrect and not supported in the record or this proceeding. Mr. Kasprzak states that the current LLMP is not a compromise plan because (1) FOSL withdrew it acceptance on September 1998, and (2) the Maine Bureau of Parks and Recreation refrained from participating in the lake level debate and of commenting on lake levels at Sebago Lake.

Response: The current LLMP was based on facts evident at the time it was adopted in 1997. Those facts and the Commission's rationale relative to the 1997 LLMP have no bearing on our analysis in this final EA. In the final EA, we recommend changes to the existing LLMP that should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding, but maintain appropriate levels to protect wetlands and recreational boating opportunities.

Comment: FOSL states that stage damage curves studies need to be carried out to assess the relationship of water level height and degree of damage from storms. In addition, FOSL states: (1) the comments and analysis of Steve Kasprzak, regarding accretion, need to be read and analyzed; (2) the final EA should analyze the relationship of lake regulation to the proliferation of invasive species, especially variable milfoil; and (3) staff should obtain information from Maine and other agencies, regarding erosion damage on Sebago Lake and permits issued by Maine.

Response: We question the value of stage damage curves, particularly since it would be difficult and costly to calculate meaningful curves on a large lake the size of Sebago Lake, with a non-heterogeneous shoreline. We are recommending a lower maximum target level of 0.5 feet below the spillway crest, which should help limit damage from high water levels. In addition, we have reviewed all the comments filed in response to the draft EA. In response to item (3), agencies and individuals were asked to submit relevant materials for the record during the scoping process. Thus, we assume that all relevant information from the agencies has been filed. With regards to item (2) above, there is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such a variable milfoil. Nonetheless, invasive species (e.g., variable milfoil) appear to be present in Sebago Lake. Assuming higher water levels have played a part in the establishment of milfoil in the lake, our recommendation to reduce the full pond target by 6 inches, and to move the full pond date to May 15 would reduce problems associated with this invasive species.

Comment: FOSL contends that the lake level changes approved by the Commission since 1987 add up to this license being a major federal action with significant adverse effects.

Response: In 1997, Commission staff prepared an EIS that specifically addressed the issue of lake level management on Sebago Lake. This EIS supported the Commission's decision in approving the current LLMP. Under CEQ regulations, we are not required to prepare an EIS to readdress the same issue. According to those regulations the analysis can be a "tiered" analysis. Thus, we can prepare an EA that considers the analysis, statements, and conclusions of the prior NEPA document, but focuses on new information developed since the earlier NEPA analysis. The final EA does just that.

Comment: Mr. Kasprzak requests that evidence justifying the May 1 target elevation date and the additional week in June when the lake could be at full pond be discussed in greater detail in the final EA. Furthermore, he seeks clarification on: (1) what resources are considered in determining the May 1 date for reaching full pond, as opposed to May 31; (2) what resources require that lake levels be kept near full pond from May 1 to June 22; and (3) what are the economic and recreational benefits derived from the higher lake levels.

Response: Based on the many comments received on the LLMP, we now recommend a full pond target elevation of 266.15 feet * 0.5 foot, and moving the earliest date for reaching that target to May 15. We also recommend that water be spilled should lake levels exceed the crest elevation of 266.65 feet. We modified our analysis in the final EA to address these changes to the LLMP.

Comment: Mr. Kasprzak makes 10 recommendations for changes to the existing LLMP, one of which accepts the 3-inch tolerance around the August 1 target elevation. As recommended, the lake could be 3 inches higher, which would flood an additional 18 acres of beach. In response to this potential effect, Mr. Kasprzak recommends that the target should be 264.67, with a range up to 265.67 and down to 264.17.

Response: We have analyzed the potential effects associated with adding a 3-inch tolerance range around the August 1 lake level target and conclude that an additional 3 inches above the existing target would have minimal, if any, effects to the various resources around Sebago Lake.

Comment: Mr. Kasprzak raises an issue with staff's recommendation in the draft EA to replace the current target of hitting full pond sometime between May 1 and June 15 with "manage the lake during spring fill-up to reach a target level of 266.65 feet on but not before May 1." Mr. Kasprzak states that this reduces flood capacity during spring months, resulting in a greater likelihood of trespasses of flowage easements and increasing spillage.

Response: As noted in previous responses, we recommend changes to the existing LLMP that would reduce the maximum lake level and shorten the time the lake is at the maximum level. Our recommended changes to the existing LLMP should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding, but maintain appropriate levels to protect wetlands and recreational boating opportunities.

Comment: Thirty-six property owners filed comments stating that lake levels have exceeded the flowage easements, causing flooding and increased erosion. The property owners contend that staff's recommended target for full pond on May 1 would raise lake levels 20 inches higher than the historical average for this date. The property owners argue that allowing lake elevations at or near full pond for 8 weeks, and raising lake levels by as much as 20 inches above the historical average in May and up to 15 inches in the summer would flood beaches and accelerate the historic rate of erosion. In addition, the property owners argue that, if the LLMP is not amended to mimic the historical average, they should be compensated for (1) the lost use of the beaches, (2) accelerated shoreline erosion, and (3) the cost of stabilizing beaches.

Response: Based on the many comments received on the LLMP, we now recommend a full pond target elevation of 266.15 feet * 0.5 foot, and moving the earliest date for reaching that target to May 15. We also recommend that water be spilled should lake levels exceed the crest elevation of 266.65 feet. Our recommended changes should substantially reduce shoreline erosion around Sebago Lake, as well as the risk of flooding. In regards to compensation for damages, the FPA does not authorize the Commission to impose liquidated damages, or otherwise include a damages provision in a project license. Any actions for damages resulting from trespasses of flowage easement are matters left for review by state courts.

Comment: Mr. Theodore Tibbals, Mr. Ben Chapman and other property owners state that when full pond is achieved early in the rainy season, there is no storage capacity in the lake to prevent flooding. These citizens recommend that the spring target elevation should be lowered to prevent flooding.

Response: We now recommend a maximum lake elevation (266.15 feet), or 0.5-foot below the spillway crest elevation, to be reached no sooner than May 15. These changes are expected to increase flood control capability and storage in the rainy season.

Comment: Mr. Charles Bragdon, Jr. and another property owner contend that the draft EA incorrectly refers to "concerning camp owners losing a few feet of beach." They state that no beach remains. Also, Mr. Bragdon states that the "loophole" or vague language from pages 206 and 207 of the draft EA that allows S.D. Warren to modify their operations under emergency conditions is unacceptable. Mr. Bragdon states that this provision would allow continued flooding and violation of flowage easements. Such confusing language should be corrected and revised in all sections of the final EA.

Response: Beach profile studies indicate that beaches do exist along the shoreline of Sebago Lake, albeit at reduced widths compared to their historical sizes. Also, it is standard Commission practice to include language in license articles that allow changes to normal operation under two situations: (1) for planned events when agreed to by the resource agencies and other relevant entities; and (2) for emergency conditions beyond the control of the licensee.

Comment: Mr. Tibbals states that staff's conclusions relative to lakeshore front beaches showing long term stability and no appreciable erosion (page 205 of draft EA) are incorrect. Mr. Tibbals contends that S.D. Warren's analysis of beach profile data is flawed and does not explain the loss of many sand beaches around the lake.

Response: The purpose of the shoreline beach profile study was to document what effect, if any, the current LLMP has on beach erosion or accretion rates. We have revised the language to be consistent with the context and results presented in S.D. Warren's beach profile study.

Comment: Mr. Tibbals contends that staff failed to consider the possibility of increased erosion by having the lake at full pond for 7 weeks. Mr. Tibbals states that erosion is as likely to result from moderate winds as from big storm events. According to Mr. Tibbals, there is a danger of more flooding if a heavy rain event occurs at or near full pond; which leads to downstream flooding when the river flows are increased to relieve flooding of the lake.

Response: Our analysis did consider the relationship between lake levels, erosion/ accretion, and flood control storage. In fact, based on our analysis, we are now recommending that the target date for the maximum lake elevation be moved to May 15, and that the new maximum elevation be lowered to 0.5 feet below the spillway crest.

Comment: Mr. Tibbals contends that the Commission has not addressed the issue of wasting water with flows above the maximum required for hydropower generation. He states that increased flows would occur more frequently with the lake at full pond and a significant rainfall occurs.

Response: Issues related to higher flows (spillage) in the bypassed reach, should lower lake elevations be required, are addressed in every resource section of the final EA, including the Developmental Analysis section.

Comment: Mr. Tibbals requests that any revised LLMP include a number of changes. First, the target for full pond be amended from 266.65 to 260.65 ft. msl (or less), with increased flowage through the dam gates required whenever heavy rains are predicted. Second, full pond should be restricted to a time interval from May 31 to June 6, which is the historical time span. Third, the LLMP should not increase the August 1 target by 3 inches, rather reduce it to match the long term historical average. Finally, the Commission should require S.D. Warren to develop a plan to restore the Sebago Lake's beaches.

Response: We are now recommending that the full pond elevation be lowered 0.5 foot below the spillway crest elevation and that the period at full pond be reduced by beginning the full pool period on May 15, and maintaining it for no more than 3 weeks. We are also continuing to recommend the 2-in-9-year winter drawdown provision of the LLMP, as a measure to restore the beaches.

Comment: Phillip and Pearl White contend that lowering the water level by 3 feet, as recommended, would negatively affect bait and game fish and the quality of fishing in Sebago Lake. Sebago Harbor comments on low lake levels (i.e., 261.0 feet reached in 2 in 9 years) and its effect on boating access, water milfoil growth and wildlife. Sebago Harbor recommends that lake levels should never drop below 263.5 feet.

Response: Sebago Lake level data back to 1910 (figure 7 in the draft and final EA) indicate that the lake typically has a seasonal drawdown of about 4 feet (and as high as 6 feet about 10 percent of the time). There is no information in the record to indicate that these drawdowns have negatively affected the boating, fish populations in Sebago Lake, or other wildlife. Our recommended LLMP would continue this seasonal drawdown, which would remain within the range that occurred historically. With regards to invasive species, there is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such as Eurasian water milfoil.

Comment: Mr. Ted Davis comments on the history of lake level management on Sebago Lake. Mr. Davis states that Sebago Lake does not owe S.D. Warren water to make paper or power, does not owe the marinas and boaters water, nor does it owe property owners a beach. Mr. Davis also states that sea walls and riprap deprives the lake from its source sediment and sand. Finally, Mr. Davis states that Sebago Lake is clean, and that not lowering the lake level has hurt the fishing. Daniel and Jeanne Boland comment on high water levels, stating that high lake levels, when coupled with severe storms, results in the destruction of sea walls, flooding, property damage (e.g., homes, septic systems, and well contamination). Consequently, Mr. and Mrs. Boland recommend that staff consider lowering the maximum high water level (by 5 to 10 feet).

Response: We have considered the comments and information provided by Mr. Davis in preparing the final EA. We have revised our discussion and analysis of the LLMP to more accurately reflect the history of lake level management on Sebago Lake. Figure 9 of the final EA shows that the average elevation of Sebago Lake has increased since implementing the current LLMP. Based on comments received on the draft EA and our analysis in the final EA, we are recommending changes to the LLMP that would lower the average water level on Sebago Lake. Our recommendations would reduce shoreline erosion and reduce the risk of flooding around Sebago Lake, but protect wetlands and maintain recreational boating opportunities.

Comment: Sebago Coalition comments on various aspects of the low-water/high water debate, including the effects of sea-wall construction and major storm events on beach dynamics, historic water levels, state politics, and effects of boating. Sebago Coalition recommends the LLMP be modified as follows: (1) eliminate the 2-in-9-years portion of the LLMP because the lake may not recover from these excessive low levels; (2) move the August 1 target level to 265.5 msl, instead of the present 265.17 and add a 3-inch buffer on each side of the new level so S.D. Warren can better control the lake to a range; and, (3) move the 265.17 msl level to September 1, instead of August 1 to ensure adequate water for late summer/early fall use of the lake without having any adverse effects on recreation.

Response: We have reviewed the record and conclude that the information is inconclusive where it concerns eliminating the 2-in-9-year drawdown and, therefore, recommend retaining this provision. Our hydrologic analysis shows that in all, but extreme dry years, the lake can be refilled. In addition, based on our revised analysis, we now recommend a full pond target elevation of 266.15 feet * 0.5 foot, and moving the earliest date for reaching that target to May 15. We also recommend adding a * 3-inch operating band around the August 1 target level, but do not recommend changing the target elevation. Nor do we recommend moving the current August 1 target to September 1. Sebago Coalition's recommendation would increase the potential for shoreline erosion and damage if the area experiences late summer/early fall storms. Our recommended changes would reduce shoreline erosion and reduce the risk of flooding around Sebago Lake, but protect wetlands and maintain recreational boating opportunities.

Comment: The USGS indicates that page 36, Section V.C.1, Geological and Soil Resources, first full paragraph, second sentence in incorrect. The USGS states that it has not conducted beach erosion studies on Sebago Lake, and recommends that the Johnston citation be corrected to refer to the Maine Geological Survey.

Response: We have corrected this sentence accordingly.

Comment: The USGS states that Table 17 on page 67 of the draft EA should be clarified. The USGS states that the peak flow values reported as the referenced USGS streamflow gaging station are an instantaneous value, and are not directly comparable to the average daily discharge.

Response: We agree. However, the text utilizes this information to highlight the fact that Sebago Lake typically has available storage during peak flows downstream at the Westbrook gage, which shows that S.D. Warren was able to decrease the outflow of Sebago Lake for at least a day.

Comment: The Portland Water District commented on the LLMP, stating that it was in general agreement with the conclusions of the draft EA and staff's recommendations. However, the Portland Water District recommends that the LLMP be modified as follows: (1) manage the lake during spring fill-up to be within an allowable target range of 266.65 to 266.15 feet between May 1 and the third week in June. The Water District states that this would give S.D. Warren more flexibility in managing the lake and would allow the lake to handle spring storms without exceeding maximum elevations. Mr. Timothy Toomey comments on the need for a responsible management plan for Sebago Lake that considers citizens and results in less flooding. Mr. Toomey states that the current management of the lake has lead to the decline in fishing quality. Mr. Toomey contends that the current LLMP and the recommendations of the draft EA are inconsistent with sound science and environmental responsibility. Mr. Toomey recommends that lake levels never exceed 265.6 feet.

Response: Based on comments filed on the draft EA and our revised analysis in the final EA, we now recommend reducing the spring target elevation to 266.15 feet * 0.5 foot, and moving the earliest date for reaching the spring target to May 15. We also recommend releasing water if elevations exceed 266.65 feet. Our recommended changes would provide S.D. Warren substantial flexibility in managing lake levels, while reducing the risk of shoreline erosion, flooding, and exceeding its easements.

Comment: The Portland Water District recommends that S.D. Warren be required to develop a hydrologic model of Sebago Lake and install a USGS real-time stream gauge on the Crooked River to better predict lake level changes.

Response: We question the feasibility and value of a hydrologic model. In order for this type of model to be useful in predicting and managing Sebago Lake levels, real-time data would have be available from several sources (besides the Crooked River), to accurately monitor inflow and outflow from the lake. The model would need the ability to input real-time precipitation and snowmelt data from throughout the drainage area, and most of this type of information is currently unavailable. Development of such a model would require that real-time monitoring stations be established throughout the basin, and several years may be required to accurately calibrate the model. Although S.D. Warren uses the outflow from the lake for the Eel Weir Project, it has no control over other major factors affecting the lake level. Development of any such model should not be the sole responsibility of S.D. Warren, but, rather, should be a joint effort by both governmental and non-governmental entities.

Water Resources

Comment: S.D. Warren states that measures already in place permit verification of compliance without unnecessary cost, and without the additional risk of vandalism. Consequently, S.D. Warren contends that no additional measures or plans are needed or appropriate to provide documentation of compliance with required bypass flows.

Response: The Commission must ensure that a licensed project is operated in accordance with the operational parameters set forth in the license. A project operations and flow monitoring plan (or compliance plan) is the vehicle by which the Commission ensures compliance. Based on our analysis in section V.C.2.b, Water Resources - Environmental Analysis, we conclude that such a plan is necessary for project purposes.

Comment: S.D. Warren opposes the USFWS recommendation for temperature monitoring to evaluate whether higher minimum flows jeopardize coldwater refugia in the bypassed reach. S.D. Warren states that the flow study shows that the cold water seeps in the bypassed reach become compromised when flows reach 115 cfs, which is higher than Commission staff's recommended flows. According to S.D. Warren, water temperature monitoring at higher flows would only prove that high summer flows further compromise the conditions that support the coldwater fishery. S.D. Warren further states that if it is required to monitor water temperatures during the summer, it should be with the stated purpose of adjusting bypass flows downward (back to the current range of 25 to 75 cfs) should the monitoring document that the seeps are adversely affected by flows.

Response: We recognize that monitoring performed for relicensing indicates that flows above 115 cfs would likely compromise the viability of the coldwater refugia. However, this monitoring represents a snapshot in time, and may not sufficiently define the temporal extent of effects (within and among years). Therefore, we recommend that water temperatures in the coldwater refugia, be monitored for a 3-year period during the critical summer period (June through September). To address S.D. Warren's concerns regarding the purpose of temperature monitoring, we recommend that the 3-year monitoring report (a) include monitoring data, (b) describe the status of the fishery and the use of the coldwater refugia by trout and salmon, and (c) include an assessment of any further operational and/or structural measures needed to manage flows, and advance the agencies' fishery management goals, in the bypassed reach.

Comment: The USFWS concurs with staff's recommendation regarding compliance monitoring at the project.

Response: We continue to recommend that S.D. Warren develop and implement and project operations and monitoring plan.

Comment: Ms. Carol Steiman comments on high water levels, beach erosion, and damage to her dock. In addition, Ms. Steiman contends that high water levels have negatively affected water quality in Sebago Lake. She states that there is now algae growth, a profusion of Eurasian water milfoil, and more weed growth.

Response: There is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such a water milfoil. Nonetheless, water milfoil appears to be present in Sebago Lake. Assuming higher water levels have played a part in the establishment of milfoil in the lake, our recommendation to reduce the full pond target by 6 inches, and to move the full pond date to May 15 would reduce problems associated with this invasive species.

Fishery and Aquatic Resources

Comment: S.D. Warren states that the record does not contain substantial evidence supporting the need for additional minimum flows and the Commission should not impose any change to the existing minimum flow requirements of the Eel Weir bypass reach. Furthermore, S.D. Warren does not agree that staff's recommended flows are needed to support fisheries management objectives for the bypassed reach.

Response: The existing flow regime in the Eel Weir bypassed reach was designed to support a viable fishery for landlocked salmon, brook trout, and other species of warmwater sport fishes. The MDIFW currently manages the bypassed reach as a brook trout fishery. Based on this information, it is clear that fishery management objectives for the bypassed reach have changed since the existing flows were implemented, and, thus, supports a change in the flow regime in the bypassed reach. In addition, our analysis in section V.C.3, Fisheries and Aquatic Resources, indicates that the MDIFW's current fishery management objectives for the Eel Weir bypassed reach are not being met. For example, angler use data collected by the MDIFW indicates that objectives for catch rate and fish size are not being met.

Comment: S.D. Warren does not agree with the habitat/flow analysis in the draft EA. S.D. Warren states that the incremental gain of 6-8 percent habitat for an increase from 75 cfs to 100 cfs is marginal and does not justify the increased minimum bypass flows. Furthermore, S.D. Warren states that minimum bypass flows above 75 cfs are contrary to the goal of limiting the smallmouth bass population, that flows over 79 cfs would adversely affect thermal refugia in the bypassed reach, and that flows of about 75 cfs provide favorable angler conditions (i.e., wadeability) throughout most of the reach..

Response: As the result of the section 10(j) negotiations, and other information provided in comments on the draft EA, we reevaluated the minimum flow issue. Based on our analysis we have modified our flow recommendation by increasing the flows to 125 cfs from April 1 to October 31 and to 75 cfs from November 1 through March 31. An increase from 75 to 125 cfs would result in an incremental gain in habitat for juvenile and adult brook trout of 9-12 percent during the spring and fall, while the incremental gain would be even greater during the summer months (19-24 percent). In the winter, an increase from 25 to 75 cfs would result in an incremental gain of 24-28 percent. We consider these modest incremental gains worth the cost, as these flows would further the agencies' goals of managing flows in the bypassed reach to promote the brook trout fishery. We find S.D. Warren's other arguments unpersuasive. First, based on information presented at the section 10(j) meeting, smallmouth bass no longer appears to be a consideration in flow management decisions for the bypassed reach. Second, we recommend temperature monitoring in coldwater refugia to determine any potential effects of higher flows and identify any measures needed to further protect those habitats. Finally, based on the wadeability study, our recommended flows would enhance angling opportunities in the bypassed reach.

Comment: S.D. Warren points out that the draft EA, on page 210, incorrectly reports that "aquatic macroinvertebrate habitat would be improved under staff's recommended flow regime, with total wetted area in the riffle/run areas being nearly 75 percent of the maximum at 100 cfs. Total wetted area in the braided channel habitats would exceed 80 percent." S.D. Warren states that the draft EA, page 130, shows that 75 percent of the maximum macroinvertebrate habitat is provided at 50 cfs in the riffle/run habitat.

Response: We have corrected section VII, Comprehensive Development, in accordance with our modified flow recommendation.

Comment: S.D. Warren agrees to provide upstream and downstream eel passage at the Eel Weir Project, and to the development of an eel passage plan with most of staff's recommended provisions. However, it does not agree with the timing of installation, as recommended by the resource agencies and staff, and the need for effectiveness testing. S.D. Warren states that no eel passage, or plans for eel passage, exists for the downstream North Gorham Project (P-2591), and that eels currently pass the Eel Weir dam without formal passage facilities. In addition, S.D. Warren states that information from a 3-year monitoring study, as well as project features (i.e., trash rack and new eel passage gate) makes it unclear what the goals of the effectiveness study would be or what additional actions would be required based upon the results of any testing.

Response: In section V.C.3.a, Fisheries and Aquatic Resources - Affected Environment, we summarized the results of fishery surveys in the Presumpscot River and Sebago Lake. We described the species of fish present in the project area, including the bypassed reach and Sebago Lake. We found that American eels are present throughout the basin. Based on our review in section V.C.3.b, Fisheries and Aquatic Resources - Environmental Analysis, we conclude that American eels, despite other downstream hindrances, would benefit from the immediate installation of upstream and downstream eel passage at Eel Weir. As for our recommendation for an effectiveness study, we continue to support such a measure. We recognize that upstream eel passage technology is well established; however, important behavioral characteristics remain unknown. With regard to downstream eel passage, eel mortality can be quite high when passed through turbines. While much has been learned about downstream eel passage, there is no proven downstream passage technology. Therefore, we conclude that effectiveness and out-migration timing monitoring is warranted.

Comment: The USFWS states that the upper modeled limit of 440 cfs (for the instream flow study) is equivalent to the Aquatic Base Flow for fall/winter spawning flows, and does not represent the upper range of flows than can occur or could be delivered to the bypassed reach. The USFWS also states that weighted useable area (WUA) values for many of the targeted species continued to increase up to, and including, the upper cut-off of 440 cfs, and would likely continue to increase at flows above 440 cfs. Thus, the USFWS contends that 440 cfs for the riffle/run habitat does not represent the "maximum" WUA as stated in the draft EA, nor does 185 cfs represent the "maximum" WUA for the braided channel habitats.

Response: We do not dispute that 440 cfs is the Aquatic Base Flow for fall/winter spawning flows, nor do we dispute the USFWS's claim that the 440- and 185-cfs flows do not represent the upper range of flows that occurred historically in the bypassed reach. However, the modeled flows represent the range of flows for which we can reasonably make flow management decisions for the Eel Weir bypassed reach. To make decisions based on higher flows, flows not modeled, would be speculative, at best, and would be arbitrary and capricious.

Comment: The USFWS contends that staff's recommended minimum flow regime of 50 cfs (11/1-3/31), 100 cfs (4/1-6/30), 75 cfs (7/1-8/31), and 100 cfs (9/1-10/31) is not supported by the results of the instream flow study, and is inconsistent with the agencies' recommended flows. After reviewing the record, the USFWS recommends the following flow regime as an acceptable alternative to staff's flow alternative: 115 cfs from November 1 to March 31, 200 cfs from April 1 to June 30, 115 cfs from July 1 to August 31, and 200 cfs from September 1 to October 31.

Response: As the result of the section 10(j) negotiations, and other information provided in comments on the draft EA, we reevaluated the minimum flow issue. Based on our analysis we have modified our flow recommendation by increasing the flows to 125 cfs from April 1 to October 31 and to 75 cfs from November 1 through March 31. We consider the modest incremental gains in aquatic habitat with these flows over the existing flows worth the cost to S.D. Warren. In addition, our recommended flows, as modified in the final EA, would further the agencies' goal of managing flows in the bypassed reach for brook trout. While the USFWS's alternative flow recommendation would provide incremental gains in habitat over our recommended flows, it would cost over $130,000 annually. The relatively small incremental gains do not justify the significant added cost.

Comment: The USFWS does not agree with staff's rationale for not recommending the agencies' higher minimum flows. First, the USFWS contends that the resource agencies have not identified any need to reduce flows to discourage smallmouth bass in the bypassed reach, as stated in the draft EA. Second, the USFWS states that higher flows would (a) expand habitat for trout and salmon in the bypassed reach, (b) result in more and healthier fish, and (c) provide additional fishing opportunities. This is inconsistent with staff's "radical departure" logic. Third, the USFWS supports temperature monitoring in the coldwater refugia as a way to address the effects of higher minimum flows on this habitat. Finally, the USFWS contends that staff's economic analysis does not account for the cumulative effects of hydro development on the coldwater riverine resources in the Presumpscot River.

Response: We revised our minimum flow analysis based on discussions at the section 10(j) meeting and the USFWS's comments on the draft EA. In addition, because we recommend flows that could affect the coldwater refugia, we now recommend temperature monitoring in that important coldwater habitat. Finally, the USFWS comment regarding our economic analysis appears to suggest that the Commission should mitigate for past hydropower development on the Presumpscot River. The Commission is not required to mitigate for past effects. Our recommended flows represent an appropriate balance among competing uses and are in the public interest.

Comment: The MDIFW is concerned about the lack of suitable instream flow releases recommended for the Eel Weir bypassed reach.

Response: We have reassessed our instream flow recommendation for the bypassed reach, and now recommend a minimum flow of 125 cfs from April 1 to October 31, and 75 cfs from November 1 to March 31. This recommended flow represents a balancing of instream flow needs for the fishery and costs to the project in the form of foregone energy production.

Comment: At the section 10(j) meeting, the MDIFW stated that it did not disagree with staff's finding regarding its recommendation for a fall/winter drawdown to control lake trout spawning, but stated that staff's rationale in the draft EA was inaccurate. The MDIFW provided additional information on typical lake trout spawning depth and substrate in Maine lakes, and recommended that staff consider a drawdown later into the winter that would be 6 to 8 feet lower than whatever the elevation reached on November 1. The MDIFW indicated that it is not concerned about lower lake levels in the spring, as it relates to smelt spawning, because most smelt spawning now occurs along the lake shore, not in the tributaries. The USFWS indicated that it does not oppose a 6- to 8-foot winter drawdown to control lake trout spawning.

Response: We have modified our analysis of this issue in the final EA to reflect the information provided by the MDIFW and the USFWS.

Comment: The USFWS concurs with the draft EA's conclusion regarding landlocked Atlantic salmon passage. FOSL states that opposing higher minimum flows in the Eel Weir bypassed reach, due to an alleged effect on coldwater refugia, is not supported in the scientific record and the MDIFW's scientific research over the past 40 years. FOSL states that brook trout and salmon existed in the Presumpscot River, in the absence of the Eel Weir dam, and that these fish would survive and successfully reproduce if the artificial migration barrier at the project dam is made passable.

Response: Staff continues to support the agencies' position regarding fish passage for landlocked salmon (and brook trout) at the Eel Weir dam. Also, as noted previously, we reanalyzed the issue of minimum flows, based on new information presented at the September 22, 2005, section 10(j) meeting and in comments on the draft EA. We now recommend higher flows for the Eel Weir bypassed reach: 75 cfs from November 1 to March 31 and 125 cfs from April 1 to October 31.

Comment: The USFWS states that the fish screens (3/4-inch clear space) at the entrance to the power canal effectively prevent entrainment of migratory adult and juvenile yellow American eel, and that the fish screens should remain in place during the duration of the downstream eel migration period. This measure, in combination with a plunge pool at the exit of the river gate, as described in Option #3 (see section III.C, Proposed Action), should preclude the need for turbine shutdowns to protect migrating eel.

Response: S.D. Warren proposes, and we recommend, that the existing fish screens with 3/4-inch bar spacing be maintained as part of the licensed project, including during the eel out-migration period. Regarding the plunge pool, information provided by S.D. Warren, including photo documentation, indicates that the plunge pool recommended by the USFWS may be unwarranted (see S.D. Warren reply comments on draft EA, filed October 17, 2005). The information provided by S.D. Warren shows that the gate(s) to be used for downstream eel passage is located near the elevation of the bypass channel. In addition, there appears to be an existing pool at the base of the dam. These features, when combined with the flows discharged for passage, would seem adequate to safely pass eels. Nonetheless, this is a detail that can be worked out during consultation to develop the downstream eel passage plan. In addition, we expect alternative measures for downstream eel passage (e.g., project shutdown), if found to be necessary, would be jointly developed based on the results of effectiveness monitoring.

Comment: FOSL states that their recommendation for a small fishway and fish collection facility at the project for Atlantic salmon would eliminate any justification for the "salmon spawning limitation" in the LLMP, which now impedes the ability of S.D. Warren to lower the lake during the autumn months to protect the lake shoreline from storms and promote beach accretion. FOSL requests that staff reevaluate the need for salmon passage and collection, because the existing analysis in the draft EA relies solely on the USFWS and the MDIFW letters that lack credible facts or evidence to justify denial of such a measure. FOSL argues that, because no facts or scientific evidence has been entered into the record to refute its request for salmon passage facilities, staff must accept the request. To do anything otherwise would be arbitrary and capricious.

Response: The Commission does not establish specific fishery management policies (a resource agency function), but, rather, considers the information in the record in identifying appropriate license conditions that further the goals and objectives of existing management programs. Within this framework, we note that the state and federal agencies responsible for management of the Sebago Lake fishery are not recommending installation of a fishway at the project, nor do the agencies support passage for landlocked salmon at the project. Thus, requiring fish passage at the project, at this time, would not further existing fishery management goals for Sebago Lake or the Eel Weir bypassed reach. Even if a fishway were installed at the project, the requirement to maintain lake levels in the fall to provide for salmon spawning would not be eliminated. Maintaining wild salmon spawning is a primary goal of the MDIFW, and lower water levels during the fall spawning period could affect salmon movement into the spawning tributaries.

Comment: Conservation Law states that, on July 6, 2005, two days prior to release of the July 8, 2005 EA, the USFWS issued a finding in the Federal Register concluding that listing of the American eel may be warranted under the ESA and initiated a one year status review. Conservation Law notes that the draft EA did not mention this finding, which raises questions regarding staff's analysis and conclusions related to the eel and about the sufficiency of the data contained in the draft EA. Conservation requests that staff reanalyze effects on the eel and recommendations in light of this finding.

Response: We have revised section V.C.3.a, Fisheries and Aquatic Resources - Affected Environment, of the final EA to include information relative to the USFWS's July 6, 2005, finding in the Federal Register. To the extent necessary, we reanalyzed the issue of eel passage based on this finding. However, this new information does not change our recommendations regarding eel passage at the Eel Weir Project.

Comment: Conservation Law contends that, under the FPA, the USFWS and the MDMR eel passage recommendations must be accepted as written and may not discard or modify them. Conservation Law states that data from agency reports provide enough data to justify the longer downstream passage window. Conservation Law also comments on other reasons for accepting the agencies' recommendations.

Response: First, the Commission is only required to accept, without modification, measures prescribed under Section 18 of the FPA. The USFWS has not filed any such prescription. The Commission is not required to accept, without modification, section 10(j) recommendations. Rather, section 10(j) of the FPA requires the Commission to include license conditions based on recommendations provided by state and federal resource agencies if such recommendations are supported by substantial evidence and are not inconsistent with the purposes and requirements of the FPA or other applicable law. Second, as we stated in section V.C.3.b, Fisheries and Aquatic Resources - Environmental Analysis, the record does not support the 14-week operational window for downstream eel passage at Eel Weir. To address this issue, we recommend that a timing component be added to the effectiveness monitoring study. Alternatively, out-migration timing at the Eel Weir Project could be incorporated into S.D. Warren's on-going 3-year monitoring study.

Comment: Conservation Law questions whether the Commission has sufficient evidence to continue using its conclusions from 2002, because eel passage provisions are relatively new and untested. Conservation Law contends that longer operational periods are necessary (8 hours vs. 4 hours), and that full-scale and comprehensive monitoring studies should be undertaken by the MDMR and funded by S.D. Warren.

Response: Though we disagree with the longer operational periods of 8 hours, as described in FERC (2002) and in the draft EA for Eel Weir, we ultimately recommend that the facilities be operated for 8 hours per night. The final EA for Eel Weir includes a similar recommendation. With regard to the monitoring study, we typically require that a licensee evaluate the effectiveness of installed facilities (e.g., fish passage and recreation facilities). We cannot compel a third party (in this case the MDMR) to conduct a study required of a licensee. However, a licensee and a resource agency may reach agreement on such an arrangement. Ultimately, though, the Commission holds the licensee responsible for the operation of the facilities, as well as any required monitoring.

Comment: Conservation Law states that re-opener clauses should be included in the license, which would mandate that S.D. Warren take any additional actions deemed necessary by state or federal agencies in order to protect eel populations or to correct a violation of state water quality standards. In addition, Conservation Law states that in the event eels are listed under the ESA, the license should automatically be re-opened and any changes needed to avoid illegal take be undertaken.

Response: We find no basis to recommend the inclusion of separate re-opener clauses in any license issued for the Eel Weir Project. We recommend, instead, that the effectiveness monitoring plan for eel passage include a provision to identify any additional measures that may be warranted based on the outcome of the monitoring. Furthermore, we would recommend that the Commission reserve its authority to require changes to project facilities and/or operation based on the outcome of the monitoring study. Finally, because American eel have not been listed under the ESA, it is pre-mature to recommend measures be included in the license to address ESA matters.

Wildlife and Terrestrial Resources

Comment: S.D. Warren contends that a SMP is unnecessary and inappropriate for the Eel Weir Project, with respect to the lands that it owns within the project boundary.

Response: The SMP under consideration in the final EA would cover more than the lands that S.D. Warren owns within the project boundary. The purpose of any SMP is to manage the development along the shoreline to ensure the protection and enhancement of the project's recreational, environmental, cultural, and scenic resources, as well as the project's primary function (which is to produce electricity). To address S.D. Warren's concerns regarding the SMP, we have expanded our discussion in sections V.C. 4 (Terrestrial Resources) and V.C.5 (Recreational Resources and Land Use) of the final EA to clarify the intent of the SMP and any potential effects it would have on the various resources.

Comment: The USFWS concurs with staff's recommendations regarding conservation easements and aesthetic measures. The USFWS does not fully supports staff's recommendation for shoreline protection measures, requesting that staff's recommended SMP include mitigation for the effects to wetlands and aquatic resources resulting from project operation associated with staff's recommended LLMP. The USFWS also requests that it be consulted during the development of the SMP.

Response: The results of the wetland monitoring studies, as described in section V.C.4.b, Terrestrial Resources - Environmental Effects, showed only minimal changes in wetland species composition and percent total cover of wetlands since the implementation of the LLMP, with no loss of wetlands. In addition, the changes to the LLMP we recommend in the final EA would have no effects on wetlands. As a result, it is not appropriate to include mitigation for effects on wetlands in the SMP.

Comment: The USFWS concurs with staff's recommendation for wetlands monitoring.

Response: We continue to recommend wetlands monitoring in the final EA.

Comment: Sebago Pines objects to the target level of 261.0 feet or lower 2 times in 9 years, because it dewaters wetlands, increases Eurasion water milfoil, and negatively affects wildlife (including frogs and turtles), fish, and healthy lake vegetation.

Response: As discussed in section V.C.4.b, Terrestrial Resources - Environmental Effects, a drawdown to 261.0 feet in 2 out of 9 years are outside of the growing season and, thus, would not adversely affect wetlands. A drawdown of this nature occurred historically, so it is unlikely that such a drawdown would negatively affect wildlife, fish, or other lake resources. With regard to invasive species, there is no evidence in the record that shows the current LLMP is contributing to the proliferation of aquatic invasive weeds such as Eurasian water milfoil. Also, our recommended LLMP would continue the seasonal drawdown, which would remain within the range that occurred historically.

Recreation and Land Use

Comment: S.D. Warren contends that no additional boat access is needed on Sebago Lake. S.D. Warren states that locating such a facility in Sebago Basin is inappropriate and potentially unsafe (e.g., the facility is not likely to see significant use and is in close proximity to the project dam). To recover costs associated with operating such a site, S.D. Warren states that it would charge users ($19 to $29/launch), and these cost estimates should be factored into the economic analysis.

Response: Currently, the general public does not have free or inexpensive boating access to Sebago Lake. The development of the recommended boat launch could remedy this situation. To address S.D. Warren's concerns we have added a discussion of usage, safety, and a cost analysis, as presented by S.D. Warren, in section V.C.5.b, Recreational Resources and Land Use - Environmental Effects, of the final EA in an attempt to clarify S.D. Warren's expectations and responsibilities.

Comment: S.D. Warren contends that lands recommended for placement in a conservation easement with the town of Windham should not be included in the project boundary. S.D. Warren states that, only lands necessary to operate the project, and nothing more, should be included within the project boundary.

Response: S.D. Warren did not propose any changes to the project boundary in the license application and, as such, no alternative configurations were analyzed in the final EA. However, in order that the recreational resources associated with the bypassed reach remain available to the public, inclusion with the project boundary ensures their status forward as part of S.D. Warren's project responsibility.

Comment: The USFWS concurs with staff's recommendation for public access and recreation monitoring. The USFWS requests that it be consulted during the development of the SMP recommended in the EA.

Response: We continue to recommend measures for public access and recreation monitoring in the final EA. With regards to consultation, S.D. Warren would be required to consult with the USFWS during the development of the SMP.

Comment: FOSL states that the statement in the draft EA that, "our recreation analysis did not find any relationship between lake levels and the amount of boating use on the lake" affirms the factual basis of the Commission's decision in the 1997 FEIS to reject the state's LLMP, and that all recommendations in the final EA must be consistent with this statement. According to FOSL, this statement shows there is no factual justification based on recreational uses to keep Sebago Lake higher than historic levels.

Response: Commission staff concluded in the 1997 EIS that both the "compromise" plan and the staff LLMP would provide lake elevations conducive for recreation during the active recreation season, while minimizing shoreline erosion potential. We agree that the recreation data does not show a relationship with lake levels (those above boating thresholds). However, we expanded the discussion in section V.C.5.b, Recreational Resources and Land Use - Environmental Effects, of the final EA to clarify the dates boating use numbers were collected, which corresponds to times of year when lake levels would be above the boating threshold. Furthermore, the various lake levels proposed in the final EA could affect resources other than recreation, and the final EA makes every attempt to identify the effects to those resources.

Comment: Sebago Pines comments on boating and fishing on Sebago Lake. Sebago Pines states that Sebago Lake must be maintained at 264.0 ft. to achieve safe boating. Sebago Pines objects to taking the lake down to 261.0 ft. or lower 2 times in 9 years, as it results in a complete drawdown of Muddy River. Sebago Pines recommends that the lake level remain above 263.5 ft. at all times, and recommends the August 1 target level be 265.5 ft. * 3 inches. In addition, the town of Naples comments on lake level and its effects on Muddy River.

Response: The Commission's record in this proceeding, through numerous filings, shows that the minimum lake level suitable for boating is 263.5 feet. Our recommended changes to the LLMP would maintain sufficient lake levels during the boating season to provide safe boating opportunities. In addition, our analyses show that lake levels in Sebago Lake are not so much correlated to the fall lake level (even the 2-in-9-year drawdown to 261.0 feet), as to over-winter and spring precipitation. Only in the most extreme dry years would we expect potential problems in reaching a lake level that may limit boating opportunities.

Socioeconomic Resources

Comment: Maine PEER supports the comments made by Stephen Kasprzak and FOSL. Maine PEER requests that the Commission recognize the significant ecological and economical value that Sebago Lake's beaches represent, and recommend measures that protect the lake and shoreline for the long-term health of the lake and not for the short-term desire of increasing development. In addition, FOSL states that the negative effect on the economic value and importance of the rare inland beaches on Sebago Lake due to erosion needs to be assessed.

Response: We have discussed the potential effects of lake level management on beach erosion, but a detailed valuation and economic analysis of the beaches is beyond the scope of issues identified during the scoping process for this EA.

Developmental Analysis

Comment: S.D. Warren states that replacing a 25-cfs minimum flow gates with a 50-cfs minimum flow gate, to meet the 100-cfs total flow would cost $30,000.

Response: We used S.D. Warren's estimate of $30,000 to determine the appropriate capital cost of upgrading the existing minimum flow release structure for the various recommended minimum flow regimes. Table 42 in the final EA was updated to reflect our estimate for replacing existing minimum flow gates, as appropriate. Our economic analysis of the recommended alternatives reflects this capital cost, in addition to the annual cost of lost generation.

Comment: S.D. Warren raises concerns that changes to the LLMP will continue to diminish its ability to obtain power benefits from the project, and requests that, in the final EA, staff include a detailed and complete analysis of the economic costs of the license requirements as part of the balancing of the regulatory obligations imposed on the project, including the cost of implementing the revised LLMP and the foregone generation, as well as the cost of lost generation due to the increases in minimum bypass flows.

Response: Our developmental analysis (section VI of the final EA) includes an economic analysis of the costs to S.D. Warren of continuing to operate the project under various new license requirements, including alternative LLMPs.

Comment: The USFWS states that staff should clarify the estimate for downstream eel passage mitigation costs. The USFWS states that once the facilities are installed, operational costs would consist of opening and closing the downstream passage gate, and spillage of water through the gate, which may partially or entirely be offset by reciprocal reductions in minimum flow discharge during downstream passage operation. S.D. Warren states that the economic analysis should not discount generation losses associated with the downstream eel passage because those flows can not necessarily be deducted from the minimum flows for the bypassed reach.

Response: S.D. Warren addressed this concern in its filing of October 17, 2005. We reviewed S.D. Warren's filing and concur that, at times, the eel passage releases can not be used as a substitute for minimum flow releases due to the need to prevent loss of landlocked salmon to the bypassed reach. However, for purposes of our analysis, we used S.D. Warren's cost and lost energy estimates, which indicates that there is no increase in costs (over the minimum flow release) because the water would be spilled either by the downstream eel passage facility (at least partially) or through the minimum flow gate (i.e., the loss in generation is accounted for once as part of the minimum flow release). We acknowledge that there may be some cost difference in operating one gate over the other (or having to occasionally operate both the gate and downstream eel passage facility at the same time). However, we assume any such cost would be negligible. To assume otherwise would be speculative at best.

Comment: FOSL questions the economic analysis in the draft EA that estimates the cost of salmon fish passage, but does not account for the value of the salmon fishery and cost to the salmon population in Sebago Lake. FOSL questions the economic analysis related to American eel passage on the same grounds. FOSL contends that if the Commission has no consistent dollar accounting method for fisheries enhancements, then the Commission's decision is arbitrary and capricious.

Response: Our economic analysis analyzes the costs to S.D. Warren of the project under any new license conditions. However, our analysis is not able to analyze the value of the salmon or eel fisheries because there are no reliable economic data available for these fisheries in the record.

Comment: Mr. Kasprzak cites a July 21, 2005, newspaper article quoting the current price of electricity of $0.083/kwh, and requests that the final EA update the Developmental Analysis to reflect this current market rate of electricity.

Response: The rate cited by Mr. Kasprzak reflects the retail rate charged to commercial and industrial customers. The energy rate used in the EA reflects equivalent wholesale replacement energy costs to produce the energy generated by the project. Retail rates include the wholesale energy costs plus the cost of transmitting power produced by the project to a distribution substation and the cost of then distributing the energy to the customer.

Comment: Mr. Kasprzak comments that the developmental analysis section of the draft EA does not (and the final EA should) evaluate: (1) lost hydropower due to increased spillage; (2) the cost of rip rapping the shoreline to protect it from erosion; (3) the loss of public beach access due to flooding of beaches; and (4) the effect higher water has on beach users. In addition, Mr. Theodore Tibbals contends that staff's economic analysis left out the value of shoreline and beaches lost, the cost to property owners to stabilize their shore fronts, the value of wasted water dumped that could be otherwise used for hydropower generation, the cost of electricity that will have to be generated from fossil fuels, the losses suffered by land owners who are flooded downstream, and the loss in aesthetic value of Sebago Lake.

Response: The draft and final EA estimates the value of water that could otherwise be used for hydropower generation and pollution abatement in section VI, Developmental Analysis. The cost for property owners to stabilize their shore-fronts is not a cost item attributable to S.D. Warren, nor was it identified during scoping as an issue to analyze. As noted above, a detailed valuation and economic analysis of Sebago Lake's beaches is beyond the scope of issues identified during the scoping process for this EA.

Footnotes

[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [79] [80] [81] [82] [83] [84] [85] [86] [87] [88] [89] [90] [91] [92] [93] [94] [95] [96] [97] [98] [99] [100] [101] [102] [103] [104] [105]

S.D. Warren filed additional comments on October 17, 2005, responding to many of the comments filed by the agencies and non-governmental organizations.

[106] Includes letters dated August 24 and 31, 2005.

Document Content(s)