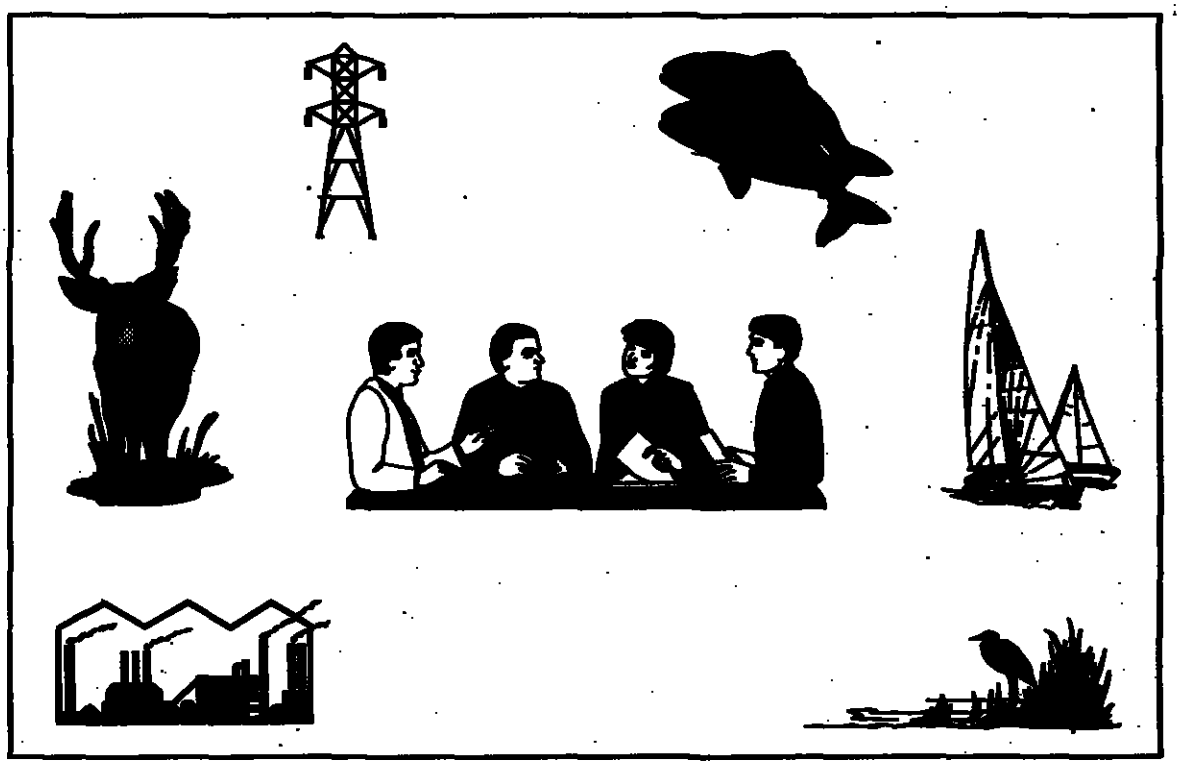
Federal Energy Regulatory Commission

Office of Hydropower Licensing

July 1996

FERC/FEIS - 0100

Final Environmental Impact Statement



Lower Androscoggin River Basin Hydroelectric Projects Maine

(FERC 2283-005, 11482-000)

888 First Street N.E. Washington, DC 20426

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426

TO THE PARTY ADDRESSED

Attached is the Final Environmental Impact Statement (FEIS) for two hydroelectric projects located in Androscoggin County, Maine.

The FEIS documents the views of government agencies, non-governmental organizations (NGO), the public, and the Commission's staff and includes staff recommendations regarding the application for the new license application for the Gulf Island-Deer Rips Project (P-2283) and for the unlicensed Marcal Project (P-11482), located in the Androscoggin River Basin in Androscoggin County, Maine. Before the Commission makes a decision on licensing, it will take into account all concerns relevant to the public interest. The Final Environmental Impact Statement will be part of the record from which the Commission will make its decision.

Any Commission order issued pursuant to this document will be subject to the Commission's rehearing process under 18 C.F.R. Section 385.713. Requests for rehearing must be filed within 30 days of the date of issuance of the two subject orders.

Attachment

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF HYDROPOWER LICENSING

FINAL ENVIRONMENTAL IMPACT STATEMENT

RELICENSING THE GULF ISLAND-DEER RIPS HYDROELECTRIC PROJECT AND LICENSING THE MARCAL HYDROELECTRIC PROJECT IN THE LOWER ANDROSCOGGIN RIVER BASIN

FERC Project Nos. 2283-005, 11482-000

Applicants:

Central Maine Power Company
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83 Edison Drive
Augusta, ME 04336

Consolidated Hydro Maine, Inc.
Andover Business Park
200 Bulfinch Drive
Andover, MA 01810

Additional copies of this Final EIS are available from:

Public Reference and Files Maintenance Branch
Federal Energy Regulatory Commission
888 First St., NE
Washington, DC 20426

July 1996

COVER SHEET

a. Title: Relicensing the Gulf Island-Deer Rips Hydroelectric Project and licensing the Marcal Hydroelectric Project in the lower Androscoggin River Basin.

b. Final Environmental Impact Statement

c. Lead Agency: Federal Energy Regulatory Commission

d. Abstract: Central Maine Power Company (Central Maine) filed an application with the Federal Energy Regulatory Commission (Commission) for new license (relicense) for the existing 31.12 megawatt (MW) Gulf Island-Deer Rips Project located on the lower Androscoggin River, in Auburn and Lewiston, Maine. Consolidated Hydro Maine, Inc. (Consolidated Hydro) filed an application for original license for the existing 1.31 MW Marcal Project located on the Little Androscoggin River, a tributary of the Androscoggin River, in Mechanic Falls, Maine. Central Maine's application contains a proposal for increased generating capacity. Generating capacity for the two projects, as proposed, would total about 36.73 MW, an increase of 4.30 MW over existing capacity.

The primary environmental resource issues are potential impacts to and effects on (1) geology and soils; (2) water quality and quantity; (3) fisheries resources; (4) vegetation and wildlife resources; (5) recreational resources; (6) aesthetic resources; (7) cultural resources; (8) air quality; and (9) cumulative interactions with other projects.

The staff's recommendation is to relicense Central Maine's project and license Consolidated Hydro's project as proposed with additional resource enhancement and mitigation measures.

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f. Transmittal: This final environmental impact statement prepared by the Commission's staff in connection with relicense and license applications filed by Central Maine for the existing Gulf Island-Deer Rips Project (FERC No. 2283) and Consolidated Hydro for the existing unlicensed Marcal Project (FERC No. 11482) is being made available to the public on or about July 19, 1996, as required by the National Environmental Policy Act (NEPA) of 1969 and the Commission's regulations implementing NEPA (18 CFR Part 380).

FOREWORD

The Federal Energy Regulatory Commission (Commission), pursuant to the Federal Power Act (FPA)[1] and the U.S. Department of Energy (DOE) Organization Act[2] is authorized to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric developments subject to its jurisdiction, on the necessary conditions:

> [T]hat the project adopted...shall be such as in the judgement of the Commission will 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 water power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in Section 4(e)....[3]

The Commission may require such other conditions not inconsistent with the FPA as may be found necessary to provide for the various public interests to be served by the project.[4] Compliance with such conditions during the licensing period is required. Section 385.206 (1987) of the Commission's Rules of Practice and Procedure allows any person objecting to a licensee's compliance or noncompliance, with such conditions, to file a complaint noting the basis for such objection for the Commission's consideration.[5]

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1 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 102-486 (1992).

2 Public Law 95-91, 91 Stat. 556 (1977).

3 16 U.S.C. Sec. 803(a).

4 16 U.S.C. 803(g).

5 18 CFR 385.206 (1987).

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ACRONYMS AND ABBREVIATIONS

AVCG	Androscoggin Valley Council of Governments
ABF	Aquatic Base Flow Policy
ASRSC	Atlantic Sea-Run Salmon Commission
BOD	Biological oxygen demand
Boise Cascade	Boise Cascade, Inc.
Brunswick	Brunswick Hydropower Project (FERC No. 2284)
CEA	Cumulative effects analysis
Central Maine	Central Maine Power Company
cfs	cubic feet per second
CSO	Combined sewer overflow
Commission, the, or FERC	Federal Energy Regulatory Commission
Conservation Coalition	Conservation Law Foundation, American Rivers, Appalachian Mountain Club, and Maine Audubon Society
Consolidated Hydro	Consolidated Hydro Maine, Inc.
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DEIS	draft environmental impact statement
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	final environmental impact statement
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
GIPOP	Gulf Island Pond Oxygenation Project
Gulf Island	Gulf Island-Deer Rips Hydropower Project (FERC No. 2283)
GWh	gigawatthours
Hackett Mills	Hackett Mills Hydropower Project (FERC No. 6398)
Hackett Mill Hydro	Hackett Mills Hydro Associates
HU	habitat units
HSI	habitat suitability index
IFIM	Instream Flow Incremental Methodology
Interior	U.S. Department of the Interior
International Paper	International Paper Company
James River	James River Paper Company
kV	kilovolt
kW	kilowatt
KWh	kilowatthours
Land Trust *et al.*	Androscoggin Land Trust, Androscoggin Valley County of Governments, City of Lewiston, and City of Auburn
Lewiston Falls	Lewiston Falls Hydropower Project (FERC No. 2302)
Lower Barkers	Lower Barkers Mills Hydropower Project (FERC No. 2808)

Marcal	Marcal Hydropower Project (FERC No. 11482)
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
MSPO	Maine State Planning Office
mgd	million gallons per day
Miller Hydro	Miller Hydro Group
MW	megawatt
NEPA	National Environmental Policy Act
NEPLAN	New England Power Planning
NEPOOL	New England Power Pool
NYPP	New York Power Pool
NGVD	National Geodetic Vertical Datum
NGO	Non-governmental organizations
NHPA	National Historic Preservation Act
NPCC	Northeast Power Coordinating Council
Pejebscot	Pejebscot Hydropower Project (FERC No. 4784)
PHABSIM	Physical Habitat Simulation
RM	river mile
SDI	Scoping Document I
SHPO	State Historic Preservation Officer
SOD	Sediment oxygen demand
ft^2	square feet
mi^2	square miles
staff, the	Federal Energy Regulatory Commission's staff
Topsham-Hydro	Topsham-Hydro Partners
TU *et al.*	Trout Unlimited, Trout Unlimited - Maine Council, Atlantic Salmon Federation, and Atlantic Salmon Federation - Maine Council
Upper Barkers	Upper Barkers Mill Hydropower Project (FERC No. 3562)
USGS	U.S. Geological Survey
UWPC	Union Water Power Company
WUA	Weighted Useable Area
Wetlands Act	Wetlands Resources Act
Worumbo	Worumbo Hydropower Project (FERC No. 3428)
WQC	Water Quality Certification

EXECUTIVE SUMMARY

This Final Environmental Impact Statement (FEIS) encompasses the lower Androscoggin River downstream from river mile (RM) 41.1 and the Little Androscoggin River downstream from RM 17.0. Included within this scope are the Brunswick, Pejebscot, Worumbo, Lewiston Falls, Deer Rips, and Gulf Island Dams (lower Androscoggin River), as well as Lower Barkers, Upper Barkers, Hackett Mills, and Marcal Dams (Little Androscoggin River). This FEIS evaluates the potential environmental benefits, economic costs, and environmental effects associated with (1) relicensing the Gulf Island-Deer Rips Project, and (2) issuing a license for the unlicensed Marcal Project.

The Gulf Island-Deer Rips Project, located on the Androscoggin River, is an operating licensed facility, located in Androscoggin County, Maine, in the Cities of Lewiston and Auburn and the Towns of Greene, Turner, Leeds, and Livermore. The project was constructed by Central Maine Power Company (Central Maine) during the period from 1903 through 1928. The Androscoggin River drains an area of about 2,865 square miles (mi^2) at the Deer Rips/Androscoggin No. 3 dam. The project's principal features consist of two dam structures, two impoundments, three powerhouses, and appurtenant facilities. Presently, the project has a total installed capacity of 31.12 MW; an average annual generation of about 189.72 gigawatthours (GWh); and costs about $2,135,000 more to operate annually than alternative generation in the region (negative net benefits). Cumulatively, energy generation at the six lower Androscoggin River projects would be about 569.65 GWh, and have a total annual net benefit of -$14,256,000.

For the new licensing term, Central Maine proposes modifications to the Gulf Island-Deer Rips Project operation and several environmental enhancements at the project, which include: (1) turbine/generator upgrades; (2) limiting impoundment level fluctuations from May 1 to June 15 each year; (3) releasing a year-round minimum flow of 1,100 cubic feet per second (cfs) from the project; (4) flow ramping at the Deer Rips/Androscoggin No. 3 levelopments; (5) continuing to participate in the oxygen injection program for the Gulf Island impoundment; (6) several recreation enhancements; and (7) cultural resource protection measures. Under Central Maine's proposed unit upgrade and operational modifications, the project would have an installed capacity of 35.42 MW, an average annual generation of about 207.18 GWh, and a total annual net benefit of about -$2,737,000. Cumulatively, energy generation at the six lower Androscoggin River projects would be about 587.13 GWh, and have a total annual net benefit of -$14,856,000.

On November 27, 1991, Central Maine requested that the Maine Department of Environmental Protection (MDEP) issue a Section 401 Water Quality Certificate (WQC), as required by the Clean Water Act (CWA). Central Maine subsequently withdrew and refiled its request for water quality certification on November 24, 1992, November 24, 1993, November 16, 1994, and November 16, 1995. MDEP has taken no action on Central Maine's request for water quality certification for Gulf Island-Deer Rips, which is currently pending before the MDEP.

The unlicensed Marcal Project, owned by Consolidated Hydro Maine, Inc. (Consolidated Hydro), is located on the Little Androscoggin River, in the Town of Mechanic Falls, Androscoggin County, Maine. The Marcal Project was likely constructed in 1866. The Little Androscoggin River drains an area of about 250 mi^2 at the Marcal dam. The project's principal features consist of a dam with two spillway sections, an intake area, a penstock, a powerhouse, an impoundment, a transmission line, and appurtenant facilities. The project has a total installed capacity of 1.31 MW, an average annual generation of about 4.52 GWh, and a total annual net benefit of about -$112,000. Cumulatively, energy generation of the four Little Androscoggin River projects would be about 20.41 GWh, and have a total annual net benefit of -$631,000.

Consolidated Hydro has not proposed any modification to the Marcal project facilities. To resolve several environmental enhancement and mitigation issues, Consolidated Hydro proposes several project operational changes and environmental enhancement measures at Marcal for the licensing term, including: (1) limiting impoundment level fluctuations from May 1 to October 15 each year; (2) releasing a year-round minimum flow of 56 cfs from the project and a bypass minimum flow of 20 cfs to the project's bypassed reach from June 1 to November 1 each year; (3) downstream fish passage facilities; and (4) recreation enhancements. Under Consolidated Hydro's proposal, the project would have an installed capacity of 1.31 MW, an average annual generation of about 4.23 GWh, and a total annual net benefit of about -$142,000. Cumulatively, energy generation at the four Little Androscoggin River projects would be about 19.65 GWh, and have a total annual net benefit of -$672,000.

On May 25, 1994, Consolidated Hydro requested that MDEP issue a Section 401 WQC, as required by the CWA. Consolidated Hydro subsequently withdrew and refiled its request for water quality certification on May 24, 1995 and May 24, 1996. MDEP has taken no action on Consolidated Hydro's request for water quality certification for Marcal, which is currently pending before the MDEP.

On October 7, 1994, the U.S. Department of the Interior prescribed two conditions for fish passage at Marcal pursuant to Section 18 of the Federal Power Act. Interior subsequently clarified several aspects of its fishway prescription. We view Interior's fishway prescription as a reservation of authority to prescribe fishways.

In addition to the proposed actions, the Commission's staff evaluated alternatives to the proposed actions and recommendations raised during the scoping process. The issues addressed in this FEIS for both Gulf Island-Deer Rips and Marcal are impacts to and effects on: (1) geology and soils; (2) water quality and quantity, (3) fishery resources, (4) terrestrial resources, (5) recreational resources, (6) aesthetic resources, (7) archeological and historic resources, (8) land use; (9) socioeconomic resources; and (10) air quality.

Alternatives to the applicants' proposals considered in detail are (1) modifications to proposed project operation or facilities to further protect and enhance environmental

resources and values, and (2) no action. A draft EIS was sent out for comment on December 8, 1995. Comments were received and are addressed (where pertinent) within the text of this FEIS, and in detail in Appendix E.

Based on the comments provided during the scoping process, the license applications for Gulf Island-Deer Rips and Marcal, previous agency comments, and staff analysis, we reviewed the resources listed above to determine (1) which resources, if any, could be affected in a cumulative manner by the proposed actions and non-hydro activities, and (2) the geographic and temporal scope of the EIS analysis. We identified water quality, resident and anadromous fish, wetlands, and hydroelectric generation as resources that could be affected in a cumulative manner by the proposed actions and other activities in the Lower Androscoggin River Basin.

Because the proposed actions involve tradeoffs between energy production and enhancement of environmental quality, we gave equal consideration to developmental and non-developmental values in accordance with the Federal Power Act (FPA). Based on our independent review and evaluation of the license applications under Sections 4(e) and 10(a) of the FPA, we recommend relicensing the proposed Gulf Island-Deer Rips Project and licensing the proposed Marcal Project with additional staff recommended measures.

For the Gulf Island-Deer Rips Project, the measures that we recommend, in addition to Central Maine's proposed measures, include (1) providing a project operation monitoring plan, (2) developing and implementing an alternatives study plan for protecting water quality in the Androscoggin River, (3) providing additional minimum flows and impoundment fluctuation restrictions, and (4) providing a mechanism to re-open the project license to address cumulative effects in the future. Under the staff's recommended alternative, the Gulf Island-Deer Rips Project would have an installed capacity of 35.42 MW, an average annual generation of about 207.26 GWh, and a total annual net benefit of about -$2,760,000. Cumulatively, energy generation at the six lower Androscoggin River projects would be about 587.23 GWh, and have a total annual net benefit of -$14,869,000.

With regards to Marcal, the measures that we recommend, in addition to Consolidated Hydro's proposed measures, include providing (1) a project operation and monitoring plan, (2) additional minimum bypass flows, and (3) a schedule and plan for monitoring the proposed downstream fish passage facilities. In addition, we recommend Consolidated Hydro periodically conduct recreation use monitoring studies. Under the staff's recommended alternative, the Marcal Project would have an installed capacity of about 1.31 MW, an average annual generation of about 4.10 GWh, and a total annual net benefit of about -$145,000. Cumulatively, energy generation at the four Little Androscoggin River projects would be about 19.44 GWh, and have a total annual net benefit of -$676,000.

We believe our recommended alternative for each project would be best adapted to a comprehensive plan for the use of water power development, while concurrently protecting and enhancing environmental resource values and uses, because: (1) issuing a new license

for Gulf Island-Deer Rips and an original license for Marcal would allow Central Maine and Consolidated Hydro to operate their projects as beneficial and dependable sources of electric energy for Central Maine's customers; (2) implementing our required environmental measures would enhance the existing resources; and (3) we believe our alternative for each project would be best adapted to a comprehensive plan for the use of water power development, while concurrently protecting natural resource values and uses.

Section 10(j) of the Federal Power Act (FPA) requires the Commission to include license conditions, based on recommendations provided by the federal and state fish and wildlife agencies. We have addressed the concerns of the federal and state fish and wildlife agencies and made recommendations, some of which are inconsistent with those of the agencies. In the DEIS we made a preliminary determination that some of Interior's recommendations for Gulf Island-Deer Rips and Marcal conflicted with the comprehensive planning and public interest standards of Section 4(e) and 10(a) of the FPA. Pursuant to Section 10(j), staff met with a representative of the U.S. Fish and Wildlife Service, on April 8, 1996, to attempt to resolve such inconsistencies. Commission staff were unable to resolve the inconsistencies between our recommendations and Interior's recommendations. The results of the 10(j) meeting are discussed in Sections 4.0. and 5.5. of this FEIS.

1. PURPOSE AND NEED FOR POWER

1.1. Purpose of actions

Two proposed actions are pending before the Federal Energy Regulatory Commission (Commission). These two actions consist of the issuance of a new license (relicense) for the continued operation of the Gulf Island-Deer Rips Hydroelectric Project (Gulf Island-Deer Rips) and the issuance of an original license for the continued operation of the currently unlicensed Marcal Hydroelectric Project (Marcal).

This Final Environmental Impact Statement (FEIS), as required by the National Environmental Policy Act (NEPA)[1] and Commission regulations, provides the Commission with descriptions and evaluations of the potentially significant environmental effects associated with the two aforementioned projects. The Commission will use the information in this FEIS in taking action on the proposed relicensing of Gulf Island-Deer Rips and licensing of Marcal.

This FEIS assesses the impacts associated with the continued operation of the projects, analyzes alternatives to the proposed projects, and makes recommendations to the Commission on whether to issue licenses for Gulf Island-Deer Rips and Marcal, and if so, recommends terms and conditions to become a part of any licenses issued. The Federal Power Act (FPA) provides the Commission with the exclusive authority to license nonfederal water power projects on navigable waterways and federal lands.

In deciding whether to issue any license, the Commission must determine that the project adopted will 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 of 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 FEIS reflects the above considerations.

In this FEIS, we assess the environmental and economic effects of the continued operation of Gulf Island-Deer Rips and Marcal (1) as proposed by Central Maine Power Company (Central Maine) and Consolidated Hydro Maine, Inc. (Consolidated Hydro), (2) with agency and non-governmental organization (NGO) recommended mitigation, protection, and enhancement measures, and (3) with our recommended mitigation and enhancement measures. We also consider the effects of the no-action and project decommissioning alternatives. There are no competing applications for Gulf Island-Deer Rips or Marcal.

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[1] National Environmental Policy Act of 1969, as amended (Pub. L. 91-190. 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, §4(b), Sept. 13, 1982).

1.2. Need for power

The existing Gulf Island-Deer Rips Project was constructed by Central Maine during the period from 1903 through 1928. Specifically, the Deer Rips development was constructed in 1903, the Gulf Island development was constructed in 1926, and the Androscoggin No. 3 development was constructed in 1928.

The Marcal Project at Mechanic Falls includes a stone dam which was likely constructed by the Denison Paper Company in 1866 (Federal Energy Regulatory Commission; FERC, 1989). The Marcal Project powerhouse, as currently exists, was constructed in 1889, and is divided into two sections; one housing the turbines and one housing the generators and switchgear.

Historically, the average annual generation for Gulf Island-Deer Rips has been about 189.72 gigawatthours (GWh) (from 1970 to 1990), while the average annual generation for Marcal has been 4.52 GWh.

Consolidated Hydro has no end-use customers for the energy produced by Marcal. The output (capacity and energy) produced by Marcal is purchased by Central Maine and distributed to its end-use customers. Central Maine has relied on electricity produced by: (a) the Deer Rips development for approximately 91 years; (b) the Gulf Island development for approximately 68 years; and (c) the Androscoggin No. 3 development for approximately 66 years. Additionally, Central Maine has relied on the power produced by the Marcal development, and purchased from Consolidated Hydro, for about eight years.

Central Maine's customers, and the public in general, have benefitted from the hydropower generation from these four generating facilities.

Central Maine reports to the Northeast Power Coordinating Council (NPCC). Central Maine's service area is located in the NPCC reliability council region. The NPCC reliability region consists of the New England Power Planning (NEPLAN) and the New York Power Pool (NYPP). Central Maine reports -- on matters related to the reliability of electric power supply -- to New England Power Pool (NEPOOL).

Each year the NPCC and the other ten reliability councils prepare Regional Reliability Council Long Range Coordinated Bulk Power Supply Program Reports from data reported by the parties within the council regions. These data are edited and consolidated by each council and published as the Long Range Coordinated Bulk Power Supply Programs Report. The Report is known to the electric power industry, and others, as the "OE-411 Report," and is published in April of each year.

As stated above, Central Maine's service area is located in the NEPOOL portion of the NPCC region. According to NPCC's 1994 OE-411 Report, the annual compound growth rate for 1994 through 2003 is 1.3 percent for the summer peak load, 1.3 percent for the

winter peak load, and 1.4 percent for annual net energy requirements. These growth rates are sufficient to assure Central Maine's long term need for the electricity generated by the four hydropower developments with which we are herein concerned.

Considering the extended periods of time during which Central Maine and Central Maine's customers have benefitted from the Gulf Island-Deer Rips and Marcal Projects generation, and NEPOOL's growth rate projections, staff concludes that the short-term and long-term needs of Central Maine for the energy generated by the projects have been adequately established.

1.3. Scope of the EIS

Pursuant to the Commission's Notice of Application Ready for Environmental Analysis for Gulf Island-Deer Rips dated October 23, 1993, the U.S. Department of the Interior (Interior), the U.S. Environmental Protection Agency (EPA), the Conservation Coalition, and Trout Unlimited *et al.* requested, among other things, that a comprehensive cumulative impact assessment be prepared for the Androscoggin River. Additionally, the Conservation Coalition in its comments requested the Commission prepare a comprehensive EIS addressing the impacts of the Gulf Island-Deer Rips Hydropower Project.

In response to these comments, we issued notice in the Federal Register on April 11, 1994, of our intent to prepare an EIS that would analyze the five hydro-projects on the mainstem of the lower Androscoggin River. The notice also scheduled scoping meetings and site visits.

We reviewed public and agency comments filed with the Commission, prepared a Scoping Document I (SDI), visited the sites in May 1994, held public scoping meetings in Auburn, Maine on May 11 and 12, 1994, and reviewed public and agency comments resulting from this process.

At the May 12, 1994, scoping meeting, the Maine Department of Marine Resources (MDMR) recommended that the staff consider the Little Androscoggin River, a tributary of the Androscoggin River, within the scope of the EIS. Subsequent to the scoping meetings, and as a result of comments received during the scoping process, the Little Androscoggin River was incorporated into the EIS. In addition to the five hydro-projects on the mainstem of the lower Androscoggin River, the EIS will also analyze the four lower hydro-projects on the Little Androscoggin River (Table 1-1). We issued notice in the Federal Register on August 25, 1994, of our intent to include the Marcal Hydroelectric Project in the EIS for the lower Androscoggin River.

During the scoping process, the U.S. Fish and Wildlife Service (FWS) and the Conservation Coalition requested that the Commission expand the scope of the EIS to include all hydropower projects in the Androscoggin River Basin which are unlicensed, undergoing review for licensing now, and soon to undergo review for licenses expiring in 1999.

Specifically, the EIS should include an analysis of the effects of projects upstream from Gulf Island-Deer Rips, including the seven projects pending relicensing on the Upper Androscoggin, the pending relicense on the Middle Androscoggin, the unlicensed Marcal Project on the Little Androscoggin River, and the licensed and unlicensed headwater storage reservoirs in Maine (Table 1-2; *see Figure 2-1 in Section 2.0*). The Conservation Coalition and FWS also recommended that the scope of the EIS be expanded to include the effects on the estuarine portions of the Androscoggin River downstream from Brunswick.

Table 1-1. Lower Androscoggin River Basin hydroelectric projects (listed in order from downstream to upstream) and Commission action needed. Source: FERC, 1994.

Project	Project Number	Commission Action Needed	Capacity (MW)
Brunswick[1]	2284	None	19.6
Pejebscot[1]	4784	None	13.88
Worumbo[1]	3428	None	19.1
Lower Barker's Mill[2]	2808	None	1.5
Upper Barker's Mill[2]	3562	None	0.95
Hackett Mills[2]	6398	None	0.485
Marcal[2]	11482	License	1.31
Lewiston Falls[1]	2302	None	36.804
Gulf Island-Deer Rips[1]	2283	Relicense	32.717

[1] Projects identified in the Commission's April 11, 1994, public notice.

[2] Projects located on the Little Androscoggin River.

We agree with the need for an assessment of cumulative effects, but have chosen not to assess the headwater storage reservoirs or other hydropower projects in the Upper and Middle Androscoggin River Basin in this EIS. Our decision to limit the scope of the EIS is discussed below.

First, the detailed information and studies we need for our NEPA analysis is inextricably intertwined with processing of license applications. On August 1, 1994, the Commission ruled that the Upper Dam and Middle Dam Projects, located at two headwater storage reservoirs are jurisdictional and must be licensed[2]. As a result, it could take 3 to 5 years before they are ready for environmental analysis. We could not justify the 3- to 5-year delay in relicensing Gulf Island-Deer Rips or licensing Marcal, and the improvements to environmental resources that would occur. Our analysis in this FEIS considers the

[2] Union Water Power Company, 68 FERC ¶ 61,180 (1994).

cumulative effects of fishery, water quality, and wetland impacts, as well as hydropower generation in the Lower Androscoggin River Basin, and recommends enhancement measures for Gulf Island-Deer Rips and Marcal in accordance with our analysis where appropriate.

Second, on August 1, 1994, new licenses were issued for the seven projects included in the Upper Androscoggin River EIS[3] (the final EIS, including a cumulative effects analysis, was issued November 12, 1993). In addition, a new license was issued for the Rumford Falls Project (FERC Project No. 2333) on October 18, 1994[4] (the final EA, including a cumulative effects analysis, was issued March 25, 1993). The environmental analyses for any future licensing actions will be initiated when license or relicense applications are received and accepted. This EIS, and any subsequent NEPA analyses, will use the conclusions of previous NEPA analyses in the river basin.

Finally, any cumulative effects analysis (CEA) requires us to consider the distribution of the relevant environmental resources in the basin. We will discuss the effects that (1) the headwater storage reservoirs have on water use in the Androscoggin River and (2) industrial and municipal discharges have on water quality in the Androscoggin River. However, cumulative effects of Gulf Island-Deer Rips and Marcal are more apparent in the lower Androscoggin River; environmental resources in the Upper Androscoggin are not affected. Previous NEPA analyses have addressed cumulative effects in the upper/middle river basin.

The Commission's policy statement on the Use of Reserved Authority in Hydropower Licenses to Ameliorate Cumulative Impacts[5] states that issues of cumulative impacts ought to be examined at the time of licensing to the fullest extent that such examination is possible, and that reservations of authority to reopen licenses should be resorted to only if it is not possible to examine all such impacts during the relicense process. However, there will be circumstances (such as the number of existing licenses that aren't due to expire, in some cases, for many years, and on-going water quality, fish passage, and other basin-wide efforts), in which a comprehensive analysis of all potential cumulative impacts could entail unacceptably long delays in the relicensing process. Such delays could in themselves generate harm to the environment by delaying the implementation of measures pursuant to a new license. Additionally, if at a future date the Commission foresees the need to deal with a cumulative impact issue, it will tailor specific license conditions to do so to the maximum extent possible.[6]

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[3] See Public Service Company of New Hampshire, 68 FERC ¶ 61,177 (1994), and the companion orders issuing licenses.

[4] Rumford Falls Power Company, 69 FERC ¶ 61,063 (1994).

[5] Use of Reserved Authority in Hydropower Licenses to Ameliorate Cumulative Impacts: Policy Statement, RM93-25-000, III FERC States. & Regs., Regs. Preambles ¶ 31,010 (1994).

[6] Re-opener articles in licenses already issued and in any new license issued for Gulf Island-Deer Rips would allow imposition of additional unforeseen measures determined to be necessary by subsequent analyses.

The Commission released a draft EIS on Gulf Island-Deer Rips and Marcal for comment on December 8, 1995. Comments were received and are addressed herein.

Based on the scoping comments on SDI, the license applications for Gulf Island-Deer Rips and Marcal, previous agency comments, and preliminary staff analysis, we reviewed all resources to see whether they could be affected in a cumulative manner by the proposed actions and other non-hydro activities in the basin, and used the results of that review to determine the geographic and temporal scope of the EIS analysis. We then prepared and distributed to agencies, NGOs, the public, and interested parties a document entitled *Scoping Document II*, which identified the issues to be addressed in the FEIS. These issues include potential impacts to and effects on (1) geology and soils, (2) water quality and quantity, (3) fisheries resources, (4) terrestrial resources, (5) recreational resources, (6) aesthetic resources, (7) cultural resources, (8) land use, (9) socioeconomic resources, and (10) air quality.

1.3.1 Cumulative Effects Analysis of Cumulatively Affected Resources

1.3.1.1. Geographic scope

The geographic scope of our CEA defines the physical limits or boundaries of the proposed actions' effects on the resources. The scope of our CEA will, with two exceptions, encompass the lower Androscoggin River downstream from river mile (RM) 41.1 and the Little Androscoggin River downstream from RM 17.0. Included within this scope are the Brunswick (RM 0.2), Pejebscot (RM 4.5), Worumbo (RM 8.3), Lewiston Falls (RM 22.8), Deer Rips (RM 25.2), and Gulf Island (RM 26.4) Dams (dams 1-6; Figure 2-1), as well as the Lower Barkers (RM 0.7), Upper Barkers (RM 1.3), Hackett Mills (RM 9.8), and Marcal (RM 14.8) Dams (dams 28-31; Figure 2-1).

Since the proposed actions affect the resources differently, the geographic scope for each resource may vary. In this case, for water quality, the geographic scope of our CEA encompasses the mainstem of the lower Androscoggin River and the Little Androscoggin River; we also consider certain cumulative impacts associated with industrial discharges that occur above RM 41.1 on the Androscoggin River. We chose this geographic scope because of the water quality issues related to (a) wastewater discharges from industries and municipalities, (b) impoundments' effect on streamflow, and (c) the Little Androscoggin River's effect on water quality in the lower Androscoggin River.

For anadromous and resident fishery resources, the geographic scope of our CEA encompasses the mainstream of the lower Androscoggin River and the Little Androscoggin River, including several storage dams in the Little Androscoggin River Sub-Basin above RM 17.0. We chose this geographic scope because of the aquatic habitat issues related to downstream minimum flows, Gulf Island-Deer Rips's and Marcal's reregulation of streamflow in the lower Androscoggin and Little Androscoggin Rivers, and Maine's anadromous fish restoration program in the Lower Androscoggin River Basin.

For wetlands and dependent wildlife resources, the geographic scope of the CEA will encompass the mainstem of the lower Androscoggin River. We chose this geographic scope because of the effects of project operations (reservoir drawdowns and fluctuating water surface elevations) on the location and amounts of wetlands and littoral zone habitat. We did not include the Little Androscoggin River in the scope of analysis for wetlands and dependent wildlife resources because the operation of the four projects on the river have little, if any, effects on wetlands that may exists along the river.

For hydroelectric generation and cost of energy, the geographic scope of our CEA encompasses the lower Androscoggin River downstream from the Gulf Island dam, and the Little Androscoggin River downstream from the Marcal dam. We chose this geographic scope because of the operational effects the proposed projects (peaking operation and minimum flows) have on the other hydroelectric projects in the Lower Androscoggin River Basin.

For the remaining resource areas, we focused our analysis to the specific project areas of the Gulf Island-Deer Rips Project and the Marcal Project. These resource areas are not specifically cumulatively affected by operating Gulf Island-Deer Rips and/or Marcal.

1.3.1.2. Temporal scope

The temporal scope of our CEA includes a discussion of the past, present, and future actions and their effects on water quality, resident and anadromous fisheries, wetlands and dependent wildlife, and hydroelectric generation. Based on the new and original license terms, the temporal scope will look 30-50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion was, by necessity, limited to the amount of available information for each resource. We've adequately identified the present resource conditions based on the license applications and previous comments. These are documented in this FEIS.

1.4. Project interaction and cumulative affects

1.4.1. Water quality

When the Clean Water Act (CWA) was enacted in 1972, the Androscoggin River was the same as almost every other major New England river -- abused and heavily used for subsistence, transportation, power generation, and industrial purposes.

The suitability of the Androscoggin River as a source of hydropower led to the industrialization of the valley (Androscoggin Valley Council of Governments; AVCG, 1983). The first dam was constructed at Topsham in 1753. The textile industry was the first major user of the Androscoggin River. The river was used as a source of power and to dispose of manufacturing by-products, including dyes, wool and cotton fiber particles, and chemical wastes. By the mid-1800's, the pulp and paper industry had developed along the river,

which has had long-term impacts on the basin's economy and the quality of its waters.

As industry and the economy grew, increased demands were placed on the river to assimilate industrial and municipal wastes. Untreated wastes from three major pulp and paper mills and many municipal sources, coupled with the use of the river for log drives, created a severe dissolved oxygen (DO) deficit problem in the river (Mitnik, 1983). Because of this type of use, the Androscoggin River was once characterized as one of the ten most polluted rivers in the nation (Maine Department of Environmental Protection; MDEP, 1990).

Today, the Androscoggin River continues to act as receiving water for numerous industries, as well as municipal wastewater treatment plants from Berlin, New Hampshire to Brunswick, Maine (*see Section 3.2.1 for further discussion of these point source discharges*). MDEP (1990) cites dioxin from industrial sources and untreated wastewater from combined sewer overflows (CSO) as the most significant causes of water quality problems in Maine rivers, including the Androscoggin River.

In addition, there are a series of impoundments on the mainstem Androscoggin River created by dams used for both industrial and hydropower production, including both the Gulf Island and Deer Rips impoundments (see Figure 2-1). As Mitnik (1983) reports, most of the river's usable elevation in Maine has been developed extensively for hydropower generation; about 72 percent. These impoundments, including the Gulf Island impoundment, affect the Androscoggin River's water quality by acting as settling basins for oxygen-demanding pollutants, and by slowing the travel time of water in the river.

The Little Androscoggin River is the largest tributary of the Androscoggin River, with a total drainage area of 350 square miles (mi^2) (Miller, 1990). Like the Androscoggin River, the water quality in the Little Androscoggin River has historically been poor. As evidence indicates, the Little Androscoggin River was used as a log-and-lumber waterway as early as the eighteenth century (FERC, 1989). Since that time, the Little Androscoggin River has experienced considerable development, receiving inadequately treated wastewater discharges from manufacturing industries (mainly paper mills) and several municipal sources.

Today, the Little Androscoggin River continues to act as receiving water for one industrial discharge and one municipal treatment facility in the vicinity of Mechanic Falls, Maine (*see Section 3.2.1 for further discussion of these point source discharges*). In addition, there are a series of impoundments on the Little Androscoggin River created by dams used for both industrial and hydropower generation, including the Marcal impoundment (*see Figure 2-1*). As evidenced by two water quality modeling studies (Consolidated Hydro, 1994a; Miller, 1990), these impoundments, including the Marcal impoundment, affect the Little Androscoggin River's water quality through regulated flow regimes.

Point source discharges do not tell the complete story of the Androscoggin River Basin's water quality problems. The basin is mostly forested in its upper reaches. However, agriculture, in addition to urban development, is an important land use in the lower portion

of the basin (Mitnik, 1983). Consequently, agricultural run-off has been, and continues to be, a significant contributor to non-point source pollution in the lower Androscoggin and Little Androscoggin Rivers.

Water quality in the Androscoggin and Little Androscoggin Rivers has improved considerably over the past 20 years due to (a) amendments made to the CWA in 1972 and (b) efforts of federal, state, and local resource agencies, NGOs, Central Maine, and several paper companies (e.g. Boise Cascade, James River, and International Paper). Central Maine and the paper companies have recently implemented an oxygenation injection program for the Gulf Island impoundment, and the Maine Department of Environmental Protection (MDEP) has recently selected the Androscoggin River for implementation of its new pollution prevention program *(Total Quality Environmental Management)*. However, high biological and sediment oxygen demand (BOD and SOD), and inadequate stream flows continue to adversely effect water quality in the lower Androscoggin and Little Androscoggin Rivers.

1.4.2. Resident and anadromous fisheries

Historically, Maine's abundance and accessibility of freshwater resources supported thriving populations of diadromous (anadromous and catadromous)[7] fish which flourished in pristine lakes, rivers, streams, and marine waters of the northeastern United States (Maine Department of Marine Resources; MDMR, 1982). Prior to the early 1800's, the Androscoggin River was noted for its large runs of Atlantic salmon, American shad, and alewives (Maine Department of Inland Fisheries and Wildlife; MDIFW, 1986). These species were a primary source of sustenance for Maine's Indian tribes, and contributed significantly to Maine's commercial fisheries in the 1800's and early 1900's.

In addition to Atlantic salmon, American shad, and alewife, the Androscoggin River supported large stocks of blueback herring, rainbow smelt, striped bass, Atlantic sturgeon, sea lamprey, sea-run brook trout, and catadromous American eel. The Androscoggin River also supported a population of shortnose sturgeon (*Acipenser brevirostrum*).

During the 19th century, the State of Maine experienced considerable settlement and growth (Atlantic Sea-Run Salmon Commission; ASRSC, 1982). Throughout this period, the Androscoggin River, throughout much of its length, was heavily developed for industrial and municipal purposes. Commercial fishing and water pollution were major factors leading to the demise of many of the anadromous fish runs. However, ASRSC (1982) and MDMR (1982) cite construction of dams with inadequate (or non-existent) fish passage facilities as the primary cause leading to the collapse of the river's anadromous fish runs. Additionally, altered streamflows in the lower Androscoggin River since the early 20th century have limited the amount of suitable habitat available for resident and anadromous fish.

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[7] Anadromous refers to species which grow and mature at sea and return to freshwater to spawn; Catadromous refers to species which grow and mature in freshwater and return to the sea to spawn; and diadromous is a collective term which refers to both anadromous and catadromous fish species.

At one time, Atlantic salmon ascended the Androscoggin River to Rumford, while American shad and alewife ascended the river as far as Lewiston. All three fish species utilized spawning and nursery habitat in the Little Androscoggin River. At present, fish passage facilities in the basin do not fully meet the collective management goals and objectives of the Androscoggin River anadromous fish restoration program. Currently, only the first three hydroelectric projects (Brunswick, Pejebscot, and Worumbo) have operating upstream fish passage facilities. None of the generating stations on the Little Androscoggin River have operating upstream fish passage facilities.

The lower Androscoggin and Little Androscoggin Rivers currently support remnant populations of historical anadromous species, as well as a healthy population of shortnose sturgeon and several resident species, including brown trout, largemouth and smallmouth bass, and chain pickerel. Today, however, overall abundance of anadromous fish stocks in the lower Androscoggin River is estimated at less than 10 percent of historic levels (MDMR, 1982).

In an effort to restore anadromous fish to the Androscoggin River Basin, FWS, MDMR, the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the Maine Atlantic Sea-Run Salmon Commission (ASRSC), recently renamed the Maine Atlantic Salmon Authority, have targeted Atlantic salmon, American shad, and alewife for restoration to the Androscoggin River Basin.

Atlantic salmon is an important sport fish in the northeastern United States. Since the loss of the Androscoggin River's (and most other northeastern rivers) Atlantic salmon fishery in the early 19th century, restoration of Atlantic salmon stocks to the Androscoggin River has received little attention. From 1871 to 1884, periodic attempts were made to restore Atlantic salmon to the Androscoggin River, but were abandoned (MDIFW, 1986). Overfishing remained a problem, and water quality continued to decline through the early 20th century, making salmon restoration impractical (U.S. Fish and Wildlife Service; FWS, 1989). While habitat assessments indicate that suitable habitat for Atlantic salmon exists in the Androscoggin River Basin, the river basin is considered low priority for restoration (ASRSC, 1984, 1995).

American shad and alewife were also historically important in the lower Androscoggin River. Commercial fisheries for both species existed below Lewiston in Lisbon Falls, Topsham, and Brunswick, but were adversely affected by dam construction and degraded water quality. Currently, alewife are harvested locally in the Lisbon Falls-Topsham-Brunswick area for use primarily as lobster bait and American shad are only taken as incidental to the alewife fishery (MDMR, 1982).

Due to the efforts of federal and state resource agencies, NGOs, and Central Maine to restore anadromous fish to the Androscoggin River, the potential for successful anadromous fisheries in the basin has improved considerably. Recent progress in water pollution abatement has greatly improved water quality in the lower Androscoggin and Little

Androscoggin Rivers. Current programs are designed primarily to increase the availability of historic anadromous fish spawning habitat. In addition, the gradual improvement in water quality has resulted in initiation of active programs for freshwater sport fisheries throughout the Lower Androscoggin River Basin. However, altered streamflows in the lower Androscoggin River and inadequate fish passage above Lewiston and on the Little Androscoggin River continue to have adverse cumulative effects on resident and anadromous fish resources in the Lower Androscoggin River Basin.

1.4.3. Wetlands

The Wetlands Resources Act (Wetlands Act), P.L. 99-645, states that wetlands are an integral part of maintaining the quality of life through material contributions to our national economy, food supply, water supply and quality, flood control, and fish, wildlife, and plant resources; and thus to the health, safety, recreation, and economic well-being of all our citizens of the Nation (U.S. Congress, 1986).

The wetlands along the lower Androscoggin River exhibit, at least in part, all of the functions and values that Congress described in the Wetlands Act. Historically, these wetlands have been affected, both adversely and beneficially, by a variety of influences, both natural and man-induced, including hydroelectric development. Current laws and regulations are designed to preserve and enhance remaining wetlands, and in some cases restore some wetlands that have been lost.

1.4.4. Hydroelectric generation

Maine has a long history of hydroelectric generation due to its abundant river systems and their suitability for hydroelectric development. Presently, Maine has 122 hydroelectric projects including utility, industrial, and small hydro generating stations. Collectively, these facilities provide 731 megawatts (MW) of capacity and comprise 31 percent of Maine's electricity supply (Maine State Planning Office; MSPO, 1992).

In the Androscoggin River Basin, there are 45 hydropower developments generating a total of about 261.0 MW (FERC, 1994) (Table 1-2). Within the Lower Androscoggin River Basin there are 17 licensed hydroelectric developments and two unlicensed developments that represent about 125.0 MW of capacity, including 13 developments on the mainstem of the lower Androscoggin River (121.8 MW of capacity) and six developments on the Little Androscoggin River (4.61 MW of capacity).

The Androscoggin River contains several storage projects, including five headwater storage reservoirs (Table 1-2). Two of these reservoirs, Errol and Aziscohos, were licensed by FERC in 1986 and 1988, respectively. As discussed in Section 1.3, the Middle and Upper Dam Projects were found jurisdictional by the Commission in August 1994. Union Water Power Company (UWPC) operates these headwater storage reservoirs such that a

Table 1-2. Existing hydropower projects in the Androscoggin River Basin listed in order from downstream to upstream. Source: Staff.

Name	FERC Project No.	River	Capacity (MW)
Brunswick	2284	Androscoggin	19.000
Pejebscot	4784	Androscoggin	13.800
East Worumbo	None	Androscoggin	0.900
West Worumbo	3428	Androscoggin	19.100
Lower Barker's Mill	2808	L. Androscoggin	1.500
Upper Barker's Mill	3562	L. Androscoggin	1.000
Hackett Mills	6398	L. Androscoggin	0.470
Marcal	11482	L. Androscoggin	1.310
Norway	UL90-15-ME	Pennesseewassee	0.320
Biscoe Falls	8411	L. Androscoggin	0.050
Lower Androscoggin	2302	Gulley Brook	0.270
Upper Androscoggin	11006	Lewiston Canal	0.995
Continental Mills	2302	Lewiston Canal	1.584
Bates 2	2302	Lewiston Canal	0.450
Hill Mill	2302	Lewiston Canal	2.160
Bates Weave Shed	2302	Lewiston Canal	3.900
Lewiston	None	Lewiston Canal	0.750
Lewiston Falls	2302	Androscoggin	28.440
Deer Ripe	2283	Androscoggin	6.625
Androscoggin No. 3	2283	Androscoggin	3.600
Gulf Island	2283	Androscoggin	20.900
Livermore Mill	2375	Androscoggin	8.615
Otis Falls	8277	Androscoggin	10.350
Jay	2375	Androscoggin	3.125
Riley Mill	2375	Androscoggin	7.800
Upper Spears	9079	Spears Stream	0.050
Thurston Mill	8321	Swift	0.388
Lower Rumford Falls	2333	Androscoggin	12.800
Upper Rumford Falls	2333	Androscoggin	26.550
Abbots Mills	8505	Concord	0.040
Gardner Brook	9421	Gardner Brook	0.060
Stony Brook	8450	Stony Brook	0.035
Wight Brook	7591	Wight Brook	0.025
Whites Brook	9384	Whites Brook	0.060
Shelburne	2300	Androscoggin	3.720
Gorham	2288	Androscoggin	2.150
Gorham	2311	Androscoggin	4.800
Cascade	2327	Androscoggin	7.920
Cross	2326	Androscoggin	3.220
J. Brodie Smith	2287	Androscoggin	15.000
Riverside	2423	Androscoggin	7.400
Sawmill	2422	Androscoggin	3.174
Pontook	2861	Androscoggin	9.900
Errol*	3133	Androscoggin	2.031
Aziscohos*	4026	Magalloway	5.200
Middle Dam*	None	Rapid	None
Upper Dam*	None	Rapid	None
Rangeley Dam*	None	Rangeley Stream	None
Kennebago Falls	4413	Kennebago	0.800
Mahancy	4413	Kennebago	0.100

Headwater storage reservoirs for the Androscoggin River Basin.

consistent flow is provided to the Androscoggin River during the summer months (*see Section 2.1.1.2.*).

On the mainstem of the Androscoggin River, there are 15 hydroelectric generating projects upstream of Gulf Island-Deer Rips and five generating projects downstream from Gulf Island-Deer Rips. Because the 15 upstream projects are all operated as run-of-river facilities, flow throughout much of the upper portions of the Androscoggin is relatively uniform. While the upper portions of the river contain relatively uniform flows, the lower portions of the river are regulated through the operation of Gulf Island-Deer Rips. Flows from Gulf Island-Deer Rips are released on a variable daily discharge schedule (according to a weekly drawdown schedule) depending on system energy demand and total available river flow *(see Section 2.1.1.2. for further discussion of current project operations).*

Gulf Island-Deer Rips affects the operation of the downstream hydroelectric generating stations through the re-regulation of river flow. The generating stations downstream of Gulf Island-Deer Rips (*see Figure 2-1*) operate as run-of-river facilities, utilizing the peaking flows released from Gulf Island-Deer Rips, albeit not necessarily during peak load periods. The operational specifications for the projects downstream of Gulf Island-Deer Rips are listed in Section 2.1.1.2. Each generating station normally passes close to the same volume of water on a 24-hour basis.

The Little Androscoggin River contains several small, non-jurisdictional, storage reservoirs upstream of Marcal. These storage dams are mostly inactive, and are located both on the mainstem of the river and at the outlets of many of its tributaries. There are two hydroelectric generating facilities upstream of Marcal. The Biscoe Falls Project (FERC Project No. 9411), located on the Little Androscoggin River, was exempted from licensing by the Commission.[8] The Biscoe Falls Project is operated as a run-of-river facility, and has no significant influence on the operation of Marcal. The Norway Project, which is located on Pennesseewassee Stream, a tributary of the Little Androscoggin River, is an unlicensed facility that has no significant effect on the operation of Marcal.

The Little Androscoggin River is relatively unregulated upstream of Marcal, but the lower reaches of the river are regulated through Marcal's operation. Flows from Marcal are released on a variable daily discharge schedule depending on system energy demand and total available river flow *(see Section 2.1.2.2. for further discussion of current project operations).*

Marcal affects the generating capability of the downstream facilities through the re-regulation of river flow. The generating stations downstream of Marcal (*see Figure 2-1*) operate as run-of-river or modified run-of-river/storage-and-release facilities, and are operated on a schedule according to flows released from Marcal. These facilities generate with the flows released from Marcal, but not necessarily during peak load periods. The operational specifications for the projects downstream from Marcal are discussed in Section 2.1.2.2. Each generating station normally passes close to the same volume of water on a 24-hour basis.

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[8] 35 FERC ¶ 62,214 (1986).

2. PROPOSED ACTIONS AND ALTERNATIVES

The proposed actions are to issue a new license for the continued operation of the Gulf Island-Deer Rips Project, and to issue an original license for the continued operation of the unlicensed Marcal Project.

2.1. Description of the projects and current operations

2.1.1. Gulf Island-Deer Rips

2.1.1.1. Existing project facilities

The Gulf Island-Deer Rips Project, on the Androscoggin River, is an operating licensed facility in Androscoggin County, Maine, in the Cities of Lewiston and Auburn and the Towns of Greene, Turner, Leeds, and Livermore (Figure 2-1). The project consists of three discrete generating facilities, including: the Gulf Island powerhouse, the Deer Rips powerhouse, and the Androscoggin No. 3 powerhouse. The Androscoggin River drains an area of about 2,865 mi^2 at the Deer Rips-Androscoggin No. 3 dam.

The Gulf Island-Deer Rips Project's principal features consist of two dam structures, two impoundments, three powerhouses, and appurtenant facilities (Figure 2-2). The existing project has a total authorized installed[1] capacity of 31.12 MW and an average annual generation of about 189.72 GWh.

The existing project facilities are described in detail as follows:

Gulf Island Development:

(1) a concrete gravity and earthfill dam, totalling about 2,488 feet long, with a maximum height of 92 feet, consisting of (a) a 1,042-foot-long western earth embankment, with a crest elevation of 270.0 feet[2]; (b) a 370-foot-long spillway section, with a crest elevation of 255.0 feet (NGVD), topped with 7-foot-high flashboards; (c) a 340-foot-long gated section, with (i) two stoney gates, each measuring 16 feet high by 8.5 feet wide, (ii) seven Taintor gates, each measuring 15 feet high by 30 feet wide, (iii) a stanchion section, 13 feet high by 49.5 feet wide, and (iv) a 16-foot-wide sluice gate; (d) a 149-foot-long intake section, integral with the powerhouse, equipped with trashracks having 7/16-inch steel bars at 4-9/16 inches openings; (e) a 349-foot-bulkhead; and (f) 240-foot-long eastern earth embankment;

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[1] The total authorized installed capacity is derived from the limiting capacity of either the generator or the turbine nameplate capacities. See also 63 FERC ¶62,225 (1993) and 67 FERC ¶62,044 (1994).

[2] Feet are in National Geodetic Vertical Datum (NGVD).

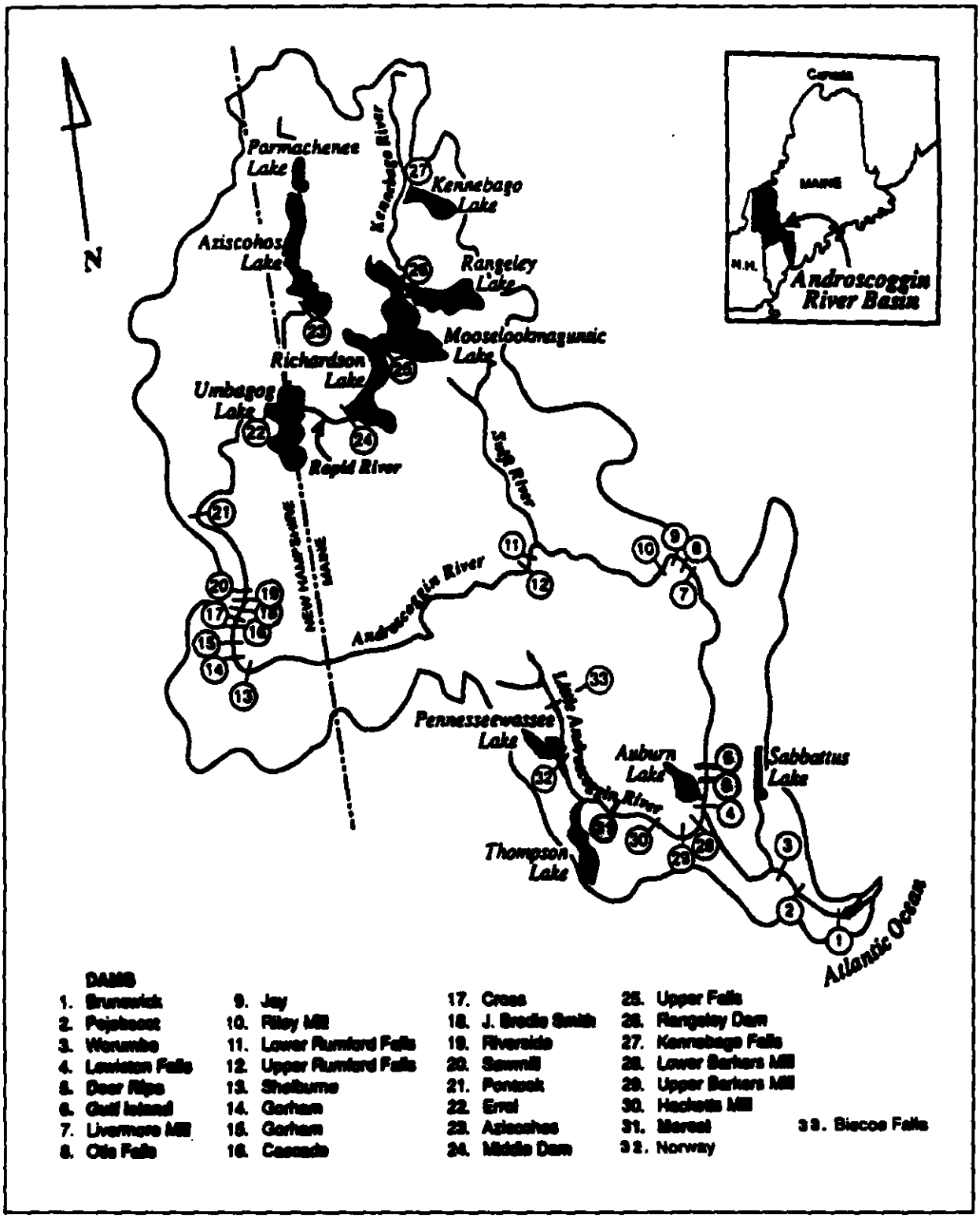

Figure 2-1. Location of Androscoggin River Basin and the Gulf Island-Deer Rips and Marcal Projects, Maine (Source: the staff; modified from Central Maine, 1991).

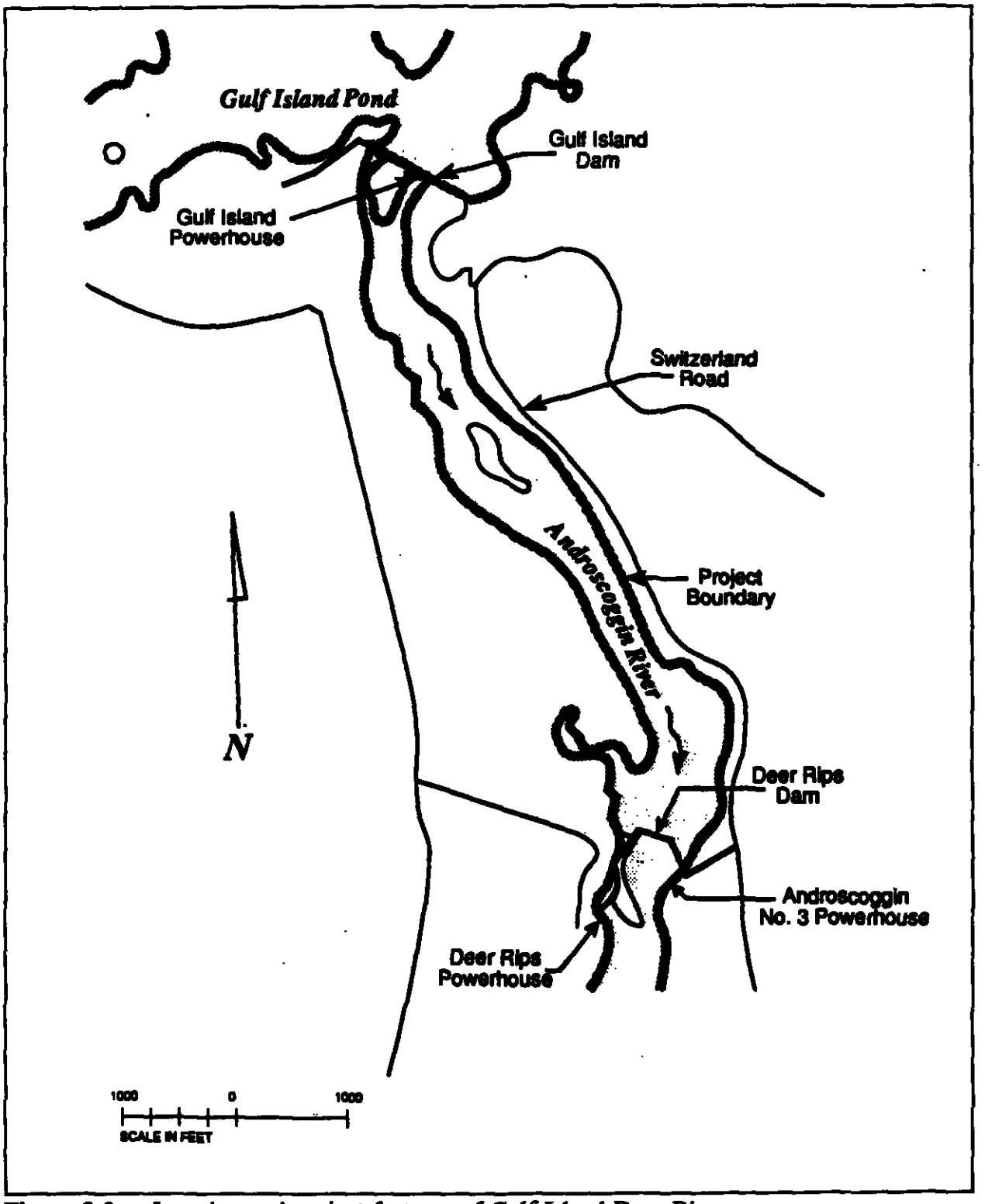

Figure 2-2. Location and project features of Gulf Island-Deer Rips Hydroelectric Project, FERC No. 2283, Maine (Source: Central Maine, 1991).

(2) a concrete, steel, and brick powerhouse, about 90 feet high by 32 feet wide by 146 feet long, equipped with three vertical Francis turbine-generator units with (a) an existing total authorized installed capacity of 20,900 kW, maximum hydraulic capacity of 6,450 cfs[3], and an average annual generation of 131,098 MWh; (b) a total proposed installed capacity of 25,200 kW, maximum hydraulic capacity of 6,610 cfs, and an average annual generation of 148,780 MWh; and (c) a rated head of 56 feet;

(3) an impoundment, about 14.7 miles long, with (a) a surface area of about 2,862 acres; (b) a gross storage capacity of 55,100 acre-feet (AF); (c) a useable storage capacity of 10,300 AF; and (d) a normal pool elevation of 262.0 feet (NGVD) and tailwater elevation of 206.0 feet (NGVD); and

(4) appurtenant facilities.

Deer Rips - Androscoggin No. 3 Development:

(1) a concrete gravity dam, totalling about 933 feet long, with a maximum height of 50 feet consisting of (a) a 94-foot-long headworks section of the Deer Rips powerhouse, located on the west bank, with eight wooden gates, each measuring 14 feet high by 7 feet wide, leading to a canal, measuring 650 feet long by 75 feet wide by an average depth of 22 feet; (b) a concrete wastegate section, about 55.5 feet long, with two gated deep discharge tubes, each about 7 feet in diameter; (c) a 738-foot-long spillway section, with a crest elevation of 201.7 feet (NGVD), topped with about 4-foot-high pin-supported flashboards; and (d) a forebay, located on the east bank, about 45 feet long by 38 feet wide, with 3- and 5-foot-high flashboards, leading to a 45-foot-long headworks section of the Androscoggin No. 3 powerhouse, equipped with two steel gates, each measuring 14 feet high by 17.5 feet wide;

(2) the Deer Rips concrete, steel, and brick powerhouse, about 70 feet high by 47 feet wide by 136 feet long, with a 32-foot-wide by 57-foot-long addition, equipped with five horizonal twin-runner Francis turbine-generator units and two vertical Francis turbine-generator units, with (a) a total authorized installed capacity of 6,625 kW[4]; (b) a total hydraulic capacity of 3,345 cfs; (c) an average annual generation of 31,628 MWh; (d) a rated head of 32 feet; (e) six trashracks having 3/8-inch steel bars at 2-1/4 inch openings, and a seventh trashrack with 1/4-inch steel bars with 2-1/2 inch spacings; and (f) an excavated tailrace about 250 feet long by 150 feet wide;

(3) the Androscoggin No. 3 concrete, steel, and brick powerhouse, about 70 feet high by 44 feet wide by 52 feet long, equipped with one vertical fixed-blade turbine-generator unit, with (a) an authorized installed capacity of 3,600 kW; (b) a total

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[3] Revised Exhibit A submitted on June 6, 1994.

[4] Revision to Exhibit A for New Authorized Installed Capacity submitted on June 10, 1995.

hydraulic capacity of 1,775 cfs; (c) an average annual generation of 26,997 MWh; (d) a rated head of 32 feet; (e) one trashrack having 3/8-inch steel bars at 3-1/2 inch openings; and (f) an excavated tailrace about 400 feet long by 60 feet wide;

(4) an impoundment, about 1.3 miles long, with (a) a surface area of about 130 acres; (b) a gross storage capacity of 1,200 AF; (c) a negligible useable storage capacity; and (d) a normal pool elevation of 205.7 feet (NGVD) and tailwater elevation of 173.7 feet (NGVD); and

(5) appurtenant facilities.

2.1.1.2. Existing project operation

Upstream storage reservoirs are used to regulate river flow in the Androscoggin River. During the summer months, river flow is released at a uniform rate from Errol Dam (FERC Project No. 3133; see Figure 2-1) about 115 miles upstream from Gulf Island-Deer Rips. In accordance with the 1909 original operating agreement and the current Androscoggin River Headwater Benefits Agreement approved by the Commission in its Order HB22-92-2-000[5], the target flow that UWPC attempts to maintain for the summer months is between 1,550 cfs and 2,500 cfs at Berlin, New Hampshire. A flow of 1,550 cfs[6] at Berlin equates to a flow of 1,950 cfs to 2,000 cfs at Gulf Island-Deer Rips.

The Gulf Island powerhouse is an intermittent peaking facility which causes fluctuation of the Gulf Island impoundment and fluctuation in the river flow below the project. The Deer Rips and the Androscoggin No. 3 powerhouses operate as run-of-river facilities in that they utilize inflows from the Gulf Island powerhouse. Consequently, Deer Rips and Androscoggin No. 3 generate on approximately the same schedule as Gulf Island.

The Gulf Island powerhouse has a maximum hydraulic capacity of 6,450 cfs. The lower two facilities have a combined hydraulic capacity of 5,120 cfs. When inflows are in this range, all three developments operate in the most efficient manner to provide base load power (i.e., the units are run 24 hours a day). When inflows are in excess of the total project generation flows, or storage capacity, these flows are spilled through the gates or over the spillways at the dams.

Riverflow is considered controlled when inflows to Gulf Island-Deer Rips are less than Gulf Island's maximum turbine hydraulic capacity of 6,450 cfs. When inflows to the

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[5] 59 FERC ¶ 62,372 (1992).

[6] MDEP stated that the 1,550-cfs flow is a target only, and is maintained only if there is sufficient water in storage. Although rare, the target of 1,550 cfs is not always met. For example, in 1995 low spring run-off and a hot, dry summer resulted in an average weekly flow of about 1,300 cfs at Gulf Island-Deer Rips in September.

Gulf Island impoundment are significantly below 6,450 cfs, the Gulf Island development operates in its normal peaking mode, where water is stored and released to maximize energy generation during daily peak electrical loads. Peaking operation consists of generating during the weekday morning and evening peak periods when the industrial and residential demand is highest. This requires that the Gulf Island impoundment elevation be drawn down during the peaking generation. Over the period of a week, the pond level is generally drawn down by two to four feet below the full reservoir elevation. The extent and duration of the drawdown is dependent upon inflow. Discharge from Gulf Island-Deer Rips is reduced to 1,000 cfs during the daily off-peak hours and on the weekends to allow the reservoir to refill.

In addition to the two- to four-foot drawdown during peaking operation, the Gulf Island impoundment is drawn down about five feet in anticipation of high spring inflows and other circumstances that are outside of normal project operation.

The current license for Gulf Island-Deer Rips does not include any minimum flow requirements. However, Central Maine's Lewiston Falls Project, the next downstream facility, has a FERC license requirement to pass 1,000 cfs as an interim minimum flow. Because of the hydraulic connection between Gulf Island-Deer Rips and Lewiston Falls, Central Maine voluntarily releases the 1,000 cfs minimum flow for Lewiston Falls from the Gulf Island development.

There are two other Central Maine hydroelectric projects located downstream of Gulf Island-Deer Rips. Lewiston Falls is located immediately below Gulf Island-Deer Rips and Brunswick is the first project on the Androscoggin River. In addition to these two facilities there are three other hydroelectric developments downstream of Gulf Island-Deer Rips, including the Upper Androscoggin Project[7] (FERC Project No. 11006; owned and operated by the City of Lewiston), Worumbo (owned and operated by Miller Hydro Group), and Pejebscot (owned and operated by Topsham Hydro Partners). All five of these developments typically operate as run-of-river facilities. An operational schematic of the mainstem Androscoggin River projects is shown in Figure 2-3.

2.1.2. Marcal

2.1.2.1. Existing project facilities

The Marcal Project, located on the Little Androscoggin River, is an existing unlicensed project, in the Town of Mechanic Falls, Androscoggin County, Maine (Figure 2-1). The Little Androscoggin River drains an area of about 250 mi^2 at the Marcal dam.

The Marcal Project's principal features consist of two spillway sections, an intake area, a penstock, a powerhouse, an impoundment, a primary transmission line, and

[7] Included as part of the Lewiston Falls Project.

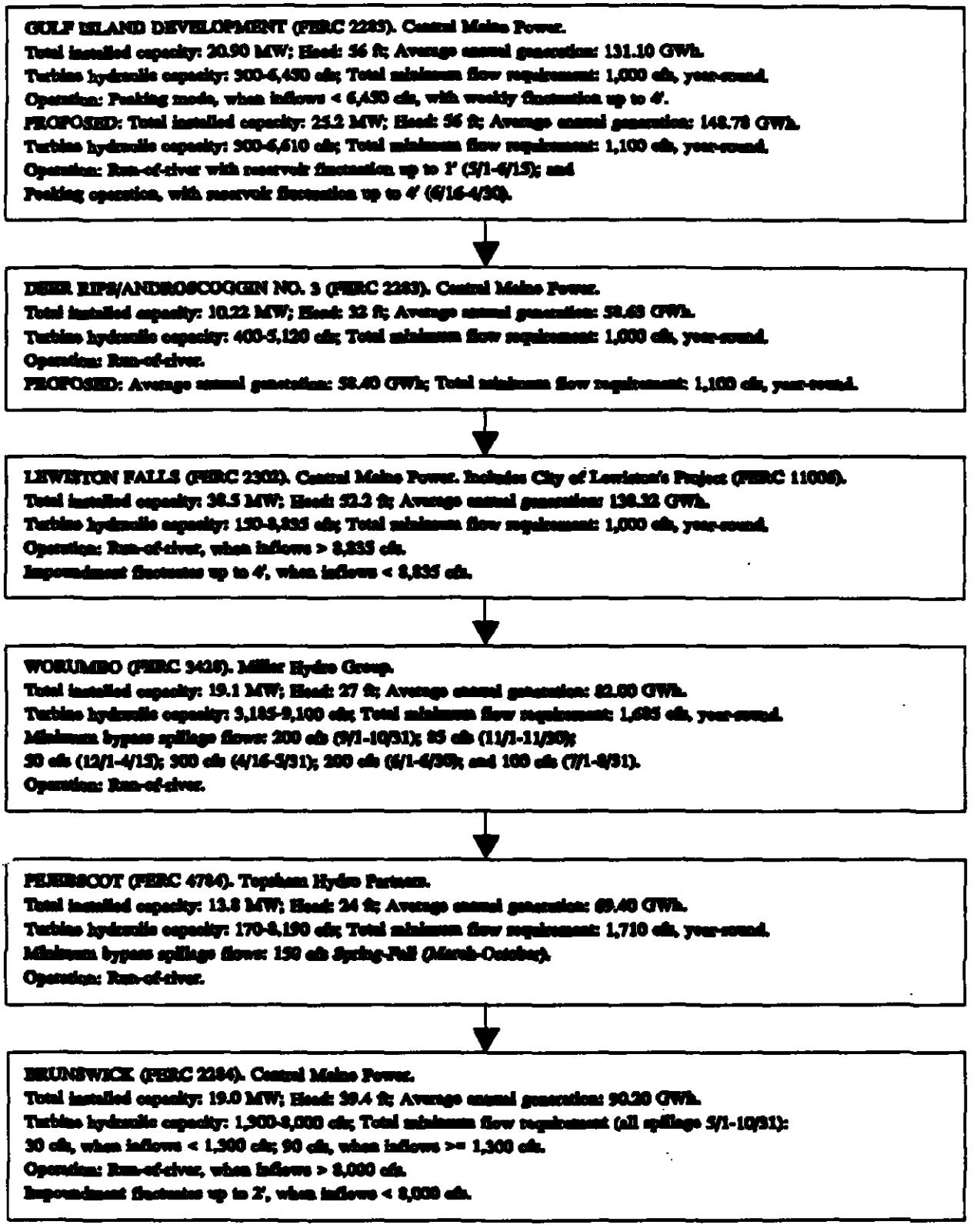

Figure 2-3. Operational schematic of the mainstem Androscoggin River projects.

appurtenant facilities (Figure 2-4). The project has a total installed capacity of 1.31 MW, and an average annual generation of about 4.52 GWh.

In detail, from right to left, looking upstream, the existing unlicensed project consists of:

(1) a dam, consisting of (a) a westerly abutment, adjoining the Elm Street Bridge; (b) a concrete spillway section, about 29.5 feet long by 15.4 feet high, with a crest elevation of 273.3 feet (NGVD); (c) a granite blocked pier, about 6 feet long; (d) a granite blocked spillway section, about 96 feet long by an average height of 12 feet, with a crest elevation of 271.3 feet (NGVD), topped with 2-foot-high pin-supported wooden flashboards; and (e) an easterly abutment adjoining the foundation of an abandoned mill building, with two 4-foot-wide by 5-foot-high deep sluice gates (one gate is inoperable);

(2) an intake area leading to the penstock, which consists of (a) a forebay canal, about 38 feet wide by 120 feet long, equipped with 45-foot-long by 11-foot-deep steel trashracks with 3/8-inch steel bars at 2-inch spacings; (b) a triangular headgate flume, with a 12-foot by 12-foot wooden headgate;

(3) a 470-foot-long by 11-foot diameter buried steel penstock;

(4) a powerhouse, equipped with two horizontal generating units, consisting of a 960-kW General Electric generator driven by an S. Morgan Smith double-runner turbine, with two 36-inch-diameter runners, each rated at 707 and 625 horsepower (hp) and a 350-kW Westinghouse synchronous generator driven by an S. Morgan Smith double-runner turbine, with two 27-inch diameter runners, each rated at 308 hp, and having (a) a hydraulic capacity of 120 cfs to 560 cfs; (b) an average head of 37.7 feet; and (c) a power factor of 1.0 kW/kVA;

(5) a tailrace channel about 290 feet long by 40 feet wide, with a normal tailwater elevation of 235.6 feet (NGVD);

(6) an impoundment, with (a) a normal headpond elevation of 273.3 feet (NGVD); (b) a surface area of about 27 acres; and (c) a gross storage capacity of about 103 acre-feet;

(7) a 34.5-kV transmission line, consisting of 122 feet of underground line and 260 feet of overhead line; and

(8) appurtenant facilities.

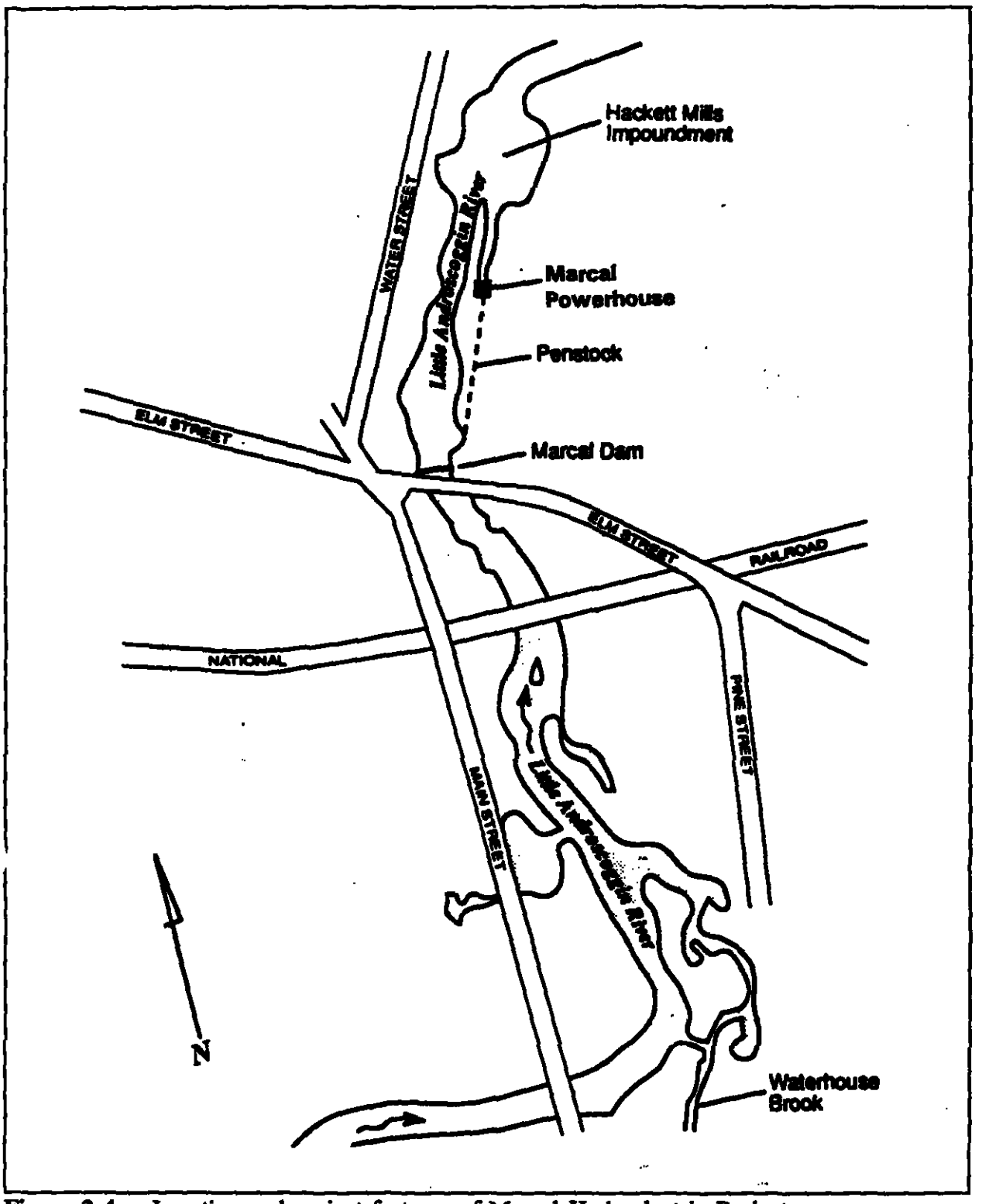

Figure 2-4. Location and project features of Marcal Hydroelectric Project, FERC No. 11482, Maine (Source: Consolidated Hydro, 1994a).

2.1.2.2. Existing project operation

Under existing conditions, Marcal has no minimum flow requirements, no restrictions on impoundment operations, and thereby operates to make the most efficient use of the available water. Marcal operates in a seasonal run-of-river/storage-and-release mode; at inflows greater than the minimum hydraulic capacity of 120 cfs, Marcal operates in a run-of-river mode. At inflows less than 120 cfs, the project typically operates in a daily cycling mode, using up to two feet of storage in the impoundment. At flows higher than the minimum capacity of 120 cfs, the project operates up to its maximum hydraulic capacity of 560 cfs. Flows in excess of the maximum capacity of 560 cfs are spilled over the spillway.

There are two other Consolidated Hydro hydroelectric projects located downstream of Marcal. Lower Barkers Mill is the first project on the Little Androscoggin River and Upper Barkers Mill is the second project on the Little Androscoggin. The Lower Barkers Mill and Upper Barkers Mill Projects normally operate as run-of-river/modified storage-and-release facilities. In addition to these two facilities, Synergics, Inc. (through its wholly owned subsidiary, Hackett Mills Hydro Associates) owns and operates the Hackett Mills Project, located immediately below Marcal. Hackett Mills is operated as a run-of-river facility. An operational schematic of the Little Androscoggin River Projects is shown in Figure 2-5.

2.2. Projects as proposed

2.2.1. Gulf Island-Deer Rips

2.2.1.1. Proposed project facilities

As part of their relicensing proposal, Central Maine proposes to increase the project's generating capacity by replacing two of the three turbine runners and rewinding a generator at the Gulf Island development. With the generation increase, the Gulf Island powerhouse would have an proposed installed capacity of 25.20 MW, a maximum hydraulic capacity of 6,610 cfs, and an average annual generation of 148.78 GWh. Additionally, due to the proposed modification and more efficient operation at the Gulf Island development, the average annual generation at the Deer Rips and Androscoggin No. 3 developments would increase to 58.39 GWh. Collectively, with the unit upgrade, alone, the Gulf Island-Deer Rips Project would have a total proposed installed capacity of 35.42 MW, and an average annual generation of about 207.17 GWh.

2.2.1.2. Proposed project operation

For the new licensing term, Central Maine proposes a few modifications to the existing project operation, which are described as follows:

- provide a continuous minimum flow of 1,100 cfs or inflow, whichever is less;

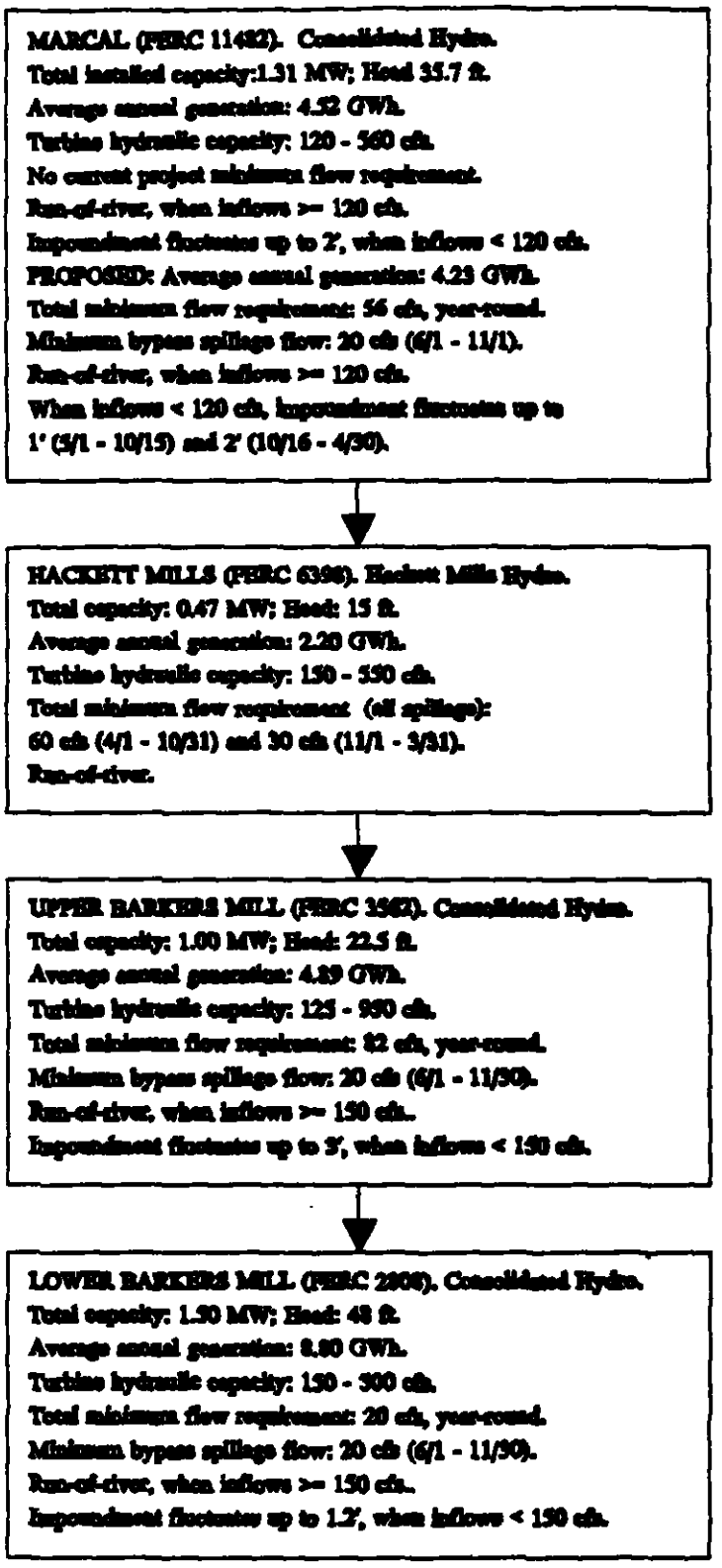

Figure 2-5. Operational schematic of the Little Androscoggin River Projects.

- limit water level fluctuations in the Gulf Island impoundment to no greater than one foot from May 1 through June 15[8], and four feet the remainder of the year; and

- restrict downramping at Deer Rips [flows would be reduced from 5,120 cfs (full generation flow) to 1,100 cfs, no faster than linearly over 20 minutes].

Under Central Maine's proposed unit upgrade and operational modifications, the project would have a total proposed installed capacity of 35.42 MW, and an average annual generation of about 207.18 GWh.

2.2.1.3. Proposed environmental measures

In addition to the operational changes proposed by Central Maine, which would have certain environmental benefits, Central Maine also proposes the following environmental enhancements to the Gulf Island-Deer Rips Project:

- continue to participate in the partnership with upstream paper companies to maintain the existing oxygen injection program for the Gulf Island impoundment, which is known as the Gulf Island Pond Oxygenation Project (GIPOP);

- investigate the feasibility of developing carry-in boat launch facilities on the Androscoggin River below Deer Rips;

- continue to maintain the boat launch on Gulf Island impoundment at the Turner-Greene bridge;

- continue to maintain three island day-use/picnic areas, and two other informal day-use areas (Googins Island, Greene) located on the Gulf Island impoundment;

- expand the roadside parking area and provide additional public access at the Deer Rips impoundment informal carry-in access site on Switzerland Road;

- construct canoe portage trails around both the Gulf Island and Deer Rips dams;

- provide public access to the Deer Rips facility;

- cooperate with the Androscoggin Land Trust to provide formal recreational access to the river at the Waterman Road site;

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[8] Central Maine, based on a review of NEPOOL requirements for the project, clarified its impoundment fluctuation proposal. Central Maine requested that its one foot fluctuation restriction from May 1 through June 15 be viewed as a target fluctuation, with an allowance of up to two feet to meet any unusual NEPOOL power requirements.

- develop a conservation and trail plan for those lands already within the project boundary and any additional Central Maine lands not within the project boundary but within 200 feet of the high-water elevation of the project's two impoundments;

- submit to the appropriate resource agencies a copy of the FERC Form 80 recreational assessment every six years and consult with those agencies regarding the adequacy of the existing recreational facilities to meet user demand;

- develop a schedule and computerized tracking system for implementing its proposed recreational improvements;

- mitigate for project-related impacts on eight archaeological sites in accordance with the "Programmatic Agreement Among the Federal Energy Regulatory Commission, the Advisory Council of Historic Preservation, and the Maine State Historic Preservation Officer for the Management of Historic Structures and Eligible Archaeological Sites for Ten Hydroelectric or Storage Projects in Maine," executed on October 27, 1993; and

- avoid or mitigate adverse effects on the National Register of Historic Place-eligible Gulf Island facility that could inadvertently occur during non-routine maintenance activities.

2.2.2. Marcal

2.2.2.1. Proposed project facilities

Consolidated Hydro has not proposed any modification to the existing project facilities. However, to resolve several environmental enhancement and mitigation issues, Consolidated Hydro proposes to modify the existing project operation.

2.2.2.2. Proposed project operation

For the licensing term, Consolidated Hydro proposes the following modifications to the existing project operation:

- limit water level fluctuations in the Marcal impoundment to no greater than one foot from May 1 through October 15, and two feet from October 16 through April 30;

- provide a year-round project minimum flow of 56 cfs, or inflow, whichever is less; and

- provide a seasonal bypass minimum flow of 20 cfs, or inflow, whichever is less, from June 1 through November 1.

Under Consolidated Hydro's proposed operation modifications, the project would have a total proposed installed capacity of 1.31 MW and an average annual generation of about 4.23 GWh.

2.2.2.3. Proposed environmental measures

In addition to the operational changes proposed by Consolidated Hydro, which would have certain environmental benefits, Consolidated Hydro also proposes several environmental enhancements for the Marcal Project:

- provide downstream fish passage facilities, consisting of the existing trashracks, an entrance weir and plunge pool, a fish bypass pipe, and a naturally existing exit pool;
- develop a permanent carry-in boat access facility to the project's impoundment, including (a) a gravel access road; (b) a gravel parking area for ten cars, including two handicap parking spaces; (c) a carry-in boat launch; (d) a handicapped-accessible riverbank fishing access; (e) fencing, security lights, and signage; and (f) a dry hydrant for use by the Mechanic Falls Fire Department; and
- develop a canoe portage route.

2.3. Modification to proposed project operation or facilities

Commission regulations require applicants to consult with the appropriate resource agencies before filing a hydropower license or relicense application. This consultation is required in order to comply with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, the Coastal Zone Management Act, and other federal statutes. Pre-filing consultation must be completed and documented in accordance with the Commission's regulations.

After acceptance of the application, the Commission issues public notices and seeks formal comments in accordance with these statutes.

2.3.1. Gulf Island-Deer Rips

2.3.1.1. Mandatory conditions

a. Section 18 Fishway Prescription. The U.S. Department of the Interior (Interior) did not prescribe fishways for the Gulf Island-Deer Rips Project pursuant to Section 18 of the FPA[9] (Willie K. Taylor, Acting Director, Office of Environmental Policy and Compliance,

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[9] Section 18 of the Federal Power Act provides: "The Commission shall require construction, maintenance, and operation by a licensee at its own expense of ... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior as appropriate."

U.S. Department of the Interior, Washington, D.C., December 15, 1993). However, Interior did request reservation of authority to prescribe the construction, operation, and maintenance of fishways in the future pursuant to Section 18 of the FPA.

b. Water Quality Certification. On November 27, 1991, Central Maine requested that MDEP issue a Section 401 Water Quality Certification (WQC), as required by the CWA. Central Maine subsequently withdrew and refiled its request for water quality certification on November 24, 1992, November 24, 1993, November 16, 1994, and November 16, 1995. Presently, MDEP has taken no action on Central Maine's request for water quality certification for Gulf Island-Deer Rips, and is currently pending before the MDEP. The conditions in the WQC will be addressed in any order taking final action on the new license application for the project.

c. Coastal Zone Management Program. The Maine State Planning Office (MSPO) Coastal Program is responsible for reviewing Gulf Island-Deer Rips for consistency with the state's Coastal Management Program. Gulf Island-Deer Rips is located outside of Maine's coastal zone boundary. Further, MSPO's Coastal Program has not defined a geographic area for federally licensed activities which are located outside of the coastal zone but likely to affect the coastal zone (MSPO, 1994). Following the notice of the license application, MSPO provided no specific comments regarding the project's potential effects on the state's coastal resources. Therefore, we conclude that the MSPO has waived its right to review the project's consistency with the Maine Coastal Management Program, under Section 930.54 of the Coastal Zone Management Act of 1972, as amended. In Section 4.0 we address how Gulf Island-Deer Rips affects coastal resources.

2.3.1.2. Agency and interested party recommendations

Interventions

On November 17, 1992, a public notice was issued that provided an opportunity for filing protests or motions to intervene. All entities that filed motions to intervene have become parties to this proceeding.

Interior filed with the Commission, on January 12, 1993, a motion to intervene not in opposition. In its motion, Interior states that they have statutory responsibility and represents national public interests that would be directly affected by the outcome of the proceedings. Interior also states that they have broad obligations under the laws of the United States to protect (from loss or depletion), to develop, to restore, and to enhance those recreational opportunities and resources and fish and wildlife and their habitats that are subject to the effects of water developments.

On January 13, 1993, MSPO filed with the Commission a motion to intervene not in opposition. In its motion, MSPO states that the participation of MSPO in this proceeding is necessary to represent the interests of the state's natural resource agencies and the interest of

the citizens of Maine. In accordance with the FPA, MSPO also stated that the Commission can issue a new license for Gulf Island-Deer Rips on the condition that the Commission finds the project to be best adapted to Maine's Comprehensive Hydropower Plan.

On January 15, 1993, EPA filed with the Commission a motion to intervene not in opposition. In its motion, EPA is concerned that the project not directly or indirectly cause or contribute to degradation of waters of the United States, or to any violations of water quality standards in any project impoundments, downstream of the project, or in any river reaches bypassed as a result of the project. Specifically, EPA is concerned that the project may contribute to violations of Maine's water quality standards for dioxin and DO concentrations.

On January 15, 1993, the Conservation Coalition filed with the Commission a motion to intervene not in opposition, requesting that the Commission (1) consolidate review of Gulf Island-Deer Rips and other pending Androscoggin River projects, (2) prepare an EIS, (3) prepare a comprehensive river plan, and (4) conduct an evidentiary hearing to resolve disputed issues. The Conservation Coalition also raised concerns regarding instream flows for fish habitat, fish passage, recreation facilities and access, canoe portage routes, shoreland zone protection, a mitigation and enhancement fund, and impacts on water quality, fish, and wildlife.

On January 15, 1993, TU *et al.* filed with the Commission a motion to intervene in opposition to the project. In its motion, TU *et al.* requests that an EIS be prepared, that the Commission conduct an evidentiary hearing to resolve disputed issues, and that the Commission consolidate all proceedings involving project licensing in the Androscoggin River Basin for review with this proceeding. Except for the evidentiary hearing, we discuss these requests in Section 1.3.[10] TU *et al.* also raised concerns regarding minimum flows and water quality, flow fluctuations and ramping, fish passage, and cumulative impacts of the Androscoggin River projects.

In response to the Commission's April 11, 1994, Notice of Intent to Prepare an Environmental Impact Statement and include downstream hydroelectric projects in the EIS's scope, Topsham Hydro Partners (Topsham-Hydro) filed with the Commission, on April 22, 1994, a motion for leave to intervene out of time and not in opposition. In its motion, Topsham-Hydro is concerned that the Pejebscot Project, located downstream of Gulf Island-Deer Rips may be affected by the action taken by the Commission in this proceeding. Topsham-Hydro's motion to intervene out of time was granted.

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[10] We believe an evidentiary hearing was not warranted in this case. Neither the FPA nor the Administrative Procedure Act (5 U.S.C. § et seq.) requires a trial-type hearing, with witnesses under oath, cross-examination and compulsory process, instead of a notice-and-comment type hearing. The Conservation Coalition and TU *et al.* have not demonstrated that any issues of material fact were inadequately considered or addressed in the record of the notice-and-comment hearing associated with this relicensing proceeding. [*see 75 FERC ¶ 61,111; order issued April 29, 1996, relicensing the Ayers Island Project, P-2456*]

Commentors

Pursuant to the public notice issued October 28, 1993, various state and federal agencies and non-governmental organizations (NGOs) provided comments and recommendations for inclusion in any new license issued for Gulf Island-Deer Rips. Following issuance of the DEIS, commenting parties are afforded the opportunity to revise their formal recommendations. A list of DEIS comment letters and staff's responses are included in Appendix E.

The agencies, NGOs, other interested parties, and dates of their comments for Gulf Island-Deer Rips are listed below. All comments received from concerned entities become part of the record and are considered during the staff's analysis of the proposed action.

Commentor	Comment dates
U.S. Department of the Interior	12/15/93
Maine State Planning Office	12/16/93
Land Trust *et al.*	12/21/93
U.S. Environmental Protection Agency	12/22/93 4/28/95
Conservation Coalition	12/22/93
TU *et al.*	12/27/93

U.S. Department of the Interior

- Operate the project in the following manner:

May 1 - June 30	Run-of-river operation[11]
July 1 - April 30	1,700 cfs minimum flow, or inflow, whichever is less

- Limit drawdowns in the Gulf Island and Deer Rips impoundments to no more than one foot except as may be exceeded by natural flow events, and as may be required for emergencies and periodic maintenance.

[11] Interior defines run-of-river operation as outflows from the project equal inflows on an instantaneous basis, and water level fluctuations above the Gulf Island Dam are minimized (no more than one foot drawdown). At the Section 10(j) meeting, FWS clarified that this run-of-river recommendation permits only minor fluctuations to accommodate monitoring error and/or changes in natural flow conditions, and does not allow the one-foot fluctuation to be used for peaking purposes.

- Develop a plan for complying with the seasonal run-of-river and minimum flow requirements. The monitoring plan should describe the mechanisms and structures that will be used, the level of automatic or staffed facility operation, the methods for recording data on run-of-river operation and minimum flows, and a plan for maintaining these data.

- Monitor recreational use of the project area to determine whether existing access facilities are meeting demands for public use of fish and wildlife resources. Monitoring studies should begin within six years of any new license, and should consist, at a minimum, of annual recreational use data.

  Every six years during the license term, the Licensee should file a report including: (1) annual use figures; (2) a discussion of the adequacy of the existing facilities; (3) a description of the methodology used to collect the study data; (4) if additional facilities are needed, a recreation plan to accommodate needs in the project area; and (5) agency comments and a description of how the agency comments were accommodated in the report.

- Develop a plan for providing buffer strips and other appropriate shoreline protection measures in the project area.

- Develop a plan and schedule for monitoring DO and aquatic invertebrate populations in downstream areas affected by the operation of Gulf Island-Deer Rips.

Maine State Planning Office

- Stated that the decisions, terms, and conditions made by MDEP on the application for 401 WQC shall represent the sole position of the State of Maine regarding the Gulf Island-Deer Rips Project application.

Land Trust *et al.*

- The Commission should require Central Maine to implement measures to raise DO levels to 8.0 milligrams per liter (mg/l), and the Commission should retain the right to require Central Maine to increase DO levels in the Gulf Island impoundment by means other than oxygen injection should alternative methods be environmentally preferable.

- Fund a sediment sampling program to determine rate of sediment deposition and level of dioxin contamination.

- Provide a minimum flow of 1,430 cfs to the Androscoggin River downstream from Gulf Island-Deer Rips.

- Implement one or more pilot programs to create shoreland vegetation along the Gulf Island impoundment.

- Place conservation easements on all of Central Maine's land bordering the Gulf Island and Deer Rips impoundments that lies within the 250-foot shoreland zone.

- Provide funding for trails, and work with Land Trust *et al.*, to develop and implement a network of trails along the Androscoggin River.

- Provide three canoe portages and two car-top boat launch facilities.

- Continue to seek review by, and approval of, the Maine Historic Preservation Commission for non-routine maintenance to the Gulf Island station.

- Establish an enhancement fund (equivalent to two percent of the project's gross revenue) to support, create, and maintain programs within the watershed of the project.

U.S. Environmental Protection Agency

- Prepare an alternatives study plan (in consultation with EPA, Boise-Cascade, James River, and International Paper) by March 31, 1998, and conduct the alternatives study in conjunction with the alternatives analysis that the paper companies will be preparing[12] and report the results to FERC and EPA by March 31, 1999. Central Maine should also update its alternatives analysis in conjunction with the paper companies at each NPDES permit renewal stage unless EPA notifies the paper companies and Central Maine that further alternatives analyses are no longer necessary. Any new license should include a specific reopener clause to facilitate incorporation of alternative project operations in the license.

- Evaluate the effects of the operation of Gulf Island-Deer Rips on dioxin in the reach of the Androscoggin River affected by Gulf Island-Deer Rips and explore operating regimes that may reduce the effects.

- Investigate the relationship among project operations and excessive color, odor, foam, and turbidity in the Androscoggin River downstream of Gulf Island-Deer Rips.

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[12] National Pollution Discharge Elimination System (NPDES) permits are issued to the paper companies every five years. In accordance with EPA's regulations, the paper companies will be required to investigate alternatives to the existing oxygen injection system at the Gulf Island impoundment, and to submit the results of the alternatives analysis along with their permit renewal applications 180 days before the expiration of their NPDES permits.

- Limit drawdowns in the Gulf Island impoundment to no more that one foot throughout the year.[13]

- Any wetland enhancement considered by the applicant should be restricted to previously filled or degraded wetlands in the project area.

- A thorough evaluation of the cumulative impacts on wetlands, aquatic habitat and dependent wildlife, free-flowing river segments, and resident and anadromous fisheries prior to issuance of a new license for the project.

Conservation Coalition

- Require Central Maine to submit a comprehensive, up-to-date, water quality report, including parameters such as color, odor, turbidity, pH, as well as concentrations of phosphorus, bacteria, heavy metals, organic contaminants, and other toxins.

- Develop a plan that analyzes mercury in gamefish and selected waterfowl or birds of prey in the project impoundment and downstream reaches of the Androscoggin River. The plan should (1) describe the study species and analytical methods, (2) provide a sampling protocol, and (3) require the use of a laboratory that meets EPA and FWS criteria. The study should (1) determine the role that reservoir fluctuations and the oxygenation project (e.g. Gulf Island Pond Oxygenation Project; GIPOP) have on mercury mobility and bioaccumulation, (2) assess human health risks, and (3) assess the risk to selected waterfowl and birds of prey.

  The mercury study should be completed within five years of the new license, and any new license should include a reopener clause for modification of project operations if warranted.

- Central Maine, Boise Cascade, James River, and International Paper should develop a plan to determine the effect of bubbling from the oxygen injection system and impoundment drawdowns on circulation and resuspension of dioxin-laden sediments in the impoundment and downstream waters.

  The dioxin study should be completed within five years of the new license, and any new license should include a reopener clause for modification of project operations if warranted.

- Central Maine, Boise Cascade, James River, and International Paper should outline additional measures to raise DO levels if the GIPOP does not adequately address the DO deficit, and implement measures to raise DO levels to 8.0 mg/l.

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[13] In addition to the one-foot impoundment fluctuation restriction, EPA, while not making any specific recommendations, supports the flow recommendations of Interior and the FWS.

- Operate the project in a run-of-river mode for the months of May and June.

- Limit drawdowns in the Gulf Island impoundment to no more than one foot on a year-round basis.

- Provide a minimum flow of 1,400 cfs to 1,800 cfs, or inflow, from Gulf island-Deer Rips to the Androscoggin River downstream.

- Extend the project boundaries to incorporate additional land owned by Central Maine so that adequate buffer zones and greenways are provided around the project. Central Maine owned or controlled lands should be put under conservation easements. Central Maine should pursue conservation easements on a 500-foot-wide buffer on both sides of the river on properties Central Maine does not own.

- Develop a recreation plan which incorporates the interests of state agencies, municipal governments, and private groups in developing recreational access and amenities around the project impoundments.

- Establish an enhancement fund (equivalent to five percent of the net present value of the project) for the purpose of restoring and enhancing the environmental and recreational resources of the Androscoggin watershed. The fund should not be used as a substitute for other mitigation required by Central Maine, but could be used for future acquisition of land and water rights, purchasing of easements and land along the river, and monitoring of the easements and corridors.

- Accept responsibility for project decommissioning and dam removal, including contaminated sediment remediation or disposal.

Trout Unlimited *et al.*

- Operate the project in a run-of-river mode on a year-round basis, or operate the project in a run-of-river mode at a minimum for the months of May and June.

- Provide a minimum flow of at least 1,700 cfs from Gulf Island-Deer Rips to the Androscoggin River downstream.[14]

- Limit drawdowns in the Gulf Island impoundment to no more than one foot.

- Install upstream and downstream fish passage facilities at Gulf Island-Deer Rips, and at Lewiston Falls downstream from Gulf Island-Deer Rips.

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[14] TU *et al.*'s assertion that inflow to Gulf Island-Deer Rips would never fall below 1,950 cfs, and that 1,700 cfs would never exceed inflow is inaccurate for reasons described in Section 2.1.1.2.

- Monitor DO levels and the macroinvertebrate populations in the Gulf Island impoundment and downstream from the proposed project.

- Central Maine should assess the operation of the headwater storage reservoirs and alternatives to the proposed project operations to enhance salmonid habitat and angling opportunity in the lower Androscoggin River watershed.

- The public should have unimpeded access to the Androscoggin River, and be able to safely enjoy recreational activities at and on the river.

2.3.1.3. Staff alternatives

Staff considered additional alternatives at Gulf Island-Deer Rips. For flow related resources, we considered operating Gulf Island-Deer Rips under two additional alternatives to those proposed by Central Maine and/or recommended by agencies and NGOs. The two alternatives include operating Gulf Island-Deer Rips with: (1) minimum flows of 1,700 cfs from May 1 to November 30 and 1,100 cfs from December 1 to April 30; and (2) minimum flows of 1,700 cfs from May 1 to November 30 and 1,400 cfs from December 1 to April 30. In both cases, impoundment fluctuations in the Gulf Island impoundment would be a one-foot target limit from May 1 to June 30 and four feet from July 1 to April 30.

For recreational resources, we considered an alternative that would require Central Maine to assist in providing for the proper use, conservation, and development of project area shorelands and islands through the preparation and implementation of a Commission-approved comprehensive management plan for all shorelands and islands necessary for project operation and maintenance and for other project purposes such as recreation, shoreline control, and protection of environmental resources.

2.3.2. Marcal

2.3.2.1. Mandatory conditions

a. Section 18 Fishway Prescription. Interior prescribed two conditions for providing fish passage facilities at the Marcal Project, pursuant to Section 18 of the FPA (Andrew L. Raddant, Acting Regional Environmental Officer, Office of Environmental Policy and Compliance, U.S. Department of the Interior, Boston, Massachusetts, October 7, 1994).[15]

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[15] **Condition 1:** Although we would recommend that the fishway to be installed at Marcal conform to Interior's specifications, this condition, as it is written, does not prescribe a fishway. In Sections 4.1.2.3., 4.2.2.2., and 5.4.2., we discuss the merits of Consolidated Hydro's proposed fish passage plan. In response to our request for clarification of their fishway prescription, Interior commented on several aspects of Consolidated Hydro's proposed downstream fish passage facility; we address these comments in Section 4.2.2.2. Interior also responded, in part, by stating "Although the Department anticipates providing its fishway prescription for downstream passage facilities following post-licensing consultation with the applicant (...), the FWS ...." In light of this admission, we will continue to view this as a reservation of

Interior timely filed the following measures pursuant to Section 18 of the FPA:

(1) The licensee shall ensure that the design, location, installation (including scheduling), maintenance, and operation of fishways at the Marcal Project conform to the specifications of the FWS; and

(2) The Secretary of the Interior's authority to prescribe the construction, operation and maintenance of fishways is reserved under Section 18 of the FPA.

b. Water Quality Certification. On May 25, 1994, Consolidated Hydro requested that MDEP issue a Section 401 WQC, as required by the CWA. Consolidated Hydro subsequently withdrew and refiled its request for water quality certification on May 24, 1995 and May 24, 1996. Presently, MDEP has taken no action on Consolidated Hydro's request for water quality certification for Marcal, and is currently pending before the MDEP. The conditions in the WQC will be addressed in any order taking final action on the license application for the project.

c. Coastal Zone Management Program. The MSPO Coastal Program is responsible for reviewing Marcal for consistency with the state's Coastal Management Program. Marcal is located outside of Maine's coastal zone boundary. Further, MSPO's Coastal Program has not defined a geographic area for federally licensed activities which are located outside of the coastal zone but likely to affect the coastal zone (MSPO, 1994). Following the notice of the license application, MSPO provided no specific comments regarding the project's potential effects on the state's coastal resources. Therefore, we conclude that the MSPO has waived its right to review the project's consistency with the Maine Coastal Management Program, under Section 930.54 of the Coastal Zone Management Act of 1972, as amended. In Section 4.0 we address how Marcal affects coastal resources.

2.3.2.2. Agency and interested party recommendations

Interventions

On August 25, 1994 a public notice was issued that provided an opportunity for filing protests or motions to intervene. All entities that filed motions to intervene have become parties to this proceeding.

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authority to prescribe fishways.

Condition 2: The Commission made it clear in Lynchburg (39 FERC ¶ 61,079 at p. 61,218) that conditions that essentially seek to reserve authority to prescribe a fishway are not themselves fishway prescriptions. Consequently, reservation of authority is not mandatory under Section 18 but rather is a matter of Commission policy.

On October 6, 1994, the MSPO filed with the Commission a motion to intervene not in opposition. In its motion, MSPO states that the participation of the MSPO in this proceeding is necessary to represent the interests of the state's natural resource agencies and the interest of the citizens of Maine. In accordance with the FPA, MSPO also stated that the Commission can issue an original license for Marcal on the condition that the Commission finds the project to be best adapted to Maine's Comprehensive Hydropower Plan.

On October 21, 1994, EPA filed with the Commission a motion to intervene not in opposition. In its motion, EPA is concerned that the project not directly or indirectly cause or contribute to degradation of waters of the United States, or to any violations of water quality standards in any project impoundments, downstream of the project, or in any river reaches bypassed as a result of the project. Specifically, EPA is concerned that the project may impact water quality and the aquatic community in the Little Androscoggin River.

On October 17, 1994, Hackett Mill Hydro filed with the Commission a motion to intervene not in opposition. In its motion, Hackett Mill Hydro states that its Hackett Mills Project is located immediately downstream of the Marcal Project on the Little Androscoggin River. Hackett Mill Hydro also states that the current store-and-release mode of operation at Marcal adversely effects the generating output of the Hackett Mills Project by reducing the flow in the river to a level which prevents the operation of the Hackett Mills Project, or increasing the flow to a level that exceeds the capacity of the Hackett Mills Project.

Commentors

Pursuant to the public notice issued August 25, 1994, various state and federal agencies and NGOs provided comments and recommendations for inclusion in any original license issued for Marcal. Following issuance of the DEIS, commenting parties are afforded the opportunity to revise their formal recommendations. A list of DEIS comment letters and staff's responses are included in Appendix E.

The agencies, NGOs, other interested parties, and dates of their comments for Marcal are listed below. All comments received from concerned entities become part of the record and are considered during the staff's analysis of the proposed action.

Commentor	Comment dates
U.S. Department of the Interior	10/14/94
Synergics, Inc.[16]	10/17/94

[16] Synergics, Inc., through its wholly-owned subsidiary, Hackett Mills Hydro Associates (Hackett Mill Hydro), is the owner of the Hackett Mills Hydroelectric Project.

Department of the Interior

- Provide a continuous minimum flow of 56 cfs, or inflow, whichever is less, from the Marcal dam downstream to the bypassed reach of the Little Androscoggin River.

- Within three months after the date of issuance of the license, prepare a plan to monitor minimum flow requirements and impoundment water levels at the Marcal Project.

- Monitor recreational use of the project area to determine whether existing access facilities are meeting demands for public use of fish and wildlife resources. Monitoring studies should begin within six years of any new license, and should consist, at a minimum, of annual recreational use data and meetings with consulted agencies every six years.

  Every six years during the license term, the Licensee should file a report including: (1) annual use figures; (2) a discussion of the adequacy of the existing facilities; (3) a discussion of the need for additional recreation facilities at the project site; (4) if additional facilities are needed, a recreation plan to accommodate or control visitation in the project area; and (5) documentation of agency consultation and agency comments on the report.

- Within three months of issuance of a new license for the project, develop a plan for providing buffer strips and other appropriate shoreline protection measures in the project area.

Hackett Mill Hydro

- Operate the project in a run-of-river mode on a year-round basis.

2.3.2.3. Staff alternatives

Staff considered several additional alternatives at Marcal. For flow related resources, we considered operating Marcal under four additional alternatives to those proposed by Consolidated Hydro and/or recommended by Interior and Hackett Mill Hydro. The four alternatives include operating Marcal with: (1) a year-round run-of-river scenario with a year-round 20 cfs minimum bypass flow; (2) a seasonal minimum bypass flow of 10 cfs from June 1 to November 1 and 0 cfs (leakage) from November 2 to May 31; (3) a seasonal minimum bypass flow of 56 cfs from June 1 to November 1 and leakage from November 2 to May 31; and (4) a year-round minimum bypass flow of 20 cfs. Alternatives 2, 3, and 4 include a year-round project minimum flow of 56 cfs and a seasonal impoundment fluctuation of one foot from May 1 to October 15 and two feet from October 16 to April 30.

2.4. No-Action alternative

2.4.1. Gulf Island-Deer Rips

The no-action alternative would maintain the *status quo* and result in no change to the existing environment. The project would continue to operate under the terms and conditions of the existing license. If the project is allowed to operate as it has in the past, it would probably have the same effect on the environment as it does now. Central Maine would (a) continue to produce energy, but would not be able to increase energy production and (b) not have to provide any environmental measures to enhance natural and cultural resource values.

No party advocates the *status quo*. We use this alternative to compare existing environmental conditions with other alternatives.

2.4.2. Marcal

The no-action alternative would maintain the *status quo* and result in no change to the existing environment. The unlicensed project would continue to operate as it has in the past, and would probably have the same effect on the environment as it does now. Consolidated Hydro would continue to produce energy, but would not provide any additional measures to enhance the environmental resources.

No party advocates the *status quo*. We use this alternative to compare existing environmental conditions with other alternatives.

2.5. Alternatives considered but eliminated from detailed analysis

We considered several other alternatives to the applicants' relicensing and licensing proposals but eliminated them from detailed study in the FEIS, because they are not reasonable in the circumstances of this case. They are: (1) federal takeover and operation of Gulf Island-Deer Rips; (2) issuing a non-power license upon expiration of the original license for Gulf Island-Deer Rips; (3) denial of the license application for Gulf Island-Deer Rips, with termination or surrender of the existing license; (4) denial of the license application for Marcal, with termination of project operation; and (5) Demand-Side Management (DSM) on the part of Central Maine, and wind power.

We don't consider federal takeover to be a reasonable alternative. Federal takeover of Gulf Island-Deer Rips would require Congressional approval. While that fact alone wouldn't preclude further consideration of this alternative, there is no evidence indicating that a federal takeover should be recommended to Congress. No federal agency has suggested federal takeover would be appropriate and no federal agency has expressed interest in operating Gulf Island-Deer Rips.

Issuing a non-power license for Gulf Island-Deer Rips wouldn't provide a long-term resolution of the issues presented. 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. No government agency has suggested its willingness or ability to do so. No party 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 mitigation and enhancement measures.

The Commission could deny the license applications, which would in effect result in project retirement and/or termination of project operation. Denial of the license applications, leading to termination or surrender of Gulf Island-Deer Rips's existing license and termination of Marcal's operation, would entail two alternatives which would require a departure from the *status quo*. The first alternative is surrender or termination coupled with removal of the dams. While the FWS recommends that the EIS look at dam removal as an alternative, no entity has recommended dam removal and we have no basis for recommending it. Dam removal would restore a free-flowing river and aeration potential, eliminate any fish entrainment mortality that may be occurring, provide unobstructed fish movement within the stream, and provide unobstructed canoeing. However, while we recognize these potential benefits, we don't regard this alternative as reasonable because it would result in the loss of substantial electric power generation, as well as, possible significant adverse environmental impacts. For example, dam removal could result in sediments accumulated behind the dams being washed downstream, loss of wetlands, and loss of recreational opportunities due to the change from a lacustrine environment to a riverine environment. Thus, dam removal is not a reasonable alternative to licensing the projects with appropriate mitigation and enhancement measures.

The second alternative involving surrender or termination would be to retain the dams, with removal or disabling of the equipment used to generate power. Project facilities would remain in place and could be used for historic or other purposes. No agency or party has suggested this alternative; nor have we any basis for recommending it. Because the power supplied by the projects is needed, a source of replacement power would have to be identified. Under the circumstances, we don't consider removal of the electric generating equipment to be a reasonable alternative.

During the scoping meetings, the Conservation Coalition requested that the Commission address DSM on the part of Central Maine and wind power as methods of reducing air quality impacts[17] and other impacts of utilizing flows for hydroelectric generation. The objectives of DSM programs are to reduce the consumption of electric energy and to reduce the demand for additional generating capacity by improving electricity consumption efficiency, and reducing capacity demand peaks by shifting, when possible,

[17] DSM and wind power could be used instead of hydroelectric generation to off-load fossil fuel plants, thereby reducing the air quality impacts associated with these generating facilities.

electric loads from peak-demand hours to off-peak hours. Appendix H-V of the license application for a new license is a 30-page report describing Central Maine's DSM programs[18].

Consolidated Hydro has no end-use customers for the energy produced by the Marcal Project. The total net output of Marcal is sold to Central Maine for distribution to its customers. Therefore, DSM is not applicable to Consolidated Hydro.

Central Maine has an excellent record and a national reputation as a leader in the design, marketing, and evaluation of DSM programs. Central Maine has won national awards from the Edison Electric Institute, the U.S. Department of Energy, and from Renew America for its study and implementation of DSM programs. Based on the staff's review of Central Maine's DSM program, we conclude that Central Maine has an excellent record for supporting, and complying with, the objectives of the Electric Consumers Protection Act of 1986.

The Conservation Coalition anticipates that DSM and wind power would allow changes to Gulf Island-Deer Rips's operation at little, if any, cost in terms of power loss. However, when included in a utility's or region's power resource mix, load reduction, energy conservation measures, and wind power[19], do not displace other relatively low-marginal-cost generating resources such as nuclear, solar, high quality geothermal, and hydropower; except in very rare instances when those are the only resources operating. The generating resources that are displaced in actual practice are those with the higher marginal costs, such as oil-fueled, natural-gas-fueled, and coal-fueled generating resources. For this reason, load reduction, energy conservation, and wind power, are not reasonable alternatives to the operation of generating resources with low marginal operating costs, such as in the case of licensing and relicensing existing hydropower projects. Load reduction, energy conservation, and wind power should be considered as alternatives to only the highest marginal cost resources, or considered to the extent that they can effectively delay the date at which any new generating capacity would need to be constructed to serve power demands.

Additionally, any economic or need-for-power studies based on the regional load/resource data in the OE-411 Reports[20] have fully considered all the reasonable, economical, alternative load-reduction, conservation measures, and alternative generation sources. No additional studies are needed to demonstrate that the hydropower projects, in

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[18] Central Maine currently offers eight DSM programs for residential customers (including no-cost programs for low-income customers), 12 DSM programs for industrial and commercial customers, and load management programs, including interruptible load rates, time-of-use rates, and storage heat rates.

[19] Section 3, Appendix H-II of the license application for a new license describes developing generation technologies, including wind turbine generation.

[20] Reports entitled "Regional Reliability Council Long Range Coordinated Bulk Power Supply Programs" are submitted to the Department of Energy each year. They are know as DOE Code OE-411.

this case Gulf Island-Deer Rips and Marcal, would not displace more cost-efficient conservation or load-reduction measures, or alternative generation sources.

2.6. Project retirement studies and trust funds

The Conservation Coalition proposes a procedural measure that relates indirectly to the environmental enhancements described above. The Conservation Coalition recommends that Central Maine accept the fiscal responsibility for project decommissioning and dam removal, either through establishment of a decommissioning fund, or alternatively, some other method of guaranteeing that funds would be available to decommission and/or remove the dams at the end of the project's new license term.

On December 14, 1994, the Commission issued a policy statement that addresses issues arising out of the September 15, 1993 Notice of Inquiry[21] concerning relicensing and decommissioning of hydropower projects.[22] Specifically, the policy statement states that the Commission will look at funding decommissioning costs on an individual basis, taking into account the condition and expected lifespan of the project in question and the applicant's financial ability to fund such an action at the end of any license issued.

Commensurate with its decommissioning policy, the Commission will address project decommissioning and the proposed decommissioning trust fund in the licensing orders for Gulf Island-Deer Rips and Marcal. The orders will address the need for license requirements, which would require the licensees to conduct studies, make financial provisions, or otherwise make reasonable provisions for retirement of the projects.

2.7. Economic comparison of alternatives

In view of the changing economics in the electric industry, and the fact that project economics is one of the many public interest factors the Commission considers in project licensing, the Commission has changed its approach to evaluating the economics of both new and existing hydroelectric projects. We no longer will employ an analysis that assumes alternative fossil fuel and other costs escalate steadily over the term of the license. Instead, we will use current costs to compare the costs of the project and likely alternative power.[23]

We have applied this new analysis to evaluate the cumulative and project-specific effects of the Gulf Island-Deer Rips and Marcal Projects. The assumptions used in our new

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[21] Notice of Inquiry, Project Decommissioning at Relicensing, Docket No. RM93-23-000, September 15, 1993. 58 F.R. 48,991-96(1993).

[22] Dam Decommissioning at Relicensing, Policy Statement. 69 FERC ¶ 61,336. An errata was issued on January 11, 1995, to correct one project number and add another.

[23] See Mead Corporation, Publishing Paper Division, 72 FERC, ¶ 61,027 (July 13, 1995).

economic analysis are summarized in Appendix A.

Overview of Cumulative Hydropower Generation and Economics Studies

The proposed generating capacity expansion at the Gulf Island development and the changes in the minimum flows and impoundment fluctuation limitations at Gulf Island-Deer Rips on the lower Androscoggin River and at Marcal on the Little Androscoggin River would affect not only the power benefits of those projects, but also the respective downstream projects. The five projects we studied for cumulative effects on the lower Androscoggin River were Gulf Island-Deer Rips,[24] Lewiston Falls,[25] Worumbo, Pejebscot, and Brunswick. The four projects we studied for cumulative effects on the Little Androscoggin River were Marcal, Hackett Mills, Upper Barkers Mill, and Lower Barkers Mill (*see Figure 2-1*).

Because of these operational inter-relationships among the projects to be licensed, and the other existing projects on the lower Androscoggin River and Little Androscoggin River, we have done a cumulative evaluation of the effects of various combinations of environmental enhancement measures on power generation for all the projects in the Lower Androscoggin River Basin, and in the Little Androscoggin River Sub-Basin. There is no significant interaction between the two separate groups of projects, so our hydropower generation and economic analyses consist of two separate cumulative studies, one for the mainstem lower Androscoggin River and one for the Little Androscoggin River sub-basin.

Proposed capacity expansion at the Gulf Island Development

Central Maine's proposed replacement of the runners on Units #2 and #3 at the Gulf Island powerhouse with new, more efficient runners and rewinding the Unit #2 generator would increase the powerhouse's generating hydraulic capacity and the total energy generation. With a higher hydraulic capacity at the Gulf Island development, the Deer Rips/Androscoggin No. 3 developments, located directly downstream, with a lower hydraulic capacity, would spill more water during peak-load hours, and thus, would generate less energy than what they are currently generating. However, the increase in energy generation at the Gulf Island development due to the generating capacity expansion would more than offset the decrease in the energy generation at the Deer Rips/Androscoggin No. 3 developments.

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[24] In our studies, we considered the Gulf Island development separately from the Deer Rips and Androscoggin No. 3 developments; since the latter developments operate essentially in a run-of-river mode, and Gulf Island operates in a peaking mode.

[25] In our studies, we considered the multi-development Lewiston Falls Project as one complete project, consisting of: Monty, Bates, Red Shop, Hill, Bates Lower, Continental, Upper Androscoggin (City of Lewiston's project, P-11006), and Lower Androscoggin Powerhouses.

The proposed generation expansion at the Gulf Island development would shift a very small amount of base-load energy production to on-peak hours at Lewiston Falls. For Worumbo, Pejebscot, and Brunswick, the same generating capacity expansion at the Gulf Island development would shift some of the projects' peak-power production to off-peak hours.

Various operational environmental enhancements

Environmentally beneficial changes in the operation of Gulf Island-Deer Rips on the lower Androscoggin River, such as increasing minimum flows and employing impoundment-fluctuation restrictions, would shift some of the project's peak power production to off-peak hours, and would cause similar on-peak to off-peak power shifts at Lewiston Falls, which has about a one-half hour travel time downstream. For other downstream projects which have more than a five-hour flow travel time below Gulf Island-Deer Rips, these same peak-power-reducing operational changes at Gulf Island-Deer Rips would actually cause an increase in peak power production. This is because reducing the on-peak generation at Gulf Island-Deer Rips increases the off-peak generation and flows from Gulf Island-Deer Rips. Some of the off-peak flows reach the downstream projects hours later, during on-peak load hours.

For example, Worumbo, Pejebscot, and Brunswick are far enough downstream -- 6.5 hours, 7 hours, and 8.5 hours, respectively -- that in almost all cases, these projects produce more power on peak when Gulf Island-Deer Rips generates less power on-peak. However, the power benefit gains at these downstream projects are relatively small for the various cases; cumulatively, they would make up for about two to 11 percent of the peak energy losses at Gulf Island-Deer Rips. On a project-specific basis, the off-peak power benefits at these three downstream projects are not significant, representing less than about a two percent gain in the gross value of power in the most extreme case (TU *et al.*'s run-of-river operational scenario) at the two larger downstream projects (i.e., Worumbo and Brunswick).

Overall, we found that the power benefit losses on the lower Androscoggin River would occur at Gulf Island-Deer Rips, and that the majority of those losses would be due to energy shifts from on-peak hours to off-peak hours caused by minimum flow requirements and impoundment fluctuation restrictions.

With regards to the four projects on the Little Androscoggin River, none of the projects below Marcal are far enough downstream to experience a significant reversal in the on-peak to off-peak power shift from upstream peaking restrictions, such as occurs at the lower three projects on the lower Androscoggin River. Hackett Mills, Upper Barkers Mill, and Lower Barkers Mill are about 2.5 hours, 4.5 hours, and 4.75 hours flow travel time downstream from Marcal, respectively.

Unlike the generation impacts on the lower Androscoggin River, the power benefit gains or losses to the projects on the Little Androscoggin River would result from energy loses due to changes in forced spill rather than from power being shifted from on-peak hours

to off-peak hours. Also, unlike the projects downstream from Gulf Island-Deer Rips on the lower Androscoggin River, the power effects at the projects downstream from Marcal on the Little Androscoggin River are much more significant in the cumulative hydropower effects. The power benefit losses at the projects downstream from Marcal would be cumulatively about equal to the power benefit losses experienced at Marcal.

Table 2-1 and Table 2-2 summarize the cumulative annual values, costs, and net benefits of all of the projects on the lower Androscoggin River and Little Androscoggin River under existing and all proposed alternatives, operational and non-operational, considered at Gulf Island-Deer Rips and Marcal, respectively.

Overview of Project-Specific Economics Studies

Within the scope of our analyses, we evaluate the capital cost expenditures and additional operation and maintenance expenses of the proposed operational enhancements at the Gulf Island development and the various proposed non-operational environmental enhancement measures at Gulf Island-Deer Rips and Marcal. We also evaluated the cost of the existing net investment and annual project operation and maintenance for all projects.

The operational enhancement measures that would require capital cost expenditures and additional operation and maintenance expenses at the Gulf Island development consist of Central Maine's proposed upgrade of the generating units at the Gulf Island development. The details are discussed in Section 2.7.1. At Marcal, there are no operational enhancement measures that would require capital expenditures and additional operation or maintenance expenses on the part of Consolidated Hydro.

The non-operational enhancement measures that would require capital expenditures and additional operation or maintenance expenses at Gulf Island-Deer Rips are as follows: the GIPOP facility and associated DO monitoring program, plan to monitor aquatic invertebrates, mercury/dioxin monitoring, recreational enhancements (monitoring, trail development, boat launches and canoe portages, and other recreational facilities), archeological and historical resources enhancements, conservation easements/buffer zones, and environmental enhancement funds.

The non-operational enhancement measures that would require capital expenditures and additional operation or maintenance expenses at Marcal are as follows: the downstream fish bypass facility, recreational enhancements, and instream flow monitoring plan.

We detail the costs of the non-operational enhancement measures for Gulf Island-Deer Rips and Marcal in Appendix C.

In our analyses, we evaluate the annual costs of Central Maine's proposed generating capacity expansion, operational changes, and non-operational environmental enhancements on the project as it currently exists. For the agencies', NGOs', and staff's recommended

Table 2-1. Cumulative incremental annual costs for the **five lower Androscoggin River Projects**[1] under existing and all proposed alternative conditions considered at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[2].

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1,000)	(6) Non-operational Annual Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)	(8) Total Annual Net Benefits to Existing Conditions ($1,000)
Case 1: Total Existing Conditions	121.52	232.79	336.86	569.65	12,844	27,100	0	-14,256
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2A: CMP's proposed generation upgrade w/ existing project operation	4.30	10.22	7.25	17.47	411	440	-29	-14,286
Case 2B: CMP's proposed generation upgrade and project operation	4.30	-0.31	0.33	0.01	-1	598	-599	-14,856
Case 3: EPA's proposal	4.30	-12.90	13.33	0.42	-62	594	-656	-14,912
Case 4: Interior's proposal	4.30	-12.90	13.33	0.42	-62	594	-656	-14,912
Case 5: CLF et al's proposal with min. flow of 1,400 cfs (July 1 - April 30)	4.30	-11.67	12.08	0.41	-56	1,899	-1,955	-16,211
Case 6: CLF et al's proposal with min. flow of 1,800 cfs (July 1 - April 30)	4.30	-13.54	13.98	0.44	-66	1,899	-1,965	-16,221
Case 7: TU et al's proposal with min. flow of 1,700 cfs (July 1 - April 30)	4.30	-12.90	13.33	0.42	-62	594	-656	-14,912
Case 8: TU et al's proposal for year-round run-of-river operation	4.30	-35.74	37.90	2.16	-153	594	-746	-15,003
Case 9: Land Trust et al's proposal	4.30	-2.44	2.53	0.09	-12	1,240	-1,251	-15,508
Case 10: Staff's option #1 with min. flow of 1,100 cfs (December 1 - April 30	4.30	-3.81	3.92	0.11	-19	594	-612	-14,868
Case 11: Staff's option #2 with min. flow of 1,400 cfs (December 1 - April 30	4.30	-3.95	4.06	0.11	-19	594	-613	-14,869

1 Gulf Island-Deer Rips, Lewiston Falls, Worumbo, Pejebscot, and Brunswick.

Note: In our studies, we considered: (1) the Gulf Island Development separately from the Deer Rips and Androscoggin No. 3 Developments, since the latter two developments operate essentially in a run-of-river mode, and Gulf Island operates in a peaking mode of operation. (2) the multi-development Lewiston Falls Project as one complete, consisting of the following powerhouses: Monty, Bates, Red Shop Hill, Bates Lower, Continental, Upper Androscoggin (City of Lewiston's project, P-11006), and Lower Androscoggin.

2 The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are rounded to the nearest integer.

Table 2-2. Cumulative incremental annual costs for the **four Little Androscoggin River Projects**[1] under existing and all Proposed alternative conditions considered at Marcal (P-11482) (Source: staff).[2]

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1000)	(6) Non-operational Annual Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)	(8) Total Annual Net Benefits to Existing Conditions ($1000)
Case 1: Existing Project	4.29	6.95	13.46	20.41	453	1,084	0	-631
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2: Applicant's proposal	0.00	-0.16	-0.61	-0.76	-16	24	-40	-671
Case 3: Interior's proposal	0.00	-0.36	-1.20	-1.56	-34	21	-55	-686
Case 4: Hackett Mill's proposal	0.00	-0.39	-0.23	-0.62	-15	24	-39	-670
Case 5: Staff's alternative #1	0.00	-0.48	-0.40	-0.88	-20	22	-42	-673
Case 6: Staff's alternative #2	0.00	-0.26	-0.71	-0.97	-21	23	-44	-675
Case 7: Staff's alternative #3	0.00	-0.08	-0.46	-0.54	-11	25	-36	-667
Case 8: Staff's alternative #4	0.00	-0.26	-0.71	-0.97	-21	23	-45	-676

[1] Marcal, Hackett Mill, Upper Barkers Mill, and Lower Barkers Mill.

[2] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are to the nearest integer.

measures, we evaluate the recommended operational changes with the Gulf Island's upgraded units in place, and compare them to the existing project operational conditions with the upgraded units in place. We also compare the cost of Gulf Island-Deer Rips, as proposed with the various alternative non-operational environmental enhancements, to the cost of the existing project.

Since Consolidated Hydro proposes no power expansion at Marcal, we evaluate the annual costs of various operational and non-operational environmental enhancement measures on the project as it currently exists.

We estimate that, cumulatively, the five projects as they currently exist and operate on the lower Androscoggin River would have a total net economic benefit of about -$14,256,000 annually (Tables 2-1 and B-1)[26]. In other words, the power produced by these projects annually would have a cost about $14,256,000 more each year than Central Maine's cost of power generation from alternative energy sources for the same amount of power.

We estimate that, cumulatively, the four projects as they currently exist and operate on the Little Androscoggin River would have a total net economic benefit of about -$631,000 annually (Tables 2-2 and B-13).

In the next few pages, and in Appendix B, we discuss the details of our overall study approach and the results of our cumulative and project-specific hydropower studies for the lower Androscoggin River and Little Androscoggin River.

In Section B.1. of Appendix B, we describe the effects of operational and non-operational environmental enhancement measures on each of the five projects on the lower Androscoggin River, including Gulf Island-Deer Rips, under the following proposals:

Central Maine	(CASE 2: Table B-2, Table B-3);
EPA	(CASE 3: Table B-4);
Interior	(CASE 4: Table B-5);
Conservation Coalition	(CASE 5: Table B-6, CASE 6: Table B-7);
TU *et al.*	(CASE 7: Table B-8, CASE 8: Table B-9);
Land Trust *et al.*	(CASE 9: Table B-10); and
Staff's options	(CASE 10: Table B-11, CASE 11: Table B-12).

Description of the operational scenarios for each of the above alternatives considered for Gulf Island-Deer Rips are summarized in Table 2-3.

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[26] Since all of the projects, other than the Central Maine's projects, sell power to Central Maine, we used Central Maine's on- and off-peak annual power value for year 1995 (Central Maine's additional information response letter, August 25, 1995).

Table 2-3. Description of the existing and proposed operational alternatives for the Gulf Island-Deer Rips Project (P-2283).

	Total minimum flow requirement [cfs]		Maximum allowable fluctuation [ft][1]	
Proposer/Date	5/1 - 6/15	6/16 - 4/30	5/1 - 6/15	6/16 - 4/30
CASE 1: Existing	1,000	1,000	4	4
CASE 2: Central Maine	1,100	1,100	1	4
Proposer/Date	5/1 - 6/30	7/1 - 4/30	5/1 - 6/30	7/1 - 4/30
CASE 3: EPA[2]	(ROR)	1,700	0 (ROR)	1
CASE 4: Interior[3]	(ROR)[3]	1,700	0 (ROR)[3]	1
CASE 5: Conservation Coalition	(ROR)	1,400	0 (ROR)	1
CASE 6: Conservation Coalition	(ROR)	1,800	0 (ROR)	1
CASE 7: TU *et al.*	(ROR)	1,700	0 (ROR)	1
CASE 8: TU *et al.*	(ROR)	(ROR)	0 (ROR)	0 (ROR)
CASE 9: Land Trust *et al.*	1,430	1,430	1[2]	4[2]
Proposer/Date	5/1-11/30	12/1-4/30	5/1 - 6/30	7/1 - 4/30
CASE 10: Staff's option	1,700	1,100	1[4]	4
CASE 11: Staff's option	1,700	1,400	1[4]	4

[1] Fluctuation applies only to the Gulf Island impoundment, and occurs when inflows are less than the development's turbine maximum hydraulic capacity.

[2] EPA did not specifically recommend operational changes related to minimum flow releases, but deferred to, and support, Interior's flow recommendations. We also assume that EPA would defer to, and supports, Interior's impoundment fluctuation recommendations.

[3] Interior specifies their run-of-river recommendation as having a one-foot fluctuation bandwidth, to accommodate minor fluctuations due to monitoring error and/or changes in natural flow conditions.

[4] Based on Central Maine's comments on the DEIS, staff found that the Gulf Island impoundment would, at times, need to be fluctuated at a minimum of two feet to meet the current NEPOOL requirements for a weekly peaking facility. The one foot fluctuation restriction from May 1 to June 15 would be a target fluctuation, with an allowance of up to two feet to meet any unusual NEPOOL power requirements.

In Section B.2. of Appendix B, we describe the effects of operational and non-operational environmental enhancement measures on each of the four projects on the Little Androscoggin River, including Marcal, under the following proposals:

Consolidated Hydro	(CASE 2: Table B-14);
Interior	(CASE 3: Table B-15);
Hackett Mill Hydro	(CASE 4: Table B-16); and
Staff's options	(CASE 5: Table B-17, CASE 6: Table B-18, CASE 7: Table B-19, CASE 8: Table B-20).

Description of the operational scenarios for each of the above alternatives considered for Marcal are summarized in Table 2-4.

We discuss the project-specific hydropower effects of the operational scenarios and the details of the non-operational environmental enhancement measures proposed for Gulf Island-Deer Rips in Section 2.7.1., and for Marcal, in Section 2.7.2. These sections respectively show the effects of the proposed and recommended enhancement measures on Gulf Island-Deer Rips's and Marcal's annual energy generation, annual value of project power, annual project costs, and annual net economic benefits. We also include the economic details of our studies for the four projects downstream of Gulf Island-Deer Rips and the three projects downstream of Marcal in Appendix D.

2.7.1. Details of the economic studies for Gulf Island-Deer Rips

Under the cumulative assessment of the lower Androscoggin River, we analyzed the economic impacts of the five hydroelectric projects on the lower river. We made numerous assumptions in our economic analyses for these five projects (*see Appendix A*). We discuss our assumptions, and the details of our economic analyses, for Gulf Island-Deer Rips in this section to provide the reader a better understanding of our methodologies. We discuss the economics of Lewiston Falls, Worumbo, Pejebscot, and Brunswick in Appendix D.

In analyzing the costs of the various proposed environmental measures, we compared the differences between the annual project cost and value for the project power resulting from the measures with the net economic benefits of the project as currently licensed. We developed an in-house spreadsheet model which utilizes median flow conditions to estimate annual energy production. The spreadsheet also utilizes the on-peak and off-peak power values, provided in Central Maine's August 25, 1995 additional information response to estimate the value of the project's annual energy production.

By using our in-house spreadsheet, we duplicated the existing operation to produce the baseline annual energy production of the Gulf Island development (131,100,000 kWh) and the Deer Rips and Androscoggin No. 3 developments (58,630,000 kWh). The costs of Central Maine's proposed generating capacity expansion at the Gulf Island development were then modelled by adding the upgraded hydraulic capacity to the existing development's

Table 2-4. Description of the existing and proposed operational alternatives for the Marcal Project (P-11482).

	Total minimum flow requirement [cfs]		Minimum flow spillage [cfs]		Maximum allowable fluctuation [ft][1]	
Proposer/Date	5/1-10/15	10/16-4/30	6/1-11/1	11/2-5/31	5/1-10/15	10/16-4/30
CASE 1: Existing	0	0	0	0	2	2
CASE 2: Consolidated Hydro	56	56	20	0	1	2
Proposer/Date	5/1-10/15	10/16-4/30	6/1-11/1	11/2-5/31	5/1-10/15	10/16-4/30
CASE 3: Interior	56[2]	56[2]	56	56	1[2]	2[2]
CASE 4: Hackett Mills Hydro	(ROR)	(ROR)	20[2]	0[2]	0 (ROR)	0 (ROR)
CASE 5: Staff's option	(ROR)	(ROR)	20	20	0 (ROR)	0 (ROR)
CASE 6: Staff's option	56	56	56	0	1	2
CASE 7: Staff's option	56	56	10	0	1	2
CASE 8: Staff's option	56	56	20	20	1	2

[1] Fluctuation occurs when inflows are less than the project minimum hydraulic capacity of 120 cfs, when flows in excess of minimum required flow are stored for release on-peak.

[2] Comments were not provided by the specified agency; thus, we used Consolidated Hydro's proposal.

operational conditions, with the resulting annual energy generation and power values being compared to the project's existing conditions. The costs of the various entities' proposed or recommended operational scenarios were then modelled by changing the existing operational parameters to that which we were studying, with the resulting annual energy generation and power values being compared to the existing conditions.

We used information from the project description and operation provided in Central Maine's license application and/or responses to our additional information requests in our analyses. From this information, we learned that the existing Gulf Island powerhouse is an intermittent peaking facility which causes fluctuation in the Gulf Island impoundment and fluctuations in the river flow below the project. When inflows to the Gulf Island impoundment are significantly below the turbines' maximum hydraulic capacity, the Gulf Island development operates in its peaking mode, which results in the Gulf Island impoundment being drawn down from two to four feet from the full impoundment elevation either daily or over a period of a week. The Deer Rips and Androscoggin No. 3 powerhouses operate as run-of-river facilities using inflows from the Gulf Island powerhouse. During off-peak periods and on the weekends, discharge from the project is reduced to 1,000

cfs to allow the Gulf Island impoundment to refill.

To duplicate the Gulf Island development's existing operation in our modelling, we specified the development as having a minimum hydraulic capacity of 300 cfs, a maximum hydraulic capacity of 6,450 cfs, a maximum head of about 56 feet, an impoundment with a headwater surface elevation of 262.0 feet, a tailwater surface elevation of 206.0 feet, an impoundment with a surface area of about 2,862 acres, and a four-foot-high useable storage capacity of about 11,448 acre-feet.

To duplicate the Deer Rips and Androscoggin No. 3 developments' existing operation in our modelling, we specified the developments as having a minimum hydraulic capacity of 400 cfs, a maximum hydraulic capacity of 5,120 cfs, a maximum head of about 32 feet, an impoundment with a headwater surface elevation of 205.7 feet, a tailwater surface elevation of 173.7 feet, and an impoundment with a surface area of about 130 acres.

By using the spreadsheet, we estimate that operation of the project under existing conditions would result in an annual value of project power of about $4,382,000 (1995 $).

For the existing project annual cost analysis, we considered undepreciated capital investment and annual operation and maintenance costs. For Gulf Island-Deer Rips, we obtained the undepreciated capital investment from the Form 1's which Central Maine files with the Commission. Additionally, for Gulf Island-Deer Rips we included the accumulated debt of Central Maine's GIPOP contribution, including annual operation, maintenance, and monitoring, from the year 1991 through 1995.[27] We straight-line depreciated these two outstanding sunk costs to the estimated licensed year of 1995 and added them for a total of about $16,762,000. In Central Maine's August 25, 1995 additional information response, Central Maine estimated the project's annual operation and maintenance cost to be about $2,030,000. Central Maine also estimated the additional O&M for the near-term capital improvements as follows: $130,000 (year 1995), $200,000 (year 1996), $275,000 (year 1997), $1,100,000 (year 1998), and $990,000 (year 2000). Based on these costs, we estimate the annual project cost to be about $6,517,000 (1995 $).

The annual cost of the existing outstanding sunk costs, combined with the annual power value, resulted in the existing project having a net economics benefit of about -$2,135,000 annually or -11.25 mills/kWh (1995 $) (Table 2-5).

Once we established the net economic benefits of the existing project, we analyzed the incremental cost of the various entities' proposed or recommended environmental enhancements. Some of these proposed enhancements, as described in Table 2-3 and in Sections B.1.1 - B.1.11., would change the existing project operation, energy generation,

[27] As described in Central Maine's response, dated June 29, 1994, to our additional information request letter.

Table 2-5. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) under all alternative conditions considered for the **Gulf Island-Deer Rips Project (P-2283)** (Source: staff)[1].

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1,000)	(6) Non-operational Annual Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)	(8) Total Annual Net Benefits to Existing Conditions ($1,000)
Case 1: Total Existing Conditions	31.12	96.55	93.17	189.72	4,382	6,517	0	-2,135
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2A: CMP's proposed generation upgrade w/ existing project operation	4.30	10.26	7.19	17.45	411	440	-30	-2,165
Case 2B: CMP's proposed generation upgrade and project operation	0.00	-0.72	0.72	0.01	-4	598	-602	-2,737
Case 3: EPA's proposal	0.00	-13.64	13.95	0.31	-69	594	-662	-2,797
Case 4: Interior's proposal	0.00	-13.64	13.95	0.31	-69	594	-662	-2,797
Case 5: CLF et al's proposal with min. flow of 1,400 cfs (July 1 - April 30)	0.00	-11.87	12.17	0.30	-59	1,899	-1,958	-4,093
Case 6: CLF et al's proposal with min. flow of 1,800 cfs (July 1 - April 30)	0.00	-14.29	14.62	0.33	-72	1,899	-1,971	-4,106
Case 7: TU et al's proposal with min. flow of 1,700 cfs (July 1 - April 30)	0.00	-13.64	13.95	0.31	-69	594	-662	-2,797
Case 8: TU et al's proposal for year-round run-of-river operation	0.00	-30.85	32.22	1.37	-142	594	-735	-2,870
Case 9: Land Trust et al's proposal	0.00	-3.98	4.05	0.07	-20	1,240	-1,260	-3,395
Case 10: Staff's option #1 with min. flow of 1,100 cfs (December 1 - April 30	0.00	-5.38	5.48	0.09	-28	594	-621	-2,756
Case 11: Staff's option #2 with min. flow of 1,400 cfs (December 1 - April 30	0.00	-5.99	6.08	0.09	-31	594	-625	-2,760

[1] The values in columns 1 through 4 are rounded to t[illegible]gnificant digits, while those in columns 5 through 8 are rounded to the nearest integer.

and project power values. The annual incremental cost of these operational enhancements over the existing project conditions are compared in column (5) of Table 2-5.

Other enhancement measures would increase the capital cost and annual operation and maintenance cost, and thereby increase the annual debt service cost of the project. The capital cost, annual operational and maintenance costs, and the annual cost of the proposed or recommended non-operational enhancements are compared in Table C-1 and in column (6) of Table 2-5. Table 2-5 also shows the incremental change in annual energy generation and in the annual net benefits for Gulf Island-Deer Rips.

2.7.2. Details of the economic studies for Marcal

Under the cumulative assessment of the Little Androscoggin River, we analyzed the economic impacts of the four hydroelectric projects on the river. We made numerous assumptions in our economic analyses for these four projects (*see Appendix A*). We discuss our assumptions, and the details of our economic analyses, for Marcal in this section to provide the reader a better understanding of our methodologies. Appendix D contains our discussion of the economics for Hackett Mills, Upper Barkers Mill, and Lower Barkers Mill.

In analyzing the costs of the various proposed environmental measures, we compared the differences between the annual project cost and value for the project power resulting from the measures with the net economic benefits of the unlicensed project as it currently exists. As stated in Section 2.7.1., we developed an in-house spreadsheet, which utilizes median flow conditions, on-peak power values, and off-peak power values, to model changes to the four Little Androscoggin River projects' generation with operational and non-operational enhancement measures at Marcal.

By using our in-house spreadsheet, we were able to model Marcal's existing operation to produce the baseline annual energy production of 4,522,000 kWh at Marcal. We then analyzed the cost of the various entities' proposed or recommended operational scenarios by changing the existing operational parameters to those of the alternative we wanted to study, and comparing the resulting annual energy generation and power values to the existing conditions.

We used information from the project description and operation provided in Consolidated Hydro's license application and/or responses to our additional information requests in our analyses. The existing Marcal Project has no minimum flow requirements, no restrictions on impoundment operations (i.e., drawdowns), and thereby operates to make the most efficient use of the available water. Specifically, Marcal operates in a seasonal run-of-river/storage-and-release mode. When inflows are greater than the project's minimum hydraulic capacity of 120 cfs, the project operates as a run-of-river facility. The project operates in a daily cycling mode, using up to two feet of storage in the impoundment, when inflows are less than 120 cfs. Flows in excess of the maximum capacity of 560 cfs are spilled over the dam into the bypassed reach.

To duplicate the Marcal Project's existing operation in our modelling, we specified the development as having a minimum hydraulic capacity of 120 cfs, a maximum hydraulic capacity of 560 cfs, a net head of about 35.7 feet (assuming two feet of head loss), an impoundment with a headwater surface elevation of 273.3 feet and impoundment surface area of about 27 acres, a tailwater surface elevation of 235.6 feet, and a two-foot-high useable storage capacity of about 54 acre-feet.

By using the spreadsheet, we estimate that operation of the project under the existing conditions would result in an annual value of project power of about $101,000 (1995 $).

For the existing project annual cost analysis, we considered undepreciated capital investment and annual operation and maintenance costs. For Marcal, we obtained the undepreciated capital investment and license application preparation cost from Consolidated Hydro's response to our request for additional information.[28] We straight-line depreciated these two outstanding sunk costs to the estimated licensed year of 1995 and added them for a total of about $1,610,000. Based on industry averages, we estimate the project's annual operation and maintenance cost to be about $105,000. Based on these costs, we estimate the annual project cost to be about $213,000 (1995 $).

The annual cost of the existing outstanding sunk costs, combined with the annual power value, resulted in the existing project having a net economic benefit of about -$112,000 annually or -24.79 mills/kWh (1995 $) (Table 2-6).

Once we established the net economic benefits of the existing project, we analyzed the incremental cost of the various entities' proposed or recommended environmental enhancement measures. Some of these proposed enhancements, as described in Table 2-4 and in Sections B.2.1 - B.2.8., would change the existing project operation, energy generation, and project power values. The annual incremental cost of these operational enhancements over the existing project conditions are compared in column (5) of Table 2-6.

Other enhancement measures would increase the capital cost and annual operation and maintenance cost, and thereby increase the annual debt service cost of the project. The capital cost, annual operational and maintenance costs, and the annual cost of the proposed or recommended non-operational enhancements are compared in Table C-2 and in column (6) of Table 2-6. Table 2-6 also shows the incremental change in annual energy generation and in the annual net benefits for Marcal.

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[28] Consolidated Hydro's response letters to our additional information request letters are dated November 17, 1994, and April, 21 1995.

Table 2-6. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) under all Alternative conditions considered for the **Marcal Project (P-11482)** (Source: staff).[1]

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1000)	(6) Non-operational Annual Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)	(8) Total Annual Net Benefits to Existing Conditions ($1000)
Case 1: Existing Project	1.32	1.63	2.89	4.52	101	213	0	-112
INCREMENTAL ANNUAL CHANES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2: Applicant's proposal	0.00	-0.07	-0.22	-0.29	-6	24	-30	-142
Case 3: Interior's proposal	0.00	-0.19	-0.53	-0.73	-16	21	-37	-149
Case 4: Hackett Mill's proposal	0.00	-0.22	-0.08	-0.30	-7	24	-31	-143
Case 5: Staff's alternative #1	0.00	-0.31	-0.25	-0.56	-13	22	-35	-147
Case 6: Staff's alternative #2	0.00	-0.13	-0.28	-0.41	-9	23	-32	-144
Case 7: Staff's alternative #3	0.00	-0.04	-0.18	-0.23	-5	25	-30	-143
Case 8: Staff's alternative #4	0.00	-0.13	-0.29	-0.42	-9	23	-32	-145

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are to the nearest integer.

3. AFFECTED ENVIRONMENT

3.1. General setting (Sources: Central Maine Power Company; Central Maine, 1991 and Consolidated Hydro Maine, Inc.; Consolidated Hydro, 1994a, unless indicated otherwise).

The Androscoggin River Basin extends from the United States/Canadian border at New Hampshire and Maine to the coast of Maine, where it joins the Kennebec River to form Merrymeeting Bay (see Figure 2-1). The Androscoggin River has a total drainage area of approximately 3,470 mi^2; about 720 mi^2 is located in New Hampshire and 2,750 mi^2 is in Maine. The total length of the Androscoggin River is approximately 169 miles.

Much of the northern portion of the Androscoggin River Basin is mountainous and heavily forested. About 30 percent of the land in the basin is owned by paper companies. The Magalloway, Cupsuptic, and Kennebago Rivers, which flow into a system of large lakes and reservoirs, make up the basin's headwaters. Flow from these lakes drains to Umbagog Lake via either the Rapid River or continuation of the Magalloway River, and is controlled by UWPC and the Androscoggin Reservoir Company. The Androscoggin River begins at the outlet of Umbagog Lake.

The Little Androscoggin River is the largest tributary of the Androscoggin River, with a total drainage area of 350 mi^2. The Little Androscoggin originates in Bryant Pond approximately 22 miles northwest of the Marcal Project area, and flows in a southeasterly direction for approximately 15 miles to its confluence with the mainstem of the Androscoggin River at Auburn, Maine. Several lakes and ponds exist on tributary streams upstream of Marcal, including Pennesseewassee Lake, Thompson Pond, Hogan Pond, Whitney Pond, and Upper, Middle, and Lower Range Ponds (see Figure 1-2).

Topography - The Androscoggin River Basin is characterized by three distinct regions: the White Mountain region, the Northern New England Upland region, and the Coastal Lowland region.

The White Mountain region includes nearly two-thirds of the basin, and is characterized by mountains and deep valleys heavily forested with pine, hemlock, and northern hardwoods. Elevations can exceed 4,000 feet above mean sea level (msl), with the highest elevation being Mount Washington's summit at 6,288 feet msl. In the northern part of this mountainous region there are a series of lakes including Rangeley Lake, Cupsuptic Lake, Mooselookmeguntic Lake, Upper and Lower Richardson Lakes, Aziscohos Lake and Umbagog Lake. These lakes, which collectively form the Androscoggin's headwaters, lie in a relatively broad valley where the elevation is generally between 1,500 to 2,500 feet msl. From its formation at Umbagog Lake to its head-of-tide at Brunswick, Maine, the Androscoggin River drops approximately 1,245 feet (Federal Power Commission; FPC, 1964).

The New England Upland region, or central region, is characterized by rolling hills, plateau-like ridges, and broad flat valleys, with elevations ranging from 500 to 600 feet msl. This region generally includes the Androscoggin River's drainage area from Bethel-Rumford to Auburn-Lewiston. Below Auburn-Lewiston and the confluence of the Little Androscoggin River with the Androscoggin River, the landscape is characterized by low rolling hills and flat plains. Known as the Coastal Lowland, this region was formed by glaciers and the ocean.

Geology - The Gulf Island-Deer Rips and Marcal Project areas are located in the New England Upland Geomorphic Province, which consists of glacial and marine sediments underlain by igneous and metamorphic rocks, mostly granites and schists. The region's bedrock is generally hard, stable, and resistant to erosion. Thick layers of glacial till overlay the bedrock in the valleys, while thinning on the upper slopes. The glacial till is overlain along the rivers by deposits of glacial outwash and marine sediments. In the southeastern portion of the basin, glacial outwash sediments were reworked and redeposited by ocean currents.

Climate - The climate of the Lower Androscoggin River Basin varies depending on elevation and proximity to the ocean, but is generally characterized by moderately cool summers and cold, snowy winters. Influenced by both the inland regions to the north and west and the ocean to the south and east, the average annual temperature in the Lower Androscoggin River Basin is 46 degrees Fahrenheit (°F), with a range from 29°F to 12.0°F in January to 60°F to 80°F in July. The average annual temperatures for winter (December-February), spring (March-May), summer (June-August), and fall (September-November) are 23°F, 43°F, 68°F, and 46°F, respectively.

Average annual precipitation in the Lower Androscoggin River Basin, including the water equivalent of snow, is roughly 44 to 45 inches, with somewhat less in the low elevation areas and slightly more in the higher elevations. Precipitation is generally distributed evenly among the seasons, though summer receives only about 21 percent of the total. Annual snowfall over the Androscoggin River Basin varies from year to year and from place to place. The average snowfall at Lewiston is nearly 78 inches (Central Maine, 1991), while Consolidated Hydro (1994a) reported average snowfall in the Mechanic Falls area to be approximately 81 inches. Average snowfall in the lower Androscoggin watershed varies from about less than one inch in October and May to as much as 20 to 22 inches in January and February.

During the months of March, April, and May, large volumes of melting snow and heavy rainfall combine to cause large runoffs and destructive flooding. The magnitude of these floods is dependent on several natural factors, including water content of the snow cover, the extent of frost, temperature variations, and rainfall. Heavy rainfall in November and December can also result in large volumes of runoff.

Vegetation and Wildlife - The lower Androscoggin and Little Androscoggin Rivers are within the hemlock-white pine-northern hardwoods region as described by Braun (1950). The hemlock-white pine-hardwoods region is characterized by the pronounced alternation of deciduous, coniferous, and mixed forest communities.

Braun (1950) separates New England into two principle forest types, hemlock-hardwoods and spruce-hardwoods. According to Braun (1950), the Lower Androscoggin River Basin is situated primarily within the hemlock-hardwoods area.

Historically, New England was nearly covered by forests. However, in a span of about 300 years (beginning in the early to mid 1600's and extending through the 1920's), logging for lumber, paper, and pulp; agriculture; and fire had reduced the virgin hemlock-white pine-northern hardwoods forest in New England from 95 percent to five percent of the total land area. Today, only a few small virgin stands remain.

The remaining forested areas were too small to provide habitat for all the native animals originally present. Wolf, mountain lion, and wapiti (elk) were extirpated from the region (Shelford, 1963). The second growth forests, or forests that become established following logging or abandonment of agricultural areas, bear little resemblance to the original forests (Braun, 1950; Shelford, 1963).

Presently, 84 percent of Maine's land area is classified as forested land. In comparison, Androscoggin County is 75.5 percent forested and ranks eight in forested area out of the state's 16 counties. Androscoggin County represents 1.6 percent of Maine's total land area and contains 1.3 percent of the state's forested land. The dominant forest type in Androscoggin County is white/red pine (42.1 percent). Other dominate species include hemlock, beech, sugar maple, yellow birch, northern red oak, American chestnut, and basswood at lower elevations. White pine occurs as an early successional species.

The mainstem of the river, and its tributaries and associated wetlands, provide habitat for nesting waterfowl and suitable nesting areas for migrating ducks and geese. These species include the black duck, wood duck, mallard, blue- and green-winged teal, mergansers, and Canada geese (AVCG, 1983). The existence of cropland, primarily corn fields adjacent to the river, are attractive feeding areas during fall migration. Several segments along the mainstem of the river and a number of wetlands along the river have been identified by the MDIFW as being of high or moderate quality habitat for waterfowl nesting. Furbearing animals, including beaver, mink, muskrat, otter, and raccoon are present along the mainstem of the river and associated wetlands (AVCG, 1983).

Land use - The dominant land uses in the region are urban development, forestry, and agriculture (Central Maine, 1989). Except for several small towns, Brunswick, and the Auburn-Lewiston metropolitan area, Androscoggin County is characterized by hilly forested and agricultural land. Principal agricultural activities are dairy, poultry, crops, and forest products (FPC, 1964). Leading crops include potatoes, apples, vegetables, hay, and oats.

Historically, the Androscoggin River Basin has been an industrialized region with considerable reliance on the river itself as an energy source and as a water supply for various manufacturing needs. Even today, the Androscoggin River is recognized as "a valuable, indigenous and renewable energy resource for hydroelectric energy which provides a significant contribution to the economic development and general welfare of the state" (Maine's water quality standards, 38 MRSA 467). The principal manufacturing centers in the lower basin include Brunswick, Lewiston, and Auburn -- cotton textiles, shoes, and boots being the major products. The paper industry contributes significantly to the basin's economy. The major centers for the paper industry include Rumford, Maine and Berlin, New Hampshire; these industries produce pulpwood, paper, and associated products.

As a major tributary to the mainstem, the Little Androscoggin River was historically heavily developed by industry, largely textiles and paper. Today, small businesses and light industrial development predominate along the Little Androscoggin River.

Transportation in the region consists of interstate highways, state highways, rural roads, and several railroad lines.

Recreation use is the primary land and water use in the upper basin (including the headwater lakes and ponds) due to this area's clean water, exceptional fishing, and high scenic value. The Androscoggin River downstream from Berlin, New Hampshire to head-of-tide at Brunswick offers little, if any, recreational opportunities due to the polluted river. More recently, Central Maine (1989) states that recreation demand on the lower Androscoggin River is currently light, but is likely to grow substantially as water quality continues to improve and population grows. Three segments of the Androscoggin River have been recognized as Maine State outstanding river segments due to their natural and recreational resource values -- Brunswick to Merrymeeting Bay, south of Auburn to Leeds, and Rumford to the New Hampshire-Maine border (MSPO, 1987).

In Maine, the Androscoggin River and Little Androscoggin River shorelines are protected by municipal shoreland zoning ordinances mandated by the State through the Mandatory Shoreland Zoning Act and the Natural Resources Protection Act. Lands protected by local and state shoreland zoning laws include all land within 250 feet of the normal high water mark on each side of a river, including hydroelectric impoundments on the river.

Socioeconomics - The greatest population centers in the basin are located along the lower Androscoggin River, and include Brunswick, Lisbon, Auburn, and Lewiston. Large population centers within 50 miles of the Lower Androscoggin River Basin include Portland and Augusta. Boston, the largest city in New England, is located 120 miles from the basin's southern boundary (Central Maine, 1989).

The Gulf Island-Deer Rips and Marcal Projects are located in Androscoggin County in southern Maine. Androscoggin County is a relatively small county by Maine standards with only 1.6 percent of the state's total land area. Maine's total population in 1990 was

1,227,928; 8.6 percent (105,259 persons) reside in Androscoggin County (personal communication, Robert Bonnette, Statistical Information Assistant, U.S. Bureau of Census, Suitland, Maryland, November 30, 1994). Androscoggin County's population increased 5.6 percent from 99,657 in 1980 to 105,259 in 1990. The main population centers in the region are Brunswick, Topsham, Lisbon, Lewiston, and Auburn, with a combined population that was 103,175 in 1990. The smaller towns of Durham, Turner, Greene, Livermore, Leeds, Mechanic Falls, Poland, Oxford, and Minot had a combined population of 27,067 in 1990.

In the mid-1800's, several large industries were established in the lower Androscoggin River corridor (AVCG, 1983). Plentiful water power, cheap labor, and readily available building materials attracted the textile, leather, lumber, paper, food processing, and transportation (ship building) industries to the area. Many of these industries have experienced declines in Androscoggin County. However, new industries, including rubber and plastics and electrical machinery, have stabilized and diversified the county's economy. The agricultural industry, including milk, apple, and egg production, is also important to the county's economy.

The economy of south coastal Maine has had the strongest growth and prosperity of any region in the state (Central Maine, 1989). Unlike other regions in Maine, natural resource and clothing industries do not dominate the manufacturing sector. Metal and electronics play a leading role. Economic growth in this area is tied to a growing population, increased tourism, and expanding industries.

The economy of Maine's western inland region, including the Auburn and Lewiston area, is heavily dependent on manufacturing (constituting one-third of all payroll jobs) (Central Maine, 1989). The clothing industry and those industries that are natural-resource based largely comprise this regions manufacturing base. While experiencing declines in the recent past, these industries have begun to stabilize. Industries in this region have been expanding due to economic growth in southern Maine and New England. The Town of Mechanic Falls' economy is supported by small retail businesses, construction contractors, and agriculture in the surrounding rural area.

Air quality - In the industrialized coastal areas of New England, poor air quality occurs periodically as a result of ozone emissions (PR New Wire Association, Inc., 1992). Air quality is considered unhealthy when it exceeds the National Ambient Air Quality Standard of 12 parts per million (ppm). Oxides of nitrogen (NO_x), emitted from cars, trucks, and stationary sources (such as industries), contribute to smog and ground-level ozone in the northeast. About 24 percent of NO_x emissions come from electric utilities burning fossil fuels (Coal & Synfuels Technology, 1992).

Regionally, air quality in the Androscoggin River Basin varies from good in the sparsely populated headwaters region in the upper basin to problematic in the more industrialized areas along the river. On the White Mountain National Forest (situated along the Androscoggin River in the upper one-half of the basin), the U.S. Forest Service (USFS)

monitors the effects of air pollution on visibility, acid deposition, vegetation, and water quality. Results of the monitoring suggest that terrestrial resources have been adversely affected by sulfur deposition and that aquatic communities in the region have been affected by both sulfur and nitrogen emissions (Carlson and O'Brien, 1993).

3.2. Cumulative effect analysis of resources

3.2.1. Water quality and quantity

There are 18 rivers in the State of Maine that have drainage areas in excess of 500 mi^2 (MDEP, 1990). Seven of the 18 rivers, including the Androscoggin River, are pristine in their upper watersheds but pass through urbanized, industrialized areas in their lower reaches. As noted previously, the Androscoggin River was once characterized as one of the ten most polluted rivers in the nation. With Lewiston, Maine's second largest city, located on the banks of the Androscoggin River, the pollution of the past generated widespread public concern for water quality.

Since the late 1800's, the Androscoggin River Basin has been heavily industrialized. Today, as in the past, the Androscoggin River continues to act as receiving water for numerous industries, as well as municipal wastewater treatment facilities from Berlin, New Hampshire to Brunswick, Maine. As a major tributary to the lower Androscoggin River, the Little Androscoggin River also receives industrial and municipal wastewater discharges.

The major industrial discharges to the Androscoggin River are from paper mills located upstream of Gulf Island-Deer Rips (i.e., James River, Boise Cascade, and International Paper). The major municipal discharge to the lower Androscoggin River is the Lewiston-Auburn wastewater treatment facility. The Little Androscoggin River receives wastewater discharge from industrial and municipal sources [the Mechanic Falls Wastewater Treatment Facility discharges 1,500 feet below Marcal]. Table 3-1 summarizes the point sources on the Androscoggin and Little Androscoggin Rivers.

In addition to the discharges listed in Table 3-1, many impoundments exist on the Androscoggin and Little Androscoggin Rivers, and include those at Gulf Island, Deer Rips, and Marcal. We estimate that about 32 percent, or about 53 miles, of the Androscoggin River's entire length (about 169 miles) has been impounded by dams. We also estimate that those 53 miles contain about 58 percent of the Androscoggin River's total drop; 722 feet of the total drop of 1,245 feet.[1] These impoundments affect the rivers' water quality by acting as settling basins for oxygen-demanding pollutants, and by slowing the travel time of river waters. Moreover, because most of the dams on the Androscoggin River are located at major hydraulic areas (i.e., falls and other steep-gradient reaches), an important source for

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[1] Mitnik (1983) estimates that approximately 72 percent, or about 488 feet, of the Androscoggin River's total drop in Maine (about 680 feet) has been impounded by dams; which encompasses about 40 miles of the river's 120-mile length in Maine.

Table 3-1. Point sources on the Androscoggin and Little Androscoggin Rivers and their permit limitations for BOD loading (Sources: Miller, 1990; Mitnik, 1983).

Point Source	Type	Permit limitation in lbs/day of BOD	
		Monthly Average	Daily Maximum
James River Paper Berlin, NH	industrial	16,000	30,000
Berlin, NH	municipal	1,025	1,700
Gorham, NH	municipal	187	312
Boise Cascade Rumford, ME	industrial	14,400	32,300[1]
Rumford-Mexico, ME	municipal	663	1,105
International Paper Jay, ME	industrial	17,696	34,050[1]
Livermore Falls, ME	municipal	250	417
Lewiston-Auburn, ME	*municipal*	*3,550*	*5,916*
Lisbon, ME	*municipal/ industrial*	*750*	*1,250*
Robinson Manufacturing West Paris, ME	industrial	290	500
Mechanic Falls, ME	*municipal*	*122*	*204*

[1] For Boise Cascade and International Paper, limits on loading during the summer are prorated according to riverflow in the Androscoggin River.

maintaining oxygen levels and/or aerating the water has been lost or reduced; thus reducing the assimilative capacity of the river for oxygen-demanding pollutants.

MDEP (1990) reports that building wastewater treatment facilities or cleaning up industrial/municipal discharges will not solve all of the water quality problems on the Androscoggin River. Many cities and towns also have problems with their wastewater collection systems. During spring and summer rain storms, CSOs become a problem. MDEP (1990) also reports that while wastewater treatment facilities and sewage collection systems are most commonly thought of as the principal means of controlling water quality, agricultural activities (eg. manure storage pits, pesticides/herbicides, fencing to keep cattle out of streams, soil conservation practices) are also important to protecting water quality.

Water quality in the lower Androscoggin River and in the Little Androscoggin River has been studied extensively by MDEP, Central Maine, Boise-Cascade, and International

Paper over the past ten years. The main focus of these studies has been on BOD and SOD loading and their affect on water quality, more specifically, DO. MDEP has conducted wasteload allocation studies, and done water quality modelling of various portions of the Androscoggin River and the Little Androscoggin River (*for further discussion of the modelling studies see Sections 3.3.1. and 3.3.2.*). In addition, USGS operates three water quality monitors in the lower Androscoggin River; at the Gulf Island dam, just downstream of Lewiston Falls, and below Dresser's Rips (about two miles below Lewiston Falls). Central Maine funds the operation of these monitors.

Water quality in both the lower Androscoggin River and the Little Androscoggin River has improved significantly since the early 1970's, with the most dramatic changes occurring between 1975 and 1985 (MDEP, 1990). However, water quality in the lower basin, particularly in the lower Androscoggin River, continues to be relatively poor and periodically falls below its classification. Dissolved oxygen depletion is one of the river's biggest problems. In a continuing effort to improve the water quality situation in the river, mainly low DO concentrations, MDEP in 1990 established an oxygenation injection program, known as GIPOP, and a water quality monitoring program under agreements among Central Maine and three upstream paper companies[2] (Central Maine, 1994a). This program, which began operation July 1, 1992, has had a beneficial cumulative effect on water quality and DO levels in the lower Androscoggin River.

Water quality standards for Maine waters are determined by the Maine Legislature and appear in 38 MRSA §465. The Androscoggin River from the Ellis River to Merrymeeting Bay, including the Gulf Island and Deer Rips impoundments, is presently classified by the Maine Legislature as having Class C waters (38 MRSA §467). Moreover, in classifying the Androscoggin River (including the impoundments), the MDEP and the Maine Legislature indicates that the Androscoggin River continues to have water quality problems which are a direct result of the historic and continued use of the waterway for industrial purposes.

The Little Androscoggin River from the Maine Central Railroad bridge in South Paris to the confluence with the Androscoggin River, including all impoundments, has been classified by the Maine Legislature as having Class C waters (38 MRSA §467).

Criteria for Class C waters, the fourth and lowest classification assigned to fresh surface waters in the State of Maine, are shown in Table 3-2. Pursuant to Paragraph B in Table 3-2, MDEP identified the stretch of the Androscoggin River in the vicinity of Dresser's Rips, located below Lewiston Falls, as a designated salmonid spawning area. This designation requires the maintenance of a 30-day average DO concentration of 6.5 mg/l, for protection of these fish. Relative to the Little Androscoggin River, no portion of the river has been formally designated as a "salmonid spawning area."

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[2] Boise-Cascade, International Paper, and James River.

Table 3-2. Class C water quality standards for Maine waters (Source: Central Maine, 1991).

A.	Class C waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as a habitat for fish and other aquatic life.
B.	The DO content of Class C water shall be not less than 5 parts per million or 60 % of saturation, whichever is higher, except that in identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, that water quality sufficient for these purposes shall be maintained. Between May 15th and September 30th, the number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 142 per 100 milliliters or an instantaneous level of 949 per 100 millimeters. The department shall promulgate rules governing the procedure for designation of designation of spawning areas. those rules shall include provision for periodic review of designated spawning areas and consultation with affected persons prior to designation of a stretch of water as a spawning area.
C.	Discharges to Class C waters may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

Flows in the Androscoggin River, and to a lesser extent in the Little Androscoggin River, are distributed relatively evenly among the seasons, though the highest flows typically occur during the spring runoff period in March, April, and May when melting snows combine with spring rains. Minimum flows in the Androscoggin and Little Androscoggin Rivers occur in the months of August and September.

The USGS has historically operated, or currently operates, streamflow gages at three locations on the lower Androscoggin River and the Little Androscoggin River[3] (Miller, 1990; Mitnik, 1983). The hydrologic characteristics of the Lower Androscoggin River Basin, as measured at USGS gaging stations, are summarized in Table 3-3.

[3] The USGS operates three additional gaging stations on the mainstem of the Androscoggin River (at Errol, Gorham, and Rumford) and operated a gaging station for two years at the Thompson Lake outlet stream on the Little Androscoggin River.

Table 3-3. Hydrologic characteristics of the lower Androscoggin River and Little Androscoggin River (Source: Miller, 1990; Mitnik, 1983; USGS, 1993).

Location of Gage Station (Source)	Drainage area (mi^2)	Discharge (cfs) Maximum	Minimum	Mean	7Q10
Androscoggin River Auburn, ME[1] (USGS 1929-1992)	3,263	135,000	340	6,143	1,484
Little Androscoggin River Auburn, ME[2] (USGS 1940-1982	328	16,500	14	569	29
Little Androscoggin River South Paris, ME[3] (USGS 1913-1924 1931-1990	73.5	9,340	1	139	2.5

Month	[1] Mean	[2] Mean	[3] Mean
January	4,461	421	88
February	4,371	447	84
March	7,255	883	210
April	15,164	1,709	468
May	11,770	866	220
June	5,827	469	110
July	3,530	256	50
August	3,122	191	40
September	3,255	204	42
October	4,148	308	79
November	5,490	524	139
December	5,256	561	130
ANNUAL	6,143	569	138

3.2.2. Resident and anadromous fisheries

The lower Androscoggin River below Gulf Island-Deer Rips currently supports both warmwater and coldwater resident species and a limited number of anadromous fish. MDIFW manages the river below the project for largemouth and smallmouth bass (commonly known as blackbass), pickerel, and perch. Moreover, since 1983, MDIFW has stocked the river below the project with brown trout. Table 3-4 shows the number of brown trout stocked below Gulf Island-Deer Rips from 1983 to 1991.

Gulf Island-Deer Rips is the fifth hydropower project on the Androscoggin River. Because of its present mode of operation, it may have an influence on estuarine and marine fishes that occur downstream of Brunswick, including Atlantic menhaden, Atlantic herring,

Atlantic pollock, Atlantic silverside, bluefish, red/white/silver hake, American sand lance, and Atlantic mackerel.

Prior to construction of dams and the pollution of the Androscoggin River from various industries and municipalities, Atlantic salmon, American shad, alewives, and shortnose sturgeon were very abundant in the river (AVCG, 1983). Pejebscot Falls supported one of the earliest (1628) river fisheries in New England. However, by the early 1930's, construction of dams and severe water pollution had virtually eliminated anadromous fish populations from the Androscoggin River. However, substantial improvement in water quality since the 1970's has enhanced the prospects for a successful restoration program for anadromous fishes in the Androscoggin River (Flagg *et al.*, 1994). In fact, remnant populations of rainbow smelt, alewives, and American shad have begun to expand in the estuary.

Table 3-4. Stocking history of brown trout in the Androscoggin River below Gulf Island-Deer Rips (Source: Central Maine, 1991).

Year	Size stocked	Number stocked
1983	4" - 6"	9,708
1984	8" - 10"	10,926
1985	6" - 8"	17,838
1986	6" - 8"	7,002
	8" - 10"	7,622
1987	6" - 8"	30,000
	8" - 10"	6,925
1988	8" - 9"	13,600
1989	8" - 9"	13,600
1990	8" - 9"	7,000
1991	8" - 9"	10,000

The objective of the Androscoggin River Fish Restoration Program is to restore anadromous fish (primarily American shad and alewife) to the Androscoggin River and its tributaries (i.e., Little Androscoggin River and Sabattus River) below Lewiston Falls (Flagg *et al.*, 1994). There are numerous factors involved in the successful restoration of anadromous fisheries to the Androscoggin River, including (1) adequate fish passage facilities, (2) habitat availability, (3) water quality, (4) agency management, and (5) funding availability. In 1977, Central Maine and MDMR entered into a formalized and cooperative fish restoration agreement. Through this agreement, upstream and downstream fish passage facilities have been constructed at Central Maine's Brunswick Project, the lowermost project on the river. Upstream and downstream fish passage facilities have since been constructed at Topsham-Hydro's Pejebscot Project and Miller Hydro's Worumbo Project, providing anadromous fish access to Lewiston Falls. Upstream fish passage facilities have not been constructed for projects on the Little Androscoggin River; though FWS (1989) indicates that a fish lift at Consolidated Hydro's Lower Barkers Mill Project would be required by 1999. Interim or permanent downstream fish passage facilities are operating at Consolidated Hydro's Lower and Upper Barkers Mill Projects and Hackett Mill Hydro's Hackett Mills Project. The FWS states that ultimately, the schedule and design criteria for fish passage on

the Little Androscoggin River will require a comprehensive approach, where the needs of each dam on the river are considered.[4]

In addition to fish passage needs, habitat availability in the lower portions of the river is dependent on hydro-operations and river flows. Water quality, although much improved in recent years, continues to be a concern, particularly local problem areas. Agency management and funding availability is always an important concern since future funding priorities can not always be foreseen, which can force agency goals and management objectives to change. For example, Central Maine quotes ASRSC as saying that due to budget constraints, its involvement in Atlantic salmon restoration efforts in rivers other than the class A priority rivers "has been discontinued" in order to focus resources on more important programs.

Atlantic salmon

At least 28 New England rivers contained significant salmon stocks in precolonial times (Ross, 1991); with several Maine river systems accounting for some of the more significant runs. Prior to the 19th century, total adult returns to rivers in Maine may have been as high as 500,000 fish (ASRSC, 1995). A large population of Atlantic salmon, historically, ascended the Androscoggin River to Rumford (ASRSC, 1982), negotiating the head-of-tide falls at Brunswick and Lewiston Falls in Lewiston. However, Atlantic salmon spawning runs were severely depleted in the Androscoggin River by the early 1800's; the last salmon reported caught at Lewiston was in 1815 (AVCG, 1983).

An attempt was made during the 1870's to restore the Atlantic salmon to the Androscoggin River through stocking and fishway construction, but was abandoned by 1884 (AVCG, 1983). Degraded water quality, inadequate fishways, and insufficient funds has prevented, and continues to prevent, successful salmon restoration to the river. According to Central Maine, ASRSC plans to restore Atlantic salmon to the Androscoggin River in the future, but has not developed a specific timetable for the restoration.

Presently, land use practices/development along the river corridor, an inadequate spawning run and insufficient stocks for restoration, fish passage, low marine survival, and conflicts with established fishery programs (i.e., inland fishery programs) are key issues affecting the restoration and management of Atlantic salmon in the Androscoggin River (ASRSC, 1995). Consequently, the Androscoggin River is one of eight rivers in Maine that is classified as a passive[5] restoration program for Atlantic salmon. Adult Atlantic salmon captured at the Brunswick fishway are transported and released at sites between Brunswick and Lewiston, and on the Little Androscoggin River. Since 1983, 547 returning adult

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[4] Given the present status of the basin's anadromous fisheries, fish passage facilities on the Little Androscoggin River would be designed primarily for alewife, rather than Atlantic salmon.

[5] Passive is defined as "limited activities occurring as resources allow."

salmon have been counted at the Brunswick fishway (Table 3-5); 534 have been released into the Lower Androscoggin River Basin. According to ASRSC (1995), the current status of Atlantic salmon in the Androscoggin River has been listed as "small, declining," while the restoration goal for the river during the 1995-2000 planning period is to "maintain current numbers, increase in future."

Despite the concerns identified above, FWS and ASRSC have recognized the importance of the Androscoggin River to the Atlantic salmon fishery in Maine. ASRSC estimates that the Androscoggin River once contained 85,000 units of spawning and nursery habitat [one unit = 100 square yards of habitat], which was about 16 percent of the total spawning and nursery habitat in Maine (ASRSC, 1984). Today, about 70 percent of the habitat remains. FWS estimates that 57,500 units of Atlantic salmon nursery habitat (about seven percent of Maine's total) exists in the Androscoggin River (FWS, 1989). This habitat has the potential to produce 115,000 salmon smolts, or about eight percent of Maine's total smolt production.[6]

Table 3-5. Counts of anadromous fish at the Brunswick fishway, 1983-1993 (Source: Rushton, *et al.*, 1990; Flagg, *et al.*, 1994).

	Fishway Counts		
Year	Alewife	Atlantic salmon	American shad
1983	601	20	2
1984	2,530	94	1
1985	23,895	22	0
1986	35,471	80	0
1987	63,523	27	0
1988	74,341	14	0
1989	100,895	19	0
1990	95,574	185	1
1991	77,511	21	0
1992	45,050	15	0
1993	5,202	47	1

Based on these habitat and smolt production estimates, FWS has established a goal of a self-sustaining Androscoggin River Atlantic salmon population of 790 adult spawners by the year 2011 (FWS, 1989). FWS projected the average annual run of returning salmon to be 130 fish for the period 1989-1996, 240 fish for the period 1997-2001, and 420 fish for the period 2002 to 2006. These projected returns were largely dependent

[6] The ASRSC estimates that currently about 3,798 square yards of habitat below Lewiston Falls are accessible as spawning and nursery habitat for Atlantic salmon in the Androscoggin River, which is about 1.3 percent of the total salmon spawning and nursery habitat in the State of Maine (ASRSC, 1995). Potential smolt production for this habitat is estimated to range from 6,350 smolts (2 smolts per unit of habitat) to 15,875 smolts (5 smolts per unit), with an average of 9,525 smolts (3 smolts per unit).

upon the installation of adequate fish passage facilities at Lewiston Falls by 2004 and Lower Barkers Mill (on the Little Androscoggin) by 1999, and the annual stocking of up to 350,000 salmon smolts starting in 1994 and 450,000 salmon fry starting in 1990[7].

American shad

Historically, American shad were abundant in all the major rivers of Maine, with a commercial fishery occurring from colonial days until about 1920 (MDMR, 1982). In 1912, an estimated 3.3 million pounds of shad were commercially harvested. However, because of dams and water pollution, the present shad runs in Maine have been reduced to a remnant of their former abundance. MDMR (1982) reports that the suitable and accessible watershed area for shad in Maine has been reduced from over 12,000 mi^2 to 690 mi^2, or about five percent of their former habitat. Today, American shad in Maine are incapable of supporting a commercial fishery.

American shad were also historically important in the lower Androscoggin River. The historical shad population in the Androscoggin-Kennebec system and tidal tributaries was reported to be greater than 500,000 fish, supporting a major commercial shad fishery below Brunswick (MDMR, 1982). However, by the early 1920's, the number of shad had declined dramatically due to dams and water pollution. Today, the Androscoggin-Kennebec complex and tidal tributaries support a shad population of less than 10,000 fish (MDMR, 1982).

American shad are only taken as an incidental catch in the alewife fishery below Brunswick, and do not represent a significant resource at this time. Since 1983, only five American shad have been counted at the Brunswick fishway (Table 3-5). Central Maine states that the reason for the low returns of shad are unknown. MDMR, however, speculates that the low returns are due to a combination of factors, including low numbers of returning adults to Merrymeeting Bay, the availability of large amounts of spawning habitat in the lower Kennebec River, and the lack of fish that were spawned in, and native to, the Androscoggin River which have the innate desire to move up into the Androscoggin River. We note that MDMR has stocked 3,215 adult shad (broodstock from the Cathance, Merrimack, and Connecticut River systems) to the Androscoggin River below Lewiston Falls since 1985 (Rushton *et al.*, 1990; Flagg *et al.*, 1994).[8] American shad have not been introduced to the Little Androscoggin River.

MDMR's present restoration plans call for maintaining and enhancing existing runs of shad, and expanding the runs in selected river systems, including the Androscoggin River

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[7] The projected allocation of Atlantic salmon hatchery production is for the Kennebec and Androscoggin Rivers combined.

[8] Central Maine, in their February 16, 1996, letter commenting on the DEIS, indicates that the MDMR has stocked 4,673 adult American shad in the Kennebec and Androscoggin Rivers, citing limited stock availability and the long trucking distance as reasons for the low numbers.

(MDMR, 1982). Restoration plans for the Androscoggin River include the Androscoggin River below Lewiston Falls, the Sabattus River, and the Little Androscoggin River below Norway. The Lower Androscoggin River Basin has the potential to produce an estimated 85,000 to 125,000 adult shad (MSPO, 1992).[9] As a means to achieve these restoration goals, MDMR, in cooperation with other partners, has developed a small American shad hatchery. This hatchery is one step towards increasing the future shad restoration efforts in Maine (Central Maine's February 16, 1996 letter commenting on the DEIS).

Alewife

Alewives were also historically common in the lower Androscoggin River below Lewiston Falls (MDMR, 1982). However, much like the American shad, alewife were adversely affected by dam construction and water pollution. Presently, alewife, although having little recreational value in Maine, are harvested locally in areas below Brunswick for use as lobster bait, trawl bait, and processing into fish protein (MDMR, 1982). Statewide, over 90 percent of the current annual harvest is used as lobster bait.

Since 1983, returns of alewife collected at the Brunswick fishway have totalled 548,488 fish, with only 5,202 being collected in 1993 (Table 3-5). MDMR has stocked a total of 286,659 adult alewife (including periodic supplemental stocks from the Kennebec River) to the Androscoggin River below Lewiston Falls (Rushton *et al.*, 1990; Flagg *et al.*, 1994). The Little Androscoggin River is a large part of MDMR's stocking program; 86,396 of the 286,659 alewife stocked in the Lower Androscoggin River Basin were stocked in lakes and ponds above Marcal on the Little Androscoggin River, or about 30 percent of the alewife released to the drainage.

According to Central Maine's February 16, 1996 letter, a major factor in the successful restoration of alewife to the lower Androscoggin River was the trapping-and-trucking of returning adult alewife at the Brunswick fishway, and the subsequent stocking of a large number of these alewife to lakes and ponds that contained superior spawning and juvenile habitat, which drain to the lower Androscoggin River. Because the public perceived that the stocked alewife competed with the more favorable trout, salmon, and bass, MDMR discontinued stocking alewife in Thompson and Sabbatis Lakes in 1986-87, which together represent more than 50 percent of the total spawning habitat available in lakes and ponds in the lower Androscoggin River watershed. Total alewife production and the number of returning alewife to the Brunswick fishway declined significantly as a result of removing these two lakes from the alewife program.

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[9] MDMR estimates that the section of river between Brunswick and the Pejebscot Project could support 37,000 adult shad, and the section between Pejebscot and the Worumbo Project could support an additional 26,000 adult shad. Between Worumbo and the Lewiston Falls Project, MDMR estimates that 100,000 adult shad could be supported. [Central Maine's February 16, 1996 letter of comment on the DEIS].

MDMR's present restoration plans call for maintaining and enhancing existing runs of alewife, and expanding the runs in selected river systems, including the Androscoggin River (MDMR, 1982). Restoration plans for the Androscoggin River include the Androscoggin River below Lewiston Falls, the Sabattus River, and the Little Androscoggin River below Norway. The Lower Androscoggin River Basin has the potential to produce an estimated 660,000 pounds of alewife (MSPO, 1992). This level of production is based on continued access to habitat in Taylor Pond, the Range Ponds, Tripp Pond, and Pennesseewassee Lake, all located on the Little Androscoggin River.

Shortnose Sturgeon

Historically, the shortnose sturgeon (*Acipenser brevirostrum*) was probably mistakenly harvested as juvenile Atlantic sturgeon, but presently are of no commercial value (MDMR, 1982). The shortnose sturgeon is the only fish species in Maine listed as endangered by the federal government. However, Edwards Manufacturing Co., Inc. (1994; Edwards) has filed a petition to delist the shortnose sturgeon population of the Kennebec River system (Kennebec, Androscoggin, and Sheepscot Rivers, Maine) under the Endangered Species Act, 16 U.S.C. Sections 1531 *et seq.* (1988) (as amended).

The species is restricted to the east coast of North America, and occurs from the St. John River, New Brunswick to the Indian River, Florida. Populations also exist in the Delaware, Hudson, and Connecticut Rivers. Throughout its range, shortnose sturgeon occur in rivers, estuaries, and the ocean, with most populations having their greatest abundance in the estuary of their respective rivers. The Androscoggin-Kennebec estuary (Merrymeeting Bay) and the Penobscot River are the only locations in Maine where the shortnose sturgeon is known to occur (MDMR, 1982). According to evidence presented by Edwards (1994) the number of adult shortnose sturgeon living in the Androscoggin-Kennebec estuary is estimated to be about 10,000 fish.

In the Androscoggin River, studies conducted from 1980 through 1983 by MDMR found that a potential spawning site of the shortnose sturgeon may be located near head-of-tide at Brunswick (Squires, 1983). Studies conducted in 1993 confirmed that a population of shortnose sturgeon utilize sites approximately 1,500 feet downstream from the Brunswick dam for spawning (Squires *et al.*, 1993).

During their study, Squires *et al.* (1993) caught a large number of shortnose sturgeon at a site located on the Brunswick shore near head-of-tide. These catches were made in late April through mid-May. Water temperatures ranged from 47.3 °F to 58.1 °F. The substrate at the sampling sites graduated from ledge, boulders, cobbles, pebbles, and gravel on the Brunswick shore to sand in the middle of the river channel to silt on the Topsham shore. The maximum depth at low tide was about 21 feet with an average depth of ten feet. Water velocities in the area during an out-going tide ranged from 1.1 feet per second (fps) to 2.0 fps. While not documented in this study, studies in New England and Canada have shown that shortnose sturgeon are estuarine dependent, and rarely, if ever, move any

distance outside a river's influence.

MDMR's management objectives for the shortnose sturgeon include maintaining good water quality on spawning and nursery grounds and maintaining a barrier-free approach to migration to and from spawning grounds (MDMR, 1982).

3.2.3. Wetlands

Historically, coastal and inland wetlands were viewed as worthless parcels of land that could only become "productive" by human-induced changes. Today, wetlands continue to be altered for agriculture, residential development, transportation, industry, and recreation.

In Maine, wetlands have been drained and ditched for establishing hay, grain, forage, and vegetable crops. Wetlands have also been drained for timber cutting. In addition, activities such as road and highway construction, building construction, and mineral mining have resulted in a loss of inland wetlands. In contrast to these avenues for wetland loss, beaver impoundments and impoundments created by dams for water supply and hydroelectric generation, as well as local changes in drainage patterns, may have been a benefit to wetland development. However, the general belief remains that there has been a net loss of wetlands in Maine, and that the quality of many existing wetlands has been reduced by improper land use management practices, adverse environmental impacts, and development pressure (New Hampshire Office of State Planning, 1989).

On a statewide basis, wetlands occupy 24.5 percent of the total surface area of Maine (Dahl, 1990). The Androscoggin River watershed occupies 2,750 mi^2 (1,760,000 acres) in the State of Maine. Applying the 24.5 wetland percentage for Maine, we estimate that about 431,200 acres of the Androscoggin River Basin in Maine are wetlands.

The FWS (1990) estimates that the state of Maine has lost about 20 percent of its total wetlands during the period from the 1780's to the 1980's. We do not have an estimate for wetland losses in the Androscoggin River Basin. However, if we apply the same loss percentage to the Androscoggin River, about 86,240 acres of wetlands have been lost. It is important to recognize that this estimate assumes that the wetland losses have been at the same rate as the whole state. This may, or may not, be the case. A variety of influences affect wetland losses and are not necessarily uniform across the state.

3.2.4. Hydroelectric generation

The Androscoggin River Basin has a long history of human inhabitants, beginning with the paleoindians between 9000-7000 B.C. Beginning largely as a result of the lumber industry, the historical development of the lower Androscoggin River and its water power started in the late 1700's.

Although settlement during the first half of the 19th century was primarily oriented toward agriculture in the upper Androscoggin River Basin, logging soon followed (FERC, 1993). The first sawmill was built in Gorham, New Hampshire in 1823. The first pulp manufacturing mill in Berlin began operation in 1877; several additional pulp and paper mills, including those in Rumford, Maine, were established during the 1800's.

From the late 1700's through the late 1800's (about 1880), the Androscoggin River was used primarily for log drives to the mills and for rafting lumber to downstream markets. Beginning in the mid-1800's, the storage reservoirs in the basin's headwaters were operated to provide adequate flow for the lumber industry. Since the late 1800's, these headwater storage reservoirs have been operated to manage the flow of water in the Androscoggin River for power and manufacturing purposes.

The central and lower Androscoggin River drainage was settled by the first Europeans throughout the 18th century. At Gulf Island-Deer Rips, the first recorded development occurred around the turn of the 19th century, when several small mill operations existed at the mouth of the Nezinscot River where it empties into what is today the Gulf Island impoundment. A small dam and box factory was also located near the mouth of the Nezinscot River. This factory existed until sometime in the 1920's, when Central Maine bought the water rights to the land for construction of the existing Gulf Island dam. Construction of Gulf Island dam was started in 1925, and commenced operation on October 26, 1926.

The Little Androscoggin River, during its early development (late 1700's - late 1800's), was used primarily as a transport route for logs and lumber (FERC, 1989). By the late 1800's, sawmills were in operation along the Little Androscoggin River. The stone dam at Marcal was likely constructed in 1866 with a log sluice structure for easy passage of logs and lumber past the dam. The existing Marcal generating facilities were constructed in 1889.

Today, in the Lower Androscoggin River Basin, there are 17 licensed hydroelectric developments and one unlicensed development that represent about 125.0 MW of capacity, including 13 developments on the mainstem of the lower Androscoggin River (121.8 MW of capacity) and six developments on the Little Androscoggin River (4.61 MW of capacity) (*see Table 1-2*).

Total useable storage in the Androscoggin River Basin is estimated to be 753,000 AF (FPC, 1964). Eighty-nine percent (670,000 AF) of the useable storage is located in the basin's headwater storage reservoirs. The lower Androscoggin River contains an estimated 1.5 percent (11,623 AF) of the basin's total useable storage; the Gulf Island impoundment represents about 89 percent (10,300 AF) of this total. Section 2.1 contains a detailed discussion of current project operations in the lower Androscoggin River.

Because the majority of the Androscoggin River's useable storage is located in the basin's headwater, maintaining a target flow of 1,550 cfs from the headwater storage reservoir has resulted in changes to the basin's surface water hydrology (AVCG, 1983). The headwater storage reservoirs are operated such that water is stored during periods of high runoff and released during periods of low runoff. This management regime reduces the seasonal fluctuation in flows that would occur naturally throughout the entire river system. For example, spring flows are reduced by about 5,000 cfs at Auburn, while summer low-flows are increased significantly (AVCG, 1983).

The combination of hydropower dams and flow regulation has had positive and negative effects on resources in the basin (AVCG, 1983). Dams have contributed to the decline, and in some cases, the elimination of historical anadromous fish runs in the lower portion of the basin. Flow regulation may also have had an adverse effect on waterfowl and recreation in the headwater reservoirs. As a benefit, maintenance of relatively uniform flows has increased the river's capacity for waste assimilation, while hydroelectric generation has provided an indigenous energy source for the industries of the basin.

3.3. Site specific resources

3.3.1. Gulf Island-Deer Rips (CASE 1)

3.3.1.1. Geology and soils

The bedrock in the project area is comprised of metamorphosed sedimentary rocks of Silurian age and granite of Devonian age. The premetamorphic character of the metamorphic rocks consisted of sandstones, limestones, and shales. The project reservoir transects a granite intrusive known as the Leeds Pluton, which is a two mico granite with weak to moderate foliation. Rock outcrops along the impoundment shoreline are rare, and there are no major structural features, no unique structural patterns, and no known mineral deposits in the project area's bedrock.

Surficial deposits overlaying the bedrock in the project area consist of glacial-marine deposits and glacial till. Glacial-marine deposits, consisting of silts and clays, are found in much of the lowland areas along the banks of the Androscoggin River. Associated with the glacial-marine deposits are numerous DeGeer moraines -- short arcuate ridges oriented parallel to the edge of the last major ice sheet that moved across New England. Glacial till deposits, consisting of an unsorted mixture of sands, silts, clays, and boulders, are found in most of the upland areas along the banks of the Androscoggin River. Glacial till is one of the most widespread surficial deposits in Maine, forming the humocky, rocky topography seen in many inland and coastal areas of the state (Central Maine, 1991).

3.3.1.2. Water quality and quantity

The Gulf Island dam impounds a narrow, 2,862-acre body of water about 14.7 miles long and 0.25 mile wide. The 130-acre Deer Rips impoundment extends upstream about 1.3 miles to the tailwater of the Gulf Island development. Lewiston Falls, the closest dam, is approximately five miles downstream.

The Gulf Island and Deer Rips impoundments are operated to generate power at each of the project's three developments. Central Maine operates the Gulf Island development as a weekly peaking facility and the Deer Rips/Androscoggin No. 3 developments as run-of-river facilities. Flows up to 6,450 cfs are used for generation with excess spilled over the project's two dams. The existing Gulf Island-Deer Rips Project has no minimum flow requirement, but acts to regulate flows in the lower Androscoggin River with flows released on a variable discharge schedule depending on system electrical demand, available storage, and total river flow (*see Section 2.1.1.*). Although the current license for Gulf Island-Deer Rips does not require a minimum flow, Central Maine provides a continuous minimum flow of 1,000 cfs at Gulf Island-Deer Rips to meet the Lewiston Falls interim minimum flow requirement. Normal peaking operation, which occurs roughly 70 percent of the time, can result in weekly impoundment drawdowns of up to four feet, depending upon inflow. Typical project flows range from 1,000 cfs to 6,450 cfs.

The USGS currently operates one streamflow gage on the lower Androscoggin River about six miles downstream from Gulf Island-Deer Rips at Auburn, Maine (USGS gaging station No. 01059000). Based on this gage's flow data, the mean annual river flow for the Androscoggin River at Auburn (drainage area = 3,263 mi^2) is 6,143 cfs; monthly and annual flow duration are provided in Table 3-6. Flow statistics for Gulf Island-Deer Rips, while not derived, would be slightly less than the flow statistics for the USGS gage, because the USGS gage has a slightly larger drainage area than the project (drainage area = 2,865 mi^2) and the gage data include the flows from the Little Androscoggin River (drainage area = 328 mi^2).

Water quality data has been collected by a variety of sources in the project area over the past 15 years, including studies by MDEP, Boise-Cascade and International Paper, and Central Maine. In addition, USGS operates one water quality monitoring station in the Gulf Island impoundment.

Dissolved Oxygen

The 1983 wasteload allocation study (Mitnik, 1983) consisted of sampling on three consecutive days at four different time periods [June, 1980; July, 1980; April, 1981; and August, 1982]. The Androscoggin River was sampled at 11 stations from Rumford to Turner in 1980 and 1981, and at eight stations in the Gulf Island impoundment in 1982. During August, 1982, the Gulf Island impoundment was also sampled (vertical profiles) weekly at ten stations. The Androscoggin River downstream from Gulf Island-Deer Rips was sampled on three consecutive days in April/May, July, and October, 1981.

Table 3-6. Monthly and annual flow duration[1] for the USGS gage No. 01059000 on the lower Androscoggin River at Auburn, Maine (1929-1992)(Source: USGS, 1993).

Month	Percent Exceedence (%)								
	10	20	30	40	50	60	70	80	90
January	6,840	5,490	4,770	4,300	3,880	3,560	3,150	2,630	2,090
February	6,640	5,430	4,740	4,270	3,900	3,570	3,240	2,620	2,040
March	12,600	8,370	6,990	6,040	5,320	4,760	4,210	3,600	2,700
April	26,100	20,400	17,300	15,000	13,100	11,500	10,000	8,600	7,180
May	21,500	16,600	14,000	11,800	9,700	8,200	7,000	5,890	4,660
June	9,750	7,460	6,370	5,500	4,790	4,270	3,880	3,370	2,560
July	5,250	4,370	3,960	3,630	3,300	3,040	2,750	2,240	1,440
August	4,610	3,930	3,550	3,240	3,020	2,770	2,500	2,080	1,110
September	4,540	3,840	3,460	3,170	2,920	2,710	2,410	1,860	1,040
October	7,040	4,850	4,120	3,670	3,300	2,970	2,650	2,270	1,230
November	9,450	7,160	5,910	5,000	4,440	3,890	3,340	2,780	2,010
December	8,600	6,370	5,350	4,700	4,200	3,700	3,270	2,780	2,030
ANNUAL	13,000	7,960	5,980	4,850	4,180	3,660	3,190	2,700	1,960

[1] The flow duration curves for the USGS gaging station on the lower Androscoggin River include flow input from the Little Androscoggin River.

Review of the 1981 and 1982 data indicate that portions of the Gulf Island impoundment were not in compliance with the State's Class C standard for DO (5.0 mg/l and 60 percent saturation) (Mitnik, 1983). Looking at 1982 data, DO levels generally decreased from the up-river sites (8.8 - 7.1 mg/l) to the Gulf Island impoundment (7.5 - 5.5 mg/l). The maximum depletion (DO sag point) occurs in the Gulf Island impoundment at the dam.

In the Gulf Island impoundment, DO conditions can vary considerably both spatially and temporally. Generally, the lowest DO concentrations are observed during July and August. Moreover, due to the depth of the impoundment, seasonal stratification (partitioning of water masses into distinct layers, most often based on temperature) often occurs in the Gulf Island impoundment during these months. Under these conditions, DO at depth is rapidly depleted and does not mix with re-aerated waters from the surface, resulting in DO concentrations which quickly decline to near zero. A typical DO profile for the Gulf Island impoundment without oxygen injection is presented in Figure 3-1. According to Mitnik

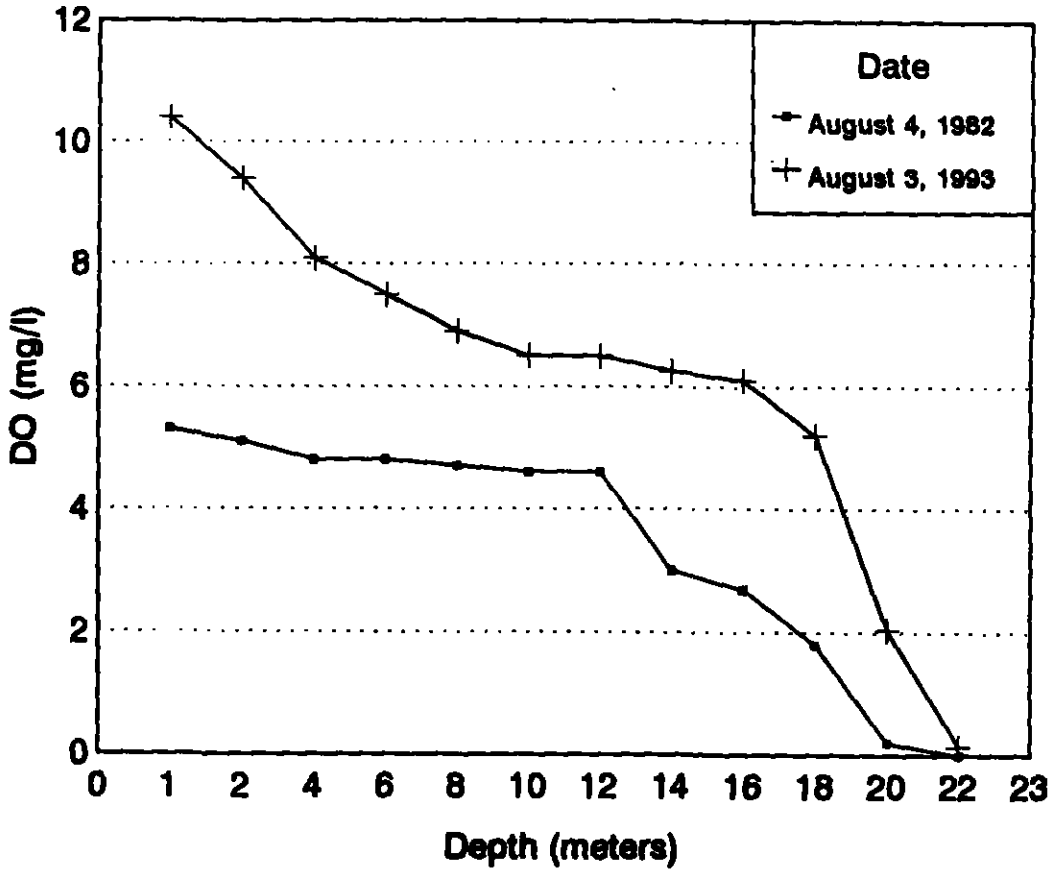

Figure 3-1. Typical summer DO profile for the Gulf Island impoundment with and without oxygen injection (Source: Mitnik, 1983; Central Maine, 1994c).

(1983), the DO stratification easily breaks down with high river flows and high winds, but quickly re-establishes thereafter. In addition to DO, SOD was measured in the Gulf Island impoundment. Values of SOD ranged from 1.5 to 2.0 $g/m^2/day$ (grams per square meter per day).

Dissolved oxygen concentrations directly below Gulf Island dam generally reflect the quality of water in the impoundment, but gradually improve in the downstream river reaches. During July, 1991, DO measured below Gulf Island dam varied from 5.4 to 6.3 mg/l. Downstream of Lewiston Falls, DO was generally above 8.0 mg/l.

Based on the 1982 sampling and water quality modelling, Mitnik (1983) concluded that: (1) Class C standards for DO are not being met under average summer flow conditions; and (2) the current discharge limits for Boise-Cascade and International Paper are excessive; a 40 percent reduction in summer limits and a 24 percent reduction over the entire year would be needed to meet Class C standards. Boise-Cascade and International Paper are

presently working with MDEP to reduce the levels of discharge to the Androscoggin River.

The major component of MDEP's 1983 Wasteload Allocation Study was the development of a one-dimensional water quality model, which was incapable of modelling water quality in the Gulf Island impoundment. MDEP's 1983 study was followed by studies conducted by Boise-Cascade and International Paper from 1984 through 1989, which resulted in a modified water quality model capable of modelling water quality in the Gulf Island impoundment.

The conclusions drawn from Boise-Cascade's and International Paper's studies were similar to those reached in MDEP's 1983 study (Water Quality Associates (WQA), 1985). In addition to these results, average SOD in the Gulf Island impoundment ranged from 1.4 to 2.6 $g/m^2/day$. In comparison, SOD in the upper river is estimated at 0.5 $g/m^2/day$. WQA (1985) also concluded that SOD and oxidation of BOD are the major factors contributing to he Gulf Island impoundment's DO problems. During the August, 1984 survey, SOD and BOD oxidation each reduced DO in the impoundment a maximum of about 2 mg/l.

Based on Boise-Cascade's and International Paper's model[10], an estimated 65 percent of the Gulf Island impoundment did not meet the state's 5.0 mg/l DO standard under extreme low flow (7Q10), summer conditions. Moreover, assuming zero discharge from the upstream paper companies, DO in the Gulf Island impoundment (eight percent of the impoundment's water volume) would continue to fall below the 5.0 mg/l: the effects of stratification, long residence time, and high SOD were cited as reasons. As a result of these findings, MDEP and the paper companies began to pursue instream oxygenation as a viable means of raising DO levels in the Gulf Island impoundment to meet Maine's Class C standards.

In 1990, under agreements with Central Maine, Boise-Cascade, International Paper, and James River, MDEP established GIPOP. Contributions to the partnership/expenses were determined based on relative contributions of upstream discharges and the Gulf Island dam to the DO deficit in the impoundment. MDEP estimated Central Maine's share to be 14 percent, with the remaining responsibility being shared among the three paper companies.

The GIPOP facilities are designed to inject pure oxygen into the Gulf Island impoundment at an effective rate of 27,000 lbs/day, an amount which MDEP and EPA determined to be required to offset the deficit created by existing BOD loads and SOD rates. The DO monitoring program associated with the operation of GIPOP consists of DO/water temperature probes placed at multiple depths at two locations in the impoundment; one upstream of, and one downstream from, the oxygen injection site (Central Maine, 1994b). The GIPOP facility is operated annually from June 1 through September 30 (*for further discussion about GIPOP, see Section 4.1.1.2.*).

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[10] The model assumes pre-1991 licensed loading limits for Boise-Cascade, International Paper, and James River.

Based on the data collected to date, GIPOP appears to have improved DO levels in the Gulf Island impoundment. The results of continuous monitoring in the impoundment indicates that operation of GIPOP has raised DO levels in nearly the entire impoundment to meet the State's 5.0 mg/l DO standard (Central Maine, 1994a). According to comments filed by the MDEP and the Conservation Coalition on the DEIS, for the four-year period from 1992 to 1995, between 84 percent to 96 percent of the Gulf Island impoundment's volume of water met the state's DO standard of 5.0 mg/l [or 4 percent to 16 percent of the impoundment's water volume continues to fall below the minimum DO standard]. A typical DO profile for the Gulf Island impoundment with oxygen injection is shown in Figure 3-1.

Prior to 1986 most of the water quality studies conducted for the Androscoggin River focused on the Gulf Island impoundment and upstream waters affected by paper mill discharges. Water quality for the Gulf Island tailwater and Deer Rips impoundment/tailwater were collected as part of a water quality monitoring/modelling study for Gulf Island-Deer Rips and Lewiston Falls (Stetson-Harza, 1990). Water quality data were collected at 18 survey stations from Gulf Island dam to the downstream end of Dresser's Rips, and were collected during two different consecutive three day periods, July 30-August 1 and August 13-15.

The results of the 1989 water quality study indicate that prior to implementing GIPOP water quality conditions downstream of the Gulf Island dam to Lewiston Falls generally reflected the low DO concentrations in the water released from the Gulf Island impoundment. During the sampling periods, DO concentrations in the Gulf Island impoundment ranged from 3.4 to 3.9 mg/l, while DO downstream to Dresser's Rips ranged from 3.0 to 5.0 mg/l. Little aeration of water discharged below either the Gulf Island or Deer Rips dams occurs. However, DO levels downstream of Lewiston Falls were elevated by 1.0 to 2.0 mg/l, which was attributed to aeration effects through the Lewiston Canal system.

The modelling conducted by Stetson-Harza (1990) produced consistent results with and confirmed the conclusions drawn from, the on-site surveys; with a starting DO concentration of 3.5 mg/l in the Gulf Island tailrace, DO levels downstream through Dresser's Rips remain below the 5.0 mg/l standard. Stetson-Harza (1990) concluded that DO levels of at least 5.0 mg/l in the Gulf Island tailrace are needed to keep the Androscoggin River from the Gulf Island dam through Dresser's Rips above the 5.0 mg/l standard. Data collected on August 13, 1993 as part of the GIPOP monitoring program shows DO levels in the Gulf Island tailrace that range from 7.03 to 9.13 mg/l (Central Maine, 1994c).

Toxic Pollutants

Boise-Cascade and International Paper conducted limited water quality sampling of the Gulf Island impoundment to document the presence of organic and heavy metal pollutants (Slocomb *et al.*, 1985). Nineteen metals (calcium, magnesium, sodium, potassium, aluminum, antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead,

manganese, mercury, nickel, selenium, silver, and zinc) were analyzed in samples from eight locations in the Androscoggin River (from RM 134 to RM 27.4), including the Gulf Island impoundment. Of the metals tested, all were found to be below detectable concentrations for each of the compounds. However, the detection limits for some metals, including mercury, were higher than the water quality criteria set by EPA (EPA, 1986).

Elevated levels of heavy metals and other pollutants (i.e., dioxin, polychlorinated byphenyls (PCB), etc.) in the Gulf Island impoundment would be indicative of a river showing general system-wide cumulative contamination from multiple input sources of these industrial pollutants. The project itself is not directly the source for any of the elemental metals, or any other point-source pollutant to water quality. The presence of the Gulf Island impoundment, however, acts as a sink for relatively insoluble elements and compounds that flow downstream from sources up-river and either sink or bind with sediments in the impoundment. While there is no evidence linking project operations and pollutants in the Gulf Island impoundment, fluctuating impoundment elevations could resuspend pollutants bound in the impoundment's sediments.

Mercury is a natural constituent of surface soils and rocks, particularly those of igneous origin. The primary mechanism of mercury release to the environment, which occurs as a natural process, includes outgassing and weathering of rocks. Studies from Wisconsin (Sheffy, 1987) have shown that as much as 66 percent of mercury input can be from natural sources. The major anthropogenic sources (i.e., human activities) that release mercury to the environment include burning fossil fuels and municipal wastes, mining and smelting ores containing mercury, using latex paints that contain mercury, and performing various industrial processes (Collins and Cole, 1990). There are at least three paper companies that historically operated upstream of Gulf Island-Deer Rips; Boise-Cascade, International Paper, and James River. These companies currently operate pulp and paper mills upstream from the project. In addition, there may exist other past or present point-sources of mercury and dioxin. In terms of point-source pollution, studies have shown that mercury is present in the Gulf Island impoundment (Slocomb *et al.*, 1985).

Inorganic mercury, the form of mercury typically released into the environment, is insoluble in water and typically not bioavailable. Microorganisms living in the sediments convert inorganic mercury to a more toxic form of mercury, methylmercury. Methylmercury can bioaccumulate in living tissue and cause toxic effects on the nervous systems of people and wildlife that consume contaminated fish. Mercury is absorbed by the gills of fish as water passes over them or, more readily, by accumulation through the food chain (Gerstenberger *et al.*, 1993). Studies have shown that mercury may become more biologically active in impoundments, and there is growing evidence to suggest that the fluctuation of impoundment levels creates an environment that may enhance the methylation of mercury (Major and Carr, 1991).

We are not aware of any sampling that has been conducted on impoundment sediments, the primary repository for relatively insoluble heavy metal compounds. It is

highly probable that impoundment sediments have elevated levels of numerous insoluble metal compounds, both naturally occurring and as the product of previous and/or existing upstream industrialization. Sediment-borne chemicals may undergo biological uptake through the food chain, resulting in bioaccumulation in aquatic organisms while being only minimally present in the water column. Thus, sampling of the water column alone may not accurately represent the presence or bioavailability of specific compounds in the project area.

Concentrations of various heavy metals in fish tissue, including mercury, were reported by Slocomb *et al.* (1985). Furthermore, concentrations of dioxin in fish tissue are reported by Mower (1995). Results of the fish tissue analysis are described in Section 3.3.1.3.

River Turbidity

To investigate concerns raised by FWS regarding potential decreases in littoral zone water clarity due to fluctuating impoundment levels, Central Maine conducted a turbidity study for the Gulf Island impoundment during the summer of 1990. Specifically, turbidity measurements were collected weekly during the months of July and August at two locations in the Gulf Island impoundment located about seven miles upstream of the Gulf Island dam.

Results of the study indicated that in general, turbidity levels (in Nephelometric Turbidity Units; NTUs) were relatively low for the littoral zone and main river channel (ranging between 1.0 and 4.0 NTUs). Moreover, there was no apparent difference in the measured main channel and littoral zone turbidity levels for the two months monitored.

Turbidity levels in the Androscoggin River were also measured by Mitnik (1983), in conjunction with the river's Wasteload Allocation Study. Turbidity was measured at multiple stations upstream of the Gulf Island dam, in the Gulf Island impoundment, and downstream from the Gulf Island dam. Mitnik (1983) reports that turbidity levels (in NTUs) in the Gulf Island impoundment (avg = 4.2) do not differ significantly from turbidity levels upstream of (avg = 3.8), or downstream from (avg = 3.5), the Gulf Island dam.

Available evidence from these two studies suggest that Central Maine's current operation of Gulf Island-Deer Rips, with up to a four foot weekly fluctuation of the Gulf Island impoundment, is having little, if any, effect on turbidity levels in the Gulf Island impoundment and the lower Androscoggin River.

Water Supply

There are no known consumptive uses of project waters, nor do we know of any future proposals for water withdrawals within the project area. Even with no change to current project operation, future water withdrawal projects in the upper portions of the basin could affect the future water supply to the Gulf Island/Deer Rips/Androscoggin No. 3 facilities and downstream river reaches. Continued peaking operation at the project would

result in on-going short-term daily and/or weekly flow fluctuations in the lower Androscoggin River below the Deer Rips and Androscoggin No. 3 developments. Because of the minimal storage capacity of the project's impoundments (particularly the Deer Rips and Androscoggin No. 3 impoundment), Gulf Island-Deer Rips would have a negligible effect on seasonal availability of water.

3.3.1.3. Fisheries resources

The Androscoggin River, including the project area, is classified by MDIFW as a mixed warm-water and cold-water fishery (MDIFW, 1982), with the segment of the river encompassing the project area having both warm-water and cold-water fishery management objectives. Moreover, in their DEIS comments, the MDEP also indicated that under Maine's water quality guidelines, the Androscoggin River should be of sufficient quality to support all species of fish indigenous to the river system, including salmonids.

Located between RM 41.1 and RM 26.4 on the Androscoggin River, the Gulf Island impoundment contains both coldwater and warmwater resident species, but is dominated by warmwater species. The Gulf Island impoundment is best known for its excellent blackbass fishery. The impoundment is the site of regular bass fishing tournaments, and gets considerable use by anglers seeking trophy-size bass. Table 3-7 lists all the resident fish species that have been found in the Gulf Island impoundment. The Deer Rips impoundment is located at RM 25.2 on the Androscoggin River. Little is known about the Deer Rips impoundment fishery, but is believed to contain similar fish species to those inhabiting the Gulf Island impoundment.

The principal game species of the warmwater fish community in the project area is the largemouth bass. Smallmouth bass, chain pickerel, pumpkinseed, yellow perch, and white perch are also fairly common game species. In addition to these warmwater species, MDIFW stocks brown trout (*Salmo trutta*) in the Androscoggin River upstream of the Gulf Island impoundment and in the Nezinscot River, a tributary to the Gulf Island impoundment. Brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), landlocked Atlantic salmon (*Salmo salar*), and various minnow species are known to occur upstream of the Gulf Island impoundment, and therefore, may be found within project waters. No anadromous fish have been stocked, or are known to occur, in the project area.

Fish growth and overall condition in the Gulf Island impoundment is considered good to excellent, and compares favorably with fish populations studied in other bodies of water (Quest Environmental Sciences, Inc., 1987; Stetson-Harza, 1989; Central Maine, 1992a).

As part of the water quality studies conducted by Boise-Cascade and International Paper in 1984 (Slocomb *et al.*, 1985), a limited investigation of fishes from Gulf Island impoundment was done, which included evaluating contaminants in fish tissue. Specifically, fish tissue samples were analyzed for various heavy metals and organic compounds. Fish tissue from largemouth and smallmouth bass, yellow perch, white sucker, and chain pickerel

were analyzed. The organic compounds analyzed included PCBs, but not dioxin. Blackbass, a recreationally significant fishery in the Gulf Island impoundment, contained levels of the organic compounds generally at or below the expected body burdens[11] (Slocomb *et al.*, 1985).

Table 3-7. Fish species known to inhabit the Gulf Island impoundment (Source: Central Maine, 1991).

COMMON NAME	SCIENTIFIC NAME
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
Chain pickerel	*Esox niger*
Yellow perch	*Perca flavescens*
White perch	*Morone americana*
Black bullhead	*Ictalurus melas*
Brown bullhead	*Ictalurus nebulosus*
Pumpkinseed	*Lepomis gibbosus*
Landlocked alewife	*Alosa pseudoharengus*
White sucker	*Catostomus commersoni*
Fallfish	*Semotilus corporalis*
Golden shiner	*Notemigonus chrysoleucas*
Common shiner	*Notropis cornutus*
Spottail shiner	*Notropis hudsonius*

Fourteen heavy metals were analyzed, including mercury. Mercury levels in fish tissue were generally less than the federal standard of 1.0 μg/g, but exceeded this 1.0 μg/g standard in nearly a third of the fish tissue samples, with the yellow perch, as a species, having the greatest overall concentrations (Slocomb *et al.*, 1985). The wholebody tissue levels for metals in blackbass caught in the Gulf Island impoundment, including those for mercury, generally fall within or below the national range of metal concentrations. Further, the mercury levels reported by Slocomb *et al.* (1985)[12] for largemouth and smallmouth bass, yellow perch and chain pickerel, when adjusted for weight differences, were also consistent with those levels reported by Stafford (1994)[13] for predatory fishes in Maine.

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[11] Expected body burdens were determined as a function of ambient water criteria levels for the organic compounds and known bio-accumulation factors for freshwater fish.

[12] Mean concentrations for mercury in fish from the Gulf Island impoundment were 0.84 μg/g (largemouth bass; mean weight=845 g), 0.72 μg/g (smallmouth bass; mean weight=756 g); 1.53 μg/g (yellow perch; mean weight=198 g); and 0.75 μg/g (chain pickerel; mean weight=444 g).

[13] Mean mercury concentrations in predatory fish from Maine were 0.57 μg/g (largemouth bass; mean weight=502 g), 0.67 μg/g (smallmouth bass; mean weight=502 g); 0.28 μg/g (yellow perch; mean weight=175 g); and 0.92 μg/g (chain pickerel; mean weight=548 g).

In the DEIS, staff stated that health advisories issued by the State of Maine on fish from the river suggested that dioxin was present in the river. The Conservation Coalition, in a February 21, 1996 letter, referred staff to Maine's 1994 report on its Dioxin Monitoring Program for specific data on dioxin levels in fish from the Gulf Island impoundment.

Data collected in 1994 (Mower, 1995) showed, among other things, the following:

(1) Dioxin concentrations were highest in fish sampled from the Androscoggin River, when compared with fish samples taken from some the state's other river systems where similar tests were conducted (i.e., the Kennebec, Penobscot, Presumpscot, Salmon Falls, and West Branch of the Sebasticook Rivers).

(2) Dioxin concentrations in fish decrease continually in fish tissue samples taken from Rumford, Maine downstream to Brunswick, Maine.[14]

(3) Dioxin concentrations exceeded Maine's maximum acceptable concentrations for the protection of consumers from an increased cancer risk of one in one million (0.15 parts per trillion; ppt), or for the protection of consumers from adverse reproductive effects (0.37 ppt).[15]

Fisheries Management and Habitat Assessments - The goals for managing the Androscoggin River's resident fisheries in the Gulf Island-Deer Rips area are: (1) to maintain optimum population levels for resident species; (2) to maintain optimum quality, quantity, and diversity of habitat; and (3) to provide optimum and diverse uses of resident fishes with respect to sport fishing, aesthetic, economic, ecological, scientific, and educational purposes.

According to the 1982 Statewide River Fisheries Management Plan (MDIFW, 1982), MDIFW's current management priority for the Gulf Island impoundment is the blackbass fishery. Future management plans include developing a brown trout fishery in the Gulf Island impoundment and in riverine habitat upstream to Livermore Falls. Between October 1986 and June 1990, MDIFW stocked a total of 31,563 brown trout above Gulf Island-Deer Rips.

As water quality conditions in the Gulf Island impoundment improve, the MDIFW expects an increased demand for a high quality warmwater fishery and expanded coldwater fishery. Current programs are designed to increase the availability of fish spawning habitat,

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[14] For bass in the Androscoggin River, dioxin concentrations decreased from 3.8 picagrams per gram (ρg/g) at Rumford to 0.6 ρg/g at Lisbon Falls, just upstream from Brunswick. For the white sucker, dioxin concentrations decreased from 4.0 ρg/g at Rumford to 2.4 ρg/g at Lisbon Falls. [*ρg/g is equivalent to ppt*]

[15] In the Gulf Island impoundment, mean dioxin concentrations varied from 1.3 ρg/g (smallmouth bass and bullhead) to 1.6 ρg/g (white sucker).

maintain or enhance existing fish populations (through stocking plans), and increase minimum instream flows.

Relative to fish habitat needs, fish habitat in the project area occurs primarily in the project's impoundments. However, the most significant habitat in the lower Androscoggin River occurs outside the Gulf Island-Deer Rips Project boundary, in the approximately 10.4-mile stretch of river between Lewiston Falls and the impoundment created by the Worumbo Project (*see Section 4.1.1.3. for the description of this river reach*).

GULF ISLAND IMPOUNDMENT

Central Maine currently fluctuates the Gulf Island impoundment up to four feet weekly. To address concerns regarding the effects of these drawdowns on fisheries, Central Maine conducted a reservoir management study of the Gulf Island impoundment in June, 1987 (Stetson-Harza, 1989). This study included (1) a detailed field survey of the shallow water habitat affected by the historic impoundment drawdowns, and (2) use of FWS's Habitat Evaluation Procedure (HEP) to assess blackbass habitat.

Based on the 1987 habitat study, the Gulf Island impoundment is characterized by three distinct habitat areas: (1) a five-mile stretch immediately above the dam which is lacustrine in nature, has a width ranging between 0.5 and 1.0 mile and depths generally 20 feet or greater (maximum depth is 68 feet), and contains several large coves and islands; (2) a 7.5-mile stretch which is relatively riverine in nature, has a width ranging between 0.1 and 0.3 mile, and depths generally less than 20 feet, and contains several large islands with interior wetlands, an extensive "backwater" wetland, numerous cove and slough wetlands, and the mouths of the Nezinscot River and Allen Stream; and (3) a relatively shallow two-mile stretch (between the Ram Islands and Twin Bridges) which has a width of 0.1 to 0.25 mile, and consists of variable run or deep riffle habitat, depending on river flow and impoundment elevation.

The majority of impoundment substrate is mud, silt, and sand. Coarse substrate (rock, boulder, cobble, and gravel) and ledge comprise less than ten percent of the total littoral habitat. Except for the primarily riverine segment upstream of the Ram Islands, most of the coarse substrate is in the lacustrine basin, and is generally found in relatively short segments interspersed with areas of mud, silt, or sand. In addition, much of the coarse substrate is compacted with fines.

The morphometry of the impoundment consists of steep to moderate shorelines and littoral zones along the main channel and islands, and relatively shallow-sloping shorelines and littoral zones in the backwater areas. At full pond, the Gulf Island impoundment is 2,862 acres. The littoral zone (area to a depth of seven feet) is about 595 acres (21 percent of the total impoundment area), and contains about 64 acres of emergent aquatic vegetation (11 percent of the littoral zone) (Stetson-Harza, 1989).

According to data provided by Central Maine to Stetson-Harza for the period 1971 through 1987, the average maximum drawdown during May and June was 3.2 feet, and was 4.4 feet from May 1 to October 1 (Stetson-Harza, 1989). In addition, maintenance drawdowns of up to eight feet frequently occur. At an impoundment drawdown of three feet, about 292 acres of littoral zone habitat (ten percent of the total impoundment area) is exposed throughout the impoundment. A four-foot drawdown exposes 382 acres of littoral zone habitat. At the project-licensed drawdown of eight feet, about 662 acres of littoral zone habitat, or 23 percent of the total impoundment area, are dewatered.

Cover is found primarily in cove and protected areas where aquatic vegetation is established, with cover ranging from 50 to 100 percent. Cover in the form of downed trees, woody debris, and course substrate is available along shorelines that do not support aquatic vegetation. The number of individual covers[16] varies from 1,869 in the zero- to three-foot drawdown zone to 1,313 in the three- to six-foot drawdown zone (Stetson-Harza, 1989). Percent cover -- which includes aquatic vegetation, cobble, and gravel -- generally ranges up to 50 percent for the zero- to three-foot drawdown zone, but is generally limited to no more than 25 percent for the three- to six-foot drawdown zone.

Based on the HEP analysis (Stetson-Harza, 1989), the mean habitat suitability index (HSI)[17] for largemouth bass with a three-foot drawdown is 0.78, with 2,232 HUs[18]. The mean HSI for smallmouth bass with a three-foot drawdown is 0.31, with a total of 887 HUs. This constitutes a loss of 286 HUs and 686 HUs for largemouth and smallmouth bass, respectively, under the existing water level management regime. This amount of temporary habitat loss does not seem to be significantly limiting blackbass growth in the Gulf Island impoundment, as evidence by the current growth and status of the fishery.

Fish Habitat in the Androscoggin River below Gulf Island-Deer Rips

Existing fishery habitat downstream at Gulf Island-Deer Rips is very diversified. Below the Deer Rips and Androscoggin No. 3 developments, and within the project oundary, there is an approximately 2,000-foot stretch of free-flowing river which contains a variety of habitats resulting from multiple channels and presence of two islands. Substrate in this stretch is generally boulder and bedrock, and is ideal for smallmouth bass and brown trout habitat. Below this stretch, water flows into the Lewiston Falls impoundment.

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[16] Includes downed trees, stumps, rocks, rock clusters, but does not include aquatic vegetation or cobble/gravel.

[17] Habitat suitability index values range from 0 [poor] to 1 [excellent], and are a measure of habitat suitability relative to habitat variables (i.e., food, cover, reproduction, etc.).

[18] A habitat unit (HU; in English units) represents one acre of optimal habitat for the evaluation species.

A significant amount of fish habitat exists in the river reach between Lewiston Falls and the impoundment created by the Worumbo Project. Several tributaries enter the Androscoggin River in this reach, the largest of which is the Little Androscoggin River. The 1.8-mile stretch of river immediately below Lewiston Falls is a run-type habitat that contains little cover and fishery habitat. Downstream of this stretch is a 0.3-mile-long segment of river known as Dresser's Rips. According to Central Maine, this pool/riffle reach provides excellent salmon and trout habitat, and is considered by MDIFW as the most significant brown trout habitat in the lower Androscoggin River. ASRSC also considers this reach to be among the best potential production areas in the river below Lewiston Falls for Atlantic salmon smolts and fishing opportunity for adult Atlantic salmon.

Below Dresser's Rips is an 8.3-mile stretch of run-type habitat (Run Reach) which extends to the Worumbo impoundment. This reach is characterized as relatively deep waters with even flows, and a predominately sand substrate. In addition, this run-type habitat has been identified as containing potential American shad spawning and nursery habitat.

Based on the results of the instream flow assessment conducted in June 1987 (Stetson-Harza, 1988) [*See Section 4.1.1.3. for specific details of the study*], Central Maine concludes that, overall, habitat conditions in the study reaches are "very good" at the existing interim minimum flow of 1,000 cfs (Table 3-8). Relative to the priority habitat[19], a minimum flow of 1,000 cfs provides between 61 and 100 percent of the peak weighted useable area [WUA; square feet (ft^2) per 1,000 feet of river] available to each species and lifestage in each of the study areas. Of the remaining habitat, the 1,000 cfs minimum flow provides between 17 and 95 percent of the peak WUA in the study reaches.

For smallmouth bass, Dresser's Rips contains little spawning, incubation, and fry habitat [946 ft^2; 41 percent of the peak WUA], with only modest amounts of juvenile and adult habitat[20] [totalling 99,659 ft^2; 68-81 percent of the peak WUA]. The Deer Rips reach contains the greatest amount of smallmouth bass habitat of any of the evaluation reaches [totalling 190,403 ft^2; 45-95 percent of the peak WUA]. In this reach, substrate and velocity are limiting for early life stages and juvenile/adults, respectively. The predominately sand substrate in the Run Reach provides little cover and habitat for all life stages of smallmouth bass.

The Dresser's Rips and Deer Rips reaches contain about the same amount of brown trout habitat, totalling 193,390 ft^2 and 213,541 ft^2, respectively. In the Dresser's Rips reach, 100 percent of the peak WUA is available for adult trout. Because of the predominantly boulder substrate, only 81 percent of the peak WUA is available to juvenile trout. Habitat conditions for adult and juvenile brown trout in the Deer Rips reach (61-75 percent of the

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[19] Based on agency management objectives, Dresser's Rips [juvenile and adult brown trout and Atlantic salmon] and Deer Rips [brown trout] was identified as priority habitat.

[20] Defined as pool-type habitat.

peak WUA) is generally limited by depth; the reach is relatively wide and shallow.

The largest quantity of Atlantic salmon habitat in the lower Androscoggin River between Gulf Island-Deer Rips and Worumbo is in the Deer Rips reach [totalling 373,756 ft^2; 54-84 percent of the peak WUA]. Habitat in the Dresser's Rips reach (totalling 319,374 ft^2) is velocity limited, but the reach is characterized by many velocity shelters and holding pools that provide adequate habitat at low and high flows. Existing habitat is 71 and 100 percent of the peak WUA for adult and juvenile salmon, respectively.

For American shad, habitat in Dresser's Rips is limited compared to the habitat available in the Run Reach and elsewhere in the lower Androscoggin River. WUA in the Dresser's Rips reach totals 402,905 ft^2, and varies from 38 to 80 percent of the peak WUA, depending on life stage. The Run Reach contains a significant amount of shad habitat, but only a limited amount is presently available (totalling 757,815 ft^2; 17-20 percent of the peak WUA).

Table 3-8. Summary of the Gulf Island-Deer Rips instream flow assessment (WUA[1]) for the existing 1,000 cfs minimum flow (Source: Stetson-Harza, 1988).

Reach/Species	WUA	Percent Peak WUA
Deer Rips		
Brown trout (adult)[2]	181,098	75
Brown trout (juvenile)[2]	32,443	61
Atlantic salmon (juvenile)	200,828	84
Atlantic salmon (adult)	172,928	54
Smallmouth bass (spawning)	663	45
Smallmouth bass (juvenile)	119,319	95
Smallmouth bass (adult)	70,421	90
Dresser's Rips		
Brown trout (adult)[2]	167,681	100
Brown trout (juvenile)[2]	25,709	81
Atlantic salmon (adult)[2]	139,955	71
Atlantic salmon (juvenile)[2]	179,419	100
American shad (spawning)	58,238	38
American shad (incubation)	70,348	44
American shad (juvenile)	93,777	80
American shad (adult in)	96,069	58
American shad (adult out)	84,473	51
Smallmouth bass (spawning)	946	41
Smallmouth bass (juvenile)	64,701	81
Smallmouth bass (adult)	34,958	68
Run Reach		
American shad (spawning)	133,302	17
American shad (incubation)	146,120	19
American shad (juvenile)	160,334	20
American shad (adult in)	160,824	18
American shad (adult out)	157,235	18

[1] Weighted Useable Area (square feet per 1,000 feet of river).

[2] Considered to be priority habitat.

Relative to the habitat duration analysis, monthly duration curves were developed for (1) juvenile and adult brown trout and adult smallmouth bass (Deer Rips), (2) juvenile and adult Atlantic salmon and brown trout (Dresser's Rips), and (3) spawning, juvenile, and in-migrating American shad (Run Reach). For the species and life stages studied, habitat remains relatively constant under existing conditions, particularly habitat conditions for Atlantic salmon in Dresser's Rips and brown trout in Deer Rips and Dresser's Rips. Moreover, there appear to be no severe habitat restrictions resulting from existing operation, although some reductions in habitat occur under the high operational flows.

To address the existing conditions relative to ramping and water level fluctuations downstream from Gulf Island-Deer Rips, ramping rates were studied for the Androscoggin River between Deer Rips and the Lewiston Falls headwater. In general, flow reductions during normal project operation result in fish stranding in pools created by cobbles and boulders on the western side of the most downstream island in the study reach. Water temperature and DO concentrations in these pools may reach critical levels depending on duration of the low flow.

3.3.1.4. Vegetation and wildlife resources

The shoreline of the Gulf Island impoundment is mostly forested, although farmland (row crops and hayfields) extends down to the impoundment in some areas, and in other areas, forested buffer strips separate the impoundment shoreline from the farmland. Numerous forested islands are located within the impoundment. In addition to scattered farmland, a few residences are also located along Gulf Island's shoreline. Wetlands exist in protected coves and backwater areas along inlet streams.

Of the approximately 49 miles of shoreline along the Gulf Island and Deer Rips impoundments, about 28 percent (13 miles) of the land within 200 feet of the shoreline is used for agricultural purposes. The remainder is forested land, except for some small developed parcels, including approximately one mile which contains the project works at the Gulf Island and Deer Rips dams.

The forested areas consist of a mixture of beech, oak, birch, maple, hemlock and spruce, but is dominated by white pine. There is a large stand of silver maple located along the east shore of Gulf Island impoundment above Twin Bridges (headwaters of the impoundment), and is considered a floodplain forest. Several plantations of red pine have been established around the Gulf Island impoundment, and many of the islands within the impoundment support mature stands of white pine. Rocky shoreline areas are vegetated with goldenrods, asters, blackberries, alders, and woody shrubs.

Wetlands - Most of the wetlands found in the Gulf Island impoundment are located in the four mile stretch of river from Turner Bridge northward, in the vicinity of Griswold Island. Thirty-eight of the 64 acres of emergent aquatic vegetation are found in three protected areas in the impoundment: (a) north of the Turner-Greene Bridge, including

Griswold Island; (b) a backwater area formed by an old road bed 800 feet southwest of Griswold Island; and (c) a swamp directly east of Griswold Island. The remaining 26 acres of aquatic vegetation are found in 59 small, independent, sites spread throughout the Gulf Island impoundment.

The dominant aquatic vegetation in and around the Gulf Island impoundment includes speckled alder, red-osier dogwood, necklaced, fringed, and broom sedge, bluejoint and rattlesnake grass, bulrush, broad-leaved cattail, sweetflag, northern arrowwood, buttonbush, meadowsweet, coontail, water lily, surface pondweed, and naiad.

The variety of land-use types and cover types described above provides for diverse habitats for numerous wildlife species, including those listed below.

Amphibians: green frog, pickerel frog, American toad

Reptiles: common snapping turtle, eastern painted turtle, northern water snake

Birds: common loon, great blue heron, Canada goose, mallard, black duck, northern shoveler, hooded merganser, osprey, bald eagle, broad-winged hawk, killdeer, American kestrel, sharp-shinned hawk, barred owl, great-horned owl, spotted sandpiper, least sandpiper, greater yellowlegs, double-crested cormorant, ring-billed gull, belted kingfisher, eastern phoebe, eastern kingbird, tree swallow, bank swallow, blue jay, American crow, common raven, black-capped chickadee, veery, American robin, gray catbird, cedar waxwing, yellow warbler, common yellowthroat, song sparrow, swamp sparrow, red-winged blackbird, common grackle, American goldfinch, ruffed grouse, whip-poor-will, hairy woodpecker, pileated woodpecker

Mammals: beaver, muskrat, raccoon, otter, mink, weasel, white-tailed deer, moose, coyote, fox, bobcat, red and grey squirrels, porcupine, snowshoe hare, and striped skunk

3.3.1.5. Endangered and threatened species

According to Interior's letter dated December 15, 1993 (Willie K. Taylor, Acting Director, Office of Environmental Policy and Compliance, U.S. Department of the Interior, Washington, D.C.), there are no federally-listed or proposed threatened and endangered species known to occur in the project area except for transient endangered bald eagles (*Haliaeetus leucocephalis*) or peregrine falcons (*Falco peregrinus anatum*).

By letter dated May 17, 1994 (E. Penn Eastbrook, Deputy Commissioner, Maine Department of Marine Resources, Augusta, Maine), MDMR stated that the Androscoggin River below Brunswick supports a large spawning population of the federally endangered shortnose sturgeon (*see Section 3.2.2. for a detailed description of the shortnose sturgeon*).

3.3.1.6. Recreation resources

The ten-mile segment of river stretching from the Gulf Island dam to a point two miles above the Greene-Turner bridge exhibits the greatest overall recreational potential in the 40 miles of river flowing from Livermore Falls to the southern border of the City of Lewiston.[21] The Gulf Island impoundment is conducive to canoeing, power boating, and boat fishing. The large islands in the impoundment enhance the potential for canoe camping and provide for wildlife habitat, while the numerous large coves or bays, which are attractive to fish and wildlife, enhance canoeing, fishing, hunting, and nature study.

Although recreational use on the lower Androscoggin River historically has been less than other watercourses in Maine, improvements in this segment of the river's water quality since the early 1960's has resulted in increased recreational use. If the trend in water quality improvement continues, recreational use along the river's undeveloped shorelines bordering Gulf Island-Deer Rips should increase.

Central Maine has provided estimates of recreational use in the Gulf Island-Deer Rips area. These use figures were derived from (1) property owner questionnaires, (2) information from commercial recreation enterprises, (3) on-water recreation access from public access points, and (4) survey flights.

According to Central Maine, annual recreational use in the Gulf Island-Deer Rips area is about 39,000 user-days and user-nights,[22] with user-days accounting for almost 75 percent of this amount. Central Maine's estimates of the 1990-91 and projected year 2002 recreational use of the Gulf Island-Deer Rips Project are based on historic recreational use trends, demographics, project setting, and general recreational trends in the northeastern United States. According to a 1983 publication by the Androscoggin Valley Council of Governments (AVCG), *Lower Androscoggin River Recreation Study and Management Plan* (Valley Council Plan), total recreational use of the Gulf Island-Deer Rips Project is projected to increase from approximately 41,740 user-days and -nights in 1991 to between 44,420 and 46,560 user-days and -nights by the year 2002.

Table 3-9 presents data for public recreational uses at the project. For each activity (i.e., table's first column), we list Central Maine's estimated number of public user-days (in brackets, user-nights) for 1990-91, the projected percent of annual increase in the number of public user-days and -nights, and, the number of public user-days (in brackets, user-nights) projected for the year 2002.

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[21] The Androscoggin Valley Council of Governments, in 1983, published the *Lower Androscoggin River Recreation Study & Management Plan*, for which it defined its study corridor as this 40-mile section of the river.

[22] A recreation user day/night means each visit by a person to a development for recreational purposes during any portion of a 24-hour period.

Table 3-9. Existing (1990-91) and projected public recreational use of the Gulf Island-Deer Rips project area (Source: Central Maine, 1992c and 1992d).

Activity	Estimated 1990-91 User Days [User Nights]	Projected % of Annual Increase	Projected User Days, Year 2002 [User Nights]
Fishing[1]	4,925 [1,955]	1.0 to 2.0	5,440 to 6,000 [2,1600 to 2,380]
Hunting	440 [0]	0.1 to 0.5	420 to 435 [0]
Boating[2]	2,250 [810]	0.2 to 0.3	2,300 to 2,320 [830 to 835]
Snowmobiling	8,535 [3,300]	1.0 to 2.0	9,425 to 10,400 [3,650 to 4,025]
Sightseeing	2,260 [275]	0.2 to 0.3	2,305 to 2,325 [280 to 285]
Winter Walking-Cross Country Skiing	1,220 [515]	0.5 to 1.0	1,280 to 1,350 [540 to 570]
Summer Nature Walk-Day Hike	690 [100]	0.3 to 1.0	710 to 760 [100 to 110]
Camping	170 [100]	0.3 to 1.0	175 to 190 [100 to 110]
Picnicking	175 [25]	0.3 to 0.5	180 to 185 [25]
Swimming	50 [20]	0.0	50 [20]
TOTALS	20,715 [7,100]	– –	– –

[1] Fishing use on the Deer Rips impoundment in 1990-91 is estimated to be 940 user days. The rate of increase is estimated to be 1.0 to 2.0 percent annually, or 1.040 to 1,150 user days by the year 2002.

[2] Boating use on the Deer Rips impoundment in 1990-91 is estimated to be 230 user days. The rate of increase is estimated to be 0.2 to 0.3 percent annually, or 235 to 240 user days by the year 2002.

According to the Valley Council Plan, the primary recreational use of the Gulf Island-Deer Rips area consists of boating, fishing, and day-use activities, such as picnicking. Land surrounding the impoundment is primarily undeveloped and is utilized extensively for informal recreation, including hunting, hiking, trapping, and nature study.

Based on the field investigations undertaken to prepare the Valley Council Plan, river bank fishing was the most often recorded recreational activity, followed by hunting for waterfowl, upland birds, deer, and other game. Trail activities (e.g., snowmobiling and cross-country skiing in winter, and off-road vehicle use and horseback riding in summer) follow closely behind bank fishing and hunting. Numerous trails are maintained by local snowmobile clubs, which can also be used by cross-country skiers.

Accounting for relatively fewer user days are power boating, boat fishing, and canoeing. Power boating is generally limited to persons residing in the study corridor who moor or dock boats on the river. Due to boat access availability, most of the power boating and boat fishing occurs in the Gulf Island impoundment. Canoeing accounts for a small number of the total user days.

The Valley Council Plan states that the direct economic impacts resulting from recreational use of the Androscoggin River, in the vicinity of the Gulf Island impoundment, are negligible, due to current public use and the lack of river-oriented facilities or services -- i.e., campgrounds, canoe rental, and marinas -- from which revenues can be derived. The Valley Council Plan also states that although individuals participating in recreational activities such as hunting or fishing may purchase goods at local stores in, or adjacent to, the study corridor, such revenues must be assumed as minimal. The Valley Council Plan further states that other economic impacts commonly associated with recreational use or development, such as seasonal residence development, is not prevalent within the study corridor.

Table 3-10 shows recreational resource types currently available in the project area, the number available for each resource type, the percent of total capacity being utilized for each resource type, and the recreational resources within the project boundary.

A paved road at the end of the East Waterman Road in Auburn, an area owned by Central Maine, is used by the public for launching boats, but waters are shallow and obstructed, and not well-suited for boat launching. In addition to this area, the Twitchell Airport, just north of the East Waterman Road, has a paved ramp to the water used to launch boats for a small fee. Local residents regularly use a Central Maine-owned parcel of land in the Town of Greene as a picnic and boat launching area. Use of this area as a boat launch is limited primarily to small carry-in boats. Additionally, this area is adequate for small scale local use, but not conducive for developed general public access.

Central Maine, in 1989, developed: (1) a public boat launch facility at the Turner-Greene bridge, with a single 20-foot-wide boat ramp, to accommodate 21 vehicle and trailer rigs; and (2) three day-use and picnic sites on islands in the impoundment under an agreement with the Town of Turner and the Gulf Island Pond Association.

In the northern extremity of the project area, Googins Island divides the Androscoggin River into an eastern channel with flat water and very little flow at normal levels, and a western channel containing a single rapid created by a three- to four-foot-high

ledge extending across the river near the middle of the island. The south end of Goggins Island receives very little use in spite of being open to public access from Route 219 as a canoe portage, carry-in boat access, and general day use area for picnicking and shore fishing. Informal access to the Deer Rips impoundment is available at a carry-in access site on property along Switzerland Road owned by Central Maine, and in the vicinity of the Deer Rips powerhouse. Although roadside parking along Switzerland Road can accommodate only two or three vehicles currently, Central Maine proposes parking for up to six vehicles.

Table 3-10. Availability and use of recreational resources at Gulf Island-Deer Rips (Source: Central Maine, 1991).

Types of Recreation Resources Available		Number	Capacity Utilized[1]
Access Areas	(unimproved, widely-known sites providing access to project waters without trespassing)	5	50%
Boat Ramps	(improved areas usually having signs, gravel or concrete surfaces, and adjacent parking)	2	54%
Boat Launching Facilities	(areas at boat ramps from which boats can be launched)	2	45%
Tailwater Fishing Facilities	(ramps and walkways facilitating downstream fishing)	1	<10%
Trails	(pathways used for hiking, bridle, trail bikes, snowmobiles, and cross country skiing)	2	<15%
Picnic Areas	(maintained areas usually containing picnic tables, grills, trash receptacles, and parking)	3	<25%
Camping Areas	(areas containing one or more campsites, tent sites, or trailer and recreational vehicle sites)	2	<25%
Tent, Trailer, & RV Sites	(sites within camping areas for tent, trailer or recreational vehicle use)	6	<25%
Hunting Areas	(public or private areas open for hunting purposes)	1 imp.	25%
Overlooks	(public areas to view natural areas or project features)	1	<10%
Winter Sports	(skiing, sledding, ice skating, and ice fishing)	1 imp.	<25%

[1] Percent of capacity utilized represents non-peak weekend use during the peak recreational season.

Two parcels of undeveloped forest land, approximately 2,000 acres, abutting the project boundary were purchased by the state (i.e., Land for Maine's Future Board) in June 1990. Wooded parcels along the east and west shores of the Androscoggin River, located in Turner and Leeds, represent prime open space and informal recreation areas for hunting, trapping, fishing, boating, and nature study. The purchase ensures that 12 miles of shoreline habitat would remain available to the public for recreational use, while forests and wetlands would continue to attract hunters and other recreationists.

Most trails used for snowmobiling are, through agreements among local snowmobile interests, the Maine State Snowmobile Association, and the Maine Bureau of Parks and Recreation, on private property located at the perimeter of the project. Central Maine permits multiple-use trails on forested land and transmission line rights-of-way adjacent to the project under formal agreements with the Maine Bureau of Parks and Recreation.

With respect to the recreational fishery, a 1989 study by Stetson-Harza concludes that fishing in the lower Androscoggin River is increasing because: (1) improved water quality conditions has enhanced the availability of fish habitat and associated aquatic species, (2) as fisheries improve, additional anglers will be attracted to the fishery, and (3) Central Maine's existing public boat launch facility at the Turner-Greene bridge (Central Maine, 1991). Consequently, these factors can contribute to a beneficial impact on the fisheries and recreational resources (*see Section 3.3.1.3.*). Further, any future improvement in the impoundment's water quality that permits water-contact recreation, would produce a substantial increase in the impoundment's recreation potential.

Whitewater boating opportunities are provided upstream of the Gulf Island impoundment at (a) a short stretch of Class IV rapids[23] at Twin Bridges in North Turner, (b) a 35-yard stretch of Class II rapids just above the confluence of the Dead and Androscoggin Rivers, and (c) a 2,000-foot stretch of Class II rapids. Local sources state that, due to the short length and poor water quality of the Class IV rapids near Googins Island, whitewater boaters favor more attractive whitewater stretches found elsewhere. Longer and more attractive whitewater stretches are available in the spring on the Carrabassett River and, during the summer months on the Dead River or more northerly stretches of the Androscoggin River; which are located within the Lewiston-Auburn area driving radius. At least 17 more attractive springtime whitewater runs with about 150 miles of Class II, III, and IV rapids are within this radius.

3.3.1.7. Aesthetic resources

Views from the Gulf Island impoundment are very scenic and are characterized by large expanses of open water, bordered by gently rolling forested hillsides that are interspersed with small agricultural fields and a few residences.

Two roads that cross the Gulf Island impoundment afford the viewer a quick glimpse up and down the reservoir. At the Turner-Greene bridge, there are excellent views of the impoundment in both directions. At the Twin Bridges crossing, a scenic set of whitewater rapids, which mark the upper end of the impoundment, are visible during normal project operations. Close-up views of the rapids are available from the southern tip of Googins Island, which Central Maine owns and opens to the public for day use. Looking upstream at the Twin Bridges location, a scenic view is afforded of the river moving through the tree-

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[23] Based on the International Scale of Difficulty, which defines six difficulty classes of whitewater: Class I, easy; Class II, novice; Class III, intermediate; Class IV, advanced; Class V, expert; and Class VI, extreme.

lined river valley.

The project impoundments' undeveloped shoreline and islands provide a scenic setting. Many of the islands contain large mature stands of white pines and none of the islands contain camps or cottages. There are numerous small wetland areas around the Gulf Island impoundment that add variety and interest to the visual character of project area landscape. The Maine Critical Areas Program, Natural Areas Inventory, has recognized the Gulf Island impoundment's special character by designating it a "natural area" for its undeveloped scenic shoreline (letter from Land Trust *et al.*, December 21, 1993).

In several places along three roads that run parallel to the project impoundment a traveler can enjoy a panoramic view of the White Mountain range to the west with the river landscape in the foreground. Other roadsides vistas are intermittent or obscured by surrounding forest cover. Most views of the river landscape from project area shorelands are similar and confined to a narrow field-of-view.

Impairments to the river's water quality, as evidenced by offensive odors, discoloration, and surface foam, have also impaired the river's aesthetic value. However, recent and ongoing cooperative efforts to improve the water quality of the river, including the elimination of CSOs and riverfront cleanup activities, are beneficially affecting the aesthetics of the river landscape in the project area (letter from the Land Trust *et al.*, May 26, 1994).

3.3.1.8. Archeological and Historic resources

Affected cultural resources at Gulf Island-Deer Rips include the Gulf Island powerhouse, constructed in 1925 and 1926, and eight archaeological properties. These properties are eligible for listing on the National Register of Historic Places (National Register) and are therefore entitled to the protection afforded by the National Historic Preservation Act (NHPA).

The neo-classical powerhouse is characterized by: (a) an ornate entry whose round arched doorway is framed by columns; (b) two flights of concrete steps bordered by brick walls leading to the entrance; (c) stone trim used around window and door openings on the first story, base cornice, and as decorative panels in the parapet; and (d) original multi-pane windows with tilt-out sash, a bulls-eye window above the entrance, operator's booth, sidewall lamps and multi-pane windows on the interior.

3.3.1.9. Land use

In a one-half-mile-wide corridor along the Gulf Island impoundment, agricultural and residential land uses occupy about 17 percent of the area to the east of the impoundment and about five percent of the area to the west of the impoundment. Of the approximate 49 miles of shoreline along the mainstem of the Androscoggin River within the existing project

boundary, about 28 percent of the land within 200 feet of the shoreline is used for agricultural purposes. The remainder is forested, except for some small developed parcels.

The existing project works, including the two project dams and three powerhouses, occupy about one mile of shoreline. These existing facilities are all located on the outer limits of the urban developments of the Cities of Auburn and Lewiston. Central Maine owns about seven miles of frontage on the Gulf Island and Deer Rips impoundments within Auburn and Lewiston -- four miles in Auburn and three miles in Lewiston -- making it the largest riverfront landowner in the two cities (letter from Land Trust *et al.*, December 21, 1993).

Central Maine owns fee title to or flowage rights on all shorelands from the project impoundments' normal full pond elevations to the existing project boundary. These existing project lands, which have been left in their natural state, vary in width from less than 100 feet to more than 500 feet, depending on topographic slope. Most of these shorelands are within the 250-foot-wide strip regulated by the State of Maine's Mandatory Shoreland Zoning Act and local shoreland zoning ordinances. Central Maine also owns most of the islands in the project impoundments as well as eight parcels of land that abut the project boundary.

The Cities of Auburn and Lewiston and the Towns of Turner, Leeds, and Livermore have all enacted ordinances substantially equivalent to the state's Guidelines for Municipal Shoreland Zoning Ordinances. The Town of Greene is the only town within the project area that has not adopted its own shoreland zoning ordinance and, therefore, faces imposition of the state's guidelines. Shoreland zoning by each of these towns is summarized as follows (letter from Land Trust *et al.*, May 26, 1994).

Auburn - The majority of the undeveloped river frontage is zoned as an Agriculture and Resource Protection District. This district is intended to allow for conservation of natural resources and open space land, and to encourage agriculture, forestry, and certain types of recreation. Buildings are severely limited. The urban portions of the riverfront are zoned residential and business.

Lewiston - The 100-year floodplain areas south of Lewiston Falls are zoned resource protection. Above the Falls the shoreland area is zoned to allow for residential development.

Turner - All land along the Androscoggin River is in a resource protection district except for a small area at the Turner-Greene bridge.

Greene - Most of the shoreland within 250 feet of the Androscoggin River is placed in a residential district requiring a 75-foot setback for new structures.

Leeds - A resource protection district covers about half of the shoreland area of the Androscoggin River. Limited residential comprises the other half. Setbacks of 100 feet are required in this area.

Livermore - The majority of the shoreland area in Livermore is designated resource protection because it lies in the floodplain. Those areas not in resource protection allow for residential uses.

In 1990, the State of Maine's Land for Maine's Future Board purchased two tracts of undeveloped forestland, totalling 2,262 acres, that abut the project boundary. These two woodland reserves -- one located on the east side of the Gulf Island impoundment in the Town of Leeds and the other located on the west side of the impoundment in the Town of Turner -- represent prime open space for informal recreation and natural resource conservation along 12 miles of shoreline.

Land Trust *et al.* is planning and implementing numerous other open space initiatives, with technical assistance from the National Park Service and the support of many local groups, in a concerted effort to link urban shorelands to the state's shoreland reserves through a comprehensive greenway/trails system along 30 miles of river frontage. Officially known as the Androscoggin Greenways Project, these coordinated initiatives include the following:

- identification of bicycle and pedestrian travel routes in Lewiston, Auburn, and Lisbon (Cities of the Androscoggin Bicycle and Pedestrian Advisory Committee);
- development of new trails and rehabilitation of existing trails on the state's shoreland reserve in Turner (Androscoggin Land Trust in cooperation with the Maine Department of Conservation, Turner Recreation Committee, and local residents);
- development of paths and parks along the Androscoggin River and in various city parks (Cities of Lewiston and Auburn);
- development of the L&A Railroad trestle as a bike and pedestrian bridge linking the communities (The Lewiston-Auburn Comprehensive Transportation Study);
- implementation of a master plan for a trails system on school property (Students at Edward Little High School); and
- negotiating with Central Maine for shoreland conservation easements and trail development (Land Trust *et al.*).

3.3.2. Marcal (CASE 1)

3.3.2.1. Geology and soils

Located in the New England upland geomorphic province, the project area is characterized by metamorphic bedrock underlying glacial deposits. Soils, or glacial-marine sediments, consist of silts, clays, and sandy loams formed during the late glacial-marine submergence of lowland areas in southern Maine. According to Jaworski Geotech Inc. (JGI, 1994), geologic investigation of the Marcal area indicates that unique geological features are absent from the impoundment shoreline, bypassed reach, and tailrace.

JGI's conclusions are based on its having collected and reviewed background information on the surficial geology, bedrock geology, and soil conditions in the project area from published maps, including maps from the State of Maine Geological Survey. JGI then compared these data with data gathered during a field survey of the impoundment and bypassed river reach.

3.3.2.2. Water quality and quantity

Under existing conditions, Consolidated Hydro operates Marcal to make the most efficient use of the available water, with typical project flows ranging from leakage to 560 cfs. Flows up to 560 cfs are used for generation with excess spilled over the spillway into the project's bypassed reach. Marcal has no minimum flow requirements, but acts as a point where flows in the Little Androscoggin River are regulated, with flows released on a variable discharge schedule depending upon system generation demand, available storage, and total river flow (*see Section 2.1.2.*). Normal peaking operation, which occurs when inflows are below 120 cfs (about 33 percent of the time), can result in daily impoundment drawdowns of up to two feet, depending upon inflow.

The USGS currently operates one streamflow gage on the Little Androscoggin Rive about 15 miles upstream of Marcal at South Paris, Maine (USGS gaging station No. 01057000). Flows at the South Paris gage are unregulated and were used by the FWS in developing its ABF (Aquatic Base Flow) Policy. Based on this gage's flow data, the mean annual river flow at Marcal (drainage area = 250 mi^2) is 459 cfs; monthly and annual flow duration are provided in Table 3-11.

Currently, there are no water quality monitoring stations located in the immediate vicinity of Marcal. However, water quality data available from studies conducted in 1989 and 1992 indicate generally good water quality in the Little Androscoggin River above and below Marcal.

The 1989 wasteload allocation study (Miller, 1990) consisted of sampling on three consecutive days, both in August and in September. The Little Androscoggin River was sampled in ten locations, including background areas, points above and below point source

Table 3-11. Monthly and annual flow duration for the Marcal Project on the Little Androscoggin River (1932-1987)(Source: Consolidated Hydro, 1994a).

Month	Percent Exceedence (%)								
	10	20	30	40	50	60	70	80	90
January	538	343	267	218	191	168	148	125	99
February	528	363	274	221	191	168	148	129	92
March	1,468	818	594	439	327	261	211	172	139
April	2,869	2,230	1,797	1,501	1,260	1,059	881	722	554
May	1,441	1,003	768	620	508	425	346	280	211
June	722	462	330	244	195	158	122	96	69
July	343	198	142	109	86	66	53	43	33
August	234	139	96	69	56	46	36	26	20
September	261	139	99	69	53	36	30	23	16
October	541	313	208	135	106	79	56	40	26
November	960	623	478	359	284	228	185	125	82
December	864	534	386	320	264	214	178	139	92
ANNUAL	1,108	613	399	277	204	155	112	69	36

discharges, and impoundments. The impoundment, including headwaters, was sampled in two locations in the main river channel. The tailrace was sampled downstream of the powerhouse and the Mechanic Falls Wastewater Treatment Facility.

Review of the 1989 data indicates compliance with the State's Class C standard for DO (5.0 mg/l and 60 percent saturation) (Miller, 1990). From August 2-4, DO levels in the impoundment were generally homogenous throughout the water column, ranging from 7.6 to 7.9 mg/l during the morning hours and 8.1 to nearly 8.5 in the afternoon. Dissolved oxygen concentrations measured from August 30 to September 1 were slightly higher than from August 2-4, and were also homogenous from top to bottom. Downstream DO levels, as measured in the Hackett Mills impoundment were similarly homogenous from top to bottom, and averaged 7.5 mg/l in the morning and 8.3 mg/l in the afternoon. Water temperatures varied little between the impoundment [avg=70.3°F; 65.0°F-77.2°F] and tailrace area [avg=70.0°F; 65.8°F-75.2°F). DO concentrations and water temperatures for effluent discharged from the Mechanic Falls Wastewater Treatment Facility averaged 1.97 mg/l and 68.4°F, respectively.

In response to MDEP's concern regarding maintenance of the Class C water quality standards in the project area, Consolidated Hydro measured DO and water temperature in the project area. Water quality studies in 1992 were from July 29 to July 31, and consisted of: (1) sampling DO and water temperature twice daily over a 48-hour period, and (2) collecting grab samples from three sites. DO and water temperature were measured at sites upstream of the impoundment, within the impoundment, in the bypassed reach, in the tailrace, and below the confluence of the tailrace and bypassed reach.

Results for DO and water temperature were similar to those observed in 1989, with no observed water quality problems (Table 3-12). The minimum DO measured was 8.0 mg/l at 71.6°F (91.5 percent saturation), while the minimum saturation level was 90.9 percent (8.1 mg/l at 69.8°F). Additionally, analysis of the grab samples (chlorophyll-a, total phosphorus, and Kjeldahl nitrogen) demonstrated unimpaired water quality (Consolidated Hydro, 1994a).

Consolidated Hydro describes the water quality of the Little Androscoggin River in the project area as unimpaired and generally meeting its classification. However, Consolidated Hydro reports that based on water quality modelling [assumes maximum daily discharge from the Mechanic Falls Wastewater Treatment Facility], DO concentrations during critical periods of extremely low flows (7Q10 flows) and high temperatures could potentially fall below the acceptable level provided for in Maine's water quality standards. Moreover, Miller (1990) identified the DO sag point for the river as occurring downstream of Marcal in the Hackett Mills impoundment.

Table 3-12. Average dissolved oxygen and water temperature measured at the Marcal Project during July, 1992 (Source: Consolidated Hydro, 1994a).

Station	Depth (ft.)	Temp. (°F)[1]	DO (mg/l)[2]	Percent Saturation[3]
Sawyer Bridge	0.0	70.7	8.8	99.5
	3.3	70.7	8.8	99.5
Elm St. Bridge	0.0	70.9	8.5	97.1
	3.3	70.7	8.6	97.7
	6.5	70.7	8.6	97.7
	9.8	69.8	8.4	94.2
Intake	0.0	70.9	8.7	99.1
	3.3	70.9	8.8	99.4
	6.5	69.8	8.9	100.5
Bypass	0.75	71.6	8.7	99.1
Tailrace	0.75	70.9	8.5	96.5
Confluence	0.75	71.8	8.5	97.3

[1] water temperature ranged from 64.4 to 78.8°F.
[2] dissolved oxygen ranged from 8.0 mg/l to 9.5 mg/l.
[3] percent saturation ranged from 90.9 to 109.7.

3.3.2.3. Fisheries resources

The Little Androscoggin River, including the project area, is classified by MDIFW as a mixed warm-water and cold-water fishery, with the segment of the river containing the project area being designated as a warmwater management type (MDIFW, 1982). The 27-acre, 2-mile long Marcal impoundment contains coldwater and warmwater resident species. Table 3-13 lists all the resident fish species that occur in the Little Androscoggin River, including Marcal's impoundment and tailwaters.

The primary game species of the warmwater fish community in the project area include smallmouth bass and chain pickerel. Largemouth bass, yellow perch, and white perch are also fairly common game species. Brown trout and brook trout are the primary coldwater species found in the upper reaches of the impoundment and most likely in the project's bypassed reach.

Table 3-13. Fish species known to inhabit the Little Androscoggin River Basin. (Source: Consolidated Hydro, 1994a).

COMMON NAME	SCIENTIFIC NAME
Brook trout*	*Salvelinus fontinalis*
Brown trout*	*Salmo trutta*
Landlocked Atlantic salmon*	*Salmo salar*
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
Chain pickerel	*Esox niger*
Yellow perch	*Perca flavescens*
White sucker	*Catostomus commersoni*
Brown bullhead	*Ictalurus nebulosus*
American eel	*Anguilla rostrata*
White perch	*Morone americana*
Minnow species	*Cyprinidae spp.*

* stocked species.

Although the Marcal impoundment is designated for warmwater fishery management, MDIFW maintains a basin-wide brook trout and brown trout fishery through an annual stocking program, with fish stocked upstream and downstream of the project area. Wild brook trout are also known to inhabit the upper reaches of the Little Androscoggin (including the headwaters of the project impoundment), as well as many of the river's tributaries. In addition, stocked land-locked Atlantic salmon have been caught throughout the river.

No anadromous fish have been stocked in the project area. However, Flagg *et al.* (1994) report that lakes and impoundments throughout the Little Androscoggin River Basin have been the subject of Atlantic salmon and alewife releases from fish captured at the

Brunswick fish passage facility on the lower Androscoggin River.

Fisheries Management and Habitat Assessments - Alewife and Atlantic salmon presently utilize habitat in the Marcal area during out-migrating periods. Therefore, one of the primary management goals of MDMR's restoration program is to manage the project area as not only a migratory pathway for salmon and alewife, but as potential spawning and nursery habitat for these species. The goals for managing the river's resident fisheries are the same as previously discussed for Gulf Island-Deer Rips (*see Section 3.3.1.3.*).

According to the 1982 Statewide Rivers Management Plan (MDIFW, 1982; MDMR, 1982), present resource management programs are directed toward mitigating adverse effects to the anadromous and resident fish resources, or enhancing these resources. Specifically, current programs are designed to increase the availability of fish spawning habitat, maintain or enhance existing fish populations (through stocking plans), and increase minimum instream flows.

Relative to fish habitat needs, fish habitat in the project area occurs primarily in the project's impoundment and to a limited extent in the project's bypassed reach.

MARCAL IMPOUNDMENT

Marcal's impoundment is small and mostly riverine in character (i.e., long, narrow, and shallow). The impoundment is relatively uniform in width, depth, and substrate. Based on a 1992 aquatic habitat survey, Consolidated Hydro states that fish habitat quality in the impoundment is fair, and is limited by poor overall cover.

According to the 1992 habitat study, the embankments along the Marcal impoundment's shoreline are generally steep, with near-shore edge depths in the range of two to four feet at full pond. The width of the Marcal impoundment varies from 120 feet to 160 feet, with mid-channel depths from five to seven feet. There are two, relatively deep (13 and 19 feet) areas in the impoundment (immediately upstream from the dam and at the mouth of Waterhouse Brook). The substrate for the majority of the impoundment is sand and silt. The headwater area of the impoundment is slightly shallower, and contains moderate boulder cover; a riffle defines the upstream limit of the impoundment. Generally, throughout the impoundment cover is limited to overhead cover along the banks, which consists of riparian vegetation, overhanging tree limbs, and occasional clumps of woody debris.

MARCAL BYPASS REACH

The project's bypassed reach extends approximately 980 feet from the dam downstream to the confluence with the tailrace. The bypassed reach and the tailrace flow directly into the impoundment for Hackett Mills.

The upper 550 feet of the bypass is characterized by heavily scoured, exposed bedrock with one moderately deep (about six feet) pool immediately below the dam and several smaller, shallower pools lower in the reach. Flows between the pools occur primarily through "chutes" in the ledge. Habitat quality is limited due to the bedrock substrate, steep slope, and absence of velocity shelters.

The lower 430 feet of the bypass reach consists of a continuous set of rapids with large cobble and boulder substrate, with an average gradient of 1.5 to two percent and average channel width of approximately 75 feet. The combination of cobble/boulder substrate and gradient produces many velocity shelters, primarily in the interstitial crevasses between boulders. Additional usable habitat is limited in much of the water column.

The relationship between flow and aquatic habitat quality in the project's bypassed reach was assessed by Kleinschmidt Associates (consultant for Consolidated Hydro) in accordance with a study plan submitted to the FWS, MDIFW, and MDMR on July 6, 1992. *See Section 4.1.2.3. for specific details of the study.*

Results of the instream flow assessment indicate that habitat for all species and life stages evaluated is limited. For brook trout, WUA at leakage (1.5 cfs) is 1,679, 3,447, and 1,639 ft^2 for fry, juvenile, and adult, respectively (43, 82, and 25 percent of maximum, respectively) (Table 3-14). The riffle area provides the majority of the useable habitat for brook trout fry, while the pool areas provides the only useable habitat available for adult brook trout. Useable habitat for juvenile brook trout is relatively equally divided between the pool areas and the riffles.

For smallmouth bass, WUA at leakage is 3,281, 1,796, and 368 ft^2 of habitat (39, 19.5, and 45 percent of maximum, respectively) for fry, juvenile, and adult, respectively (Table 3-14). The pool areas provide the majority of the useable habitat for smallmouth bass fry, while the pool areas provide the only usable habitat available for adult smallmouth bass. Useable habitat for juvenile smallmouth bass is relatively equally divided between the pool areas and the riffles.

Total wetted area in the bypassed reach, under existing conditions, is 11,690 ft^2; 4,464 ft^2 in the large pool area, 2,159 ft^2 in the small pools, and 5,067 ft^2 in the riffle segment. Section 4.1.2. discusses habitat availability and wetted area in the bypassed reach with proposed and recommended minimum flows.

3.3.2.4. Vegetation and wildlife resources

There are approximately 289 acres of undeveloped habitat adjacent to the Marcal Project. Of this land area, 77 percent (222.5 acres) is mixed forest with an overstory comprised of mature hemlock, beech, red oak, and white pine. Another eight percent (23.1 acres) is forested, and dominated by either deciduous or coniferous species. Additionally, ten percent (28.9 acres) of the undeveloped uplands is scrub shrubland. The remaining five

percent (14.5 acres) of the undeveloped uplands is comprised of open fields.

Table 3-14. Weighted Useable Area (square feet/1,000 feet of river) at 1.5 cfs for all life stages of brook trout and smallmouth bass (Source: Consolidated Hydro, 1994b).

HABITAT TYPE	WEIGHTED USEABLE AREA (WUA) BROOK TROUT	SMALLMOUTH BASS
Large Pool	211 (fry) 316 (juv) 550 (adult)	1,044 (fry) 531 (juv) 347 (adult)
Small Pool	156 (fry) 1,315 (juv) 1,088 (adult)	1,711 (fry) 577 (juv) 21 (adult)
Riffle	1,312 (fry) 1,816 (juv) 0 (adult)	526 (fry) 689 (juv) 0 (adult)
SUM	1,679 (fry) 3,447 (juv) 1,639 (adult)	3,281 (fry) 1,796 (juv) 368 (adult)

Upland areas fall into two vegetation categories: open field and scrub shrub upland. The open fields contain species such as golden rod, several variety of grasses, clovers, vetches, yarrow, and oxeye daisy.

The scrub shrub areas contain forest species, open field species, as well as the typical upland shrub species such as staghorn sumac, Japanese knotwood, raspberry, goldenrod, and poison ivy. Some of the more common overstory trees are paper birch, quaking aspen, and red maple. Understory species consist of choke cherry, hawthorn, and saplings. Broadleaf meadow sweet, speckled alder, staghorn sumac, Japanese knotwood, raspberry, and blackberry are common shrubs. In addition, poison ivy, cow's vetch, oxeye daisy, grasses, and Queen Anne's lace are common herbaceous species.

The majority of the forested cover type found around the impoundment is composed of mixed deciduous and coniferous species. Common overstory species are mature hemlock, beech, red oak, white pine, and white birch. As understory species, ironwood, witch hazel, and saplings are present, but are limited in extent. Ground cover consists of wild sasparilla, Canada mayflower, partridgeberry, bracken fern, twinflower, yellow clintonia, and trillium.

Wildlife resources of the project area are typical of small rural communities in southwestern Maine, and vary based upon the type of available habitat. Species that have been observed utilizing habitat in the project area, include common snipe, redwinged blackbird, tree swallow, eastern painted turtle, great blue heron, kingfisher, and osprey. White-tailed deer and raccoon tracks have also been observed along the impoundment.

In addition to those species observed many species are likely to utilize the various habitat types found around the project. Old stumps and downed limbs within the forest provide habitat for redback salamander and the white-footed mouse. Raspberry and blackberry attract species such as white-tailed deer, snowshoe hare, meadow voles, meadow jumping mice, and red fox. The larger trees along the impoundment may provide perch sites for kestrels, red tailed hawk, and screech owls. The open fields provide habitat for bobolinks, field sparrow, crows, woodchuck, striped skunk, and meadow voles. Also, mixed forests provide important habitat for ruffed grouse. Relative to wetland habitats, submergent and emergent wetlands provide forage and cover for woodduck, mallards, black duck, muskrat, and beaver. Riverine unconsolidated bottom wetlands provide habitat for species such as the northern leopard frog, green frog, bullfrog, American toad, and snapping turtles. Scrub shrub wetlands provide important habitat for American woodcock.

Wetlands - The riverine unconsolidated bottom[24] type of wetlands in the Marcal impoundment represents 46 percent (about 27 acres) of the total wetlands habitat within the project area. Additionally, palustrine scrub shrub and palustrine deciduous forested wetlands constitute 26 percent (19.7 acres) and 24 percent (18.5 percent) of the wetland habitat, respectively. The remaining four percent (2.8 acres) is nonpersistent emergent wetland.

Palustrine forested wetlands in the project area are primarily associated with intermittent streams and wet depressions some distance from the river. These wetlands contain deciduous species such as silver maple, green ash, red maple, alder, and willow. Palustrine scrub shrub wetlands are abundant along Waterhouse Brook, but only a portion of these wetlands are associated with the impoundment. Wetland species associated with scrub shrub wetlands include alder, buttonbush, sweetgale, Joe-Pye weed, wool grass, yellow loosestrife, royal fern, sensitive fern, and blue flag iris.

Palustrine emergent non-persistent wetlands are uncommon along the margins of Marcal's impoundment due to steep banks and the absence of backwatered areas. However, limited emergent wetlands [containing wetland species such as sensitive fern, royal fern, water smartweed, monkey flower, threeway sedge, arrow head, water plantain, pickerel weed, and cardinal flower] are found in four isolated patches, primarily in areas near the mouth of Waterhouse Brook.

3.3.2.5. Endangered and threatened species

According to Interior's letter dated October 7, 1994 (Andrew L. Raddant, Acting Regional Environmental Officer, Office of Environmental Policy and Compliance, U.S. Department of the Interior, Boston, Massachusetts), there are no federally-listed threatened or endangered species found in the project area, with the exception of occasional transient endangered bald eagles or peregrine falcons.

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[24] Classification follows Cowardin *et al.*, 1979.

3.3.2.6. Recreation resources

Although no specific recreational facilities are currently associated with Marcal, there are opportunities for recreation in the project area. The Marcal impoundment is narrow and relatively shallow, and is used primarily for bank fishing and canoeing.

During the summer of 1992, the project's operator logged the number of visitors to the vicinity of the dam and powerhouse, the purpose of the visit, and the specific area the visitor used. Altogether, 80 visitors were noted, divided equally between the impoundment and downstream of the dam. Of the 80 visitors, 77 were fishing while three were boating in the impoundment. Of those fishing, 30 chose to fish in the project's tailrace, while 10 were noted fishing in the project's bypassed reach during spillage flows.

From a regional perspective, there are many recreational resources surrounding the project area. Sabago Lake, for example, is a heavily used recreation area and lies within 15 miles of the project. Additionally, six commercial campgrounds and numerous car-top and trailered boat launches on 32 lakes and ponds are no more than 10 miles away.

The Town of Mechanic Falls also provides several opportunities for recreation within the general vicinity of Marcal. Baseball fields, basketball courts, and an outdoor ice-skating rink are provided by the Mechanic Falls Recreation Area located adjacent to the Town Municipal Building. Adjacent to the project impoundment and Main Street (State Routes 121 and 11), the town maintains a small park from which canoes can be launched.

An informal carry-in access point, with a small pull-off area for parking, is available at the upper end of the impoundment, on private land adjacent to the bridge joining Jordan Road with Route 121. Informal carry-in access to the project impoundment is also available on property owned by the Mechanic Falls Firemen's Association northwest of the Main Street (Route 11) bridge over the impoundment. Consolidated Hydro, in cooperation with the Firemen's Association, proposes to develop a carry-in boat access and limited trailered facility here.

3.3.2.7. Aesthetic resources

The project is located in a transition zone between the coastal lowland areas to the south and east and mountain ranges to the north and west. Starting upstream of the project impoundment, the Little Androscoggin River flows first through a rural and heavily wooded landscape, then through residential areas, and then through the commercial and industrial sector of the Town of Mechanic Falls where the project dam and powerhouse are located. Shorelands along the upper portions of the project impoundment appear undeveloped from the river. In contrast, the project powerhouse is situated immediately adjacent to a large, abandoned paper mill building. The mill building is in a deteriorated condition due to a fire and lack of maintenance.

During periods of low-flow operation, the project impoundment is drawn down to about two feet below the crest of the flashboards. But due to the generally steep nature of the riverbanks, very little of the littoral zone along the impoundment's shoreline becomes dewatered. A 980-foot-long bypassed segment of the river between the project dam and powerhouse tailrace receives only leakage flows from the dam, except during periods of spillage when the hydraulic capacity of the project is exceeded.

Views of the project impoundment and bypassed reach are available from the Elm Street bridge, which crosses the river just upstream of the project dam.

3.3.2.8. Archeological and Historic resources

Consolidated Hydro commissioned archaeologist Deborah B. Wilson of North Haven, Maine, to conduct an archaeological survey of the Marcal Project area. The report concluded that no properties listed on, or eligible for listing on, the National Register were found in the Marcal's area of potential effects.

3.3.2.9. Land use

The Marcal Project, which includes the approximate 45-acre area encompassed by the project boundary, is located entirely within the Town of Mechanic Falls, Maine. The area surrounding the project consists of rural, residential, commercial, industrial, and undeveloped areas. The dam and powerhouse are situated in a commercial and industrial portion of downtown Mechanic Falls.

The Town of Mechanic Falls has adopted a shoreland zoning ordinance in accordance with the State of Maine requirements. Of the 492-acre land use study area examined by Consolidated Hydro (a 1,000- to 2,500-foot-wide corridor encompassing the project area), 230 acres (47 percent) fall within the town's shoreland zoning area. The zoning ordinance divides the shorelands bordering the river into three districts: resource protection, limited residential and recreational, and general development. The shoreland zoning portion of Consolidated Hydro's land use study area (230 acres) consists of 120 acres within the resource protection district, 50 acres within the limited residential and recreational district, and 21 acres within the general development district. The project impoundment (at normal full pond level) and the river reach downstream of the project dam occupy the remaining 39 acres of the shoreland zoning area. The 262-acre (53 percent) portion of Consolidated Hydro's land use study area that lies outside the shoreland zoning area consists of 174 acres (35 percent) within a residential district zone, 49 acres (ten percent) within a rural district zone, and 39 acres (eight percent) within commercial and industrial district zones.

Transportation land uses in the project area include State Highways 11 and 121, which meet in the Town of Mechanic Falls and head eastward to the Cities of Lewiston and Auburn. A system of rural and residential roads also serves the project area. A Canadian National Railroad line passes through the Mechanic Falls downtown area.

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Federal Energy Regulatory Commission

Office of Hydropower Licensing

July 1996

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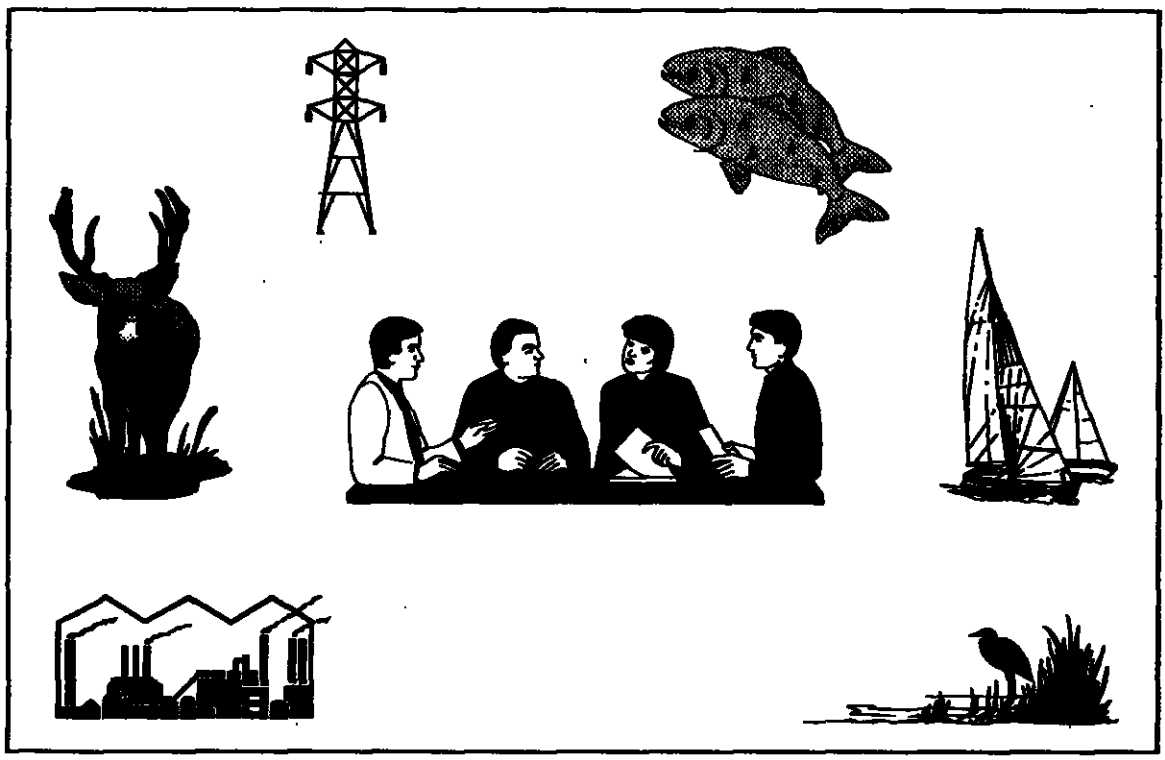
Final Environmental Impact Statement



Lower Androscoggin River Basin Hydroelectric Projects Maine

(FERC 2283-005, 11482-000)

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4. ENVIRONMENTAL CONSEQUENCES

4.1. Projects as proposed

4.1.1. Gulf Island-Deer Rips (CASE 2)

4.1.1.1. Geology and soils

The cultural resource survey conducted at Gulf Island-Deer Rips indicated that erosion (i.e., bank undercutting, tree falls, sediment spalling, and ice ramming) is present along the Gulf Island impoundment shoreline (Cowie *et al.*, 1987). These effects on geological resources are likely the result of recreational boating, wave action, wide tides (wind setup), and/or impoundment fluctuations.

Continuing to operate Gulf Island-Deer Rips as an intermittent peaking facility would result in ongoing shoreline erosion. However, shoreline erosion may be minimized due to Central Maine's proposal to limit impoundment fluctuations to a target fluctuation of one foot from May 1 through June 15 instead of the existing four foot fluctuations. During the remainder of the year, the existing four foot drawdowns would continue to affect the geological and soil resources.

4.1.1.2. Water quality and quantity

WATER QUALITY AND QUANTITY SUMMARY

The continued operation of Gulf Island-Deer Rips would affect water quality and quantity in the lower Androscoggin River.

Central Maine's proposed project operations would enhance water quality in the project vicinity and in the lower Androscoggin River. By releasing a minimum flow of 1,100 cfs from Gulf Island-Deer Rips, water quality (i.e., DO) in the free-flowing reaches of the Androscoggin River below the project would be improved, particularly during the low-flow summer period. However, because Central Maine currently releases 1,000 cfs as a minimum flow from Gulf Island-Deer Rips, only minor improvements in DO concentrations in downstream river reaches is expected. Further, Central Maine's proposal to continue operating the GIPOP facilities in partnership with Boise Cascade, International Paper, and James River would have positive effects in not only the Gulf Island impoundment, but in the Androscoggin River downstream of the project; cumulative beneficial effects in the lower Androscoggin River have occurred, and would continue to occur through release of oxygen into the Gulf Island impoundment.

With regards to aquatic resources, the implementation of the 1,000 cfs minimum flow probably has reduced the stress on the aquatic invertebrate community, as well as other resources in the river, and a healthier, more diverse invertebrate community has likely

developed. Central Maine's proposed minimum instream flow release of 1,100 cfs would result in additional improvements in the aquatic invertebrate community. However, while we can not definitively quantify the level of improvement, we believe, based on the small incremental increase in flow, that the degree of benefits provided by the proposed flow would be minor.

Central Maine's proposal to limit impoundment fluctuations to a target fluctuation of one foot from May 1 to June 15 would reduce any sediment resuspension that may be occurring during this period, thus providing benefits to the overall water quality in the Gulf Island impoundment. Further, through potential modifications to the operation of the Gulf Island powerhouse, water quality in the impoundment may be improved to some degree during the period July 1 to April 30. However, to what extent any benefits would occur remains unknown.

The specific impacts to water quality in the lower Androscoggin River are discussed below. We also describe how we reached our conclusions described above.

PROJECT OPERATION AND DOWNSTREAM FLOWS

As discussed in Section 3.3.1.2., Central Maine currently operates Gulf Island-Deer Rips as an intermittent peaking facility, which affects the generation of the remaining lower Androscoggin River projects.

Central Maine proposes to release a continuous minimum flow of 1,100 cfs or inflow, whichever is less, on a year-round basis. The primary purpose of the minimum flow is to protect and enhance aquatic habitat for resident and anadromous fish in the lower Androscoggin River below the project. While we will mainly discuss the impacts and effects of the proposed flows in the fisheries section of this document, the proposed flow would also affect water quality.

Although unquantified, increasing the flows at Gulf Island-Deer Rips from 1,000 cfs to 1,100 cfs would have a minor beneficial effect on water quality in the free-flowing reaches of the river below Gulf Island-Deer Rips, Lewiston Falls, Worumbo, and Pejebscot, particularly in the low-flow summer months. Water velocities in these areas would increase slightly, resulting in a slight increase in turbulence and potentially somewhat enhanced DO levels. By decreasing the "unnatural and artificial" periodicity of the flows, experienced when flows range from 1,000 cfs to maximum generation, the lower Androscoggin River flows would resemble a more natural distribution of flows. While we have not attempted to quantify these effects, we believe that some of these benefits would be attenuated farther downstream and that the overall water quality in the river would benefit somewhat from the proposed flow increase.

In addition to the physical and chemical properties of the water that would be affected by the proposed flow increase, macroinvertebrates species, especially those of limited

mobility, would also benefit from the minor increase in flow (*see the macroinvertebrate discussion in this section for a more detailed look at macroinvertebrates and water quality*).

DISSOLVED OXYGEN

As stated in Sections 3.2.1. and 3.3.1.2., water quality has historically been very poor in the Androscoggin River, and particularly has been a problem in the Gulf Island impoundment, where DO concentrations in some areas reached levels near 0.0 mg/l (Mitnik, 1983).

As a result of several studies conducted during the 1980s, MDEP, Central Maine, and the three paper companies implemented GIPOP as a means to improve DO concentrations in the Gulf Island impoundment. [*Appendix E-XIII in the Gulf Island-Deer Rips license application contains further discussion relative to establishment of the GIPOP program*].

Central Maine proposes to continue its role and involvement in the program, as an enhancement measure for improving water quality in the lower Androscoggin River.

The GIPOP facilities were put into operation in July 1992, and have been monitored for effectiveness since that time. DO and temperature monitoring is a significant component of GIPOP; the program being established by MDEP (Central Maine, 1994a). The DO monitoring program includes DO/temperature probes in two locations. One set of probes is placed at the Gulf Island dam, which is downstream of GIPOP, at three depths; five feet, 20 feet and 35 feet.[1] The second location is approximately two miles upstream of the site for the GIPOP diffuser system, with the probe located in about 15 feet of water. The probes at both locations provide readings on a continuous basis, and record DO and temperature on an hourly basis. The water quality data collected through this monitoring is compiled annually and provided to MDEP in accordance with the monitoring plan. Central Maine also indicates that the GIPOP monitoring program collects data from June 1 through September 30, and is supplemented periodically with water quality sampling conducted by Central Maine at several locations on the Gulf Island impoundment.

Based on monitoring during the early years of the program (*see Section 3.3.1.2. for further details of the results*), the oxygen injection program has improved DO concentrations considerably in both the Gulf Island impoundment and in the project's tailrace. As an example, an average of 90.5 percent[2] of the impoundment has met or exceeded Maine's 5.0 mg/l DO standard, whereas prior to implementing GIPOP, 65 percent of the impoundment met or exceeded Maine's DO standard. Further, DO concentrations downstream of Gulf

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[1] The Gulf Island development's intakes are located at depths from about 33 feet to about 56 feet below the water's surface.

[2] Based on data from 1992 (94 percent), 1993 (88 percent), 1994 (96 percent), and 1995 (84 percent) [*taken from Conservation Coalition's comments on the DEIS*].

Island-Deer Rips during the low-flow months are generally above 7.0 mg/l, well above Maine's 5.0 mg/l standard.

In examining the available water quality data, we believe there are two observations worth noting. First, we recognize that violations to the state's DO standard continue to occur, and that further improvements to DO concentrations should be pursued. However, it is important to note that the violations in DO concentrations that continue to occur, generally occur at a depth that would most likely cause little, if any, impacts to the biological integrity of the system. Second, the 1993 monitoring data suggests that further improvements in DO concentrations may be achieved with changes in the operational schedule for the GIPOP facility. We base this conclusion on the timing of the DO violations; the majority of violations appear to have occurred when either GIPOP was not operating or during the initial stages of start-up (i.e., late June and early July).

We concur with Central Maine with regards to the GIPOP facilities and associated water quality monitoring program. There is no evidence to suggest that continuing to operate the GIPOP facilities, including annual monitoring of DO and temperature in accordance with the existing monitoring plan, would have an adverse affect on water quality in the lower Androscoggin River. In fact, this program has had a beneficial effect, both in the Gulf Island impoundment and the river downstream of the project. The program has had a cumulative beneficial effect on water quality in the lower Androscoggin River, and should continue to have such an effect in the future. We believe, however, that changing the operating schedule for the GIPOP facility may provide additional benefits to water quality in the lower Androscoggin River, and therefore, such changes could be warranted.

MERCURY/DIOXIN CONTAMINATION

Central Maine proposes no specific measures related to mercury/dioxin contaminatior testing of sediment, fish, or various species of wildlife in, and around, the Gulf Island impoundment. However, Central Maine's proposal to limit impoundment fluctuations to a target fluctuation of one foot from May 1 to June 15 would reduce any sediment resuspension that may be occurring during this time period as a result of operating the project with the existing two- to four-foot drawdowns. During the remaining periods of the year, the existing drawdowns would continue to occur, thereby affecting the environment (i.e., sediment, fish, and/or wildlife in, or utilizing, the Gulf Island impoundment) as presently may be occurring[3].

[3] Central Maine's proposed increase in minimum flow would likely require some modification in the Gulf Island impoundment operations (i.e., reduced daily and/or weekly drawdown), which may provide some, although unknown, benefits to water quality in the impoundment.

WATER QUALITY AND AQUATIC INVERTEBRATES

Aquatic invertebrate communities can be an important indicator of water quality because different species prefer different ambient oxygen concentrations (Wetzel, 1983). For example, *Diptera*, a group of aquatic insects which include the flies, midges, and mosquitoes, are adapted to low DO concentrations. Mayflies, stoneflies, and dragonflies have fairly high respiratory demands, and require high oxygen concentrations.

These general characteristics are supported by results of studies conducted on two Maine rivers where water quality has been, and continues to be, fair to excellent. Eco-Analysts (1992a), who studied aquatic invertebrate communities in Moxie Stream, found mayflies and stoneflies to be, by far, the dominate benthic organism. The dominance by these species is reflective of good to excellent water quality. Eco-Analysts (1992b) also studied the aquatic invertebrate community in the Saco River, and found that mayflies, stoneflies, and *Diptera* are all equally abundant. This suggests that water quality in the Saco River is fair to good. [*As a point of reference, MDEP classifies Moxie Stream as Class A water and the Saco River as Class B/C water*].

MDEP uses the aquatic invertebrate community in running waters to assess the health or quality of the water (Eco-Analysts, 1992a). Central Maine has not conducted any aquatic invertebrate studies downstream from the proposed project. Nevertheless, conclusions can be drawn from the study conducted on the Saco River, relative to the project's likely effects on the aquatic invertebrate community in the lower Androscoggin River.

Eco-Analysts (1992b) described the free-flowing area below West Buxton as a "mixed" habitat. Specifically, during periods of low to no flow from Bonny Eagle, the substrate resembled a lotic, riverine habitat, while the current velocities, attached algae, and other plant growth more closely resembled a lentic, pond-like habitat. Thus, benthic invertebrate populations/diversity were very low with some stress-sensitive species absent.

In the lower Androscoggin River, the existing 1,000 cfs minimum flow has reduced the lentic character of the river reach and increased the lotic character of the habitat. Given that water velocities currently vary from about 1.0 fps to 3.3 fps (Stetson-Harza, 1988), stress on the aquatic invertebrates likely has declined significantly since the 1,000 cfs flow was implemented, and a healthier, more abundant/diverse community probably has developed.

Because the increment between the existing minimum flow and Central Maine's proposed minimum flow of 1,100 cfs is small, we would expect to see little, if any, discernable effects on the aquatic invertebrate community downstream from the proposed project. We base this conclusion on the fact that water velocity and overall water quality will not change appreciably.

4.1.1.3. Fisheries resources

FISHERIES RESOURCES SUMMARY

With Central Maine's proposals, the continued operation of Gulf Island-Deer Rips would result in no additional adverse impacts to existing fish resources in the lower Androscoggin River. With Central Maine's proposed enhancements, however, both resident and anadromous fish would experience minor to significant improvements in habitat conditions.

Central Maine's proposals to release a year-round 1,100 cfs minimum flow from the Gulf Island dam and to restrict down-ramping below the Deer Rips/Androscoggin No. 3 developments would provide minor improvements to the migratory pathway for anadromous fish in the lower Androscoggin River. The increased minimum flow would slightly enhance downstream aquatic habitat, while restricting down-ramping would reduce the effects of fluctuating flows. Further, because restoration of anadromous fish, mainly Atlantic salmon, above Gulf Island-Deer Rips has been deferred to some future date, the continued operation of Gulf Island-Deer Rips, as proposed, would not affect upstream and downstream fish passage at the site.

The tidal portion of the Androscoggin River and the downstream estuary would be affected by the proposed 1,100 cfs minimum flow. The freshwater-saltwater mixing zone would be changed slightly, while downstream movement and input of freshwater organisms (fishes and invertebrates) and nutrients into the tidal portion of the river would be slightly enhanced.

Central Maine's proposed environmental measures could also significantly enhance the existing fisheries in the Gulf Island-Deer Rips area and the lower Androscoggin River. Central Maine's proposed restriction on headpond fluctuations from May 1 to June 15 would moderately to significantly improve the blackbass fishery in Gulf Island impoundment. The proposed minimum flow of 1,100 cfs and restriction on down-ramping would provide minor to moderate benefits to the aquatic resources (i.e., resident fisheries and aquatic macroinvertebrates) in the lower Androscoggin River. The availability of resident fish habitat at Gulf Island-Deer Rips and in the downstream free-flowing segments of the Androscoggin River under extreme conditions (90 percent exceedence) in the critical summer months would be slightly increased with implementation of Central Maine's 1,100 cfs minimum flow.

Overall, Central Maine's proposed enhancements would contribute to minimizing any continued impacts of the project and would have a cumulative beneficial effect on resident and anadromous fish in the Lower Androscoggin River Basin.

The following is a detailed discussion of the fishery impacts, and how we reached our conclusions described above.

PROJECT OPERATION AND DOWNSTREAM MINIMUM FLOWS

Projects downstream from Gulf Island-Deer Rips generate with the flows released from the Gulf Island powerhouse. Currently, all river flows less than 6,450 cfs are passed through the Gulf Island powerhouse to the Deer Rips/Androscoggin No. 3 impoundment (*see Figure 2-2*). All flows less than 5,120 cfs are used for generation by the Deer Rips and Androscoggin No. 3 powerhouses then discharged to the Androscoggin River downstream. The proposed Gulf Island powerhouse would utilize all flows less than 6,610 cfs for generation. Excess flows are currently, and would continue to be, released through gates or spilled over the project dams. Spillage flows at Gulf Island dam occur about 28 percent of the time, while flows are spilled at the Deer Rips/Androscoggin No. 3 dam about 37 percent of the time. Currently, Gulf Island-Deer Rips has no minimum flow requirements. However, Central Maine currently releases a 1,000-cfs minimum flow from Gulf Island-Deer Rips to meet the minimum flow requirements for the downstream Lewiston Falls Project.

To determine the effects of the existing (*see Section 3.3.1.3.*) and proposed minimum flows (i.e., 1,100-cfs, or inflow) and the effects of fluctuating flow releases on aquatic habitat in the lower Androscoggin River, Central Maine conducted an instream flow study of the Deer Rips/Androscoggin No. 3 tailwater reach and two free-flowing areas downstream from Lewiston Falls, utilizing FWS's Instream Flow Incremental Methodology (IFIM) (Stetson-Harza, 1988). The IFIM is a flow assessment technique developed primarily to assess the impacts of water development projects (Bovee, 1982; Bovee and Milhous, 1978; and Milhous *et al.*, 1989). For all study reaches, details of IFIM model formation, methodology, and calibration are contained in Stetson-Harza (1988).

Deer Rips IFIM Results

At Gulf Island-Deer Rips, the IFIM study examined a 1,475-foot free-flowing reach of the Androscoggin River immediately below the Deer Rips and Androscoggin No. 3 powerhouses. This reach has an average width of 530 feet, and is divided into the main, or east, channel and numerous smaller channels by two islands and a peninsula. This reach is atypical of habitat conditions in the lower Androscoggin River because of its free-flowing nature and the shallow shoreline areas provided by the islands. Peaking flows from Gulf Island-Deer Rips create varying habitat conditions in this reach depending on the volume and location of flow releases.

After the collection of field data, habitat values were initially simulated with the IFIM model over a range of flows from 575 cfs to 3,600 cfs. Flows up to 15,000 cfs were subsequently studied. The species evaluated included smallmouth bass (all life stages), brown trout (juvenile and adult), and Atlantic salmon (juvenile and adult). Results of the habitat simulation for the Deer Rips reach are shown in Figures 4-1, 4-2, and 4-3.

For smallmouth bass, peak WUA occurs at 1,430 cfs for spawning/incubation/fry, juvenile, and adult smallmouth bass (Figure 4-1). At Central Maine's proposed 1,100 cfs

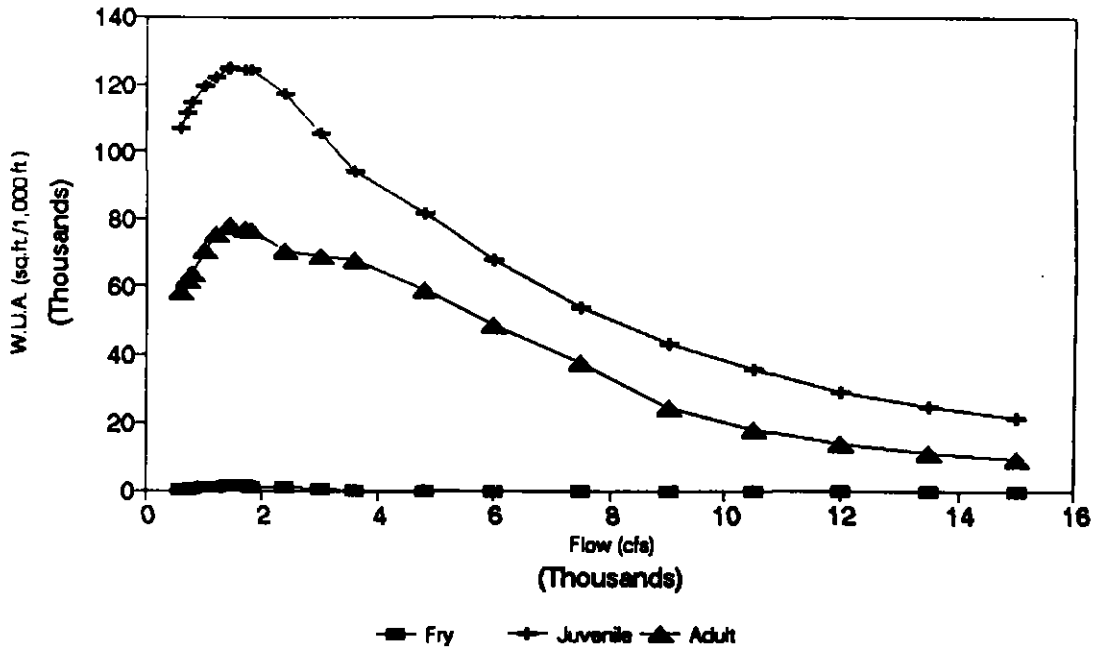

Figure 4-1. Smallmouth bass weighted useable area (WUA) vs. discharge for the Deer Rips reach (Source: Stetson-Harza, 1988).

minimum flow, the percentage of maximum WUA available varied between 58 percent and 97 percent, depending upon lifestage. At typical peaking flows of about 6,000 cfs, WUA for spawning/incubation/fry was non-existent.

The brown trout juvenile and adult WUA curves increase sharply from the lowest flows simulated up to the maximum WUA at 3,000 cfs (Figure 4-2). At Central Maine's proposed flow of 1,100 cfs, the percent of maximum WUA available was 66 percent for juveniles and 79 percent for the adults. At typical peaking flows, WUA for juvenile and adult brown trout was 82 percent and 92 percent of the peak WUA, respectively.

Peak WUA for juvenile Atlantic salmon occurs at 1,800 cfs, while for adult salmon, peak WUA occurs at 7,500 cfs (Figure 4-3). At Central Maine's proposed 1,100 cfs minimum flow, juvenile and adult habitat was 87 percent and 56 percent of the peak WUA. At typical peaking flows, WUA was 63 percent and 98 percent of the peak WUA for juvenile and adult Atlantic salmon, respectively.

Dresser's Rips IFIM Results

The Androscoggin River, from Lewiston Falls to a point approximately 1.8 miles downstream, is run-type habitat. This stretch of river averages 600 feet wide, and includes the confluence with the Little Androscoggin River. Immediately below the run-type habitat

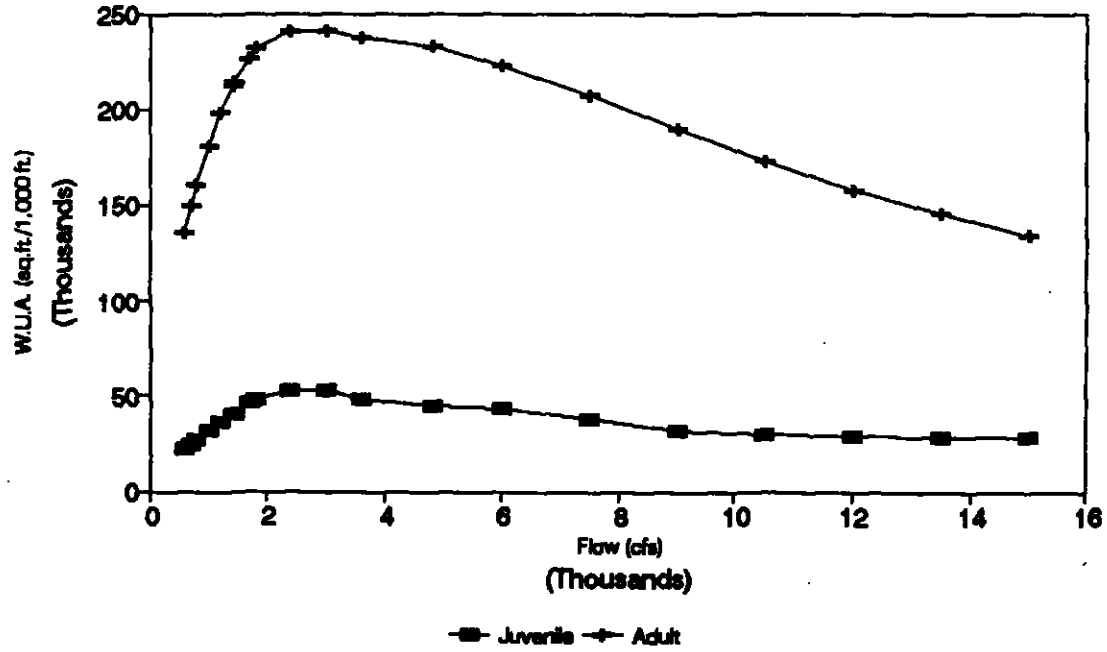

Figure 4-2. Brown trout weighted useable area (WUA) vs. discharge for the Deer Rips reach (Source: Stetson-Harza, 1988).

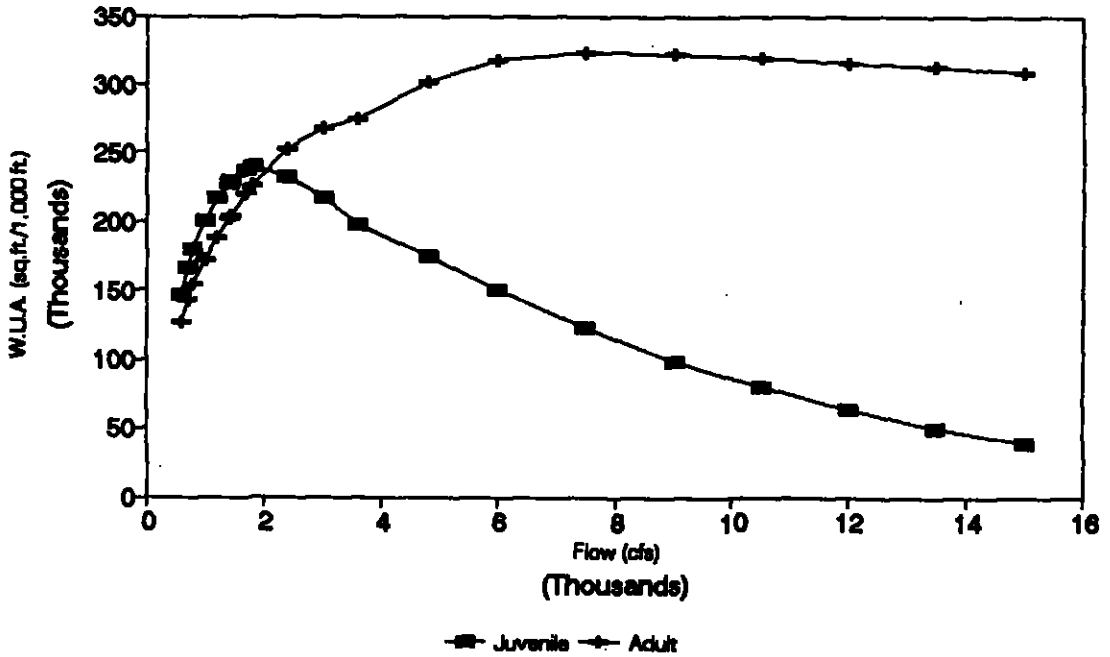

Figure 4-3. Atlantic salmon weighted useable area (WUA) vs. discharge for the Deer Rips reach (Source: Stetson-Harza, 1988).

is a 0.3 mile-long reach known as Dresser's Rips. This reach is about 300 feet wide, and is relatively steep for the 10.4-mile stretch of the Androscoggin River between Lewiston Falls and the Worumbo impoundment. Dresser's Rips is a repeating pool/riffle habitat under low-flow conditions and run/riffle under relatively high flows (greater than 3,000 cfs).

For this study reach, habitat values were initially simulated with the IFIM model over a range of flows from 575 cfs to 3,600 cfs. Flows up to 16,750 cfs were subsequently studied. The target fish species and lifestages were the same as those indicated in the above mentioned Deer Rips IFIM study. American shad (in-migration, out-migration, spawning, larval, and juvenile) was also included as a target species for this reach. Results of the habitat simulation for the Dresser's Rips reach are shown in Figures 4-4 through 4-7.

For smallmouth bass, peak WUA for spawning/incubation/fry, juveniles, and adults occurred at 575 cfs (Figure 4-4). At Central Maine's proposed 1,100 cfs minimum flow, the amount of habitat available for spawning/incubation/ fry, juveniles, and adults was 34 percent, 78 percent, and 63 percent of peak WUA, respectively. WUA at typical peaking flows of about 6,000 cfs was about four percent of peak WUA for spawning and the early lifestages, 18 percent of peak WUA for juveniles, and eight percent of peak WUA for adults.

The amount of available habitat in Dresser's Rips for brown trout varies between lifestages (Figure 4-5). Peak WUA for brown trout occurs at a flow of 1,800 cfs for

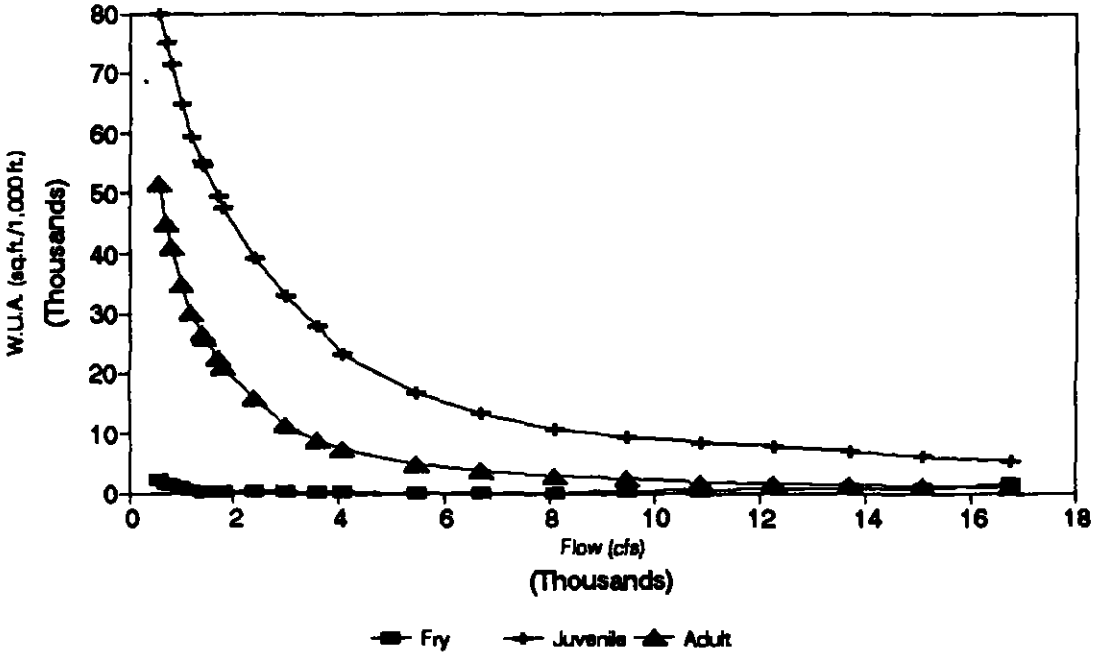

Figure 4-4. Smallmouth bass weighted useable area (WUA) vs. discharge for the Dresser's Rips reach (Source: Stetson-Harza, 1988).

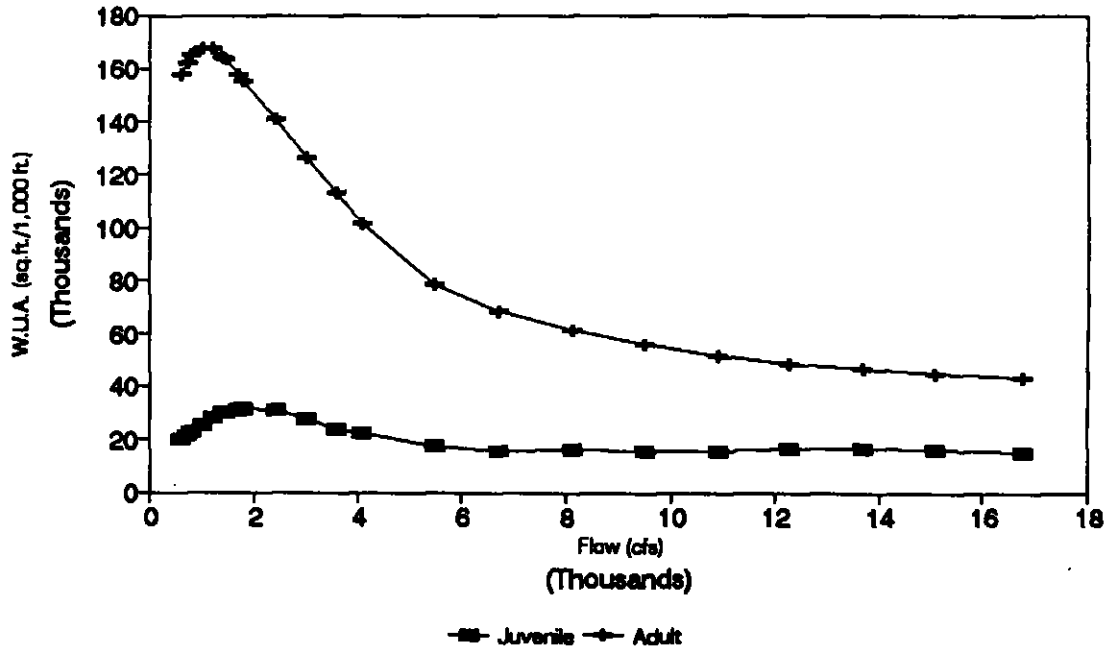

Figure 4-5. Brown trout weighted useable area (WUA) vs. discharge for the Dresser's Rips reach (Source: Stetson-Harza, 1988).

juveniles and 1,000 cfs for the adults, and, for both lifestages, decreases at higher flows. With Central Maine's proposed 1,100 cfs minimum flow, juvenile habitat was 85 percent of the lifestage's peak WUA, while WUA for the adults was at 99 percent of the peak WUA. At flows as high as 6,000 cfs, available juvenile and adult brown trout habitat drop to about 53 percent and 44 percent of the peak WUA, respectively.

Dresser's Rips contains a considerable amount of suitable substrates and depths for Atlantic salmon under a variety of flows (Stetson-Harza, 1988). The Atlantic salmon juvenile WUA curve increases slightly to a peak at 1,000 cfs, then decreases over the remainder of the flows modelled (Figure 4-6). The adult WUA curve shows that adult habitat peaks at 4,100 cfs. At Central Maine's proposed minimum flow of 1,100 cfs, the percentage of peak WUA available would be 74 percent and nearly 100 percent for adults and juveniles, respectively. At typical peaking flows, WUA for juvenile and adult salmon was about 28 percent and 97 percent of the estimated peak WUA.

Habitat for all lifestages of American shad in the Dresser's Rips reach was maximized at flows between 3,600 cfs and 5,500 cfs, depending upon lifestage (Figure 4-7). At Central Maine's proposed minimum flow of 1,100 cfs, the amount of habitat available for spawning, larval, juvenile, juvenile out-migrating, and adult in-migrating was 42 percent, 48 percent, 81 percent, 54 percent, and 60 percent of the lifestage's peak WUA, respectively. At typical peaking flows of 6,000 cfs, significantly more habitat is available for all lifestages of shad,

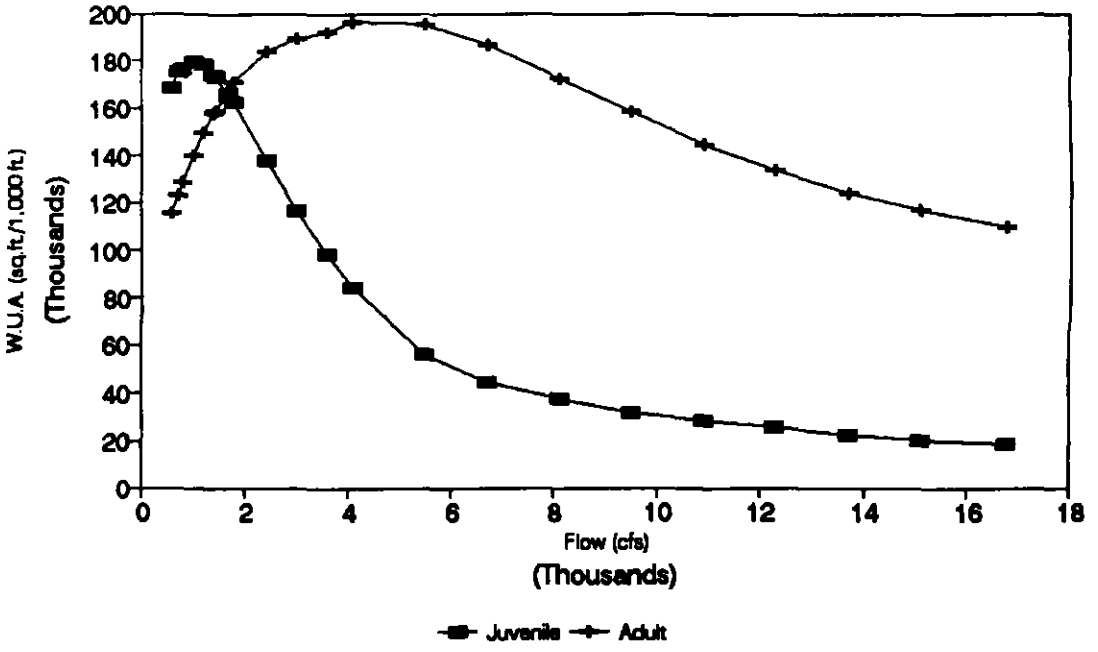

Figure 4-6. Atlantic salmon weighted useable area (WUA) vs. discharge for the Dresser's Rips reach (Source: Stetson-Harza, 1988).

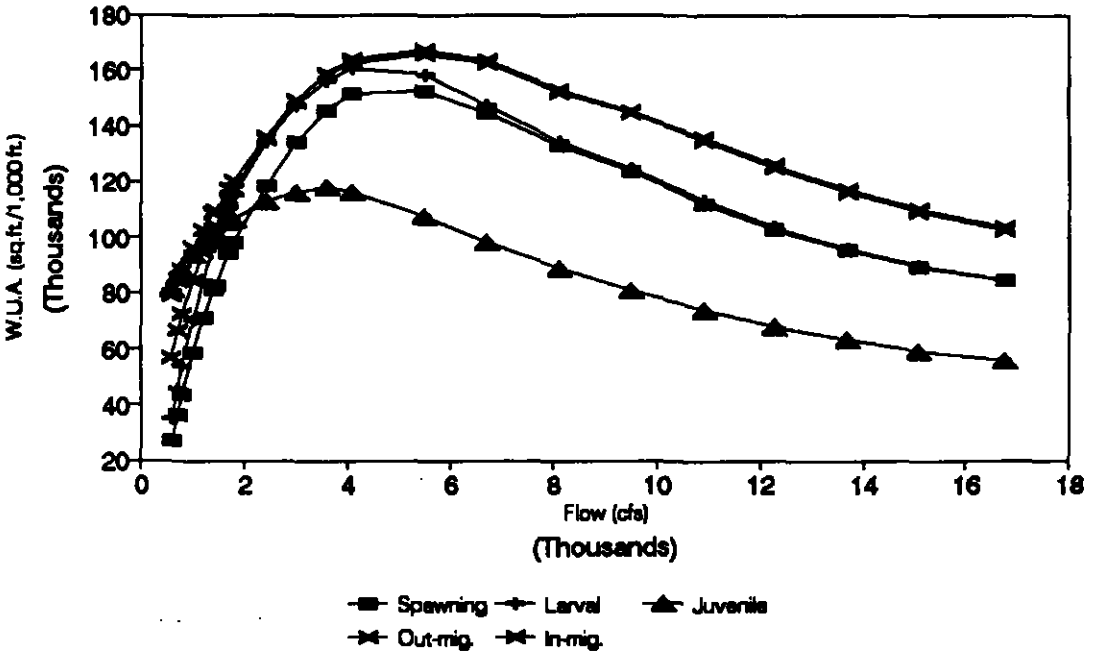

Figure 4-7. American shad weighted useable area (WUA) vs. discharge for the Dresser's Rips reach (Source: Stetson-Harza, 1988).

except juveniles, ranging between 95 and 99 percent of the peak WUA. For juveniles, the percentage of peak WUA was about 87 percent, a slight increase over baseflow conditions.

Run Reach IFIM Results

The 8.3 miles of the Androscoggin River between the downstream end of Dresser's Rips and the Worumbo impoundment is a run-type habitat. This reach has an average width of 500 feet, and is characterized by relatively deep water and even flows, even under low-flow conditions. The Run Reach, or study reach, is a 640-foot segment of this run-type habitat, and is shallower under low-flow conditions than the remainder of the run-type habitat. The study reach has an average width of 800 feet.

For this study reach, habitat values were initially simulated with the IFIM model over a range of flows from 582 cfs to 3,635 cfs. Flows up to 16,600 cfs were subsequently studied. American shad (in-migration, out-migration, spawning, larval, and juvenile) was the target species in this reach.

Results of the habitat simulation for the Run Reach are shown in Figure 4-8. Generally, American shad (in-migrating, spawning, larval, and out-migrating) showed an increase in habitat over the full range of flows modelled, with minimal, if any, declines at the highest flows. Juvenile American shad exhibit increases in habitat up to the peak at 8,300 cfs, with a slight decline in habitat above 8,300 cfs. These results reflect the broad,

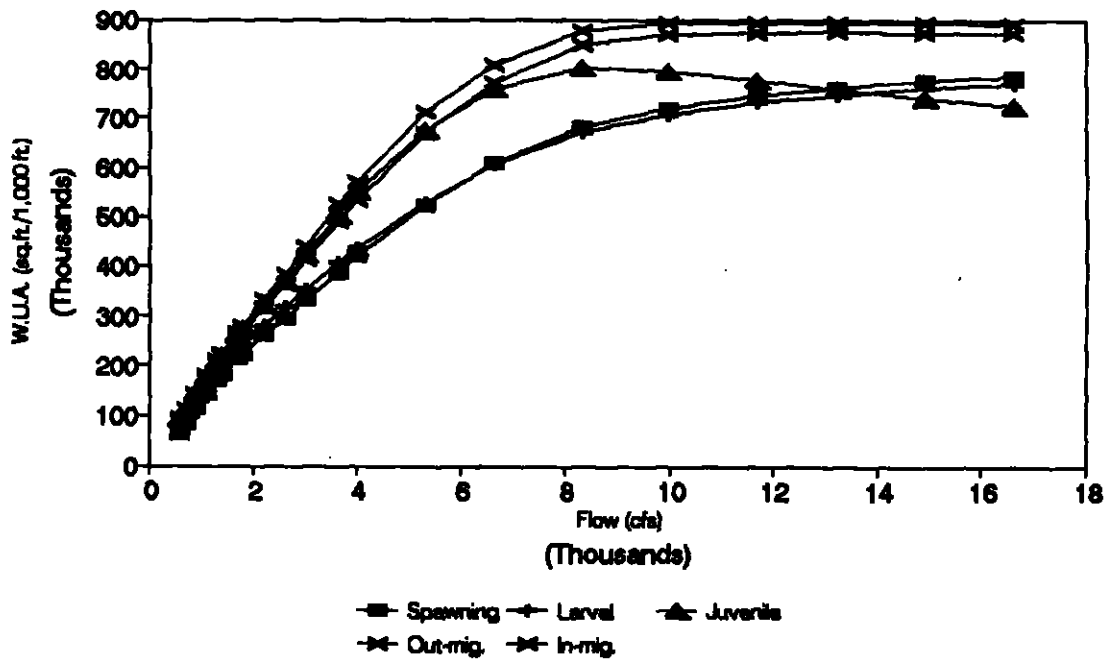

Figure 4-8. American shad weighted useable area (WUA) vs. discharge for the Run Reach (Source: Stetson-Harza, 1988).

shallow nature of this reach, where considerable flow is required before there is any appreciable gain in depth. Velocities generally remain at or below 1.0 fps over the range of flows studied, compared to the shad's 0.5 to 3.0 fps flow criteria. At Central Maine's proposed minimum flow of 1,100 cfs, the amount of available habitat for all species/lifestages modelled averages about 20 percent of the species peak WUA.

Total WUA and Habitat Duration Analysis

In order to evaluate the total effect of flows from Gulf Island-Deer Rips on habitat availability in the Deer Rips and Dresser's Rips reaches, the IFIM results for both study reaches were combined into a single set of flow versus WUA curves. More specifically, we modified the WUA results provided by Stetson-Harza (1988) for juvenile and adult smallmouth bass, brown trout, and Atlantic salmon, which were weighted based on the length of the study reach and then combined to determine a relationship that encompassed both study reaches.

The resulting composite Deer Rips/Dresser's Rips flow versus WUA curves for each species/lifestage are provided in Figures 4-9 to 4-14. In general, the habitat requirements of the various species and lifestages evaluated show predictable differences when plotted against flow. For example, juvenile and adult smallmouth bass habitat peaks at flows of 1,000 cfs and 1,500 cfs, respectively, and steadily decreases at higher flows (Figures 4-9 and 4-10). Habitat for juvenile and adult brown trout peaks at 3,000 cfs and 1,500 cfs, respectively (Figures 4-11 and 4-12). Juvenile Atlantic salmon experience slight decreases in habitat at flows in excess of 1,500 cfs (Figure 4-13). In contrast, adult Atlantic salmon experience increases in habitat up to about 6,000 cfs, with a slight decline in habitat at higher flows (Figure 14).

Utilizing the composite curves, at Central Maine's proposed minimum flow of 1,100 cfs, the percentage of the peak WUA available within both reaches would be nearly 100 percent for both juvenile and adult smallmouth bass, 74 and 89 percent for juvenile and adult brown trout, respectively, and 95 and 62 percent for juvenile and adult salmon, respectively.

Typical peaking flows of about 6,000 cfs would result in a decline in available habitat for most of the species/lifestages evaluated. For juvenile and adult smallmouth bass, habitat would be 48 percent and 54 percent of the peak habitat, respectively. For juvenile and adult brown trout, habitat would be 77 and 80 percent of the peak habitat. Available habitat for juvenile Atlantic salmon would be 54 percent of the peak habitat, while habitat for adult salmon would be maximized at peaking flows.

American shad habitat in the Run Reach, for all lifestages, generally increases linearly with flow, which is attributed to the wide range of depths and velocities considered suitable for the species. Because this type of linear relationship does not lend itself to an analysis similar to that described above, no composite habitat curves were developed for American shad in the Dresser's Rips reach and the Run Reach.

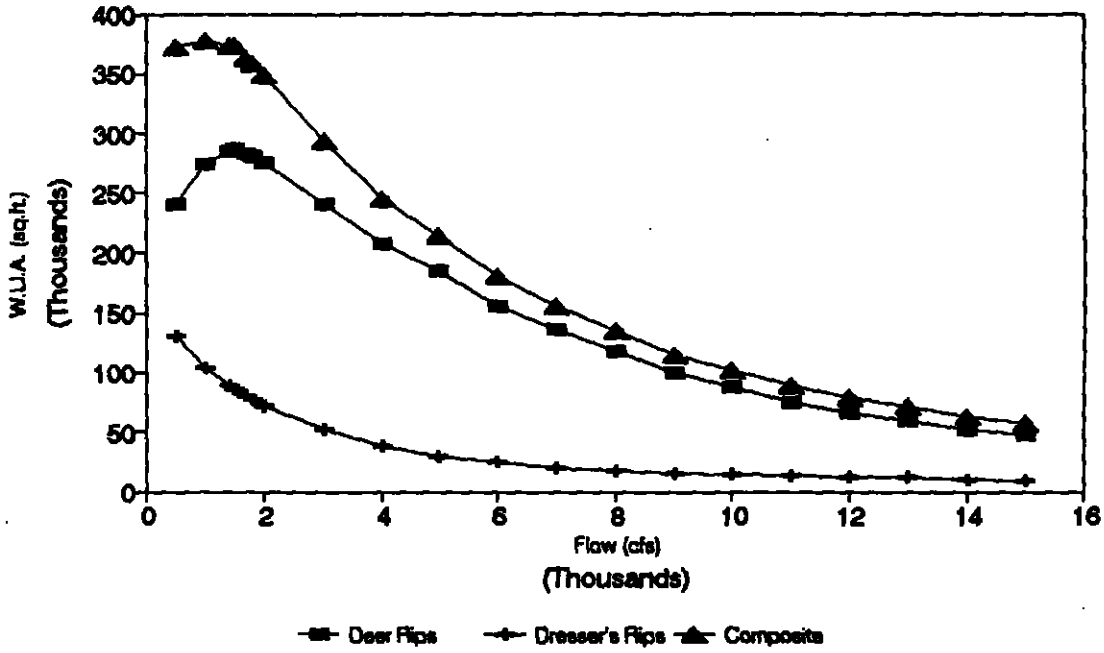

Figure 4-9. Juvenile smallmouth bass composite weighted useable area (WUA) vs. discharge for the Deer Rips and Dresser's Rips reaches (Source: Stetson-Harza, 1988).

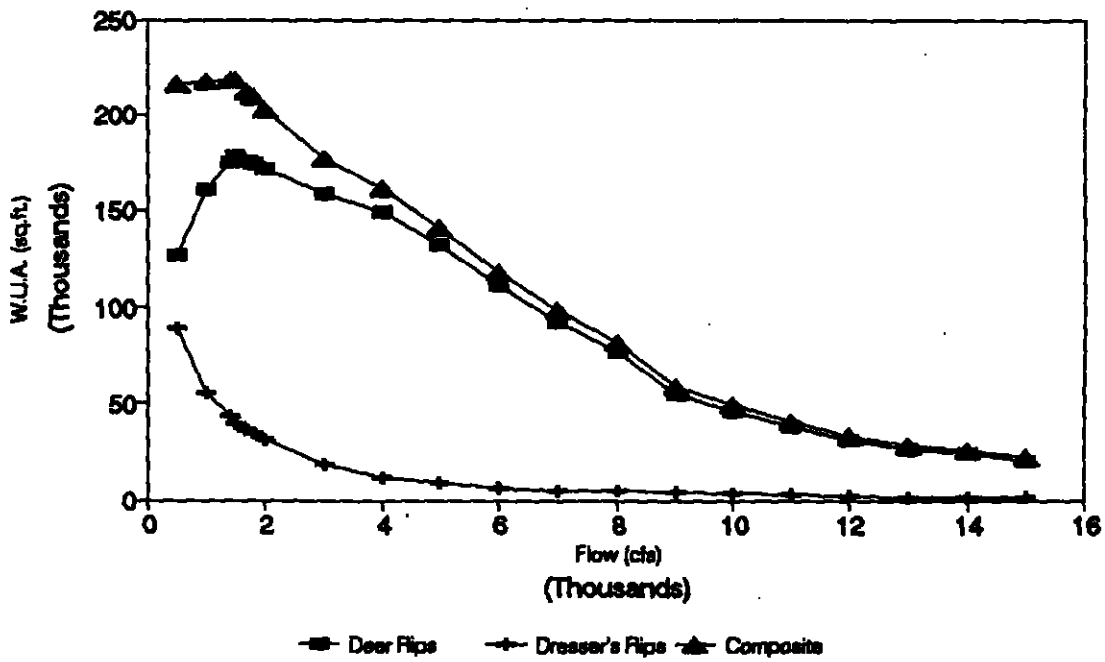

Figure 4-10. Adult smallmouth bass composite weighted useable area (WUA) vs. discharge for the Deer Rips and Dresser's Rips reaches (Source: Stetson-Harza, 1988).

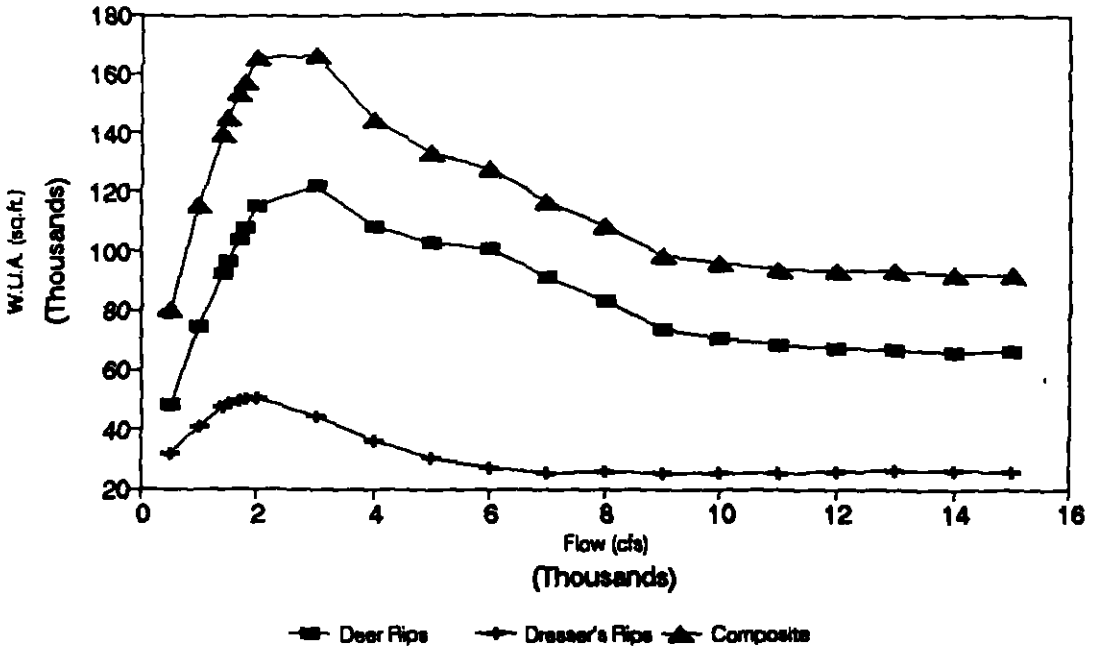

Figure 4-11. Juvenile brown trout composite weighted useable area (WUA) vs. discharge for the Deer Rips and Dresser's Rips reaches (Source: Stetson-Harza, 1988).

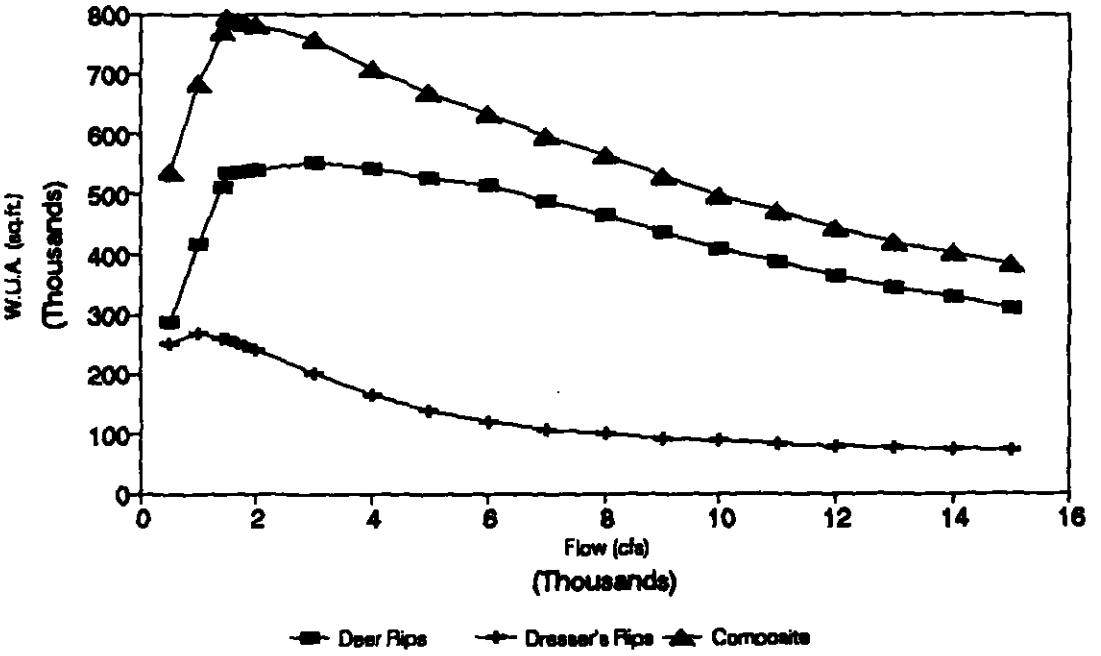

Figure 4-12. Adult brown trout composite weighted useable area (WUA) vs. discharge for the Deer Rips and Dresser's Rips reaches (Source: Stetson-Harza, 1988).

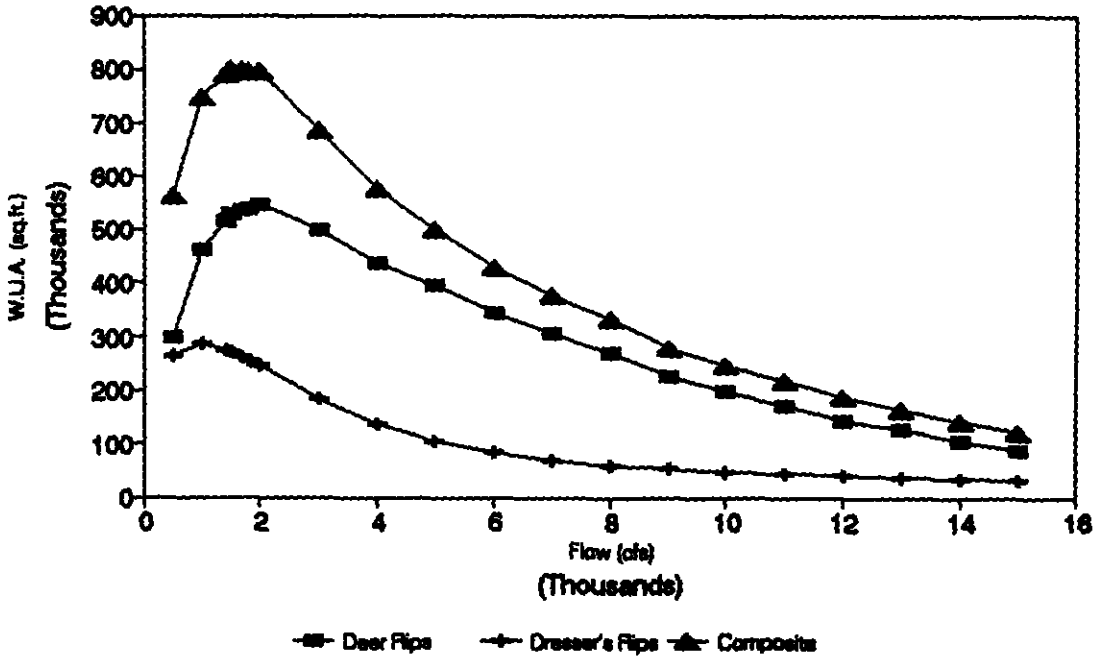

Figure 4-13. Juvenile Atlantic salmon composite weighted useable area (WUA) vs. discharge for the Deer Rips and Dresser's Rips reaches (Source: Stetson-Harza, 1988).

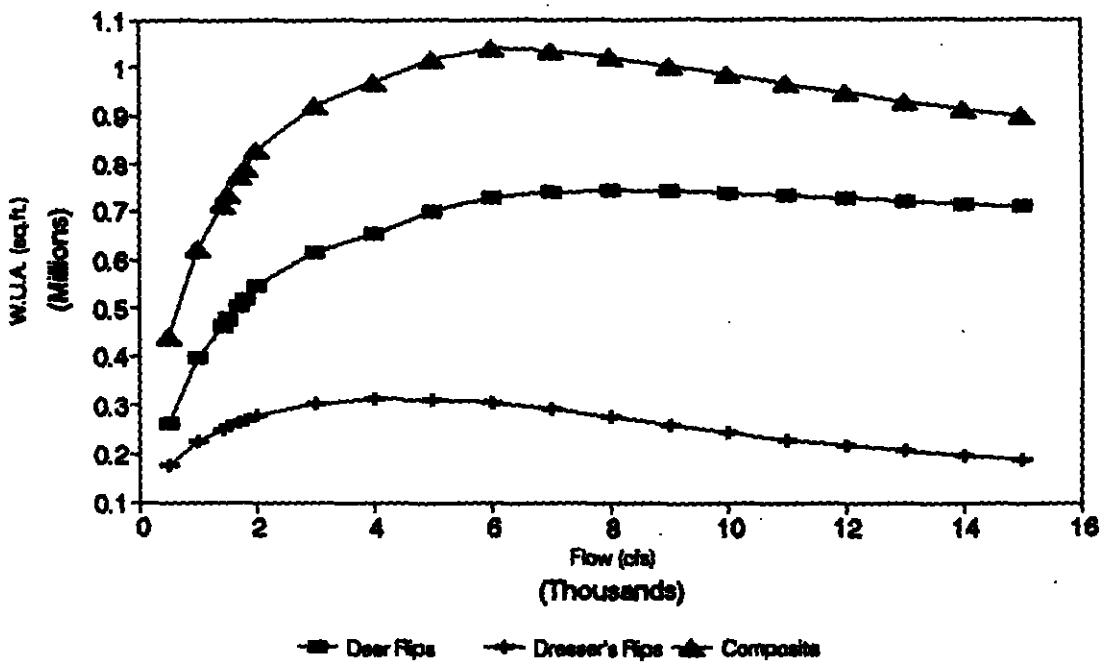

Figure 4-14. Adult Atlantic salmon composite weighted useable area (WUA) vs. discharge for the Deer Rips and Dresser's Rips reaches (Source: Stetson-Harza, 1988).

Central Maine's proposed 1,100 cfs minimum flow would provide shad habitat significantly below the maximum amount of habitat in the Run Reach. As seen in Figure 4-8, peak habitat for all lifestages is provided at flows which exceed the Androscoggin River's average summer flows (6,000-16,000 cfs),[4] and could not be maintained. Thus, large incremental increases in flow would be required to produce significant increases in shad habitat. For example, a 30 percent increase in flow from 1,100 cfs to the estimated ABF flow of 1,430 cfs would result in a six percent increase in shad spawning habitat.

Nevertheless, the 1,100 cfs minimum flow fills the channel from bank to bank, which Central Maine states would protect not only available nursery habitat for shad in the Run Reach, but available holding pool habitat for Atlantic salmon at Dresser's Rips as well. In terms of total amount of available habitat, the Run Reach provides large quantities of juvenile and adult shad habitat under existing and proposed flow conditions. However, this habitat is not unique or limited. During scoping for the IFIM study, the Run Reach was chosen as representative of large stretches of run-type habitat that occur in the lower Androscoggin River between Lewiston Falls and Brunswick (Central Maine, 1992b).

With regards to the duration of fishery habitat under existing (*see Section 3.3.1.3.*) and proposed project operations, Central Maine conducted a habitat duration analysis (Central Maine, 1992b). Specifically, Central Maine analyzed the duration of habitat for: (1) adult brown trout at Deer Rips and Dresser's Rips using the months of January, May, August, and October; (2) juvenile and adult Atlantic salmon at Dresser's Rips using the months of June and August; and (3) in-migrating, spawning, and juvenile American shad at the Run-Reach using the months of June (in-migrating and larval) and August (juvenile).

Habitat duration results are normally provided in terms of a habitat exceedence curve, with the area under the curve in the 50 to 90 percent exceedence range being the most important portion for determining biological effects (Bovee, 1982). The median value (50 percent exceedence) is significant because it represents a measure of central tendency, while the 90 percent exceedence value represents extreme conditions.

In the study reaches, the percentage of maximum WUA for median and extreme flow conditions under existing and proposed operations are shown in Table 4-1. For example, under existing project operation, adult brown trout at Deer Rips have 96 percent of the peak WUA (230,000 ft^2 of 241,000 ft^2) available about 50 percent of the time in August, while 75 percent of the peak WUA (180,000 ft^2) would be available 90 percent of the time. Under Central Maine's proposed 1,100 cfs minimum flow, the percentage of the peak WUA under extreme conditions would increase to 79 percent.

In general, the results of the habitat duration analysis indicate that for all species/lifestages evaluated in the three study reaches, habitat remains relatively constant

[4] Adult and juvenile American shad are present in the Androscoggin River from mid-May through October.

Table 4-1. Percent of peak weighted useable area for study reaches under median and extreme conditions with existing and proposed operations (Source: Central Maine, 1992b).

Study Reach Species/Month	Existing 50%	 90%	Proposed 50%	 90%
Deer Rips				
Brown trout[1]				
May	56	56	56	56
August	96	75	96	79
October	75	75	79	79
January	75	75	79	79
Dresser's Rips				
Brown trout[1]				
May	26	26	26	26
August	68	50	68	50
October	100	50	100	50
January	100	50	100	50
Atlantic salmon[2]				
June	100	87	100	87
August	97	72	97	74
Atlantic salmon[3]				
June	31	22	31	22
August	56	36	56	36
Run Reach				
American shad[4]				
June	84	73	84	73
American shad[5]				
June	71	62	71	62
American shad[6]				
August	62	22	62	23

[1] adult [2] adult [3] juvenile [4] in-migrating
[5] spawning [6] juvenile

under existing and proposed project operations. Further, the results indicate that with Central Maine's proposed 1,100 cfs minimum flow, the habitat availability under extreme conditions would be only slightly improved over the availability of habitat under existing conditions during the critical summer months (Central Maine, 1992b). As noted by Central Maine, these results can be attributed to the existing interim minimum flow of 1,000 cfs.

The habitat duration results also indicate that there are no severe habitat restrictions which result from high operational flows through Gulf Island-Deer Rips (Central Maine, 1991). Reductions in habitat occur for certain species and lifestages in response to high flows, but the most significant reductions in habitat occur at flows which exceed the capacity

of the project and are beyond the control of Central Maine [*see Table 4-5 in Section 4.2.1.2.*].

Up to this point we have limited our discussion of habitat to PHABSIM, the physical habitat component of IFIM. However, the amount of suitable habitat available to riverine fisheries is not limited solely to microhabitat availability. As described by Orth (1987), food, water quality, temperature, physical habitat structure, flow regime, and biotic interactions influence the structural and functional characteristics of river/stream ecosystems with respect to distribution and abundance of riverine fishes.

Physical habitat and flow regime were described in this section. Aquatic invertebrates as a food source are discussed relative to effects due to fluctuating flows, while water quality and temperature are discussed in Section 4.1.1.2. Biotic interactions, such as predator-prey relationships and species competition, are part of any ecosystem (Orth, 1987), but are beyond the scope of this EIS. Although we expect these interactions to influence habitat utilization by fish in the lower Androscoggin River, we are not able to quantify what the effects of these interactions on the fish resources in the river would be at this time.

FLUCTUATING FLOW RELEASES AND RAMPING

In addition to continuing to operate Gulf Island-Deer Rips as a peaking facility, Central Maine proposes to restrict downramping at Deer Rips [flows would be reduced from full generation flow to 1,100 cfs no faster than linearly over 20 minutes].

Fluctuating flow releases have the potential to impact downstream habitats. Fluctuating water levels and changes in flows can reduce fish spawning success and strand fish, subjecting them to desiccation and predation from terrestrial predators (Cushman, 1985; Orth, 1987; Bain and Boltz, 1989). Additionally, fish migration, fry and juvenile habitat, adult fish holding, and aquatic macroinvertebrates can be affected by fluctuating water levels (Central Maine, 1991).

To evaluate the effects of fluctuating flow releases on aquatic habitat, Central Maine conducted a ramping study of the Deer Rips and Lewiston Falls tailwater areas (Stetson-Harza, 1988). Downramping from 5,510 cfs to 1,800 cfs and from 5,510 cfs to 1,100 cfs over a five minute period was analyzed for the Deer Rips reach. Downramping from 6,600 cfs to 1,800 cfs and from 6,600 cfs to 1,100 cfs over a 20-minute period was analyzed for the Lewiston Falls reach.

Generally, the ramping analysis does not indicate a problem with the rate of downramping at either Deer Rips or Lewiston Falls (Central Maine, 1991). Transect analysis for the Deer Rips reach indicates a reduction in flows to 1,100 cfs or to 1,800 cfs does not appear to have any effect on stranding fish in the large pool at the upstream end of the study reach. However, downramping to either flow may have the potential to strand fish in pools created by cobbles and boulders on the western side of the most downstream island

in the study reach. Further, crowding the fish to small accessible areas may make them easier prey for predators. These impacts would be less at the 1,800 cfs flow due to greater pool depths.

For the Deer Rips reach, it is unlikely that a downramping schedule of any length would induce fish, particularly fry and young-of-the-year, to move into the main channel. Central Maine based this conclusion, and we concur, on the length of the channel on the west side of the island. Therefore, relative to habitat suitability, the duration of the non-generation period would be important in determining the effects on fish and aquatic resources.

Downstream from Lewiston Falls, results of the ramping analysis indicate that the Androscoggin River, due to channel structure, maintains at least one foot of depth over the entire channel as a result of either the 1,100 cfs or 1,800 cfs minimum flow. These flows also provide an access route to the main channel from the flood plain and shelf areas on the stream periphery. Thus, resident fisheries are unlikely to be affected by ramping. Migratory fish, as a result of an inadequate zone-of-passage, have the potential to be affected by upramping and downramping below Lewiston Falls. Because minimum flows as low as 1,100 cfs maintain a depth of at least one foot in the river channel, we conclude that ramping effects on migrating fish are not likely to be a big concern below Lewiston Falls.

While not specifically addressed as part of the ramping study, fish spawning, incubation, and rearing in the reach of river between Deer Rips and the Lewiston Falls headwaters may be affected by fluctuating water levels. The IFIM results indicate that there is very little smallmouth bass spawning habitat available in the Deer Rips reach. Further, smallmouth fry and juvenile habitat are also limited in this reach. Due to the generally poor habitat conditions available for these lifestages of smallmouth bass in the Deer Rips reach, we expect the overall impact to the population to be minimal.

With regard to juvenile brown trout, the IFIM and habitat duration results indicate that habitat conditions remain good throughout the range of flows modelled. Because of habitat conditions and because large yearling juveniles (which are assumed to have habitat preferences similar to adults) are stocked, we expect ramping effects to be low.

Fluctuating flows have the potential to impact adult fish habitat in the Deer Rips reach. For both adult smallmouth bass and brown trout, the IFIM results show that available adult habitat remains fairly constant over the range of flows modelled. Further, the habitat duration results for adults of both species indicate good to excellent habitat over the range of flows modelled. These results suggest that there would be little impact associated with changes in flow between 1,100 cfs and 4,800 cfs. Because of abundant cover in the Deer Rips reach and preferences for higher velocities (i.e., brown trout - the priority species), we would expect the overall impact to these fish populations to be low.

Artificial flow fluctuations have been shown to affect invertebrate communities by altering the periodicity of insect drift and changing the composition of invertebrate communities (Bain and Boltz, 1989). In a study of Maine rivers, Trotzky and Gregory (1974) found that in rivers subject to highly fluctuating flows, the species composition was dominated by those species which could tolerate a wide range in flow conditions. They also found a lower diversity of species in rivers subject to widely fluctuating flows in comparison with that found in unregulated rivers. Similarly, Eco-Analyst (1992b) found that the benthic community below the West Buxton Project on the Saco River in Maine[5] was exhibiting signs of stress; the diversity of benthic species was low, with the community being dominated by species tolerant of fluctuating flows.

Riverine fishes are known to feed extensively on aquatic invertebrates; those on the substrate and those in the drift (Bain and Boltz, 1989). Fish also have been shown to alter the composition and abundance of invertebrates in both warmwater and coldwater river systems. Thus, factors that reduce invertebrate abundance or habitat quality could adversely affect fish resources. Weisburg and Burton (1993), who studied fish growth below the Conowingo dam on the Susquehanna River, found that prey consumption and fish growth were positively correlated with increased minimum flows from April to September. They concluded that even when the frequency of flow fluctuation is unchanged, an increased minimum flow can positively influence the feeding and growth of fish.

Based on previous studies, it seems clear that fluctuating flows can adversely affect an aquatic invertebrate community. However, aquatic invertebrates, which are relatively sessile by nature, could also be affected by the ambient water quality. In the Androscoggin River, where water quality has historically been very poor, aquatic invertebrate populations may be reflective of poor water quality as much as they are reflective of fluctuating flows. The effects of water quality, mainly DO concentrations, on invertebrates are discussed in Section 4.1.1.2.

We generally agree with Central Maine's assessment of fluctuating flows downstream of the Deer Rips and Androscoggin No. 3 developments. The study results suggest that fluctuating flows are generally not having any significant adverse effects on downstream fisheries, relative to physical habitat requirements. However, fluctuating flows from Gulf Island-Deer Rips may be affecting the macroinvertebrate community in the lower Androscoggin River, which may be indirectly affecting the fisheries. Central Maine's proposed ramping schedule, coupled with an increase in the minimum baseflow, would reduce any effects of downramping at Gulf Island-Deer Rips and improve aquatic habitat conditions in the lower Androscoggin River.

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[5] Flows below West Buxton are influenced by fluctuating flows from the Bonny Eagle Project.

AQUATIC HABITAT IN THE LOWER ANDROSCOGGIN RIVER

The IFIM study conducted in support of licensing Gulf Island-Deer Rips addresses habitat vs. flow in a short stretch of the lower Androscoggin River, which says little, if anything, about the remainder of the habitat in the lower portion of the river. However, we can draw some conclusions from Central Maine's study about aquatic habitat in the other areas of the river.

As discussed above, Central Maine's proposed minimum flow provides certain benefits to fisheries and aquatic habitat in a limited portion of the lower Androscoggin River. Based on these results, we expect that Central Maine's proposed minimum flow release of 1,100 cfs would provide benefits to aquatic habitat throughout the lower portion of the Androscoggin River. However, we are not able to quantify what those benefits would be at this time. We expect, however, that the benefits derived from the proposed flow release would be similar in magnitude to those described for the study reaches.

The estuarine environment in the lower portion of the river may also be affected by project operation and flow releases. The primary impact on fishes in the estuary would be a function of flow levels below Gulf Island-Deer Rips. Because impoundment drawdowns occur during the migration periods for the targeted anadromous fishes, attraction flows could be periodically lost during this time and the fish may bypass the Androscoggin River or leave the river if they have not already ascended the Brunswick dam. The lack of freshwater inflow to the estuary may also eliminate any downstream movement and input of freshwater organisms and nutrients into the tidal portion of the river. Freshwater organisms inhabiting the Androscoggin River downstream of Brunswick could also be eliminated due to a sudden increase in salinity. Although this may occur from natural catastrophic events (e.g., severe storms), loss of project flows during ponding may cause decimation of the freshwater organisms inhabiting the most upstream portion of the estuary at a greater frequency than would occur from natural occurrences.

Under Central Maine's proposal to operate Gulf Island-Deer Rips, freshwater input to the estuary would continue to be affected at some level. However, Central Maine's proposal to: (1) restrict impoundment fluctuations for a portion of the year, (2) release a minimum flow to the river, and (3) restrict downramping at the project would reduce any estuary impacts that may occur, and would also reduce the project's effect on the estuary.

GULF ISLAND IMPOUNDMENT FLUCTUATIONS

Central Maine's weekly drawdowns are generally three to four feet, while the maintenance drawdowns are in the four- to five-foot range.[6] During these drawdowns, ten to 15 percent of the Gulf Island impoundment is subject to dewatering. Up to 23 percent of the

[6] The Gulf Island-Deer Rips Project is currently licensed for a maximum drawdown of up to eight feet.

impoundment is subject to dewatering with the full eight foot drawdown.

Central Maine does not propose cessation of the existing weekly (generation) or annual (maintenance) drawdowns, rather proposes to maintain the Gulf Island impoundment within one foot of full pond, as a target limit, from May 1 through June 15.

Fluctuating water levels have been shown to affect eggs and larvae of largemouth and smallmouth bass and other aquatic resources. Largemouth and smallmouth bass are late-spring or early-summer spawners, typically spawning in May, June, or early July in the northern climates (Carlander, 1977). Most bass spawn at depths of two to 4.5 feet (Edwards *et al.*, 1983; Stuber *et al.*, 1982). Stetson-Harza (1988) reports that fluctuations of water levels by three feet or more could adversely impact reproductive success, which may lead to lowered nest success, either directly due to egg desiccation, or indirectly due to susceptibility to predation of the young after nest abandonment by the male guardian (Carlander, 1977).

Based on an analysis of Gulf Island impoundment bass tournament data, MDIFW has concluded that the impoundment bass fisheries is characterized by an "attractive" imbalance in the bass populations; the impoundment's bass population may be dominated by older, larger fish and, therefore, subject to overfishing. To support their position, MDIFW cites the lack of small- to medium-sized fish reported in tournament data, and the lack of adequate fry cover (i.e., aquatic vegetation). MDIFW speculates that high turbidity in the Gulf Island impoundment is limiting the development of aquatic vegetation, which MDIFW attributes, in part, to the Gulf Island impoundment fluctuations.

Certain aspects of MDIFW's analysis, as well as other sources of information, raise questions concerning MDIFW's conclusions. First, with reference to the smaller fish, interviews with Gulf Island bass tournament fisherman indicate that tournament scoring systems and, hence the fishing gear used, are aimed at the larger-sized fish. Thus, bass catch reported during a tournament may not reflect the true size structure of the population. Second, fish surveys of the Gulf Island impoundment (Slocomb et al., 1985; Quest Environmental Services, Inc., 1987) report a relatively high percentage of young (0+ to III+ age classes) bass to the overall bass catch in their surveys. Also, interviews with experienced Gulf Island anglers (Stetson-Harza, 1988) suggest that both smallmouth and largemouth bass are abundant, and that small fish do not appear scarce. While we are aware that biases associated with the various sampling techniques used in these surveys do exist, the data do seem to indicate a relatively balanced bass population.

Regarding turbidity, while the lack of aquatic vegetation/cover may be attributable to water turbidity, there appears to be little, if any, evidence to support the fact that turbidity in the impoundment is attributable to the existing water level management regime for the Gulf Island impoundment. Mitnik (1983) indicates that river turbidity increases downstream from Jay, Maine, and remains relatively constant through the Gulf Island impoundment.

Central Maine, at the request of the staff, conducted a qualitative blackbass survey in the Gulf Island impoundment that focused on bass spawning habitat and young-of-the-year growth. The details relative to the study's scope and objectives, methodology, and results are provided in Central Maine (1992a). Briefly, the results of the blackbass study show that young-of-the-year blackbass are prevalent in the Gulf Island impoundment, and the condition of the young bass is good and compares favorably with growth of young fish in two regional lakes known for their excellent bass fisheries (Table 4-2).

Central Maine's study also indicates that there was no evidence of bass nest dewatering during the study period (Central Maine, 1992a). However, as noted by Central Maine, these observations may not be accurate. Due to turbidity, observations below water levels were limited; maximum drawdown during the survey period was 1.5 feet below full pond. Further, the impoundment was sampled in August and September. It would seem likely that fish nests built during the bass spawning season could have become silted over and unrecognizable by that time.

Fish stranding may also occur as a result of impoundment fluctuations or drawdowns. However, there is no evidence to suggest that fish stranding, while likely occurring in isolated locations, is a problem in the Gulf Island impoundment.

Table 4-2. Comparison of young-of-the-year bass data from Cobbossee Lake, Unity Pond, and Gulf Island impoundment (Source: Central Maine, 1992a).

Species/Parameter	Water Body: Gulf Island	Water Body: Cobbossee	Water Body: Unity
Largemouth bass			
Length (in.)	2.70	3.00	2.40
Weight (oz.)	0.17	0.17	–
Smallmouth bass			
Length (in.)	3.40[1]	3.10	2.40
Weight (oz.)	0.27[1]	0.18	–

[1] based on a sample size of 2 fish.

Central Maine's proposed restriction on headpond fluctuations to a target fluctuation of one foot from May 1 to June 15 would provide moderate to significant benefits to the blackbass fishery by improving the suitability and access to littoral-zone habitat. A one foot impoundment fluctuation would dewater 112 acres (or four percent) of the habitat, while existing fluctuations dewater about 300 acres (or ten percent) of the habitat (Table 4-3).

Based on available evidence, Central Maine concluded that the existing Gulf Island bass fishery appears healthy and relatively unaffected by project operation. We generally agree. The impact of project operations on bass spawning habitat was not specifically addressed by the licensee's reconnaissance surveys or the HEP analysis. Adult and juvenile bass, as well as bass fry, are mobile and can adapt relatively easily to changing water levels. Bass nests, on the other hand, which are generally located in water depths of one to three

feet, are vulnerable to dewatering. Maintenance of relatively stable water levels during the critical spawning and incubation period would insure protection of nests and eggs, and represent an enhancement that will help to protect bass spawning habitat.

Table 4-3. Comparison of total impoundment area and littoral zone dewatered with drawdowns between 0 and 8 feet (Source: Stetson-Harza, 1988).

Elevation (ft.)	Total Acreage	Dewatered Habitat	
		Acres	Percent
262.0	2,862	0	0.0
261.0	2,750	112	4.0
260.0	2,660	202	7.0
259.0	2,570	292	10.0
258.0	2,480	382	13.0
257.0	2,400	462	16.0
256.0	2,330	532	19.0
255.0	2,267	595	21.0
254.0	2,200	662	23.0

In the DEIS we assessed the environmental effects of a drawdown limit of one foot from May 1 through either June 15 or June 30. Central Maine, in its February 16, 1996 letter, and at the Section 10(j) meeting, expressed concern with staff's mis-interpretation regarding the need for greater fluctuations than one foot from May 1 through June 30. Central Maine states that it would attempt to maintain a one-foot fluctuation limit from May 1 through June 15, but indicated that it could not guarantee than such a limit would be sufficient to meet NEPOOL requirements to maintain the project's status of a weekly peaking facility. Central Maine also objected to a one-foot restriction from June 16 through June 30. Therefore, Central Maine is requesting that staff consider the one foot fluctuation restriction from May 1 through June 15 as a target fluctuation, with an allowance of up to two feet to meet any unusual NEPOOL power requirements.

We recognize the environmental benefits of a strict one-foot fluctuation limit. However, we believe the difference in environmental benefits between a continuous one-foot fluctuation requirement and a one-foot target fluctuation with a rare two-foot drawdown would be minor; a one-foot drawdown would dewater four percent of the littoral habitat versus seven percent of the littoral area that would be dewatered with a periodic two-foot drawdown. Hence, we do not expect any significant environmental resource impacts with an occasional two-foot drawdown. While we concur with a target elevation of one foot, and an occasional two-foot drawdown, we believe that this one-foot target elevation should extend from May 1 through June 30 in order to protect spawning habitat, and provide some enhancement to wetlands.

FISH PROTECTION AND PASSAGE FACILITIES

The goals of Maine's anadromous fisheries management program for the Androscoggin River and its tributaries are to restore anadromous fish resources, most notably American shad, alewife, and Atlantic salmon to the river, and to provide increased employment through expansion of commercial/recreational fisheries for anadromous fish.

Part of these goals have been accomplished through stocking efforts and by providing upstream and downstream fish passage at several dams on the Androscoggin River and Little Androscoggin River. In Section 3.2.2., we generally described the existing fish passage facilities in the Lower Androscoggin River Basin. The existing fish passage facilities on the lower Androscoggin River provide anadromous fish access upstream to Lewiston Falls.

The MDMR and ASRSC have no immediate plans to restore Atlantic salmon to the Androscoggin River above Lewiston Falls. This is mainly due to land development and spawning stock concerns, competing fishery programs, and the river's low priority for Atlantic salmon restoration. FWS, NMFS, MDMR, ASRSC, and MDIFW have not indicated a need for upstream or downstream fish passage facilities at Gulf Island-Deer Rips at this time. Consequently, Central Maine is not proposing any fish passage facilities for Gulf Island-Deer Rips.

While salmon restoration priorities for the Androscoggin River are not high, the resource agencies continue to strive for increased population levels through habitat protection and other means. Given this vision, the resource agencies have indicated that future plans call for restoring Atlantic salmon to its historical range; upriver to Rumford Falls (ASRSC, 1984). FWS (1989) calls for downstream passage facilities to be operational at the Gulf Island and Deer Rips dams by the year 2004. Upstream and downstream fish passage facilities would also be required at the downstream Lewiston Falls dam by 2004. The upstream fish passage facility constructed at Lewiston Falls would be a trap-and-truck facility which would be designed to transport spawning Atlantic salmon to river reaches upstream of the Gulf Island impoundment to Rumford (encompassing International Paper's Livermore, Otis, Jay, and Riley Projects). We recognize this schedule, but believe that, realistically, any fish passage facilities proposed to be constructed at Gulf Island-Deer Rips would require a comprehensive approach, taking into account existing or other future facilities and the status of current restoration efforts.

Deferring installation of fish passage facilities at Gulf Island-Deer Rips to some future date would continue to prevent access to upstream river reaches and preclude expansion of the Atlantic salmon fishery at this time. Operation of Gulf Island-Deer Rips also would continue to contribute to cumulative effects relative to fish passage in the Androscoggin River. However, in light of the resource agency's comprehensive river management plans and fisheries management programs, we agree with Central Maine and the resource agencies regarding fish passage needs at Gulf Island-Deer Rips; and therefore find no evidence at this time to support the need for fish passage facilities at Gulf Island-Deer Rips.

4.1.1.4. Vegetation and wildlife resources

Central Maine proposes to maintain the current weekly peaking operation with impoundment fluctuations up to four feet from June 16 through April 30, while maintaining a target one foot fluctuation limit from May 1 through June 15. In addition, Central Maine proposes to increase the total year-round minimum flow from 1,000 cfs to 1,100 cfs. Upland vegetation and associated wildlife resources would not be affected by the proposed project operations. Central Maine's proposed operation, however, could have a beneficial effect on wetlands and associated wildlife resources as discussed below.

GULF ISLAND IMPOUNDMENT FLUCTUATIONS

To address concerns related to impacts of water level fluctuations on wetlands and associated wildlife, Central Maine conducted three wetland studies for the Gulf Island impoundment. In a 1989 impoundment fluctuation assessment, Stetson-Harza (1989) concluded that based on water depth, suspected influence of wave action, and turbidity, changing to a run-of-river mode of operation could result in the establishment of an additional 98 acres of emergent wetlands. In another study, Eco-Analysts, Inc. (1993) concluded that wetlands in the Gulf Island impoundment are not adversely impacted by current project operations. However, Eco-Analysts, Inc. (1993) suggests that due to improved water quality conditions and the establishment of new vegetation in the drawdown zone, their study could not determine events under a more stable water regime. Interior, MDIFW, and the Conservation Coalition expressed concerns about Eco-Analysts, Inc. wetland study, and questioned the conclusions reached in the study. The commentors cite the 1989 Stetson-Harza study which used a HEP study to reach the conclusion that potential wetland development is probably limited by the current two- to four-foot weekly drawdown.

Central Maine's wetland study (Eco-Analysts, Inc., 1993) indicates that most of the wetlands found along the Gulf Island impoundment were not present prior to creating the impoundment, and that the soils in most of the impoundment's wetland areas (except for six acres) are indicative of a recent change in hydrologic conditions. Eco-Analysts, Inc. (1993) also found limited shoreline erosion along banks with wetlands, concluding that most of the Gulf Island impoundment wetlands have become stable under current project operations. The study results indicated that limiting project operations to a one foot fluctuation between May 1 and June 15, which is a critical time for seasonal growth for many submergent and emergent aquatic vegetation, may help to promote wetland vegetation growth (Eco-Analysts, Inc., 1993).

Based on the study results, as discussed above, we agree that Central Maine's proposed project operations would maintain the existing wetlands, as well as perhaps establish new aquatic vegetation growth in these wetlands.

Central Maine contends that continuing to operate the project with the two- to four-foot weekly fluctuation would not adversely affect existing wildlife resources.

The Eco-Analysts, Inc. study concluded that the Gulf Island impoundment wetlands are highly valued for wildlife diversity/abundance. We agree with this conclusion, citing the three studies conducted for Central Maine to assess the impoundment's wetlands which found a diversity of wildlife utilize the impoundment's wetlands. These species include common loon, Canada geese, black duck, mallard, common merganser, bald eagle, osprey, great blue heron, green heron, kingfisher, spotted sandpiper, beaver, mink, white-tailed deer, moose, and red fox.

Normandeau Associates (1991), who conducted Central Maine's second wetland study, concluded that a two- to four-foot weekly fluctuation (as compared with daily fluctuations) appear to reduce the effects of fluctuation on wildlife in the area. In support of this statement, the study found that waterfowl and shorebird nesting are not likely to be impacted by the drawdown primarily because the frequent fluctuations would deter the birds from nesting in the drawdown zone. In addition, the study also found that the drawdowns create dewatered areas that are used by foraging sandpipers, killdeer, and migrating species. Normandeau Associates (1991) also states that the typical water level fluctuations resulting from the project's operation does not seem to restrict beaver access to stored food caches for extended periods of time; the rising water levels overnight and on the weekends restore the access to food sources between drawdowns.

MINIMUM FLOWS

Central Maine's proposal to increase the minimum flow by 100 cfs, from 1,000 cfs to 1,100 cfs, could have minor long-term beneficial effects on downstream riparian wetlands. In addition, with an increased minimum flow, the impoundment drawdown would likely need to be modified. For example, during low-flow periods, the drawdown would probably need to be reduced to accommodate the weekly refill and higher minimum flow. This would be expected to provide benefits to both downstream riparian wetlands and wetlands in the Gulf Island impoundment.

1.1.1.5. Endangered and threatened species

SHORTNOSE STURGEON

The federally-listed shortnose sturgeon inhabits riverine, estuarine, and nearshore waters. It is most commonly found in productive mesohaline environments with salinities between 1.0 and 20.0 parts per million (ppm) (Marchette and Similey, 1982; Bugler *et al.*, 1990). Freshwater habitats are characterized as deep river channels or shallow regions with soft bottoms and abundant macrophytes (Hastings, 1983; Squires *et al.*, 1993).

Shortnose sturgeon spawning areas have been characterized as relatively deep (15-20 feet), with gravel and cobble substrates (Buckley, 1982). Buckley (1982) also found that shortnose sturgeon spawning began the first week in May with increasing water temperatures and decreasing flows. Dadswell (1979) observed shortnose sturgeon foraging in freshwater

habitats about seven feet deep, and located in muddy bottoms with abundant macrophytes. Dadswell (1979) also observed that shortnose sturgeon are tolerant of light and temperature variations, and are active during the night or on windy days when turbidity is high.

Squires *et al.* (1993) documented a shortnose sturgeon spawning population in the lower Androscoggin River below Brunswick. A description of the spawning habitat is found in Section 3.2.2. The Androscoggin River's spawning habitat, as described in Section 3.2.2., is similar to spawning habitat found in other river systems. Because considerable spawning activity has been documented to occur below Brunswick, it would appear that Gulf Island-Deer Rips, under its current mode of operation, is not having a significant adverse effect on the shortnose sturgeon. In support of this conclusion, Edwards (1994) reported an average density of shortnose sturgeon in the Androscoggin-Kennebec estuary system of 0.90 fish per hectare, which is comparable with the population density in the Hudson River (0.93 fish/ha)[7]. Edwards (1994) also suggests that the total shortnose sturgeon population in the Androscoggin-Kennebec system may be as high as 50,000 fish.

Increasing the minimum flow release from 1,000 cfs to 1,100 cfs at Gulf Island-Deer Rips, as proposed by Central Maine, may affect the aquatic habitat in the river below Brunswick through several mechanisms, including velocity, temperature, and salinity changes. First, increasing the minimum flow would increase water velocity throughout the river's length. Based on the IFIM study conducted by Central Maine, the velocities in the lower Androscoggin River would generally be around 1.5 fps to 2.5 fps with an 1,100 cfs minimum flow release. Velocities at higher streamflows are not significantly higher, with a range generally between 2.0 fps and 3.0 fps. In comparison, shortnose sturgeon have been found in velocities ranging from 1.2 fps to 4.2 fps (Taubert, 1980).

Second, streamflow has a significant effect on water temperature downstream of a water control structure. Bartholow (1989) identifies streamflow as one of the four most significant factors affecting the mean and maximum daily water temperature. This would be particularly evident if the control structure was equipped with a deep-water release, where cold, hypolimnetic water is released to the river. In this situation, downstream water temperature would be reduced, with discharge (or streamflow) controlling the relative distance affected by the colder water. The Gulf Island development is equipped with a mid- to low-level release, which would be more likely to affect downstream water temperatures. However, the intervening impoundments would temper any changes that may occur as a result of Gulf Island's flow releases. Therefore, we would not expect Central Maine's proposed minimum flow to appreciably affect water temperatures in the lower Androscoggin River. Increasing the minimum flow to 1,700 cfs (as recommended by Interior, the Conservation Coalition, TU *et al.*, and staff) could potentially reduce the water temperature below Gulf Island-Deer Rips; however, we expect the changes that may occur to be minor.

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[7] The Hudson River is thought to have one of the largest shortnose sturgeon populations on the east coast, estimated at 27,000 adult fish.

The third habitat feature that can be affected by increasing the minimum flow release is the location of the saltwater/freshwater interface (mixing zone) in the tidal portion of the river. An increase in the amount of freshwater entering the mixing zone could result in the displacement of the mixing zone downstream, thus reducing the salinity in a small area. Because salt water is denser than freshwater, the increased amount of freshwater may displace some of the saltwater in the water column, thus extending the freshwater influence downstream (Gordon *et al.*, 1992; Patrick, 1994). Central Maine's proposed 1,100 cfs minimum flow would likely have little, if any, affect on the mixing zone; 1,100 cfs represents only a ten percent increase in the minimum baseflow. However, a flow release of 1,700 cfs could have a minor to moderate affect on the location of the mixing zone, because the flow represents a 70 percent increase in the minimum baseflow.

It should also be noted that during the time shortnose sturgeon are found on their spawning grounds (i.e., late April and May) the hydropower projects on the lower Androscoggin River, including Gulf Island-Deer Rips, are operating as run-of-river facilities. During this time, the natural river flows can be up to two to three times greater than the projects' generating capacities. Thus, the projects on the mainstem lower Androscoggin River are having little, if any, effect on flow in the lower Androscoggin River during the period when shortnose sturgeon would be most susceptible to adverse impacts.

Shortnose sturgeon are generalistic in that they are adaptable to a wide range of environmental conditions; in this case, streamflow, water temperature, and salinity (Dadswell *et al.*, 1984; Marchette and Smiley, 1982; McCleave *et al.*, 1977). Further, shortnose sturgeon prefer the lower portions of major river systems that usually are not subject to radical changes in environmental conditions. The effects of abnormally high or low flows, or other natural phenomena, are mitigated in the sturgeon's habitat by the ocean's tidal influence (Edwards, 1994). Therefore, we do not expect an increase in the minimum flow release from Gulf Island-Deer Rips to have any significant adverse affect on the shortnose sturgeon population below Brunswick.

Based on the best information available, we conclude that relicensing Gulf Island-Deer Rips is not likely to adversely affect the shortnose sturgeon and their spawning habitat. Our recommendations found in Section 5.4. would maintain, and possibly enhance, the existing population of shortnose sturgeon in the lower Androscoggin River.

Furthermore, if the project is modified or if new information about the project becomes available that indicates listed or proposed species or critical habitat may be present in the project area and/or affected by project operation, the Commission would initiate Section 7 consultation with NMFS and/or FWS.

By letter dated January 29, 1996 (Dr. Andrew A. Rosenburg, Regional Director, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Gloucester, Massachusetts), the National Marine Fisheries Service (NMFS) concurred with our recommendations and findings in the DEIS, and determined that

relicensing Gulf Island-Deer Rips is not likely to adversely affect the shortnose sturgeon.

4.1.1.6. Recreation resources

Recognizing that anadromous and inland fisheries are being restored, Central Maine asserts that the Gulf Island impoundment provides a substantial recreational opportunity close to the Lewiston-Auburn area. Recreational needs identified include additional, and improved, camp sites and boat ramps for fishing and recreational boating (Central Maine, 1991).

In its *Recreational Facilities Plan*, Central Maine proposed recreational enhancement measures for Gulf Island-Deer Rips, and the nearby, downstream Lewiston Falls Project. Some of the measures identified in the plan have already been implemented (Central Maine, 1991). Further, Central Maine proposed additional recreation-related enhancements in its February 16, 1996, letter commenting on the DEIS.

Central Maine proposes to (1) monitor public use at Googins Island to determine the need for recreational improvements (such as parking, picnic tables, directional signs, carry-in boating, and canoe portage); (2) consider the need to enhance existing informal carry-in access below Deer Rips based on fishery management efforts to restore the Androscoggin River fishery; (3) construct canoe portage trails around both the Gulf Island and Deer rips dams; (4) enhance the existing informal carry-in and bank fishing access site along Switzerland Road, and provide additional public access to the river along Switzerland Road; and (5) submit the FERC's Form 80 every six years to agencies, and summarize existing and potential recreational use.

Moreover, Central Maine proposes to continue (1) permitting use of the unimproved launch area at Waterman Road, while working with the Androscoggin Land Trust to provide formal recreational access at the Waterman Road site; (2) permitting parking at the Deer Rips powerhouse for canoeists, and the annual canoe race; (3) permitting public access to the undeveloped parcel on the east side of the impoundment, adjacent to the North River Road;[8] and (4) maintaining the Googins Island informal carry-in boat launch at the impoundment's north end.

Based on our analysis of information provided by Central Maine, we conclude that Central Maine's proposed recreational enhancements would significantly improve recreational opportunities in the project area and would compliment the comprehensive plan to improve public use of the lower Androscoggin River. Central Maine's hard-surface boat launch at the Turner-Greene bridge and three picnic and day-use sites on the Gulf Island impoundment's islands are in place and contribute significantly to the recreational opportunities at the project. Further, Central Maine's proposal to increase roadside parking and provide

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[8] Central Maine indicates that this parcel of land is being held in reserve for future development of a hard surface boat ramp in the event the need for one can be demonstrated.

additional public access to the river along Switzerland Road would allow greater use of this site as an informal carry-in boat launch at the impoundment's north end.

IMPOUNDMENT FLUCTUATION

Central Maine's existing water level management regime for the Gulf Island impoundment consists a of year-round two- to four-foot weekly drawdown, which Central Maine proposes to modify in order to maintain the impoundment within a target one foot fluctuation limit from May 1 through June 15, while continuing existing drawdowns during the remainder of the year.

Existing drawdowns at the Gulf Island impoundment affect seasonal recreation activities, such as boating and fishing, and facilities such as docks and boat ramps. Summer peak recreational use of the Gulf Island impoundment occurs between June and August when drawdowns (from June 16 through April 30) are about four feet. In the winter months, when snowmobiling is the primary recreation use of the impoundment, fluctuating water levels can cause thin ice and expose open water along the shoreline (*see Section 4.2.1.4.*).

Central Maine's proposed impoundment fluctuation schedule would protect the blackbass fishery in the impoundment (*see Section 4.1.1.3.*), and thereby, enhance angling opportunities.

While drawdowns have the potential to affect recreational use of the Gulf Island impoundment, we conclude that Central Maine's proposed water level management regime for the Gulf Island impoundment would result in a beneficial and adverse impact on recreational resources, depending on recreation use. Boating would remain accessible during the summer months (after June 15) when the impoundment would be fluctuated up to four feet on a weekly basis; resulting in potential adverse impacts to recreational boaters' ability to maneuver boats on the impoundment. However, as discussed in Section 4.1.1.4., drawdowns of the impoundment would create dewatered areas used by waterfowl. This would provide a recreational opportunity to observe wildlife. Beneficial impacts on recreational fishing (i.e., blackbass) could also occur as a result of the impoundment drawdown (*see Section 4.1.1.3.*). Winter conditions would require caution among snowmobilers; however, this is generally true for most impoundments and lakes in New England.

MINIMUM FLOWS

To enhance downstream habitat for recreational fisheries, Central Maine, the resource agencies, and NGO's propose various year-round flow releases from Gulf Island-Deer Rips ranging from 1,100 cfs (Central Maine's proposed flow) to 1,800 cfs, or inflow. We conclude that flows between 1,100 and 1,400 cfs, released to the Androscoggin River below the project, would provide beneficial cumulative effects for juvenile and adult brown trout, as well as other resident and anadromous fish species, which occur downstream of the Gulf

Island impoundment. We note that brown trout is an important recreational fishery in the lower Androscoggin River (Central Maine, 1991). We expect any recreational benefits that may occur, while not known at this time, would be commensurate with fish habitat benefits provided by the different flows (*see Sections 4.1.1.3. and 4.2.1.2.*).

Because implementing any proposed or recommended minimum flow regimes would affect the economics of the project, we discuss our minimum flow recommendation in Section 5.4.

4.1.1.7. Aesthetic resources

As discussed in Section 3.3.1.7., the shorelines and islands in and around the Gulf Island and Deer Rips impoundments are undeveloped and provide a very scenic setting. There are localized streambank erosion problems visible to boaters on the Gulf Island impoundment which have a limited adverse impact on the otherwise very scenic setting. In general, the proposed limited impoundment surface fluctuations associated with continued intermittent peaking operations would not adversely affect the existing scenic environment at the project.

Although Central Maine has no specific plans to improve shoreline aesthetics at the project impoundments, they propose to limit surface fluctuations on the Gulf Island impoundment and downstream river reaches, and to develop a conservation and trail plan for all its land abutting the project. In Section 4.1.1.9., we conclude that Central Maine should develop a comprehensive shoreland and island management plan to designate allowable uses for project lands, and provide benefits for wildlife, riparian vegetation, and recreation. Such a plan, together with some reduction in water surface fluctuations, would help protect existing and future shoreline aesthetic values.

We noted in Section 3.3.1.7. that a relationship exists between water quality problems in the lower Androscoggin River and aesthetic values, including offensive odors, discoloration, surface foam, and turbidity. Although available data are limited, upstream industrial and municipal discharges may be primary contributors to these problems. The operation of Gulf Island-Deer Rips and the turbulence in the project tailwaters could at times agitate the discharged substances, and some to extent, natural substances, which may lead to aesthetic problems in downstream river reaches.

EPA has expressed general concerns relating to all these issues, and suggests that Gulf Island-Deer Rips's intermittent peaking operations may be causing or exacerbating these water quality-related problems. The slightly improved 1,100-cfs minimum flow release proposed by Central Maine, by reducing the effects of the present peaking operations, could potentially help to alleviate some of these problems. As recommended by Interior, the Conservation Coalition, TU *et al.*, and Land Trust *et al.*, higher alternative minimum flow releases, or run-of-river operation, might help to further offset some of these problems.

Our review indicates that, lacking detailed information on these issues, the issues of foaming, odor, discoloration, and turbidity should be considered in the general context of project-related water quality issues (*see Sections 4.1.1.2. and 4.2.1.1.*).

4.1.1.8. Archeological and Historic resources

While Central Maine's proposal to continue operating the historic Gulf Island facilities would generally ensure long-term protection of the National Register eligible Gulf Island powerhouse, constructed between 1925 and 1926, non-routine maintenance (i.e., the repair of replacement of significant structural fabric and mechanical systems) could involve adverse effects, as could future implementation of upstream fish passage. Moreover, continuing to operate Gulf Island-Deer Rips as proposed, or future recreational development, could adversely affect the eight National Register eligible archaeological sites at Gulf Island-Deer Rips.

After consulting together, the Commission, SHPO, the Advisory Council on Historic Preservation (Advisory Council), and Central Maine, on October 27, 1993, executed a Programmatic Agreement, to protect National Register-eligible properties at ten of Central Maine's hydroelectric projects, including Gulf Island-Deer Rips (FERC *et al.*, 1993).

The Programmatic Agreement requires Central Maine to conduct non-routine repair and upkeep of the historic structures according to the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 Federal Register 444716 et seq.). Adhering to these standards and guidelines would also ensure to the historic structures a reasonable degree of protection if Central Maine were to construct upstream fish passage facilities in the future. The Programmatic Agreement also contains provisions to protect the archaeological sites.

4.1.1.9. Land use

Central Maine proposes to develop a land conservation and trail plan for the Gulf Island-Deer Rips area, which will include those lands already within the project's boundary and any additional Central Maine-owned lands that are not within the project boundary but are within 200 feet of the high-water elevation of the project's two impoundments; however, no specific details of the plan have been provided. This plan would be developed in consultation with appropriate agencies and NGOs, including, but not limited to, the Maine Department of Conservation (MDOC), NPS, the Androscoggin Land Trust, the Androscoggin Valley Council of Governments, the Appalachian Trail Conference, the Appalachian Trail Club, the Conservation Law Foundation, and local municipalities including the Cities of Lewiston and Auburn.

The development and implementation of the land conservation and trail plan could result in additional protection and enhancement for environmental resources within the project boundary.

4.1.1.10. Socioeconomics

Central Maine is not proposing to increase the existing capacity of Gulf Island Deer Rips. However, Central Maine proposes to spend approximately $3,000,000 for the project, primarily to replace two turbine runners and rewind a generator at the Gulf Island development.

Central Maine estimates that the local taxes on Gulf Island Deer Rips in 1994 were about $446,000. Central Maine would continue to pay taxes on the project, escalating at a rate of four percent annually, through the year 2023.

Under existing conditions, recreation on the lower Androscoggin River is somewhat limited. Central Maine proposes various environmental enhancements related to impoundment fluctuations, downstream minimum flows, and recreational access and facilities. The level of recreation in the project area and on the lower Androscoggin River, and any related revenue, could potentially improve as a result of the proposed enhancements. We expect that angling opportunities on the lower Androscoggin River would increase the economic value of the fisheries resource, since recreational angling is expected to increase along the lower Androscoggin River. Consequently, increased recreational use would contribute to the revenue sources of the local economy, as well as, the basin's tourism industry.

While improvement is expected to occur, the degree of improvement, however, would likely be in accordance with the level of benefits derived from: (1) changes in project operations and minimum flows, (2) improved water quality conditions, and (3) increased recreational development. [*See Sections 4.1.1.2., 4.1.1.3., 4.1.1.6., 4.2.1.1., 4.2.1.2., and 4.2.1.4. for the discussion of benefits associated with the proposed and recommended environmental enhancements, as they pertain to water quality, fisheries, and recreation*].

4.1.1.11. Air Quality

Central Maine has not proposed any specific measures that would affect air quality beyond the energy source tradeoffs discussed in Section 4.2.1.5.

4.1.2. Marcal (CASE 2)

4.1.2.1. Geology and soils

A geologic survey of the Marcal impoundment shoreline was conducted to note the steepness, soil type, and vegetative cover around the impoundment, and to assess whether any slope instability from recent slumping exists (Jaworski Geotech, Inc.; JGI, 1994).

For the most part, the bank near the shoreline is nearly vertical, within approximately one foot of the shoreline. This feature is characteristic of most river shorelines in the

region. However, the steepness of the shoreline did not appear to be a significant factor in slope stability, due to the type of vegetative cover that exists along the impoundment's shoreline, and role of tree root systems in securing the shoreline. Root systems appeared to be extensive, with most being derived from mature trees greater than one foot in diameter. Thick grass mats also exists along the impoundment, which play an important role in securing the shoreline.

Occasional segments of the impoundment's shoreline lacks vegetation, which was observed to have experienced some minor slumping. We note that there are a number of forces which may act to reduce bank stability, including groundwater fluctuations resulting from precipitation or snow melt events, freezing and thawing, wind, wave action, ice and ice flows, and the movement of water against the shoreline.

Large trees which had fallen adjacent to the shoreline, or rather into the impoundment, were observed to have removed some minor amounts of soil from areas along the Marcal impoundment's bank. However, the dense root structure of the trees generally act to stabilize the shoreline environment.

Based on the study conducted by JGI (1994), we believe that operating Marcal, with a one- to two-foot change in water level would have minimal, if any, effects on the natural shoreline area surrounding the Marcal impoundment. We would expect that Consolidated Hydro's proposal to limit the impoundment drawdown to one foot or less from May 1 to October 15 to have certain, but unknown, beneficial effects to shoreline areas and aquatic habitat in the impoundment.

4.1.2.2. Water quality and quantity

WATER QUALITY AND QUANTITY SUMMARY

The continued operation of Marcal would affect water quality and quantity in the Little Androscoggin River.

Consolidated Hydro's proposed project operations would enhance water quality in the Little Androscoggin River. By providing a year-round minimum flow of 56 cfs, periods of only leakage flows from the project would be eliminated. Water quality downstream of Marcal would be enhanced by the flow release. More specifically, flow related stress on the fish and aquatic invertebrates would decrease and a more diverse and abundant aquatic community would likely develop. Further, water quality in the bypassed reach would be enhanced by the implementation of a seasonal 20 cfs minimum flow.

The specific impacts to water quality in the project vicinity and the Little Androscoggin River are discussed below. We also discuss how we reached our conclusions described above.

PROJECT OPERATION AND MINIMUM FLOWS

As discussed in Section 3.3.2.2., Consolidated Hydro currently operates Marcal as a seasonal storage-and-release facility, and is proposing to continue operating the facility in such a manner. Consolidated Hydro also is proposing to provide a year-round project minimum flow of 56 cfs, or inflow, whichever is less. A component of this minimum flow would be a minimum bypass flow of 20 cfs from June 1 to November 1. The primary purpose of the year-round 56 cfs minimum flow is to protect and enhance water quality in the Little Androscoggin River downstream of Marcal. The main purpose of the 20 cfs minimum bypass flow is to enhance fisheries habitat in the bypassed reach. While we discuss the impacts and effects of the proposed minimum bypass flow in Section 4.1.2.3., the proposed flow would also affect water quality in the bypassed reach.

Consolidated Hydro's water quality study indicated that Class C water standards in the vicinity of the project were being met or exceeded during periods of no spillage (*see Section 3.3.2.2.*). However, MDEP expressed concerns regarding water quality in the lower portions of the Little Androscoggin River and requested that Consolidated Hydro determine the river flow needed to assimilate the treated wastewater from the Mechanic Falls Wastewater Treatment Facility, which discharges to the river approximately 1,500 feet downstream of the project.

To assess whether assimilation limits are currently met, or would continue to be met, under daily maximum discharge from the Mechanic Falls Wastewater Treatment Facility and 7Q10 river flow conditions, Consolidated Hydro used MDEP's QUAL2E model, or the Streeter-Phelps model, for their evaluation. Many of the assumptions for the modelling were based on data reported in Miller (1990) and Consolidated Hydro (1994a). Details of the model formulation, methodology, and calibration are contained in Miller (1991).

Results of the Streeter-Phelps model demonstrate that at the 7Q10 flow of about 8.34 cfs and a daily maximum discharge from the Mechanic Falls Wastewater Treatment Facility, the DO standard of 5.05 mg/l (60 percent saturation at 75.2°F) would not be maintained. The minimum DO predicted by the model at the 7Q10 flow is 4.48 mg/l. As predicted by the model, the flow needed to maintain the minimum DO concentration (5.05 mg/l at 75.2°F) downstream of the wastewater treatment facility is 11.5 cfs.

Thus, Consolidated Hydro believes, and Interior concurs, that the proposed year-round project minimum flow of 56 cfs would be sufficient to continue to assimilate all licensed discharges from the Mechanic Falls Wastewater Treatment Facility. We also concur with this year-round flow, and because baseline conditions do not include a minimum flow below Marcal, we conclude that the 56 cfs minimum flow likely would provide significant benefits to water quality in the Little Androscoggin River downstream of the proposed project.

Relative to the bypass flow, although unquantified, increasing the minimum bypass flow from leakage to 20 cfs during the summer and fall months would have a beneficial effect on water quality and aquatic habitat in the bypassed reach. Areas normally only periodically wetted during spill events would be continuously inundated. Water velocities would increase and stagnation and retention times would decrease. Macroinvertebrate species, especially those of limited mobility, would benefit from the increased flows. Additionally, given the substrate in the bypassed reach (*see Section 3.3.2.3.*), it is likely that DO levels would be improved, to what extent, however, is not known.

Water temperature in the bypassed reach, although not specifically identified as a concern, appears to reach the upper lethal temperature for brook trout, and probably other salmonids, during the critical summer months. By reducing retention time in the bypass reach, Consolidated Hydro's proposed seasonal 20 cfs minimum bypass flow (June 1 to November 1) would likely improve water temperature somewhat in the bypassed reach.

4.1.2.3. Fisheries resources

FISHERIES RESOURCES SUMMARY

Consolidated Hydro's proposals for the installation of downstream fish passage facilities and a year-round 56 cfs minimum flow, of which 20 cfs would be provided seasonally in the project's bypassed reach, would significantly enhance the existing fisheries in the Marcal area and the Little Androscoggin River. Downstream migrating fish would be provided safe passage through the Marcal hydro station and an adequate zone-of-passage would be provided below Hackett Mills and Upper and Lower Barkers Mill for migrating alewives, American shad, and Atlantic salmon. Thus, any contributions of Marcal to cumulative effects on anadromous fish passage mortality would be significantly reduced. In the project's bypassed reach, Consolidated Hydro's proposed 20 cfs flow would provide significantly enhanced fisheries habitat for a seasonal coolwater/coldwater fishery. Additionally, the availability of resident fish habitat at Marcal and in the downstream free-flowing segments of the Little Androscoggin River under extreme conditions (90 percent exceedence) in the critical summer months would be increased with implementation of Consolidated Hydro's 20/56 cfs minimum flows.

The following is a detailed discussion of the fishery impacts, and how we reached our conclusions described above.

PROJECT OPERATION AND DOWNSTREAM FLOWS

Consolidated Hydro operates Marcal as a seasonal run-of-river/storage-and-release facility, and proposes to continue this mode of operation with the implementation of a year-round project minimum flow of 56 cfs (*see project operation and downstream flows in this section*). Projects downstream from Marcal generate with the flows released from the Marcal powerhouse. Currently, all river flows less than 560 cfs are passed through the

Marcal powerhouse to the Hackett Mills impoundment and the Little Androscoggin River downstream (*see Figure 2-4*). Excess flows are currently, and would continue to be, spilled over the project dam. Spillage flows at the Marcal dam occur about 23 percent of the time. Currently, Marcal has no minimum flow requirements.

Consolidated Hydro states that because Marcal's tailrace discharges directly to the Hackett Mills impoundment, the operation of Marcal has little effect on aquatic habitat in the Little Androscoggin River downstream from the project. Consolidated Hydro further states that the only major concern relative to downstream impacts is in the area of water quality. We discuss effects on water quality in Section 4.1.2.2. Therefore, to enhance downstream water quality, Consolidated Hydro proposes to release a year-round minimum flow of 56 cfs or inflow, whichever is less.

We disagree with Consolidated Hydro's conclusion that operation of Marcal would have little effect on downstream aquatic habitat. While the primary purpose of the minimum flow is to enhance downstream water quality, the proposed flow would also affect resident and anadromous fisheries.

We base our conclusion on the results of the instream flow study conducted by Consolidated Hydro for Marcal's bypassed reach, which we discuss below. While not directly transferable to the downstream river reaches, the results of the bypass flow study do show that aquatic habitat changes with changing flows. The intervening Hackett Mills Project is operated as a run-of-river facility. This mode of operation may temper the releases from Marcal, as suggested by Consolidated Hydro, but would likely not significantly alter the flows in the Little Androscoggin River downstream from Marcal. Therefore, flows released from Marcal would likely be carried downstream, and the general relationship between aquatic habitat and flows observed in Marcal's bypass reach would exist in downstream river reaches, particularly in the free-flowing stretches of river.

FLUCTUATING FLOW RELEASES

As discussed in Section 4.1.1.3., fluctuating flow releases have the potential to impact downstream habitats.

Marcal's tailrace flows directly into the impoundment for Hackett Mills. Based on this physical characteristic, Consolidated Hydro concluded that operation of Marcal has little, if any, impact on downstream aquatic habitat. Therefore, Consolidated Hydro is proposing no specific enhancement measures relative to ramping flow releases from Marcal. We believe that implementing Consolidated Hydro's proposed year-round project minimum flow at Marcal would reduce any ramping effects that currently do exist, because downramping would occur only to the proposed project minimum flow of 56 cfs, and not to the existing leakage flow release level.

BYPASS MINIMUM FLOWS

The Marcal powerhouse is located downstream from the project dam, and the maximum hydraulic capacity of the facility is 560 cfs. Excess flows are spilled into a 980-foot-long bypassed reach.

Because the Little Androscoggin River is managed for a variety fish species, Consolidated Hydro proposes to release a seasonal minimum flow in Marcal's bypassed reach of 20 cfs during the fish growing season from June 1 through November 1 each year.

To evaluate the effects of various flows on aquatic habitat in the bypassed reach, (*see Section 3.3.2.3.*), Consolidated Hydro assessed aquatic habitat and flow in the short reach using FWS's PHABSIM software (Consolidated Hydro, 1994a). PHABSIM is a component of IFIM, whereby, habitat-discharge relationships can be derived using hydraulic flow models and HSI criteria. Details of the model formation, methodology, and calibration are contained in Consolidated Hydro (1994a).

At Marcal, the IFIM study examined the 980-foot reach of the Little Androscoggin River between the project dam and tailrace. This reach is comprised of several pools, having an average width of about 140 feet, and a riffle section, having an average width of about 75 feet. Habitat conditions in the bypassed reach are dependent on the volume of spill occurring at the Marcal dam.

Field data were collected at leakage (1.5 cfs; existing condition), 16 cfs, 42 cfs, and 72 cfs. HSI values used in the analysis were derived from published literature and are contained in Consolidated Hydro (1994a). After the collection of field data, habitat values for the pools and riffles were simulated with the IFIM model over a range of flows from 1.5 cfs to 56 cfs. The species evaluated included brook trout and smallmouth bass; fry, juvenile, and adult lifestages. Results of the habitat simulation for the bypassed reach are shown in Figures 4-15 and 4-16.

WUA for fry and juvenile brook trout was maximized at flows of 15 cfs and 30 cfs, respectively (Figure 4-15), with the majority of the habitat for both lifestages occurring in the riffle segment; 81 percent for fry and 66 percent for juveniles. At Consolidated Hydro's proposed 20 cfs minimum bypass flow, the percentage of the peak WUA available was 93 percent for fry and 85 percent for juveniles.

For adult brook trout, WUA was maximized at a minimum bypass flow of 56 cfs, with the greatest gains in habitat occurring between leakage and 20 cfs (Figure 15). Overall, the pool areas provided slightly more adult brook trout habitat than did the riffle area. For adult brook trout, WUA at Consolidated Hydro's proposed 20 cfs minimum bypass flow was 84 percent of the peak WUA.

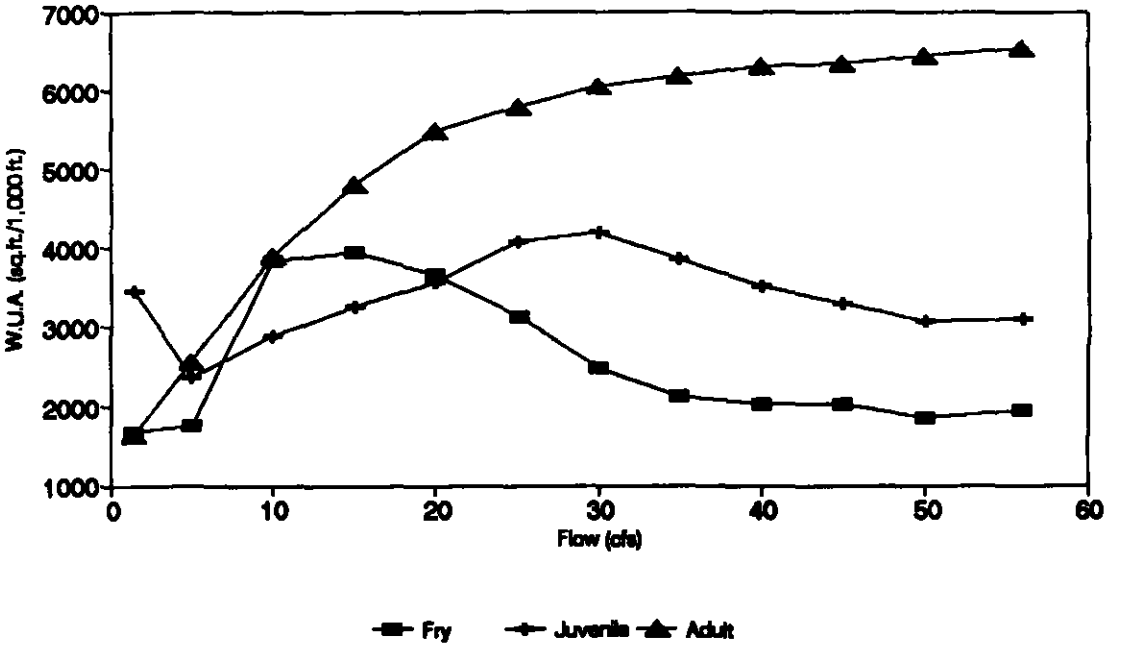

Figure 4-15. Brook trout weighted useable area (WUA) vs. discharge for Marcal's bypassed reach (Source: Consolidated Hydro, 1994b).

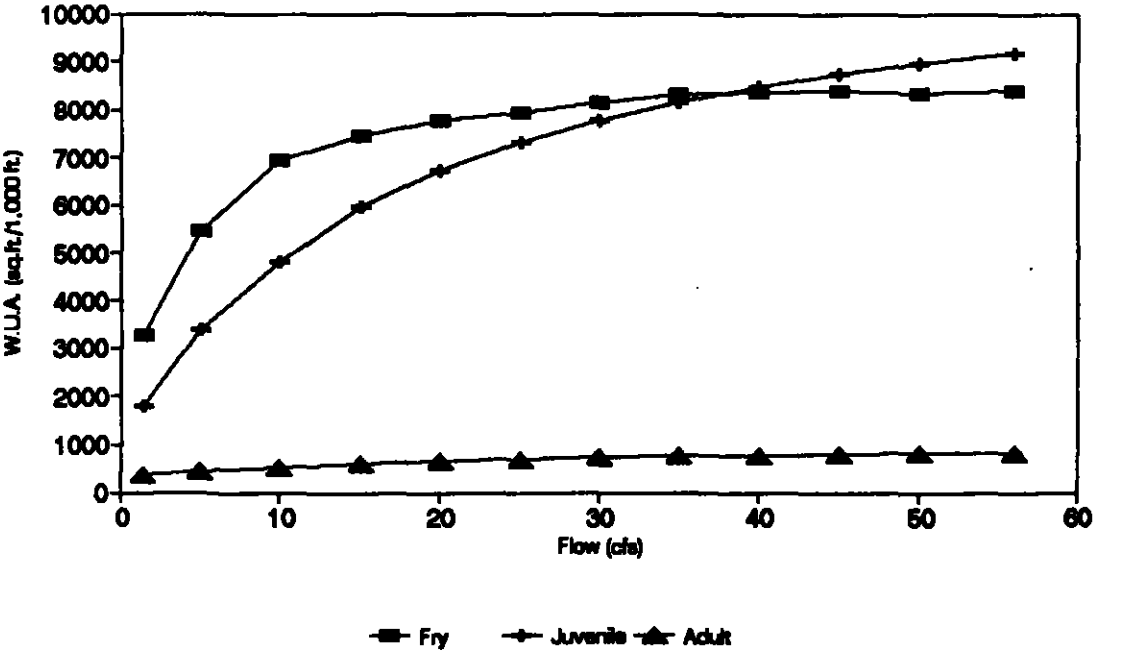

Figure 4-16. Smallmouth bass weighted useable area (WUA) vs. discharge for Marcal's bypassed reach (Source: Consolidated Hydro, 1994b).

For smallmouth bass fry, peak WUA occurs at 45 cfs (Figure 16). The riffle area provides the greatest amount of habitat of any area studied within the bypass, but generally, suitable habitat is fairly equally distributed throughout the bypass reach. The largest gains in habitat occur between leakage and 10 cfs. At Consolidated Hydro's proposed 20 cfs minimum bypass flow, fry habitat was 92 percent of the peak WUA.

Peak WUA for juvenile smallmouth bass occurs at 56 cfs, but the greatest gains in suitable habitat occur between leakage and 20 cfs (Figure 16). Relative to the pool areas, the riffle area provides slightly more juvenile habitat, but overall, habitat is proportionally good throughout the bypass reach. At Consolidated Hydro's proposed 20 cfs minimum bypass flow, the percentage of the peak WUA available to juvenile smallmouth bass was 73 percent.

Adult smallmouth bass were the most habitat limited of the species/lifestage evaluated (Figure 16); the bypassed reach lacks deep-water, low-velocity habitat. The large pool immediately below the project dam accounts for about 80 percent to 90 percent of the adult bass habitat in the bypass reach. Albeit limited, habitat is maximized at 56 cfs. Consolidated Hydro's proposed minimum bypass flow would provide 81 percent of the adult's peak WUA in the bypass reach.

Relative to wetted area, the total amount of area in the bypass reach inundated by Consolidated Hydro's proposed minimum bypass flow is 27,511 ft^2 of substrate, approximately 82 percent of the maximum wetted area. Of the total wetted area, the large pool area contributes 6,215 ft^2, the small pool area, 4,657 ft^2, and the riffle area, 16,639 ft^2. The most significant gains in wetted area over leakage conditions, occurs in the riffle area.

Based on the results of the bypass flow study, Consolidated Hydro concluded that for all of the species/lifestages evaluated, the most significant gains in WUA occur as flows increase from leakage to about 20 cfs. Further, Consolidated Hydro suggests that any gains in WUA with flows over 20 cfs are offset by losses due to high water velocities and the relative scarcity of velocity refuges within the bypass reach. We concur with these conclusions. A minimum flow of 20 cfs would nearly maximize the available habitat within the bypassed reach, thereby, improving the quality of the fishery over what currently exists and would enhance the fish stocking efforts of the MDIFW by increasing available habitat. The bypass flow is considered further in Sections 4.2.2.2. and 5.4.

MARCAL IMPOUNDMENT FLUCTUATIONS

Consolidated Hydro proposes to continue operating the project in a seasonal run-of-river/storage-and-release mode, but to limit impoundment fluctuations to no greater than one foot from May 1 through October 15 and two feet from October 16 through April 30. Marcal, currently, is operated with no restrictions on the daily impoundment fluctuations.

Species that inhabit the littoral zone of the impoundment typically are displaced when their preferred habitat is dewatered. Other species that normally occupy deeper, mid-

channel, areas may spawn in shallow water, and dewatering due to drawdowns could affect their reproductive success, depending upon the magnitude and timing of the drawdown. Impoundment drawdowns also can lead to fish stranding in small pocket areas, making tributaries inaccessible to species that migrate to habitat to spawn. Large fluctuations in water levels also can be detrimental to wetland plant species that depend on saturated soil (Rochester *et al.*, 1984). These wetland areas may be important to the reproductive success of certain fish species. Table 4-4 summarizes the spawning habitat requirements of various species, including the seasons of spawning and incubation when water levels are critical.

Table 4-4. Spawning habitat for common impoundment species (Source: Smith, 1985; Werner, 1980).

Species	Spawning Habitat and Season
Largemouth bass	Shallow shoreline areas at depths from 1 foot to 4 feet during May or June
Smallmouth bass	Shallow shoreline areas at depths from 2 feet to 20 feet (average of about 3 feet) during May or June
Chain pickerel	Marshy, vegetated areas and shallow bays during April and May
Yellow perch	Shoreline areas (sand, gravel, vegetated substrate) at depths from 5 feet to 10 feet or tributary streams during April or May
Brown bullhead	Shallow areas along shoreline during late May and June; prefer sites with shelter (i.e., log or rock)

The existing project is operated such that the impoundment generally experiences drawdowns of no more than two feet. Consolidated Hydro states that since the majority of the impoundment contains steep banks with edge depths greater than four feet, neither the quantity or quality of aquatic habitat is significantly affected by the existing water level fluctuations. The existing two-foot headpond fluctuation reduces depths along the impoundment shorelines from three-four feet to one-two feet, maximum depths typically are reduced from five-seven feet to four-five feet. Wetted width in the impoundment is generally not affected by the existing fluctuations. Substrate in the drawdown zone is composed primarily of sand and silt, with poorly developed cover.

Fish stranding is generally considered a problem in riverine reaches that are characterized by shallow backwater areas, or small pocket water areas created by instream obstructions. Based on the survey conducted by Consolidated Hydro, there are only a few shoreline areas, and no submerged obstructions, which could potentially lead to fish stranding. Therefore, we conclude fish stranding is likely not a concern in the project

impoundment.

With regards to tributary access, a drawdown up to two feet generally does not affect access to tributaries, particularly if the mouth of the tributary is characterized by a relatively shallow-sloping bed along its course. Given the character of the project impoundment, we would expect drawdowns of two feet in the project impoundment to have virtually no effect on access to any tributaries.

Smallmouth bass and a variety of other resident fishes are recreationally important species that reside in the project impoundment. These fishes are most vulnerable to adverse effects from water level fluctuations during their spring spawning period when impoundment fluctuations can lead to nest desiccation or nest abandonment (which may ultimately lead to predation of the young). The potential for adverse impacts is largely dependent upon the loss of aquatic habitat when the impoundment is drawn down.

The project, as proposed, would annually operate with daily impoundment fluctuations about 37 percent of the time [*see Table 3-11 in Section 3.3.2.2.*]. On a monthly basis, impoundment drawdowns would occur from about one percent of the time in May to about 80 percent of the time in August and September. Based on the flow duration curves, we conclude that impoundment fluctuations would occur during the May/June spawning period, with drawdowns occurring about 35 percent of the time in the month of June. Therefore, depending upon the timing of spawning activity, drawdowns in the project impoundment could have a minor to moderate effect on the availability of suitable spawning areas.

Smallmouth bass generally spawn at depths that may be affected by the drawdown (Table 4-4). However, we expect these impacts to be minimal because, (1) substrate and cover in the fluctuation zone generally does not conform to habitat criteria for smallmouth bass nesting, and (2) the only suitable nesting habitat for smallmouth bass exists in the boulder/riffle area at the upstream end of the project impoundment, which most likely would not be significantly affected by water level fluctuations.

In addition to stranding, tributary access, and spawning impacts, repeated exposure of the substrate also could adversely affect production of aquatic insects and forage fish, particularly in the more shallow, backwater areas.

Because this FEIS assesses impacts using the existing conditions as a baseline, we conclude that continued operation of Marcal, as proposed by Consolidated Hydro would adequately protect aquatic habitat in the project impoundment. Restricting drawdowns during this period would provide moderate to significant benefits over existing conditions for spawning, rearing, and juvenile habitat of smallmouth and largemouth bass, chain pickerel, and other inhabitants of the Marcal impoundment. Further, limiting impoundment fluctuations during this period would enhance aquatic invertebrate habitat.

MDIFW's Inland Fisheries River Management Plan (MDIFW, 1982), recommends a water level management regime for blackbass of relatively stable impoundment levels between May 1 through July 1. Consolidated Hydro's proposed drawdown restriction is consistent with, and goes beyond, MDIFW's guidelines. Therefore, we agree with the proposed schedule of impoundment drawdowns.

AQUATIC HABITAT IN THE LITTLE ANDROSCOGGIN RIVER

The instream flow study conducted in support of licensing Marcal addresses habitat vs. flow in a short, bypassed, stretch of the Little Androscoggin River, which says little, if anything, about the remainder of the habitat in the lower portion of the river.

Our analysis shows that the average annual flow in the Little Androscoggin River for a few miles below Marcal is about 465 cfs. According to Tennant (1975), ten percent of the mean annual flow is a minimum instantaneous flow recommended to sustain short-term survival habitat for most aquatic life and 30 percent of the mean annual flow is recommended to sustain good survival habitat. In the Little Androscoggin River downstream of Marcal, these values would be 47 cfs and 140 cfs, respectively. Consolidated Hydro's proposed, and Interior's recommended, year-round 56 cfs project minimum flow is about 11 percent of the mean annual flow. This flow is slightly above Tennant's recommendation for sustaining short-term survival habitat, and well below the flow recommended for maintaining good survival habitat.

The 56-cfs project minimum flow would be released from Marcal whenever the project is operated as a peaking facility, which would occur about 37 percent of the time [*see Table 3-11*]. The remainder of the time, Marcal would be operated as a run-of-river facility, passing at least 120 cfs to 140 cfs. Flows of this magnitude are about 26 percent to 30 percent of the mean annual flow, which is nearly equivalent to Tennant's recommended flow for maintaining good survival habitat. During August and September, the critical summer months, the project would operate as a run-of-river facility for about 20 percent of the time, and as a peaking facility for about 30 percent of the time. The remaining 50 percent of the time, with the proposed 56-cfs minimum flow, the project would not operate.

FISH PROTECTION AND PASSAGE FACILITIES

Project operation may continue to affect the fishery resources by entraining fish into the project turbines that could cause injury and mortality. Mortality or injury could occur as a result of fish being struck by turbine blades, pressure changes, sheer forces in turbulent flows, and water velocity accelerations (Knapp *et al.*, 1982; Cada, 1990).

The Little Androscoggin River is a significant component of the restoration program for the Lower Androscoggin River Basin; American shad and alewife are currently stocked in lakes and ponds throughout the Little Androscoggin sub-basin. Atlantic salmon also have been periodically released into the Little Androscoggin River. Consequently, for fish

passage purposes, Consolidated Hydro proposes to provide permanent downstream fish passage facilities concurrent with any license issued for the project.

Regarding current restoration efforts, presently there is no formal fish restoration plan in place for restoring anadromous fish, except Atlantic salmon, to the Little Androscoggin River (Consolidated Hydro, 1994c). The timetable established by FWS for restoring Atlantic salmon to the Little Androscoggin River would require downstream fish passage facilities and protection measures at Marcal by 1995, while upstream fish passage facilities would not be required at Marcal, but would be required at the downstream Lower Barkers Mill dam by 1999 (FWS, 1989).[9]

Downstream Fish Protection and Passage - Consolidated Hydro proposes to install a single downstream fish passage facility at the dam, with fish being returned to the project's bypassed reach. Final fishway design specifics, including transport flows during operation, are proposed to be determined during the final design phase in consultation with the fishery agencies. Consolidated Hydro concludes that the final design for the proposed downstream fish passage facilities will be according to agency specification, and therefore does not propose to monitor the effectiveness of the facility after installation is complete.

The proposed downstream fish passage facility would consist of a surface bypass arrangement, which would be constructed at the end of the 120-foot-long power canal and adjacent to the project's intake structure. Specifically, the proposed downstream passage facilities would consist of: (1) a surface weir designed to accommodate the proposed two-foot impoundment fluctuation, with the headpond surface elevation (273.3 - 271.3 feet) controlled by stoplogs; (2) a 3.7 feet-deep plunge pool with a water surface elevation of 259.7 feet; and (3) a steel bypass pipe that would spill into a natural pool area in the bypassed reach, which has a water surface elevation of 257.3 feet. Up to two percent of the maximum generational flow, or about 11 cfs, would be utilized for attraction and conveyance. Consolidated Hydro states that the flows passed through the downstream fish passage facilities would be used to satisfy a portion of the proposed bypass and project minimum flows (*see minimum flow discussion in this section*).

Consolidated Hydro proposes to complete construction and initiate operation of the downstream passage facility within two years of issuance and acceptance of any license for the project. Consolidated Hydro proposes to operate the facility between June 1 and November 1 of each year to accommodate downstream migrating anadromous fish.

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[9] FWS concluded that a trap-and-truck facility installed at Lower Barkers Mill would be the most practical means of attaining restoration goals in the Little Androscoggin River. FWS also believes that the schedule and design criteria for fish passage on the Little Androscoggin River will require a comprehensive approach, where the needs of each dam on the river are considered; this comprehensive approach might, in the future, determine that something other than a trap-and-truck facility at Lower Barkers Mill is needed.

The proposed conceptual design does not contain plans for any changes to the existing project's trashracks. Presently, Marcal's trashracks are constructed of 3/8-inch bars placed two inches on center, and having a 1.625-inch clear bar spacing. Based on the trashrack's rating curve, average approach velocities across the trashrack at the maximum generating capacity of 560 cfs vary from about 1.8 fps (elevation = 273.3 feet) to 1.3 fps (elevation = 271.3 feet).

While the final downstream fish passage facility design has not been developed and would be subject to further consultation with the resource agencies, the proposed design has been shown to be an effective means of passing downstream migrating fish at other similar projects; a similar facility is in use at the downstream Hackett Mills Project, which has been shown to be very effective. We foresee no reasons why, conceptually, the proposed facilities would not provide adequate downstream fish passage. Thus, we believe that Consolidated Hydro's proposed downstream fish passage facility would contribute to a beneficial cumulative effect on anadromous fish and thereby, further the goals and objectives of the lower Androscoggin River's anadromous fish restoration efforts.

Upstream Fish Passage - Consolidated Hydro states that anadromous fish migrating upstream to spawn in the Little Androscoggin River do not have access to the project area; there are no upstream passage facilities at the three projects below Marcal on the Little Androscoggin River. Therefore, Consolidated Hydro does not propose to install, nor have they developed conceptual plans for, upstream fish passage facilities at Marcal at this time.

We note, however, that Consolidated Hydro, FWS, MDMR, and MDIFW are currently involved in on-going discussions regarding fish passage needs at Marcal, and on the Little Androscoggin River in general (Consolidated Hydro, 1994c). We address the content of the discussions to date in a later section (*see Section 4.2.2.2. for further discussion regarding upstream fish passage facilities on the Little Androscoggin River*).

4.1.2.4. Vegetation and wildlife resources

Consolidated Hydro proposes to continue operating Marcal in a seasonal run-of-river/storage-and-release mode (*see Sections 4.1.2.2. and 4.1.2.3. for Consolidated Hydro's proposed operating regime for Marcal*). We conclude that upland vegetation and associated wildlife would not be affected by the proposed project operations. Consolidated Hydro's proposed operations, however, could affect wetlands and associated wildlife as discussed below.

IMPOUNDMENT FLUCTUATION

Consolidated Hydro's proposal to limit impoundment fluctuation from two feet to one foot (from May 1 through October 15) would protect and enhance existing wetland conditions. In particular, limiting impoundment fluctuations from May through August would enhance wetland vegetation and associated wildlife by providing some protection for

those species susceptible to water level fluctuations, and would expose less of the shoreline. May through August is an important time for terrestrial resources because (1) vegetation is growing, (2) some wildlife species lay eggs along shoreline areas (such as spotted sandpiper, common snapping turtle, and eastern painted turtle), and (3) some migratory birds (i.e., common loon and Canada geese) stop-over in this area to feed and rest, while completing their spring migrations.

MINIMUM FLOWS

Consolidated Hydro's proposal to release 56 cfs year-round from Marcal, with a 20-cfs minimum flow in the bypassed reach from June 1 through November 1, would have a beneficial effect on the riparian wetlands in the bypassed reach, as well as vegetated areas downstream of the project. The additional flows in the bypassed reach during the wetland vegetative growing season would result in more water being available to the vegetation in the affected areas, thus resulting in increased growth. The 20-cfs flow in the bypassed reach may also enhance wildlife habitat by providing water for travel corridors, nesting areas, and brood protection. The year-round release of 56 cfs from the project could have a minor, long-term beneficial effect on downstream riparian wetlands. The additional water provided by the continuous 56-cfs minimum flow would be available to potentially enhance existing wetlands and perhaps provide hydrologic conditions suitable for development of new wetlands.

4.1.2.5. Endangered and threatened species

By letter dated December 15, 1993, Interior states that there are no federally listed threatened or endangered species in the Marcal area. Therefore, consultation under Section 7 of the ESA of 1973, as amended, is not necessary. Based on the best available information, we conclude that the operation of Marcal is not likely to adversely affect any federally listed threatened or endangered species. However, if the project is modified or if new information about the project becomes available that indicates listed or proposed species or critical habitat may be present in the project area and/or affected by project operation, the Commission would initiate Section 7 consultation with the FWS.

4.1.2.6. Recreation resources

Consolidated Hydro proposes to construct and operate (1) a carry-in boat launch facility on the project's impoundment[10], and (2) a canoe portage route[11] [*see Section 2.2.2.3. for further details*].

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[10] This facility would be developed on land owned by the Mechanic Falls Firemen's Association.

[11] The canoe portage would be developed on land owned by the Town of Mechanic Falls and Central Maine.

With regards to the canoe portage, Consolidated Hydro initiated discussions with the Town of Mechanic Falls, to ensure the feasibility of access at the town park, and with Central Maine, regarding public use of its substation property as a downstream terminus of the canoe portage route. Both the Town of Mechanic Falls and Central Maine have conditionally approved the use of their respective properties; the Town of Mechanic Falls is requiring that Consolidated Hydro install a gate in the fence along the impoundment shoreline and Central Maine is requiring that Consolidated Hydro post public safety warning signs.

Consolidated Hydro's proposal to construct a permanent carry-in facility on the project's impoundment, including a parking area, a carry-in boat launch ramp, and bank access along the impoundment would ensure the availability of the recreational opportunities offered at the Marcal site, and would allow greater use of the Marcal impoundment for angling and other recreational activities. Consolidated Hydro's proposed canoe portage route would also provide certain recreational benefits in the project area by creating a route for canoe travel past the project.

In addition to the recreation facilities mentioned above, Consolidated Hydro and Interior have proposed and/or recommended various minimum flow releases at Marcal. We conclude that flows in the project's bypassed reach and downstream of the project ranging from 20 cfs up to 56 cfs, as proposed and recommended, would provide beneficial, cumulative effects for the resident fishery in the Little Androscoggin River (mainly smallmouth bass, brook trout, and brown trout). We would expect that any recreational angling benefits that do occur, while not known at this time, to be commensurate with fish habitat benefits provided by the different flows (*see Sections 4.1.2.3. and 4.2.2.2.*).

Because implementing any proposed or recommended minimum flow would affect the economics of the project, we discuss our minimum flow recommendation in Section 5.4.

4.1.2.7. Aesthetic resources

Although Consolidated Hydro has no specific plans to improve shoreline aesthetics in, and around, the Marcal impoundment, the company's proposal to limit impoundment fluctuations to one foot from May 1 through October 15 would provide some minor aesthetic improvement along the Little Androscoggin River in the project vicinity. As discussed in Section 3.3.2.7., the aesthetic affects of water surface fluctuations in the impoundment and downstream river reaches, the result of seasonal storage-and-release operation at Marcal, would be minimal because the impoundment is generally characterized by steep-sided banks.

The 20-cfs minimum flow release (or inflow) proposed by Consolidated Hydro in the project's bypassed reach from June 1 to November 1 would provide some aesthetic improvement at the proposed project over present conditions. We note that views of the bypassed reach are available from the Elm Street Bridge. Higher minimum flows in the project's bypassed reach, as are recommended by Interior, may provide a somewhat better aesthetic viewscape of the river reach.

Consolidated Hydro's proposed and Interior's recommended year-round downstream minimum flow of 56 cfs would enhance the aesthetic appeal of the free-flowing reaches of the river, primarily the stretch between the Hackett Mills tailwater and the headwater for Upper Barkers. Hackett Mill Hydro's recommendation that Consolidated Hydro operate Marcal in a strict run-of-river mode would result in natural streamflows that would likely produce the best overall aesthetic enhancement.

4.1.2.8. Archeological and Historic resources

Marcal would not affect any National Register, or National Register-eligible properties if operated as proposed by Consolidated Hydro, or as recommended by Hackett Mill Hydro (i.e., run-of-river operation). Nevertheless, there remains the possibility that there could be undiscovered properties in the project area that could be adversely affected by future ground disturbing activities or by project operation.

Before engaging in any future ground disturbing activities, or if properties are found in the future during project operation, Consolidated Hydro should take the following actions; (1) consult with the SHPO; (2) prepare a plan, in consultation with the SHPO, describing the appropriate course of action and a schedule for carrying it out; (3) file the plan with the Commission, for approval; and (4) take the necessary steps to protect the properties until notified by the Commission that all of these requirements have been satisfied.

4.1.2.9. Land use

The Town of Mechanic Falls has adopted a shoreline zoning ordinance in accordance with State of Maine requirements. The ordinance divides the areas bordering the river into four districts: limited residential, recreational, resource protection, and general development. Within the shoreline zoning region there are 120 acres zoned as resource protection, 50 acres of limited residential and recreational, and 21 acres of general development. About 39 acres within the zoning region is the surface area of the Little Androscoggin River at full pond.

Consolidated Hydro does not propose any changes in land use, and contends that proposed operations would not adversely impact land uses. We agree, and further believe that no additional environmental measures related to land use are warranted at this time, particularly in light of what we believe would be significant costs to implement such measures.

4.1.2.10. Socioeconomics

Consolidated Hydro proposed no changes to Marcal that would significantly effect the socioeconomic resources in the project area or along the Little Androscoggin River.

Under existing conditions, recreation on the Little Androscoggin River is somewhat limited. Consolidated Hydro proposes various environmental enhancements related to

impoundment fluctuations, downstream and bypass minimum flows, fish passage, and recreational access and facilities. The level of recreation in the project area and on the Little Androscoggin River downstream of the project could potentially increase as a result of the proposed enhancements. This could result in increased revenues to the local economy. The degree of improvement, however, would likely be in accordance with the level of benefits derived from: (1) changes in project operations and minimum flows, (2) enhancement of the lower Androscoggin River fish restoration program, and (3) increased recreational development. [*See Sections 4.1.2.3., 4.1.2.6., 4.2.2.2., and 4.2.2.4. for the discussion of benefits associated with the proposed and recommended environmental enhancements, as they pertain to fisheries and recreation*].

4.1.2.11. Air Quality

Consolidated Hydro, with the exception of constructing downstream fish passage facilities, has not proposed any measures that would affect air quality beyond the energy resource tradeoffs discussed in Section 4.2.2.5. The construction of downstream fish passage facilities would have localized affects on air quality. However, any construction-related impacts would be minor and last for only a short time during the construction period.

4.2. Modification to proposed project operation or facilities

4.2.1. Gulf Island-Deer Rips (CASES 3-11)

In this section, we analyze the environmental impacts associated with licensing Gulf Island-Deer Rips with additional environmental enhancement measures. Proposed modifications to the project's operation and facilities to further protect, enhance, or mitigate adverse impacts to environmental resources and values were developed by various federal and state agencies, NGOs, and staff.

For flow related resources, we analyzed the effects of operating Gulf Island-Deer Rips under nine alternatives, including those proposed by federal and state agencies, NGOs, and staff (*see Table 2-3 in Section 2.7.*). For other resources, modifications were either resource or facility specific.

4.2.1.1. Water quality and quantity

WATER QUALITY AND QUANTITY SUMMARY

Any of the recommended project operations, including the staff's alternative flow scenarios, would enhance water quality in the lower Androscoggin River over the existing baseline conditions. By operating the project in a run-of-river mode or releasing a higher minimum flow, whether year-round or seasonally, the temporal distribution of streamflow would resemble, more closely, the natural flow distribution in the river. For the purposes of water quality, however, the extent of enhancements realized by any of flow alternatives over

Central Maine's proposal is unquantified and probably significant only in periodicity.

Central Maine has demonstrated a significant commitment to improving water quality in the lower Androscoggin River, as evidenced by its involvement in the GIPOP partnership and its commitment to investigate alternatives should additional measures be needed to enhance the river's water quality. We consider this to be a significant enhancement measure for water quality at this time.

As for MDIFW's brown trout program in the lower Androscoggin River, we are not convinced that existing DO concentrations are severely limiting the brown trout fishery in the river, and that additional measures are needed to improve DO levels to enhance MDIFW's brown trout program. Suitable habitat for brown trout is generally only available in certain reaches of the river below the proposed project. We believe that existing DO levels probably do not preclude the use of the majority of this habitat by brown trout. Further, installation and operation of the GIPOP facility has probably produced significant benefits for managing brown trout in the lower Androscoggin River. We expect these benefits to be the same in the future with the continued operation of the GIPOP facility. Coupled with an improved flow regime, the prospects for brown trout management may be further enhanced.

The Gulf Island dam traps sediments, which may contain elevated levels of certain contaminants, including mercury and dioxin. However, we do not believe that the existing or proposed operation of Gulf Island-Deer Rips has, or would, contribute significantly to mobilization of mercury and dioxin in the system. Further, pollutants currently bound in sediment, or transported downstream in the future, would continue to exist in the basin, whether the project existed or not. The presence of the Gulf Island dam, because it traps sediments laden with contaminants, could have a cumulative beneficial effect on water quality downstream of the project, and ultimately on downstream riverine and estuarine resources.

We conclude that neither the dam nor Central Maine is responsible for producing the contaminants in question. Therefore, Central Maine should not be solely responsible for "studying and fixing" the contaminants problem in the Gulf Island impoundment and the Androscoggin River. We believe this to be a problem that should be addressed cooperatively among all appropriate parties; the GIPOP partnership being a good example of this approach. In this regard, we encourage the appropriate parties to cooperatively pursue discussions regarding appropriate measures each entity should take to study the contaminants issue, and to evaluate the effects that the oxygen injection program may have on the levels of contaminants in the Gulf Island impoundment.

The following is a detailed discussion of the water quality impacts, and how we reached the conclusions described above.

PROJECT OPERATION AND DOWNSTREAM FLOWS

As an enhancement, Central Maine proposes a flow regime for the project (*see Section 2.2.1.3.*). However, various entities disagree with Central Maine's proposed flow regime. As an alternative to Central Maine's proposed mode of operation, Interior (CASE 4), the Conservation Coalition (CASES 5-6), TU *et al.* (CASES 7-8), and Land Trust *et al.* (CASE 9) recommend various minimum flows and impoundment operations for Gulf Island-Deer Rips (*see Section 2.3.1.2.*).

We interpret Interior's, the Conservation Coalition's, TU *et al.'s*, and Land Trust *et al.'s* recommended project operations and minimum flows as primarily being for the enhancement of fisheries and aquatic habitat. However, the recommended flow alternatives would also affect water quality in the lower Androscoggin River, as well as project economics (*see Section 2.7.*).

Interior and the NGOs based their recommendations on the instream flow studies conducted by Central Maine, the habitat needs of various fish species, and the need for sufficient fish passage and transport flows. Interior's recommendation for run-of-river operation during the late spring-early summer is based on the need for sufficiently high flows during the spring upstream migration periods for American shad, alewife, and Atlantic salmon (*see Section 4.2.1.2. for discussion of the effects of flows on fisheries*). TU *et al.'s* run-of-river recommendation is based on the need to protect impoundment and downstream aquatic habitat.

While no specific data is available to quantify the effects of Interior's and the NGOs' recommended flows on water quality, we believe that the effects would not be significantly different from those discussed in Section 4.1.1.2. for Central Maine's proposal to increase the minimum project flow from 1,000 cfs to 1,100 cfs.

Based on our analysis of Central Maine's proposal, increasing the flows at Gulf Island-Deer Rips from 1,000 cfs to as high as 1,700 cfs or 1,800 cfs in the low-flow summer months (July, August, and September) would have some beneficial effects on water quality in the free-flowing reaches of the river below Gulf Island-Deer Rips, Lewiston Falls, Worumbo, and Pejebscot.[12] Water velocities in these areas would increase and the resulting increased turbulence would probably improve DO levels to some extent. In the Gulf Island impoundment, and the impoundments downstream of Gulf Island-Deer Rips, water retention times would decrease. By further reducing the "unnatural and artificial" periodicity of the flows, experienced during peaking operations, the lower Androscoggin River flows would resemble a more natural temporal spacing of flow. We would expect some of these benefits to be realized farther downstream at Lewiston Falls, Worumbo, Pejebscot, and Brunswick, resulting in cumulative beneficial effects.

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[12] Central Maine's existing minimum flow of 1,000 cfs has probably provided the greatest overall benefits to water quality. Flows above the 1,000 cfs are likely to provide benefits, but with diminishing returns.

The staff looked at two additional options for project operation and downstream minimum flows; 1,700 cfs from May 1 to November 30 and either 1,100 cfs (CASE 10) or 1,400 cfs (CASE 11) from December 1 to April 30 (*see Table 2-3*). The difference between the staff's flow scenarios and Central Maine's, Interior's, and the NGOs' is flow periodicity. Central Maine's proposed and the agency/NGO-recommended project operations would result in a single, year-round minimum flow, whereas, staff's alternatives would provide minimum flows on a seasonal basis. Based on mean river flows for December to April (ranging from 4,371 cfs to 15,164 cfs), and expected water temperatures, we do not anticipate that water quality would be a problem during this time of year. Therefore, the effects of either seasonal flow alternative proposed by the staff would not be significantly different from Central Maine's, Interior's, or NGOs' proposed or recommended alternatives.

We also agree with Interior and TU *et al.* that conditions for macroinvertebrates below the project would improve with increased minimum flows. Stress on the macroinvertebrates would decrease and community diversity and abundance would likely increase with increased minimum flows from the project (*the effects of operating Gulf Island-Island-Deer Rips is discussed in more detail in Section 4.1.1.2.*). Implementation of any of the proposed or recommended minimum flow alternatives at Gulf Island-Deer Rips should be adequate to create a more healthy and abundant macroinvertebrate community given the anticipated enhanced conditions. However, Interior's, the Conservation Coalition's, and TU *et al.*'s higher minimum flow recommendations would be expected to provide slightly better habitat than the lower flow recommendations.

Interior's, the Conservation Coalition's, and TU *et al.*'s (CASE 7) seasonal recommendation for run-of-river operation, and TU *et al.*'s year-round run-of-river recommendation (CASE 8), would also be beneficial to water quality in the lower Androscoggin River. Based on our analysis of the run-of-river alternative, operating Gulf Island-Deer Rips in this mode would (1) minimize impoundment fluctuations and prevent fluctuations in flows downstream of the project that could reduce or alter available aquatic habitat and affect water quality, and (2) protect aquatic resources and water quality in the project area by maintaining a constant flow regime below the project and by preventing the dewatering of aquatic habitat. Further, operating the project in a run-of-river mode would minimize fluctuations in the impoundment's water surface elevation and would also benefit fish and wildlife habitat in the impoundments created by the Gulf Island and Deer Rips dams. Year-round run-of-river operation would result in the greatest overall improvements to water quality in the lower Androscoggin River. However, we do not expect the benefits provided by year-round versus seasonal run-of-river to be significantly different. In Section 2.7., we analyze the economic consequences of operating Gulf Island-Deer Rips in a run-of-river mode.

DISSOLVED OXYGEN

DO Enhancement Alternatives - EPA and the Conservation Coalition recommend that Central Maine, either individually or in cooperation with the upstream paper companies,

continue to investigate alternative methods to meet water quality standards throughout the Gulf Island impoundment and in waters downstream from the Gulf Island and Deer Rips dams. More specifically, EPA recommends that Central Maine, in consultation with EPA and the upstream paper companies, prepare an alternatives study plan and conduct the alternatives study in conjunction with the alternative analyses the paper companies will be required to perform as a condition of their NPDES permits.

As discussed in Section 3.3.1.2., water quality modelling shows that no degree of BOD removal by upstream dischargers would be sufficient to meet DO criteria throughout the Gulf Island impoundment, which appears to be largely do to the high oxygen demand of sediments deposited behind the Gulf Island dam. Nevertheless, EPA states that the oxygen injection program that is currently in place on the Gulf Island impoundment is a temporary solution to the depressed DO problem in the Androscoggin River.

EPA indicates that the decision to allow implementation of the oxygen injection program for the Gulf Island impoundment was based on 40 CFR 125.3(f), which permits the use of non-treatment techniques (such as oxygen injection) to meet water quality limits upon the demonstration that such a technique is the preferred environmental and economic alternative. Based on a 1990 report filed jointly by Boise Cascade, International Paper, and James River, EPA agreed that for at least the five-year term of discharge permits to the paper companies, oxygen injection was the preferred environmental alternative.

The current NPDES permits for the three paper companies, as described by EPA, require that other alternatives, including sediment containment or removal, alternative wastewater treatment, and changes in operations of Gulf Island-Deer Rips be studied further. The long-term goal of these requirements is that the water quality necessary to support uses and restore aquatic habitat be attained in a more natural fashion.

Relative to EPA's NPDES permits, Central Maine would not be required to alter the operation of Gulf Island-Deer Rips as part of any condition contained in the permits issued to the paper companies for discharges to the Androscoggin River. Central Maine does not hold a NPDES permit for the operation of Gulf Island-Deer Rips, nor does EPA consider the existence of a dam to constitute a discharge to a waterway under its guidelines.

We note that Central Maine has performed a "cursory assessment" of operational changes that could be implemented at Gulf Island-Deer Rips to improve DO concentrations in the lower Androscoggin River. The alternatives evaluated included lowering of powerhouse intakes, turbine venting, draft tube aeration, project operational changes, sediment removal, and oxygen injection (Central Maine, 1991).

EPA and the Conservation Coalition believe that these, and other alternatives (such as dam removal and run-of-river operation), by themselves or in combination with other opportunities to improve DO warrant additional study. Central Maine objects to EPA's characterization that GIPOP is a temporary solution, but concurs with EPA's

recommendation to prepare and implement an alternatives study plan (letter dated July 19, 1995, from F. Allen Wiley, P.E., Director of Hydro Operations, Central Maine Power Company, Augusta, Maine).

We do not believe that additional study of alternatives at this time is warranted, but preparation of a plan to study alternatives in the future might help to achieve EPA's long-term goal of improving water quality and restoring aquatic habitat in a more natural fashion.

The existing oxygen injection system (i.e., GIPOP facility) has been very effective in improving DO levels in the Gulf Island impoundment. Because of its engineering and environmental benefits, the long-term effectiveness of the GIPOP facility and the GIPOP program should be monitored to determine whether additional remedial measures are required for the Gulf Island impoundment and/or the Androscoggin River.

Central Maine is correct in stating that the water quality problems in the Gulf Island impoundment were jointly caused, and should continue to be jointly remedied by the GIPOP Partnership. The water quality problems of the Androscoggin River are the result of many factors resulting from over 150 years of industrial development, and have been the responsibility of no one entity. Central Maine has demonstrated a significant commitment to the GIPOP partnership and its willingness to assume its share of the responsibility for continuing to improve water quality in the lower Androscoggin River.[13]

Therefore, we conclude that EPA's recommendation that the DO issues at the Gulf Island impoundment be addressed jointly by the GIPOP Partnership in accordance with a common timetable and regulatory plan is reasonable. Except for the specific re-opener provision, we believe that the measures recommended by EPA would be a good first step in the process involving the cooperation of the upstream paper companies, Central Maine, EPA, and MDEP.

With respect to re-openers, EPA and Land Trust *et al.* recommend that any new license issued for Gulf Island-Deer Rips contain a specific re-opener clause to facilitate incorporation of alternative operations in the license. Neither EPA or Land Trust *et al.* have provided any evidence to support the inclusion of a specific re-opener clause in any new license issued for Gulf Island-Deer Rips, nor have they demonstrated the benefits of such a specific re-opener clause. In the event that future evidence shows that Central Maine should consider additional DO enhancement measures, the fish and wildlife agencies, EPA, or any other entity may request such measures under the provisions of the standard articles included in any license issued for Gulf Island-Deer Rips. Moreover, there are no procedural differences between either the standard re-opener or a specific re-opener; both require notice and an opportunity for a hearing. Because the process is the same for both types of re-openers and there is no evidence to support the need for a specific re-opener, we conclude

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[13] We note that Central Maine has committed to investigate other enhancement alternatives more thoroughly should additional measures be needed (Central Maine, 1991).

that a specific re-opener for future DO enhancement measures is not warranted.[14]

Raising DO Levels to 8.0 mg/l - The Conservation Coalition and Land Trust *et al.* recommend that any new license issued for Gulf Island-Deer Rips contain provisions for raising DO levels in the project area and downstream areas to support MDIFW's coldwater fishery program for the lower Androscoggin River.

Based on our own analysis of the issue, and the evidence presented in this licensing proceeding, we are not convinced that current DO concentrations in the lower Androscoggin River are severely limiting the brown trout fishery. First, the coldwater criteria relative to ambient DO concentrations for early life stages of salmon and trout is 8.0 mg/l for a 1-day minimum concentration and 9.5 mg/l for a 7-day mean concentration (EPA, 1981). These levels would result in intergravel DO concentrations of 5.0 mg/l (1-day minimum) and 6.5 mg/l (7-day mean). EPA (1981) also reported the DO criteria for the older life stages of salmon and trout; 4.0 mg/l (1-day minimum) and 6.5 mg/l (30-day mean). In addition to EPA's coldwater criteria, Raleigh *et al.* (1986) reported the lethal level of DO for juvenile and adult brown trout to be about 3.0 mg/l, depending on environmental conditions.

In the case on the Androscoggin River's brown trout fishery, we note that MDIFW stocks juvenile- to adult-sized brown trout in suitable stretches of the river below Gulf Island-Deer Rips. The monitoring results from the GIPOP program show that DO concentrations downstream of the project are generally above 7.0 mg/l during the critical summer months. DO concentrations of this magnitude have probably significantly enhanced the prospects for brown trout management in the lower Androscoggin River relative to pre-GIPOP DO conditions. We consider the existing DO levels, with GIPOP, to be sufficient for maintaining brown trout in the lower Androscoggin River.

Second, the habitat characteristics of the Gulf Island impoundment may not be conducive to establishing a brown trout fishery in the impoundment. In lacustrine environments, optimal brown trout habitat is generally characterized by clear, cool to cold, lakes that generally are oligotrophic, but may vary in size and chemical quality (Raleigh *et al.*, 1986). Further, brown trout are typically stream spawners and require gravel substrate in riffle-run areas for reproduction. Based on our review of the habitat in the Gulf Island impoundment, we believe that suitable habitat for brown trout in the impoundment is limited.

Finally, the segment of the Androscoggin River containing the Gulf Island impoundment is designated as a warmwater management type. The Gulf Island impoundment is well suited for this type of fisheries management, as evidence by the existing blackbass fishery.

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[14] We support the preparation of an alternatives study plan and recommend the inclusion of standard language reserving the Commission's authority to require operational changes and/or other environmental enhancements at Gulf Island-Deer Rips, should a more cost-effective and environmentally sound alternative be identified through the study process.

Based on our review of the literature and the evidence presented in this licensing proceeding, we are not convinced that raising DO concentrations to 8.0 mg/l or higher would significantly enhance MDIFW's brown trout program in the lower Androscoggin River.

Water Quality Monitoring - Interior and TU *et al.* recommend that Central Maine, in consultation with FWS, EPA, MDEP, and MDIFW monitor DO and aquatic invertebrate populations in the Gulf Island impoundment and in downstream areas affected by the operation of Gulf Island-Deer Rips. Interior states that Central Maine should, within three months after any license is issued for the project, file with the Commission a plan and implementation schedule for monitoring water quality in areas affected by operation of the project.

We agree with Interior's and TU *et al.*'s recommendations to monitor water quality, including DO and aquatic invertebrates, in the impoundment and downstream areas affected by the project. Water quality monitoring studies are particularly important in the lower Androscoggin River, and specifically at Gulf Island-Deer Rips, because water quality problems continue to preclude the full restoration of the river's fisheries and recreational resources.

Water quality monitoring studies at Gulf Island-Deer Rips would assess the adequacy of DO enhancement measures at the project throughout the term of the license. Specifically, the monitoring studies would provide an opportunity to evaluate the future need for additional enhancement measures in the project area.

Therefore, we recommend that Central Maine be required to prepare a water quality monitoring plan, which should include: (1) descriptions of all mechanisms and structures used; (2) the extent of Central Maine's involvement in the monitoring program; and (3) the methods for recording and maintaining data on water quality and providing it to the Commission and resource agencies. The plan should include a provision for using the existing GIPOP facility and associated DO monitoring program. A water quality monitoring plan should be required before any changes in project operation take place.

MERCURY/DIOXIN CONTAMINATION

EPA recommends that Central Maine evaluate the contribution that operating Gulf Island-Deer Rips has on the dioxin in this reach of the Androscoggin River. EPA further recommends that alternative operating regimes that may reduce the impact should be explored.

The Conservation Coalition made the following recommendations concerning contaminants in the Androscoggin River:

(1) The Commission should ensure that Central Maine's proposed fluctuation of impoundment water levels does not act to elevate levels of mercury in the aquatic biota. A

study plan should be developed, which analyzes the severity of the mercury problem in game fish and selected waterfowl/birds of prey, for the Gulf Island impoundment and downstream riverine reaches of the Androscoggin River. Specifically, the plan should: (a) determine the role that impoundment operations and the oxygenation project have on mercury mobility and bioaccumulation, (b) assess the human health risk, and (c) assess the risk to reproductive success of selected waterfowl/birds of prey from consumption of contaminated fish.

(2) Central Maine and its partners in the oxygenation project should be required to determine the extent to which bubbling may affect the circulation and resuspension of dioxin-laden sediments within the impoundment and tailwaters. Central Maine and its partners should also be required to determine the role impoundment drawdowns have in influencing the resuspension of dioxin-laden sediments.

(3) The license should include a re-opener to modify impoundment operation if the mercury and dioxin studies verify a contaminants problem, and that Central Maine should develop and implement a public fish consumption advisory if the studies indicate that the operation of the hydropower system is responsible, in part, for the contaminants problem.

The release of trace metals, and other toxic contaminants (i.e., dioxin), from sediments under anoxic (reducing) conditions is well documented, and may be a factor in what may be elevated levels of mercury and dioxin in the water samples and fish tissue.

- Mercury -

The construction of artificial impoundments, which release mercury from flooded soils, has contributed to an observed elevation of mercury levels in fish tissue taken from certain localities (Eisler, 1987). While evidence exists suggesting that elevated levels of mercury exists in newly-formed impoundments (Gilmour and Henry, 1991; Stokes and Wren, 1987), there is no evidence to suggest that long-established impoundments (about 66 years in the present case) contribute to increased mercury concentrations or increased production of methylmercury over background concentrations. Great Northern Paper, Inc. (GNP), at the request of the Commission, researched impoundment fluctuations at the Penobscot Mills Project (FERC Project No. 2458) on the Penobscot River, Maine and their effect on mercury concentrations in fish and invertebrates (FERC, 1994b). GNP reached the following conclusions:

(1) Concentrations of mercury in the study lakes with water level fluctuations were within the range of concentrations typically found in other Maine watersheds.

(2) Tissue concentrations in draw-down and reference impoundments were all below EPA criteria.

(3) Mercury concentrations were generally lower in forage and bottom feeding fish than in predatory fish, but the difference between the trophic classes was found not to be significant.

(4) The higher concentrations of mercury in lake trout do not indicate that periodic drawdowns in the impoundments promote accumulation.[15]

(5) Because tissue concentrations were similar in forage and bottom-feeding fish from drawdown and control impoundments, the data do not support the conclusion that existing project operations enhance movement of mercury through the food chain.

In analyzing the data from GNP's study, Dr. Terry Haines (Station Leader, FWS National Fisheries Contaminant Research Center, University of Maine), in a letter dated December 30, 1992, concluded that, based on a normalized distribution of data, lake trout and rainbow smelt from the project lakes (those with impoundment fluctuations) had statiscally more significant levels of mercury than fish taken from control lakes (those without impoundment fluctuations). Mercury levels in whitefish, sucker, and chain pickerel did not exhibit significantly different concentrations.

These findings appear to indicate that differences between trophic classes may exist, which could be indicative of physiological and biological characteristics of the species. For example, rainbow smelt, which is a migratory species, consume a variety of food organisms. Rainbow smelt, in turn, are a key forage species of the lake trout; lake trout, a top predator, contains a considerable amount of fatty tissue, which is the primary repository for accumulated mercury. Bio-accumulation of mercury through the food chain, then, beginning with ambient levels in the water, may be the most likely factor contributing to the mercury levels exhibited by these two species, particularly the elevated levels in the lake trout.

Given that there were no differences in the mercury concentrations in the tissues of bottom feeding fish species and other top predators, there is little evidence suggesting that fluctuating impoundment elevations cause the elevated levels in lake trout, and to a lesser extent rainbow smelt. Thus, the role that impoundment fluctuations play in the bio-accumulation of mercury in these two species remains unclear.

In 1984, Boise Cascade and International Paper commissioned a study to determine the state of contamination of fish taken from the Gulf Island impoundment (Slocomb *et al.*, 1985). The study showed that Androscoggin River wholebody fish tissue levels for several organic compounds (i.e., chlorinated pesticides, PCBs, and organophosphorus pesticides) are generally at or below the expected body burdens. Further, the wholebody tissue levels of various heavy metals (i.e., lead, copper, zinc, silver, chromium, nickel, arsenic, mercury, beryllium, selenium, and cadmium) generally fall within or below the national range of metal

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[15] GNP maintains that because lake trout are long lived and on the top of the food chain, they accumulate mercury naturally.

concentrations.[16]

The mean mercury concentration for all species was 0.8195 μg/g dry weight, and ranged from 0.16 μg/g to 2.1 μg/g. Location-specific mercury levels did not appear to be significantly different, suggesting the widespread presence of mercury in the Gulf Island impoundment. Mercury levels in fish in excess of 1.1 μg/g fresh-weight are considered to be presumptive evidence of an environmental mercury problem (FERC, 1994c). In comparison, the mercury concentrations in blackbass taken from the Gulf Island impoundment ranged from 0.29 μg/g to 1.55 μg/g for individual fish. The study does not draw any conclusions relative to impacts on fish resources in the Gulf Island impoundment or the lower Androscoggin River.

As reported in FERC (1994c), studies have quantified background mercury concentrations in uncontaminated natural waters ranging from about 0.001 μg/g to 0.05 μg/g. Slocomb *et al.* (1985) reported mercury concentrations of <0.20 μg/g in water samples taken from particular areas on the Androscoggin River (RM 134.0 to RM 27.4). We note, however, that the Androscoggin River's mercury concentrations do not necessarily suggest that mercury is a serious problem in the Gulf Island impoundment; sample concentrations for mercury were below its detection limit (0.2 μg/g) in the present study. More sensitive analyses would need to be done to reach a more definitive conclusion. We also note that the most recent mercury criteria proposed by the EPA for the protection of freshwater aquatic life is a water concentration of 0.012 μg/g, with an hourly average not to exceed 2.4 μg/g.

The effects of mercury contamination on terrestrial resources (i.e., birds and mammals) and the merits of including such species in a mercury monitoring plan is discussed in Section 4.2.1.3.

- Dioxin -

Dioxin is presumed to be present in the industrial discharge from paper mills that use the bleached kraft process for manufacturing paper (MDEP, 1990), and has been documented to exist in the Androscoggin River (Mower, 1995).

Hydroelectric development does not produce or otherwise discharge dioxin to the environment. This substance can result from discharges of municipal and industrial effluent and nonpoint sources such as spills, runoff, and landfill leachates. Like mercury, dioxin tends to attach to, or is otherwise associated with, solids in the aquatic environment. Solids tend to settle in impoundments, which leads to dioxin becoming trapped behind dams and accumulating in the sediments. Consequently, operation of Gulf Island-Deer Rips could affect concentrations of dioxin, and other toxics, in the water column, sediments, and fish through accumulation, scour, and resuspension of sediments and potential increased

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[16] The Androscoggin River from Berlin, New Hampshire, to Brunswick, Maine is significantly developed, with numerous point sources of contamination, including landfills, and industrial and municipal discharges.

bioavailability because of water level fluctuations.

The proposed relicensing of the project also could adversely affect dioxin concentrations in the lower Androscoggin River through cumulative impacts. The resuspended contaminants could be carried to downstream areas in greater concentrations than previously experienced.

We believe that it is not possible to fully evaluate the impact of impoundment operations on dioxin in fish and other aquatic and terrestrial resources. However, we can draw some general conclusions regarding potential impacts that may occur due to the continued operation of Gulf Island-Deer Rips. First, the continued existence of dams on the Androscoggin River, including the Gulf Island dam (even in the absence of hydropower operation), would continue to trap sediments and potentially concentrate dioxin, among other pollutants, in the sediments. Cumulative impacts would result in conjunction with continued inputs of dioxin from the upstream paper companies, in that for the present and foreseeable future the dams would continue to trap sediments. Given the contamination levels in the river (and without knowledge of what the system would be like if the sediment-bound dioxin was permitted to move freely downriver), we believe that continued operation of the generation facilities at Gulf Island-Deer Rips would probably be the best available option, and that continued sequestering of dioxin in the sediments would likely be preferable to flushing them downriver.

Second, Maine uses guidelines to evaluate safe levels of toxic substances in fish that may be consumed by the public. Further, the State of Maine is currently involved in a dioxin monitoring program to determine the level of dioxin contamination in the waters and fisheries of the State [*see Mower (1995) for the most recent data*]. Fish consumption advisories for such substances as dioxin may be posted in the future, and/or already exist, for specific areas within the river basin because of the accumulation of dioxin in fish tissue.

EPA and the Conservation Coalition suggest that increased resuspension of sediment, coupled with methylated mercury during drawdowns could mobilize mercury into the food chain. They also feel that resuspension of sediment could release dioxin trapped in the sediments. As cited in Section 3.3.1.2., Central Maine's measurements of total suspended solids, or turbidity, revealed that turbidity was not higher in the Gulf Island impoundment than in upstream reaches of the river. Therefore, the existing data does not support the theory that resuspension of sediment is mobilizing methylated mercury and/or dioxin in the Gulf Island impoundment. The levels present in the Gulf Island impoundment are probably the result of long-term pollutant input from industrialization throughout the basin, with a minor increase in mercury caused by natural processes.

We agree that the Gulf Island dam traps sediments, and that these sediments may harbor elevated levels of certain contaminants. However, we agree with Central Maine, in that neither the dam nor Central Maine is responsible for producing the contaminants in question. The minimal fluctuations, which occur along the relatively steep banks and expose

minimal shoreline area, would likely not resuspend or contribute significantly to any additional mercury methylation; we would expect minimal sedimentation to occur in these areas. The exception to the minimal dewatering would be in isolated areas where extensive wetlands exists. Trace metals bound in sediment at present, or transported downstream in the future, would continue to be present in the basin. The operation of Gulf Island-Deer Rips would not have an effect on the presence of these metals. However, the Gulf Island dam, because it traps sediment laden with contaminants, may have a cumulative beneficial effect on water quality downstream of the project.

The Conservation Coalition's recommendation that Central Maine study the effects that the oxygen injection program has on dioxin and mercury concentrations in the Gulf Island impoundment has some merit. Central Maine, however, objects to the suggestion that the existence and availability of mercury and dioxin in the Gulf Island impoundment is a problem which belongs to Central Maine. Central Maine states that "if sediments are clean (i.e., free from toxics or high concentrations of nutrients and/or organic matter), the accumulation of sediments alone does not constitute a water quality problem."

We agree with Central Maine's reasoning, and believe that Central Maine should not be solely responsible for such studies. The two most likely sources of mercury and dioxin in the Gulf Island impoundment are industry and natural processes (i.e., weathering and atmospheric inputs). Both of these sources have been, and continue to be, beyond the control of Central Maine. Central Maine's role relative to water quality problems in the Androscoggin River is limited to the existence of the Gulf Island impoundment. If not for the existence of the Gulf Island dam, sediment accumulation and the deposition of dioxin and mercury would simply occur at some downstream location or ultimately in Merrymeeting Bay. This could have significant adverse effects on downstream riverine and estuarine resources, including the federally endangered shortnose sturgeon.

Because GIPOP is a partnership, which includes Central Maine and three paper companies, it would seem logical that the same partnership should be responsible for investigating the role that oxygen injection has on resuspension of toxic-laden sediments in the Gulf Island impoundment. As an alternative to EPA and the Conservation Coalition recommending that Central Maine be required to study mercury and dioxin in the Gulf Island impoundment, we encourage Central Maine, the three paper companies, MDEP, and other interested parties to cooperatively pursue discussions regarding appropriate measures each entity should take to evaluate the effects that the oxygen injection program may have on the levels of mercury and dioxin that exist in the Gulf Island impoundment.

Based on the evidence in the record, including our independent review of pertinent literature, we cannot find any definitive link between impoundment fluctuations, variable flow regimes associated with hydropower operations, or operation of the GIPOP facility and increased bioavailability of mercury and/or dioxin. If, however, through any future studies, a link is discovered, operation of Gulf Island-Deer Rips could cause localized and cumulative effects on the downstream riverine system. Therefore, a cumulative effects article,

specifically designed to address the contaminants issue in the future, is warranted. The need for mercury/dioxin studies is discussed further in Section 5.4., as the recommendation would involve substantial costs.

OPERATIONAL AND FLOW MONITORING

Interior recommends that Central Maine develop and implement a plan for monitoring instream flows, impoundment water levels, and seasonal run-of-river operation at Gulf Island-Deer Rips. Additionally, Interior recommends this plan be developed in consultation with the agencies, including FWS, USGS, MDEP, MDIFW, MDMR, ASRSC, and NMFS.

We agree. A plan for describing the methods for releasing minimum flows and operating the project, and how flows would be maintained below the project when the impoundment is refilled after generation drawdowns, or after any maintenance and/or repairs, would provide necessary information for the resource agencies and the Commission.

We recommend that Central Maine should prepare an operations and monitoring plan, which should include: (1) descriptions of all mechanisms and structures that would be used; (2) the level of manned or automatic facility operation; and (3) the methods for recording and maintaining data on project operations and providing it to the Commission and resource agencies. The plan should be required before any changes in project operation take place.

4.2.1.2. Fisheries resources

FISHERIES RESOURCES SUMMARY

Interior's and the NGOs' recommended minimum flows and project operation would provide moderate to significant enhancements to the existing and anticipated fisheries both in the immediate Gulf Island-Deer Rips area and in the Androscoggin River downstream of the project.[17] A significantly improved zone of passage would be provided below Lewiston Falls during the peak migration periods for migrating alewives, Atlantic salmon, and American shad with the implementation of either run-of-river operation or higher minimum flows than Central Maine's proposed 1,100 cfs. However, the habitat duration for adult and juvenile Atlantic salmon during the late-spring/early-summer may be adversely affected with implementation of a minimum flow above 1,100 cfs. The same may be true of habitat conditions for in-migrating American shad and larval/juvenile shad.

As for the resident fishery, Interior's and the NGOs' recommended minimum flows would provide significantly enhanced fisheries habitat for a seasonal, or year-round, brown

[17] Based on our analysis of the IFIM study results and habitat duration analysis, we believe the quantity of habitat would not vary significantly among flows analyzed. However, with a few exceptions (i.e., adult Atlantic salmon and various lifestages of American shad), the amount of time the enhanced habitat is available would be significantly improved at higher flows.

trout fishery and increased recreational angler opportunities. Interior's recommended flow of 1,700 cfs (July 1 - April 30) would probably provide the greatest overall benefits to the fishery. The improved habitat conditions would be particularly evident during extreme, low-flow, river conditions. While providing significantly improved habitat conditions for brown trout, flows of 1,400 cfs or 1,700 cfs would not severely affect habitat conditions for smallmouth bass below Gulf Island-Deer Rips.

The staff looked at two additional minimum flow options, which included seasonal minimum flows (i.e., 1,700 cfs and either 1,100 cfs or 1,400 cfs) rather than a single year-round flow regime. The 1,700 cfs minimum flow during the summer and fall periods, with few exceptions, would result in moderately to significantly improved habitat conditions in the lower Androscoggin River, particularly for adult brown trout. Also, a flow of this magnitude would generally meet the needs of improving habitat conditions for anadromous fish, but may adversely effect the habitat availability for certain species and lifestages of anadromous fish. During the winter/early-spring periods, we would not expect flows of either 1,100 cfs or 1,400 cfs to seriously jeopardize the fish resources.

Relative to the federally-listed endangered shortnose sturgeon, we expect Interior's and the NGOs' recommended project operations and minimum flows to have little, if any effect on the population in the estuary below Brunswick. However, higher minimum flows above Central Maine's proposed 1,100 cfs flow, or run-of-river operation would result in changes to the freshwater/saltwater mixing zone in, and in the input of freshwater organisms/nutrients to, the tidal portion of the river.

Interior's and the NGOs' recommended restriction on impoundment fluctuations from May 1 to June 30 would provide similar benefits to Central Maine's proposed restriction on impoundment fluctuations, but would provide additional protection to blackbass nursery habitat primarily because it would protect the nursery habitat for an additional two weeks. Further, limiting drawdowns from July to April probably would not result in any significant benefits to Gulf Island's blackbass fishery because blackbass are mobile and can re-occupy aquatic habitat temporarily dewatered during the weekly drawdown.

Overall, agencies' management objectives for the lower Androscoggin River in the project area and downstream river reaches would be enhanced. Increased flows in the spring and summer would fully accomplish the agencies' objective of managing the lower portion of the river below Lewiston Falls for anadromous fish. The agencies' objective of providing optimum and diverse uses of resident fishes, including recreational utilization would be moderately to significantly enhanced with implementation of a higher minimum flow in the lower Androscoggin River and restriction of impoundment fluctuations in the late-spring and early-summer. Finally, increased minimum flows would further enable the agencies to achieve their habitat objectives and sustained production objectives for all fish species.

The following is a detailed discussion of the fishery impacts, and how we reached our conclusions described above.

PROJECT OPERATION AND DOWNSTREAM MINIMUM FLOWS

Interior's and the three coalition group's (the Conservation Coalition, TU *et al.*, and Land Trust *et al.*) recommended project operation and minimum flow scenarios (*see Table 2-3*) would affect the availability of fisheries habitat in the lower Androscoggin River below Gulf Island-Deer Rips. For purposes of this discussion, three alternative flows were considered, including 1,400 cfs[18], 1,700 cfs, and 1,800 cfs. To analyze the effects of these flows, we utilized the results of the IFIM studies discussed in Section 4.1.1.3. A more detailed description of the three study reaches evaluated in the IFIM study can be found in Sections 3.3.1.3. and 4.1.1.3.

Deer Rips IFIM Results

Smallmouth bass - Juvenile and adult smallmouth bass habitat was nearly maximized at the three flows analyzed; 98 percent to 99 percent of the peak WUA (*see Figure 4-1*). For spawning and the early life-history stages, the IFIM studies indicated that habitat availability varied widely among flows and study reaches; the amount of peak WUA available declined with increasing flow, and was 96 percent (1,400 cfs), 88 percent (1,700 cfs), and 83 percent (1,800 cfs).

Brown trout - Juvenile brown trout habitat ranged from 77 percent to 91 percent of the peak WUA at flows of 1,400 cfs and 1,800 cfs, respectively (*see Figure 4-2*). The amount of habitat available at 1,700 cfs was 88 percent of the peak WUA. The availability of adult brown trout habitat, relative to peak WUA in the reach, was 88 percent at 1,400 cfs, 94 percent at 1,700 cfs, and 96 percent at 1,800 cfs.

Atlantic salmon - Habitat in the Deer Rips reach was excellent for juveniles and fair to good for adults. Under a 1,400 cfs flow, salmon habitat varied from 95 percent of the peak WUA for juveniles to 63 percent of peak WUA for adults (*see Figure 4-3*). Under a flow of 1,700 cfs, the amount of habitat available to juveniles and adults was about 99 percent and 68 percent of peak WUA, respectively. A flow of 1,800 cfs maximizes juvenile habitat, while providing 70 percent of the peak WUA for adult salmon.

Dresser's Rips IFIM Results

Smallmouth bass - Smallmouth habitat generally declined with increasing flows above 575 cfs (*see Figure 4-4*). For juvenile smallmouth bass, the amount of habitat available, below the peak WUA, was 69 percent, 62 percent, and 60 percent for 1,400 cfs, 1,700 cfs, and 1,800 cfs, respectively. For adult bass, the percent of peak WUA available was lower than juvenile habitat availability at comparable flows; 51 percent (1,400 cfs), 44 percent (1,700 cfs), and 41 percent (1,800 cfs). For spawning and the early developmental

[18] Land Trust *et al.* recommended a flow of 1,430 cfs. Because 1,430 cfs provides only two percent more flow than 1,400 cfs, we did not see the need to analyze it separately.

stages, habitat, albeit very low, does not change with flows between 1,400 cfs and 1,800 cfs; 15 percent of the peak WUA.

Brown trout - Brown trout habitat was consistently excellent across the three flows analyzed (*see Figure 4-5*). For juvenile trout, 95 percent and 100 percent of the peak WUA is available under flows of 1,400 cfs and 1,800 cfs, respectively. For adult trout, the amount of habitat available declines slightly from 98 percent of peak WUA at 1,400 cfs to 93 percent of the peak WUA at 1,800 cfs. With 1,700 cfs, the amount of habitat available to juvenile and adult trout was 99 percent and 94 percent of the peak WUA, respectively.

Atlantic salmon - Habitat was good to excellent. At a flow of 1,400 cfs, 97 percent and 80 percent of the peak WUA was available to juvenile and adult salmon, respectively (*see Figure 4-6*). Flows of 1,700 cfs and 1,800 cfs provide comparable results; 92 percent and 91 percent of the peak WUA for juveniles, respectively and 85 percent and 87 percent of the peak WUA for adults, respectively.

American shad - Available habitat at 1,400 cfs ranged from 53 percent of the peak WUA for spawning to 86 percent of the peak WUA for juveniles (*see Figure 4-7*). For migrating shad, between 62 percent and 65 percent of the peak habitat was available. With a flow of 1,700 cfs, the amount of habitat available to the various life stages of shad increases from 62 percent of the peak habitat for spawning to 89 percent of the peak habitat for juveniles. In-migrating and out-migrating shad would have 68 percent to 70 percent of the peak habitat available. Slight improvements in habitat conditions would occur over conditions at 1,700 cfs, with a flow of 1,800 cfs.

Run Reach IFIM Results

The flows being recommended generally provide from 23 percent of the peak habitat to 34 percent of the peak habitat for American shad, with the higher flows of 1,700 cfs and 1,800 cfs providing slightly better habitat conditions for all lifestages than the 1,400 cfs flow (*see Figure 4-8*). Further, about 30 percent of the peak habitat would be available to in-migrating and out-migrating shad with the recommended flows.

Total WUA and Habitat Duration Analysis

For the Deer Rips and Dresser's Rips areas together, juvenile and adult smallmouth bass habitat is nearly maximized within the two reaches at flows between 1,400 cfs and 1,800 cfs (*see Figures 4-9 and 4-10*). The amount of habitat available to both lifestages ranged from 95 percent (1,800 cfs) to 99 percent (1,400 cfs) of the maximum habitat in the two reaches. Slightly more habitat, as a percent of maximum, is available to adult bass at the higher flows than is available to juvenile bass at the same flow.

Overall, 97 percent to 99 percent of adult brown trout habitat was available relative to the peak habitat under 1,400 cfs and 1,800 cfs, respectively (*see Figure 4-12*). For juvenile

brown trout, the effect of a 1,400 cfs flow, a 1,700 cfs flow, and an 1,800 cfs flow on the two reaches results in a composite habitat curve showing that 83 percent, 92 percent, and 95 percent of the peak habitat is available at the respective individual flows (*see Figure 4-11*).

The composite results for Atlantic salmon show that the amount of habitat available for juvenile salmon was the same across the flows analyzed; 99 percent of the peak habitat (*see Figure 4-13*). For adult salmon, overall habitat availability was good, with 69 percent, 74 percent, and 76 percent of peak habitat available at 1,400 cfs, 1,700 cfs, and 1,800 cfs, respectively (*see Figure 4-14*).

The IFIM results clearly suggests that moderate enhancements over the existing conditions would occur with the implementation of a 1,400 cfs, 1,700 cfs, or 1,800 cfs minimum flow. While this may be the case, Interior (CASE 4), the Conservation Coalition (CASES 5-6), and TU *et al.* (CASES 7-8) recommend either seasonal (May 1 - June 30) or year-round run-of-river operations. Interior states, with concurrence by the Conservation Coalition and TU *et al.*, that run-of-river operation would improve spawning conditions for American shad and river herring in the lower Androscoggin River and would enhance attraction to fishways located at hydropower projects downstream of Gulf Island-Deer Rips.

Central Maine's habitat duration analyses (*which are discussed more thoroughly in Section 4.1.1.3.*) indicate that Interior's, the Conservation Coalition's 1,800-cfs, and TU *et al.*'s flow recommendations would generally result in improved habitat duration compared to the existing project operation, Central Maine's proposed operation, and/or the Conservation Coalition's 1,400-cfs and Land Trust *et al.*'s recommended minimum flows.

The habitat duration results for Deer Rips and Dresser's Rips show that in a typical May no change in the existing habitat exceedence curves for adult brown trout would be expected under any of the flow alternatives analyzed, including run-of-river (Table 4-5) (Central Maine, 1992b). The effects of 1,400 cfs, 1,700 cfs, and 1,800 cfs would vary seasonally, however, during all other periods of the year.[19]

Using August as a typical summer month, adult trout habitat duration under median flow conditions would remain generally the same under flows ranging from 1,100 cfs to 1,700 cfs, and very likely up to 1,800 cfs. Habitat duration under run-of-river operation would not be significantly improved over the habitat conditions that would exist with minimum flows above 1,100 cfs. Under extreme flow conditions, 1,400 cfs and 1,700 cfs would result in enhancements over the existing and proposed habitat duration. While significant improvements in habitat duration would likely occur in the Deer Rips reach, habitat duration in the Dresser's Rips reach would be only marginally improved.

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[19] Central Maine (1992b) provides habitat duration results for 1,000 cfs, 1,100 cfs, 1,430 cfs, 1,600 cfs, and run-of-river operation. In doing our analysis, we assumed that habitat duration results for 1,400 cfs and 1,700 cfs would be similar to the results for 1,430 cfs and 1,600 cfs, respectively.

Table 4-5. Percent of peak weighted useable area for study reaches under median and extreme conditions with alternative flows/operations (Source: Central Maine, 1992b).

Study Reach / Species/Month	1,100 cfs 50%	1,100 cfs 90%	1,400 cfs 50%	1,400 cfs 90%	1,600 cfs[7] 50%	1,600 cfs[7] 90%	Run-of-River 50%	Run-of-River 90%
Deer Rips								
Brown trout[1]								
May	56	56	56	56	56	56	56	56
August	96	79	96	90	96	94	100	98
October	79	79	90	90	94	92	100	96
January	79	79	90	90	94	94	98	96
Dresser's Rips								
Brown trout[1]								
May	26	26	26	26	26	26	26	26
August	68	50	71	53	71	53	71	62
October	100	50	79	53	79	53	82	62
January	100	50	91	62	91	65	82	79
Atlantic salmon[2]								
June	100	87	97	82	97	82	97	82
August	97	74	97	87	97	87	97	95
Atlantic salmon[3]								
June	31	22	25	19	25	19	25	19
August	56	36	58	39	58	39	61	50
Run Reach								
American shad[4]								
June	84	73	67	56	67	56	67	54
American shad[5]								
June	71	62	78	62	78	63	78	60
American shad[6]								
August	62	23	59	33	59	34	55	48

[1] adult [2] adult [3] juvenile [4] in-migrating
[5] spawning [6] juvenile

[7] We note that Central Maine's habitat duration analysis included 1,600 cfs. We analyzed 1,700 cfs in this FEIS, which would have habitat duration results between 1,600 cfs and run-of-river.

At Deer Rips, habitat duration results for October, a typical fall month, indicate that adult trout habitat duration under median and extreme flow conditions increased from 79 percent to 90 percent with a flow of 1,400 cfs versus Central Maine's flow of 1,100 cfs (Table 4-5). Habitat duration marginally improved with Interior's seasonal 1,700 cfs flow, from 90 percent to 94 percent. At Dresser's Rips, adult trout habitat under median flow conditions declined considerably from 100 percent at 1,100 cfs to 79 percent at 1,400 cfs and 1,700 cfs. However, under extreme habitat conditions, habitat duration would be slightly

higher at 1,400 and 1,700 cfs (53 percent) than it would be at 1,100 cfs (50 percent).

With January as a typical winter month, a 1,400 cfs flow under both median and extreme riverflow conditions would significantly improve habitat duration at Deer Rips over that which would exist with Central Maine's 1,100 cfs flow (Table 4-5). With flows above 1,400 cfs (i.e., Interior's 1,700 cfs flow and run-of-river), minimal improvements in habitat duration would occur. In the Dresser's Rips reach, habitat duration for adult trout, under median flow conditions, would decline by nine percent at flows of 1,400 cfs and 1,700 cfs compared to 1,100 cfs, with an additional loss of nine percent with run-of-river operation. Under extreme flow conditions, habitat duration for adult trout would increase moderately between 1,100 cfs and 1,400 cfs, with a minimum additional increase at 1,700 cfs, and ultimately another moderate increase with run-of-river operation.

We conclude that with the implementation of an adequate minimum flow during the summer, fall, and winter months there would likely be no significant effects to resident fish or trout habitat below Gulf Island-Deer Rips. However, migrating fish habitat could be affected by significantly altered flows resulting from peaking operation.

In June, juvenile and adult Atlantic salmon habitat duration in the Dresser's Rips reach declines with flows above Central Maine's 1,100-cfs flow, while in August, salmon habitat duration would increase at flows above 1,100 cfs (Table 4-5). For American shad in the Run-Reach, habitat duration in June and August varies among life stages, and is dependent on flow conditions in the river. For example, under median flow conditions, habitat duration for in-migrating shad and juvenile shad would decline at flows above 1,100 cfs, but would increase for spawning shad. Under extreme river-flow conditions, habitat duration declines for in-migrating shad, remains unchanged for spawning shad, and increases for juvenile shad.

Anadromous fish habitat in the lower Androscoggin River during the fall period (September, October, November) would be fair to good, depending upon flow conditions in the river and the minimum flow.

In addition to habitat conditions, use of the lower reaches of the river as a migration corridor may also be affected by the operation of Gulf Island-Deer Rips. Research has described the general migrational features of anadromous fish (i.e., distribution, routes, and timing); however the underlying mechanisms affecting migrations are not well understood (Quinn and Leggett, 1987). River discharge and the tidal, coastal, and oceanic currents are widely considered the primary mechanisms for passive movement in fish. Additionally, environmental conditions in freshwater, particularly river flow and temperature, tend to be more variable than oceanic conditions. Migrations to freshwater and estuarine sites, then, are likely to be more precisely timed and directed than migrations to oceanic regions. To support this conclusion, there is some scientific evidence to suggest that river discharge is an

important behavioral cue to migration (Dadswell *et al.*, 1987; Banks, 1969).[20]

We agree with Interior that flows from Gulf Island-Deer Rips establish, to a large extent, habitat conditions and also, to some extent, upstream migration corridors in the lower Androscoggin River and estuary. Therefore, during the summer and early-fall periods, run-of-river operation generally may have the most beneficial effect on the lower Androscoggin River's fisheries. However, implementation of a minimum flow above Central Maine's 1,100 cfs, would have similar beneficial effects.

The staff's minimum flow options would require a minimum flow of 1,700 cfs from May 1 through November 30 and either 1,100 cfs (CASE 10) or 1,400 cfs (CASE 11) from December 1 through April 30. The quality and quantity of habitat provided by these flows would be the same as previously discussed. However, unlike the above alternatives, both staff alternatives would require seasonal minimum flows that would satisfy the various species/lifestage's biological needs.

The 1,700 cfs minimum flow during the summer and fall periods would, with few exceptions, result in moderate to significant improvements to habitat in the lower Androscoggin River, particularly for adult brown trout. This flow would also improve conditions for anadromous fish and may enhance fish attraction to fishways located downstream of Gulf Island-Deer Rips. The 1,700 cfs flow would also improve fish passage routes in the river and may enhance attraction to the river during the migration periods.

The biological needs of fish are generally much lower during the winter and early-spring periods when biological activity is reduced. During these periods, a flow of 1,100 cfs provides good habitat conditions for adult brown trout in the river, but would provide little, if any, additional benefits over what is provided with the existing flow of 1,000 cfs. A flow of 1,400 cfs would provide moderate to excellent habitat conditions for adult brown trout, and would result in additional benefits to trout habitat compared to habitat conditions under existing conditions. On the basis of Central Maine's IFIM study results and habitat duration analysis, we would expect flows above 1,400 cfs (i.e., 1,700 cfs and run-of-river) to provide moderate to significant additional benefits to habitat conditions, and the corresponding fishery, in the lower Androscoggin River when compared to conditions that exist at the present time.

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[20] Dadswell *et al.* (1987) concluded that once an individual fish, in this case American shad, is committed to a specific tidal basin, its migration is under strong behavioral constraints, probably controlled by residual current direction and coastline. It's not unlikely that a given river's discharge may determine, to some degree, current direction. Banks (1969) found that reductions in flow from a power station are accompanied by a downstream retreat of migrating salmon, in this case coho and sockeye, and that a sudden reduction in flow could lead to fish stranding.

Fishery Management Objectives and Flows

Based on our analysis, the agencies' management objectives would be enhanced by the implementation of Central Maine's proposal, Interior's and the NGOs' recommended flows, or staff's alternatives. In analyzing the total effects of the flows, we look at how the various flow alternatives would affect the agencies' management objectives.

Given the current status of the anadromous fish restoration program for the lower Androscoggin River, we believe that flows for anadromous fish should be considered, to some extent, in developing a flow regime. Central Maine's proposal would generally meet habitat requirements for Atlantic salmon and American shad in the lower portion of the river. Run-of-river operation or a higher minimum flow during the summer and fall periods would substantially enhance the agencies' objectives of managing the stretch of river below Gulf Island-Deer Rips for anadromous fish.

The agencies' objective of providing optimum and diverse uses of resident fishes would be enhanced. IFIM results show that any implementation of a minimum flow from Gulf Island-Deer Rips would enhance the existing fish habitat, and consequently the sport fishery, below Deer Rips/Androscoggin No. 3 and Lewiston Falls.

For American shad, upstream migration through the Gulf Island-Deer Rips area is not a management concern. However, adequate flows for upstream and downstream migration, spawning, and rearing would be necessary. MDMR (1982) indicates that spawning occurs from May to July, while juvenile American shad migrate downstream from July to December.

Downstream minimum flows during the in-migration period would likely not be a concern, as spring is a high-flow period. During much of the shad/alewife migration period (*typically May and early June in the Androscoggin River when the majority of the migration occurs*), river flow would exceed Gulf Island-Deer Rips's proposed generating capacity about 75 percent of the time in May and about 27 percent of the time in June. Seasonal flows during the spring period, then, would generally exceed any minimum flow requirement for the project, including Interior's proposed and staff's recommended 1,700-cfs flow. Therefore, we believe a downstream minimum flow during the spring migration period is a minor concern, and would likely do little to improve conditions for in-migrating shad and alewife, particularly during the early spring.

American shad habitat in the Run-Reach is generally limited to spawning and nursery habitat. Given the availability of more suitable, deeper spawning and nursery habitat areas downstream of the Run-Reach, Central Maine concluded that optimization of shad spawning and nursery habitat should not be a major concern in determining an appropriate minimum flow for Gulf Island-Deer Rips.

We agree that optimizing American shad spawning and nursery habitat is probably not warranted. Flows in excess of 4,000 cfs to 5,000 cfs would be required to maximize, or nearly maximize, habitat for shad in the Run-Reach. Flows of this magnitude would be virtually impossible to maintain, and generally would only be available during the winter and spring months (*see Section 3.2.1.*). Shad are capable of utilizing a wide range of depths and velocities during their migration, spawning, and incubation lifestages (Stetson-Harza, 1988). Therefore, shad habitat would be adequately protected by maintaining bank-to-bank flow in the Run-Reach, which could be accomplished with Central Maine's proposed 1,100 cfs minimum flow

Atlantic salmon habitat in the Dresser's Rips reach is considered priority habitat, which should be considered in determining an appropriate minimum flow regime for the lower Androscoggin River.

As of 1989, Atlantic salmon had access to 3,800 units of suitable habitat[21] in the lower Androscoggin River (FWS, 1989), which is about seven percent of the total available salmon spawning habitat in the entire Androscoggin River Basin. We estimate that Central Maine's proposed minimum flow of 1,100 cfs would be expected to provide 319 units of juvenile salmon habitat and 249 units of adult salmon habitat in the Dresser's Rips reach. In comparison, Interior's recommended flow of 1,700 cfs would be expected to provide 295 units of juvenile habitat and 298 units of adult habitat in the Dresser's Rips reach. A 1,400-cfs minimum flow would be expected to provide 309 units and 281 units of habitat for juvenile and adult salmon, respectively.

On balance, we conclude that Interior's recommended flow would provide the greatest overall benefits to Atlantic salmon habitat in the lower Androscoggin River. For example, in the Deer Rips and Dresser's Rips reaches Interior's flow of 1,700 cfs would provide nearly 100 percent of the maximum juvenile habitat (*see Figure 4-13*) and about 75 percent of the maximum adult salmon habitat (*see Figure 4-14*) in the two reaches. In comparison, 1,100 cfs and 1,400 cfs would provide the same amount of juvenile salmon habitat, but slightly reduce the amount of adult salmon habitat.

While we may agree with Interior, with respect to the benefits of a higher minimum flow for Atlantic salmon, we also recognize that a year-round flow (*from July 1 - April 30*) is probably not warranted. Atlantic salmon would be resident in the lower Androscoggin River for a portion of the year, mainly during the late summer and fall. Hence, the staff looked at the potential for providing seasonal flows in the lower Androscoggin River.

Smallmouth bass is not an agency management priority for the Deer Rips and/or Dresser's Rips reaches (Central Maine, 1991). We agree that the habitat requirements for smallmouth bass should not be given significant weight in determining an appropriate

[21] 1 Unit = 100 square yards.

minimum flow for Gulf Island-Deer Rips. Overall, juvenile and adult smallmouth bass habitat in the Deer Rips and Dresser's Rips reaches is nearly maximized with any flow between Central Maine's proposed 1,100 cfs flow (99 percent of maximum) and Interior's recommended 1,700 cfs flow (96/97 percent of maximum) (*see Figures 4-9 and 4-10*).

In the Deer Rips and Dresser's Rips reaches, MDIFW's focus for management is developing a viable brown trout fishery. As shown in Table 3-1, MDIFW has annually stocked the lower Androscoggin River below Gulf Island-Deer Rips with yearling to sub-adult brown trout since 1983. The lower Androscoggin River below Gulf Island-Deer Rips most likely contains suitable habitat for brown trout throughout its length. However, the extent of this habitat, outside the study reaches, is unknown.

Based on Central Maine's IFIM study, there is about 166,400 ft^2 of juvenile habitat and 793,200 ft^2 of adult habitat available in the Deer Rips and Dresser's Rips reaches combined (under WUA maximizing flow conditions for both reaches) (*see Figures 4-11 and 4-12*). While we believe this is a considerable amount of habitat for trout in the lower portion of the river, we have no quantitative basis for comparing habitat in these two reaches to suitable habitat in other reaches below the project. Nevertheless, we agree that brown trout habitat should be an important consideration in determining an appropriate minimum flow for Gulf Island-Deer Rips. Personal observations made during the May 1994 sites visits suggest that there are a number of river segments which may contain suitable year-round or seasonal habitat for brown trout.

Raleigh *et al.* (1986) characterizes optimal brown trout habitat as: (1) clear, cool to cold water, with a relatively silt-free rocky substrate in riffle-run areas; (2) riffle-run habitat combination with areas of slow, deep water (varying from a 30-50 percent to a 50-70 percent relationship); (3) well vegetated, stable stream banks; (4) abundant instream cover; and (5) relatively stable annual water flow and temperature regimes. Brown trout tend to occupy the lower reaches of low to moderate gradient areas (less than one percent) in suitable, high gradient rivers. In winter, salmonids occupy different habitat areas than in the summer; brown trout show a strong hiding or cover response, utilizing deep, low-velocity water.

Based on the transect profiles for the Deer Rips and Dresser's Rips reaches, suitable habitat exists for year-round brown trout survival, particularly in the Dresser's Rips reach. The Deer Rips reach, while containing a considerable amount of brown trout habitat, is somewhat limited where overwintering habitat is concerned; the Deer Rips reach is generally very broad and shallow, with a predominant boulder/ledge substrate. However, a limited number of pools do exist, which we would expect overwintering brown trout to utilize.

The quantity of habitat for juvenile trout in the two study reaches would be considerably improved with Interior's 1,700-cfs minimum flow (*see Figure 4-11*). Central Maine's 1,100-cfs minimum flow would provide minor benefits to juvenile habitat, while the 1,400 cfs flow recommended by the Conservation Coalition and Land Trust *et al.* would provide relatively modest improvements in juvenile habitat. For adult trout, the amount of

habitat in the two study reaches would remain relatively constant over the flows analyzed in this FEIS (*see Figure 4-12*).

For both brown trout and Atlantic salmon, higher river flows generally result in an increase in the quantity of habitat in the river. However, there is little difference in the quantity of habitat provided by Central Maine's 1,100 cfs, Interior's and TU *et al.'s* 1,700 cfs, and the Conservation Coalition's and Land Trust *et al.'s* 1,400 cfs to 1,800 cfs minimum flows (*see Section 4.1.1.3. for the discussion relative to 1,100 cfs*). Table 4-5 does suggest, though, that minimum flows above 1,400 cfs generally would enhance habitat duration, relative to habitat duration over what would be provided by 1,100 cfs. This is particularly evident during extreme, low-flow, conditions when the amount of suitable habitat would be most limited.

Resolution of the minimum flow issue

In their letters dated February 22, 1996[22], and February 16, 1996, respectively, and during the Section 10(j) meeting, Interior (i.e., the FWS) and Central Maine disagreed with our assessment in the DEIS regarding minimum flows below Gulf Island-Deer Rips, but provided no additional evidence to support their positions.

FWS states that run-of-river operation from May 1 through June 30 and a minimum flow of 1,700 cfs from July 1 through April 30 are necessary, at this time, to ensure that adequate flows are present during the fish passage season and to fully protect aquatic habitat downstream of the project throughout the year. FWS also indicated that changes in its recommended flow regime could be made when information becomes available to support such changes.

We believe there is a lack of evidence at this time to support changing the flow regime we recommended for Gulf Island-Deer Rips in the DEIS. However, a re-opener clause, in addition to the 1,700-cfs/1,400-cfs flow regime, could be used to address FWS's flow concerns. FWS concurs with the use of a re-opener clause, but continues to disagree with our recommended flow regime.

A specific re-opener clause may, or may not, have any discernable benefits to addressing future changes in flow needs below the project. While FWS supports the inclusion of a specific re-opener clause in any new license issued for Gulf Island-Deer Rips, we believe our recommended minimum flow would adequately protect aquatic habitat below the project at this time. Moreover, as noted in Section 4.2.1.1., there are no procedural differences between either the standard re-opener or a specific re-opener; both require notice and an opportunity for a hearing. Therefore, we conclude that a specific re-opener clause for future flow changes in the lower portion of the river below the project is not warranted.

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[22] FWS responded to our Section 10(j) finding regarding minimum flows below Gulf Island-Deer Rips in a letter dated February 22, 1996.

Central Maine questioned our flow recommendation, citing that less habitat would be available to adult brown trout and juvenile Atlantic salmon in the Dresser's Rips reach at our recommended flow regime of 1,700 cfs/1,400 cfs versus its recommended year-round flow of 1,100 cfs.

We concur with Central Maine's assessment, but point out that our flow recommendation is not based on flow needs for a specific species and/or lifestage in a given reach of the river. Rather, staff's flow recommendation is designed to accommodate the flow needs of multiple species and lifestages in the Deer Rips and Dresser's Rips reaches, and the Run-Reach. FWS concurred with our approach to addressing flow needs in the lower Androscoggin River. Furthermore, while reductions in habitat occur at our recommended flows, these reductions, with our 1,700-cfs flow, are minor in nature and generally less than ten percent of the optimum habitat conditions; about five percent for adult brown trout and about seven percent for juvenile salmon.

The minimum flow issue, including our recommendation, is further discussed in Section 5.4, as minimum flows would affect other resource areas, as well as involve an economic cost.

Water Temperatures in the Lower Androscoggin River

Water quality data collected at the USGS gage at Auburn indicate summer water temperatures regularly exceed 68°F, and periodically exceed 77°F. Our review of available temperature literature shows that these temperatures are within, but at the upper end of, the range of temperature tolerated by brown trout (Raleigh *et al.*, 1986). Based on a number of sources, Raleigh *et al.* (1986) lists the temperature range for brown trout at 32°F to 97°F, with an optimal growth and survival range of 54°F to 66°F.

Although the summer temperatures in the lower portion of the Androscoggin River generally exceed the preferred temperature for optimum brown trout growth and survival, we do not believe that the high temperatures significantly limits the fishery. McMichael and Kaya (1991) compared catch rates of rainbow trout and brown trout in two stream sections, one rarely exceeding 66°F and the other with temperatures often reaching 77°F and having sporadic periods with temperatures exceeding 81°F. Even though the combined catch rates of trout decreased with higher temperatures, this was largely due to low catch rates of rainbow trout. Total catch rates for brown trout in the higher temperature study reach were approximately equal to or greater than catch rates in the lower temperature study area.

Based on the information above, we conclude that temperature is probably not an important factor in maintaining a resident brown trout fishery below Gulf Island-Deer Rips. However, an increased minimum flow from Gulf Island-Deer Rips, particularly during the low-flow, high-temperature periods, would help to ensure that adequate habitat, with suitable temperature, is available to maintain good brown trout growth and survival. We believe that a seasonal minimum flow regime may be more appropriate for maintaining suitable brown

trout habitat than a year-round minimum flow as recommended by Interior and the NGOs.

GULF ISLAND IMPOUNDMENT FLUCTUATIONS

Interior recommends that fluctuations of the Gulf Island impoundment be limited to one foot or less on a year-round basis (CASE 4); a slightly more restrictive run-of-river operational mode is recommended from May 1 through June 30. Interior states that Central Maine's regular drawdowns may be affecting use of shallow water habitats by fish and other aquatic resources and that maintenance of a stable impoundment level, particularly during May and June, would help protect sensitive shoreline habitats during critical spawning and early life history periods.

Maintaining a relatively stable impoundment elevation from May 1 to June 30 would provide protection for eggs and larvae of largemouth and smallmouth bass, and other aquatic resources, during the spawning and early development phases of the life cycle. Largemouth and smallmouth bass are late-spring to early-summer spawners, and fluctuation of water elevations can lead to lowered nest success. Fluctuating water levels can also impact aquatic invertebrates by stranding and reductions in habitat that subject them to desiccation and predation from aquatic and terrestrial predators. In the Gulf Island impoundment, stranding of fish or invertebrates was not reported to be a significant problem (Stetson-Harza, 1989).

In Section 3.3.1.3., we indicated that the littoral zone in Gulf Island impoundment is about 595 acres, or 21 percent of the impoundment's area, which contains 64 acres of emergent aquatic vegetation. Further, we noted that the existing water level management regime results in a loss of habitat for largemouth and smallmouth bass of 11 percent and 44 percent, respectively. With a stable impoundment elevation, the mean HSI for largemouth bass is 0.88, with a total of 2,519 HUs (Stetson-Harza, 1989). For smallmouth bass, a stable impoundment would result in a total of 1,574 HUs, representing a mean HSI of 0.55.

In Section 4.1.1.4., we concluded that Central Maine's proposed May 1 to June 15 restriction on headpond fluctuations would provide moderate to significant benefits to the existing blackbass fishery. Further, we concluded that the target restriction of one foot on impoundment drawdowns would improve the suitability and access to littoral-zone habitat. Interior's recommended fluctuation restriction for the Gulf Island impoundment is similar to Central Maine's proposed impoundment fluctuations, except that Interior recommends a slightly more restrictive fluctuation limit, which they also recommend be extended through June 30. We expect Central Maine's and Interior's impoundment fluctuation restrictions to result in comparable environmental benefits. The additional two weeks recommended by Interior, however, would provide more protection to blackbass fry and their nursery habitat.

The level of protection afforded to blackbass by stable impoundment conditions, as recommended by the Conservation Coalition (CASES 5-6) and TU *et al.* (CASES 7-8), is not likely to provide discernible benefits over the benefits derived from either Interior's or Central Maine's recommendations. At best, we would expect only marginal improvements in

nursery habitat. Further, we note that stable impoundment conditions with zero fluctuations would be impossible to maintain, particularly in an impoundment the size of the Gulf Island impoundment. There are many factors that can cause changes in impoundment elevation that are beyond Central Maine's control. Wind tides (wind setup), ice jams, and floods are among these factors. As a result, Central Maine should not be expected to achieve the zero-fluctuation objective.

We agree with Interior that a May 1 to June 30 impoundment fluctuation restriction would result in a significant beneficial effect on Gulf Island's fishery resources. Stetson-Harza (1989) states that the most likely limiting factors for the blackbass populations in the Gulf Island impoundment are spawning and nursery habitat for fry and young-of-the-year. This is particularly apparent for smallmouth bass, whose preferred spawning habitat is not abundant. Under the current water level management regime, much of the available spawning and nursery habitat for largemouth and smallmouth bass is dewatered during the spawning/incubation/growing season (May through September). Limiting impoundment fluctuations from May 1 to June 30 would improve habitat conditions for blackbass and other centrarchids and enhance aquatic invertebrate habitat. However, there is no evidence to suggest that run-of-river with minimal fluctuations would provide greater benefits than a target one-foot fluctuation limit.

In addition to run-of-river from May 1 to June 30, Interior also recommends that Central Maine limit drawdowns in the Gulf Island impoundment to no greater than one foot the remainder of the year. The Conservation Coalition, TU *et al.*, and EPA support Interior's recommendation.

The HEP study considers any drawdown in the impoundment to be a permanent decrease in impoundment levels, and subsequently any habitat lost as a result of the drawdown would be a permanent loss (Stetson-Harza, 1989). In reality, there are a large number of individual weekly drawdown-refill events, which may have less impact than indicated by the HEP study. Aquatic habitat is not permanently dewatered, but rather fluctuates in area weekly. Since blackbass are mobile, they can easily reoccupy littoral-zone habitat that has been dewatered for a few days. Limiting drawdowns from July 1 through April 30 may not result in any significant benefits to the Gulf Island's blackbass fishery.

In its Section 10(j) letter dated February 22, 1996, and during the Section 10(j) meeting, FWS disagreed with our assessment of the impoundment fluctuation issue at Gulf Island-Deer Rips. FWS re-stated its position regarding the need for run-of-river operation from May 1 through June 30 and a one-foot fluctuation limit the remainder of the year, but provided no additional evidence to support its position.

Given the lack of any additional evidence, we believe FWS's recommendations pertaining to impoundment fluctuations for the Gulf Island impoundment are not warranted.

Interior's recommendations for limiting impoundment fluctuations in the Gulf Island impoundment as they relate to concerns for wetlands and wildlife are further evaluated and discussed in Section 4.2.1.3. Further, we provide a detailed discussion of the impoundment fluctuation issue, as it relates to any changes made to our recommendation based on the Section 10(j) meeting, in Section 5.5.; our recommendation is contained in Section 5.4.

FISH PASSAGE

Interior did not file mandatory conditions pursuant to Section 18 of the FPA. However, because of future restoration plans, Interior requests that the Secretary of Interior's authority to prescribe the construction, operation, and maintenance of fishways be reserved.

Section 18 of the FPA provides the Secretary of the Interior the authority to prescribe fishways. 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 Interior, it is appropriate for the Commission to reserve Interior's authority to prescribe fishways.[23]

MDMR's, ASRSC's, and FWS's existing fishery restoration program for the Androscoggin River does not require passage at Gulf Island-Deer Rips in the near future; the current status of the Atlantic salmon program, land development and spawning stock concerns, and unobstructed passage upriver negates the need for passage at Gulf Island-Deer Rips at this time. However, future plans provide for restoration of Atlantic salmon to its former range above Gulf Island-Deer Rips. Although the target date for beginning such restoration activities has not been established, the existing program assumes future provisions for upstream and downstream fish passage will be made. The program also allows for flexibility to implement new technology or other passage measures developed before passage facilities would be required at Gulf Island-Deer Rips.

These considerations have been taken into account by the resource agencies in determining that installation of upstream and downstream fish passage facilities at Gulf Island-Deer Rips is not warranted at this time. Further, only TU *et al.* recommends installation of fish passage facilities at the project.

In response to TU *et al.*'s request that fish passage facilities not be deferred to some future date, we note that Interior's reservation of authority under Section 18 of the FPA allows Interior to prescribe specific requirements for fish passage at any time they determine that passage is needed. Specifics of when, what, and how Interior would prescribe fish passage facilities at Gulf Island-Deer Rips, in light of the existing fisheries management plans, would be subject to Interior's determination. We support the resource agency's conclusions regarding fish passage needs at Gulf Island-Deer Rips, and conclude that

[23] Lynchburg Hydro Associates, 39 FERC ¶ 61,079 (1987).

consideration of fish passage at Gulf Island-Deer Rips should be deferred until such time that resource agencies deem installation of the facilities appropriate.

4.2.1.3. Vegetation and wildlife resources

IMPOUNDMENT FLUCTUATIONS

Project wetlands should be enhanced by the modification of impoundment fluctuations from May 1 through June 30 by exposing less substrate and stimulating new submergent and emergent wetland vegetation. Either seasonal (May and June) or year-round run-of-river operation (i.e., zero foot fluctuation), as recommended by the Conservation Coalition and TU *et al.*,[24] would eliminate the weekly one foot fluctuation resulting from Central Maine's proposed mode of operation.[25] However, any additional benefits to wetlands that would result from a longer seasonal run-of-river scenario or a year-round run-of-river scenario would be minimal.

Central Maine's proposal to limit weekly fluctuations to a one foot target limit from May 1 to June 15 would enhance the wetlands in the project area. In comparison, Interior's, EPA's, the Conservation Coalition's and TU *et al.'s* recommendation for a one foot fluctuation year-round would resemble natural riverflow conditions. Reducing water fluctuations from May through August as recommended would enhance wetland vegetation by providing some protection for those species susceptible to water level perturbations (*see Section 4.1.2.*).

Winter drawdowns can cause adverse impacts to wetland vegetation and wildlife. Examples of such impacts are prolonged exposure of over-wintering amphibians to freezing temperatures, prolonged restricted beaver access to stored food caches, and desiccation of vegetative roots due to prolonged exposure to freezing conditions. While we recognize the possibility of these impacts, we believe that the proposed two- to four-feet weekly drawdown would have little, if any, effect on plants and animals. Rising water levels during the night and on the weekends would restore access to beaver caches (Normandeau Associates, 1991), and would likely restore insulating water over hibernating amphibians and maintain soil saturation on a regular basis; thereby potentially tempering any adverse impacts resulting from any short-term drawdown. Currently, the Gulf Island impoundment undergoes this type of fluctuation in the wintertime, and there is no indication (based on studies conducted in support of the license application) that the wetlands or wetland-dependent wildlife are adversely affected as a result of the winter fluctuations.

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[24] In addition to TU *et al.'s* recommendation for seasonal run-of-river, they also requested that staff analyze year-round run-of-river.

[25] The reduction to a one foot fluctuation for May and June also has been recommended by Interior, EPA, Land Trust *et al.*, and is part of the staff's alternatives.

As this alternative would affect other resources, such as recreation and fisheries, we discuss the impoundment fluctuation issue further in Section 5.4.

MINIMUM FLOWS

Interior recommends run-of-river (from May 1 - June 30) and a minimum flow of 1,700 cfs the remainder of the year (July 1 - April 30) in order to provide flows to the lower Androscoggin River below Gulf Island-Deer Rips (CASE 4). These flows could have a beneficial impact on downstream wetlands and associated wildlife.

Under Interior's proposal, natural riverflows would occur during the beginning of the wetland growing season (i.e., May and June), resulting in enhancements to existing wetlands, as well as potentially promoting the establishment of additional wetlands. Decreased minimum flows during the later half of the growing season (i.e., July and August), however, could lead to some desiccation, thereby resulting in the loss of newly established wetland vegetation. The decreased flows in July and August could also potentially interfere with brood survival[26] by dewatering areas that may contain nests and reducing protective cover. While we recognize that there may be some potential adverse effects from this type of flow regime, we expect these impacts to be minor in nature.

The Conservation Coalition and TU *et al.* also recommend run-of-river (May 1 - June 30), with minimum flows of 1,800 cfs (CASE 6) and 1,700 cfs (CASE 7), respectively, the remainder of the year (July 1 - April 30) to enhance river flows in the lower Androscoggin River below Gulf Island-Deer Rips. These flow scenarios could provide additional water to newly established wetland vegetation, as well as protection of newly hatched wildlife by creating a situation in which less acreage is alternately watered and dewatered. However, as described above, there could also be adverse impacts resulting from decreased flows in the middle of the growing season.

The Conservation Coalition's and Land Trust *et al.'s* recommendation for year-round minimum flows of 1,400 cfs (CASE 5) and 1,430 cfs (CASE 9), respectively, would result in benefits to wetlands comparable to the benefits derived from Central Maine's proposed 1,100 cfs minimum flow (CASE 2). While the benefits associated with the increase to 1,400 cfs/1,430 cfs would be minor, we do expect an increase of 340 cfs to afford more protection to impoundment and downstream riparian wetlands and associated wildlife.

The staff's proposed 1,700 cfs minimum flow from May 1 to November 30, and either an 1,100 cfs (CASE 10) or 1,400 cfs (CASE 11) minimum flow from December 1 to April 30 would have beneficial effects on downstream riparian wetlands and associated wildlife. Further, an increased minimum flow requirement under this seasonal structure probably would have beneficial effects on impoundment wetlands due to potential

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[26] Species known to rear young along the project's shoreline, which may be affected by drawdowns, include mallards, black ducks, Canada geese (residents), common loon, great blue heron, and spotted sandpipers.

modifications to the drawdown regime for the Gulf Island impoundment. An increased minimum flow above Central Maine's proposed 1,100 cfs minimum flow throughout the entire wetland vegetation growing season would likely enhance existing wetland vegetation and possibly promote the establishment of additional wetlands. Requiring a higher minimum flow (1,700 cfs) should result in less area being dewatered during drawdowns, and thereby, decrease the potential for desiccation of newly established vegetation.

The reduction in minimum flows from 1,700 cfs to either 1,100 cfs or 1,400 cfs from December 1 to April 30 would not have an adverse impact on wetlands because the reduced flow is not during the critical growing periods. However, the higher minimum flows during the winter months, either 1,100 cfs or 1,400 cfs, would benefit those species of wildlife that require access to winter caches, such as beaver. This is because the area of river dewatered is reduced with increased minimum flows.

Minimum flows affect both developmental and non-developmental uses of a waterway. Therefore, we consider minimum flows further in Section 5.4.

MERCURY CONTAMINATION

As discussed in Section 4.2.1.1., the Conservation Coalition recommends that the Commission require Central Maine to study impoundment fluctuations and mercury mobility in the Gulf Island impoundment, as well as analyze top-of-the-food-chain predators that feed on fish from the Gulf Island impoundment for mercury and other contaminants (i.e., dioxin). They recommended that the species to be analyzed should include common loon, double crested cormorant, belted kingfisher, otter, and mink.

For protection of sensitive species of mammals and birds that regularly consume fish and other aquatic organisms, total mercury in these prey species should probably not exceed 100 μg/kg fresh weight for birds and 1,110 μg/kg for small mammals (Eisler, 1987). As stated in Section 4.2.1.1., heavy metal concentrations in fish flesh taken from the Gulf Island impoundment were found to be low in comparison to both nationwide values and from other studies conducted on Maine fish. The level of bioaccumulation through the food chain to the top-of-the-line predators, such as birds and mammals, was not studied. Therefore, the effect on birds and mammals of the contaminants ingested along with fish tissue is not known.

The practicality of using birds or mammals which tend to have large home ranges or are migratory in the proposed study is questionable because the source of mercury contamination, if any, would remain unknown. Thus, if warranted, other sample types (i.e., sediments) would better assess mercury contamination at the project site. The merits of the Conservation Coalition's recommendations are further discussed in Section 5.4.

BUFFER ZONES

Interior recommends that Central Maine should be required to, within three months of the issuance of a new license for Gulf Island-Deer Rips, file for Commission approval a plan for providing buffer strips and other appropriate shoreline protection measures in the project area. Central Maine should consult with FWS and MDIFW in developing this plan, and should respond to agency comments, and include their correspondence in filing with the Commission. Central Maine should provide the resource agencies a minimum of 30 days to respond to a draft plan before it is filed with the Commission for approval. Interior, however, did not provide a specific buffer zone size requirement.

The formulation and implementation of a comprehensive land use management plan as discussed in Section 4.2.1.5. would allow for the identification and implementation of measures to ensure the continued use of riparian habitats by wildlife. We conclude that the measures discussed in 4.2.1.5. would adequately protect the riparian areas within the project area that are used as wildlife habitat, and would be consistent with Interior's recommendation to develop a plan for providing buffer strips/protection measures in the project area. The comprehensive land use management plan described in Section 4.2.1.5. would require the protection of shoreline areas within a 200-foot zone around the project.

WETLAND TEST PLOTS

Land Trust *et al.* recommends the Commission require Central Maine coordinate with MDIFW to implement one or more pilot programs to create shoreland vegetation and thus increase the amount and diversity of fish and wildlife resources.

We do not perceive the need for creating additional shoreland vegetation along Gulf Island-Deer Rips's shorelines. Current wetland and upland vegetation supports a diversity of terrestrial and aquatic species (*as evidenced in Section 3.3.1.4.*). In addition, the reduction of water level fluctuations in the early part of the wetland vegetation season may result in the creation of more wetland vegetation, thus increasing the variety and diversity of fish and wildlife using these areas. Also, the reduction of water level fluctuations throughout the lower Androscoggin River, including the Gulf Island impoundment, would result in less dewatered acreage. Thus, those species which may be most affected by water level fluctuations may now be able to utilize various habitats, thereby increasing the diversity of aquatic vegetation in, and along, the river.

Therefore, we do not agree with Land Trust *et al.'s* recommendation for the establishment of pilot programs to create shoreland vegetation.

4.2.1.4. Recreation resources

Recreation-related impacts at Gulf Island-Deer Rips will be discussed relative to recreational use and public access, boating facilities, picnic areas and day-use facilities, and

recreational monitoring.

RECREATIONAL USE AND PUBLIC ACCESS

Snowmobiling represents a significant winter recreational use of the Gulf Island impoundment, with local residents being the primary snowmobile users. The Cities of Lewiston and Auburn requested winter access to the Gulf Island impoundment for snowmobiling and cross country skiing, either at the project facilities or elsewhere on the impoundment's Lewiston side.

Central Maine disagrees with Lewiston's and Auburn's recommendations for winter access, citing liability risks associated with on-ice recreation: (1) varied width, currents, and turbulence in the impoundment, which produces three areas with distinct freezing and thawing patterns[27]; and (2) the hazardous nature of snowmobiling itself, characterized by high speeds and the use of heavy machinery.

According to Central Maine, in a typical season (between January 1 and March 15), between 75 and 150 users per weekend-day snowmobile on the southernmost section of the impoundment (the seven miles of relatively placid waters varying in width from 1,000 feet to 4,000 feet), where most of the snowmobiling is concentrated. Several local snowmobile clubs hold festivities and periodically organize races on this section of the river, locally reputed to be the safest.

Trails established over private land allow snowmobilers and other winter recreationists access to the Gulf Island impoundment (Central Maine, 1991). In addition, the area's snowmobile clubs maintain a trail system, including one that crosses the river just above the Gulf Island impoundment and runs north along the river's west side for most of the impoundment's length. Central Maine objects to providing additional winter access for snowmobilers, suggesting that such a situation would likely encourage more snowmobilers, some of whom may be less familiar with the area and the impoundment's characteristics than the current users.

Central Maine concludes that snowmobilers, familiar with local ice conditions, already gain access to the impoundment. Furthermore, Central Maine indicates that logs and debris frozen in the ice, as well as currents, fluctuating water levels, and uncertain weather patterns causing open water, thin ice, and pressure ridges can create a public safety concern. Having considered additional winter public access to the Gulf Island impoundment, we conclude that the portion of the river that is most safely used for snowmobiling is already being used by organized snowmobilers and that a need for additional public access has not been identified. Therefore, we do not recommend that Central Maine develop additional

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[27] The northernmost three-mile stretch has the strongest current and the least reliable ice cover of any section of the impoundment. The middle, 3.5-mile stretch freezes earlier than the upper section, but tends to break up earlier than the lower, seven-mile section which extends to the Gulf Island dam.

winter public access.

CONSERVATION EASEMENTS

Land Trust *et al.* recommends that Central Maine place conservation easements on all the company's land bordering the Gulf Island and Deer Rips impoundments within 250 feet of the shoreline zone to preclude residential, commercial, or industrial use. Similarly, the Conservation Coalition recommends that Central Maine pursue conservation easements on land, not necessarily owned by Central Maine, within a 500-foot-wide zone on either side of the river. Conservation easements and buffer zones are discussed in more detail in Section 4.2.1.5.

BOATING FACILITIES

The Cities of Lewiston and Auburn recommend that Central Maine develop hard-surface boat launches between the Deer Rips and Great Falls (Lewiston Falls) dams, and in the vicinity of Waterman Road.

Land Trust *et al.* recommends that Central Maine (1) provide canoe portages at Twin Bridges in Leeds, at the Deer Rips dam in Auburn, and at the Gulf Island dam in Lewiston; (2) develop a boat launch for small (cartop) boats and an associated small picnic area at Switzerland Road in Lewiston, and (3) develop a boat launch for small (cartop) boats at the end of Waterman Road in Auburn. Land Trust *et al.* also concurs with Central Maine's proposal to restrict the use of the islands for public access.

Canoe Portages: Land Trust *et al.* recommends canoe portages at Twin Bridges in Leeds, at the Deer Rips dam in Auburn, and at the Gulf Island dam in Lewiston. They assert that (1) the falls at Twin Bridges have Class IV rapids, which are recommended for expert canoeists, and the lack of a suitable portage route restricts down river travel, thereby limiting water access to 80 percent of the project area; and (2) the dams block canoe travel. They maintain that properly designed and constructed canoe portages would permit canoe traffic through the southern end of the project area.

Lewiston Boat Launch: Land Trust *et al.* recommends a boat launch for small (cartop) boats and an associated small picnic area on Switzerland Road in Lewiston. They indicate that several access points to the Gulf Island impoundment are needed given the impoundment's size, and that establishing this boat launch would allow public access to the impoundment at a convenient location. Land Trust *et al.* also contends that while the Turner ramp is ideal for motor boats, it is 11 miles from downtown Lewiston and, therefore, too far away for canoe or small non-motorized boats to be able to explore the lower impoundment. Land Trust *et al.* believes that an access point and small parking area at both Waterman and Switzerland Roads would create a logical take-out point for a trip down-river from Central Maine's Turner-Greene Bridge boat launch, while at the same time, allowing access to the lower portion of the impoundment.

Auburn Boat Launch: Land Trust *et al.* recommended a boat launch for small (cartop) boats at the end of Waterman Road in Auburn. They indicate that for more than 25 years, an informal boat launch has existed at the end of Waterman Road, which has been used by individuals wanting boat access for waterfowl hunting and general river recreation.

Central Maine, in its February 16, 1996, letter commenting on the DEIS, disclosed efforts to develop a trail plan for the Deer Rips development, in cooperation with the Androscoggin Land Trust. As part of such a plan, Central Maine has agreed to construct a canoe portage trail around the Deer Rips dam and powerhouse. The trail section south of the powerhouse, in addition to facilitating canoe portage, would also provide angler access and serve as a carry-in site downstream of the Deer Rips dam. According to Central Maine, the river stretch below Deer Rips is also being served by a privately owned ramp in the Lewiston Falls area, and is covered by Article 409 of the Lewiston Falls Project's license.

As for the City of Lewiston's and the City of Auburn's recommendation for a hard-surface boat launch between the Deer Rips and Great Falls dams, Central Maine indicates that this reach of the river is not suited for a launch, because: (1) it is only 3 miles long and not large enough for power boating; (2) its riverine character and currents, which potentially could sweep power boaters over Great Falls, render the reach unsafe, and (3) it can be accessed from a private commercial facility that allows public use, which is used in the summer for fishing access.

We conclude there is insufficient public use of the Gulf Island impoundment and existing boating facilities to warrant improvements beyond those proposed by Central Maine proposes (*see Section 4.1.1.6.*). However, it is important to note that Central Maine proposes a grant of flexibility in its attempts to reach agreement over recreational improvements with the Androscoggin Land Trust and local landowners. Central Maine proposes to use "regular progress reporting requirements," rather than specific completion dates for facilities, "to permit it, the Androscoggin Land Trust, and local governments to work with and accommodate many local landowner concerns in the installation of these new or improved facilities." We concur with Central Maine's proposal and believe that such flexibility, where it concerns recreational development, should be incorporated into any license issued for the project.

Recreation-related facilities should accommodate individuals with disabilities to the extent practical. Constraints that would prevent full accessibility at the recreation sites include prohibitive cost-factors associated with the natural setting of the facility (such as terrain, slopes, soils, and other physical conditions). The facilities should comply with the national standards for disabled access established by the Architectural and Transportation Barriers Compliance Board of 1991.[28]

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[28] Pursuant to the Americans with Disabilities Act of 1990, Public Law 101-336, July 26, 1990. 104 Stat. 327.

PICNIC AREAS AND DAY-USE FACILITIES

The Cities of Lewiston and Auburn recommend that Central Maine develop, at Gulf Island-Deer Rips: (1) a scenic overlook, picnic tables, boat access, and a parking area on the Lewiston side of the Gulf Island impoundment, which is within the 3,300 feet of frontage owned by Central Maine; (2) hiking trails on the impoundment's Lewiston side, in accordance with the Androscoggin River's Greenway Trail Plan; and (3) a river viewing and picnic area near the Deer Rips/Androscoggin No. 3 dam.

Moreover, Land Trust *et al.* recommends that Central Maine establish trails in Lewiston and Auburn, with amenities, including a walkway across the dam between Lewiston and Auburn.

Lewiston Trails: establish trails (a) around the Gulf Island facility to the northern edge of Central Maine's property, (b) from Switzerland Road, around the facility and back to Maine Street in Lewiston, and (c) from Tall Pines, along the Gulf Island impoundment, to the downtown urban area. The recommended amenities for the Tall Pines trail include an 18-space, gravel parking lot, a trailhead kiosk, a picnic area, and a canoe launch.

Auburn Trails: establish trails (a) along Deer Rips Road to the dam and the rapids below the dam, back to North River Road (forming a loop), and (b) from the end of Pettingill Road to Waterman Road. For the latter trail, the recommended amenities include an 18-space, gravel parking lot, a trailhead kiosk, two simple log bridges, a picnic area, fencing adjacent to the canal, and interpretive signs and brochures.

Central Maine believes that increased demand at the project justifies its cooperating with Androscoggin Land Trust, local governments, and landowners to produce a trail plan at the Deer Rips development. As currently proposed, the plan includes (a) a portage trail around the Deer Rips dam that would also provide angler access, (b) parking and carry-in access on Switzerland Road, and (c) carry-in access at Waterman Road and a portage trail around the Gulf Island dam. Central Maine has also agreed to a conservation and trail plan to be implemented on Central Maine's project lands and other Central Maine-owned lands within 200 feet of the project. Finally, Central Maine proposes that compliance articles in any license issued for the project should allow some degree of flexibility and progress reporting, rather than require specific completion dates for these various facilities.

Based upon Central Maine's willingness to cooperate with the Androscoggin Land Trust to develop the portage trails and access facilities and what appears to be sufficient public use of the existing facilities at the project, we believe development of such facilities is warranted at this time. Further, we believe Central Maine's recommended conservation and trail plan (*see Section 4.2.1.5.*) would provide additional protection to shoreline areas and ensure adequate public access to the project lands. Therefore, Central Maine should, in consultation with interested parties, develop a comprehensive land conservation and trail plan for the project area.

RECREATION MONITORING STUDIES

Central Maine proposes to submit, every six years, copies of the FERC's Form 80 recreational use assessment to the appropriate resource agencies, and to initiate consultation with the agencies through this process to facilitate review of Gulf Island-Deer Rips's recreational facilities. Central Maine would then use this information to determine the need for additional facilities to meet recreational demand in the future.

Interior (comment letter dated December 15, 1993) recommends that Central Maine, after consultation with FWS, NPS, MDIFW, and MDOC, monitor recreational use of the project area to determine whether existing access facilities are meeting demands for public use of fish and wildlife resources.

Section 8.11 of the Commission's regulations requires licensees to prepare every six years, FERC Form 80, Recreation Use Assessment. Form 80 reports public use of recreational facilities and gives an indication of when additional recreational facilities are needed. To further ensure that recreational opportunities are sufficient to meet public demand at Gulf Island-Deer Rips over the term of a new license, we recommend that Central Maine file FERC Form 80 with the Commission to identify where additional recreation facilities are needed.

We agree with Interior's measure to monitor the demand and need for future recreation facilities at Gulf Island-Deer Rips. Monitoring studies are important at Gulf Island-Deer Rips due to the beneficial cumulative effect on water quality and DO concentrations resulting from the GIPOP facility, the recreationally-significant fishery in the Gulf Island impoundment, and potential increases in recreation use along the lower Androscoggin River.

Interior recommends that recreation monitoring studies should include: (1) annual recreation use figures; (2) a discussion of the adequacy of the licensee's recreation facilities at the project site to meet recreation demand; (3) a description of the methodology used to collect all study data; (4) if there is a need for additional facilities, a recreation plan proposed by the licensee to accommodate recreation needs in the project area; (5) documentation of agency consultation and agency comments on the report after it has been prepared and provided to the agencies; and (6) specific descriptions of how the agencies' comments are accommodated by the report.

The monitoring study would provide an opportunity to evaluate the future need for additional recreation facilities at the project.

4.2.1.5. Other resources

THREATENED AND ENDANGERED SPECIES

As stated in Section 3.2.2., the shortnose sturgeon, a federally listed endangered species, is known to occur in the upper tidal reach of the Androscoggin River. Neither Interior nor NMFS have provided any specific recommendations for any federally listed threatened or endangered species. However, we have considered the effects of the proposed project on the shortnose sturgeon in Section 4.1.1.5.

SHORELAND PROTECTION

The Conservation Coalition recommends that Central Maine be required to provide greater protection to the project's impoundment shorelines through: (1) expansion of project boundary to include additional Central Maine owned land; (2) conservation easements on all parcels within the project boundary, including all Central Maine owned or controlled lands; and (3) pursuit of additional conservation easements within a 500-foot-wide zone on both sides of the river on land not owned by Central Maine. In addition, the Conservation Coalition recommends that Central Maine prepare and implement a non-power-values management plan for all lands within the project boundary.

Land Trust *et al.* recommends that Central Maine provide greater protection to the project's impoundment shorelands through conservation easements on all Central Maine land bordering the project impoundments that lie within the 250-foot-wide zone according to the State of Maine's Mandatory Shoreland Zoning Act and local town ordinances.

In order to ensure conservation easements in a 500-foot-wide zone (buffer zone), Central Maine would need to either purchase or lease those lands they do not own. We estimate that Central Maine would have to purchase or hold in fee a total of 2,070 acres of land. This acreage consists of 1,895 acres outside the project boundary and 175 acres in which Central Maine only owns flowage rights. We estimated this acreage based on the amount of land currently held by Central Maine as described in Exhibit G maps in the license application and the revised Exhibit G, Sheet 2 map filed January 30, 1995 (F. Allen Wiley, P.E., Director, Hydro Operations, Central Maine Power Company, Augusta, Maine).

In determining the appropriate amount of land necessary for project operations, we weigh factors that make land purchases either unneeded or uneconomical for a particular project.[29] A 500-foot-wide buffer zone would be costly. By letter dated August 25, 1995, Central Maine estimates the cost for obtaining easements in the 500-foot zone (including the cost of the 250-foot zone) to be $8.55 million at an average cost of $1,684 per acre for 2,436 acres, plus $4,444,130 in the value of buildings on the property. The cost for

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[29] Order No. 308, FERC Statutes and Regulations, Regulations Preambles 1977-1981 ¶ 30,380 at p. 31,737, 46 F.R. 55,926, 55,930 (1981).

obtaining easements in the 250-foot zone, including land costs and building costs, was estimated to be $3.04 million, at an average cost of $1,756 per acre for 1,201 acres, plus $936,650 in the value of buildings on the property.

We agree that Central Maine should be responsible for protecting resources on land surrounding the impoundment shoreline within the project boundary.[30] However, the licensing record for Gulf Island-Deer Rips lacks evidence that the measures recommended by the Conservation Coalition and Land Trust *et al.* are necessary to ensure such protection. Section 4.51(i)(B) of the Commission's regulations[31] requires the boundary around a project impoundment to be located no more than 200 feet from the exterior margin of the impoundment except "where additional lands are necessary for project purposes, such as public recreation, shoreline control, or protection of environmental resources."[32]

As previously stated, the Conservation Coalition recommends a 500-foot-wide buffer zone. Land Trust *et al.* recommends a 250-foot-wide buffer zone. A practical and cost-effective way to establish shoreline protection is to develop criteria for selecting shoreland that is needed for protection, not to indiscriminately include land adjacent to the edge of the project's impoundments. The amount and location of land for a protective buffer zone should be determined on a site-specific basis using specific criteria and objectives. For these reasons, no definitive size for a buffer zone has been established by the Commission; however, a 200-foot-wide buffer zone has been included in the Commission's regulations. The Conservation Coalition and Land Trust *et al.* have presented no information to show that buffer zones of the 200-foot width would fail to protect environmental resources along the project's shoreline.

We propose that Central Maine, in consultation with MDOC, NPS, the Androscoggin Land Trust, the Androscoggin Valley Council of Governments, the Conservation Law Foundation, and the Cities of Lewiston and Auburn prepare a comprehensive land use management plan for Commission approval to protect environmental resources (including aesthetics and public access of the shorelands) for those lands already within the project boundary and any additional Central Maine-owned lands not within the project boundary but within 200 feet of the high-water elevation of the impoundment.

The comprehensive land use management plan should include maps delineating the shoreland protective buffer zone area, and text indicating the cost and types of ownership

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[30] The Commission's standard land use article would allow Central Maine to develop lands within the project boundary, under certain circumstances, without prior Commission approval.

[31] 18 C.F.R. §4.51(i)(B) (1995).

[32] The idea of a 200-foot-wide buffer zone for shoreland protection was established by Commission Order 313, pursuant to the Commission's responsibilities under Section 10(a) of the FPA and the policy on outdoor recreation found in the Outdoor Recreation Programs Act of 1963 (Federal Register, Vol. 46, No. 219, November 13, 1981, page 55930).

rights to be acquired (fee or less-than-fee) or other methods of protecting the various land parcels that comprise the buffer zone. In addition, the plan should include, but not be limited to, provisions for: (1) allowable uses for the buffer zone lands; (2) conditions to be specified for such allowable uses; and (3) any proposed permit system (with sample permit).

We conclude that the comprehensive land use management plan containing those items discussed above, would adequately protect the natural resources along the Androscoggin River from excessive or inappropriate development.

ENVIRONMENTAL ENHANCEMENT FUND

Both the Conservation Coalition and Land Trust *et al.* recommend the establishment of environmental enhancement funds. Land Trust *et al.* recommends Central Maine be required to establish a "Future Projects Fund" administered by a non-for-profit corporation that receives from Central Maine two percent of the project's gross revenue to support, create, and maintain programs for public access and trails; environmental and cultural heritage education; watershed, wetlands, water quality, and fish and wildlife habitat enhancements; natural, historical, and archaeological resource protection; and land and land rights acquisition.

The Conservation Coalition recommends that Central Maine be required to establish an "Enhancement Fund" that receives five percent of the net present value of the project, and provides for: (1) active participation of the state, municipalities, regional citizen's organizations, and environmental and user groups concerned with the Androscoggin River; (2) additional environmental measures, as needed, to address changing environmental needs and concerns that have not arisen, that are unanticipated, or that are not yet well enough understood to be addressed at the time of license issuance; and (3) the purchase of additional shoreland and/or shoreland conservation easements.

We've determined that Gulf Island-Deer Rips, under the Conservation Coalition's or Land Trust *et al.'s* recommendations, would have capital costs ranging from $6,000 to $21,000 over the term of a new license (based on 30-year license term). Under the Conservation Coalition's recommendations, Central Maine would contribute $3,000 to the fund annually, while under Land Trust *et al.'s* recommendation this amount would be $1,000.

We disagree with the Conservation Coalition that Central Maine has deprived the public of non-developmental uses of the lower Androscoggin River. The Gulf Island impoundment currently supports an excellent blackbass fishery, which supports considerable fishing tournaments. In addition, Central Maine has worked with various state and local groups to provide a continuous minimum flow below the project (i.e., voluntary flow release), and has provided recreational facilities and access improvements, above those required in the previous license issued by the Commission.

Any license issued for Gulf Island-Deer Rips would include provisions that would protect and enhance environmental resources (including fish and wildlife resources, recreational resources, aesthetics, and cultural resources) in the project area and in the lower Androscoggin River downstream from the project for the term of any new license, including measures to protect shoreline areas.

The comprehensive land management plan discussed in the previous section, would help protect the impoundment shoreline.[33] Therefore, we do not agree with the recommendations for establishing a separate enhancement fund equal to either five percent of the net project value or two percent of the project's gross revenue over the term of the new license.

HISTORICAL PROPERTIES AND ARCHEOLOGICAL RESOURCES

We expect that operating Gulf Island-Deer Rips in any of the operational modes proposed by Central Maine or recommended by Interior and the NGOs would have no adverse effect on properties eligible for listing on the National Register and located downstream of the project. Gulf Island-Deer Rips would be operated according to the stipulations of a Programmatic Agreement (*see Section 4.1.1.8.*) designed to ensure that no adverse effects occur.

AIR QUALITY

Besides economic benefits, the hydropower generated by the six projects on the lower Androscoggin River provides certain air pollution reduction benefits. If the annual loss of energy produced by projects on the lower Androscoggin River is reduced, as would occur with the proposed and recommended increases in non-generating flow releases, the resulting loss in hydroelectric generation would make it necessary to replace the loss with energy available from alternative sites or sources. Likewise, changes in the peaking operation could result in the need to rely on alternative sites or sources to meet the peak demand.

Central Maine proposes to upgrade the power output of the Gulf Island development. This enhancement would increase the development's total capacity rating from 20.9 MW to 25.2 MW. We estimate that the increase in annual average energy above existing conditions of the Gulf Island development, due to this enhancement, would be about 17.4 GWh.

Central Maine's proposal for increased minimum flows and changes in the operation of Gulf Island-Deer Rips, coupled with the proposed generation expansion at the Gulf Island development, would reduce the annual energy production of the projects on the lower Androscoggin River by about 0.3 GWh. The resulting loss of hydropower, while seemingly insignificant, would have to be replaced with energy available from alternative sources.

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[33] During the formulation of the land management plan, the establishment of an enhancement fund could be investigated as a possible means of financing shoreland protection goals.

For the Maine service area, it is highly probable that the replacement energy would have to be generated by oil-fired facilities. This would result in increased consumption of fossil fuel; and the combustion of this increment of fossil fuel would result in increased production of atmospheric pollutants.

The replacement of one GWh of hydropower generation with one GWh of oil-fired generation would require the combustion of about 1,695 barrels of oil. Using the above assumptions, we estimate 3.35 tons of oxides of sulfur, 2.62 tons of oxides of nitrogen, 0.18 tons of carbon monoxide, and 890.1 tons of carbon dioxide would be produced by replacing the loss of one GWh of hydropower generation with one GWh of oil-fired generation.

Using the above approximations and the estimated generated energy reductions resulting from Central Maine's proposals, we estimate that little, if any, oil would be required annually to produce 0.3 GWh of oil-fired electric generation. We then calculated the amount of pollutants that would likely be released into the atmosphere from the minor energy reductions at the projects on the Androscoggin River. We estimate that less than one additional ton of oxides of sulfur (0.1) and no additional oxides of nitrogen would be produced annually under Central Maine's proposal. With regards to alternative operating regimes, based on our own analysis, we conclude that the difference in average annual energy generation of the six projects on the lower Androscoggin River between Central Maine's proposals for Gulf Island-Deer Rips (including the Gulf Island development's generation upgrade) and the agencies' and NGOs' alternative operational regimes would be insignificant (Table 4-6).

Continued operation of the projects on the lower Androscoggin River, including Gulf Island-Deer Rips, would keep additional pollutants from being released into the atmosphere. These pollutants would adversely affect air quality in the region, although not necessarily in the immediate vicinity of the projects. Table 4-6 shows the specific pollution abatement benefits derived for operating the lower Androscoggin River projects; in this case under the alternative operational regimes for Gulf Island-Deer Rips.

Total Lower Androscoggin River Basin

Subject to the proposed operating regimes for Gulf Island-Deer Rips and Marcal, and losses in generation due to operation of fish passage facilities at projects on the lower Androscoggin and Little Androscoggin Rivers, the total combined hydropower generation could displace about 607 GWh of fossil-fueled generation. We used proposed conditions for this discussion, as very little difference in the total overall generation is expected to exist under the applicant's, the agencies' and the NGOs' alternatives.

As stated above, the displacement of about 607 GWh of hydropower generation in Maine's service area would most likely be supplemented, at least in the near-term, by oil-fired generating facilities. This amount of oil-fired generation would require the combustion of about 1,029,110 barrels of oil annually, the combustion of which would result in increased

Table 4-6. Comparison of the amount of pollutant emmission and its removal costs when the projects' total generation is replaced by oil-fired plants (Source: the staff).

Alternatives	Annual Average Generation (GWh)	Equivalent Oil Consumption (1,000 Barrels)	Oxides of Sulfur			Oxides of Nitrogen			Carbon Monoxide (ton)	Carbon Dioxide (ton)
			Released to Air	Residual (ton)	Removal Costs($)	Released to Air	Residual (ton)	Removal Costs($)		
Androscoggin River										
Existing	569.7	965.9	95.5	1,815.2	907,576	596.3	894.5	344,380	101.4	507,082.4
upgrade[1]	587.4	995.9	98.5	1,871.5	935,774	614.9	922.3	355,080	104.6	522,836.9
Applicant[2]	587.1	995.9	98.5	1,871.6	935,774	614.9	922.3	355,080	104.6	522,836.9
Conservation Coalition No. 1[3]	587.6	996.1	98.5	1,872.0	936,012	615.0	922.5	355,170	104.6	522,970.4
TU *et al.* No. 2	589.3	999.1	98.8	1,877.5	938,753	616.8	925.2	356,210	104.9	524,501.4
Staff #11	587.2	995.6	98.5	1,871.0	935,503	614.7	922.0	354,977	104.5	522,685.6
L. Androscoggin River										
Existing	20.4	34.6	3.4	65.0	32,515	21.4	32.1	12,338	3.6	18,166.7
Applicant	19.7	33.4	3.3	62.8	31,384	20.6	30.9	11,910	3.5	17,534.7
Interior	18.9	32.0	3.1	60.2	30,109	19.8	29.7	11,425	3.4	16,822.6
Hackett Mills Hydro	19.8	33.6	3.3	63.1	31,543	20.7	31.1	11,969	3.5	17,623.7
Staff #8	19.4	33.0	3.3	61.9	30,968	20.4	30.5	11,751	3.5	17,302.4

[1] Total energy includes Central Maine's proposed generation unit enhancement of 4.3 MW at the Gulf Island development.

[2] The difference in pollution abatement benefits among Central Maine's, Interior's, EPA's, and Land Trust *et al.*'s project operational and environmental enhancement proposals were insignificant.

[3] The differences in pollution abatement benefits between the Conservation Coalition's No. 1 and No. 2 project operational proposals and TU *et al.*'s No. 1 proposal were insignificant.

production of atmospheric pollution. Table 4-6 shows the total amount of pollutants that would be released to the air annually if the proposed projects' estimated 607 GWh of electric power were generated by a fossil-fuel plant. Table 4-6 also shows the total amount of pollutants released to the atmosphere under alternative operating regimes.

State-of-the-art pollution control technology is capable of removing about 95 percent of the oxides of sulfur and about 60 percent of the oxides of nitrogen from the quantities of pollutants shown in Table 4-6 before uncontrolled flue gases are released to the atmosphere.

Pollution control cannot be accomplished without rather substantial costs, however. Published figures on the cost of removing a ton of the oxides of sulfur from the uncontrolled flue gases range from $300 to $700. The cost of removing a ton of the oxides of nitrogen ranges from $210 to $560. We use the mid-points of the ranges.

Using a removal cost of $500 per ton, we estimated the cost of removing 95 percent of oxides of sulfur, or 1,933 tons, would be about $966,471 annually. Using a removal cost of $385 per ton, the estimated cost of removing 60 percent of the oxides of nitrogen, or 953 tons, would be about $366,728 annually.

Although pollution control technology is capable of removing some of the sulfur and nitrogen oxidized from flue gases, it can not remove carbon dioxide, which contributes to global warming. In addition to the adverse effects on air emissions, there would be adverse effects on aquatic, terrestrial, recreational, aesthetic, and cultural resources associated with the drilling and transportation of oil for an oil-fired generating facility.

4.2.2. Marcal (CASES 3-8)

In this section, we analyzed the environmental impacts associated with licensing Marcal with additional environmental enhancement measures. Proposed modifications to the project's operation and facilities to further protect, enhance, or mitigate adverse impacts to environmental resources and values were developed by various federal and state agencies and staff.

For flow related resources, we analyzed the effects of operating Marcal under six alternatives, including those proposed by federal and state agencies and staff (*see Table 2-4 in Section 2.7*). For other resources, modifications were either resource or facility specific.

4.2.2.1. Water quality and quantity

WATER QUALITY AND QUANTITY SUMMARY

Both Interior's recommended project operations and our alternative flow regimes would enhance water quality in the Little Androscoggin River, including Marcal's bypassed reach, over the existing baseline conditions. Operating the project in a run-of-river mode or

releasing a relatively high year-round minimum flow of 56 cfs would result in the temporal distribution of streamflow more closely resembling the natural unaltered flow distribution. Periods of only leakage flows from the project would be eliminated or reduced. Further, flows in the project's bypassed reach would be moderately to significantly enhanced by implementing any seasonal minimum flow between 10 cfs and 56 cfs. For purposes of water quality, however, the extent of enhancements realized by either Interior's or staff's proposed alternatives over Consolidated Hydro's proposal is unquantified.

The following is a detailed discussion of the water quality impacts, and how we reached our conclusions described above.

PROJECT OPERATION AND DOWNSTREAM FLOWS

As an enhancement, Consolidated Hydro proposes a flow regime for the project (*see Section 2.2.2.3.*). However, various entities recommend operational alternatives that differ from Consolidated Hydro's proposed flow regime.

Interior agrees with Consolidated Hydro's (CASE 2) proposed mode of operation and downstream minimum flow of 56 cfs. However, Interior (CASE 3) recommends that a year-round flow of 56 cfs be released from the project dam to the bypassed reach rather than from the powerhouse. Further, Hackett Mill Hydro recommends that Consolidated Hydro operate Marcal in a run-of-river mode on a year-round basis (CASE 4).

We interpret Interior's recommended project operations and minimum flows as primarily being for the enhancement of fisheries and aquatic habitat. However, the recommended flow regime also would affect water quality in the project's bypassed reach and in the Little Androscoggin River downstream of Marcal.

Interior based its minimum flow recommendation on the FWS's New England Method for calculating instream flow requirements (FWS, 1981). The ABF method of setting minimum instream flows results in a flow recommendation of 56 cfs, which is the unregulated median August flow. We note that in the case of Hackett Mill Hydro's recommendation, run-of-river operation would preclude the need for Interior's recommended minimum flow, as it pertains to downstream flows. However, run-of-river operation does not specifically address the need for a minimum flow in Marcal's bypassed reach. We do believe, though, that with the project's minimum hydraulic capacity of 120 cfs, flow in the bypassed reach would be improved.

While no specific data is available to quantify the effects of Interior's recommended flows, or staff's proposed alternative flows, on water quality, the effects would not be different from those discussed in Section 4.1.2.2. for Consolidated Hydro's proposal to increase the minimum project flow from leakage to 56 cfs; Interior, Consolidated Hydro, and staff agree with a project minimum flow of 56 cfs.

Based on our analysis of Consolidated Hydro's proposal, increasing the project minimum flow from leakage to 56 cfs in the low-flow summer months would have a beneficial effect on water quality in the free-flowing reaches of the Little Androscoggin River below Marcal and Hackett Mills. Water velocities in these areas would increase, and the resulting turbulence would likely increase DO levels to some extent. In the Marcal impoundment and the impoundments downstream of Marcal, water retention times would decrease. By decreasing the "unnatural and artificial" periodicity of the flows, experienced when flows widely range from leakage to maximum generation, Little Androscoggin River flows would more naturally resemble an unaltered temporal spacing of flow. Further, a portion of these benefits would be realized farther downstream at Hackett Mills, Upper Barkers Mill, and Lower Barkers Mill, thereby resulting in cumulative beneficial effects.

Likewise, in the Marcal bypassed reach, increasing flows under staff's options from leakage to 10 cfs (CASE 7), 20 cfs (CASE 8; CASE 5, which also includes run-of-river operation), or 56 cfs (CASE 6) would have a beneficial effect on water quality and aquatic habitat in the reach. As discussed in Section 4.1.2.2., it is likely that DO levels and water quality would be improved, to what extent, however, is unknown. While we expect there to be benefits to water quality, we would also expect there to be some differences among Interior's, Consolidated Hydro's, and staff's alternative flow regimes. Any benefits resulting from the alternative minimum bypass flows would be a function of the magnitude and timing of the release.[34]

Hackett Mill Hydro's (CASE 4) and staff's (CASE 5) alternatives of operating the project in a run-of-river mode would also be beneficial to water quality in the Little Androscoggin River. Based on our analysis of the run-of-river alternative, operating Marcal in this mode would (1) minimize impoundment fluctuations and prevent fluctuations in flows downstream of the project that could reduce or alter available aquatic habitat and affect water quality and (2) protect aquatic resources and water quality in the project area by maintaining a constant flow regime below the project and by preventing the dewatering of aquatic habitat. Further, operating the project in a run-of-river mode would minimize fluctuations in the impoundment's water surface elevation and would also benefit fish and wildlife habitat in the impoundment created by the Marcal dam. However, operating Marcal in a run-of-river mode would affect project economics (*see Section 2.7.*).

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[34] Staff's run-of-river alternative (CASE 5), coupled with a bypassed minimum flow, would likely have the greatest overall benefits. Interior's recommended year-round minimum bypass flow (CASE 3) would most likely have significant benefits, but probably not significantly different from staff's recommended year-round 20 cfs bypass flow or seasonal bypass flow of 56 cfs (CASES 6-8). Relative to seasonal bypass flows, based on the mean river flows for November to May (ranging from 319 cfs to 1,329 cfs) and expected water temperatures, we do not anticipate that water quality at this time would be a problem.

OPERATIONAL AND FLOW MONITORING

Interior recommends that Consolidated Hydro develop a plan for monitoring instream flows and impoundment water levels at Marcal. Additionally, Interior recommends this plan be developed in consultation with the agencies, including FWS, USGS, MDEP, MDMR, MDIFW, ASRSC, and NMFS.

We agree. A plan for describing the methods for releasing minimum flows and maintaining project operation, and how flows would be maintained below the project when the impoundment is refilled after generation drawdowns, or after any maintenance and/or repairs would provide necessary information for the resource agencies and the Commission. While we agree with the need for operational and flow monitoring, we note that additional measures, other than the proposed minimum flow gate, would be needed to monitor impoundment levels and tailwater discharge volume.

We recommend that Consolidated Hydro prepare a flow monitoring and operations plan, which should include: (1) descriptions of all mechanisms and structures that would be used; (2) the level of manned or automatic facility operation; and (3) the methods for recording and maintaining data on project operations and providing it to the Commission and resource agencies for inspection. An operational and flow monitoring plan should be required before any changes in project operation take place.

4.2.2.2. Fisheries resources

FISHERIES RESOURCES SUMMARY

Consolidated Hydro's downstream fish passage facilities, combined with Interior's requirements, would provide alewives, and other anadromous species, with downstream passage at the project. Development of a fish passage plan for the Little Androscoggin River also would provide focus and guidance for determining upstream fish passage needs on the Little Androscoggin River. Further, Interior's recommended 56 cfs minimum flow for the project's bypassed reach would significantly enhance fisheries habitat for a seasonal coolwater/coldwater fishery, but would provide only minor additional benefits over what would occur with Consolidated Hydro's proposed 20-cfs minimum bypass flow release. Hackett Mill Hydro's recommendation for run-of-river operation would eliminate fluctuations in Marcal's impoundment and provide natural river flows in the Little Androscoggin River below Marcal.

The staff looked at four operational alternatives, with respect to the bypass and project minimum flows. A year-round project minimum flow of 56 cfs and a bypass minimum flow of 10 cfs (CASE 7) would provide modest improvements to fish habitat in the bypass reach. Our option requiring a seasonal bypass flow of 56 cfs (CASE 6) is similar to Interior's recommended flow, except during the winter/early-spring period when a minimum flow may not be needed to meet biological needs. The staff's option of a year-round project

minimum flow of 56 cfs and bypass minimum flows of 20 cfs (CASE 8) would provide slightly more habitat in the bypass reach than Consolidated Hydro's proposed flow regime, and nearly as much habitat as Interior's recommended flow. Our run-of-river alternative (CASE 5), which would also require a bypass minimum flow of 20 cfs, is similar to Hackett Mill Hydro's recommended alternative, except that our year-round bypass minimum flow would protect aquatic habitat in the bypass reach during the winter months.

We conclude, that redevelopment and continued operation of Marcal (with the implementation of an appropriate bypass/project minimum flow and installation of downstream fish passage facilities) would be fully consistent with the Androscoggin River Basin fishery management plans outlined in MDMR (1982), MDIFW (1982), ASRSC (1982), MDIFW (1986), ASRSC (1984), and FWS (1989) (*see Sections 3.2.2., 3.3.1.3., 3.3.2.3., and 4.2.1.2. for further discussion*).

The following is a detailed discussion of the fisheries impacts, and how we reached our conclusions described above.

PROJECT OPERATION AND DOWNSTREAM FLOWS

Hackett Mill Hydro's recommended project operation scenario and staff's CASE 5 option (i.e., year-round run-of-river operation) would affect the availability of fisheries habitat in the Little Androscoggin River downstream of Marcal.

Run-of-river operation would minimize reservoir fluctuations and prevent fluctuations in flows downstream of the project that could reduce or alter available aquatic habitat. As discussed in Sections 4.1.1.3. and 4.1.2.3., flow fluctuations could reduce spawning success and strand fish and invertebrates, subjecting them to desiccation and predation from terrestrial predators. Further, if flows from the project fluctuated widely, benthic organisms, fish eggs, and larvae could be swept downstream (Rochester et al., 1984).

Based on our analysis of the run-of-river alternative, operating Marcal in this mode would protect aquatic resources and water quality in the project area by maintaining a constant flow regime below the project and by preventing the dewatering of aquatic habitat. Further, operating the project in a run-of-river mode would minimize fluctuations in the impoundment's water surface elevation and would also benefit fish and wildlife habitat in the impoundment created by the Marcal dam.

BYPASS MINIMUM FLOWS

Interior recommends that an instantaneous flow of 56 cfs, or inflow, whichever is less, be released from the project dam on a year-round basis. Interior's recommended flow is equivalent to Consolidated Hydro's proposed project minimum flow, but would be released from the project dam rather than from the project powerhouse.

As a basis for this recommendation, Interior states that the 56 cfs minimum flow is equivalent to the historical, unregulated, median August flow in the Little Androscoggin River, and is consistent with minimum flow requirements at other projects in the drainage (i.e., Upper Barkers Mill). Interior further states that a year-round minimum flow is needed to maintain habitat throughout the year in the bypassed reach, as well as, to sustain invertebrates, small fishes, and other aquatic life throughout the winter. Year-round flows would also be needed to maintain Atlantic salmon, potential inhabitants of the bypassed reach, once this species is restored to the river.

As described in Section 4.1.2.3., Consolidated Hydro assessed aquatic habitat and flow in the bypassed reach using the IFIM model and the wetted perimeter method to determine the effects of the existing and proposed minimum flows in the bypassed reach. We utilized the results of the bypass minimum flow study to assess Interior's recommended flow and staff's alternative flow scenario of 10 cfs.

The results of the flow assessment indicate that the optimal flow for a stocked brook trout fishery, assuming the presence of primarily adults, would be 56 cfs (*see Figure 4-15*). However, the study indicates that while Interior's recommended minimum flow of 56 cfs would be optimum, the differences between 56 cfs and 20 cfs are relatively small. Adult habitat in the bypassed reach is reduced by 26 percent (1,048 ft^2) at 20 cfs. While overall habitat in the bypassed reach declines, there is a slight gain in WUA for adult brook trout within the riffle section of this reach at flows between 20 cfs and 56 cfs. We also note that riffle habitat is relatively limiting in the lower portions of the Little Androscoggin River. If we consider the 10 cfs alternative, adult habitat is reduced by 40 percent (2,633 ft^2).

For resident smallmouth bass, the optimal flow would be about 56 cfs (*see Figure 4-16*). Like the brook trout, however, the study indicates that smallmouth bass habitat remains very good at 20 cfs. Fry habitat in the bypass reach is reduced by only eight percent, or 655 ft^2. A minimum flow of 10 cfs would result in a 17 percent, or 1,462 ft^2, decline in fry habitat. At 20 cfs, juvenile habitat in the bypassed reach is reduced by 27 percent (2,448 ft^2), while juvenile habitat at 10 cfs is reduced by nearly 50 percent of optimum. When compared to optimum, adult smallmouth bass habitat in the bypassed reach is reduced by 19 percent (154 ft^2) at 20 cfs and 34 percent (281 ft^2) at 10 cfs.

In addition to the habitat vs. flow relationships predicted by the IFIM model, wetted area is also a useful method to qualitatively look at habitat vs. flow. Due to the predominantly ledge substrate, slope, relatively turbulent hydraulics, and scarcity of velocity refuges, useable habitat within the bypassed reach is very limited, regardless of flow. At Interior's recommended flow of 56 cfs, only three percent to 26 percent of the wetted area in the bypass reach, depending upon habitat type, is useable habitat for the evaluation species. At 10 cfs, the amount of wetted area in the bypassed reach that would be suitable habitat is significantly less.

In the above discussion, we describe the benefits to aquatic habitat in the bypassed reach under several minimum flow proposals, including a year-round 20-cfs minimum bypass flow. Staff's CASE 5 option would also require Consolidated Hydro to operate Marcal in a year-round run-of-river mode. Therefore, the CASE 5 option would not only provide the benefits of a year-round minimum bypass flow, but would provide additional flow to the bypassed reach in the form of periodic spill flows due to the run-of-river operation. This may provide additional short-term benefits to fisheries and aquatic habitat, depending upon the magnitude of the additional flow.

Consolidated Hydro states that the bypassed reach contains little, if any, overwintering habitat for either brook trout or smallmouth bass, and that a bypass flow during the winter would not likely serve any significant purpose relative to protecting aquatic habitat. While we generally agree with Consolidated Hydro's conclusions, we also note that the large pool below the project dam, at a minimum, may provide suitable overwintering habitat primarily for brook trout.

In determining a minimum flow regime to protect fish resources within the affected reach, limiting factors that vary seasonally must be considered. For both brook trout and smallmouth bass, temperature is considered to be a significant limiting factor (Raleigh, 1982; Edwards *et al.*, 1983). Consolidated Hydro collected periodic temperature data in the bypassed reach during July, 1992. The observed values are within the tolerance ranges for both brook trout and smallmouth bass, although at the upper end of the range for brook trout.[35]

Brook trout and smallmouth bass occupy different habitat areas in the winter than they do during the rest of the year. During these periods they typically move to areas of deep, low-velocity water (pools, backwaters, etc.) to overwinter (Raleigh, 1982; Edwards *et al.*, 1983; Sheehan *et al.*, 1990). Lentic, or low-velocity, habitats generally provide significant benefits to fish, because pool/backwater areas effectively shorten the winter and provide a non-flowing, warmer habitat in comparison to free-flowing river channels. The project's bypass reach contains very little of this type of habitat, which is primarily limited to a single large pool below the base of the project dam. For this reason, we expect both the brook trout and smallmouth bass to leave the bypassed reach from November through March in response to cooler water temperatures to overwinter in the Hackett Mills impoundment. We also note that: (1) the low winter water temperatures would reduce the metabolic demands and corresponding activity levels of aquatic organisms; and (2) elevated flows naturally occur from March through May, which would provide fish and other aquatic organisms access to the bypassed reach during this period. Therefore, elevated flow releases to enhance aquatic habitat in the bypassed reach, beyond 20 cfs, would not be warranted from November through June.

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[35] During the two day study period, temperature varied temporally from 64.4°F to 78.8°F. The limited sampling also suggests that the average daily maximum temperature may be as high as 77.0°F. The upper lethal temperatures for brook trout and smallmouth bass are 78.8°F and 89.6°F, respectively.

Resolution of the bypass minimum flow issue

In its Section 10(j) letter dated February 22, 1996, and during the Section 10(j) meeting, FWS disagreed with our assessment of the bypass minimum flow issue at Marcal. FWS re-stated its position regarding the need for a year-round 56-cfs minimum flow in the bypassed reach, but provided little additional evidence to substantiate its position; FWS described habitat needs for Atlantic salmon, which was not a species considered during the minimum flow study.

During the Section 10(j) meeting, Commission staff, FWS, and Consolidated Hydro discussed different avenues to resolving the bypass flow issue, but did not find any common ground on the specific flow requirements. Given the lack of any substantial evidence, we believe FWS's recommendations pertaining to bypass minimum flows at Marcal are not warranted at this time.

Commission staff, at the Section 10(j) meeting, stated that unless Consolidated Hydro and FWS could resolve the issue (*see Section 5.5.2.*), we would recommend a year-round bypass minimum flow of 20 cfs with a re-opener clause[36] to reassess the bypass flow requirements when Atlantic salmon are restored to the Little Androscoggin River Basin.

By letter dated June 17, 1996, Consolidated Hydro stated that they and the resource agencies, including FWS, were unable to reach agreement on the minimum flow requirements for the project's bypassed reach. However, as an alternative to the staff's suggestion that a re-opener clause be included in the project's license, Consolidated Hydro, FWS, MDMR, and MDIFW agreed to the following conditions:

(1) Every five years, the licensee shall file with the Commission a report which summarizes the status of anadromous fish restoration efforts in the lower Androscoggin and Little Androscoggin River Basins. The report will be prepared in consultation with FWS, MDMR, and MDIFW, and will include: (a) a summary of the number of anadromous fish passed upstream at facilities downstream of the project (including Atlantic salmon, American shad, alewives, and blueback herring); (b) a summary of the numbers of anadromous fish species trapped and trucked to areas within the Little Androscoggin River Basin; and (c) an assessment of fish passage facility needs at the Marcal Project.

(2) If, as a result of an anadromous fishery report prepared pursuant to the above condition, it is concluded that significant numbers of juvenile Atlantic salmon are utilizing the Marcal Project area, the licensee shall conduct a study to reassess the bypass-reach minimum flow relative to the salmon's habitat requirements, and shall

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[36] We will recommend that any license issued include an article concerning the bypass minimum flow which would reserve the Commission's authority to require changes to the bypass minimum flow should such a need be shown during the license term for the project.

file a report with the Commission. The study shall be conducted in consultation with FWS, MDMR, and MDIFW. If the conclusions of the study indicate that the bypass reach flow should be modified to suit juvenile Atlantic salmon, then the licensee shall file an amendment application with the Commission.

We generally agree with the provisions of these conditions, as the provisions appear to contemplate a reasonable and appropriate approach to re-opening the project's license in order to reassess future flow needs in the project's bypassed reach. Therefore, we recommend these provisions be included as license requirements for the Marcal Project. In addition to the above provisions, we believe it is important to establish the criteria that will be used to determine when the bypass flow should be reassessed in the future; this is unclear in the above conditions. As alluded in condition #2, we believe a trigger number of juvenile salmon, or some other reasonable mechanism, should be included as part of the anadromous fishery report.

The bypass minimum flow issue, including our recommendation, is further discussed in Sections 5.4. and 5.5.2., as bypass flows would affect other resource areas, as well as involve an significant economic cost.

FISH PASSAGE

Interior filed fish passage conditions pursuant to Section 18 of the FPA. Interior requests that the licensee ensure that the design, location, installation (including scheduling), maintenance, and operation of fishways at the project conform to the specifications of the FWS. Further, Interior requests that the Secretary of Interior's authority to prescribe the construction, operation, and maintenance of fishways be reserved.

As discussed in Section 4.2.1.2., Section 18 of the FPA provides the Secretary of the Interior the authority to prescribe fishways. 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 Interior, it is appropriate for the Commission to reserve Interior's authority to prescribe fishways.

While Interior submitted fish passage conditions for Marcal, Interior did not provide any specifics regarding the fishways. However, Interior did comment on several aspects relative to fish passage at Marcal,[37] including: (1) functional design plans and schedules for constructing permanent upstream and downstream fish passage facilities; (2) operation and maintenance plans for the fishways; (3) fishway effectiveness studies; and (4) interim downstream fish passage measures.

[37] Comments pursuant to the Commission's notice ready for environmental analysis issued August 25, 1994.

In Section 4.1.2.3., we discussed Consolidated Hydro's conceptual plans for the proposed downstream fish passage facility. We concluded that the proposed design has been shown to be an effective means of passing downstream migrating fish at hydroelectric generating stations, and that the final fishway designs for downstream passage are not needed at this time. We consider the development of a final design for such facilities to be an appropriate post-licensing activity.

In the DEIS we requested that Interior (i.e., FWS) further clarify their Section 18 fishway prescription as it pertains to downstream fish passage facilities at Marcal. FWS, using their design criteria as a basis, reviewed Consolidated Hydro's proposed downstream fish passage facilities for Marcal. FWS identified several modifications to the downstream passage plan presented in the license application for Marcal. The potential modifications include: (1) reducing the trashrack spacing from 1.625 inches to 1.0 inch by installing an overlay screen over the existing trashracks to minimize entrainment of downstream migrants; (2) relocating the bypass entrance closer to the end of the trashrack to improve the efficiency of the facilities to pass fish; (3) increasing the attraction flow from 20 cfs to 40 cfs (three-foot depth at the 30-inch width) to create a suitable flow field between the trashrack and the bypass, with the final attraction flow requirements being determined by post-licensing effectiveness studies; (4) installing a trash boom upstream of the forebay canal to help minimize maintenance problems at the bypass; and (5) increasing the diameter of the bypass pipe from 24 inches to 36 inches or utilize an open flume, to accommodate sluicing of debris and handling additional attraction flow.

Based on our review of Consolidated Hydro's proposed facilities and FWS's fish passage design criteria, we believe that the above modifications, if deemed necessary, appear to be reasonable, and would improve the effectiveness of downstream fish passage facilities installed at Marcal. We further believe that any such design modifications can be addressed through post-licensing consultation between Consolidated Hydro and FWS, which we would recommend the Commission require in order to develop the final plans and designs for downstream fish passage at Marcal.

Relative to Interior's comments on operation and maintenance plans, Consolidated Hydro states that operational monitoring and maintenance of the fish bypass facility would be performed on a schedule that coincides with monitoring the hydro facility, which would be at least once per day. Operational monitoring and maintenance is an important function to ensure the efficient operation of any fish passage facility. Therefore, we support the need for such plans for any fish passage facility constructed at Marcal, and conclude that provisions for operational monitoring and maintaining any fish passage facility constructed at Marcal should be included in the final design plans developed in consultation with the agencies.

In response to Interior's comments regarding fish passage effectiveness studies, we note that monitoring is important to evaluating the effectiveness of a particular passage facility. Consolidated Hydro objects to such a recommendation on the grounds that the final

downstream passage facility will be constructed according to agency criteria. We disagree with this argument on the basis that passage effectiveness is site specific, and that designing passage facilities according to agency criteria may not always result in the most effective means of transporting fish downstream. We also note that effectiveness monitoring is typically required by the Commission for fish passage facilities installed at projects under the Commission's jurisdiction (eg., Brunswick, Pejebscot, Worumbo, and Hackett Mills). Therefore, in keeping with this reasoning, we support the need for studies to evaluate the effectiveness of any fish passage facility constructed at Marcal.

Interior, in commenting on the license application, concurs with Consolidated Hydro's downstream fish passage facility schedule for Marcal; Consolidated Hydro proposes to construct, and have in operation, the permanent downstream fish passage facility within two years of license issuance. However, Interior indicates that delaying construction of permanent downstream fish passage would result in continued adverse effects to fish migrating downstream past the project. Therefore, Interior recommends development of interim downstream fish passage measures.

Safe downstream passage is critical to the success of the Lower Androscoggin River Basin's anadromous fish restoration program. Alewife and American shad are currently being stocked at sites within the Little Androscoggin Sub-Basin, particularly areas upstream of Marcal. While we cannot quantify the level of benefit, interim downstream passage measures would improve passage of fish migrating downstream past the project, while permanent facilities are being constructed. Data presented by Francfort *et al.* (1994) support the conclusion that downstream fish passage can significantly reduce turbine-related mortality for downstream migrants. We conclude that Consolidated Hydro should make every effort to provide a safe passage route for downstream migrants during the period permanent downstream facilities are being constructed. We encourage the licensee and resource agencies to explore reasonable alternatives in this regard. Any such measures should be included as part of the final fish passage plan developed for Marcal.

Relative to upstream fish passage at Marcal, Interior commented that upstream passage facilities are needed at Marcal, but would likely not be required until after the need for upstream facilities have been addressed at the first three dams on the Little Androscoggin River (i.e., Lower Barkers Mill, Upper Barkers Mill, and Hackett Mills).

Preliminary discussions have been held between resource agencies and Consolidated Hydro regarding the need for upstream fish passage at Marcal and on the Little Androscoggin River, but no formal fish passage plan or proposal exists at present. The potential measures discussed have included: (1) an interim measure, which would involve increasing trap-and-truck operations from the existing trap-and-truck facility at Brunswick on the Androscoggin River; and (2) a future measure consisting of constructing a trap-and-truck facility at Consolidated Hydro's Lower Barkers Mill Project. The facility located at Lower Barkers Mill would be used to stock impoundments, lakes, and ponds in the Little Androscoggin River Sub-Basin. The purpose of the trap-and-truck facility would be to

improve passage efficiency past the dams upstream from Lower Barkers Mill, including Marcal.

As discussed in Section 3.2.2., upstream fish passage facilities exist at the first three mainstem projects on the Androscoggin River. Upstream migrants are currently trapped and trucked to upstream river reaches, including the Little Androscoggin River, from the Brunswick Fishway. The trap-and-truck operation has proven to be very efficient in providing access to the lower Androscoggin River below Lewiston (Flagg *et al.*, 1994). For example, of the 5,051 alewife counted at the Brunswick fishway and subsequently stocked in the Lower Androscoggin River Basin in 1993, only four mortalities occurred prior to release.

For fish passage on the Little Androscoggin River, we do not have sufficient information at present, nor have the parties developed a formal plan, to analyze and compare the advantages and disadvantages of trap-and-truck around upstream projects versus providing site-specific passage at each facility. Generally, the agencies and Consolidated Hydro agree that a trap-and-truck program would be the most suitable method for restoring anadromous fish to the Little Androscoggin River Sub-Basin, because most of the impoundments, lakes, and ponds where migrants are stocked are controlled by outlet dams, including two publicly owned dams upstream from Marcal in Oxford and South Paris (Consolidated Hydro, 1994c). Consequently, the resource agencies and Consolidated Hydro concluded that installing passage facilities at the first four mainstem dams on the Little Androscoggin, including Marcal, would not be effective in restoring anadromous fish, unless facilities were also installed at the other dams in the basin. We believe that funding a trap-and-truck program on the Little Androscoggin River would need to be a shared venture between the two hydro owners on the river; Consolidated Hydro and Hackett Mill Hydro.

We agree with Consolidated Hydro's and the resource agencies' assessment of the fish passage issue. Trap-and-truck, either as an interim or permanent measure, can be a cost-effective measure for providing passage around multiple dams, as is the case on the Little Androscoggin River. We also note that trap-and-truck programs are part of numerous river fisheries management plans, and have been operating at, and are currently operating on, sites in the Connecticut, Merrimack, and Saco River Basins (Stolte, 1982; Merrimack River Policy and Technical Committees, 1988; FWS *et al.*, 1987).

While we agree with the need for upstream fish passage on the Little Androscoggin River, we believe that developing functional design plans for upstream fish passage at Marcal would be premature at this time, and therefore not warranted. To facilitate the development of a fish passage plan for the Little Androscoggin River, Consolidated Hydro and the resource agencies agree that the agencies would produce an anadromous fish restoration and management plan for the Little Androscoggin River Sub-Basin before any further discussions relative to upstream passage take place (Consolidated Hydro, 1994c). We agree with this approach. Development of a fish passage plan for the Little Androscoggin River would provide valuable guidance to Consolidated Hydro, Hackett Mill Hydro, and the resource agencies regarding the adequacy of existing fish management measures and facilities, and the

need for any future passage measures to restore anadromous species (i.e., Atlantic salmon, alewife, and American shad) to the Lower Androscoggin River Basin. In addition, we assume that any prescription by Interior or recommendation by the state would be dependent on the development of a anadromous fish restoration plan for the Little Androscoggin River.

4.2.2.3. Vegetation and wildlife resources

IMPOUNDMENT FLUCTUATIONS

Interior recommends impoundment fluctuations similar to those proposed by Consolidated Hydro. The staff's alternatives (CASES 6-8) also include similar water level fluctuations to those proposed by Consolidated Hydro (*see Section 4.1.2.2.*).

By letter dated October 14, 1994, Hackett Mill Hydro recommends that Marcal operate in a run-of-river mode year-round (George H. Gardner, Vice President - Operations, Synergics, Inc., Annapolis, Maryland). Hackett Mill Hydro's recommendation, as well as staff's CASE 5 option, would provide natural river flows in the Little Androscoggin River below Marcal. This would maximize the potential for development of riparian habitat below the project, because it would eliminate any fluctuations as a result of Consolidated Hydro's peaking activity. However, because Consolidated Hydro proposes to limit the impoundment fluctuations to one foot from June 1 to October 15, the benefits resulting from changing project operations from the current modified run-of-river/storage-and-release mode of operation to a year-round run-of-river mode of operation would be minor. Project operations and impoundment fluctuations are further discussed in Section 5.4.

MINIMUM FLOWS

We analyzed several recommendations and scenarios regarding the operation of Marcal, including those alternatives recommended by Hackett Mill Hydro, Interior, and staff (*see Table 2-4*). Hackett Mill Hydro's recommendation, and staff's CASE 5 option, would ensure that natural river flows are maintained in the Little Androscoggin River.

Section 4.1.2.4. discusses the potential effect on wetland vegetation and associated wildlife related to Interior's recommendation for a minimum bypass flow and the staff's alternatives (CASES 6-8). The level of impact, and type of impact, would be dependent on the quantity and timing of the flow releases. Higher minimum flows, or more consistent minimum flows would probably increase wetland vegetation and enhance wildlife; while lower minimum flows either seasonal or year-round could potentially result in reduced benefits over the existing conditions. Section 5.4. contains further discussion on flow regimes for Marcal's bypassed reach.

BUFFER ZONES

Interior recommends that Consolidated Hydro should: (1) file, within three months of issuance of a new license for the Marcal Project, for Commission approval a plan for providing buffer strips and other appropriate shoreline protection measures in the project area; (2) consult with FWS and MDIFW in developing this plan, and respond to agency comments, including their correspondence, in the filing; and (3) provide the resource agencies a minimum of 30 days to respond to a draft plan before it is filed for Commission approval.

We acknowledge that buffer strips would protect wetlands and associated wildlife around the Marcal impoundment as suggested by Interior. However, Consolidated Hydro has not proposed any changes in land use, nor has there been any information filed to indicate that the project shoreline is proposed for either commercial or economic development. Therefore, the need for buffer strips or any other shoreline protection measures in the project area may not be warranted at this time, given what we believe to be significant costs to establish such protection measures in the project area. Section 5.4. contains further discussion on the merits of a buffer zone around the Marcal impoundment.

4.2.2.4. Recreation resources

No agencies, or other interested parties, have recommended any specific measures relative to recreational facilities at Marcal. However, Interior recommends that Consolidated Hydro develop and implement at plan to monitor recreational use in the project area.

Interior recommends that Consolidated Hydro, in consultation with FWS, NPS, MDIFW, MDOC, MDMR, and the Maine ASRSC, periodically monitor recreational use of the project area to determine whether existing access facilities are meeting demands for public use of fish and wildlife resources.

See Section 4.2.1.4. for a discussion on recreation monitoring studies. Our recommendations regarding the need for recreation-use monitoring are the same.

4.2.2.5. Other resources

HISTORICAL PROPERTIES AND ARCHEOLOGICAL RESOURCES

We would expect that operating Marcal in a run-of-river mode, as recommended by Hackett Mill Hydro, to have no affect on downstream shoreline conditions or properties listed on or eligible for listing on the National Register.

AIR QUALITY

Besides economic benefits, the hydropower projects on the Little Androscoggin River provide air pollution reduction benefits by displacing generation from fossil-fueled generating stations, among other alternative sources. Hydropower generation produces no atmospheric pollution and, therefore, is a clean, renewable source of power.

Consolidated Hydro, Interior, and Hackett Mill Hydro propose various environmental enhancement measures for Marcal, such as various minimum flow regimes, impoundment fluctuation restrictions, and flows to operate the proposed downstream fish passage facility, that would reduce the amount of generation at the projects on the Little Androscoggin River, including Marcal.

We, based on our own analysis of Consolidated Hydro's proposals and Interior's recommendations, estimate that the total annual generation of the four projects on the Little Androscoggin River would decrease from the baseline generation of about 20.4 GWh to about 19.7 GWh under Consolidated Hydro's proposed operations -- a reduction of 0.7 GWh (about three percent) -- and to about 18.9 GWh -- a reduction of about 1.5 GWh (about seven percent) under Interior's operational recommendations. Total generation under Hackett Mill Hydro's recommendation for run-of-river operation would be similar to total generation under Consolidated Hydro's proposal.

As discussed in Section 4.2.1.5., for the Maine service area, it is highly probable that the replacement energy would have to be generated by oil-fired facilities. This would result in increased consumption of fossil fuel; and the combustion of this increment would result in increased production of atmospheric pollutants.

Using the approximations and the estimated generated energy reductions for the projects on the Little Androscoggin River, we estimate that 1,200 and 2,540 barrels of oil would be required annually to produce 0.7 GWh and 1.5 GWh of oil-fired electric energy, respectively. We then calculated the amount of pollutants that would likely be released into the atmosphere from the associated energy reductions at the projects on the Little Androscoggin River. We estimate that about 2.3 additional tons of oxides of sulfur and about 2.0 additional tons of oxides of nitrogen would be produced annually under Consolidated Hydro's proposal and Hackett Mill Hydro's recommended operations. With Interior's proposal, we estimate that about 5.1 additional tons of oxides of sulfur and about 4.0 additional tons of oxides of nitrogen would be produced annually.

Continued operation of the projects on the Little Androscoggin River, including Marcal, also would keep additional pollutants from being released into the atmosphere. These pollutants would adversely affect air quality in the region, although not necessarily in the immediate vicinity of the projects. Table 4-6, in Section 4.2.1.5, shows the specific pollution abatement benefits derived for operating the Little Androscoggin River projects; in this case under the alternative operational regimes for Marcal.

The total benefits of hydroelectric generation in the Lower Androscoggin River Basin, including the projects on the Little Androscoggin River are described in Section 4.2.1.5.

4.3. No-Action alternative

4.3.1. Gulf Island-Deer Rips

The no-action alternative reflects the continuation of current project operation, with no change in the existing environment at Gulf Island-Deer Rips (*described in Section 3.0.*), and assumes that Central Maine could eliminate the voluntary enhancement measures relating to minimum flows, DO, recreation, and other resources that they have implemented at the project independent of the licensing process.

The project would continue to operate under the same terms and conditions of the previous license, and there would be continued energy production. Central Maine would not be able to increase energy production and not be required to provide any additional environmental measures to enhance natural and cultural resource values.

Flow fluctuations ranging from 1,000 cfs to 5,120 cfs at Gulf Island-Deer Rips would continue to occur below the Deer Rips dam. These fluctuations could continue to result in occasional dewatering of habitat and stranding of some aquatic organisms as flows drop from generation flow levels to minimum flow levels. The effect of the fluctuations on wildlife resources is not known. Water level fluctuations would continue to create a range of foraging conditions for both predatory and scavenging birds and mammals that feed in the shallows, utilizing optimum foraging conditions when they do exist.

Under this scenario, Central Maine could continue to release a minimum flow of 1,000 cfs to the Androscoggin River below the project. This flow level would continue to provide less than optimal aquatic habitat for fish and other aquatic organisms.

Fish passage facilities would not be required and upstream fish passage would continue to be blocked by the Gulf Island and Deer Rips dams.

With the no-action alternative, recreational improvements would not be required, and the existing recreation facilities would remain as they presently exist. Likewise, cultural resource protection measures would not be required. Further, aesthetic quality may be affected by continued project operation under present conditions, particularly during times of low inflow (i.e., typically the summer months). During periods of low inflow, exposed mud flats may visually detract from the shoreline appearance.

Regarding shoreline protection, further development (i.e., campgrounds, recreational homes, etc.) around the Gulf Island impoundment may adversely affect wildlife species, recreation, and the aesthetic quality of the shoreline. Existing impoundment fluctuations, combined with flood events, could potentially continue to affect shoreline erosion.

4.3.2. Marcal

Under the no-action alternative, Consolidated Hydro would continue to operate Marcal as a seasonal run-of-river/storage-and-release facility. The project would probably have the same effect on the environment as it does in its current operating state, and Consolidated Hydro would not be required to provide measures to enhance the existing resources. The existing daily impoundment fluctuations in the Marcal impoundment would continue to occur, potentially affecting fish and wildlife resources in the project's impoundment adversely, particularly spawning habitat for various fish species. The potential impacts would be similar to those described in Section 4.3.1.

In addition to the impoundment fluctuation effects, the project would continue to operate with flow fluctuations below the project's tailrace ranging from leakage to about 560 cfs. The effects of flow fluctuations below the project on fish and wildlife resources would be the same as those described in Section 4.3.1., but would be commensurate with the level of flow in the Little Androscoggin River. Under this scenario, Consolidated Hydro would continue to provide no enhancement, in the form of a minimum flow release, to the project's bypassed reach, which would continue to have a significant adverse affect on aquatic habitat in the bypassed reach.

Fish passage facilities would not be required and upstream fish passage would continue to be blocked by the Marcal dam. Thus, access to potentially available anadromous fish habitat above the project would be denied. Downstream fish passage from any upstream stockings would be accomplished via spillage over the project's dam.

Under this scenario, recreational improvements would not be required, and the existing recreation facilities and opportunities would remain as they presently exist. The specific impacts of continuing to operate Marcal in its present state, with respects to recreation, aesthetic quality, shoreline erosion, and shoreline protection would be similar to those described in Section 4.1.3.

4.4. Relationship to Laws and Policies

NEPA[38] mandates the preparation of an EIS for all federal actions significantly affecting the quality of the human environment. We have determined that issuance of a new license for the Gulf Island-Deer Rips Project and an original license for the Marcal Project are actions that fall within this NEPA mandate.

Section 10(a) of the FPA[39] requires that each licensed project be best adapted to a comprehensive plan for improving or developing a waterway for, among others, beneficial

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[38] 42 U.S.C. §§4332 *et seq.*

[39] 16 U.S.C. §803(a).

public uses including recreational purposes. The Commission, therefore, requires that each license applicant consult with the concerned federal, state, and local recreation agencies to determine an appropriate level of development to help meet the recreational needs of the area.

The Commission, the SHPO, and the Council executed a Programmatic Agreement on October 27, 1993, for protecting historic properties affected by ten of Central Maine's new licensed projects, including Gulf Island-Deer Rips. The Programmatic Agreement would satisfy all of the Commission's obligations under Section 106 of the National Historic Preservation Act (NHPA). For Marcal, the Commission, after consulting with the SHPO under Section 106 of the NHPA, determined that the project would not affect any historic properties.

Per the Fish and Wildlife Coordination Act[40], the Commission must consult with the FWS and the MDIFW on preventing loss or damage to fish and wildlife resources and on developing and improving water resources.

Consistent with the requirements of the Endangered Species Act[41], the Commission requires applicants for license to submit a list of federally listed or proposed threatened or endangered species and critical habitats occurring in the vicinity of projects. Interior states that except for occasional transient individuals, no federally listed or proposed endangered or threatened species are known to exist in the projects' impact area. Therefore, no biological assessment or further consultation under the Endangered Species Act is required (letters from Willie K. Taylor, Acting Director, Office of Environmental Policy and Compliance, U.S. Department of the Interior, Washington, D.C., December 15, 1993, and Andrew L. Raddant, Acting Regional Environmental Officer, Office of Environmental Policy and Compliance, U.S. Department of the Interior, Boston, Massachusetts, October 7, 1994).

Where it concerns threatened and endangered species, MDMR (letter from E. Penn Eastbrook, Deputy Commissioner, Maine Department of Marine Resources, Augusta, Maine, May 17, 1994) stated that the Androscoggin River below Brunswick supports a large spawning population of the federally endangered shortnose sturgeon (*see Sections 3.2.2. and 4.1.1.5. for discussion of impacts*). Pursuant to Section 7 of the ESA, NMFS concurred with staff's recommendations and findings in the DEIS, and determined that relicensing Gulf Island-Deer Rips is not likely to have an adverse effect on shortnose sturgeon (January 29, 1996 letter from Dr. Andrew A. Rosenburg, National Marine Fisheries Service, Gloucester, Massachusetts).

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[40] 16 U.S.C. §§661 *et seq.*

[41] 16 U.S.C. §1531, as amended.

Commission regulations require applicants to obtain, under Section 401 of the Clean Water Act[42], either (a) state certification that any discharge from the project would comply with applicable provisions of the Clean Water Act or (b) a waiver of certification by the appropriate state agency. The Commission requires that applicants apply for such certification or waiver before they file their application with the Commission. Central Maine and Consolidated Hydro applied for WQCs for Gulf Island-Deer Rips and Marcal on November 27, 1991 and May 25, 1994, respectively. Central Maine subsequently withdrew and refiled the requests on November 24, 1992, November 24, 1993, November 16, 1994, and November 16, 1995. Consolidated Hydro subsequently withdrew and refiled their requests on May 24, 1995 and May 24, 1996. MDEP is currently reviewing Central Maine's and Consolidated Hydro's requests.

Maine has regulations to maintain water quality standards in the lower Androscoggin River and the Little Androscoggin River. In addition, the Clean Water Act has anti-degradation policies, which are to prevent degradation of waters that meet or exceed the standards. The mechanism by which the state enforces the anti-degradation policy for hydropower projects is water quality certification. In the WQC the state specifies requirements for project operation that it feels are sufficient to maintain adequate water quality.[43]

The State of Maine participates in the Coastal Zone Management Program. Under the CZMA of 1972, before the Commission can issue a license or license exemption, the MSPO must either find the project consistent with the Coastal Management Program or waive the requirements by failing to act in a timely manner. MSPO has provided no specific comments regarding the projects' consistency with the Maine Coastal Zone Management Program at this time. Therefore, we conclude the MSPO has waived its right to review the projects' consistency with the Maine Coastal Management Program, under Section 930.54 of the CZMA of 1972, as amended.

4.5. Unavoidable adverse impacts

Even with staff's recommended enhancement measures (*see Section 5.4.*), minor impacts on the environmental resources would likely continue to occur. Minor localized erosion is likely to continue at isolated sites within the Gulf Island and Marcal impoundments regardless of altering project operations and impoundment fluctuations. Minor long-term reductions in DO would continue to occur at depth in the project impoundments, particularly the Gulf Island impoundment (even with the operation of the GIPOP facility), regardless of the project's operations. Short-term, unavoidable impacts from increased dust, noise, heavy equipment traffic, and increased water turbidity would occur during the construction of the

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[42] 33 U.S.C. §1341.

[43] As stated in *Tunbridge Mill Corporation* (68 FERC ¶ 61,078, 1994), under Section 401(d), states may lawfully impose only conditions related to water quality.

downstream fish passage facilities at Marcal. Minor, short-term displacements of plant and wildlife resources would occur due to constructing the proposed recreational facilities at Gulf Island-Deer Rips and Marcal. Relicensing Gulf Island-Deer Rips or licensing Marcal are not likely to adversely affect federally-listed threatened or endangered species or critical habitat.

4.6. Irreversible and irretrievable commitment of resources

Continued operation of the existing Gulf Island-Deer Rips and Marcal Projects would continue to commit the lands and waters previously developed for energy production. Habitat lost or changed due to the construction of the downstream fish passage facilities at Marcal, and development of recreational facilities at both Gulf Island-Deer Rips and Marcal would be reversed in time with proper soil erosion control and revegetation techniques.

4.7. Relationship between short-term uses and long-term productivity

Under our recommended operating alternatives for Gulf Island-Deer Rips and Marcal, the lower Androscoggin River and Little Androscoggin River projects are expected to provide an average of about 589.2 GWH of energy each year to Central Maine's service area. This long-term productivity would extend at least as long as the duration of the licenses. The recommended alternative is designed to avoid long-term decreases in biological productivity of the system.

If the projects were to operate solely to maximize hydroelectric generation, there would be a loss of long-term productivity of the river fisheries and anadromous fisheries restoration efforts due to decreases in habitat availability and loss of upstream and downstream fish passage. With the alternatives recommended and appropriate enhancement or mitigation at each site, the Lower Androscoggin River Basin should still be able to achieve the anadromous fisheries restoration goals established by the agencies and other enhancements to aquatic life.

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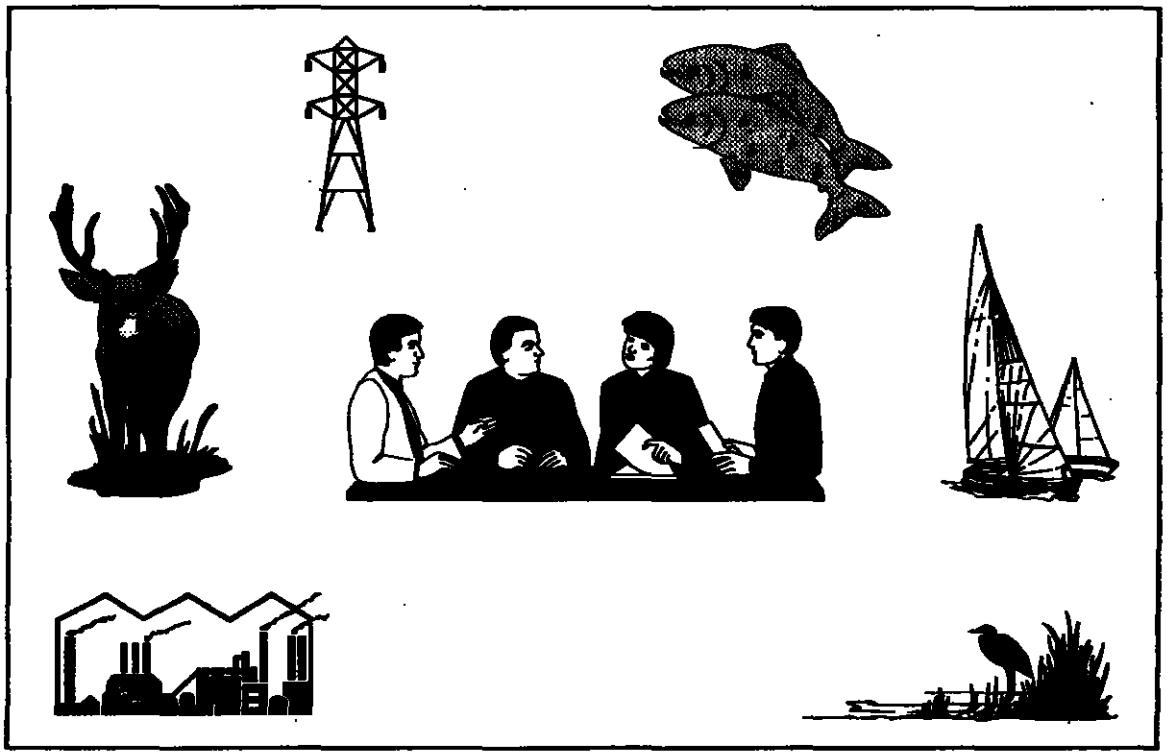
Federal Energy Regulatory Commission

Office of Hydropower Licensing

July 1996

FERC/FEIS - 0100

Final Environmental Impact Statement



Lower Androscoggin River Basin Hydroelectric Projects Maine

(FERC 2283-005, 11482-000)

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5. STAFF'S CONCLUSIONS

This section summarizes the staff's conclusions regarding the issuance of a new license for the Gulf Island-Deer Rips Project and an original license for the unlicensed Marcal Project. Section 5.1 is a summary of the cumulative effects, and the significant environmental effects of the principal alternatives are presented in Section 5.2. Section 5.3 contains an economic evaluation and summary of the alternatives; Section 5.4 deals with the staff's findings and recommendations. The fish and wildlife agency recommendations are discussed in Section 5.5. Section 4.0. contains additional details and the basis for the impacts assessment summary.

For licensing Gulf Island-Deer Rips, the eight principal alternatives evaluated are:

(1) Licensing the project as proposed by Central Maine. The enhancement measures would be those proposed by Central Maine following consultation with the resource agencies (*see Sections 2.2.1.2. and 2.2.1.3. for proposed project operation and enhancement measures*).

(2) Licensing the project as proposed by Central Maine, but supplemented by Interior's recommended enhancement measures (*see Section 2.3.1.2. for recommended enhancement measures*).

(3) Licensing the project as proposed by Central Maine, but supplemented by EPA's recommended enhancement measures (*see Section 2.3.1.2. for recommended enhancement measures*).

(4) Licensing the project as proposed by Central Maine, but supplemented by the Conservation Coalition's recommended enhancement measures (*see Section 2.3.1.2. for recommended enhancement measures*).

(5) Licensing the project as proposed by Central Maine, but supplemented by TU *et al.*'s recommended enhancement measures (*see Section 2.3.1.2. for recommended enhancement measures*).

(6) Licensing the project as proposed by Central Maine, but supplemented by Land Trust *et al.*'s recommended enhancement measures (*see Section 2.3.1.2. for recommended enhancement measures*).

(7) Licensing the project as proposed by Central Maine, but supplemented by staff-recommended enhancement measures (*see Sections 2.3.1.3., 2.7. and 5.4.*).

(8) No action alternative resulting in no change to the existing environment (*as described in Section 3.0.*). The project would continue to operate under the terms and conditions of the existing license.

The no-action alternative would result in no change to the existing environments. The project would continue to operate under the terms and conditions of the existing license. None of the parties have recommended the no-action alternative for Gulf Island-Deer Rips, and adoption of this alternative would forego any enhancement measures Central Maine proposes to provide, in addition to those enhancement measures recommended by federal and state agencies and NGOs.

For licensing Marcal, the four principal alternatives evaluated are:

(1) Licensing the project as proposed by Consolidated Hydro. The enhancement measures would be those proposed by Consolidated Hydro following consultation with the resource agencies (*see Sections 2.2.2.2. and 2.2.2.3. for proposed project operation and enhancement measures*).

(2) Licensing the project as proposed by Consolidated Hydro, but supplemented by Interior's recommended enhancement measures (*see Section 2.3.2.2. for recommended enhancement measures*).

(3) Licensing the project as proposed by Consolidated Hydro, but supplemented by staff-recommended enhancement measures (*see Sections 2.3.2.3., 2.7. and 5.4.*).

(4) No action alternative resulting in no change to the existing environment (*as described in Section 3.0.*). The project would continue to operate as it has in the past, and not be required to provide any measures to enhance natural and cultural resource values.

The no-action alternative would result in no change to the existing environment. The project would continue to operate as it has in the past. None of the parties have recommended the no-action alternative for Marcal, and adoption of this alternative would forego any enhancement measures Consolidated Hydro proposes to provide, in addition to those enhancement measures recommended by Interior.

5.1. Cumulative effects summary

As we defined in Section 1.3.1.1., the scope of our cumulative effects analysis (CEA) for each resource encompassed different geographic areas depending on their distribution. For water quality, the geographic scope of analysis encompasses the mainstem of the Androscoggin River downstream from the Maine-New Hampshire border and the Little Androscoggin River. For fisheries resources, the geographic scope of analysis encompasses the lower Androscoggin River below Gulf Island-Deer Rips and the Little Androscoggin River, including several non-operational storage dams in the Little Androscoggin River Sub-Basin. For wetlands and dependent wildlife resources, the geographic scope of analysis encompasses the mainstem of the lower Androscoggin River below Gulf Island-Deer Rips. For hydroelectric generation the geographic scope of analysis encompasses the lower Androscoggin River below Gulf Island-Deer Rips and the Little Androscoggin River below

Marcal. For the remaining resource areas, we focused our analysis on the specific project areas of Gulf Island-Deer Rips and Marcal.

The temporal scope looked 30 - 50 years into the future, concentrating on resource effects from reasonably foreseeable future actions. As stated in Section 1.3.1.2., the historical discussion of past actions and effects was, by necessity, limited to the amount of available information for each resource.

Table 5-1 summarizes our analysis of the anticipated cumulative effects. Incorporating our enhancement measures as requirements in any new license issued for Gulf Island-Deer Rips or original license issued for Marcal would result in long-term beneficial impacts to water quality, fisheries, and wetlands and dependent wildlife resources of the Lower Androscoggin River Basin, including the Little Androscoggin River.

Table 5-1. Cumulative effects summary for key resources within the lower Androscoggin River and Little Androscoggin River (Source: the Staff).

	Cumulative Effect Resources			
Recommending Entity	Water Quality[1]	Fisheries[2]	Wetland/Wildlife Resources	Hydroelectric Generation
Central Maine	DO levels at Gulf Island-Deer Rips would be monitored as part of the proposed GIPOP partnership. Any additional measures resulting from monitoring might result in minor, cumulative long-term beneficial effects. The minimum flow of 1,100 cfs would provide minor benefits to downstream water quality.	Atlantic salmon restoration above Gulf Island-Deer Rips would continue to be adversely affected. Habitat during migration periods would be slightly improved, resulting in cumulative benefits. However, for American shad, the duration of the most optimum habitat, occuring at generation flows, would be slightly reduced. Brown trout habitat would be improved, resulting in minor, long-term cumulative benefits.	Cumulative beneficial effects on wetlands below Gulf Island-Deer Rips would result from the increased minimum flow release of 1,100 cfs.	Cumulative effects on hydroelectric generation would result from increased minimum flows and reduced impoundment fluctuations; energy would increase by about 10,000 kWh, at a cost of $1,000 annually.
Consolidated Hydro	The proposed minimum flow regime (20 cfs in the project's bypassed reach from May 1 to November 1, and 56 cfs below the project on a year-round basis) would provide moderate to significant cumulative long-term beneficial effects.	Installation of downstream fish passage at Marcal would result in cumulative benefits to anadromous fish restoration efforts. Habitat for resident and anadromous fish would be enhanced, resulting in cumulative benefits.	Not applicable.	Cumulative effects on hydroelectric generation would result from increased minimum flows and reduced impoundment fluctuations; energy would decrease by about 760,000 kWh, at a cost of $16,000 annually.

Table 5-1. (Continued).

	Cumulative Effects Resources			
	Water Quality	Fisheries	Wetland/Wildlife Resources	Hydroelectric Generation
Central Maine's and Consolidated Hydro's proposals w/ Interior's recommendations	At Gulf Island-Deer Rips: Water quality monitoring, except aquatic invertebrates, is the same as Central Maine's proposal. Monitoring aquatic invertebrates would provide cumulative benefits in terms of biological monitoring. The 1,700 cfs minimum flow could potentially provide minor, long-term cumulative benefits. At Marcal, the 56-cfs flow in the bypassed reach would provide minor, additional long-term cumulative benefits.	Interior's flow at Gulf Island-Deer Rips and bypass flow at Marcal would be higher, and habitat availability and duration (especially during the summer months) would result in minor to moderate additional benefits. However, Interior's flows at Gulf Island-Deer Rips and Marcal would provide little additional habitat benefits during the winter/spring. At Marcal, the effects from installing fish passage facilities would be the same as those under Consolidated Hydro's proposal.	Additional downstream flows would provide wetlands enhancement below Gulf Island-Deer Rips. Further, run-of-river, or a one foot impoundment fluctuation limit, may create additional wetlands in the Gulf Island impoundment. However, reducing the flow from run-of-river between May and June to 1,700 cfs for the remainder of the year may have adverse affects on newly-established wetlands. The potential adverse affects are not expected to be offset by enhancements.	Cumulative effects on hydroelectric generation would result from increased minimum flows and reduced impoundment fluctuations. On the Lower Androscoggin River, energy would increase by about 420,000 KWh, at a cost of $62,000 annually. On the Little Androscoggin River, energy would decrease by about 1,560,000 kWh, at a cost of $34,000 annually.
Central Maine's proposal w/ the Conservation Coalition's recommendations	The cumulative effect of studying contaminated sediments and correction actions is not known. Additional measures to enhance DO levels would provide marginal, if any, cumulative beneficial effects. Flows between 1,400 cfs and 1,800 cfs would, at best, provide minor, long-term cumulative benefits.	The effects of flow fluctuations and increased minimum flows would be the same as those under Interior's proposal. However, cumulative benefits would be somewhat reduced with the lower recommended flow of 1,400 cfs.	Similar to Interior's proposal, except a minimum flow as low as 1,400 cfs [*or 1,100 cfs*] would result in additional adverse affects on wetlands below Gulf Island-Deer Rips.	Cumulative effects on hydroelectric generation would result from increased minimum flows and reduced impoundment fluctuations; energy would increase from between 410,000 and 440,000 KWh, at a cost of between $56,000 and $66,000 annually.

Table 5-1. (Continued).

	Cumulative Effects Resources			
	Water Quality	Fisheries	Wetland/Wildlife Resources	Hydroelectric Generation
Staff selected alternative	At Gulf Island-Deer Rips, minor to moderate, long-term cumulative benefits to water quality would occur due to water quality monitoring, the existence and continued operation of the GIPOP facility and the development of an alternatives study, and a minimum flow of 1,700 cfs from May through November and 1,400 cfs from December through April. At Marcal, cumulative, long-term benefits would occur. A project minimum flow of 56 cfs would significantly enhance the assimilative capacity of the river below Marcal when the project is not generating, and a year-round 20 cfs minimum flow would significantly enhance the water quality in the project's bypassed reach.	At Marcal, fish passage effects would be the same as those proposed by Consolidated Hydro and recommended by Interior. Our bypass flow would provide moderate to significant, long-term cumulative benefits, and would not be significantly different from Interior's recommended flow. The proposed 56-cfs project minimum flow would enhance aquatic habitat in free-flowing river reaches downstream from Marcal. At Gulf Island-Deer Rips, beneficial cumulative effects would result from the increase in flows during the major migration periods and low-flow months. Further, staff's flows would provide significant habitat increases below Gulf Island-Deer Rips during the growing season, while protecting aquatic habitat during the winter/spring.	Cumulative beneficial effects on wetlands in, and along, the lower Androscoggin River would occur. A minimum flow of 1,700 cfs from May-November would result in minor to moderate benefits, while reduced flows from December-April would not adversely affect the downstream wetlands. Impoundment wetlands would benefit from a one foot fluctuation limit from May-June, and would not be adversely affected by a four-foot fluctuation from July-April, thereby enhancing impoundment wetlands.	Cumulative effects on hydroelectric generation would result from increased minimum flows and reduced impoundment fluctuations. On the lower Androscoggin River, energy would increase by about 110,000 kWh, at a cost of $19,000 annually. On the Little Androscoggin River, energy would decrease by 970,000 kWh, at a cost of $21,000 annually.

Table 5-1. (Continued).

	Cumulative Effects Resources			
	Water Quality	Fisheries	Wetland/Wildlife Resources	Hydroelectric Generation
No-Action	At Gulf Island-Deer Rips and Marcal, no change in DO levels would occur. Central Maine would continue its partnership in the GIPOP program; the existing level of DO improvement would continue to occur. Metals and other contaminants would not be studied.	Flows for fish habitat, including adequate zone-of-passage flows for anadromous fish, would continue to fluctuate widely at projects below Gulf Island-Deer Rips and Marcal; thus contributing to long-term cumulative adverse effects. At Marcal, installation of fish passage facilities would not occur, adversely affecting anadromous fish restoration efforts.	No change	No change from existing generation of 569,650,000 KWh of energy, with a net economic benefit of -$14,256,000 (mainstem Androscoggin River) and 20,410,000 KWh of energy, with a net economic benefit of -$631,000 (Little Androscoggin River.

[1] The cumulative effects of EPA's and the Land Trust *et al.*'s environmental enhancement recommendations for water quality are similar to those described for the Conservation Coalition's recommendations.

[2] The cumulative effects of TU *et al.*'s, EPA's, and the Land Trust's *et al.*'s environmental enhancement recommendations for resident and anadromous fisheries are similar to those described for Interior's recommendations. In addition to supporting Interior's proposals, TU *et al.* also recommend installation of fish passage facilities at Gulf Island-Deer Rips. Installing fish passage facilities at Gulf Island-Deer Rips would provide long-term cumulative benefits to Atlantic salmon restoration efforts in the Androscoggin River Basin, but would not result in any near-term benefits.

5.2. Comparison of environmental effects of proposed actions and alternatives

5.2.1. Gulf Island-Deer Rips

Table 5-2 provides a summary comparison of the impacts and enhancement measures associated with the Gulf Island-Deer Rips Project under the various alternatives, respectively. The project as it currently exists (no-action alternative) provides the greatest amount of power generation, but results in no environmental enhancements. The project as proposed with our modifications (*see Sections 2.7. and 5.4. for list of recommended measures*) provides a substantial amount of enhancement while providing for the continued generation of electric power.

Table 5-2. Comparative environmental effects of the Gulf Island-Deer Rips Project with Central Maine's proposal, Central Maine's proposal with Interior's recommendations, Central Maine's proposal with the Conservation Coalition's recommendations, Central Maine's proposal with staff's modifications, and the no action alternative (Source: the staff).

Resource	Central Maine's Proposal	Central Maine's proposal with Interior's recommendations	Central Maine's proposal w/ the Conservation Coalition's recom'ds.	Central Maine's proposal with Staff's modifications	No-Action
Water Quality and Quantity					
Project operations and downstream flows[1]	Water quality in free-flowing stretches of the Androscoggin River below the project would be improved. Minor improvements in DO concentrations in downstream reaches would be expected. Overall cumulative beneficial effects would be expected.	Minimizing impoundment fluctuations and preventing downstream flow fluctuations could prevent reductions or alterations of available aquatic habitat and adverse effects on water quality. Aquatic resources and water quality would be maintained by a constant flow regime below the project and by preventing the dewatering of aquatic habitat. Minimizing fluctuations in the impoundment's water surface elevation would also benefit fish and wildlife habitat in the impoundments created by the dams.	Same as Interior's.	Same as Central Maine's and Interior's.	Neither minimum flows would be increased nor impoundment fluctuations decreased.

Table 5-2. (continued).

Resource	Central Maine's proposal	Central Maine's proposal with Interior's recommendations	Central Maine's proposal with the Conservation Coalition's recom'ds.	Central Maine's proposal with Staff's modifications	No-Action
Dissolved Oxygen	DO would be enhanced by continuing to operate GIPOP in accordance to the partnership between Central Maine, Boise-Cascade, International Paper, and James River. DO also would be improved somewhat by the slight increase in minimum flows.	Water velocities in the free-flowing reaches of the river below the Gulf Island-Deer Rips Project would increase and the resulting turbulence would probably improve DO levels to some extent.	Same as Interior's.	Same as Interior's and Central Maine's. Developing an alternatives study plan (for measures other than the GIPOP facility) would provide an additional level of protection and/or enhancement to water quality in the project area and downstream.	No effect
Operational and Flow Monitoring	No effect	A plan for describing the methods of releasing minimum flows and maintaining project operation, and how flows would be maintained below the project when the project impoundment is refilled after operational drawdowns, or after any maintenance and or repairs would provide information to the Commission and appropriate parties.	No effect	Same as Interior's.	No effect

Table 5-2. (continued).

Resource	Central Maine's proposal	Central Maine's proposal with Interior's recommendations	Central Maine's proposal with the Conservation Coalition's recom'ds.	Central Maine's proposal with Staff's alternatives	No-Action
Fisheries					
Project operations and downstream flows[1]	Minor improvements to the migratory pathway for anadromous fish in the lower Androscoggin River would be provided. A slight enhancement of downstream aquatic habitat would occur. Potential effects to the estuary downstream of the projects would be minimized.	The zone of passage below Lewiston Falls would be significantly improved during peak migration periods for migrating alewives, Atlantic salmon, and American shad. The availability of aquatic habitat for adult and juvenile Atlantic salmon during late-spring/early summer, as well as for in-migrating American shad and larval/juvenile shad may be adversely affected.	Same as Interior's.	During the summer and fall periods, with few exceptions, conditions in the lower Androscoggin River would be slightly to significantly improved, especially for adult brown trout. Some adverse affects on habitat availability for anadromous fish may occur.	No enhancement of aquatic habitat. Central Maine could continue to release a minimum flow which would provide less than optimal aquatic habitat for fish and other aquatic organisms.

Table 5-2. (continued).

Resources	Central Maine's proposal	Central Maine's proposal with Interior's recommendations	Central Maine's proposal with the Conservation Coalition's recom'ds.	Central Maine's proposal with Staff's modifications	*No-Action*
Gulf Island impoundment fluctuations[1]	Moderate to significant improvement in the fishery in the Gulf Island impoundment, specifically the blackbass fishery would occur. Minor to moderate benefits to aquatic resources in the lower Androscoggin River would result. Nests and eggs would be protected during the critical spawning and incubation period.	Similar to Central Maine's. However, run-of-river operation from May 1 to June 30 and the additional two-week fluctuation restriction would provide more protection and enhancement to blackbass fry and their nursery habitat, and other aquatic organisms and their habitats. A year-round one foot restriction would likely provide no discernable benefits.	Same as Interior's.	Same as Central Maine's, except the additional two weeks from June 16 to June 30 would provide more protection to blackbass fry and their nursery habitat.	Gulf Island-Deer Rips would continue to operate as an intermittent peaking facility. The existing weekly impoundment fluctuation would continue to occur, but at a more gradual rate. Spawning habitat for numerous fish species would continue to be adversely affected.
Fish passage[3]	No effect	Interior requested reservation of authority to prescribe fishways under Section 18.	No effect	Same as Interior's.	No future provisions for installing fish passage.

Table 5-2. (continued).

Resources	Central Maine's proposal	Central Maine's proposal with Interior's recommendations	Central Maine's proposal with the Conservation Coalition's recom'ds.	Central Maine's proposal with Staff's modifications	No-Action
Vegetation and Wildlife					
Project operations and minimum flow[3]	Upland vegetation and associated wildlife would not be affected. The current level of wetland development would be maintained and possibly enhanced. Minor cumulative benefits to wetlands would occur.	Minor cumulative benefits to wetlands would occur. The enhancement is slightly more beneficial than Central Maine's proposal.	Same as Interior's.	Same as Interior's.	No effect
Recreation and Land Use					
Recreational facilities[4]	Proposal would significantly improve recreational opportunities in the project area and complement the comprehensive plan to improve public use of the lower Androscoggin River. Proposal also would allow greater use of the project lands and facilities.	Same as Central Maine's.	Same as Central Maine's.	Same as Central Maine's.	No additional recreational enhancements.

Table 5-2. (continued).

Resources	Central Maine's proposal	Central Maine's proposal with Interior's recommendatoins	Central Maine's proposal with the Conservation Coalition's recom'ds.	Central Maine's proposal with Staff's modifications	No-Action
Recreation Monitoring studies	Proposal would maintain existing recreational facilities and periodically monitor the need for additional recreation facilities.	Same as Central Maine's.	No additional benefit	Same as Interior's and Central Maine's.	No established opportunity, other than the FERC Form 80, for Central Maine and agencies to evaluate the need for additional facilities.
Shoreland protection[5]	Development and implementation of the land conservation and trail plan would result in additional protection and enhancement of environmental resources within the project boundary.	Same as Central Maine's.	No additional benefit	The comprehensive land management plan would adequately protect shoreline resources, including wildlife and vegetation.	No effect
Cultural					
Historic facilities and archaeological sites	There would be long term benefits from implementing the Programmatic Agreement.	Same as Central Maine's.	Same as Central Maine's.	Same as Central Maine's.	Routine maintenance may affect the historic values of the project facilities and long term adverse effects may occur to archaeological sites due to recreation use or localized erosion.

Table 5-2. (continued).

Resource	Central Maine's proposal	Central Maine's proposal with Interior's recommendations	Central Maine's proposal with the Conservation Coalition's recom'ds.	Central Maine's proposal with Staff's modifications	No-Action
Geology and soils					
Shoreline erosion	Localized shoreline erosion resulting from project operations could continue. However, limiting fluctuation would help to prevent erosion.	Same as Central Maine's, with some minor additional beneficial effects.	Same as Interior's.	Same as Central Maine's.	Without impoundment water level restrictions, drawdowns could cause continued shoreline erosion.

[1] EPA, Land Trust *et al.*, and TU *et al.* had similar recommendations as Interior.

[2] EPA and Land Trust *et al.* had similar recommendations as Interior.

[3] TU *et al.* had similar recommendations as Interior.

[4] Land Trust *et al.* and TU *et al.* had similar recommendations as the Conservation Coalition

[5] Land Trust *et al.* had similar recommendations as the Conservation Coalition

5.2.2. Marcal

Table 5-3 provides a summary comparison of the impacts and enhancement measures associated with the Marcal Project under the various alternatives, respectively. The project as it currently exists (no-action alternative) provides the greatest amount of power generation, but results in no environmental enhancements. The project as proposed with our modifications (*see Sections 2.7. and 5.4. for list of recommended measures*) provides a substantial amount of enhancement while providing for the continued generation of electric power.

Table 5-3. Comparative environmental effects of the Marcal Project with Consolidated Hydro's proposal, Consolidated Hydro's proposal with Interior's recommendations, Consolidated Hydro's proposal with Staff's modifications, and the no-action alternative (Source: the staff).

Resource	Consolidated Hydro's proposal	Consolidated Hydro's proposal with Interior's recommendations	Consolidated Hydro's proposal with Staff's modifications	No-Action
Water Quality and Quantity				
Project operations and minimum flows	The proposed year-round minimum flow would assimilate all licensed discharges for the Mechanic Falls Wastewater Treatment Facility, as well as providing significant benefits to water quality in the Little Androscoggin River. Releasing 20 cfs in the bypassed reach during the summer and fall months would have a beneficial effect on water quality and aquatic habitat in the bypassed reach (such as more permanently wetting areas, decreasing stagnation and retention time, and improving DO levels and temperature).	Same as Consolidated Hydro's.	Similar to Consolidated Hydro's. Our recommended year-round minimum bypass flow of 20 cfs would provide greater protection to aquatic habitat during the winter months.	Neither minimum flows would be increased nor impoundment fluctuations decreased.

Table 5-3. (continued).

Resource	Consolidated Hydro's proposal	Consolidated Hydro's proposal with Interior's recommendation	Consolidated Hydro's proposal with Staff's modifications	No-Action
Operational and flow monitoring	No effect	A plan for describing the methods of releasing minimum flows and maintaining project operation, and how flows would be maintained below the project when the project impoundment is refilled after operational drawdowns, or after any maintenance and or repairs would provide information to the Commission and appropriate parties.	Same as Interior's.	No effect.

Table 5-3. (continued).

Resource	Consolidated Hydro's proposal	Consolidated Hydro's proposal with Interior's recommendations	Consolidated Hydro's proposal with Staff's modifications	No-Action
Fisheries				
Project operations and minimum flows	Downstream migrating fish would be provided safe passage through the Marcal hydro station and an adequate zone-of-passage would be provided below Hackett Mills and Upper and Lower Barkers Mill for migrating alewives, American shad, and Atlantic salmon. Any contribution of Marcal to cumulative effects on anadromous fish passage mortality would be significantly reduced. In addition, availability of resident fish habitat at Marcal and in the downstream free-flowing segments of the river in the critical summer months would be enhanced.	Same as Consolidated Hydro's.	Same as Consolidated Hydro's and Interior's.	No enhancement of aquatic habitat. Consolidated Hydro would continue to fluctuate the impoundment daily, potentially affecting fish and wildlife resources in the project's impoundment adversely, particularly spawning fish habitat.

Table 5-3. (continued).

Resource	Consolidated Hydro's proposal	Consolidated Hydro's proposal with Interior's recommendations	Consolidated Hydro's proposal with Staff's modifications	No-Action
Bypass minimum flows	The proposed flow would nearly maximize the available habitat within the bypassed reach, thereby improving the quality of the fishery over the existing conditions and enhancing the fish stocking efforts of the MDIFW by increasing available habitat.	Minor to moderate additional benefits.	Minor additional benefits (i.e., protecting aquatic habitat and resident fish during the winter months). The amount of aquatic habitat provided by our recommended flow would not significantly vary from the amount habitat provided by Interior's flow.	Consolidated Hydro would continue to provide no minimum flow to the bypassed reach, thus continuing to have an adverse affect on aquatic habitat in the bypassed reach.
Marcal impoundment fluctuation	Restricting drawdowns to 1 foot from May 1 to October 15 would provide moderate to significant benefits to the spawning, rearing, and juvenile habitat of smallmouth and largemouth bass, chain pickerel, as well as enhancing aquatic invertebrate habitat in the Marcal impoundment.	Same as Consolidated Hydro's.	Same as Consolidated Hydro's and Interior's.	No effect.
Fish passage	The proposed downstream fish passage facility would provide significantly improved downstream fish passage and would further the goals and objectives of the lower Androscoggin River's anadromous fish restoration efforts.	Interior did not recommend any fish passage measures at Marcal, but prescribed two conditions for providing fish passage facilities under section 18 of the FPA.	Same as Interior's and Consolidated Hydro's.	No future provisions for installing fish passage.

Table 5-3. (continued).

Resource	Consolidated Hydro's proposal	Consolidated Hydro's proposal with Interior's recommendations	Consolidated Hydro's proposal with Staff's modifications	No-Action
Vegetation and Wildlife				
Project operations and minimum flows	Upland vegetation and associated wildlife would not be affected. The current level of wetland development would be maintained and possibly enhanced. Minor cumulative benefits to wetlands would occur.	Minor cumulative benefits to wetlands would occur, particularly in the project's bypassed reach. The enhancement is slightly more beneficial than Consolidated Hydro's.	Same as Consolidated Hydro's.	No effect
Recreation and Land Use				
Recreation facilities	Proposed recreational facilities would ensure the availability of recreational opportunities offered at Marcal, and would allow greater use of the impoundment for angling and other additional recreational activities.	Similar to Consolidated Hydro's. Monitoring recreational use would provide a mechanism to address future needs regarding recreational facilities at the project.	Same as Consolidated Hydro's and Interior's.	No additional recreational enhancements.
Geology and Soils				
Shoreline erosion	Limiting the drawdown to one foot May 15 to October 15 would have some beneficial effects on shoreline areas.	Same as Consolidated Hydro's.	Same as Consolidated Hydro's and Interior's.	No effect

5.3. Economic evaluation of proposed actions and alternatives

5.3.1. Lower Androscoggin River

As shown in Table 2-1 in Section 2.7, and as discussed in Section 2.7, the five lower Androscoggin River projects[1], under median flow conditions, generate about 569.65 GWh of energy consisting of about 232.79 GWh kWh of on-peak energy and about 336.86 GWh of off-peak energy. Gulf Island-Deer Rips contributes about 189.73 GWh of energy. The power produced by the five lower Androscoggin River projects under existing conditions would be about $14,256,000 more expensive (negative net annual benefits), annually, than generation of the equivalent power from alternative resources.

For convenience of the reader in following the discussion which follows, we are including a copy of Table 2-1 on the next page.

Central Maine proposes to improve two of the generating units at the Gulf Island development. This improvement would increase the development's effective generation flow by about 160 cfs, and the installed capacity by about 4.3 MW. When comparing the existing level of generation of the five lower Androscoggin River projects with the proposed level of generation of the five projects (CASE 2A), the cumulative annual average energy generation would increase by about 17.47 GWh; on-peak energy generation would increase by about 10.22 GWh, while off-peak energy would increase by about 7.25 GWh. The annual value of the project power would cumulatively increase by about $411,000. Based on the cost information provided in the license application (Central Maine, 1991), the annual cost of the units' upgrade would be about $440,000.

For the five lower Androscoggin River projects, the upgrade would cumulatively provide 17.47 GWh of net energy, with a net economic loss of about $29,000 annually (1995 $). The power produced by the five lower Androscoggin River projects under existing conditions, with the units' upgrade at the Gulf Island development, would be about $14,286,000[2] more expensive, annually, than generation of the equivalent power from alternative resources.

Central Maine proposes additional operational and non-operational environmental enhancement measures for Gulf Island-Deer Rips. For the five lower Androscoggin River projects, Central Maine's additional operational enhancement proposals, with the upgraded units in place at the Gulf Island development (CASE 2B), would cumulatively increase the

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[1] Gulf Island-Deer Rips, Lewiston Falls [Monty, Bates, Red Shop, Hill, Bates Lower, Continental, Upper Androscoggin (City of Lewiston's project), and Lower Androscoggin developments], Worumbo, Pejebscot, and Brunswick.

[2] Total net annual benefits = Existing net annual benefits + Incremental net annual benefits: [(-$14,286,000) =($-14,256,000) + (-$29,000)].

Repeat Table 2-1. Cumulative incremental annual costs for the **five lower Androscoggin River Projects**[1] under existing and all proposed alternative conditions considered at Gulf Island-Deer Rips Project (P-2283) (Source: staff) [2].

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1,000)	(6) Non-operational Annual Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)	(8) Total Annual Net Benefits to Existing Conditions ($1,000)
Case 1: Total Existing Conditions	121.52	232.79	336.86	569.65	12,844	27,100	0	-14,256
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2A: CMP's proposed generation upgrade w/ existing project operation	4.30	10.22	7.25	17.47	411	440	-29	-14,286
Case 2B: CMP's proposed generation upgrade and project operation	4.30	-0.31	0.33	0.01	-1	598	-599	-14,856
Case 3: EPA's proposal	4.30	-12.90	13.33	0.42	-62	594	-656	-14,912
Case 4: Interior's proposal	4.30	-12.90	13.33	0.42	-62	594	-656	-14,912
Case 5: CLF et al's proposal with min. flow of 1,400 cfs (July 1 - April 30)	4.30	-11.67	12.08	0.41	-56	1,899	-1,955	-16,211
Case 6: CLF et al's proposal with min. flow of 1,800 cfs (July 1 - April 30)	4.30	-13.54	13.98	0.44	-66	1,899	-1,965	-16,221
Case 7: TU et al's proposal with min. flow of 1,700 cfs (July 1 - April 30)	4.30	-12.90	13.33	0.42	-62	594	-656	-14,912
Case 8: TU et al's proposal for year-round run-of-river operation	4.30	-35.74	37.90	2.16	-153	594	-746	-15,003
Case 9: Land Trust et al's proposal	4.30	-2.44	2.53	0.09	-12	1,240	-1,251	-15,508
Case 10: Staff's option #1 with min. flow of 1,100 cfs (December 1 - April 30	4.30	-3.81	3.92	0.11	-19	594	-612	-14,868
Case 11: Staff's option #2 with min. flow of 1,400 cfs (December 1 - April 30	4.30	-3.95	4.06	0.11	-19	594	-613	-14,869

1 Gulf Island-Deer Rips, Lewiston Falls, Worumbo, Pejebscot, and Brunswick.

Note: In our studies, we considered: (1) the Gulf Island Development separately from the Deer Rips and Androscoggin No. 3 Developments, since the latter two developments operate essentially in a run-of-river mode, and Gulf Island operates in a peaking mode of operation. (2) the multi-development Lewiston Falls Project as one complete, consisting of the following powerhouses: Monty, Bates, Red Shop Hill, Bates Lower, Continental, Upper Androscoggin (City of Lewiston's project, P-11006), and Lower Androscoggin.

2 The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are rounded to the nearest integer.

annual energy generation by about 0.01 GWh, with on-peak generation decreasing by about 0.31 GWh and off-peak generation increasing by about 0.33 GWh. The cumulative power value would decrease by about $1,000 annually. With Central Maine's proposed unit upgrades and other non-operational enhancement measures for Gulf Island-Deer Rips, the cumulative cost would be about $598,000. The total cumulative net benefit loss at the five projects (operational and non-operational) would be about $599,000 annually. In summary, the power produced under Central Maine's proposal would be about $14,856,000[3] more expensive than alternative generation in the region.

Interior, EPA, and the NGOs also propose additional operational and non-operational environmental enhancement measures for Gulf Island-Deer Rips. For the five lower Androscoggin River projects, the agencies' and NGO's recommended operational enhancement measures (CASES 3 through 9), which include Central Maine's proposed unit upgrades at the Gulf Island development, would cumulatively increase the energy generation by 0.09GWh to 2.16 GWh, with on-peak generation decreasing by 2.44 GWh to 35.74 GWh, and off-peak generation increasing by 2.53 GWh to 37.9 GWh. Most of the increase in energy generation would occur during the low-value, off-peak periods, causing the cumulative power value to decrease by $12,000 to $153,000 annually. The cumulative cost of the agencies' and NGO's recommended non-operational enhancement measures for Gulf Island-Deer Rips range from $594,000 to $1,899,000 annually. The total cumulative net benefits loss at the five projects (operational and non-operational) would range from $656,000 to $1,965,000. In summary, the power produced by the five lower Androscoggin River projects under Interior's, EPA's, and NGO's recommendations would be about $14,912,000 to $16,221,000[4] more expensive than alternative generation in the region.

Staff analyzed two additional operational and non-operational environmental enhancement measures for Gulf Island-Deer Rips (CASES 10 and 11). For the five lower Androscoggin River projects, our recommended operational enhancement measures, which includes Central Maine's proposed unit upgrades at the Gulf Island development, would cumulatively increase energy generation about 0.11 GWh, with on-peak generation decreasing by 3.81 GWh to 3.95 GWh, and off-peak generation increasing by 3.92 GWh to 4.06 GWh. Again, most of the increase in energy generation would occur during the low-value, off-peak periods, causing the cumulative power value to decrease by $18,500 to $19,000 annually. The cumulative cost of our recommended non-operational enhancement measures for Gulf Island-Deer Rips would be about $594,000 annually. The total cumulative net benefits loss at the five projects (operational and non-operational) would range from

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[3] Total net annual benefits = Existing net annual benefits + Incremental net annual benefits: [(-$14,856,000) = (-$14,256,000) + (-$599,000)].

[4] Total net annual benefits = Existing net annual benefits + Incremental net annual benefits:

Minimum limit of range: [(-$14,912,000) = (-$14,256,000) + (-$656,000)];
Maximum limit of range: [(-$16,221,000) = (-$14,256,000) + (-$1,965,000)].

$612,000 to $613,000. In summary, the power produced by the five lower Androscoggin River projects under our recommendations would be about $14,274,000 to $14,275,000[5] more expensive than alternative generation in the region.

5.3.2. Little Androscoggin River

As shown in Table 2-2 in Section 2.7, and as discussed in section 2.7, the four Little Androscoggin River projects[6], under median flow conditions, generate about 20.41 GWh of energy annually; about 6.95 GWh of on-peak energy and about 13.46 GWh of off-peak energy. Marcal contributes about 4.522 GWh of energy. The power produced by the four Little Androscoggin River projects, under existing conditions, would be about $631,000 more expensive, on an annual basis, than generation of the equivalent power from alternative resources.

For convenience of the reader in following the discussion which follows, we are including a copy of Table 2-2 on the next page.

Consolidated Hydro does not propose any power expansion at Marcal. However, Consolidated Hydro proposes operational and non-operational environmental enhancement measures. For the four existing Little Androscoggin River projects, Consolidated Hydro's additional operational enhancement proposals (CASE 2), would cumulatively decrease the annual energy generation by about 0.76 GWh, with on-peak generation decreasing by about 0.16 GWh and off-peak generation decreasing by about 0.61 GWh. The cumulative power value would decrease by about $16,000 annually. The cumulative cost of Consolidated Hydro's recommended non-operational enhancement measures for Marcal would be about $24,000. With both operational and non-operational enhancement measures, the total cumulative net benefits loss at the four projects would be about $40,000 annually. In summary, the power produced under Consolidated Hydro's operational and non-operational proposal would be about $672,000[7] more expensive than alternative generation in the region.

Interior and Hackett Mill Hydro also propose additional operational and non-operational environmental enhancement measures for Marcal. For the four existing Little Androscoggin River projects, Interior's and Hackett Mill Hydro's recommended operational enhancement measures (CASES 3 and 4, respectively) would cumulatively decrease the energy generation by 1.56 GWh and 0.62 GWh, with on-peak generation decreasing by 0.36

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[5] Total net annual benefits = Existing net annual benefits + Incremental net annual benefits:

Minimum limit of range: [(-$14,868,000) = (-$14,256,000) + (-$612,000)];
Maximum limit of range: [(-$14,869,000) = (-$14,256,000) + (-$613,000)].

[6] Marcal, Hackett Mills, Upper Barkers Mill, and Lower Barkers Mill.

[7] Total net annual benefits = Existing net annual benefits + Incremental net annual benefits: [(-$672,000) = (-$631,000) + (-$40,000)].

Repeat Table 2-2. Cumulative incremental annual costs for the **four Little Androscoggin River Projects**[1] under existing and all Proposed alternative conditions considered at Marcal (P-11482) (Source: staff).[2]

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1000)	(6) Non-operational Annual Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)	(8) Total Annual Net Benefits to Existing Conditions ($1000)
Case 1: Existing Project	4.29	6.95	13.46	20.41	453	1,084	0	-631
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2: Applicant's proposal	0.00	-0.16	-0.61	-0.76	-16	24	-40	-671
Case 3: Interior's proposal	0.00	-0.36	-1.20	-1.56	-34	21	-55	-686
Case 4: Hackett Mill's proposal	0.00	-0.39	-0.23	-0.62	-15	24	-39	-670
Case 5: Staff's alternative #1	0.00	-0.48	-0.40	-0.88	-20	22	-42	-673
Case 6: Staff's alternative #2	0.00	-0.26	-0.71	-0.97	-21	23	-44	-675
Case 7: Staff's alternative #3	0.00	-0.08	-0.46	-0.54	-11	25	-36	-667
Case 8: Staff's alternative #4	0.00	-0.26	-0.71	-0.97	-21	23	-45	-676

[1] Marcal, Hackett Mill, Upper Barkers Mill, and Lower Barkers Mill.

[2] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are to the nearest integer.

GWh and 0.39 GWh and off-peak generation decreasing by 1.2 GWh and 0.23 GWh. The cumulative power value would decrease by $15,000 to $34,000 annually. The cumulative cost of Interior's and Hackett Mill Hydro's recommended non-operational enhancement measures for Marcal ranges from $21,000 to $24,000 annually. The total cumulative net benefits loss at the four projects (operational and non-operational) would range from $39,000 to $55,000. In summary, the power produced by the four Little Androscoggin River projects under Interior's and Hackett Mill Hydro's recommendations would be about $670,000 to $686,000[8] more expensive than alternative generation in the region.

Staff analyzed four additional operational and non-operational environmental enhancement measures for Marcal. For the four existing Little Androscoggin River projects, our recommended operational enhancement measures (CASES 5 through 8) would cumulatively decrease the energy generation by 0.54 GWh to 0.97 GWh, with on-peak generation decreasing by 0.08 GWh to 0.48 GWh and off-peak generation decreasing by 0.40 GWh to 0.71 GWh. The cumulative power value would decrease by $11,000 to $21,000 annually. The cumulative cost of our recommended non-operational measures for Marcal would range from $22,000 to $25,000 annually. The total cumulative net benefits loss at the four projects (operational and non-operational) would range from $36,000 to $45,000. In summary, the power produced by the four Little Androscoggin River projects under our recommendations would be about $667,000 to $676,000[9] more expensive than alternative generation in the region.

5.4. Comprehensive development and recommended alternative

Sections 4(e) and 10(a)(1) of the FPA, 16 U.S.C. Sections 797(e) and 803(a)(1), respectively, require the Commission to give equal consideration to all uses of the waterway on which the project is located. When the Commission reviews a hydropower project, the fish and wildlife, recreational, and other nondevelopmental values of the involved waterway are considered equally with its electric energy and other developmental values. In determining whether, and under what conditions, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved in the decision.

Based on our independent review and evaluation of the proposed projects, the projects with the resource agency and NGO recommendations, the projects with our

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[8] Total net annual benefits = Existing net annual benefits + Incremental net annual benefits:

Minimum limit of range: [(-$670,000) = (-$631,000) + (-$38,000)];
Maximum limit of range: [(-$686,000) = (-$631,000) + (-$55,000)].

[9] Total net annual benefits = Existing net annual benefits + Incremental net annual benefits:

Minimum limit of range: [(-$667,000) = (-$631,000) + (-$36,000)];
Maximum limit of range: [(-$676,000) = (-$631,000) + (-$45,000)].

recommendations, and the no-action alternative under Sections 4(e) and 10(a) of the FPA, we have selected the proposed projects with our recommended environmental measures (*see Section 5.3 above*) as the preferred option. **Note: the staff's preferred option is an aggregate of agencies', NGOs', and staff's recommended environmental measures. In our preferred option, we adopt many of the agencies' recommendations, except for recommendations related to project operations and minimum flows. Herein, we refer to the preferred option as the staff/agency aggregate option.** Based on our findings, we recommend issuing a new license and an original license for the continued operation of Gulf Island-Deer Rips and Marcal, respectively.

We recommend the staff/agency aggregate option in both cases because: (1) issuing a new license for Gulf Island-Deer Rips and an original license for Marcal would allow Central Maine and Consolidated Hydro to operate the projects as beneficial and dependable sources of electric energy for Central Maine's customers; (2) implementing our recommended environmental measures would result in improvements to the existing human environment; and (3) we believe the staff/agency aggregate option for both Gulf Island-Deer Rips and Marcal would be best adapted to a comprehensive plan for the use of water power development, while concurrently protecting and enhancing natural resource values and uses. The staff/agency aggregate option for both projects includes the measures that are listed below under each project.

5.4.1. Gulf Island-Deer Rips

(1) Water Resources

- Provide a plan describing the methods for releasing required minimum flows and monitoring project operations

- Provide a plan to study alternatives other than the GIPOP facility to protect and/or enhance DO concentrations in the Gulf Island impoundment and the lower Androscoggin River

- Continue Central Maine's partnership (for the new license term or as long as the partnership exists) in the oxygen injection program on the Gulf Island impoundment, including funding responsibilities to operate and maintain the GIPOP facility

- Provide a plan and schedule for monitoring water quality, including DO in the Gulf Island impoundment, and DO and aquatic invertebrates in downstream areas affected by the operation of Gulf Island-Deer Rips

- Reserve the Commission's authority to require changes in project operations and/or other environmental enhancements to ameliorate for cumulative effects identified in the future, due to operating the headwater storage impoundments under alternative operations, and affects on contaminants in the Androscoggin River

(2) Fishery Resources

- Restrict downramping at Deer Rips [flows would be reduced from 5,120 cfs (full generation flow) to the base flow, no faster than linearly over 20 minutes] to protect aquatic resources below the Deer Rips/Androscoggin No. 3 and Lewiston Falls developments

- Limit impoundment drawdowns in the Gulf Island impoundment to a target limit of one foot below normal full pond elevation from May 1 to June 30, with an allowance of up to two feet to meet any unusual NEPOOL power requirements, and no more than four feet below normal full pond elevation from July 1 to April 30

- Provide a minimum flow of 1,700 cfs from May 1 to November 30 and 1,400 cfs from December 1 to April 30, or inflow, whichever is less, for the enhancement of aquatic habitat below Gulf Island-Deer Rips

- Reserve the Commission's authority to require the construction, operation, and maintenance of fishways prescribed by the Secretary of the Interior pursuant to Section 18 of the FPA

(3) Recreation Resources

- Maintain the existing recreation facilities at Gulf Island-Deer Rips, which includes ensuring the continued operation of the trailered boat launch facility at the Turner-Greene bridge, and the three island day-use picnic areas and two informal day-use areas located on the Gulf Island impoundment

- Investigate the feasibility of developing a carry-in boat launch facility on the Androscoggin River below Deer Rips

- Expand the roadside parking area, and provide additional public access, at the Deer Rips impoundment informal carry-in access site on Switzerland Road

- Construct canoe portage trails around both the Gulf Island and Deer Rips dams

- Provide public access to the Deer Rips facility

- Cooperate with the Androscoggin Land Trust to provide formal recreational access to the river at the Waterman Road site

- Develop a comprehensive land-use management plan for those lands already within the project boundary and any additional Central Maine-owned lands not within the project boundary, but within 200 feet of the high-water elevation of the headpond

- Periodically conduct recreation use monitoring studies (FERC Form 80, Recreation Use Assessment) in consultation with the resource agencies and evaluate the future need for additional recreation facilities to meet user demand

- Develop a schedule and computerized tracking system for implementing any proposed recreational improvements

(4) Cultural Resources

- Implement the executed Programmatic Agreement to protect cultural resources at Gulf Island-Deer Rips

Among the measures we have selected for Gulf Island Deer Rips, there are 12 that affect the project's economics and warrant further discussion. These measures were analyzed in Section 4.0., and are discussed below under the appropriate resources: water resources, fisheries resources, comprehensive land management plan, recreation resources, and cultural resources. While we cannot directly quantify the environmental enhancement that would be provided by each of these recommendations, collectively these measures would afford Gulf Island-Deer Rips a greater level of environmental protection and enhancement, which would be a worthwhile expenditure when compared to the revenue that Central Maine would forego.

Water Resources. We recommend several enhancements for the benefit of water resources and water quality in the project area and in the lower Androscoggin River.

Operational and flow monitoring plan - We recommend that Central Maine prepare a plan describing the methods for releasing minimum flows and monitoring project operation, and showing how the required flows will be maintained below the project when the impoundment is refilled after generation drawdowns, or after any maintenance and/or repairs. The plans should include descriptions of all mechanisms and structures that will be used, the level of manned or automatic facility operation, the methods for recording and maintaining data on project operations and providing it to the Commission and resource agencies for inspection. These plans should be approved before any changes in project operation take place.

The capital cost associated with the preparation of these plans would be minimal. Requiring the plans, however, would provide the resource agencies and the Commission with useful and necessary information.

Gulf Island Pond Oxygenation Program - To enhance and protect DO concentrations in the project area and downstream river reaches affected by the operation of Gulf Island-Deer Rips, we recommend that Central Maine continue its partnership (for the duration of the license term or as long as the partnership exists) in the existing oxygen injection program (i.e., GIPOP) on the Gulf Island impoundment with Boise-Cascade,

International Paper, and James River.

As discussed in Sections 4.1.1.2. and 4.2.1.1., the existing GIPOP facility has improved DO concentrations considerably in both the Gulf Island impoundment and in the project's tailrace. Since 1992 an average of 90.5 percent of the Gulf Island impoundment has met or exceeded the state's Class C water quality criteria for DO (i.e., 5.0 mg/l), while downstream DO concentrations during low-flow periods have generally been above 7.0 mg/l. Further, we concluded that Central Maine's significant commitment to the GIPOP partnership is an acceptable level of enhancement for water quality at this time.

The capital and annual operational costs associated with operating and maintaining the GIPOP facilities and monitoring DO as part of the oxygen injection program is estimated to be $0 and $79,000, respectively (*see Table C-1*). We believe the above costs to Central Maine represent a significant investment to improving water quality in the project area, which is commensurate with the effect of the presence of the Gulf Island dam on DO concentrations in the impoundment. Given the considerable improvement in DO concentrations in the Gulf Island impoundment and the project's tailrace area that has already occurred since the installation of the GIPOP facilities, we conclude that the benefits to water quality in the lower Androscoggin River justify the considerable costs to Central Maine of continuing to participate in the GIPOP partnership.

Alternatives to Maintain State Water Quality Standards - Central Maine, in accordance with EPA's April 28, 1995, letter, proposes to prepare and implement an alternatives study plan. The purpose of this plan would be to coordinate efforts (i.e., establishing a common timetable and regulatory plan), among the GIPOP Partnership, to study alternative means to meet water quality standards throughout the Gulf Island impoundment and in the waters upstream of and downstream from the project's two dam. As discussed in Section 4.2.1.1., Central Maine would develop this plan in consultation with EPA, MDEP, Boise-Cascade, James River, and International Paper.

While we do not believe that alternatives measures to the GIPOP facility are warranted at this time, the development and implementation of an alternatives study plan would provide a formalized mechanism for establishing a common timetable and regulatory plan among several entities that would be critical to protecting and enhancing water quality in the project area and the lower Androscoggin River.

Central Maine has provided no specifics of the plan, so estimating the costs of implementing an alternatives study plan for the Gulf Island impoundment with any reasonable degree of accuracy is not possible. Therefore, we did not include these costs in our economic analysis of the project.

We do recognize that preparation of an alternative study plan, as recommended by EPA, would carry with it a capital investment on the part of Central Maine. However, we expect that the cost associated with the preparation of such a plan would be minimal.

Furthermore, we recognize that any measure that may be implemented as part of an alternative study plan may result in substantial costs to Central Maine. We will consider the merits of such measures when the plan is filed with the Commission for approval.

To facilitate implementation of additional DO enhancement measures at the project, we recommend the preparation of an alternatives study plan, and the inclusion of standard language reserving the Commission's authority to require any reasonable operational changes and/or other environmental enhancements at Gulf Island-Deer Rips, should a more cost-effective and environmentally sound alternative be identified through the study process.

Water quality monitoring plans - We recommend that Central Maine develop plans to monitor DO at sites in the Gulf Island impoundment and downstream from the project, and aquatic invertebrates in downstream areas affected by the operation of the project. The plans should include descriptions of all mechanisms and structures that would be used, the extent of Central Maine's involvement in the monitoring program, and the methods for recording and maintaining data on DO and aquatic invertebrate populations, and providing data to the Commission and resource agencies for review. The plan also should include a provision for incorporating the DO monitoring program associated with the GIPOP facility, which we recommend as a water quality enhancement measure (*see discussion above*). These plans should be approved before any changes in project operation take place.

The capital cost associated with our recommended aquatic invertebrate monitoring plan is estimated to be $21,000 (*see Table C-1*). At an annual cost of $3,000, monitoring aquatic invertebrates in downstream areas affected by the operation of Gulf Island-Deer Rips would provide the resource agencies and the Commission with useful and necessary information relative to the adequacy of the proposed DO enhancement measures to maintain and enhance biotic integrity in the lower Androscoggin River below the project, and would provide an opportunity to evaluate the future need for additional enhancement measures in the project area. We believe these benefits justify the small cost to Central Maine of conducting the studies.

The capital and annual costs of developing a DO monitoring plan is included in the cost of our recommended DO enhancement measure, or GIPOP partnership, discussed above.

Cumulative effects - We acknowledge the role played by the upstream headwater storage impoundment releases (i.e., releases made mainly from Errol Dam); we included an evaluation of the headwater storage impoundments to the extent practical, and considered associated impacts where appropriate. However, in Section 1.3, and in staff's responses to the Conservation Coalition's comments on the DEIS (particularly comment Nos. 4 and 6), we discussed in detail our reasons for not including them in an extensive analysis of cumulatively affected resources.

In the future, through on-going studies to support the licensing of two headwater storage impoundments, UWPC, federal and state resource agencies, the Commission, and

other stakeholders will be in a better position to determine the basin-wide, or cumulative, effects associated with alternative project operations on the environmental resources associated with the headwater storage impoundments, and the developmental and environmental effects on downstream users and resources. To accommodate any measures needed to ameliorate those impacts, we recommend a cumulative effects article be included in any new license issued for the project reserving the Commission's authority to require operational changes and/or other enhancements at Gulf Island-Deer Rips in the future.

In Sections 3.2.1., 3.3.1.2., and 4.2.1.1. we describe the contaminants issue, and any potential impacts that impoundments may have on the fate and transport of these substances. Hydroelectric facilities can affect, impact, or exacerbate the existing contaminant levels found in fish from the river, and presumed to be trapped in impoundment sediments.

In Section 4.2.1.1. we conclude, based on the evidence in the record, that there is no definitive link between impoundment fluctuations, variable flow regimes associated with hydropower operations, or operation of the GIPOP facility and increased bioavailability of mercury and/or dioxin. We also conclude that if, through future studies, a link is established, operation of Gulf Island-Deer Rips could cause localized and cumulative effects on the downstream riverine system. To ensure that cumulative effects can be addressed in the future, including those related to contaminants, we recommend including a cumulative effects article, in any license issued for the project reserving the Commission's authority to require operational changes and/or other environmental enhancements to ameliorate any adverse impacts.

We recognize that any measure that may be implemented (i.e. operational changes and/or other environmental enhancements) in the future to ameliorate cumulative effects at the project[10] could result in substantial costs to Central Maine. We will consider the costs and merits of such measures at such time as when the measures are deemed necessary.

Fishery Resources. We recommend several enhancements at Gulf Island-Deer Rips for the benefit of fishery resources in the project area and in the lower Androscoggin River.

Project operation and minimum flows - Our biological analysis in Section 4.0 concluded that 1,000 cfs, the minimum flow that Central Maine has voluntarily released from the project to meet the minimum flow requirement for the downstream Lewiston Falls Project, significantly improved aquatic habitat in the lower Androscoggin River, not only in the project area, but below the project as well. This voluntary minimum flow release has resulted in a shift of 2.3 GWh of on-peak generation to off-peak generation at Gulf Island-Deer Rips, which has had an annual cost of $11,315.

[10] This approach is consistent with the Commission's August 1, 1994 policy statement, Use of Reserved Authority in Hydropower Licenses to Ameliorate Cumulative Effects (18 C.F.R. § 2.23).

To further enhance resident and anadromous fisheries in the project area and in the lower Androscoggin River, and the anadromous fish restoration program on the lower Androscoggin River, we recommend three operational measures that would result in environmental enhancements (*CASE 11 for Gulf Island-Deer Rips*). These measures include: (1) restricting downramping at Deer Rips from 5,120 cfs (full generation flow) to the base flow, no faster than linearly over 20 minutes; (2) a target impoundment fluctuation of one foot from May 1 to June 30, with an allowance of up to two feet to meet any unusual NEPOOL requirements, and four feet from July 1 to April 30; and (3) releasing a minimum flow of 1,700 cfs from May 1 to November 30 and 1,400 cfs from December 1 to April 30, or inflow, whichever is less.

Our recommended impoundment fluctuations and minimum flows would provide: (1) moderately to significantly enhanced instream flows during anadromous fish migration periods, thereby enhancing the agencies' objective of managing the lower Androscoggin River for anadromous fish, (2) significantly improved spawning and nursery habitat for blackbass in the Gulf Island impoundment, and (3) moderately improved flows for resident brown trout and smallmouth bass in the project area and downstream from the project. Additionally, our recommended mode of operation and minimum flows would maintain the existing peaking operation of the project, with some modifications, and would maintain the existing impoundment wetlands (*see Section 4.2.1.3.*).

As outlined in Sections 3.2.2. and 4.2.1.2., the objective of the Androscoggin River fish restoration program is to restore anadromous fish to the Androscoggin River and its tributaries below Great Falls in the Cities of Lewiston and Auburn.[11] Habitat availability is one of many factors directly related to the successful restoration of anadromous fish. In the case of the lower Androscoggin River, habitat availability is very much controlled by hydro operations at, and flows released from, Gulf Island-Deer Rips. With regards to the resident fishery, maintaining optimum population levels, and maintaining optimum quality/quantity and diversity of habitat, are two of the most important fishery management objectives for the project area and downstream reaches of the lower Androscoggin River (*refer to Sections 3.1.1.3. and 4.2.1.2. for additional discussion of management priorities*).

Given the current status of the anadromous fish restoration program in the lower Androscoggin River, we concluded in Section 4.2.1.2. that flows for anadromous fish, to some extent, should be considered when determining a minimum flow regime for the lower Androscoggin River. We considered the flow versus habitat relationships for American shad and Atlantic salmon.

Upstream migration to Great Falls is a management concern for American shad in the lower Androscoggin River. As noted by MDMR, there are numerous areas of suitable habitat downstream from Lewiston Falls, which American shad are expected to use for

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[11] Great Falls is a natural barrier to upstream migration of anadromous fish, except for Atlantic salmon which historically occurred upstream past Gulf Island-Deer Rips to Rumford Falls.

spawning and nursery habitat. We concluded in Section 4.2.1.2. that optimizing habitat for American shad is not warranted, as this would require flows in excess of 5,000 cfs to 6,000 cfs. We believe that these flows would not be feasible year-round.

MDMR (1982) indicates that juvenile American shad (and alewife) downstream migration takes place from July to December, with spawning occurring from May to July. Our recommended 1,700 cfs minimum flow from May 1 to November 30 would provide a moderately improved zone-of-passage, while also providing flows to enhance shad and alewife spawning and incubation. For example, at 1,700 cfs, American shad would generally have fair habitat availability in the Run-Reach, while in the Dresser's Rips area, American shad would have fair to good habitat conditions [ten to 25 percent improvement in habitat availability over existing conditions; *see Figures 4-7 and 4-8*]. While improving the amount of habitat available, this flow could also have an adverse effect on habitat duration at the more optimum flows of 5,000 cfs to 6,000 cfs, as the amount of time these higher flows are available would most likely be reduced.

With regards to Atlantic salmon, we concluded in Section 4.2.1.2. that, while there are no definitive, near-term plans to restore salmon to the Androscoggin River above Gulf Island-Deer Rips (i.e., active restoration program), there is a passive restoration program that should be considered in developing a minimum flow recommendation for the lower Androscoggin River. Further, habitat conditions at Dresser's Rips is an important reach of the lower Androscoggin River below Lewiston Falls for salmon smolts and adult salmon fishing opportunities.

With the 1,700 cfs from May 1 to November 30, Atlantic salmon would generally have good to excellent habitat availability at Dresser's Rips (*see Figure 4-6*). Juvenile habitat availability was just above 90 percent, a slight decline from optimum habitat conditions with the existing 1,000 cfs flow. Adult habitat availability in this river reach was 85 percent, a 14 percent increase over existing habitat conditions. Overall, our recommended 1,700 cfs flow results in a composite WUA curve indicating that nearly 100 percent of juvenile habitat and 74 percent of adult habitat are available for salmon in the stretch of river between the Deer Rips and Dresser's Rips (*see Figures 4-13 and 4-14*). For adult salmon, this is a 14 percent increase over existing habitat conditions in the two reaches. As is the case for American shad habitat, adult salmon habitat, which is maximized at about 6,000 cfs, could be somewhat adversely affected by the amount of time these higher flows are available.

For resident fish in the Gulf Island impoundment, our recommended target impoundment level fluctuation of one foot from May 1 to June 30 would significantly enhance spawning and nursery habitat for blackbass and other centrarchids, and enhance aquatic invertebrate habitat. For example, with a relatively stable impoundment level, the mean habitat suitability for largemouth and smallmouth bass would be about 0.88 and 0.55, an improvement of ten percent and 24 percent, respectively. Further, we do not expect any significant environmental resource impacts with an occasional two-foot drawdown during this

time period. In the lower Androscoggin River below the project, smallmouth bass is not a management priority. Consequently, we do not consider smallmouth bass habitat as significant for determining a minimum flow regime. However, juvenile and adult smallmouth bass habitat is nearly maximized in the Deer Rips and Dresser's Rips study reaches under our recommended flows (96 and 97 percent, respectively; *see Figures 4-9 and 4-10*).

In the lower Androscoggin River, MDIFW's focus for resident fisheries management is developing a viable brown trout fishery. Our recommended minimum flow of 1,700 cfs from May 1 to November 30 would provide moderate to significant habitat enhancements for brown trout below the project and downstream from Lewiston Falls, particularly during the critical summer months. Below the Deer Rips/Androscoggin No. 3 developments, juvenile and adult trout habitat availability at 1,700 cfs would be 88 percent and 94 percent, respectively; an improvement of about 20 to 25 percent over the existing 1,000 cfs minimum flow (*see Figure 4-2*). Taking both Deer Rips and Dresser's Rips together, adult trout habitat would be nearly maximized in the two reaches, while juvenile trout habitat availability would be 92 percent (*see Figures 4-11 and 4-12*). This would be an improvement of about 25 percent (juveniles) and 13 percent (adult) over existing flow conditions.

From December 1 to April 30, our recommended flow of 1,400 cfs would provide a moderate enhancement over the existing 1,000 cfs minimum flow during off-peak periods. On the basis of Central Maine's IFIM study, we concluded in Section 4.2.1.2. that habitat availability in the lower Androscoggin River with a 1,400 cfs minimum flow would not be significantly different than the habitat availability with 1,700 cfs or run-of-river. Consequently, because the biological needs of fish are reduced in the winter and early spring periods, we do not believe that a flow greater than 1,400 cfs from December 1 to April 30 is warranted, nor would such a flow be an appropriate balance between environmental and non-environmental resources.

In balancing environmental and non-environmental resources in the lower Androscoggin River, our recommended project operations and flow regime, coupled with Central Maine's proposed ramping schedule, would, with few exceptions, result in significantly improved habitat conditions in the Gulf Island impoundment and in the lower Androscoggin River. Additionally, this type of flow regime would meet the needs of improving habitat conditions for American shad, alewife, and Atlantic salmon, and may enhance the attraction of fish to fishways located downstream of Gulf Island-Deer Rips, as well as the attraction of anadromous fish to the Androscoggin River during the migration periods. Fish passage routes in the river also would generally be enhanced.

The operational cost of our impoundment level restrictions and releasing our recommended flows would be about $31,000 annually (*see Table B-12*), or an additional annual operational cost of about $27,000 over Central Maine's proposed mode of operation (*see Table B-3*). In total, our recommended mode of operation would result in a cumulative annual cost of about $19,000 at the five lower Androscoggin River projects (*see Tables 2-1*

and B-12).

While we recognize that these are substantial expenses, our recommended impoundment level fluctuation restrictions and minimum flows would provide significant cumulative benefits to the anadromous fish restoration program in the Lower Androscoggin River Basin, and to the resident fishery in the project area and in the lower Androscoggin River. We also note that existing wetlands downstream from the project and the extensive wetlands that currently exist in the project impoundment would be protected, and somewhat enhanced, by our recommended project operations and minimum flows.

Fish passage - As discussed Section 4.1.1.3., the MDMR and ASRSC have no present plans to restore anadromous fish. However, future plans call for restoring Atlantic salmon to its historical range above Gulf Island-Deer Rips. While we recognize that deferring fish passage at Gulf Island-Deer Rips to some future date would continue to contribute to cumulative effects relative to fish passage on the Androscoggin River, we do not believe there is any evidence at this time to support the need for fish passage facilities at Gulf Island-Deer Rips.

In Section 4.2.1.2., we discussed Interior's authority to prescribe fish passage facilities under Section 18 of the FPA. To accommodate installation of fish passage facilities at Gulf Island-Deer Rips we recommend an article be included in any new license issued for the project reserving the Commission's authority to require the construction, operation, and maintenance of fishways prescribed by the Secretary of the Interior pursuant to Section 18 of the FPA

The capital cost associated with the potential future installation of fish passage facilities at Gulf Island-Deer Rips would be significant. Because the resource agencies have deferred installation of such facilities to some future date, we considered evaluating the costs of such facilities at Gulf Island-Deer Rips to be premature. Therefore, we did not include these costs in our economic analysis of the project. We will consider the costs and merits of fish passage facilities when such facilities are required. However, we do recognize that installation of fish passage at Gulf Island-Deer Rips, as well as at Lewiston Falls downstream and several projects upstream would provide significant cumulative benefits to the Androscoggin River Basin's anadromous fish restoration program.

Comprehensive Land Management Plan. Central Maine proposes to develop a land conservation and trail plan for the Gulf Island-Deer Rips area. To protect environmental resources (including riparian habitat, aesthetics, and public access of the shorelands) on land within the project boundary and any additional Central Maine-owned lands not in the project boundary but within 200 feet of the project's shoreline areas, we also recommend that Central Maine prepare a comprehensive land management plan. As discussed in Section 4.2.1.5., Central Maine would develop this plan in consultation with various agencies, NGOs, and local governments.

We believe the development and implementation of a comprehensive land management plan could result in substantial protection and enhancement for environmental resources within the project area, and would allow for the identification and implementation of measures to ensure the continued use of riparian habitats by wildlife. In addition, we conclude that the measures discussed in Section 4.2.1.5. would adequately protect the riparian areas within the project water area that are used as wildlife habitat, and would be consistent with Interior's recommendation to develop a plan for providing buffer strips/protection measures in the project area.

While we agree with the need for such a plan, Central Maine has provided few specifics of the plan at this time. We considered evaluating the costs of implementing a comprehensive land management plan for the Gulf Island-Deer Rips area to be premature. Therefore, we did not include these costs in our economic analysis of the project.

Nevertheless, we expect there to be a cost associated with the preparation and development of such a plan, but expect this cost to be minimal. However, we do recognize that any potential measure included in the land management plan may result in substantial costs to Central Maine. We will consider the merits of such measures when the plan is filed with the Commission for approval.

Recreational Resources. We recommend several enhancements for the benefit of recreational resources in the project area and in the lower Androscoggin River.

The capital and annual operational and maintenance costs associated with Central Maine's proposed recreational enhancement measures for Gulf Island-Deer Rips, which staff also recommended, are $135,000 and $7,000, respectively (*see Table C-1*). Specifically, the costs include: (1) $5,100 to $6,000 annually to maintain Gulf Island-Deer Rips's existing recreational facilities; (2) $105,000 for proposed recreational facilities; and (3) $15,000 to evaluate the feasibility and location of two carry-in boat launch facilities.

Based on the above costs, we estimate the annual cost of the enhancement to be $27,000. However, requiring these measures would ensure that Gulf Island-Deer Rips's recreation facilities remain available to the public. Additionally, requiring these measures would significantly improve recreational opportunities in the project area and compliment the comprehensive plan to improve public use of the lower Androscoggin River. We believe these benefits would justify the associated expense.

In addition to these costs, Central Maine proposes to: (1) monitor recreational use in the project area in accordance with the FERC Form 80, Recreational Use Assessment; and (2) develop a land conservation and trail plan for the Gulf Island-Deer Rips area (*see previous section, Comprehensive Land Management Plan*). Further, through consultation with the Androscoggin Land Trust, Central Maine has agreed to additional recreation-related enhancements, which are not included in the above proposals and cost projections, including canoe portage trails around the Gulf Island and Deer Rips dams and additional recreational

access in the project area. Although costs are not available for these proposals, we recommend these measures to further enhance the recreational opportunities offered at the project and protect the shoreland areas.

Recreational monitoring - As discussed in Section 4.2.1.4., monitoring recreational use in the project area would provide opportunities to reassess Gulf Island-Deer Rips's recreation facilities in the future. This would ensure that recreational opportunities are sufficient to meet public demand at Gulf Island-Deer Rips over the term of a new license. The capital cost associated with conducting these monitoring studies would be minimal. However, recreation monitoring studies would provide Central Maine, the resource agencies, and the Commission with useful and necessary information.

Cultural Resources. We recommend that Central Maine implement the Programmatic Agreement executed among the Commission, the SHPO, and the Council. Implementing the Programmatic Agreement ensures the long-term protection of historic and archaeological resources at Gulf Island-Deer Rips. Central Maine, as a concurring party to the Programmatic Agreement, has allotted about $299,000 to design and implement a monitoring and data recovery plan at the archaeological sites at Gulf Island-Deer Rips (*see Table C-1*).[12] The cost to protect the archaeological sites amounts to an annual cost of $44,000. We conclude that these expenditures are warranted and in the public's interest given the value of protecting Gulf Island-Deer Rips's cultural resources afforded by the Programmatic Agreement.

Measures considered, but not recommended

The staff/agency aggregate option did not include adopting 18 measures recommended or requested by the agencies and NGOs. The measures include: (1) Interior's, EPA's, the Conservation Coalition's, TU *et al.*'s, and Land Trust *et al.*'s recommended project operations and minimum flows; (2) EPA's and the Conservation Coalition's recommended mercury/dioxin studies; (3) Land Trust *et al.*'s recommended recreation enhancement proposals; and (4) the Conservation Coalition's and Land Trust *et al.*'s recommended conservation easements and/or buffer zones. We concluded that the additional costs to implement these measures are more than the value of their potential incremental benefits (*see Table 2-5*).

Project operations and minimum flows - Releasing Interior's recommended minimum flow of 1,700 cfs from July 1 to April 30 and operating the project in a run-of-river mode from May 1 to June 30, and with a one foot impoundment fluctuation[13] from July 1 to April 30, would shift 310.0 MWh from on-peak to off-peak generation periods,

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[12] Based on Central Maine's calculated funding levels for the Programmatic Agreement (FERC *et al.*, 1993).

[13] Interior's run-of-river recommendation would permit an impoundment fluctuation of one foot or less in the Gulf Island impoundment to accommodate monitoring error and natural variations in river flow.

resulting in a decrease of the annual power value by $69,000[14] (*see Table B-5*). Operating Gulf Island-Deer Rips with this minimum flow and impoundment fluctuation would affect fish resources, as well as wetlands and associated wildlife.

We agree with Interior that limiting impoundment fluctuations from May 1 to June 30 would significantly improve spawning and nursery habitat for blackbass and other centrarchids in the impoundment. However, there is no evidence to suggest that run-of-river with minimal fluctuations would provide greater benefits than a target one-foot fluctuation, as recommended by staff. Moreover, because blackbass are mobile and can inhabit littoral-zone habitat that has been alternately watered and dewatered, we see very little additional benefit to limiting impoundment fluctuations to one foot the remainder of the year. Regarding minimum flows, our recommended 1,700 cfs minimum flow from May 1 to November 30 would provide the same benefits to fish resources below the project as Interior's recommended flow release during critical times of the year. As discussed in Section 4.2.1.2., May 1 to November 30 encompasses the fish growing season, as well as the migration season for American shad/alewife and Atlantic salmon. Habitat availability for resident brown trout during the winter months is virtually identical between Interior's 1,700 cfs and our recommended 1,400 cfs minimum flow (*see Table 4-5*). Therefore, because the biological needs of fish are generally lower in the winter, the additional 300 cfs at this time of year would provide little, if any, additional habitat benefits.

We do not believe that the incremental benefits to fishery resources in the Gulf Island impoundment and in the river below Gulf Island-Deer Rips would be worth the additional $38,000 annual cost of operating the project as recommended by Interior[15] at this time (*see Table B-5*).

For wetlands, Interior's run-of-river operation and one-foot impoundment fluctuation could have an adverse effect on the extensive wetlands in the Gulf Island impoundment. In Section 4.1.1.4., our analysis indicates that the current impoundment fluctuation regime in the Gulf Island impoundment is responsible for the productive wetlands that are highly valued for wildlife diversity and abundance. Changes in the operation of Gulf Island-Deer Rips to a more stable impoundment level could alter the composition of the existing impoundment wetlands in such a way that may result in less productive wetlands. While we may agree that run-of-river operation from May 1 to June 30 may help to promote wetland vegetation growth, we do not believe that run-of-river in May and June and a one-foot impoundment fluctuation restriction from July through April would provide enough

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[14] Cumulatively, the annual value of power for the five projects on the lower Androscoggin River would be reduced by $62,000 under Interior's recommended project operations.

[15] The incremental annual value of power for Gulf Island-Deer Rips under Interior's proposal ($69,000) would cost an additional $38,000 over staff's option #11 ($31,000). Cumulatively, the incremental annual value of power for the five projects on the lower Androscoggin River under Interior's proposal ($62,000) would cost an additional $43,000 over staff's option #11 ($19,000). [*see Tables B-5 and B-12*].

incremental benefits to warrant the significant additional expense. In addition to the impoundment wetlands, Interior's recommended 1,700-cfs minimum flow would improve wetland development in the lower Androscoggin River. However, because wetland growth does not occur during the winter months, we believe 1,700 cfs would provide little, if any, incremental benefits to warrant this flow from December to April. Our recommended 1,400-cfs flow would adequately protect the wetlands below the project during this time period.

The Conservation Coalition's, TU *et al.*'s, EPA's, and Land Trust *et al.*'s recommended impoundment fluctuations and minimum flows would decrease Gulf Island-Deer Rips's annual value of power by $59,000 to $72,000, $69,000 to $142,000, $69,000, and $20,000, respectively[16] (*see Tables B-6, B-7, B-8, B-9, B-4, B-10, Section 5.3, and Appendix D*). The Conservation Coalition, TU *et al.*, and EPA recommend run-of-river operation, either seasonally from May 1 to June 30 with a one foot impoundment fluctuation from July 1 to April 30, or on a year-round basis. [*Run-of-river in these cases was defined as no fluctuation*].

While we believe that relatively stable impoundment levels may be appropriate from May 1 to June 30, we do not think run-of-river with no fluctuation is realistic or feasible in a body of water the size of the Gulf Island impoundment, particularly considering habitat in the impoundment would be marginally improved, at best. Our analysis in Section 4.0. indicates that a target one-foot fluctuation limit from May 1 to June 30 (i.e., relatively stable impoundment levels) would provide significant environmental benefits to resources in the Gulf Island impoundment. However, as previously discussed year-round run-of-river operation, or one foot impoundment fluctuation from July 1 to April 30 may result in adverse effects to wetlands in the impoundment and in downstream river reaches, while providing uncertain additional benefits, if any, to fish and wildlife resources in areas affected by the project. Given the considerable costs and meager potential environmental benefits cited above, we do not think these recommendations are warranted.

The Conservation Coalition recommends a flow release between 1,400 cfs and 1,800 cfs from July 1 to April 30. Our recommended flows of 1,700 cfs from May 1 to November 30 and 1,400 cfs from December 1 to April 30 generally would be consistent with the range of flows recommended by the Conservation Coalition. Based on our analysis of Central Maine's IFIM study and habitat duration analysis, we do not recommend a flow release of 1,800 cfs because there would be no appreciable benefits in habitat availability above the benefits provided by 1,700 cfs, which would not warrant the additional annual cost. Regarding TU *et al.*'s 1,700 cfs flow recommendation, which would be released from July 1 to April 30, we agree that such a flow would provide significant benefits to resident and anadromous fish resources in the lower Androscoggin River below Gulf Island-Deer Rips, and is therefore warranted from May 1 to November 30. However, for the same reasons

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[16] Cumulatively, the annual value of power for the five projects on the lower Androscoggin River would be reduced by $56,000 - $66,000, $62,000 - $153,000, $62,000, and $12,000 under the Conservation Coalition's, TU *et al.*'s, EPA's and Land Trust *et al.*'s recommended project operations, respectively.

discussed on Pages 5-35 and 5-36 regarding Interior's flow recommendation, we are not adopting the 1,700-cfs minimum flow from December 1 to April 30.

Land Trust *et al.*'s year-round 1,430 cfs flow recommendation would result in minor to moderate benefits for fish habitat in the Androscoggin River below the project. For brown trout habitat in the lower Androscoggin River (regarded as management priority for select river reaches), our recommended flow of 1,700 cfs from May 1 to November 30 would provide additional improvements in habitat conditions over those provided by Land Trust *et al.*'s flow. Our recommended 1,700 cfs flow also would provide improved habitat conditions for anadromous fish in the lower Androscoggin River, as well as possibly enhance attraction flow during the fish migration season. For smallmouth bass, habitat availability is nearly identical under our flow of 1,700 cfs and Land Trust *et al.*'s flow. From December 1 to April 30, we are recommending a 1,400 cfs minimum flow. Habitat availability under this flow would be identical to habitat conditions under Land Trust *et al.*'s flow. We believe the incremental benefits of our recommended flow regime justify the additional expense.

In summary, operating the project with our recommended impoundment fluctuations and minimum flows would still allow Central Maine to operate in a peaking mode, although modified from the current peaking operation. The Gulf Island impoundment would be managed in a manner that would maintain, and potentially enhance, the existing impoundment wetlands, and would enhance the blackbass fishery in the impoundment and resident and anadromous fish inhabiting the lower Androscoggin River below the project.

Mercury/dioxin monitoring - EPA recommended that Central Maine study the effects that operating Gulf Island-Deer Rips has on dioxin concentrations in the project area and downstream river reaches, including evaluating operational alternatives to reduce any impacts. The Conservation Coalition recommended that both game fish and selected waterfowl or birds of prey from the project be analyzed for the severity of mercury contamination. We estimated the capital cost of conducting a mercury/dioxin study, including evaluating the presence and concentrations (body burden) of these contaminants, to range from a minimum of $21,000 (annual cost of $3,000) to $255,000 (annual cost of $38,000) (*see Table C-1*).

As discussed in Section 4.2.1.1., there is little, if any, evidence at present to conclude that mercury and dioxin concentrations are significantly affecting the fish resources in Gulf Island impoundment or the lower Androscoggin River. Further, there is no convincing argument that the limited amount of sediment surface area affected by the weekly peaking operation results in any significant resuspension of dioxin or additional methylation of mercury. Consequently, there is no evidence that additional analysis might identify alternative project operations likely to reduce bioavailable concentrations of mercury and dioxin at the project. Finally, while background sediment samples could be useful in assessing potential mercury contamination, we do not believe the burden of discovery should be borne by Central Maine, nor would we expect the results of such studies to identify solutions within the responsibility of Central Maine. Therefore, we do not believe it is

appropriate to require Central Maine to conduct costly background contaminant monitoring, especially since Gulf Island-Deer Rips has not been linked to either the source or continued cause of any mercury and dioxin problems.

In Section 4.2.1.1. we also discussed the Conservation Coalition's recommendation that Central Maine and its partners in the oxygenation project study the impacts that bubbling may have on circulation and resuspension of dioxin-laden sediments within the Gulf Island impoundment and tailwaters. We concluded that this recommendation has some merit. However, we do not believe the cost of such studies should be borne solely by Central Maine. GIPOP is a partnership, hence the partnership should be responsible for evaluating the role that oxygen injection has on resuspension of toxic-laden sediments in the Gulf Island impoundment. Therefore, we do not recommend that the Commission require Central Maine to study GIPOP's effect on mercury and dioxin in the Gulf Island impoundment, and did not include this recommendation in our economic evaluation of Gulf Island-Deer Rips.

If, through future studies, impoundment operations are linked to mobilization of mercury and/or dioxin, we recommend that any license issued for Gulf Island-Deer Rips be amended at a later date, so that localized and cumulative effects may be addressed during the term of the project's new license. In this regard, we recommend that a cumulative effects re-opener article be included in any license issued for the project.

Conservation easements/buffer zone - The Conservation Coalition requested that Central Maine expand the Gulf Island-Deer Rips project boundary to incorporate additional land owned by Central Maine, and that conservation easements be obtained on land within a 500-foot-wide zone on both sides of the river (in the project vicinity) on properties not owned by Central Maine. Providing the Conservation Coalition's suggested conservation easements/buffer zone could require Central Maine to spend an annual amount of about $1,268,000 ($8,550,000 capital cost) at Gulf Island-Deer Rips to acquire land rights around the project's two impoundments (*see Table C-1*). These annual costs are not warranted when compared to their potential incremental benefits over our recommended comprehensive land management plan, which would include a 200-foot-wide buffer zone (*see land management plan discussion in previous section*).

Similarly, Land Trust *et al.* requested that Central Maine grant conservation easements on all of its land bordering the two project impoundments that lies within the 250-foot shoreland zone. The costs of requiring conservation easements on land owned by Central Maine would be minimal, and would be limited primarily to administrative costs. We estimate that providing a 250-foot-wide buffer zone on all land within 250 feet of the project's two impoundments could require Central Maine to spend $3,040,000 (capital cost) to acquire needed land rights (*see Table C-1*). At an annual cost of $451,000, we do not believe that these annual costs are warranted when compared to their potential benefits as compared to our recommended comprehensive land management plan, which would include a 200-foot-wide buffer zone (*see land management discussion in previous section*).

We conclude that our recommended comprehensive land management plan (*see discussion in previous section*) would adequately protect the natural resources along the Androscoggin River from inappropriate or excessive development. Furthermore, Central Maine's existing project boundary provides the public adequate access to project lands.

Recreation enhancement measures along the lower Androscoggin River - Providing Land Trust *et al.*'s trail network, canoe portages, and car-top boat launch facilities in the Gulf Island-Deer Rips area and along the lower Androscoggin River in the Cities of Lewiston and Auburn would require a capital cost of $1,449,000 and an annual operational and maintenance cost of $7,000. This would result in an annual cost of $222,000 (*see Table C-1*). Based on Central Maine's use estimates, we concluded in Section 4.2.1.4. that there was sufficient public use of the Gulf Island impoundment and existing boat launches and day-use picnic facilities to support the recreational development proposed by Central Maine, but was insufficient to justify the extensive development of recreation facilities recommended by Land Trust *et al.* Central Maine's recreation use assessments would provide the opportunity to evaluate the need for additional recreational development in the future. Therefore, we conclude that the economic costs to provide Land Trust *et al.*'s recommended recreation development would result in marginal public benefits, and are not warranted. Central Maine's proposed, and our recommended, comprehensive land management plan for the project area generally would accommodate many of Land Trust *et al.*'s recommendations relating to recreational opportunities in the project vicinity.

Additional measures not adopted - Among the recommendations filed by commenting entities, which were not discussed above, we do not recommend adopting the following additional measures, as analyzed in Section 4.0 of this document.

(1) implement measures to raise DO levels in the project impoundment and tailrace area to 8.0 mg/l;

(2) fund a sediment sampling program to determine the rate of sediment deposition and level of dioxin contamination;

(3) Central Maine should assess the operation of the headwater storage reservoirs and alternatives to the proposed project operations to enhance salmonid habitat and angling opportunity in the lower Androscoggin River watershed (*see Section 1.3.*);

(4) implement pilot programs to create shoreland vegetation along the Gulf Island impoundment;

(5) investigate the relationship among project operations and excessive color, odor, foam, and turbidity in the Androscoggin River below Gulf Island-Deer Rips; and

(6) Central Maine should accept responsibility for project decommissioning and dam removal, including contaminated sediment remediation or disposal, at some future time (*see Section 2.6.*).

We cannot directly quantify what, if any, environmental enhancements may be provided by any of these recommendations, nor can we quantify what the economic impact of most of these recommendations would be at the project. The agencies and/or NGOs have provided no sound reasoning or evidence supporting these recommendations, in terms of how implementing these recommendations would protect resource values in the vicinity of Gulf Island-Deer Rips. Without sufficient information to evaluate these recommendations, we do not have a proper basis to recommend inclusion of one or more of these recommendations in any license issued for the project. Therefore, we believe these measures are not warranted at the project; thus, we are not adopting the recommendations.

In addition to the six measures listed above, the Conservation Coalition and Land Trust *et al.* recommend Central Maine establish environmental enhancement funds (i.e., two percent of the project's gross revenue and five percent of the net present value of the project, respectively) to help protect resources in, and along, the lower Androscoggin River corridor.

We did estimate the cost to Central Maine of establishing trust funds for environmental enhancements (*see Table C-1*). In order to evaluate whether the inclusion in the license of an enhancement fund should be recommended to the Commission, we must have supporting documentation that shows the public benefits to be gained by implementing the measure. The requests for enhancement funds in this case lacks evidence sufficient for our evaluation. We must consider and evaluate the recommendation for an enhancement fund under Section 10(a) of the FPA; that is, we must consider all aspects of the public interest in the use of the waterway by weighing, or giving value to, the resources the recommendation would affect. The staff/agency aggregate option includes recommendations and provisions that would protect and enhance environmental resources in the project area and in the lower Androscoggin River below the project for the term of any new license. The environmental measures we recommend to the Commission are those measures where the benefit to the non-developmental resources balances or justifies the developmental costs.

Without sufficient information to evaluate the recommendations for enhancement funds, we do not have a proper basis to recommend inclusion of an enhancement fund in the license. We believe that establishing an environmental enhancement fund to enhance environmental resources in the lower Androscoggin River is not warranted, and therefore, we are not adopting the Conservation Coalition's and Land Trust *et al.*'s environmental trust fund recommendations.

5.4.2. Marcal

(1) Water resources

- Provide plans describing the methods for releasing required minimum flows and monitoring project operation

- Limit impoundment fluctuations to no more than one foot below normal full pond elevation from May 1 to October 15, and no more than two feet below normal full pond elevation from October 16 to April 30

- Provide a year-round project minimum flow of 56 cfs, or inflow, whichever is less, for the protection of water quality below Marcal

(2) Fisheries resources

- Provide a schedule and plan for installing downstream fish passage facilities at the project

- Provide a plan to monitor the effectiveness of the downstream fish passage facilities according to a schedule agreed to between Consolidated Hydro and the resource agencies

- Ensure that the design, location, installation (including scheduling), maintenance, and operation of fishways at the project conform to the specifications of the FWS, subject to final Commission approval

- Reserve the Commission's authority to require the construction, operation, and maintenance of fishways prescribed by the Secretary of Interior pursuant to Section 18 of the FPA

- Provide a year-round project minimum flow of 56 cfs, or inflow, whichever is less, for the enhancement of aquatic habitat below Marcal and Hackett Mills

- Provide a year-round minimum flow of 20 cfs, or inflow, whichever is less, in the project's bypassed reach to enhance aquatic habitat and fisheries in this portion of the Little Androscoggin River, and include a provision to address future flow needs in the bypassed reach (flow would be a portion of the overall project minimum flow)

(3) Recreation resources

- Develop a permanent carry-in boat access facility to the project's impoundment, including (a) a gravel access road; (b) a gravel parking area for ten cars; (c) a carry-in boat launch; (d) handicapped-accessible riverbank fishing access; (e) fencing,

security lighting, and signage; and (f) a dry hydrant for use by the Mechanic Falls Fire Department

- Provide a canoe portage route around the project

- Periodically conduct recreation use monitoring studies (FERC Form 80, Recreation Use Assessment) in consultation with the resource agencies and evaluate the future need for additional recreation facilities to meet user demand

Among the measures we have selected for Marcal, there are nine that affect the project's economics and warrant further discussion. These measures were analyzed in Section 4.0, and are discussed below under the appropriate resources: water resources, fisheries resources, and recreation resources.

Water Resources. We recommend two enhancements for the benefit of water quality and quantity in the project area and in the Little Androscoggin River.

Operational and flow monitoring - We recommend that Consolidated Hydro prepare plans describing the methods for releasing minimum flows [*i.e., project and bypass minimum flows*] and monitoring project operation, and showing how the required flows will be maintained below the project and in the project's bypassed reach when the impoundment is refilled after generation drawdowns, or after any maintenance and/or repairs. The plans should include descriptions of all mechanisms and structures that will be used, the level of manned or automatic facility operation, the methods for recording and maintaining data on project operations and providing it to the Commission and resource agencies for inspection. These plans should be approved before any changes in project operation take place.

The costs associated with the preparation of these plans would be minimal, while the capital costs and annual operation and maintenance costs associated with the instream flow monitoring equipment are estimated to be $50,000 and $5,000, respectively (*see Table C-2*) [total annual cost of about $6,770]. Requiring the plans, however, would provide the resource agencies and the Commission with useful and necessary information.

Project minimum flow - In Sections 4.1.2.2. and 4.2.2.1., we discussed the need for a project minimum flow to protect water quality in the Little Androscoggin River below Marcal. We concluded that Consolidated Hydro's proposed year-round flow release of 56 cfs would enhance the assimilative capacity of the Little Androscoggin River, thereby providing significant cumulative benefits to water quality in the lower reaches of the river below Marcal.

The capital and annual operational costs associated with releasing the 56-cfs project minimum flow are included in the costs of our recommended project operations and minimum flows discussed below.

Fishery Resources. We recommend several enhancements for the benefit of fishery resources in the project area, the Little Androscoggin River, and the lower Androscoggin River.

Downstream fish passage - In Section 4.1.2.3., we discussed the need for fish passage facilities at Marcal and the merits of the proposals/recommendations for the immediate installation of downstream fish passage facilities at the project. We concluded that Consolidated Hydro's proposed conceptual design drawings for Marcal's downstream fish passage facilities, consisting of a surface bypass at the project dam, would provide adequate downstream fish passage.

As shown in Table C-2, the capital cost associated with the installation of the downstream fish passage facilities is estimated to be $100,000. The annual cost associated with operating and maintaining the downstream fish passage facilities is estimated to be $10,000. While final fishway design specifics, including spillage and/or transport flows during operation, is proposed to be determined during the final design phase in consultation with the fishery agencies, we concluded that Consolidated Hydro's proposed design would provide significantly improved downstream fish passage. At an annual cost of $14,960, which includes the costs of the fish passage effectiveness studies discussed below, we conclude that the cumulative benefits to the lower Androscoggin River's and Little Androscoggin River's anadromous fish restoration are worth the additional expense.

Fish passage effectiveness studies - To monitor the effectiveness of any downstream fish passage facility constructed at Marcal, we recommend that Consolidated Hydro develop and implement a monitoring plan for evaluating the effectiveness of downstream fish passage facilities at Marcal. The study plan, including the implementation/monitoring schedule, should be developed and implemented in consultation with the resource agencies. While the capital cost of conducting the study is estimated at $22,000 (*see Table C-2*), information obtained from the study would provide useful data on current and future fish passage facility design. The annual cost of the studies, which is included in the annual cost of downstream fish passage cited above, would be more than offset by the benefits to anadromous fishery restoration efforts.

Upstream fish passage - In Section 4.2.2.2., we discussed the need for upstream fish passage facilities at Marcal and the merits of the proposed deferral of installation of such facilities until some future time, pending the development of a fisheries management plan for the Little Androscoggin River. We agreed with the proposed deferral, and concluded that upstream fish passage facilities would be necessary at some point in the future. We base our conclusion on: (1) the success and criteria of the anadromous fishery restoration efforts, (2) the importance of the Little Androscoggin River to the restoration program, and (3) the need for future installation of upstream facilities at projects on the Little Androscoggin River, including Marcal, has been demonstrated by the past, present, and future planned stockings of anadromous fish above Marcal, as well as at various other locations within the basin.

The capital cost associated with the potential future installation of upstream fish passage facilities at Marcal would be significant. While the need for fish passage facilities at projects on the Little Androscoggin River will be a significant component of any future fisheries management plan for the watershed, we considered evaluating the costs of such facilities at Marcal to be premature at this time. We can not, with any accuracy, predict when, or if, upstream fish passage facilities would be required at Marcal, nor can we predict what type of upstream facilities, if any, would be required. Therefore, we did not include these costs in our economic analysis of the project. However, we do recognize that installation of fish passage facilities at projects on the Little Androscoggin River, including Marcal, if necessary, would provide significant cumulative benefits to the Lower Androscoggin River Basin's anadromous fish restoration program and would eventually enable anadromous fish to utilize significant portions of the Little Androscoggin River.

Project operation and minimum flows - For the enhancement of the resident and anadromous fisheries in the Little Androscoggin River, and the anadromous fish restoration efforts in the Lower Androscoggin River Basin, we recommend three environmental measures (CASE 8 for Marcal), including (1) an impoundment level fluctuation of one foot from May 1 to October 15 and two feet from October 16 to April 30; (2) a year-round project minimum flow of 56 cfs, or inflow, whichever is less; and (3) a year-round bypass minimum flow of 20 cfs, or inflow, whichever is less (*see bypass flow discussion below*). Water quality and quantity would also benefit from our recommended project operations and minimum flows (*see minimum flow discussion in Water Resources Section*).

Our recommended impoundment fluctuations and project minimum flow would provide: (1) moderately to significantly enhanced instream flows during anadromous fish migration periods, thereby enhancing the agencies' objective of managing the Little Androscoggin River for anadromous fish; (2) moderately enhanced aquatic habitat in the Marcal impoundment during the fish growing season; and (3) significantly enhanced downstream flows for resident fisheries (primarily brook trout and smallmouth bass).

These environmental measures would significantly affect the economics of Marcal. The operational cost of our recommended impoundment level fluctuations and minimum flows would be about $9,000 annually (*see Table B-20*), or an additional annual operational cost of about $3,000 over Consolidated Hydro's proposed mode of operation (*see Table B-14*). Our recommended mode of operation, including a project minimum flow, would result in a cumulative annual cost of about $21,000 at the four projects on the Little Androscoggin River, or an additional $5,000 annually over Consolidated Hydro's proposed operational alternative (*see Tables 2-2 and B-20*).

While we recognize that these are substantial costs, these measures would provide significant cumulative and project specific benefits to the anadromous fish restoration program in the Lower Androscoggin River Basin, and to the resident fishery in the Little Androscoggin River. We also note that existing wetlands in the project impoundment and downstream would be maintained and somewhat enhanced.

Marcal bypass reach minimum flows - To enhance aquatic habitat in the project's bypassed reach and for the establishment of a coolwater/coldwater fishery, we recommend that a minimum flow of 20 cfs, or inflow, whichever is less, be released in the project's bypassed reach on a year-round basis. Contrary to Interior's bypass minimum flow (*see our discussion of measures considered but not adopted in the next section*), our recommended bypass minimum flow would be a portion of our overall project minimum flow.

As discussed in Sections 4.1.2.3. and 4.2.2.2., providing a year-round minimum flow of 20 cfs would nearly maximize brook trout, as well as smallmouth bass habitat in Marcal's bypassed reach. This flow would also provide near optimum conditions for a stocked brook trout fishery, as well as protect aquatic habitat and resident fish during the winter months (November - February). Given what is probably an overall low amount of brook trout habitat in the project area and the potential habitat available in the project's bypassed reach, we conclude that the operational costs of providing this flow are worth the potential enhancements to the fisheries. The annual operational costs of releasing a 20-cfs minimum flow is included in the cost of our recommended project minimum flow discussed above. Similarly, the annual capital cost of installing a bypass minimum flow structure at the Marcal dam is included in the cost of our recommended project operation and flow monitoring plan discussed in the previous section.

At the 10(j) meeting, staff attempted to resolve our inconsistencies with Interior's recommendation by stating that a re-opener clause was warranted. Consolidated Hydro, after consultation with FWS, MDMR, and MDIFW, submitted reasonable and appropriate conditions to re-open the project's license, as it pertains to the bypass flow, in the event that flow needs change in the future. Therefore, in addition to our specific bypass-flow recommendation, we also recommend provisions consistent with those in the June 17, 1996 agreement between Consolidated Hydro, FWS, MDMR, and MDIFW [*see Section 4.2.2.2. for a detailed description of the provisions in the agreement, and our conclusions relative to those provisions*].

Recreation Resources. The capital costs associated with Consolidated Hydro's proposed recreation measures for Marcal, which were also recommended by the staff, include: (1) $30,000 to construct a boat launch/public access site on the project's impoundment; and (2) $5,000 to develop a canoe portage route around the project's dam and bypassed reach. The annual operational and maintenance costs would be about $3,500.

Requiring these measures would enhance recreational opportunities on the Little Androscoggin River, and ensure that recreation facilities developed at Marcal remain available to the public. These recreation measures would result in an annual cost of $4,760 (*see Table C-2*).

In addition to these costs, we recommend that Consolidated Hydro periodically conduct recreation use monitoring studies, as required by FERC Form 80 (Recreation Use Assessment), to further enhance the recreational opportunities offered at the project. This

measure would provide opportunities to reassess Marcal's recreation facilities in the future. The capital cost associated with doing these studies would be minimal. Recreation monitoring studies, as required by the Commission's regulations, would, however, provide Consolidated Hydro, the resource agencies, and the Commission with useful and necessary information.

Measures considered, but not recommended

The staff/agency aggregate option did not include adopting three measures recommended or requested by the agencies and NGOs. The measures include: (1) Interior's recommended minimum bypass flow; (2) Interior's recommendation to provide a buffer zone around the project impoundment; and (3) Hackett Mill Hydro's recommended run-of-river operation. We concluded that the additional costs to implement these measures are more than the value of their potential incremental benefits.

Interior's recommended minimum bypass flow - Releasing Interior's minimum bypass flow of 56 cfs would provide: (1) about 100 percent of the smallmouth bass habitat (all lifestages) in the bypassed reach; and (2) 74 percent of the juvenile brook trout habitat and 100 percent of the adult brook trout habitat[17] in the bypassed reach. Interior's operational recommendations, including the bypass minimum flow release, would result in an annual cost of about $16,000, or an additional $10,000 over Consolidated Hydro's proposal. Cumulatively, Interior's recommended operational changes would cost the projects on the Little Androscoggin River an estimated $34,000, or an additional $18,000 over Consolidated Hydro's proposal [*see Tables 2-2, B-14, B-15, Section 5.3, and Appendix D*].

For smallmouth bass, Interior's bypass flow release provides from eight percent to 27 percent more habitat than does our recommended bypass flow release, depending on the lifestage. This is a modest incremental increase in habitat over what would exist under our recommended bypass flow release. For brook trout, juvenile habitat in the bypassed reach would decline by 11 percent and adult habitat in the same reach would increase by 16 percent with Interior's bypass flow release. Again, these are incrementally small changes, both beneficial and adverse, when compared to the significant positive changes that occur with our recommended bypass flow release. We conclude that these habitat differences under Interior's and the staff's recommended bypass minimum flow releases are probably not significant, and that Interior's recommended minimum bypass flow does not justify the additional expense at this time.

We recognize that management priorities and flow needs in the Little Androscoggin River, particularly in Marcal's bypassed reach, may change in the future [*see Section 5.5.2.*]. For this reason, we recommend including a provision to address the bypass flow issue at the project in the future(*see staff's recommendation*).

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[17] We did not consider brook trout fry habitat in our discussion at this point, as the brook trout fishery in this area of the Little Androscoggin River is a stocked fishery and not naturally reproducing.

Buffer zones - Interior recommended that Consolidated Hydro develop a plan for providing buffer strips and other appropriate shoreline protection measures in the project area. Consolidated Hydro owns only flowage rights on the land upstream of the Marcal dam, and does not own any additional land surrounding the Marcal impoundment.

We must consider and evaluate the recommendation for a buffer zone under Section 10(a) of the FPA; that is, we must consider all aspects of the public interest in the use of the waterway by weighing, or giving value to, the resources the recommendation would affect. We would not recommend Consolidated Hydro develop a plan to provide buffer strips or other shoreline protective measures on land surrounding the project for two reasons.

First, in order to evaluate whether the inclusion in the license of a buffer zone should be recommended to the Commission, we must have supporting documentation that shows the public benefits to be gained by implementing the measure. By letter dated November 4, 1994, we requested from Interior information regarding buffer strips or other protective measures along the project impoundment. However, Interior provided no sound reasoning or evidence supporting this recommendation, in terms of how implementing this recommendation would protect resource values in the vicinity of Marcal.

Second, we have not specifically quantified the cost associated with this recommendation. However, staff estimated that this measure would involve the purchase or lease of about 100 acres of land around the Marcal impoundment,[18] at a cost of about $175,000.[19] This estimate is conservative in that it does not account for the value the buildings presently located within 200 feet of the shoreline. Because Marcal is marginally economic under current conditions, the additional cost for buffer strips around the project impoundment would constitute a significant cost to Consolidated Hydro.

Without sufficient information to evaluate the recommendation for a buffer zone, we do not have a proper basis to recommend inclusion of a buffer zone in the license. Further, we do not believe that any potential benefits would outweigh the significant cost associated with Interior's recommended shoreline protection measures.[20] Therefore, we believe that requiring a buffer zone to protect shoreland areas in the project area is not warranted, and are not adopting Interior's buffer zone recommendation.

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[18] We based this estimate on a 200-foot-wide buffer zone for shoreland protection as established by Commission Order 313.

[19] We assumed the land surrounding the Marcal impoundment is similar to the land surrounding the Gulf Island-Deer Rips project area. Therefore, we used an average land value of $1,750 per acre.

[20] We are recommending buffer zones at Gulf Island-Deer Rips and not at Marcal because: (1) economically, Gulf Island-Deer Rips could support such protection measures; and (2) Central Maine, unlike Consolidated Hydro, already owns or controls the majority of the property that would be included in a 200-foot buffer zone around the Gulf Island-Deer Rips project area, and would not incur a significant added cost.

Hackett Mill Hydro's recommended project operation - Operating the project in a year-round run-of-river mode would protect aquatic resources and water quality in the project area by maintaining a constant flow regime below the project and by preventing the dewatering of aquatic habitat. Further, impoundment level fluctuations would be minimized, resulting in benefits to aquatic habitat in the impoundment.

Alternatively, our recommended mode of operation for Marcal, including a project minimum flow, would: (1) allow Consolidated Hydro to continue operating the project as a seasonal run-of-river/storage-and-release facility, although modified from the current peaking operation; and (2) provide enhancements to aquatic habitat in the project's impoundment/bypassed reach and downstream river reaches, which would provide significant benefits to water and fisheries resources.

We conclude that any changes to project operation and minimum flows from the existing operating regime would significantly affect the economic viability of the project. The annual cost of operating Marcal in a run-of-river mode, according to Hackett Mill Hydro's proposal, would be about $7,000, or an additional $1,000 over Consolidated Hydro proposal. The annual cost at the four projects on the Little Androscoggin River would be about $15,000; annually $1,000 less than Consolidated Hydro's proposal. [*see Tables 2-2, B-14, B-16, Section 5.3, and Appendix D*].

Based on our environmental analysis, we do not believe that Hackett Mill Hydro's run-of-river operation would provide significantly different benefits from our recommended project operation regime that would justify our considering the more stringent operational regime. Moreover, run-of-river operation would be more costly for the projects on the Little Androscoggin River than our recommended operational regime. Our recommended mode of operation for Marcal, including appropriate year-round project and bypass minimum flows, would adequately protect the aquatic habitat in the project's impoundment/bypassed reach and in the downstream river reaches, and would justify the additional cost.

5.4.3. 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 or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Under Section 10(a)(2) of the FPA, federal and state agencies filed a total of 14 comprehensive plans that address various resources in Maine. Of these, we identified and reviewed 10 plans relevant to the hydroelectric projects on the lower Androscoggin River.[21] No inconsistencies were found.

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[21] **State:** (1) Strategic plan for management of Atlantic salmon in the State of Maine, Maine Atlantic Sea-Run Salmon Commission, July 1984; (2) Maine rivers study-final report, Maine Department of Conservation, May 1982; (3) State of Maine comprehensive rivers management plan, Maine State Planning Office, Volumes 1-3, May 1987; (4) State of Maine comprehensive rivers management plan, Maine State Planning Office, Volume 4, December 1992 [includes Maine's statewide river fisheries management plan, Maine

We also reviewed federal and state plans that were relevant to the projects but weren't listed as Commission approved comprehensive plans. They are as follows: (1) Androscoggin River habitat suitability and fish management potential, Maine Department of Inland Fisheries and Wildlife, 1986; (2) New Hampshire wetlands priority conservation plan, New Hampshire Office of State Planning, 1989; (3) Lower Androscoggin River recreation study and management plan, Androscoggin Valley Council of Governments, 1983; (4) the Androscoggin River Basin overview, New England River Basins Commission, 1981; and (5) Maine Atlantic salmon restoration and management plan, 1995-2000, Atlantic Sea Run Salmon Commission, 1995.

From our evaluation of the environmental and the economic effects of the projects and the alternatives, as well as comprehensive plans relevant to the projects, we conclude that relicensing Gulf Island-Deer Rips and licensing Marcal, and implementation of our environmental recommendations, would best adapt the projects to a comprehensive plan for developing the Lower Androscoggin River Basin.

5.5. Fish and Wildlife agency recommendations

Section 10(j) of the FPA requires the Commission to include license conditions, based on recommendations provided by the federal and state fish and wildlife agencies for the protection of, mitigation of adverse impacts to, and enhancement of fish and wildlife resources affected by the project(s). We have addressed the concerns of the federal and state fish and wildlife agencies and made recommendations, some of which are inconsistent with those of the agencies.

Section 10(j) of the FPA states that whenever the Commission believes any fish and wildlife agency recommendations are inconsistent with the purposes and requirements of the FPA or other applicable law, the Commission and the agencies shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agencies.

Interior is the only entity to have filed 10(j) recommendations for Gulf Island-Deer Rips and Marcal. No state fish and wildlife resource agency has filed recommendations under 10(j) of the FPA. MSPO, in providing 10(j) comments on the license applications for Gulf Island-Deer Rips and Marcal, stated that the decisions, terms and conditions made by

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State Planning Office, June 1982]; and (5) State of Maine comprehensive rivers management plan, Maine State Planning Office, Volume 5, February 1993.

Federal: (1) Final environmental impact statement - restoration of Atlantic salmon to New England rivers, Department of the Interior, May 1989; (2) North American wildlife management plan, U.S. Fish and Wildlife Service, May 1986; (3) North American waterfowl management plan, U.S. Fish and Wildlife Service, May 1986; (4) Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service, U.S. Fish and Wildlife Service, undated; (5) the nationwide rivers inventory, National Park Service, January 1982.

MDEP on the applications for Section 401 Water Quality Certification shall represent the sole position of the State of Maine regarding the Gulf Island-Deer Rips and Marcal license applications. As indicated in Section 4.4, MDEP has not issued 401 WQC's for Gulf Island-Deer Rips or Marcal.

We are making a determination that some of Interior's recommendations for Gulf Island-Deer Rips and Marcal conflict with the comprehensive planning and public interest standards of Sections 4(e) and 10(a) of the FPA. For both projects, the specifics of each recommendation's inconsistency are discussed below.

5.5.1. Gulf Island-Deer Rips

At Gulf Island-Deer Rips, we believe that the following recommendations made by Interior are inconsistent with Part 1 of the FPA, including the comprehensive development and balancing of resource values requirements of Section 10(a) and 4(e) of the FPA: (1) restricting water level fluctuations at the Gulf Island impoundment; and (2) releasing minimum flows below the project.

Moreover, pursuant to Section 10(j) of the FPA, we make a determination that Interior's recommendation to monitor recreational use at the project is an inappropriate fish and wildlife recommendation, in that it does not provide specific measures for the protection, mitigation of damages to, and enhancement of fish and wildlife resources. Although the recommendation was considered outside of the scope of 10(j), we considered it under Section 10(a) of the FPA. Further, the recommendation is addressed in the specific resource section of the FEIS (*see Section 4.0.*).

Table 5-4 lists the federal recommendations subject to Section 10(j) and 10(a), and whether they are adopted under the staff alternative.

Summary of 10(j) Process

Based on the analysis in the DEIS, we made a preliminary determination that Interior's recommendations for impoundment fluctuation restrictions and project minimum flows may have been inconsistent with sections 10(a) and 4(e) of the FPA. We were unable to resolve the inconsistencies of Interior's impoundment fluctuation restrictions and minimum flow recommendations and the FPA. A detailed discussion of the 10(j) process and issues follows.

Recommendations in the DEIS

We recommended adopting Interior's recommended run-of-river operation from May 1 to June 30, based on Interior's one-foot fluctuation definition of run-of-river operation. However, we did not recommend adopting Interior's recommendation to limit impoundment fluctuations to no greater than one foot from July 1 to April 30, which Interior argued was

Table 5-4. Summary of fish and wildlife agency recommendations at Gulf Island-Deer Rips (Source: the staff).

	Agency Recommendation (recommending agency)	Within the Scope of § 10(j)	Annual Cost of Environmental Measures (1995$)	Conclusion
1.	Operate the project in a run-of-river mode from May 1 through June 30, with impoundment fluctuations no greater than 1 foot [Interior]	Yes	$69,000[1]	Not adopted - The costs of implementing run-of-river operation outweigh the potential benefits; our one foot target fluctuation limit would provide nearly the same benefits to aquatic habitat and wetlands.
2.	Limit impoundment drawdowns to no more than 1 foot year-round [Interior]	Yes		Not adopted - The costs to restrict the peaking operation outweigh the potential benefits; a four foot impoundment fluctuation from July 1 - April 30 would maintain impoundment wetlands and associated resources
3.	Discharge a minimum flow of 1,700 cfs, or inflow, whichever is less, from the project during the period between July 1 to April 30 [Interior]	Yes		Not adopted - The benefits associated with Interior's recommended minimum flow do not outweigh the costs; our flow regime would provide significantly enhanced instream flows for fishery resources, while preserving the existing peaking operation
4.	DO and aquatic invertebrate monitoring plan [Interior]	Yes	$3,000	Adopted
5.	Operations and flow monitoring plan [Interior]	Yes	Minor	Adopted
6.	Monitor recreational use [Interior]	No	Moderate	Adopted
7.	Shoreline protection plan, including buffer zones [Interior]	Yes	Major	Adopted - We conclude that our recommended comprehensive land management plan is consistent with Interior's recommendation

[1] Interior's recommended operational scenario encompasses three recommendations related to impoundment fluctuations and downstream flows, and would cost $69,000 annually, as opposed to our recommended mode of operation which would have an annual cost of $31,000. Interior's recommendation would result in additional lost benefits of about $200,000 per year, due to changes in the project's peaking status in NEPOOL's rating system.

needed to fully protect fisheries habitat and wetlands in the Gulf Island impoundment. We concluded that a one-foot restriction from July 1 to April 30 would have a significant effect on the economics of the project ($57,000 per year)[22] while providing minor benefits, at best, to aquatic resources and wetlands in the Gulf Island impoundment.

Our recommendation for a four-foot drawdown limit from July 1 to April 30 would dewater about 13 percent of the littoral zone habitat, as opposed to only four percent with a one foot drawdown. However, because blackbass are mobile and can inhabit littoral-zone habitat that has been alternately watered and dewatered, we believe there would be little additional benefit to restricting impoundment fluctuations to one foot during this ten-month period. Moreover, a more stable impoundment regime may alter the composition of the existing wetlands in such a way that may result in less productive wetlands (*see Sections 4.1.1.3., 4.2.1.2., and 4.2.1.3.*). Therefore, we concluded that the recommendation might be inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA.

We also did not recommend adopting Interior's recommendation to release a minimum flow of 1,700 cfs downstream from the project from July 1 to April 30. We concluded that such a flow, in combination with Interior's recommended impoundment fluctuation restrictions, would have a significant effect on the economics of the project (*we included the cost of releasing Interior's recommended flow in our estimate of $57,000 identified above*). Our recommendation for 1,700 cfs from May 1 to November 30 would be consistent with Interior's recommendation during the fish growing season and migration seasons for American shad/alewife and Atlantic salmon; thus providing the same benefits. Moreover, our recommended 1,400-cfs flow from December 1 to April 30 would fully protect aquatic habitat and resident fish during the winter months; habitat availability with 1,400 cfs versus 1,700 cfs is nearly identical (*see section 4.2.1.2. for further discussion*). Therefore, we concluded that Interior's recommendation might be inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA.

Preliminary Determination of Inconsistency Letter

By letter dated December 1, 1995, we informed Interior of the potential inconsistencies and requested that they consider other options that would be agreeable to Interior, and would adequately protect (1) aquatic habitat and wetlands in the Gulf Island impoundment and (2) resident and anadromous fisheries interests in reaches of the river below the project consistent with other project purposes. The staff requested that Interior submit these options to the Commission within 45 days of the date of the letter, which was subsequently extended an additional 30 days.

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[22] Cumulatively, Interior's recommendation would cost the six (including the Upper Androscoggin Project) projects on the lower Androscoggin River roughly about $55,000 annually.

Interior, in their response letter dated February 22, 1996, stated that "we are not optimistic that we will be able to resolve our differing recommendations in a meeting ... ." Nevertheless, in a further attempt to resolve these issues and because staff had revisited its operational recommendations for the project, staff held a 10(j) meeting with a representative of Interior on April 8, 1996.

10(j) Meeting

- Impoundment fluctuation issue -

Interior reiterated its position regarding the need for run-of-river operation from May 1 to June 30 and a one foot fluctuation limit for the remainder of the year to fully protect the resident and anadromous fisheries interests in the lower Androscoggin River. Interior also clarified its run-of-river recommendation by stating that its definition of run-of-river would restrict fluctuations to those needed to accommodate monitoring error or changes in natural flow conditions.

In the DEIS, staff adopted Interior's run-of-river recommendation on the grounds that it permitted peaking with the one foot fluctuation limit, as would have been the case with our run-of-river recommendation. Because of what appears to be differences in our recommendations, we revised our conclusions and findings pertaining to run-of-river operation from May 1 to June 30 in the FEIS (*we provide further clarification below*).

Central Maine, in its February 16, 1996, letter commenting on the DEIS, suggested that Interior's recommendation to limit impoundment fluctuations to one foot from July 1 to April 1 and the staff's one-foot restriction from May 1 to June 30 could "significantly impact the revenue benefits that the Licensee derives from the Gulf Island Project within the NEPOOL system." Staff subsequently re-analyzed the impoundment fluctuation issue, and found that the Gulf Island impoundment, at times during May and June, would need to be fluctuated at a minimum of two feet to meet the NEPOOL requirements for a weekly peaking facility, which is how Gulf Island-Deer Rips is currently classified. Central Maine estimated the cost of such a reclassification to be about $200,000 annually; this would be in addition to the lost power benefits from restricting impoundment fluctuations.

Based on a lengthy discussion with Central Maine at the 10(j) meeting, staff stated that it would revise its recommended fluctuation regime in the FEIS as follows; a one-foot target fluctuation from May 1 to June 30, with an allowance of up to two feet to meet any unusual NEPOOL power requirements.

In summary, Interior did not comment on the proposed revisions to our operational recommendations for the Gulf Island impoundment. Moreover, while we recognize the environmental benefits of run-of-river, or a strict one-foot fluctuation limit, either seasonally or annually, we do not believe these benefits are commensurate with the significant additional cost that Central Maine would incur if the project were to lose its NEPOOL rating as a

weekly peaking project. Therefore, the inconsistencies that exist between staff's recommendations and Interior's recommendations were not resolved.

- Minimum flow issue -

Interior continued to support run-of-river operation from May 1 to June 30 and a 1,700 cfs minimum flow from July 1 to April 30. Interior believes these flows are necessary, at this time, to ensure that adequate flows are present during the fish passage season and to fully protect aquatic habitat downstream from the project throughout the year. Staff explained that a higher minimum flow was justified during the fish growing season and fish passage period, but could not be justified during the relatively in-active winter months.

Staff concluded that there was a lack of evidence, at this time, to support changing the flow regime recommended in the DEIS. However, we recognize that management priorities and flow needs below the project may change in the future. Furthermore, we acknowledge that there are on-going studies related to fish passage that could identify a need to alter the flow regime in the lower portion of the river. Thus, as an alternative, staff stated that a re-opener could be used to address future flow needs (i.e., either increases or decreases in flow) in the Androscoggin River below the project, more specifically the river reaches studied as part of Central Maine's minimum flow study. Interior agreed to the use of a re-opener, but continued to disagree with our flow recommendations. Consequently, the flow issue was not resolved.

5.5.2. Marcal

At Marcal, we believe that the following recommendations made by Interior are inconsistent with Part I of the FPA, including the comprehensive development and balancing of resource values requirements of Section 10(a) and 4(e) of the FPA: (1) releasing a minimum flow of 56 cfs to the project's bypassed reach; and (2) development of shoreland protection measures/buffer strips.

Moreover, pursuant to Section 10(j) of the FPA, we make a determination that Interior's recommendation to monitor recreational use at the project is an inappropriate fish and wildlife recommendation, in that it does not provide specific measures for the protection, mitigation of damages to, and enhancement of fish and wildlife resources. Although the recommendation was considered outside of the scope of 10(j), we considered it under Section 10(a) of the FPA. We addressed the recommendation in the specific resource section of the FEIS (*see Section 4.0.*).

Table 5-5 lists the federal recommendations subject to Section 10(j) and 10(a), and whether they are adopted under the staff alternative.

Table 5-5. Summary of fish and wildlife agency recommendations at Marcal (Source: the staff).

	Agency Recommendation (recommending agency)	Within the Scope of § 10(j)	Annual Cost of Environmental Measures (1995 $)	Conclusion
1.	Minimum flow and project operational monitoring plan [Interior]	Yes	$50,000	Adopted
2.	Discharge a minimum flow of 56 cfs to the project's bypass reach year-round [Interior]	Yes	$16,000	Not adopted - The benefits associated with Interior's recommended minimum bypass flow do not outweigh the costs. Our recommended minimum bypass flow would provide significantly enhanced bypass flows for fishery resources, while maintaining the existing peaking operation.
3.	Monitor recreational use [Interior]	No	Moderate	Adopted
4.	Shoreline protection plan, including buffer zones around the project area [Interior]	Yes	Major[1]	Not adopted - The benefits associated with Interior's recommended shoreline protection measures do not outweigh the costs. We conclude that because Consolidated Hydro is not proposing any changes in land use around the project, buffer strips or other shoreline protection measures are not warranted at this time.

[1] We conservatively estimate this measure would cost Consolidated Hydro a minimum of $175,000.

Summary of 10(j) Process

Based on the analysis in the DEIS, we made a preliminary determination that Interior's recommendations for minimum flows in the project's bypassed reach and a buffer zone around the project might be inconsistent with sections 10(a) and 4(e) of the FPA. We were unable to resolve the inconsistencies between Interior's bypassed reach minimum flow and buffer zone recommendations and the FPA. A detailed discussion of the 10(j) process and issues follows.

Recommendations in the DEIS

We did not recommend adopting Interior's recommendation to release a year-round minimum flow of 56 cfs, or inflow, whichever is less to fully protect aquatic habitat and resources in the project's bypassed reach. We concluded that such a flow would have a significant effect on the project's economics ($16,000 per year)[23] while providing incrementally small changes in the bypassed reach habitat. Our recommendation for a year-round 20-cfs bypass flow would provide eight to 27 percent less habitat for smallmouth bass, 16 percent less habitat for adult brook trout, and 11 percent more habitat for juvenile brook trout at roughly half the cost (*see Sections 4.2.2.2. and 5.4.2.*). Therefore, we concluded that the recommendation might be inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA.

We also did not recommend adopting Interior's recommendation for a buffer zone around the project. We concluded that without sufficient information to evaluate the recommendation for a buffer zone, we did not have a proper basis to recommend inclusion of a buffer zone in any license issued for the project. We also concluded that any potential benefits would not justify the significant cost associated with Interior's recommended shoreline protection measures. Therefore, we concluded that Interior's recommendation might be inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA.

Preliminary Determination of Inconsistency Letter

By letter dated December 1, 1995, we informed Interior of the potential inconsistencies and requested that they consider other options that would be agreeable to Interior, and would adequately protect (1) resident fish habitat in the bypassed reach and (2) shoreline areas around the project consistent with other project purposes. The staff requested that Interior submit these options to the Commission within 45 days of the date of the letter, which was subsequently extended an additional 30 days.

Interior, in their response letter dated February 22, 1996, stated that "we are not optimistic that we will be able to resolve our differing recommendations in a meeting ... ." Nevertheless, in a further attempt to resolve these issues and because staff had revised its operational recommendations for the project, staff held a 10(j) meeting with a representative of Interior on April 8, 1996.

[23] Cumulatively, Interior's recommendation would cost the four projects on the Little Androscoggin River roughly about $34,000 annually.

10(j) Meeting

- Bypass flow issue -

Interior reiterated its position that a year-round 56-cfs flow was needed to fully protect aquatic habitat in the bypassed reach, stating that the bypassed reach at Marcal is a unique habitat in that it is a free-flowing, high-gradient river reach. To support its position, Interior stated that it would have been prudent to have included juvenile Atlantic salmon and macroinvertebrates, in addition to brook trout and smallmouth bass, as target species in the bypass minimum flow study. Staff agreed with Interior's argument, but continued to hold that 56 cfs was not warranted at this time; 20 cfs provides a significant level of enhancement to aquatic habitat in the project's bypassed reach.

Variations in the flow release schedule and the use of a re-opener clause were discussed as potential alternatives. Interior expressed its willingness to work with Consolidated Hydro to reach a settlement that would (1) establish a mutually-acceptable minimum flow for the project's bypassed reach and (2) provide some level of off-site mitigation in return. Staff accepted this approach, and recommended that Interior and Consolidated Hydro file a settlement with the Commission by June 15, 1996. In the absence of such a settlement, staff stated that it would recommend a year-round 20-cfs minimum flow with a re-opener clause to accommodate future changes in flow needs.

By letter dated June 17, 1996, Consolidated Hydro filed certain provisions pertaining to the bypass flow at Marcal, pursuant to staff's request at the Section 10(j) meeting. Consolidated Hydro met with representatives from FWS, MDMR, and MDIFW. Consolidated Hydro and FWS were unable to reach an agreement on the bypass-reach minimum flow requirements. However, Consolidated Hydro, FWS, MDMR, and MDIFW jointly agreed to specific provisions related to bypass flows, future flow needs, and re-opening the bypass flow issue at some future date.

In Section 4.2.2.2. we describe in detail the provisions agreed to by Consolidated Hydro and the resource agencies, and discuss staff's conclusions pertaining to those provisions. Further, Section 5.2.2. contains our recommendations for bypass flows at Marcal and any provisions that would allow parties to reevaluate flow requirements in the bypassed reach at some future date.

- Buffer zone issue -

Staff re-stated its position that a buffer zone was not warranted for the Marcal Project at this time. Interior recognized the Commission's Policy, and stated that it was encouraging to see that the Commission has acknowledged that buffer zones do provide additional protection, and in some cases are recommending the establishment of shoreland protection measures. However, Interior continued to recommend that a buffer zone be established around the project. Thus, no resolution of the issue was reached.

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APPENDIX A: ASSUMPTIONS FOR ECONOMIC ANALYSES

Assumptions used in the economic analyses of the Lower Androscoggin River FEIS.

Assumption	Utility-Owned Project	Privately-Owned Project
Reference starting year	1995	1995
Financing period (if applicable)	20 years	20 years
Term of analysis	30 years	30 years
Construction escalation (if applicable)	0.0%	0.0%
Operation and maintenance escalation	0.0%	0.0%
Maximum federal tax	34%	34%
State and local taxes	3.05%	3.05%
Interest rate	10%	10%
Discount rate	10%	10%
Current alternative on-peak energy value	25.80 mills/kWh	25.80 mills/kWh
Current alternative off-peak energy value	20.30 mills/kWh	20.30 mills/kWh

APPENDIX B: ADDITIONAL ECONOMIC ANALYSES

B.1. Lower Androscoggin River

B.1.1. CASE 1: Baseline conditions

Under existing conditions, the Gulf Island powerhouse is an intermittent peaking facility which causes fluctuations of the Gulf Island impoundment and in the river flow below the project. When inflows to the Gulf Island impoundment are significantly below the turbines' maximum hydraulic capacity, the Gulf Island development operates in its peaking mode, which results in the pond level fluctuating by two to four feet from the full impoundment elevation either daily or over a period of a week. The Deer Rips and the Androscoggin No. 3 powerhouses operate as run-of-river facilities using inflows from the Gulf Island powerhouse. During off-peak periods and on the weekends, discharge from the project is reduced to 1,000 cfs to allow the impoundment to refill. The 1,000 cfs is a year-round flow, which Central Maine voluntarily maintains at Gulf Island-Deer Rips to meet Lewiston Falls's interim minimum flow requirement. We estimate that, by maintaining this flow, Central Maine has been generating about 2,300,000 kWh of energy during the low-value, off-peak periods that otherwise could have been generated during high-value, peak-load periods. We estimate this shift in energy generation has cost Central Maine about $11,315 in annual power value benefits.

Based on the project's description and operation (*see discussion in Section 2.1*), and under median flow conditions, we duplicate the project's annual energy generation of 131,100,000 kWh for the Gulf Island development and 58,625,000 kWh for the Deer Rips and Androscoggin No. 3 developments. With the on- and off-peak power values provided in Central Maine's additional information response letter, dated August 25, 1995, we estimate the annual value of the existing project's power would be about $4,382,000 (1995 $).

For the existing project's annual cost analysis, we consider undepreciated capital investment and annual operation/maintenance costs for Gulf Island-Deer Rips. Based on these costs, we estimate the annual project cost to be about $6,517,000 (1995 $).

The annual cost of the existing outstanding sunk costs combined with the annual power value as described above, would result in an existing project's net economic benefit of about -$2,135,000 annually or -11.25 mills/kWh (1995 $). For more details of the economic studies for Gulf Island-Deer Rips, see Section 2.7.1.

Cumulatively, the five existing projects on the lower Androscoggin River would produce about 569,650,000 kWh of total energy, with 232,790,000 kWh of on-peak energy and 336,860,000 kWh of off-peak energy, annually. The cumulative power generation would have a total annual value of about $12,844,000 (Table B-1). With available information of the projects' net investment, sunk costs, and operation and maintenance cost, we estimate the projects' cumulative annual cost to be about $27,100,000. We estimate that the five projects, as they currently exist and operate, would have a total cumulative net annual economic benefit of about -$14,256,000, or -25.02 mills/kWh (1995 $).

Table B-1. Annual energy generation under median flow conditions and economics (in 1995 year dollars) for the five lower Androscoggin River projects under **existing operating conditions** at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1]

Project Names	Total Plant Capacity (MW)	Annual Energy Generation			Net Annual Economics Results		
		On-peak (GWh)	Off-peak (GWh)	Total (GWh)	Power values ($1,000)	Project Costs ($1,000)	Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	31.12	96.55	93.17	189.72	4,382	6,517	-2,135
Gulf Island Development	20.90	69.05	62.05	131.10	3,041	4,503	-1,462
Deer Rips/Andros.3 Development	10.22	27.50	31.13	58.63	1,341	2,014	-673
Lewiston (P-2302 and P-11006)	38.50	64.86	73.46	138.32	3,165	6,925	-3,760
Worumbo (P-3428)	19.10	25.73	56.27	82.00	1,806	3,898	-2,092
Pejebscot (P-4784)	13.80	20.75	48.65	69.40	1,523	4,298	-2,775
Brunswick (P-2284)	19.00	24.90	65.30	90.20	1,968	5,462	-3,494
TOTAL	**121.52**	**232.79**	**336.86**	**569.65**	**12,844**	**27,100**	**-14,256**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.2. CASE 2: Central Maine's proposal

Central Maine proposes to improve two of the generating units at the Gulf Island development. This improvement would increase the effective generation flow by about 160 cfs, and the installed capacity by about 4,300 kW. In comparing the Gulf Island development with the upgrade to the existing development, we estimate the annual average energy generation would increase by about 17,690,000 kWh, with on-peak energy generation increasing by about 10,260,000 kWh and off-peak energy increasing by about 7,430,000 kWh. The annual value of power would increase by about $415,000. As a result of the increase in generation flow demand at the Gulf Island development, the Deer Rips and Androscoggin No. 3 developments would lose a total of about 230,000 kWh of off-peak energy generation annually. Due to this loss in energy generation, the annual value of the Deer Rips and Androscoggin No. 3 developments' power would decrease by about $5,000.

Based on the cost information provided in the license application (Central Maine, 1991), we estimate the annual cost of the units' upgrade to be about $440,000. We find the applicant's proposed upgrade at the existing Gulf Island development would provide 17,450,000 kWh net energy with a net economic benefit loss of about $30,000[1] annually (1995 $) at Gulf Island-Deer Rips.

Table B-2 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from Central Maine's proposed upgrade at the existing Gulf Island development with existing project operational conditions.

Central Maine's proposed operational enhancement measures consist of a year-round minimum flow release of 1,100 cfs, and an impoundment drawdown restriction of one-foot[2] from May 1 through June 15 and four feet from June 16 through April 30. The operational enhancement measures would result in a shift of about 720,000 kWh of annual energy generation from high-value, peak-load generation periods to low-value, off-peak generation periods at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power benefits of about $4,000 at Gulf Island-Deer Rips.

In addition to the energy generation upgrade and the operational enhancement measures, Central Maine also proposes other environmental enhancement measures that would require capital expenditures and additional operation and maintenance expenses at Gulf Island-Deer Rips. The non-operational enhancement measures consist of the GIPOP facility and associated DO monitoring program, the recreational facilities enhancements, and the

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[1] Incremental net annual benefits = Incremental annual power values - Incremental annual enhancement cost: $1,218,000 = [$1,701,000 + (-13,000)] - $470,000.

[2] Central Maine's one foot restriction from May 1 through June 15 is a target fluctuation, with an allowance of up to two feet in order to meet any unusual NEPOOL power requirements.

Table B-2. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **Central Maine's proposed generating unit upgrades under existing operating conditions** at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	4.30	10.26	7.19	17.45	411	440	-30
Gulf Island Development	4.30	10.26	7.43	17.69	415	440	-25
Deer Rips/Andros.3 Development	0.00	0.00	-0.23	-0.23	-5	0	-5
Lewiston (P-2302 and P-11006)	0.00	0.07	-0.07	0.00	0	0	0
Worumbo (P-3428)	0.00	-0.02	0.04	0.01	0	0	0
Pejebscot (P-4784)	0.00	-0.03	0.04	0.01	0	0	0
Brunswick (P-2284)	0.00	-0.05	0.04	-0.01	0	0	0
TOTAL	**4.30**	**10.22**	**7.25**	**17.47**	**411**	**440**	**-29**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

archeological and historical resources enhancements. We estimate that Central Maine's proposed generating capacity expansion and the non-operational enhancements would have an annual cost of about $598,000 at Gulf Island-Deer Rips (*see Table C-1*).

The annual cost of Central Maine's capitalized enhancement measures, combined with the annual power value loss with Central Maine's alternative, would result in a net benefit loss of about $602,000 annually (1995 $) at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), Central Maine's proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in total energy generation of about 10,000 kWh, with on-peak energy generation decreasing by about 310,000 kWh and off-peak energy increasing by about 320,000 kWh. The cumulative value of power would decrease by about $1,000 annually at the five lower Androscoggin River projects. In addition, Central Maine's proposed generating capacity expansion and non-operational enhancement measures for Gulf Island-Deer Rips would increase the cumulative cost of the five existing projects by about $598,000 over current conditions. The cumulative cost of Central Maine's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $599,000 annually (1995 $) from current conditions at the five projects.

Table B-3 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from Central Maine's proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-3. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **Central Maine's proposed operational scenario and enhancements** at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-0.72	0.72	0.01	-4	598	-602
Gulf Island Development	0.00	-0.64	0.64	0.00	-4	429	-433
Deer Rips/Andros.3 Development	0.00	-0.08	0.08	0.01	0	169	-169
Lewiston (P-2302 and P-11006)	0.00	0.24	-0.24	0.00	1	0	1
Worumbo (P-3428)	0.00	0.07	-0.07	0.00	0	0	0
Pejebscot (P-4784)	0.00	0.05	-0.05	0.00	0	0	0
Brunswick (P-2284)	0.00	0.05	-0.04	0.00	0	0	0
TOTAL	**0.00**	**-0.31**	**0.33**	**0.01**	**-1**	**598**	**-599**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.3. CASE 3: EPA's proposal

EPA did not specifically recommend operational changes related to minimum flow releases, but deferred to, and supports, Interior's flow recommendations. Staff also assumes that EPA would defer to, and support, Interior's fluctuation recommendations (*see Section B.1.4.*). The operational enhancement measures would result in a decrease of about 13,640,000 kWh in high-value, peak-load energy generation and an increase of about 13,950,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $69,000 at Gulf Island-Deer Rips.

Since EPA did not comment on Central Maine's proposed environmental enhancement measures for Gulf Island-Deer Rips, we used Central Maine's non-operational enhancement proposals, as discussed in Section 2.7.1.2. In addition to these enhancements, EPA also recommends mercury/dioxin monitoring and development of a plan to study alternatives to the existing GIPOP facility. We estimate that EPA's proposed non-operational enhancements would have an annual cost of about $594,000 at Gulf Island-Deer Rips (*see Table C-1*).

The annual cost of EPA's capitalized enhancement measures, combined with the annual value of lost power with EPA's alternative, would result in a net benefit loss of about $662,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), EPA's proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 420,000 kWh, with on-peak energy generation decreasing by about 12,900,000 kWh and off-peak energy increasing by about 13,330,000 kWh. The cumulative value of power would decrease by about $62,000 annually at the five lower Androscoggin River projects. In addition, EPA's non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $594,000 over current conditions. The cumulative cost of EPA's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $656,000 annually (1995 $) from current conditions at the five projects.

Table B-4 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains from existing conditions for the five lower Androscoggin River projects that would result from EPA's proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-4. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **EPA's proposed operational scenario and enhancements** at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-7.08	7.09	0.01	-50	594	-643
Gulf Island Development	0.00	-6.34	6.34	0.00	-42	426	-469
Deer Rips/Andros.3 Development	0.00	-0.74	0.74	0.01	-7	167	-174
Lewiston (P-2302 and P-11006)	0.00	-0.97	0.97	0.00	-13	0	-13
Worumbo (P-3428)	0.00	0.02	-0.02	0.00	-6	0	-6
Pejebscot (P-4784)	0.00	0.01	-0.01	0.00	-5	0	-5
Brunswick (P-2284)	0.00	0.01	-0.01	0.00	-6	0	-6
TOTAL	**0.00**	**-8.01**	**8.02**	**0.01**	**-79**	**594**	**-673**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.4. CASE 4: Interior's proposals

Interior's proposed operational enhancement measures consist of a minimum flow release of 1,700 cfs from July 1 through April 30 and operating in a run-of-river mode from May 1 through June 30. Interior also recommends a year-round drawdown limitation of one foot at the Gulf Island impoundment; not to be used for peaking purposes. The operational enhancement measures would result in a decrease of about 13,640,000 kWh in high-value, peak-load energy generation and an increase of about 13,950,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $69,000 at Gulf Island-Deer Rips.

Since Interior did not comment on Central Maine's proposed environmental enhancement measures for Gulf Island-Deer Rips, we used Central Maine's non-operational enhancement proposals, as discussed in Section B.1.2. In addition to these enhancement measures, Interior also recommends an aquatic invertebrate monitoring plan. We estimate that Interior's proposed non-operational enhancements would have an annual cost of about $594,000 at Gulf Island-Deer Rips (*see Table C-1*).

The annual cost of Interior's capitalized enhancement measures, combined with the annual value of lost power with Interior's alternative, would result in a net benefit loss of about $662,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), Interior's proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 420,000 kWh, with on-peak energy generation decreasing by about 12,900,000 kWh and off-peak energy increasing by about 13,330,000 kWh. The cumulative value of power would decrease by about $62,000 annually at the five lower Androscoggin River projects. In addition, Interior's non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $594,000 over current conditions. The cumulative cost of Interior's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $656,000 annually (1995 $) from current conditions at the five projects.

Table B-5 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains from the existing conditions for the five lower Androscoggin River projects that would result from Interior's proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-5. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **Interior's proposed operational scenario and enhancements** at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-10.53	10.58	0.05	-57	594	-650
Gulf Island Development	0.00	-8.99	8.99	0.00	-49	426	-476
Deer Rips/Andros.3 Development	0.00	-1.54	1.60	0.05	-7	167	-175
Lewiston (P-2302 and P-11006)	0.00	-0.24	0.24	0.00	-1	0	-1
Worumbo (P-3428)	0.00	0.21	-0.21	0.00	1	0	1
Pejebscot (P-4784)	0.00	0.14	-0.14	0.00	1	0	1
Brunswick (P-2284)	0.00	0.14	-0.13	0.01	1	0	1
TOTAL	**0.00**	**-10.28**	**10.35**	**0.06**	**-55**	**594**	**-649**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.5. CASE 5: Conservation Coalition's Run-of-River/1,400 cfs proposal

The Conservation Coalition's proposed operational enhancement measures consist of run-of-river operation from May 1 through June 30, and a minimum flow release of 1,400 cfs from July 1 through April 30 with a one foot drawdown limitation from July 1 through April 30. The operational enhancement measures would result in a decrease of about 11,870,000 kWh in high-value, peak-load energy generation and an increase of about 12,170,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $59,000 at Gulf Island-Deer Rips.

Since the Conservation Coalition did not comment on Central Maine's proposed environmental enhancement measures for Gulf Island-Deer Rips, we used Central Maine's non-operational enhancement proposals, as discussed in Section B.1.2. In addition to these enhancement measures, the Conservation Coalition also recommends a mercury/dioxin monitoring plan, development of a plan to study alternatives to GIPOP, a 500-foot-wide conservation easement/buffer zone, and an enhancement fund consisting of five percent of the project's net present value. We estimate that the Conservation Coalition's proposed non-operational enhancements would have an annual cost of about $1,899,000 at Gulf Island-Deer Rips (*see Table C-1*).

The annual cost of the Conservation Coalition's capitalized enhancement measures, combined with the annual value of lost power with the Conservation Coalition's alternative, would result in a net benefit loss of about $1,958,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), the Conservation Coalition's proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 410,000 kWh, with on-peak energy generation decreasing by about 11,670,000 kWh and off-peak energy increasing by about 12,080,000 kWh. The cumulative value of power would decrease by about $56,000 annually at the five lower Androscoggin River projects. In addition, the Conservation Coalition's non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $1,899,000 over current conditions. The cumulative cost of the Conservation Coalition's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $1,955,000 annually (1995 $) from current conditions at the five projects.

Table B-6 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from the Conservation Coalition's proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-6. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **CLF, et al's proposed R-O-R/1,400 cfs operational scenario and enhancements** at the Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-11.87	12.17	0.30	-59	1,899	-1,958
Gulf Island Development	0.00	-10.24	10.24	0.00	-56	1,362	-1,418
Deer Rips/Andros.3 Development	0.00	-1.63	1.93	0.30	-3	537	-540
Lewiston (P-2302 and P-11006)	0.00	-1.37	1.37	0.00	-8	0	-8
Worumbo (P-3428)	0.00	0.48	-0.48	0.00	3	0	3
Pejebscot (P-4784)	0.00	0.46	-0.42	0.04	3	0	3
Brunswick (P-2284)	0.00	0.64	-0.57	0.07	5	0	5
TOTAL	**0.00**	**-11.67**	**12.08**	**0.41**	**-56**	**1,899**	**-1,955**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.6. CASE 6: Conservation Coalition's Run-of-River/1,800 cfs proposal

Under CASE 6, the Conservation Coalition's alternative operational enhancement measures consist of run-of-river operation, as described in Section B.1.5., and a minimum flow release of 1,800 cfs from July 1 through April 30 (instead of 1,400 cfs) with a one foot drawdown limit from July 1 through April 30. The operational enhancement measures would result in a decrease of about 14,290,000 kWh in high-value, peak-load energy generation and an increase of about 14,620,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $72,000 at Gulf Island-Deer Rips.

As discussed in Section B.1.5, the Conservation Coalition's proposed non-operational enhancements would have an annual cost of about $1,899,000 at Gulf Island-Deer Rips.

The annual cost of the Conservation Coalition capitalized enhancement measures, combined with the annual value of lost power with the Conservation Coalition's alternative, would result in a net benefit loss of about $1,971,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), the Conservation Coalition's proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 440,000 kWh; on-peak energy generation would decrease by about 13,540,000 kWh, while off-peak energy generation would increase by about 13,980,000 kWh. The cumulative value of power would decrease by about $66,000 annually at the five lower Androscoggin River projects. In addition, the Conservation Coalition's non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $1,899,000 over current conditions. The cumulative cost of the Conservation Coalition's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $1,965,000 annually (1995 $) from current conditions at the five projects.

Table B-7 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from the Conservation Coalition proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-7. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **CLF, et al's proposed R-O-R/1,800 cfs operational scenario and enhancements** at the Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-14.29	14.62	0.33	-72	1,899	-1,971
Gulf Island Development	0.00	-12.04	12.04	0.00	-66	1,362	-1,428
Deer Rips/Andros.3 Development	0.00	-2.25	2.58	0.33	-6	537	-543
Lewiston (P-2302 and P-11006)	0.00	-1.04	1.04	0.00	-6	0	-6
Worumbo (P-3428)	0.00	0.57	-0.57	0.00	3	0	3
Pejebscot (P-4784)	0.00	0.52	-0.47	0.04	4	0	4
Brunswick (P-2284)	0.00	0.70	-0.63	0.07	5	0	5
TOTAL	**0.00**	**-13.54**	**13.98**	**0.44**	**-66**	**1,899**	**-1,965**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.7. CASE 7: TU *et al.*'s Run-of-River/1,700 cfs proposal

TU *et al.*'s proposed operational enhancement measures consist of run-of-river operation from May 1 through June 30 and a minimum flow release of 1,700 cfs with a one foot drawdown limitation from July 1 through April 30. The operational enhancement measures would result in a decrease of about 13,640,000 kWh in high-value, peak-load energy generation and an increase of about 13,950,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $69,000 at Gulf Island-Deer Rips.

Since TU *et al.* did not comment on Central Maine's proposed environmental enhancement measures for Gulf Island-Deer Rips, we used Central Maine's non-operational enhancement proposals, as discussed in Section B.1.2. In addition to these enhancement measures, TU *et al.* also recommends an aquatic invertebrate monitoring plan. We estimate that TU *et al.*'s proposed non-operational enhancements would have an annual cost of about $594,000 at Gulf Island-Deer Rips (*see Table C-1*).

The annual cost of TU *et al.*'s capitalized enhancement measures, combined with the annual value of lost power with TU *et al.*'s alternative, would result in a net benefit loss of about $662,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), TU *et al.*'s proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 420,000 kWh, with on-peak energy generation decreasing by about 12,900,000 kWh. Off-peak energy would increase by about 13,330,000 kWh. The cumulative value of power would decrease by about $62,000 annually at the five lower Androscoggin River projects. In addition, TU *et al.*'s non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $594,000 over current conditions. The cumulative cost of TU *et al.*'s capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $656,000 annually (1995 $) from current conditions at the five projects.

Table B-8 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from TU *et al.*'s proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-8. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to TU, et al's proposed R-O-R/1,700 cfs operational scenario and enhancements at the Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-13.64	13.95	0.31	-69	594	-662
Gulf Island Development	0.00	-11.56	11.56	0.00	-64	426	-489
Deer Rips/Andros.3 Development	0.00	-2.07	2.39	0.31	-5	168	-173
Lewiston (P-2302 and P-11006)	0.00	-1.04	1.04	0.00	-6	0	-6
Worumbo (P-3428)	0.00	0.56	-0.56	0.00	3	0	3
Pejebscot (P-4784)	0.00	0.51	-0.47	0.04	4	0	4
Brunswick (P-2284)	0.00	0.70	-0.63	0.07	5	0	5
TOTAL	**0.00**	**-12.90**	**13.33**	**0.42**	**-62**	**594**	**-656**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.8. CASE 8: TU *et al.*'s Year-round Run-of-River proposal

Under CASE 8, TU *et al.*'s alternative operational enhancement measure consists of year-round run-of-river operation. This operational enhancement measure would result in a decrease of about 30,850,000 kWh in high-value, peak-load energy generation and an increase of about 32,220,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $142,000 at Gulf Island-Deer Rips.

As discussed in Section B.1.7, TU *et al.*'s proposed non-operational enhancements would have an annual cost of about $594,000 at Gulf Island-Deer Rips.

The annual cost of TU *et al.*'s capitalized enhancement measures, combined with the annual value of lost power with TU *et al.*'s alternative, would result in a net benefit loss of about $735,000 annually (1995 $) over the existing conditions at the Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), TU *et al.*'s proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 2,160,000 kWh; on-peak energy generation would decrease by about 35,740,000 kWh, while off-peak energy would increase by about 37,900,000 kWh. The cumulative value of power would decrease by about $153,000 annually at the five lower Androscoggin River projects. In addition, TU *et al.*'s non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $594,000 over current conditions. The cumulative cost of TU *et al.*'s capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net-benefit loss of about $746,000 annually (1995 $) from current conditions at the five projects.

Table B-9 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from TU *et al.*'s proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-9. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to TU, et al's proposed year-round R-O-R operational scenario and enhancements at the Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1]

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-30.85	32.22	1.37	-142	594	-735
Gulf Island Development	0.00	-24.70	24.70	0.00	-136	423	-559
Deer Rips/Andros.3 Development	0.00	-6.15	7.52	1.37	-6	170	-176
Lewiston (P-2302 and P-11006)	0.00	-8.61	8.61	0.00	-47	0	-47
Worumbo (P-3428)	0.00	0.72	-0.60	0.12	6	0	6
Pejebscot (P-4784)	0.00	1.11	-0.82	0.28	12	0	12
Brunswick (P-2284)	0.00	1.90	-1.52	0.38	18	0	18
TOTAL	**0.00**	**-35.74**	**37.90**	**2.16**	**-153**	**594**	**-746**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.9. CASE 9: Land Trust *et al.*'s proposal

Land Trust *et al.*'s proposed operational enhancement measures consist of a year-round minimum flow release of 1,430 cfs. Since Land Trust *et al.* did not comment on the drawdown limitation, we used Central Maine's proposal (one foot drawdown from May 1 through June 15 and four feet from June 16 through April 30). The operational enhancement measures would result in a decrease of about 3,980,000 kWh in high-value, peak-load energy generation and an increase of about 4,050,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $20,000 at Gulf Island-Deer Rips.

With the exception of recreational enhancements, Land Trust *et al.* did not comment on Central Maine's proposed environmental enhancement measures for Gulf Island-Deer Rips. Therefore, we used Central Maine's non-operational enhancement proposals, as discussed in Section B.1.2. In addition to these enhancement measures, Land Trust *et al.* recommends recreational enhancements, including the development of a Greenway Trails, a 250-foot-wide conservation easement/buffer zone, an enhancement fund consisting of two percent of the project's gross revenue, and a mercury/dioxin monitoring plan. We estimate that Land Trust *et al.*'s proposed non-operational enhancements would have an annual cost of about $1,240,000 at Gulf Island-Deer Rips (*see Table C-1*).

The annual cost of Land Trust *et al.*'s capitalized enhancement measures, combined with the annual value of lost power with Land Trust *et al.*'s alternative, would result in a net benefit loss of about $1,260,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), Land Trust *et al.*'s proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 90,000 kWh, with on-peak energy generation decreasing by about 2,440,000 kWh and off-peak energy increasing by about 2,530,000 kWh. The cumulative value of power would decrease by about $12,000 annually at the five lower Androscoggin River projects. In addition, Land Trust *et al.*'s non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $1,240,000 over current conditions. The cumulative cost of Land Trust *et al.*'s capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $1,251,000 annually (1995 $) from current conditions at the five projects.

Table B-10 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from Land Trust *et al.*'s proposed operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-10. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **Land Trust, et al's proposed operational scenario and enhancements** at the Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-3.98	4.05	0.07	-20	1,240	-1,260
Gulf Island Development	0.00	-3.50	3.50	0.00	-19	890	-909
Deer Rips/Andros.3 Development	0.00	-0.48	0.56	0.07	-1	350	-351
Lewiston (P-2302 and P-11006)	0.00	0.81	-0.81	0.00	4	0	4
Worumbo (P-3428)	0.00	0.32	-0.32	0.00	2	0	2
Pejebscot (P-4784)	0.00	0.21	-0.21	0.00	1	0	1
Brunswick (P-2284)	0.00	0.21	-0.19	0.02	2	0	2
TOTAL	**0.00**	**-2.44**	**2.53**	**0.09**	**-12**	**1,240**	**-1,251**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.10. CASE 10: Staff's 1,700 cfs/1,100 cfs flow option

Staff evaluated an optional scenario that would require a minimum flow release of 1,700 cfs from May 1 through November 30 and 1,100 cfs from December 1 through April 30. Drawdowns in Gulf Island impoundment would be one foot from May 1 through June 30 and four feet from July 1 through April 30. The operational enhancement measures would result in a decrease of about 5,380,000 kWh in high-value, peak-load energy generation and an increase of about 5,480,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $28,000 at Gulf Island-Deer Rips.

We agree with Central Maine's non-operational enhancement proposals, as discussed in Section B.1.2. In addition to these enhancement measures, we also recommend an aquatic invertebrate monitoring plan and development of a plan to study alternatives to the existing GIPOP facility. We calculate that our proposed non-operational enhancements would have an annual cost of about $594,000 at Gulf Island-Deer Rips(*see Table C-1*).

The annual cost of staff's capitalized enhancement measures, combined with the annual value of lost power with our alternative, would result in a net benefit loss of about $621,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), staff's proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 110,000 kWh, with on-peak energy generation decreasing by about 3,810,000 kWh and off-peak energy increasing by about 3,920,000 kWh. The cumulative value of power would decrease by about $19,000 annually at the five lower Androscoggin River projects. In addition, staff's non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $594,000 over current conditions. The cumulative cost of staff's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $612,000 annually (1995 $) from current conditions at the five projects.

Table B-11 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from staff's alternative operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-11. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **Staff's option of 1,700 cfs/1,100 cfs operational scenario and enhancements** at the Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-5.38	5.48	0.09	-28	594	-621
Gulf Island Development	0.00	-4.52	4.52	0.00	-25	426	-451
Deer Rips/Andros.3 Development	0.00	-0.86	0.96	0.09	-3	167	-170
Lewiston (P-2302 and P-11006)	0.00	0.70	-0.70	0.00	4	0	4
Worumbo (P-3428)	0.00	0.38	-0.38	0.00	2	0	2
Pejebscot (P-4784)	0.00	0.25	-0.25	0.00	1	0	1
Brunswick (P-2284)	0.00	0.25	-0.23	0.02	2	0	2
TOTAL	**0.00**	**-3.81**	**3.92**	**0.11**	**-19**	**594**	**-612**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.1.11. CASE 11: Staff's 1,700 cfs/1,400 cfs flow option

Under CASE 11, staff evaluated a second operational scenario similar to the operational mode described in Section B.1.10., except that a minimum flow of 1,400 cfs from December 1 through April 30 (instead of the 1,100 cfs) would be released. Furthermore, this project operational scenario would include an impoundment drawdown limitation of one foot from May 1 through June 30, and four feet from July 1 through April 30. The operational enhancement measures would result in a decrease of about 5,990,000 kWh in high-value, peak-load energy generation and an increase of about 6,080,000 kWh in low-value, off-peak energy generation at Gulf Island-Deer Rips. This shift in energy equates to an annual loss of power value benefits of about $31,000 at Gulf Island-Deer Rips.

As discussed in Section B.1.10, our proposed non-operational enhancements, including an aquatic invertebrate monitoring plan and an alternatives study plan, would have an annual cost of about $594,000 at Gulf Island-Deer Rips.

The annual cost of staff's capitalized enhancement measures, combined with the annual value of lost power with our alternative, would result in a net benefit loss of about $625,000 annually (1995 $) over the existing conditions at Gulf Island-Deer Rips.

Overall, when compared with the existing project (including unit upgrades), staff's proposed change in the operation of Gulf Island-Deer Rips would result in a cumulative increase in energy generation of about 110,000 kWh; on-peak energy generation would decrease by about 3,950,000 kWh and off-peak energy would increase by about 4,060,000 kWh. The cumulative value of power would decrease by about $19,000 annually at the five lower Androscoggin River projects. In addition, staff's non-operational enhancement measures for Gulf Island-Deer Rips would cumulatively increase the cost of the five existing projects by about $594,000 over current conditions. The cumulative cost of staff's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $613,000 annually (1995 $) from current conditions at the five projects.

Table B-12 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the five lower Androscoggin River projects that would result from staff's alternative operational and non-operational enhancement measures at Gulf Island-Deer Rips.

Table B-12. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the five lower Androscoggin River projects due to **Staff's option of 1,700 cfs/1,400 cfs operational scenario and enhancements** at the Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1,000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)
Gulf Island-Deer Rips Project (P-2283)	0.00	-5.99	6.08	0.09	-31	594	-625
Gulf Island Development	0.00	-5.13	5.13	0.00	-28	426	-454
Deer Rips/Andros.3 Development	0.00	-0.86	0.95	0.09	-3	167	-170
Lewiston (P-2302 and P-11006)	0.00	0.98	-0.98	0.00	5	0	5
Worumbo (P-3428)	0.00	0.45	-0.45	0.00	3	0	3
Pejebscot (P-4784)	0.00	0.30	-0.30	0.00	2	0	2
Brunswick (P-2284)	0.00	0.30	-0.28	0.02	2	0	2
TOTAL	**0.00**	**-3.95**	**4.06**	**0.11**	**-19**	**594**	**-613**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2. Little Androscoggin River

B.2.1. CASE 1: Baseline conditions

Under existing conditions, the Marcal Project has no minimum flow requirements and no restrictions on impoundment fluctuations, thereby operating to make the most efficient use of the available water. Marcal operates in a seasonal run-of-river/storage-and-release mode, which consists of operating the project in a run-of-river mode when inflows are greater than the project's minimum hydraulic capacity, and in a daily cycling mode (using up to two feet of storage in the impoundment) when inflows are less than the project's minimum hydraulic capacity.

Based on the project's description and operation (*see discussion in Section 2.1*), and under median flow conditions, we duplicate the project's annual energy generation of 4,522,000 kWh. With the on-peak and off-peak power values provided in Central Maine's August 25, 1995, additional information response, we estimate the annual value of the existing project's power to be about $101,000 (1995 $).

For the existing project's annual cost analysis, we consider undepreciated capital investment and annual operation and maintenance costs for Marcal. Based on these costs, we estimate the annual project cost to be about $213,000 (1995 $).

The annual cost of the existing outstanding sunk costs combined with the annual power value as described above, would result in an existing project's net economic benefit of about -$112,000 annually or -24.79 mills/kWh (1995 $). For more details of the economic studies for Marcal, see Section 2.7.2.

Cumulatively, the four existing projects would produce 20,410,000 kWh of total energy, with 6,950,000 kWh of on-peak energy and 13,460,000 of off-peak energy. The cumulative power generation would have a total value of about $453,000 annually. With available information of the projects' net investment, sunk costs, and operation and maintenance expenses, we estimate the projects' cumulative annual cost to be about $1,084,000. Therefore, we estimate that cumulatively, all four projects, as they currently exist and operate on the Little Androscoggin River, would have a total net economic benefit of about -$631,000, or -30.92 mills/kWh (1995 $).

Table B-13 shows the project specific and cumulative total, peak-, and off-peak energy generation, and annual power value for the four Little Androscoggin River projects under existing operating conditions.

Table B-13. Annual energy generation under median flow conditions and economics (in 1995 year dollars) for the four Little Androscoggin River projects under **existing operating conditions** at Marcal Project (P-11482) (Source: staff).[1]

Project Names	Total Plant Capacity (MW)	Annual Energy Generation			Net Annual Economics Results		
		On-peak (GWh)	Off-peak (GWh)	Total (GWh)	Power values ($1000)	Project Costs ($1000)	Net Benefits ($1000)
Marcal (P-11482)	1.32	1.63	2.89	4.52	101	213	-112
Hackett Mills (P-6398)	0.47	0.76	1.44	2.19	49	178	-129
Upper Barkers Mill (P-3562)	1.00	1.63	3.26	4.89	108	365	-257
Lower Barkers Mill (P-2808)	1.50	2.94	5.87	8.81	195	328	-133
TOTAL	**4.29**	**6.95**	**13.46**	**20.41**	**453**	**1,084**	**-631**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2.2. CASE 2: Consolidated Hydro's proposal

Consolidated Hydro proposes no power expansion at Marcal. However, Consolidated Hydro proposes to change the existing project operation to maintain a year-round total minimum flow of 56 cfs below the project, of which 20 cfs would be released into the approximate 1,000-foot-long bypassed reach from June 1 through November 1. Consolidated Hydro also proposes to limit drawdowns of the Marcal impoundment to one foot from May 1 through October 15, and continue the existing two-foot drawdown from October 16 through April 30. The operational enhancement measures would result in a decrease of about 70,000 kWh in high-value, peak-load energy generation and a decrease of about 220,000 kWh in low-value, off-peak energy generation at Marcal. This loss in energy equates to an annual loss of power value benefits of about $6,000 at Marcal.

In addition to the operational enhancements, Consolidated Hydro also proposes other environmental enhancement measures that would require capital expenditures and additional operation and maintenance expenses at Marcal. These non-operational enhancement measures consist of constructing downstream fish passage facilities, establishing an instream flow monitoring plan [more specifically, the automated minimum flow gate], and recreational facilities. We estimate that Consolidated Hydro's proposed non-operational enhancements would have an annual cost of about $24,000 at Marcal (*see Table C-2*).

The annual cost of Consolidated Hydro's capitalized enhancement measures, combined with the annual value of lost power with Consolidated Hydro's alternative, would result in a net benefit loss of about $30,000 annually (1995 $) over the existing conditions at Marcal.

Overall, when compared with the existing project, Consolidated Hydro's proposed change in the operation of Marcal would result in a cumulative decrease in energy generation of about 760,000 kWh, with on-peak energy generation decreasing by about 160,000 kWh and off-peak energy decreasing by about 610,000 kWh. The cumulative value of power would decrease by about $16,000 annually at the four Little Androscoggin River projects. In addition, Consolidated Hydro's proposed capitalized non-operational enhancement measures for Marcal would increase the cumulative cost of the four existing projects by about $24,000 over current conditions. The cumulative cost of Consolidated Hydro's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $40,000 annually (1995 $) from current conditions at the four projects.

Table B-14 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the four Little Androscoggin River projects that would result from Consolidated Hydro's proposed operational enhancement measures at Marcal.

Table B-14. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the four Little Androscoggin River projects due to **Consolidated Hydro's proposed operational scenario and enhancements** at Marcal Project (P-11482) (Source: staff).[1]

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)
Marcal (P-11482)	0.00	-0.07	-0.22	-0.29	-6	24	-30
Hackett Mills (P-6398)	0.00	0.03	0.00	0.02	1	0	1
Upper Barkers Mill (P-3562)	0.00	-0.03	-0.11	-0.14	-3	0	-3
Lower Barkers Mill (P-2808)	0.00	-0.08	-0.27	-0.36	-8	0	-8
TOTAL	**0.00**	**-0.16**	**-0.61**	**-0.76**	**-16**	**24**	**-40**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2.3. CASE 3: Interior's proposal

Interior's recommended operational enhancement measures consist of a year-round minimum flow release of 56 cfs below the project, which would be released into the project's bypassed reach. Since Interior did not provide any comments on impoundment drawdowns, we used Consolidated Hydro's proposal of a one foot drawdown from May 1 through October 15, and two feet from October 16 through April 30. The operational enhancement measures would result in a decrease of about 190,000 kWh in high-value, peak-load energy generation and a decrease of about 530,000 kWh in low-value, off-peak energy generation at Marcal. This loss in energy equates to an annual loss of power value benefits of about $16,000 at Marcal.

Since Interior did not comment on Consolidated Hydro's proposed capitalized non-operational environmental enhancement measures for Marcal, we used Consolidated Hydro's non-operational enhancement proposals, as discussed in Section B.2.2. We estimate that Interior's proposed non-operational enhancements would have an annual cost of about $21,000 at Marcal (*see Table C-2*).[3]

The annual cost of Interior's capitalized enhancement measures, combined with the annual value of lost power with Interior's alternative, would result in a net benefit loss of about $37,000 annually (1995 $) over the existing conditions at Marcal.

Overall, when compared with the existing project, Interior's recommended change in the operation of Marcal would result in a cumulative decrease in energy generation of about 1,560,000 kWh; 360,000 kWh being on-peak energy generation and 1,200,000 kWh being off-peak energy. The cumulative value of power would decrease by about $34,000 annually at the four Little Androscoggin River projects. In addition, Interior's proposed capitalized non-operational enhancement measures for Marcal would increase the cumulative cost of the four existing projects by about $21,000 over current conditions. The cumulative cost of Interior's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $55,000 annually (1995 $) from current conditions at the four projects.

Table B-15 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the four Little Androscoggin River projects that would result from Interior's proposed operational and non-operational enhancement measures at Marcal.

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[3] Interior's operational alternative would reduce the project's profits, thereby reducing the project's federal tax obligation; thus the project's annual costs are different than those for Consolidated Hydro's proposal.

Table B-15. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the four Little Androscoggin River projects due to **Interior's proposed operational scenario and enhancements** at Marcal Project (P-11482) (Source: staff).[1]

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)
Marcal (P-11482)	0.00	-0.19	-0.53	-0.73	-16	21	-37
Hackett Mills (P-6398)	0.00	0.02	-0.06	-0.04	-1	0	-1
Upper Barkers Mill (P-3562)	0.00	-0.03	-0.12	-0.15	-3	0	-3
Lower Barkers Mill (P-2808)	0.00	-0.16	-0.49	-0.65	-14	0	-14
TOTAL	**0.00**	**-0.36**	**-1.20**	**-1.56**	**-34**	**21**	**-55**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2.4. CASE 4: Hackett Mill Hydro's proposals

Hackett Mill Hydro's proposed operational enhancement measures consist of year-round run-of-river operation. Because Hackett Mill Hydro did not comment on Consolidated Hydro's minimum flow proposal, we used Consolidated Hydro's proposal to provide a minimum flow of 20 cfs to the project's bypassed reach from June 1 through November 1 and leakage from November 2 through May 31. The operational enhancement measures would result in a decrease of about 220,000 kWh in high-value, peak-load energy generation and a decrease of about 80,000 kWh in low-value, off-peak energy generation at Marcal. This loss in energy equates to an annual loss of power value benefits of about $7,000 at Marcal.

Since Hackett Mill Hydro did not comment on Consolidated Hydro's proposed capitalized non-operational environmental enhancement measures for Marcal, we used Consolidated Hydro's non-operational enhancement proposals, as discussed in Section B.2.2. We estimate that Hackett Mill Hydro's proposed non-operational enhancements would have an annual cost of about $24,000 at Marcal (*see Table C-2*).[4]

The annual cost of Hackett Mill Hydro's capitalized enhancement measures, combined with the annual value of lost power with Hackett Mill Hydro's alternative, would result in a net benefit loss of about $31,000 annually (1995 $) over the existing conditions at Marcal.

Overall, when compared with the existing project, Hackett Mill Hydro's recommended change in the operation of Marcal would result in a cumulative decrease in energy generation of about 620,000 kWh; on-peak energy generation would decline by about 390,000 kWh and off-peak energy would decline by about 230,000 kWh. The cumulative value of power would decrease by about $15,000 annually at the four Little Androscoggin River projects. In addition, Hackett Mill Hydro's proposed capitalized non-operational enhancement measures for Marcal would increase the cumulative cost of the four existing projects by about $24,000 over current conditions. The cumulative cost of Hackett Mills Hydro's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $39,000 annually (1995 $) from current conditions at the four projects.

Table B-16 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the four Little Androscoggin River projects that would result from Hackett Mill Hydro's proposed operational and non-operational enhancement measures at Marcal.

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[4] Hackett Mill Hydro's operational alternative would reduce the project's profits, thereby reducing the project's federal tax obligation; thus the project's annual costs are different than those for Consolidated Hydro's proposal.

Table B-16. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the four Little Androscoggin River projects due to **Hackett Mills Hydro's proposed operational scenario and enhancements** at Marcal Project (P-11482) (Source: staff).[1]

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)
Marcal (P-11482)	0.00	-0.22	-0.08	-0.30	-7	24	-31
Hackett Mills (P-6398)	0.00	-0.05	-0.02	-0.07	-2	0	-2
Upper Barkers Mill (P-3562)	0.00	-0.03	-0.02	-0.04	-1	0	-1
Lower Barkers Mill (P-2808)	0.00	-0.10	-0.11	-0.21	-5	0	-5
TOTAL	**0.00**	**-0.39**	**-0.23**	**-0.62**	**-15**	**24**	**-39**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2.5. CASE 5: Staff's year-round run-of-river/20 cfs bypass flow option

Staff's first operational enhancement alternative consists of year-round run-of-river operation, with a year-round minimum flow release of 20 cfs to the project's bypassed reach. The operational enhancement measures would result in a decrease of about 31,000 kWh in high-value, peak-load energy generation and a decrease of about 25,000 kWh in low-value, off-peak energy generation at Marcal. This loss in energy equates to an annual loss of power value benefits of about $13,000 at Marcal.

We agree with Consolidated Hydro's non-operational enhancement proposals, as discussed in Section B.2.2. We estimate that our proposed non-operational enhancements would have an annual cost of about $22,000 at Marcal.[5]

The annual cost of our capitalized enhancement measures, combined with the annual value of lost power with our alternative, would result in a net benefit loss of about $31,000 annually (1995 $) over the existing conditions at Marcal.

Overall, when compared with the existing project, our first alternative would change the operation of Marcal, and would result in a cumulative decrease in energy generation of about 880,000 kWh, with on-peak energy generation decreasing by about 480,000 kWh and off-peak energy decreasing by about 400,000 kWh. The cumulative value of power would decrease by about $20,000 annually at the four Little Androscoggin River projects. In addition, staff's proposed capitalized non-operational enhancement measures for Marcal would increase the cumulative cost of the four existing projects by about $22,000 over current conditions. The cumulative cost of staff's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $42,000 annually (1995 $) from current conditions at the four projects.

Table B-17 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the four Little Androscoggin River projects that would result from staff's alternative operational and non-operational enhancement measures at Marcal.

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[5] Staff's run-of-river/20 cfs flow alternative would reduce the project's profits, thereby reducing the project's federal tax obligation; thus the project's annual costs are different than those for Consolidated Hydro's proposal.

Table B-17. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the four Little Androscoggin River projects due to **Staff's year-round R-O-R/20 cfs project flow option** at Marcal Project (P-11482) (Source: staff).[1]

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)
Marcal (P-11482)	0.00	-0.31	-0.25	-0.56	-13	22	-35
Hackett Mills (P-6398)	0.00	-0.05	-0.02	-0.07	-2	0	-2
Upper Barkers Mill (P-3562)	0.00	-0.03	-0.02	-0.04	-1	0	-1
Lower Barkers Mill (P-2808)	0.00	-0.10	-0.11	-0.21	-5	0	-5
TOTAL	**0.00**	**-0.48**	**-0.40**	**-0.88**	**-20**	**22**	**-42**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2.6. CASE 6: Staff's year-round 56 cfs project flow/56 cfs seasonal bypass flow option

Staff's second operational enhancement alternative consists of a year-round minimum flow of 56 cfs below the project, which would be released to the project's bypassed reach from June 1 through November 1; 0 cfs (leakage) would be released to the bypassed reach from November 2 through May 31. For this option, we also recommend an impoundment drawdown regime consisting of a one-foot drawdown from May 1 through October 15 and a two-foot drawdown from October 16 through April 30. The operational enhancement measures would result in a decrease of about 130,000 kWh in high-value, peak-load energy generation and a decrease of about 280,000 kWh in low-value, off-peak energy generation at Marcal. This loss in energy equates to an annual loss of power value benefits of about $9,000 at Marcal.

As discussed in Section B.2.5, all of our proposed non-operational enhancements would have an annual cost of about $23,000 at Marcal.[6]

The annual cost of our capitalized enhancement measures, combined with the annual value of lost power with our alternative, would result in a net benefit loss of about $32,000 annually (1995 $) over the existing conditions at Marcal.

Overall, when compared with the existing project, our second alternative would change the operation of Marcal, and would result in a cumulative decrease in energy generation of about 970,000 kWh, where 260,000 kWh would be on-peak energy generation and 710,000 kWh would be off-peak energy generation. The cumulative value of power would decrease by about $21,000 annually at the four Little Androscoggin River projects. In addition, staff's proposed capitalized non-operational enhancement measures for Marcal would increase the cumulative cost of the four existing projects by about $23,000 over current conditions. The cumulative cost of staff's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $44,000 annually (1995 $) from current conditions at the four projects.

Table B-18 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the four Little Androscoggin River projects that would result from staff's alternative operational and non-operational enhancement measures at Marcal.

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[6] Refer to footnote for CASE 5, in section B.2.5. of this document.

Table B-18. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the four Little Androscoggin River projects due to **Staff's 56 cfs project/56 cfs bypass flows option** at Marcal Project (P-11482)

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)
Marcal (P-11482)	0.00	-0.13	-0.28	-0.41	-9	23	-32
Hackett Mills (P-6398)	0.00	0.02	0.00	0.01	0	0	0
Upper Barkers Mill (P-3562)	0.00	-0.04	-0.12	-0.16	-4	0	-4
Lower Barkers Mill (P-2808)	0.00	-0.11	-0.31	-0.41	-9	0	-9
TOTAL	**0.00**	**-0.26**	**-0.71**	**-0.97**	**-21**	**23**	**-44**

(Source: staff).[1]

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2.7. CASE 7: Staff's year-round 56 cfs project flow/10 cfs seasonal bypass flow option

Staff's third operational enhancement alternative consists of a year-round minimum flow of 56 cfs below the project, of which, 10 cfs would be released to the project's bypassed reach from June 1 through November 1. Leakage would be provided to the bypassed reach from November 2 through May 31. In this option, we also recommend an impoundment drawdown regime similar to the drawdown regime we recommended for CASE 6 in Section B.2.6. (i.e., one foot from May 1 through October 15 and two feet from October 16 through April 30). The operational enhancement measures would result in a decrease of about 40,000 kWh in high-value, peak-load energy generation and a decrease of about 180,000 kWh in low-value, off-peak energy generation at Marcal. This loss in energy equates to an annual loss of power value benefits of about $5,000 at Marcal.

As discussed in Section B.2.5, our proposed non-operational enhancements would have an annual cost of about $25,000 at Marcal.[7]

The annual cost of our capitalized enhancement measures, combined with the annual value of lost power with our alternative, would result in a net benefit loss of about $30,000 annually (1995 $) over the existing conditions at Marcal.

Overall, when compared with the existing project, our third alternative would change the operation of Marcal, and would result in a cumulative decrease in energy generation of about 540,000 kWh, with on-peak energy generation decreasing by about 80,000 kWh and off-peak energy being reduced by about 460,000 kWh. The cumulative value of power would decrease by about $11,000 annually at the four Little Androscoggin River projects. In addition, staff's proposed capitalized non-operational enhancement measures for Marcal would increase the cumulative cost of the four existing projects by about $25,000 over current conditions. The cumulative cost of staff's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $36,000 annually (1995 $) from current conditions at the four projects.

Table B-19 shows the project specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the four Little Androscoggin River projects that would result from staff's alternative operational and non-operational enhancement measures at Marcal.

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[7] Refer to footnote for CASE 5, in section B.2.5. of this document.

Table B-19. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the four Little Androscoggin River projects due to **Staff's 56 cfs project/10 cfs bypass flows option** at Marcal Project (P-11482) (Source: staff).[1]

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)
Marcal (P-11482)	0.00	-0.04	-0.18	-0.23	-5	25	-30
Hackett Mills (P-6398)	0.00	0.03	0.00	0.03	1	0	1
Upper Barkers Mill (P-3562)	0.00	-0.02	-0.09	-0.11	-2	0	-2
Lower Barkers Mill (P-2808)	0.00	-0.04	-0.19	-0.24	-5	0	-5
TOTAL	**0.00**	**-0.08**	**-0.46**	**-0.54**	**-11**	**25**	**-36**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

B.2.8. CASE 8: Staff's year-round 56 cfs/year-round 20-cfs bypass flow option

Staff's fourth operational enhancement alternative consists of a year-round minimum flow of 56 cfs below the project, of which 20 cfs would be released into the project's bypassed reach year-round. In this option, we also recommend an impoundment drawdown regime similar to the drawdown regime we recommended for CASE 6, Section B.2.6., (i.e., one foot from May 1 through October 15 and two feet from October 16 through April 30). The operational enhancement measures would result in a decrease of about 130,000 kWh in high-value, peak-load energy generation and a decrease of about 290,000 kWh in low-value, off-peak energy generation at Marcal. This loss in energy equates to an annual loss of power value benefits of about $9,000 at Marcal.

As discussed in Section B.2.5, our proposed non-operational enhancements would have an annual cost of about $23,000 at Marcal.[8]

The annual cost of our capitalized enhancement measures, combined with the annual value of lost power with our alternative, would result in a net benefit loss of about $32,000 annually (1995 $) over the existing conditions at Marcal.

Overall, when compared with the existing project, staff's fourth alternative would change the operation of Marcal, and would result in a cumulative decrease in energy generation of about 970,000 kWh. Of this generation, about 260,000 kWh would be energy generated during on-peak periods and about 710,000 kWh would be generated during off-peak periods. The cumulative value of power would decrease by about $21,000 annually at the four existing Little Androscoggin River projects. In addition, staff's proposed capitalized non-operational enhancement measures for Marcal would increase the cumulative cost of the four existing projects by about $23,000 over current conditions. The cumulative cost of staff's capitalized enhancement measures, combined with the cumulative power value loss, would result in a cumulative net benefit loss of about $45,000 annually (1995 $) from current conditions at the four projects.

Table B-20 shows the project-specific and cumulative total, peak-, and off-peak energy losses or gains and annual power value losses or gains for the four Little Androscoggin River projects that would result from staff's alternative operational and non-operational enhancement measures at Marcal.

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[8] Refer to footnote for CASE 5, in section B.2.5. of this document.

Table B-20. Losses (-) and gains (+) in annual energy generation and economics (in 1995 year dollars) for the four Little Androscoggin River projects due to **Staff's 56 cfs project/20 cfs bypass flow option** at Marcal Project (P-11482) (Source: staff).[1]

Project Names	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Incremental Annual Operational Benefits ($1000)	(6) Incremental Annual Non-operational Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)
Marcal (P-11482)	0.00	-0.13	-0.29	-0.42	-9	23	-32
Hackett Mills (P-6398)	0.00	0.02	0.00	0.02	0	0	0
Upper Barkers Mill (P-3562)	0.00	-0.04	-0.12	-0.16	-3	0	-3
Lower Barkers Mill (P-2808)	0.00	-0.10	-0.30	-0.41	-9	0	-9
TOTAL	**0.00**	**-0.26**	**-0.71**	**-0.97**	**-21**	**23**	**-45**

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 7 are rounded to the nearest integer.

APPENDIX C: NON-OPERATIONAL ENHANCEMENT COSTS

Table C-1. The capital investment cost, annual operation and maintenance cost, annual economic ts, or costs (in 1995 year dollars) of the various enhancement measures considered at the **Gulf Island-Deer Rips Project (P-2283)** and the recommending entity (Source: staff).

Description	1995 Capital Costs ($1,000)	1995 Annual O&M ($1,000)	1995 Annual Costs ($1,000)	Recommending Entity - 1*
*Total Existing Project - 2**	$16,762	$2,030	$6,517	Existing License Baseline
INCREMENTAL ANALYSES OF PROPOSED ENHANCEMENT MEASURES FROM EXISTING CONDITIONS				
Proposed turbine and generator upgrade at Gulf Island development - 3*	$2,969	$0	$440	Central Maine, EPA, Interior, CLF, TU, ALT, Staff
Continued annual O&M of GIPOP facility from 1997 - 4*	$0	$79	$79	Central Maine, EPA, Interior, CLF, TU, ALT, Staff
Aquatic invertebrate monitoring plan - 5*	$21	$0	$3	Interior, TU, Staff
Mercury/dioxin monitoring:				
Minimum limit - 6*	$21	$0	$3	EPA, ALT
Maximum limit - 7*	$255	$0	$38	Conservation Coalition (CLF)
Recreational Enhancement and O&M:				
Applicant's proposal - 8*	$135	$7	$27	Central Maine, EPA, Interior, CLF, TU, Staff
ALT's proposal (includes Greenway Trail Development) - 9*	$1,449	$7	$222	ALT
*Cultural Resources Enhancement - 10**	$299	$0	$44	Central Maine, EPA, Interior, CLF, TU, ALT, Staff
Conservation easements/buffer zone: - 11*				
250-foot-wide buffer strip (1,035 total acres)	$3,040	$0	$451	ALT
500-foot-wide buffer strip (2,070 total acres)	$8,550	$0	$1,268	Conservation Coalition
Enhancement Funds: - 12*				
2% of project's gross revenue	$6	$0	$1	ALT
5% of project's net present value revenue.	$21	$0	$3	Conservation Coalition
INCREMENTAL ANALYSES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES FROM EXISTING CONDITIONS - 13*				
Applicant: Central Maine	$3,404	$86	$598	Central Maine
EPA	$3,424	$86	$594	EPA
Interior	$3,425	$86	$594	Interior
Conservation Coalition	$12,230	$86	$1,899	Conservation Coalition
Trout Unlimited	$3,425	$86	$594	TU
Androscoggin Land Trust	$7,784	$86	$1,240	ALT
Staff	$3,425	$86	$594	Staff

1* For an entity which does not oppose nor provide any additional and clear alternative recommendation to the applicant's proposal, we used the applicant's proposal

2* The capital cost for baseline or existing condition consists of the project net investment (Central Maine 's additional information response letter 8/25/95), and the capital cost contribution and O&M (from 1991 through 1995) to the GIPOP facility (Central Maine's comment letter 2/9/94). We also considered Central Maine's estimate of the additional O&M for the near-term capital improvements as follows: $130,000 (year 1995), $200,000 (year 1996), $275,000 (year 1997), $1,100,000 (year 1998), and $990,000 (year 2000).

3* Based on Gulf Island-Deer Rips license application, Exhibit D, 1991, and escalated to the present year of 1995 by 3%.

4* Based on Central Maine's letter, dated February 9, 1994, and escalated to the present year of 1995 by 3%.

5* Based on costs derived in the Saco DEIS (November, 1994), and escalated to the present year of 1995 by 3%.

6* Based on costs derived in the Ayers DEIS (September, 1994), and escalated to the present year of 1995 by 3%.

7* Based on costs from FAX communication with Mr. W. Richkus from VERSAR, Inc. (March 8, 1995), and escalated to the present of 1995 by 3%.

8* Based on Gulf Island-Deer Rips license application, Exhibit E, 1991, and escalated to the present year of 1995 by 3%.

9* Based on Land Trust's letter, dated November 14, 1994, and escalated to the present year of 1995 by 3%. The O&M cost for Land Trust's recreational proposal was not provided; therefore, staff used Central Maine's estimate.

10* The total capital cost of the cultural resources enhancement consists of Phase I, II, and III site survey (Application Volume I, page E4-9, 1991) and the applicant's committed contribution to the Programmatic Agreement, October, 1993 (Derived by staff). The capital costs were depreciated to year 1995 by the straight-line method.

11* The value of land was provided by Central Maine's additional information response letter, dated August 25, 1995, and escalated to the present year of 1995 by 3%.

12* The capital cost was derived by using the gross revenue and the net present value of the project under Central Maine's proposed operational and non-operational enhancement conditions.

13* The incremental total capital cost and O&M cost of each proposal do not include any existing net investment nor sunk cost. The incremental annual cost of each proposal should be added to the annual cost of the existing project. The incremental annual cost of each complete proposal does not reflect the direct summation of the incremental annual cost of each enhancement measures described above.

Table C-2. The capital investment cost, annual operation and maintenance cost, annual economic impacts, or costs (in 1995 year dollars) of the various enhancement measures considered at the **Marcal Project (P-11482)** and the recommending entity (Source: staff).

Description	1995 Capital Costs ($1,000)	1995 Annual O&M ($1,000)	1995 Annual Costs ($1,000)	Recommending Entity
Baseline project (includes application cost)	1610.0	105.0	212.86	Existing
INCREMENTAL ANALYSES OF PROPOSED ENHANCEMENT MEASURES FROM EXISTING CONDITIONS:				
Downstream fish passage facility (includes study costs)	122.0	10.0	14.96	Consolidated, Interior, Staff
Recreational facilities & access Boat launch ($30,000) Canoe portage ($5,000)	35.0	3.5	4.76	Consolidated, Interior, Staff
Instream flow monitoring plan	50.0	5.0	6.77	Consolidated, Interior, Staff
INCREMENTAL ANALYSES OF ENTITY'S TOTAL PROPOSED ENHANCED MEASURES FROM EXISTING CONDITIONS:				
Applicant's total proposal	207.0	18.5	24.14	Consolidated
Interior's total proposal	207.0	18.5	20.89 *	Interior
Hackett's proposal	207.0	18.5	23.74 *	Hackett
Staff's Alternative No. 1	207.0	18.5	21.83 *	Staff
Staff's Alternative No. 2	207.0	18.5	23.18 *	Staff
Staff's Alternative No. 3	207.0	18.5	24.62 *	Staff
Staff's Alternative No. 4	207.0	18.5	23.11 *	Staff

* The project cost is different for other alternatives than for Consolidated's proposal, because the annual project costs include federal income taxes and other alternatives would reduce the project's profits, and thereby reduce the project's tax obligation.

APPENDIX D: ADDITIONAL CUMULATIVE ECONOMIC ANALYSES

Within the scope of our analyses, we evaluate the costs and power generation impacts at all of the affected projects on the lower Androscoggin River and the Little Androscoggin River, that would be associated with: (1) the proposed generating capacity expansion at the Gulf Island development; and (2) the various proposed operational alternatives, such as the changes in minimum flows and impoundment fluctuation limitations, at Gulf Island-Deer Rips and Marcal. Changes in these operational scenarios at Gulf Island-Deer Rips and Marcal would either reduce the downstream projects' energy generation or shift the energy generation from high-value, peak-load periods to low-value, base-load periods, thereby reducing the annual value of the downstream projects' power. Therefore, we have evaluated the effects and costs of these various operational changes of Gulf Island-Deer Rips and Marcal on the projects in the affected reach of the lower Androscoggin River and the Little Androscoggin River. On the lower Androscoggin River, from upstream to downstream, we studied four projects located downstream of Gulf Island-Deer Rips, including Lewiston Falls, Worumbo, Pejebscot, and Brunswick. From upstream to downstream on the Little Androscoggin River, we studied three projects located downstream of Marcal, including Hackett Mills, Upper Barker's Mill, and Lower Barker's Mill.

The downstream projects are not being considered for relicensing at this time; thus, the information we present here is only for purposes of discussing the cumulative effects, if any, that Gulf Island-Deer Rips and Marcal have on the respective downstream projects and the affected reaches of the respective rivers.

The following sections will describe each of the projects' facilities and operation. These sections will also contain tables comparing, for each downstream project, the incremental energy generation shifts and the annual costs or benefits in power values of the various proposed operational alternatives, over the existing project conditions.

D.1. Lower Androscoggin River

D.1.1. Lewiston Falls Project (P-2302, P-11006)

Lewiston Falls is located at approximately RM 22.8 on the lower Androscoggin River, in Androscoggin County, Maine. The Androscoggin River has a drainage area of about 2,900 mi^2 at the project site.

The components of the existing Lewiston Falls Project are more than 100 years old. Lewiston Falls is a multi-development project, consisting of a dam, an impoundment, and two distinct hydroelectric generating portions: the Monty hydroelectric generating station and the Lewiston Canal System. The canal system consists of the following hydroelectric generating developments: Bates, Red Shop, Hill, Bates Lower, Continental, Upper Androscoggin (City of Lewiston's project, P-11006), and Lower Androscoggin.

In our studies we considered this multi-development project as one cumulative project. The project has a total installed generating capacity of 38.46 MW[9] and an average annual energy generation of about 138.42 GWh.

The project is owned by Central Maine, UWPC (Union Water Power Company), and the City of Lewiston. Lewiston Falls has a license which expires August 31, 2026. The project operates in a run-of-river mode when river flows exceed the project's maximum hydraulic generating capacity, and has an interim project minimum flow of 1,000 cfs. To duplicate the project's existing operation in our modelling, we specified the project as having a minimum hydraulic capacity of 150 cfs[10], a maximum hydraulic capacity of 8,835 cfs, a maximum head of about 52.2 feet, an impoundment with a headwater surface elevation of 168.2 feet, a tailwater surface elevation of 114.0 feet, an impoundment surface area of about 200 acres, and a 4-foot-high useable storage capacity of about 800 acre-feet. We calculate the existing project's average annual energy generation to be about 138.32 GWh, with an annual power value of about $3,165,000, an annual project cost of about $6,925,000, and an annual net benefit of about -$3,760,000 or -27.18 mills/kWh (1995 $).

Table D-1 compares the incremental energy generation shifts and the annual costs or benefits in power values at the existing project due to the various operational alternatives proposed at Gulf Island-Deer Rips.

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[9] Monty (28.44 MW), Bates Upper (3.90 MW), Hill Mills (2.16 MW), Lower Androscoggin (0.27 MW), Continental Mills (1.584 MW), Bates Lower (0.45 MW), and Upper Androscoggin (1.70 MW).

[10] Under the current allocation of flowage rights, the first 150 cfs is directed to the Upper Androscoggin development to maintain as the continuous minimum flow for the canal system.

Table D-1. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) at **Lewiston Falls Project (P-2302)** due to alternatives considered at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1,000)	(6) Non-operational Annual Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)	(8) Total Annual Net Benefits to Existing Conditions ($1,000)
Case 1: Total Existing Conditions	38.50	64.86	73.46	138.32	3,165	6,925	0	-3,760
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2A: CMP's proposed generation upgrade w/ existing project operation	0.00	0.07	-0.07	0.00	0	0	0	-3,760
Case 2B: CMP's proposed generation upgrade and project operation	0.00	0.24	-0.24	0.00	1	0	1	-3,759
Case 3: EPA's proposal	0.00	-1.04	1.04	0.00	-6	0	-6	-3,766
Case 4: Interior's proposal	0.00	-1.04	1.04	0.00	-6	0	-6	-3,766
Case 5: CLF et al's proposal with min. flow of 1,400 cfs (July 1 - April 30)	0.00	-1.37	1.37	0.00	-8	0	-8	-3,768
Case 6: CLF et al's proposal with min. flow of 1,800 cfs (July 1 - April 30)	0.00	-1.04	1.04	0.00	-6	0	-6	-3,766
Case 7: TU et al's proposal with min. flow of 1,700 cfs (July 1 - April 30)	0.00	-1.04	1.04	0.00	-6	0	-6	-3,766
Case 8: TU et al's proposal for year-round run-of-river operation	0.00	-8.61	8.61	0.00	-47	0	-47	-3,807
Case 9: Land Trust et al's proposal	0.00	0.81	-0.81	0.00	4	0	4	-3,756
Case 10: Staff's option #1 with min. flow of 1,100 cfs (December 1 - April 30	0.00	0.70	-0.70	0.00	4	0	4	-3,756
Case 11: Staff's option #2 with min. flow of 1,400 cfs (December 1 - April 30	0.00	0.98	-0.98	0.00	5	0	5	-3,755

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are rounded to the nearest integer.

D.1.2. Worumbo Project (P-3428)

Worumbo is located at approximately RM 8.3 on the lower Androscoggin River, in Androscoggin County, Maine. The Androscoggin River has a drainage area of about 3,382 mi^2 at the project site.

The Worumbo Project, constructed in 1985, consists of a dam, an impoundment, a powerhouse, and upstream and downstream fish passage facilities. The project has a total installed capacity of 19.0 MW and an average annual energy generation of about 82.0 GWh.

The project is owned by Miller Hydro, and has a license which expires November 30, 2025. Worumbo operates in a run-of-river mode, with a project minimum flow requirement of 1,685 cfs, as well as an annual minimum bypass flow regime.[11] To duplicate the project's existing operation in our modelling, we specified the project as having a minimum hydraulic capacity of 3,185 cfs, a maximum hydraulic capacity of 9,100 cfs, a head of about 27.0 feet, an impoundment with a headwater surface elevation of 97.0 feet, a tailwater surface elevatior of 70.0 feet, and an impoundment surface area of about 180 acres. We calculate the existing project's average annual energy generation to be about 82.0 GWh, with an annual power value of about $1,806,000, an annual project cost of about $3,898,000, and an annual net benefit of about -$2,092,000 or -25.51 mills/kWh (1995 $).

Table D-2 compares the incremental energy generation shifts and the annual costs or benefits in power values at the existing project due to the various operational alternatives proposed at Gulf Island-Deer Rips.

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[11] The following minimum bypass flow regime was established in a fish passage agreement dated December 30, 1991:

200 cfs	(September 1 - October 31)
50 or 85 cfs	(November 1 - November 30)
50 cfs	(December 1 - April 15)
300 cfs	(April 16 - May 31)
200 cfs	(June 1 - June 30)
100 cfs	(July 1 - August 31)

Table D-2. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) at **Worumbo Project (P-3428)** due to alternatives considered at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1,000)	(6) Non-operational Annual Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)	(8) Total Annual Net Benefits to Existing Conditions ($1,000)
Case 1: Total Existing Conditions	19.10	25.73	56.27	82.00	1,806	3,898	0	-2,092
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2A: CMP's proposed generation upgrade w/ existing project operation	0.00	-0.02	0.04	0.01	0	0	0	-2,092
Case 2B: CMP's proposed generation upgrade and project operation	0.00	0.07	-0.07	0.00	0	0	0	-2,091
Case 3: EPA's proposal	0.00	0.56	-0.56	0.00	3	0	3	-2,089
Case 4: Interior's proposal	0.00	0.56	-0.56	0.00	3	0	3	-2,089
Case 5: CLF et al's proposal with min. flow of 1,400 cfs (July 1 - April 30)	0.00	0.48	-0.48	0.00	3	0	3	-2,089
Case 6: CLF et al's proposal with min. flow of 1,800 cfs (July 1 - April 30)	0.00	0.57	-0.57	0.00	3	0	3	-2,089
Case 7: TU et al's proposal with min. flow of 1,700 cfs (July 1 - April 30)	0.00	0.56	-0.56	0.00	3	0	3	-2,089
Case 8: TU et al's proposal for year-round run-of-river operation	0.00	0.72	-0.60	0.12	6	0	6	-2,085
Case 9: Land Trust et al's proposal	0.00	0.32	-0.32	0.00	2	0	2	-2,090
Case 10: Staff's option #1 with min. flow of 1,100 cfs (December 1 - April 30	0.00	0.38	-0.38	0.00	2	0	2	-2,090
Case 11: Staff's option #2 with min. flow of 1,400 cfs (December 1 - April 30	0.00	0.45	-0.45	0.00	3	0	3	-2,089

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are rounded to the nearest integer.

D.1.3. Pejebscot Project (P-4784)

Pejebscot is located at approximately RM 4.5 on the lower Androscoggin River, in Cumberland and Androscoggin Counties, Maine. The Androscoggin River has a drainage area of about 3,405 mi^2 at the project site.

The Pejebscot Project was licensed on September 16, 1982. The principal features of the project consist of a dam, an impoundment, a powerhouse, and upstream and downstream fish passage facilities. The project has a total installed capacity of 13.8 MW and an average annual energy generation of about 69.4 GWh.

The project is owned by Topsham-Hydro, and has a license which expires August 31, 2022. Pejebscot operates in a run-of-river mode, has a project minimum flow requirement of 1,710 cfs, and has a minimum flow requirement of 150 cfs from the spring through the fall for the fish bypass facilities. To duplicate the project's existing operation in our modelling, we specified the project as having a minimum hydraulic capacity of 170 cfs, a maximum hydraulic capacity of 8,190 cfs, a head of about 24.0 feet, an impoundment with a headwater surface elevation of 67.5 feet, a tailwater surface elevation of 42.0 feet, and an impoundment surface area of about 225 acres. We calculate the existing project's average annual energy generation to be about 69.4 GWh, with an annual power value of about $1,523,000, an annual project cost of about $4,298,000, and an annual net benefit of about -$2,775,000 or -39.98 mills/kWh (1995 $).

Table D-3 compares the incremental energy generation shifts and the annual costs or benefits in power values at the existing project due to the various operational alternatives proposed at Gulf Island-Deer Rips.

Table D-3. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) at **Pejebscot Project (P-4784)** due to alternatives considered at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1,000)	(6) Non-operational Annual Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)	(8) Total Annual Net Benefits to Existing Conditions ($1,000)
Case 1: Total Existing Conditions	13.80	20.75	48.65	69.40	1,523	4,298	0	-2,775
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2A: CMP's proposed generation upgrade w/ existing project operation	0.00	-0.03	0.04	0.01	0	0	0	-2,775
Case 2B: CMP's proposed generation upgrade and project operation	0.00	0.05	-0.05	0.00	0	0	0	-2,775
Case 3: EPA's proposal	0.00	0.51	-0.47	0.04	4	0	4	-2,772
Case 4: Interior's proposal	0.00	0.51	-0.47	0.04	4	0	4	-2,772
Case 5: CLF et al's proposal with min. flow of 1,400 cfs (July 1 - April 30)	0.00	0.46	-0.42	0.04	3	0	3	-2,772
Case 6: CLF et al's proposal with min. flow of 1,800 cfs (July 1 - April 30)	0.00	0.52	-0.47	0.04	4	0	4	-2,771
Case 7: TU et al's proposal with min. flow of 1,700 cfs (July 1 - April 30)	0.00	0.51	-0.47	0.04	4	0	4	-2,772
Case 8: TU et al's proposal for year-round run-of-river operation	0.00	1.11	-0.82	0.28	12	0	12	-2,763
Case 9: Land Trust et al's proposal	0.00	0.21	-0.21	0.00	1	0	1	-2,774
Case 10: Staff's option #1 with min. flow of 1,100 cfs (December 1 - April 30	0.00	0.25	-0.25	0.00	1	0	1	-2,774
Case 11: Staff's option #2 with min. flow of 1,400 cfs (December 1 - April 30	0.00	0.30	-0.30	0.00	2	0	2	-2,774

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are rounded to the nearest integer.

D.1.4. Brunswick Project (P-2284)

Brunswick is located at approximately RM 0.2 on the lower Androscoggin River, Cumberland and Sagadahoc Counties, Maine. The Androscoggin River has a drainage area of about 3,430 mi^2 at the project site.

The principal features of the project consist of a dam, an impoundment, a powerhouse, and upstream and downstream fish passage facilities. The project has a total installed capacity of 19.0 MW and an average annual energy generation of about 90.2 GWh.

The Brunswick Project, owned by Central Maine, has a license that expires on February 28, 2029. Brunswick operates in a run-of-river mode when river flows exceed the project's maximum hydraulic generating capacity. The project does not have any minimum flow requirement, but does have a flow requirement for the fish passage facilities from May 1 through November 1. The fish passage flows vary from 30 cfs (inflow not available for generation) to 90 cfs (inflow available for generation). To duplicate the project's existing operation in our modelling, we specified the project as having a minimum hydraulic capacity of 1,300 cfs, a maximum hydraulic capacity of 8,000 cfs, a head of about 39.4 feet, an impoundment with a headwater surface elevation of 39.4 feet, a tailwater surface elevation of 0.0 feet, an impoundment surface area of about 325 acres, and a 2-foot-high useable storage capacity of about 240 acre-feet. We calculate the existing project's average annual energy generation to be about 90.2 GWh, with an annual power value of about $1,968,000, an annual project cost of about $5,462,000, and an annual net benefit of about -$3,494,000 or -38.74 mills/kWh (1995 $).

Table D-4 compares the incremental energy generation shifts and the annual costs or benefits in power values at the existing project due to the various operational alternatives proposed at Gulf Island-Deer Rips.

Table D-4. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) at **Brunswick Project (P-2284)** due to alternatives considered at Gulf Island-Deer Rips Project (P-2283) (Source: staff)[1].

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1,000)	(6) Non-operational Annual Environmental Enhancement Costs ($1,000)	(7) Incremental Annual Net Benefits ($1,000)	(8) Total Annual Net Benefits to Existing Conditions ($1,000)
Case 1: Total Existing Conditions	19.00	24.90	65.30	90.20	1,968	5,462	0	-3,494
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2A: CMP's proposed generation upgrade w/ existing project operation	0.00	-0.05	0.04	-0.01	0	0	0	-3,495
Case 2B: CMP's proposed generation upgrade and project operation	0.00	0.05	-0.04	0.00	0	0	0	-3,494
Case 3: EPA's proposal	0.00	0.70	-0.63	0.07	5	0	5	-3,489
Case 4: Interior's proposal	0.00	0.70	-0.63	0.07	5	0	5	-3,489
Case 5: CLF et al's proposal with min. flow of 1,400 cfs (July 1 - April 30)	0.00	0.64	-0.57	0.07	5	0	5	-3,489
Case 6: CLF et al's proposal with min. flow of 1,800 cfs (July 1 - April 30)	0.00	0.70	-0.63	0.07	5	0	5	-3,489
Case 7: TU et al's proposal with min. flow of 1,700 cfs (July 1 - April 30)	0.00	0.70	-0.63	0.07	5	0	5	-3,489
Case 8: TU et al's proposal for year-round run-of-river operation	0.00	1.90	-1.52	0.38	18	0	18	-3,476
Case 9: Land Trust et al's proposal	0.00	0.21	-0.19	0.02	2	0	2	-3,493
Case 10: Staff's option #1 with min. flow of 1,100 cfs (December 1 - April 30	0.00	0.25	-0.23	0.02	2	0	2	-3,492
Case 11: Staff's option #2 with min. flow of 1,400 cfs (December 1 - April 30	0.00	0.30	-0.28	0.02	2	0	2	-3,492

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are rounded to the nearest integer.

D.2. Little Androscoggin River

D.2.1. Hackett Mills Project (P-6278)

Hackett Mills is located at approximately RM 9.8 on the Little Androscoggin River, Androscoggin County, Maine. The Little Androscoggin River has a drainage area of about 313 mi^2 at the project site.

The principal features of the project consist of a dam, an impoundment, a powerhouse, and downstream fish passage facilities. The project has a total installed capacity of 0.47 MW and an average annual energy generation of about 2.2 GWh.

Hackett Mills is owned by Hackett Mill Hydro, a subsidiary of Synergics, Inc., and has a license which expires August 31, 2024. The project operates in a run-of-river mode, and has a fish passage flow of 60 cfs from April 1 through October 31 and 30 cfs from November 1 through March 31. To duplicate the project's existing operation in our modelling, we specified the project as having a minimum hydraulic capacity of 150 cfs, a maximum hydraulic capacity of 550 cfs, a net head of about 15.0 feet (assuming a 2-foot head loss), an impoundment with a headwater surface elevation of 235.0 feet, a tailwater surface elevation of 218.0 feet, and an impoundment surface area of about 60 acres. We calculate the existing project's average annual energy generation to be about 2.19 GWh, with an annual power value of about $49,000, an annual project cost of about $178,000, and an annual net benefit of about -$129,000 or -58.90 mills/kWh (1995 $).

Table D-5 compares the incremental energy generation shifts and the annual costs or benefits in power values at the existing project due to the various operational alternatives proposed at Marcal.

Table D-5. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) at **Hackett Mills Project (P-6398)** due to alternative considered at **Marcal Project (P-11482)** (Source: staff).[1]

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1000)	(6) Non-operational Annual Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)	(8) Total Annual Net Benefits to Existing Conditions ($1000)
Case 1: Existing Project	0.47	0.76	1.44	2.19	49	178	0	-129
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2: Applicant's proposal	0.00	0.03	0.00	0.02	1	0	1	-129
Case 3: Interior's proposal	0.00	0.02	-0.06	-0.04	-1	0	-1	-130
Case 4: Hackett Mill's proposal	0.00	-0.05	-0.02	-0.07	-2	0	-2	-131
Case 5: Staff's alternative #1	0.00	-0.05	-0.02	-0.07	-2	0	-2	-131
Case 6: Staff's alternative #2	0.00	0.02	0.00	0.01	0	0	0	-129
Case 7: Staff's alternative #3	0.00	0.03	0.00	0.03	1	0	1	-128
Case 8: Staff's alternative #4	0.00	0.02	0.00	0.02	0	0	0	-129

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are to the nearest integer.

D.2.2. Upper Barkers Mill Project (P-2808)

Upper Barkers Mill is located at approximately RM 1.3 on the Little Androscoggin River, in Androscoggin County, Maine. The Little Androscoggin River has a drainage area of about 350 mi^2 at the project site.

The principal features of the project consist of a dam, an impoundment, a powerhouse, and downstream fish passage facilities. The project has a total installed capacity of 1.0 MW and an average annual energy generation of about 4.9 GWh.

The project is owned by Consolidated Hydro, and has a license which expires July 31, 2023. The project operates in a run-of-river mode when inflows are greater than 150 cfs. When inflows are between 20 cfs and 150 cfs, the project impoundment is fluctuated up to three feet. When inflows are less than 20 cfs, the project does not operate. The project has a minimum flow requirement of 82 cfs and a downstream fish passage flow requirement of 20 cfs from June 1 through November 30. To duplicate the project's existing operation in our modelling, we specified the project as having a minimum hydraulic capacity of 125 cfs, a maximum hydraulic capacity of 950 cfs, a net head of about 22.5 feet (assuming a one-foot head loss), an impoundment with a headwater surface elevation of 192.0 feet, a tailwater surface elevation of 168.5 feet, and an impoundment surface area of about 42 acres. We calculate the existing project's average annual energy generation to be about 4.89 GWh, with an annual power value of about $108,000, an annual project cost of about $365,000, and an annual net benefit of about -$257,000 or -52.52 mills/kWh (1995 $).

Table D-6 compares the incremental energy generation shifts and the annual costs or benefits in power values at the existing project due to the various operational alternatives proposed at Marcal.

Table D-6. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) at **Upper Barkers Mill Project (P-3562)** due to alternative considered at **Marcal Project (P-11482)** (Source: staff).[1]

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1000)	(6) Non-operational Annual Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)	(8) Total Annual Net Benefits to Existing Conditions ($1000)
Case 1: Existing Project	1.00	1.63	3.26	4.89	108	365	0	-257
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2: Applicant's proposal	0.00	-0.03	-0.11	-0.14	-3	0	-3	-260
Case 3: Interior's proposal	0.00	-0.03	-0.12	-0.15	-3	0	-3	-260
Case 4: Hackett Mill's proposal	0.00	-0.03	-0.02	-0.04	-1	0	-1	-258
Case 5: Staff's alternative #1	0.00	-0.03	-0.02	-0.04	-1	0	-1	-258
Case 6: Staff's alternative #2	0.00	-0.04	-0.12	-0.16	-4	0	-4	-260
Case 7: Staff's alternative #3	0.00	-0.02	-0.09	-0.11	-2	0	-2	-259
Case 8: Staff's alternative #4	0.00	-0.04	-0.12	-0.16	-3	0	-3	-260

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are to the nearest integer.

D.2.3. Lower Barkers Mill Project (P-3562)

Lower Barkers Mill is located at approximately RM 0.7 on the Little Androscoggin River, in Androscoggin County, Maine. The Little Androscoggin River has a drainage area of about 353 mi^2 at the project site.

The principal features of the project consist of a dam, an impoundment, a powerhouse, and interim downstream fish passage facilities. The project has a total installed capacity of 1.5 MW and an average annual energy generation of about 8.81 GWh.

The project is owned by Consolidated Hydro and has a license which expires January 31, 2019. The project operates in a run-of-river mode when inflows are greater than 150 cfs. When inflows are between 20 cfs and 150 cfs, the project impoundment is fluctuated up to 1.2 feet. When inflows are less than 20 cfs, the project does not operate. The project has a minimum flow requirement of 20 cfs and a downstream fish passage flow requirement of 20 cfs from June 1 through November 30. To duplicate the project's existing operation in our modelling, we specified the project as having a minimum hydraulic capacity of 150 cfs, a maximum hydraulic capacity of 500 cfs, a net head of about 48.0 feet (assuming a one-foot head loss), an impoundment with a headwater surface elevation of 165.0 feet, a tailwater surface elevation of 116.0 feet, and an impoundment surface area of about 8.4 acres. We calculate the existing project's average annual energy generation to be about 8.81 GWh, with an annual power value of about $195,000, an annual project cost of about $328,000, and an annual net benefit of about -$133,500 or -15.20 mills/kWh (1995 $).

Table D-7 compares the incremental energy generation shifts and the annual costs or benefits in power values at the existing project due to the various operational alternatives proposed at Marcal.

Table D-7. Comparison of the losses (-) or gains (+) of annual project generation and economics (in 1995 year dollars) at **Lower Barkers Mill Project (P-3562)** due to alternative considered at **Marcal Project (P-11482)** (Source: staff). [1]

Alternatives considered	(1) Total Plant Capacity Loss or Gain (MW)	(2) On-peak Energy Generation Loss or Gain (GWh)	(3) Off-peak Energy Generation Loss or Gain (GWh)	(4) Total Energy Generation Loss or Gain (GWh)	(5) Operational Annual Benefits ($1000)	(6) Non-operational Annual Environmental Enhancement Costs ($1000)	(7) Incremental Annual Net Benefits ($1000)	(8) Total Annual Net Benefits to Existing Conditions ($1000)
Case 1: Existing Project	1.50	2.94	5.87	8.81	195	328	0	-133
INCREMENTAL ANNUAL CHANGES OF ENTITY'S TOTAL PROPOSED ENHANCEMENT MEASURES OVER EXISTING CONDITIONS								
Case 2: Applicant's proposal	0.00	-0.08	-0.27	-0.36	-8	0	-8	-141
Case 3: Interior's proposal	0.00	-0.16	-0.49	-0.65	-14	0	-14	-148
Case 4: Hackett Mill's proposal	0.00	-0.10	-0.11	-0.21	-5	0	-5	-138
Case 5: Staff's alternative #1	0.00	-0.10	-0.11	-0.21	-5	0	-5	-138
Case 6: Staff's alternative #2	0.00	-0.11	-0.31	-0.41	-9	0	-9	-142
Case 7: Staff's alternative #3	0.00	-0.04	-0.19	-0.24	-5	0	-5	-138
Case 8: Staff's alternative #4	0.00	-0.10	-0.30	-0.41	-9	0	-9	-142

[1] The values in columns 1 through 4 are rounded to two significant digits, while those in columns 5 through 8 are to the nearest integer.

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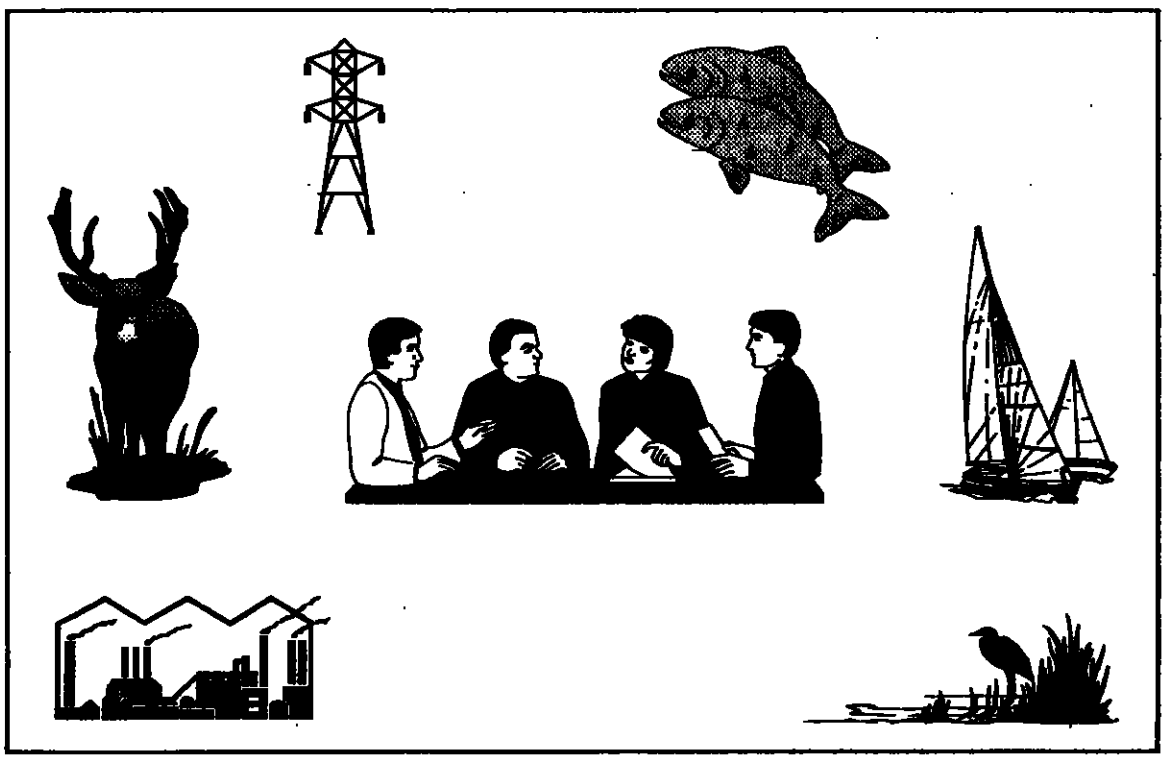
Federal Energy Regulatory Commission

Office of Hydropower Licensing

July 1996

FERC/FEIS - 0100

Final Environmental Impact Statement



Lower Androscoggin River Basin Hydroelectric Projects Maine

(FERC 2283-005, 11482-000)

9610030361

888 First Street N.E. Washington, DC 20426

APPENDIX E: LETTERS OF COMMENT ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT AND STAFF RESPONSES

The Notice of Availability of the draft environmental impact statement (DEIS) was published in the *Federal Register* on December 8, 1995. The DEIS was mailed to federal, state, local and non-governmental agencies and individuals on November 30, 1995. Section 8.0 contains a list of those agencies and individuals that were sent a copy of both the DEIS and FEIS.

All letters of comment that address specific analyses in the DEIS were reviewed by the FERC staff. Suggestions for correcting data or text and requests for further discussion of a subject have been considered. Those editorial changes and suggestions which were practicable, reasonable, and which improved the quality of the FEIS were incorporated.

Constructive criticism presenting a major environmental point of view or one in opposition to staff, when persuasively supported, is treated by making revisions in the appropriate part of the FEIS. When the major point of view is not persuasive, reasons are given why the staff did not change its point of view.

A "no response required" response is given to comments that are statements that raised no questions concerning treatment of subject matter in the DEIS. A "your opinion has been noted" or "comment noted" response is given to comments considered to be statements of opinion.

Where possible, our responses start next to the start of the comment, which may extend for several pages. Our responses are numbered sequentially. Where necessary to avoid confusion, the comments are numbered as well.

The respondents, the date of their response, and the page on which they occur are as follows:

Commentor	Date of Letter	Page
Independent Hydro Developers, Inc.	January 16, 1996	E-2
Joseph P. Maloney	February 2, 1996	E-5
Central Maine Power Company	February 16, 1996	E-8
Consolidated Hydro Maine, Inc.	February 16, 1996	E-34
Androscoggin Land Trust *et al.*	February 18, 1996	E-38
U.S. Environmental Protection Agency	February 20, 1996	E-77
Maine Department of Environmental Protection	February 21, 1996	E-81
Conservation Coalition	February 21, 1996	E-85
Trout Unlimited *et al.*	February 21, 1996	E-111
U.S. Department of the Interior	March 1, 1996	E-115

INDEPENDENT
HYDRO
DEVELOPERS,
INC.

[illegible] STREET
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NIAGARA FALLS, NEW YORK 14303
TELEPHONE [illegible]
TELEFAX [illegible]

January 16, 1996

Lois Cashell, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington DC 20426

RE: CENTRAL MAINE POWER COMPANY, PROJECT NO. 2283-005.
LIMITED COMMENTS OF TOPSHAM HYDRO PARTNERS ON DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Cashell:

Topsham Hydro Partners, an intervenor of Docket No. P-2283-005 and the holder of a license for the Pejepscot Project No. 4784, which is located downstream from Project No. 2283, hereby files its limited comments on the Draft Environmental Impact Statement ("DEIS") issued by the Staff of the Federal Energy Regulatory Commission ("FERC") on or about December 8, 1995.

I.
SUMMARY OF POSITION

IHDI--1- At page iii of the DEIS, it is noted that "potential impacts to and effects on...cumulative interactions with other projects" are environmental resource issues to be considered. These comments are limited to effects of the operation of the Gulf Island-Deer Rips Project on the downstream Pejepscot Project.

In summary, when properly analyzed, the adverse impacts of the Central Maine Power Company ("CMP") Gulf Island-Deer Rips Project on the Pejepscot Project, whether Gulf Island-Deer Rips is operated as proposed, as recommended by Staff, or as recommended by any of the intervenors, are within limits acceptable to Topsham Hydro Partners. However, whichever of the aforementioned operating regimes is adopted by the Commission herein, the license must clearly state that the regime selected shall not be changed unless, upon application and after opportunity for all affected persons to be heard, the license is amended by the Commission.

II.
IMPACT ON PEJEPSCOT PROJECT

IHDI--2- Currently, river flow on the Androscoggin River is controlled by two large reservoirs, Errol and Aziscohos, in the upper reaches of the Androscoggin basin. Relatively uniform flow is released from these reservoirs (DEIS Section 1.4.4 Hydroelectric Generation and Section 2.1.1.2 Existing Project Operation), which is re-regulated at Gulf Island to produce non-uniform flow at Pejepscot (and other downstream plants), causing a shift of on-peak energy to off-peak.

RESPONSE TO COMMENTS

IHDI--1- Comment noted.

IHDI--2- Our studies of existing conditions show what the on- and off-peak generation of all the projects would be if Central Maine were to operate Gulf Island-Deer Rips to maximize power production during the peak-load hours within the constraints of its current license conditions. Your generation summaries show that, historically, Central Maine has not maximized the peak generation at Gulf Island-Deer Rips to the full extent possible, and the downstream projects have been generating more peak power than they would have if Central Maine had maximized the peak generation at Gulf Island-Deer Rips.

IHDI--2-cont.

Topsham Hydro Partners does not agree with the Staff's determination of downstream effects of peaking at the Gulf Island development. Topsham Hydro Partners has analyzed its on-peak/off-peak generation for a six year period, 1990-1995, using energy generation from monthly statements of actual power sold to CMP (see Table 1 attached hereto). From Table 1, it is seen that the 6 year average on-peak power as a percent of total energy produced varies from 42.8 percent in March to 36.4 percent in October and about 39.1 percent for the year. With uniform flow (no hourly variation of flow) percent on-peak is calculated to be 38.0 percent (summer period), 42.5 percent (winter period), and 39.8 percent for the year. Under current operating conditions, approximately 486 MWHRS (0.7%) of annual energy produced is shifted from on-peak to off-peak.

Thus, there is less than a 0.75 percent negative effect on Topsham from the current operation of the Gulf Island Project and, except for Case 2A (generation upgrade with existing project operation-Appendix D), there should be even less negative effect from CMP's, Staff's and Intervenors' proposed operation regimes. Accordingly, Topsham has no objection to any of the proposals, except for Case 2A, provided that the current peak time periods are not altered.

III.
THE FUTURE

IHDI--3-

As the Commission and Staff are well aware, the electric industry is in the early stages of transition to a more competitive industry. The extent of those changes are not known at this time but it is quite possible that years from now, CMP, or a subsequent owner of the Gulf Island Project and Topsham Hydro Partners might be competitors for power sales, in Maine or elsewhere. For example, energy produced in Maine (eastern time zone) may be sold in a westerly time zone to capture higher value peak markets. Nothing should be done now that might unfairly impact the Pejepscot Project under circumstances that cannot be foreseen today. Accordingly, whichever of the proposed flow regimes are adopted by the Commission in this proceeding, that regime must be strictly enforced as a license condition and must not be subject to change except upon application for amendment and opportunity for affected persons to be heard.

Copies of these comments have been served upon the persons listed in the DEIS and the official service list.

Very truly yours,

TOPSHAM HYDRO PARTNERS

By _____
Olaf M. Erickson, P.E.
Vice President, Operations

Attachment

cc: Service List

RESPONSE TO COMMENTS

IHDI--2-cont. We believe, in the future, Central Maine will operate Gulf Island-Deer Rips to maximize its peak generation as regional loads grow and the power market becomes more competitive. Our studies reflect the generation impacts of the various enhancement scenarios assuming Central Maine would maximize its hydro peaking operations. The validity of this assumption is supported by Central Maine's proposal to increase the maximum generating capability of the Gulf Island power plant. In addition, power plants will operate closer to theoretical maximized or optimized conditions in the future than in the past because of continuing advances in, and reduced costs of, computer technology.

IHDI--3- Comment noted.

The following page contains an attachment to the comment letter. No responses are required.

[illegible]

ON P = ON PEAK
OFF P = OFF PEAK

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NOTE: [illegible]

[illegible]

E-4

February 2, 1996

Lois Cashell
Secretary FERC
888 First St.
Washington, D.C. 20426

I am writing regarding the Draft Environmental Impact Statement FERC # 2283-005 / 11482-000. While I may agree with some sections of this statement and disagree with others, I wish to particularly clarify one section Re: 3-39.

JPM--1- This section describes land supposedly owned by CMP and cites ALT as its source of information. I have deeds that tend to refute these claims and am enclosing photo copies of flowage rights and pole easements.
#1. Flowage rights are granted as specified in the deed beginning at the crest of Union Water Powers stone dam #2 which is 164.7 ft. above sea level re: UWP plus 38.5 ft. (Deer Rips Dam) plus 3.5 ft. (flash boards) total elevation 206.7 ft. above sea level with no mention 216 ft. as qouted in your statement.
#2. Pole easements are for 10 poles and required electrical wires. No transfer of land was involved only right of access to CMP for maintenance purposes.

JPM--2- In order to avoid future problems with FERC,CMP ALT or anyone else I wish to be on record that that this land is not available for trail development. This land is now being utilized in Forestry and Agriculture and is now open to hunting and fishing on a random basis.

In conclusion, I find it disturbing that a Government agency would accept and publish inaccurate information. I am also disturbed at the way utilities are harrassed and forced to spend millions of dollars to relisence existing hydro facilities. It seems to me that these funds could be better spent upgrading equipment, generating and distribution networks and most of all lowering rates.

Sincerely

Joseph P. Maloney
1101 N. River Rd.
Auburn, Me. 04210

copies
Robert Thorpe Mayor City of Auburn
Olympia Snowe U.S. Senate
William Cohen U.S. Senate
Robert Wingfass Rep. Maine Legislature

RESPONSE TO COMMENTS

JPM--1- Any lands included within the project boundary for Gulf Island-Deer Rips are identified on maps as fee title, easement, or flowage easement. In preparing the DEIS, we undertook a comprehensive land use analysis using these maps, as a result of which we describe the existing environment, made some generalizations with regards to Central Maine's interests. In the case of the Deer Rips impoundment, we did not conclude that Central Maine's interests included all land up to the 216-foot contour. We recognize that Central Maine has rights to land above the 216-foot contour in some cases, while in other cases, Central Maine has rights to less land.

In the DEIS we did not suggest that Central Maine develop any land that the company does not have legal rights to. Any recommendations made regarding land use practices around the project's two impoundments would be limited to land owned by Central Maine, land that Central Maine currently has the rights to use, or land that Central Maine may need to acquire rights to use in the future. We are not suggesting that any of Mr. Maloney's land be used for any other purpose than its existing uses.

JPM--2- Your opinion has been noted.

The following pages contain attachments to the comment letter. No responses are required.

State of Maine,
Androscoggin, ss. September 22, 1915.

Personally appeared the above named Stanley Shaban and acknowledged the above instrument to be his free act and deed.

Before me,
A. L. Kavanagh,
Justice of the Peace.

Received September 24, 1915 at 2 H. 30 M. P. M. and recorded from the original

Attest: Lloyd Hughes Register.

KNOW ALL MEN BY THESE PRESENTS, That I, George W. Dill of Auburn, in the County of Androscoggin and State of Maine, in consideration of one dollar and other valuable considerations paid by Androscoggin Electric Company, a corporation duly established by law and having its principal place of business at Lewiston in said County, the receipt whereof I do hereby acknowledge, do hereby give, Grant, Bargain, Sell and Convey unto said Androscoggin Electric Company, its successors and assigns forever, the right and privilege of flowing by the waters of the Androscoggin River, my homestead farm situated on the River road in said Auburn, to the extent that the same may be flowed at all seasons of the year by the waters of said river when raised by the dam of the said Androscoggin Electric Company at Deer Rips, so called, constructed at its present height of thirty-eight and one-half (38½) feet above the crest of the stone dam No. 2 of the Union Water Power Company, on the Androscoggin River at Lewiston, Maine, and when further raised by the use of flash boards three and one-half (3½) feet high on the permanent structure of said dam at Deer Rips, so.

50 cts Documentary Revenue Stamp.

G. W. D. Sep 22,1915.

The premises above referred to as my homestead farm are the same formerly owned by my father, William R. Dill, bounded northerly by land now or formerly of one Charles C. Wilson, and southerly by land now or formerly of Nepentill H. Bisbee, known as the Drake farm , and are the same conveyed to me by said William R. Dill by deed recorded in Androscoggin Registry of Deeds, Book 279, page 97, and by my two sisters by deed dated March 1, 1911, recorded in said Registry, in Book 254, page 142, and by my mother by deed dated March 2, 1911, recorded in said Registry in Book 254, page 143.

And for the consideration aforesaid I do hereby release, acquit and forever discharge said Androscoggin Electric Company and its predecessor in title the Lewiston & Auburn Electric Light Company, from all claims for damages I now have against them or either of them, caused by flowing said lands by the use of said dam at Deer Rips and the flash boards maintained thereon.

TO HAVE AND TO HOLD the aforegranted and bargained right and privilege to the said Androscoggin Electric Company, its successors and assigns, to its and their use and behoof forever. And I do COVENANT with the said Grantee, its successors and assigns, that it and they shall and may hereafter enjoy said right and privilege to the full extent hereby granted, free from interruption by any person, and that I will Warrant and Defend the same to the said Grantee, its successors and assigns forever against the lawful claims and demands of all persons.

In Witness Whereof we, the said George W. Dill and Martha Marsh Dill, wife of the said George W. Dill, joining in this deed as Grantor, have hereunto set our hands and seals, this fifteenth day of September, A. D. 1915.

George W. Dill. (Seal)

Martha Marsh Dill. (Seal)

State of Maine,
Androscoggin, ss. September 22d, 1915.

Personally appeared the above named George W. Dill and acknowledged the foregoing instrument to be his free act and deed.

Before me,
Thomas Atwood,
Justice of the Peace.

Received September 27, 1915 at 9 H. 15 M. A. M. and recorded from the original.

Attest: Lloyd Hughes Register.

KNOW ALL MEN BY THESE PRESENTS, That we, Edith G. Breen, and Annie E. Curran, both of Lewiston, in the County of Androscoggin, and State of Maine, in consideration of one dollar and other valuable consideration, paid by Mark Berman, of Lewiston, in said County of Androscoggin, the receipt whereof we do hereby acknowledge, do hereby give, grant, bargain, sell and convey, unto the said Mark Berman, his Heirs and Assigns forever, the following described lot of land with the buildings thereon, situated in said Lewiston, bounded and described as follows, to wit:

Commencing on the southerly line of College Street one hundred feet southwesterly from the lot now or formerly belonging to the City of Lewiston; thence running southeasterly at a right angle with said line of College Street one hundred feet; thence at a right angle southwesterly to Sabattus road; thence by said road to a point marked by a stone monument where said Sabattus road intersects College Street; thence northwesterly by the southerly line of said College Street to the point of commencement; meaning and intending to convey the premises conveyed to these grantors by the Heirs of Annie M. Alden.

This Agreement, made the Fourth day of August 1925

WITNESSETH that I George E. Dill

of Auburn in the County of Androscoggin and State of Maine

in consideration [illegible] grant unto the CENTRAL MAINE POWER COMPANY its successors and assigns the right to set and maintain over and across my land in the town of Auburn in the County of Androscoggin TWO poles together with fixtures and wires connecting to convey currents of electricity and the right to attach wires and appliances for guying from said poles, where necessary, to or into my land. The location of said poles to be as follows:–

from the land of the Androscoggin Electric Co. or Central Maine Power Company running Northerly to the land of Frederick C. Sargent said line to be a double line 15 feet apart.

together with the right to enter upon said land for the purpose of making the necessary repairs to said poles or wires and for the purpose of trimming and cutting such tree or trees as may be necessary to keep the wires of said Company free from interference by said tree or trees and with the further understanding that in case it becomes necessary for said Company to set additional poles on my land in the same line as those now staked out, the right to set said additional poles is hereby granted, said Company to pay for the same at the rate of $10 per pole; Provided said Company pays me the sum of Two hundred dollars on or before Sept. 1st 1925 it being understood that nothing except surveying shall be done on said land until after receipt of said payment.

George E. Dill

August 18th 1925

Received of the Central Maine Power Company Two hundred dollars in accordance with the above agreement and said right is hereby granted.

In Witness Whereof, I, the said George E. Dill and Martha M. Dill and [illegible] my wife who joins to release whatever right she might have to interfere with the continuance of this grant after my death have hereunto set our hands and seals this 18th day of August A. D. 1925.

Geo. E. Dill (Seal)

Martha M. Dill (Seal)

STATE OF MAINE
Androscoggin, ss.

Aug. 18th A. D. 1925

Personally appeared the above named and acknowledged this instrument to be his free act and deed.

Before me,

Leslie B. Kisler

Justice of the Peace.

Received Aug. 21st A. D. 1925 at 7 h. – m. A. M. and recorded from the Original.

E-7

Central Maine Power
North Augusta Office Annex
4 Anthony Avenue Augusta Maine 04330

February 16, 1996

Ms Lois D Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, NE, Room 3110
Washington, D C 20426

RE: Lower Androscoggin River Basin Draft Environmental Impact Statement (FERC No. 2283-005, 11482-000)
Comments on Lower Androscoggin DEIS (FERC\DEIS - 0100)

Dear Ms Cashell

On December 8, 1996, the Federal Energy Regulatory Commission (FERC or Commission) issued the Draft Environmental Impact Statement (DEIS) for the Lower Androscoggin River projects Central Maine Power Company (CMP) is licensee for the Gulf Island - Deer Rips project included in the DEIS. The following represent CMP's comments on the Lower Androscoggin River DEIS

CMP--1- **DEIS recommended minimum flows for Gulf Island - Deer Rips for improvement of fish habitat are not supported by evidence in the record.**

CMP objects to the DEIS recommendation of a seasonally variable minimum flow of 1400/1700 cfs for the Gulf Island - Deer Rips Project. Licensee's proposal to increase the minimum flow at Gulf Island - Deer Rips from 0 cfs to 1,100 cfs or inflow, whichever is less, on a year round basis provides significant enhancement to habitat conditions in the Lower Androscoggin. The DEIS recommendation of a seasonally variable minimum flow for the Project of 1,700 cfs from May 1 through November 30 for the enhancement of anadromous fish and brown trout, and of 1,400 cfs from December 1 through April 30 for the enhancement of brown trout habitat is not justified because it is not supported by the evidence in the record.

CMP's proposed minimum flow of 1,100 cfs or inflow, whichever is less is fully protective of fish habitat for all species of interest. The DEIS clearly states that, "with Central Maine's proposals, the continued operation of Gulf Island - Deer Rips would result in no adverse impacts to existing fish resources of the lower Androscoggin River."[1] Moreover, the DEIS also concludes that with the proposed increase in the minimum flow from the current voluntary 1,000 cfs to 1,100 cfs "both resident and anadromous fish would experience minor to significant improvements in

[1] Page 4-5 of the DEIS.

RESPONSE TO COMMENTS

CMP--1- Central Maine correctly states that a change in flow from 0 cfs to 1,100 cfs, or inflow, whichever is less, would provide significant enhancement to habitat conditions in the lower Androscoggin River.

In addition, the composite WUA curves presented in the FEIS (Figures 4-9 through 4-14) clearly show the minor to moderate benefits in the amount of habitat available at any given flow above 1,100 cfs. With few exceptions (i.e., juvenile brown trout and Atlantic salmon in the Dresser's Rips reach), the reach-specific WUA curves (Figures 4-1 through 4-8) also show improved habitat conditions. Furthermore, the habitat duration analyses also demonstrate the positive benefits of flows higher than 1,100 cfs. We believe these benefits could be significant, depending upon the time of year. For example, the amount of time that optimum, or near optimum, habitat conditions exist for adult brown trout increases by about 15 percent (1,100 cfs versus 1,600 cfs) in the Deer Rips [summer period] and the Dresser's Rips reaches [winter period] (Table 4-5).

habitat conditions." [2] Yet, despite its own conclusions, the DEIS ultimately recommends a seasonally variable minimum flow of 1,400/1,700 cfs.

CMP--2- The DEIS suggests that increases in minimum flows from the proposed 1,100 cfs to 1,700 cfs for the period May 1 through November 30 are necessary in order to protect and enhance anadromous fish runs in the lower Androscoggin River. The Licensee disagrees with this conclusion.

CMP--3- First, IFIM studies conducted by the Licensee [3] demonstrated that there would be improvements in anadromous fish habitat in the lower Androscoggin River associated with increased minimum flows. CMP's proposal of 1,100 cfs provided increases in anadromous fish habitat to all management species and lifestages. The DEIS recommended seasonal minimum flow of 1,700 cfs provided additional increases in anadromous fish habitat, and the USFWS recommendation for run-of-river flows resulted in even greater increases in habitat. However, neither the DEIS recommendation nor the USFWS recommendation provide increases for all species/lifestages of anadromous fish. Additionally, the DEIS fails to recognize that the incremental increases in habitat for anadromous fish species/lifestages are relatively small, and, in the case of alewife and shad, represent only a very small portion of the total habitat available to these species in the lower Androscoggin River.

CMP--4- Second, the DEIS also fails to evaluate the IFIM results in the context of a more comprehensive picture of anadromous fish restoration management plans and efforts. IFIM is a modeling tool which provides an understanding of flow/habitat relationships in specific or representative river reaches. But, IFIM should not be used as the sole determinant when making decisions regarding minimum flows or other flow regimes. Instead, IFIM results and, more importantly minimum flow recommendations, should be examined in the context of the other factors that also have a significant bearing on the restoration of anadromous fish in the lower Androscoggin River.[4]

CMP--5- It is premature to provide increased minimum flows for the enhancement of Atlantic salmon.. The DEIS justifies the 1700 cfs recommendation based on the fact that the IFIM studies show that there would be increased salmon habitat available over CMP's 1100 cfs recommendation at Dresser's Rips and Deer Rips. The Deer Rips stretch of river is located above Lewiston Falls. However, as the DEIS acknowledges, there are no plans in the foreseeable future to restore salmon above Lewiston Falls. Consequently, there is no need for increasing habitat for salmon in this river stretch. Also, as the DEIS acknowledges, active restoration of salmon in the river below Lewiston Falls (including the Dresser's Rips reach) has not been initiated. Nor is there any time frame within the foreseeable future that such plans are intended to be initiated. Finally, even if there were active salmon restoration efforts below or above Lewiston Falls, the incremental increase in salmon habitat from 1100 cfs to 1700 cfs is minimal and unwarranted.

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[2] CMP has been voluntarily releasing a minimum flow of 1000 cfs from the Project since 1986.

[3] The IFIM studies are summarized in the DEIS at pp. 4-6 to 4-19.

[4] These other factors are discussed later in our response.

RESPONSE TO COMMENTS

CMP--2- See our responses to comments CMP--3 through CMP--13.

CMP--3- We recognize that any given flow would, in most cases, fall short of maximizing habitat conditions for all species and lifestages present in a river system; habitat needs vary considerably among aquatic organisms, in this case anadromous fish. The habitat suitability index curves for Atlantic salmon and American shad are good examples of how habitat needs vary among species.

In Section 4.2.1.2., staff stated that "For both brown trout and Atlantic salmon, higher river flows generally result in an increase in the quantity of habitat in the river. However, there is little difference in the quantity of habitat provided by Central Maine's 1,100 cfs..." Furthermore, the WUA curves presented in the FEIS also show the changes in habitat with flow. Staff also stated in Section 4.2.1.2. that "American shad habitat in the Run-Reach is generally limited to spawning and nursery habitat. Given the availability of more suitable, deeper spawning and nursery habitat areas downstream of the Run-Reach..." We, therefore, believe Central Maine's statements are without merit.

CMP--4- We agree that IFIM is merely a modelling tool, that IFIM should not be used as the sole determinant when making decisions regarding minimum flows or other flow regimes, and that IFIM results and minimum flow recommendations should be examined in the context of other factors. Commission staff, in analyzing the minimum flow issue considered not only the habitat needs of the various fish species of concern, but also considered the type, amount and location of habitat present in the river. Staff also evaluated the minimum flow issue, and ultimately recommended a flow regime, within the context of the fishery management objectives for the river at the time the DEIS was prepared. We recognize that some of these goals and priorities have changed [*as shown by Interior's comments of the DEIS*]. We believe our recommended flows are consistent with fishery management plans for the river.

CMP--5- The DEIS does suggest that Atlantic salmon habitat would be improved with a 1,700-cfs flow. We also recognize Central Maine's argument that a flow of 1,700 cfs does not provide significant benefits over their 1,100-cfs proposed flow; depending upon lifestage and study reach, a 1,700-cfs flow provides minor benefits to habitat conditions, and in some cases results in a slight loss of habitat for juvenile salmon. For this reason, we do not solely justify our flow recommendation on the benefits to Atlantic salmon habitat. Staff's flow recommendation also incorporates the flow needs of the resident fishery, as well as the needs of the stocked brown trout fishery.

CMP--5-cont. For instance, the DEIS stresses the importance of adult and juvenile salmon habitat in the Dresser's Rips reach. Licensee's 1100 cfs recommendation provides 100% of the available juvenile salmon habitat and approximately 75% of the adult salmon habitat in this reach. While Licensee acknowledges that some salmon may be reaching Dresser's Rips today, there are no immediate plans by USFWS or the State of Maine to initiate active salmon restoration efforts on the lower Androscoggin River. In fact, the Androscoggin River is one of the lowest priority rivers for salmon restoration efforts in the Maine and New England.

The availability of salmon stocks (brood stock, eggs, fry and smolts) for restoration efforts in Maine is extremely limited, and are not likely to increase significantly in the near future. Competition for the available stocks among Maine's eight active restoration rivers (the Dennys, East Machias, Machias, Pleasant, Narraguagus, Penobscot, Ducktrap, and Sheepscot) is already quite fierce, leaving lower priority rivers such as the Androscoggin well down the list of those rivers vying for management resources. Given the number of rivers that will receive priority for limited salmon stocks over the Androscoggin, it is highly unlikely that stocking will be occurring or Atlantic salmon runs will be increasing on the Lower Androscoggin River in the foreseeable future.

In the meantime, the availability of both adult and juvenile habitat provided in the Dresser's Rips reach at Licensee's proposed minimum flow of 1,100 cfs is very good to excellent (juvenile salmon habitat is at 100% of available WUA at 1,100 cfs) and should be more than sufficient to support the limited run of salmon which is likely to characterize the lower Androscoggin River in the near future. The DEIS recommendation provides only minimal habitat increase over 1100 cfs and the additional impact on generation of providing 1700 cfs is not justified.

CMP--6- As with salmon, American shad runs on the lower Androscoggin River are almost non-existent and it is highly unlikely that the shad population will increase dramatically in the near future. To date, restoration efforts for shad have involved very limited stocking of adults. Like salmon, shad stocks in Maine and New England are extremely scarce. Until very recently, all shad being stocked into the Androscoggin and Kennebec Rivers were adults which were captured and transported from the Connecticut River, and to a much lesser extent, the Merrimack River. Since Maine's take of Connecticut and Merrimack River shad is limited, and the trucking distance is very long, to date DMR has been able to stock only very limited numbers of adult shad in these rivers. Specifically, in the Androscoggin River DMR has stocked only 4,673 adult shad since 1987.

More recently, DMR, in cooperation with others, has developed a small shad hatchery. It is anticipated that shad hatchery efforts in Maine will increase in the future. But with no good Maine source of adult shad brood stock, even hatchery efforts will take significant time to develop.

Since stocking of shad in the Androscoggin River has been minimal, it is not surprising that returning numbers of adult shad to the Androscoggin River are also very low. Since 1983, only five shad have been observed in or captured at the Brunswick fishway. Moreover, observations of

RESPONSE TO COMMENTS

CMP--5-cont. Although Atlantic salmon do not presently have access to the Deer Rips reach, but can ascend only as far as Lewiston Falls, suitable habitat most likely exists throughout the river downstream from this point. For example, the Dresser's Rips reach contains what is considered significant habitat for Atlantic salmon. Therefore, while considering the salmon's habitat needs in the Deer Rips reach may be inappropriate, there are most likely other areas available to the salmon, where suitable habitat exists, that would benefit from the higher flow of 1,700 cfs.

Furthermore, while there is no active restoration program for Atlantic salmon in the Androscoggin River at this time, there is a passive restoration program that should be considered in developing a minimum flow recommendation for the lower Androscoggin River.

CMP--6- See revised text in Section 3.2.2.

shad in the vicinity of the fishway are very limited, strongly suggesting that there are very few shad returning to the Androscoggin River each season. The reason for the small returns of shad to the Androscoggin is unknown. DMR speculation is that the low returns are due to a combination of effects including low numbers of returning adults to Merrymeeting Bay, the availability of large amounts of spawning habitat in the lower Kennebec River (below Edward's dam), and the lack of fish that were spawned in, and native to, the Androscoggin River which have the innate desire to move up into the Androscoggin River. For whatever reason, there are very few shad currently utilizing the habitat between Brunswick and Lewiston.[1]

CMP--7- Licensee's IFIM studies looked at the effects of flow on shad habitat in Dresser's Rips and the Run Reach. The latter reach was modeled to represent the run type habitat which characterizes large portions of the lower Androscoggin River. IFIM results indicate that at Licensee's proposed 1,100 cfs minimum flow the percent of maximum available shad habitat at Dresser's Rips ranges from 42% to 81% depending on lifestage, while for the Run Reach the percent of maximum available habitat for shad ranges from 18% to 22% depending on lifestage.

CMP--8- Surficially, the availability of shad habitat at 1,100 cfs seems relatively low. However, in viewing the shad IFIM results, the shape of the WUA curves and the sustainability of maximum habitat must be considered. Specifically, the WUA curves for all of the shad lifestages modeled for the Run Reach are largely asymptotic curves which do not peak, but continue to increase (WUA) with increasing flows. Maximum habitat values in this reach for these lifestages are achieved at flows in excess of 8,000 cfs. Clearly, a flow of 8,000 cfs is not sustainable in the lower Androscoggin River, and in fact is likely to occur on an average annual basis (according to the annual flow duration curve) only 17% of the time. Since such flows, and therefore habitat, cannot be sustained for any significant period of time, viewing shad habitat availability at minimum flows in comparison to periodic and unsustainably high flows is illogical.

A much more reasonable comparison in this case would be to compare the habitat available at the proposed minimum flow as compared to the annual median flow for the river. In this case, the median flow is approximately 3,700 cfs, and habitat availability for the five shad lifestages modeled in the Run Reach range from 30% to 40% of the habitat available at the median annual river flow.

Similarly, at Dresser's Rips, peak shad habitat availability occurs at very high, unsustainable river flows. However, viewed as a percentage of habitat available at a median annual flow of 3,700 cfs, Licensee's proposed minimum flow of 1,100 cfs provides between 50% and 83% of shad habitat for the various life stages modeled.

CMP--9- The DEIS also fails to recognize that the habitat available in the Dresser's Rips and Run reaches which were modeled as part of the IFIM study represent only a portion of the total amount of shad habitat available in the lower Androscoggin River. DMR estimates that the section of river

[1] Returning numbers of adult shad to the Kennebec River below Edwards Dam are also very low. Thus, it may be that there are other reasons impacting the return to the Androscoggin and Kennebec Rivers which are not yet known.

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CMP--7- Comment noted.

CMP--8- In Section 4.2.1.2. of the DEIS we agreed that optimizing American shad habitat is probably not warranted, and concluded that flows required to maximize, or nearly maximize, shad habitat would be virtually impossible to maintain. Our flow recommendation, therefore, was not driven by trying to maximize shad habitat.

Central Maine's argument relative to what is an appropriate comparison in regards to American shad habitat in the lower Androscoggin River may have merit in certain fishery applications. We believe, however, that the more relevant comparison, in this case, is one drawn between not only the base flow and the optimum flow, but the base flow and the full generation flow as well. This was the approach we used to analyze the flow issue in the DEIS, and is also used in the FEIS.

Whether the median flow comparison is valid or not, we believe it is irrelevant in this case. In the DEIS we stated that shad are capable of utilizing a wide range of depths and velocities, and therefore have rather broad habitat requirements. Because of this, we concluded that shad habitat would be adequately protected by releasing a minimum flow of 1,100 cfs. Again shad was not a driving force behind our flow recommendation.

CMP--9- See our response to CMP Comment No. 3. and Section 3.2.2., which we have revised to reflect MDMR estimates of the amount of shad habitat available in the Androscoggin River below Gulf Island-Deer Rips.

between the Brunswick and the Pejepscot projects alone could support 37,000 adult shad, and the section between Pejepscot and Worumbo could support an additional 26,000 adult shad For the reach between Worumbo and Lewiston Falls which includes the Dresser's Rips and Run Reach sections, DMR estimates *there is habitat available to support another* 100,000 adult shad Thus, even if minimum flows do not allow optimization of shad habitat in the Run Reach and the Dresser s Rips reach, there would clearly be more than enough habitat in the lower Androscoggin River under the Licensee's proposed *1,100 cfs minimum flow to support a very sizable population* of returning adult shad

CMP--10- Considered in combination with the fact that returning shad numbers are extremely low, that the number of stocked shad is low, and that shad stocks are and will continue to be very limited, Licensee's proposed minimum *flow of 1,100 cfs is more than sufficient* to provide habitat necessary to support both the existing shad population and future populations resulting from shad restoration efforts

CMP--11- Alewife restoration on the lower Androscoggin River has been underway since 1983 As a result of DMR's considerable efforts in the early 1980s, alewife production in the lower Androscoggin has increased dramatically, with peak adult returns of 100,895 and 95,574 at Brunswick in 1989 and 1990 respectively The major component of the success of the alewife restoration on the lower Androscoggin was the trapping and trucking of returning adult alewife at the Brunswick fishway Large numbers of these returning adults were then stocked into a number of lakes and ponds which drain to the lower Androscoggin River and which provide superior spawning and juvenile rearing habitat for alewife. However, the stocking of adult alewife in many of the important spawning lakes was very controversial, since the public believed that alewife were competing with other more favorable sport fish such as trout, salmon and bass. As a result of the significant public outcry, stocking of alewife in two of the most significant lakes, Thompson and Sabbatis lakes, in the lower Androscoggin basin was discontinued by DMR in 1986-87

The loss of these lakes for alewife stocking was a significant setback to the alewife restoration effort on the Androscoggin. Combined, they represent more than 50% of the total spawning habitat available in lakes and ponds in the lower Androscoggin River drainage. Not surprisingly, the loss of these lakes to the alewife program has resulted in a significant decline in total alewife production and a precipitous decline in the numbers of returning adults to Brunswick. It is quite apparent that the lack of suitable lakes for spawning and juvenile rearing is the limiting factor, not river flows, to alewife restoration. Under these circumstances, increasing minimum flows from the Licensee's proposed 1,100 cfs to 1,700 cfs will do nothing to enhance alewife restoration efforts on the lower Androscoggin.

CMP--12- Based on comments provided primarily by the USFWS, the DEIS suggests that lower minimum flows and peaking flows may adversely affect the utilization of existing upstream fishways by returning anadromous species. First, the DEIS provides no information or evidence to substantiate the supposition put forth by USFWS that fluctuating flows affect fishway utilization. This is an issue which has been argued about for years in New England, but the effect of which has never been conclusively demonstrated. Nor is there any information or evidence provided in the DEIS that even begins to substantiate the supposition that the current minimum flow from

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CMP--10- We agree. We stated in Section 4.2.1.2. of the DEIS that "shad habitat would be adequately protected by maintaining bank-to-bank flow in the Run-Reach, which could be accomplished with Central Maine's proposed 1,100-cfs minimum flow."

CMP--11- We recognize that alewife restoration efforts in the Lower Androscoggin River Basin may be largely tied to the amount of habitat available for stocking adult alewife to spawn. We believe that under these conditions increasing the minimum flow to 1,700 cfs may do little to enhance alewife restoration efforts in the lower part of the basin. However, while unknown at this time, the 1,700-cfs minimum flow would probably be critical to protecting and enhancing the remaining habitat (particularly that which exists in the mainstem Androscoggin River), and thus, provide positive benefits to the fishery. Furthermore, our recommended flow regime was not designed to meet the flow needs of alewife, to the exclusion of other species. Staff's flow recommendation is designed to accommodate the flow needs of multiple species/lifestages in the river, giving weight to the existing management objectives and priorities.

See Section 3.2.2. of the FEIS, which we have revised to more accurately present the current state of alewife restoration in the lower Androscoggin and Little Androscoggin Rivers.

CMP--12- Our position regarding fluctuating flows and attraction to fishways was largely based on comments and information provided by the FWS. The knowledge base from which we derived this conclusion was limited in scope, and somewhat subjective. However, we deferred to the expertise and knowledge of the FWS where this issue was concerned.

CMP--12-cont. Gulf Island or related peaking operations have in any way adversely affect fishway utilization on the lower Androscoggin River

To the contrary, the DEIS summarizes the excellent success which the Licensee has had in successfully moving fish through the existing upstream fishway at the Brunswick Project. As noted correctly in the DEIS, since 1983, the Brunswick fishway has successfully passed over 575,000 alewife Atlantic salmon are also successful in their utilization of the Brunswick fishway, with an average of 44 returning adult salmon passed each season.[6] The utilization of the fishway by shad is discussed above There is no evidence at Brunswick or any other fishway facilities that the ability of shad to successfully utilize fish passage facilities is adversely affected by fluctuating flows.

There is no evidence provided in the DEIS to suggest that the existing minimum flow or the peaking operation of Gulf Island adversely affects fishway utilization. Therefore, it is completely inappropriate for the DEIS to conclude that increasing the minimum flow and resulting reductions in peaking operations will enhance fishway utilization by anadromous species.

CMP--13- The DEIS also concludes that increased minimum flows are necessary to enhance brown trout habitat in the Dresser's Rips and Deer Rips reaches of the Androscoggin River. Licensee disagrees with this conclusion for a number of reasons.

CMP--14- First, MDIFW has consistently indicated that the Dresser's Rips reach is the most significant area of potential brown trout habitat in the lower Androscoggin River. IFIM results demonstrated that for adult brown trout, habitat in Dresser's Rips is maximized at a flow of 1,000 cfs, and that 99% of the maximum adult brown trout habitat is available at a flow of 1,100 cfs. At higher minimum flows, adult brown trout habitat availability is only further reduced.

CMP--15- The IFIM results also indicated that juvenile brown trout habitat in the Dresser's Rips reach is very minimal and is limited due to the predominance of boulder substrates and a lack of preferred cobble and gravel substrates. Thus, while juvenile brown trout habitat in this reach is maximized at a flow of 1,800 cfs, juvenile habitat availability remains low and relatively constant over the entire range of flows modeled. In fact, increasing the minimum flow from 1,100 cfs to 1,700 cfs results in an increase of only about 6,600 sq. ft of river of juvenile brown trout habitat.

CMP--16- Just as importantly, the brown trout fishery in the lower Androscoggin River is a stocked fishery, and fish stocked by MDIFW are generally large yearling fish 6-10" in length, with habitat preferences which are much more similar to adults than fry or fingerling juveniles. Thus, for the existing brown trout fishery, habitat in Dresser's Rips is nearly maximized at a minimum flow of 1,100 cfs. It should also be noted that no brown trout were stocked by MDIFW in the lower Androscoggin River below Gulf Island in 1994 and 1995.

Since 1983 the number of Atlantic salmon passed at the Brunswick fishway has ranged from a low of 14 to a high of 184 salmon in 1990. 1990 was considered an unusual year, with the next highest annual total of salmon passed being 91.

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CMP--12-cont. During the course of the project's 10(j) meeting, the issue of fluctuating flows and attraction to fishways was discussed in some detail. The FWS, at this meeting, admitted that sufficient data to reasonably evaluate the relationship between flow fluctuations and fishway attraction was lacking at this time. However, the FWS indicated that on-going studies designed to evaluate the effectiveness of fish passage facilities currently operating at projects on the lower Androscoggin River would provide the needed information.

Given the current level of knowledge regarding this issue, and the discussion that occurred at the 10(j) meeting, we believe that it may have been presumptuous for the DEIS to conclude that 1,700 cfs would enhance the fish attraction to fishways... In the FEIS, we have revised staff's conclusion relative to this issue, and are including a re-opener clause in any flow article written for the project to address this issue in the future.

CMP--13- See our responses to the following comments: CMP--14 through CMP--19.

CMP--14- Based on the current fishery plans on file with the Commission, and as stated by MDIFW at the 10(j) meeting, both the Deer Rips and Dresser's Rips reaches are considered priority habitat for brown trout, which the DEIS alluded to in its description of the existing fishery. While Dresser's Rips may be the most significant area of potential habitat for brown trout in the lower Androscoggin River, we believe its important to consider both Deer Rips and Dresser's Rips in our analysis. Moreover, we recognize that the WUA curves for the Dresser's Rips reach show reduced habitat for adult brown trout at flows above the optimum flow of 1,000 cfs. However, staff's recommended 1,700-cfs flow results in about a five percent reduction in habitat over habitat conditions at 1,000 cfs.

CMP--15- At the 10(j) meeting, the MDIFW stated that, although the brown trout fishery is a stocked fishery, it is a fishery where some trout holdover through the next year. The possibility, therefore, exists that some of these "resident" fish may spawn, making nursery and juvenile habitat important. We recognize that juvenile habitat in Dresser's Rips may be limited by substrate more than flows. This situation would make existing habitat that much more valuable. Further, we believe the habitat in the Deer Rips reach is also an important consideration, which would justify a flow higher than 1,100 cfs.

CMP--16- See our response to CMP's Comment Nos. 14 and 15.

Because juvenile habitat in the Dresser's Rips reach is limited by substrate more than flows, and because the stocked brown trout yearlings likely have habitat preferences similar to adults, increasing the minimum flow at Dresser's Rips from 1,100 cfs to 1,700 or 1,400 cfs will provide no enhancement to the brown trout fishery in this reach. In fact, increasing the minimum flow to 1,400 or 1,700 cfs will result in a reduction in adult brown trout habitat, and therefore a loss of habitat to the stocked fish. Thus, the DEIS recommendation to increase minimum flows for enhancement of brown trout habitat at Dresser's Rips is both unnecessary and unjustified.

CMP--17- The situation with respect to brown trout habitat at Deer Rips is similar. At Deer Rips, the IFIM results indicate that juvenile brown trout habitat in this reach is very limited. In this reach the limitation is due to shallow depths (the river through this reach is very broad and shallow) and the predominance of low habitat value boulder and ledge substrates. Again, the WUA curve for juvenile brown trout is relatively flat, and shows little change in total available habitat over the full range of flows modeled.

Adult brown trout habitat in the Deer Rips reach is much more abundant, and nearly 80% of the maximum available adult brown trout habitat is provided at the proposed minimum flow of 1,100 cfs. Adult habitat in the Deer Rips reach does increase at a flows of 1,400 and 1,700 cfs, however, given the total abundance of adult brown trout habitat in this reach, such an increase is not necessary in order to support the existing stocked brown trout fishery.

CMP--18- The DEIS also fails to recognize that the habitat found in the Deer Rips reach is probably not utilized by brown trout in the winter. In their June, 1986 report on Androscoggin River Habitat Suitability and Fish Management Potential, MDIFW clearly states that adult salmonids (including brown trout) require pools and deadwaters for overwintering. The Deer Rips reach provides no pools of significant size, and is therefore not likely to be utilized by brown trout during the winter months, regardless of flow conditions. Thus, recommending an increase in the minimum flow from Gulf Island above the 1,100 cfs proposed by CMP during the winter will provide no enhancement of adult habitat for over-wintering brown trout in the Deer Rips reach.

CMP--19- In conclusion, the minimum flows recommended in DEIS are unnecessary and unjustified for either anadromous or resident fish species. Moreover, because the DEIS has done a poor job of examining the IFIM results in the context of larger fishery management and river habitat issues, increasing the minimum flows as recommended in the DEIS over the 1,100 cfs proposed by the Licensee in some cases may not produce any enhancement at all to fish habitat for the species of interest. CMP estimates that implementing the DEIS recommended seasonally variable 1,700/1,400 cfs minimum flow at the Gulf Island Deer Rips project as compared to the Licensee's proposed 1,100 cfs will result in a reduction of nearly 10,000 MWH of on-peak generation annually. This is a significant loss of peak power generation in order to provide small increases in anadromous and resident fish habitat which are not biologically justified. The DEIS recommendation frankly appears to be an attempt to reach a middle ground between Licensee's proposal and other agency recommendations. This middle ground can't be supported by evidence in the record and clearly does not provide an adequate balance of resources, especially considering that there will be an increase from the current license of 0 cfs minimum flow

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CMP--17- While juvenile brown trout habitat in the Deer Rips reach is limited to some extent by shallow depths and suitable substrate, the WUA curve for this lifestage does show that suitable habitat increases considerably as flows increase above 1,000 cfs. This suggest that water velocity (i.e., streamflow) may be an important component to achieving suitable habitat for juvenile brown trout.

Because of MDIFW's priority habitat determination, juvenile and adult brown trout habitat in the Deer Rips reach should not be viewed within a vacuum; flow determinations should not ignore what is happening to habitat in other locations of the river.

CMP--18- The DEIS did not include an adequate discussion of the type of habitat found in the Deer Rips reach, and its potential use by brown trout throughout the year. Section 4.2.1.2. of the FEIS has been revised with a brief discussion the potential utilization of this habitat by brown trout.

CMP--19- In the DEIS, we evaluated the minimum flow issue within the context of the information and resources available at that time, including the license application for Gulf Island-Deer Rips, supplemental information provided by the licensee, and various federal and state fish and wildlife agencies, and the comprehensive fisheries management plans that had been filed with the Commission. We believe, based on this information, that the DEIS, with few exceptions, adequately evaluated the IFIM results and habitat duration analyses within the context of broader fishery management and river habitat issues. Any changes in the fishery management strategies for the Androscoggin River that were identified since the DEIS was issued have been considered and incorporated in the FEIS, where appropriate.

We recognize this flow regime carries an economic cost, but believe that these flows are biologically justified, are supported by the evidence in the record, and are an appropriate balance among competing resources at this time.

requirement. For these reasons, FERC should recommend in the DEIS CMP'S proposed flow of 1100 cfs, or inflow Attachment 1 lists by page number Licensee's specific objections to the DEIS minimum flow conclusions.

CMP--20- Licensee feels that there is an economic penalty incurred by the staff's proposal. As described above, there appears to be no practical biological basis for the Commission's proposed seasonal minimum flow of 1400/1700 The staff's proposal does however carry an economic penalty to the Licensee Specifically the 1400/1700 scenario means a shift of 10,000 MWh per year from on-peak to off-peak generation (see attached data sheet). This is a significant loss of peaking power (on top of the loss of 16,000 peaking MWh by increasing the minimum flow from 0 cfs to 1,100 cfs as proposed by Licensee), for no apparent gain in fisheries resources.

CMP--21- On another front, the staff's proposal calls for a limitation in the allowable fluctuation of the Gulf Island impoundment from four feet to one foot during the period of May 1 through June 30 This may be of consequence to Licensee in that, within the NEPOOL system, Gulf Island currently is assigned weekly-cycling status. By limiting the impoundment drawdown and increasing the minimum flow, there is not enough storage to run for the 10 hours required by NEPOOL to qualify as a weekly-cycling facility. This shift from a weekly-cycling to a daily-cycling facility could significantly impact the revenue benefits that Licensee derives from the Gulf Island project within the NEPOOL system, and further negatively impact the project's economics.

Finally, taking a broader perspective, it should also be pointed out that if FERC persists in imposing high minimum flows on projects, they are at the same time cutting into one of the basic benefits that hydro offers, that is generation flexibility. High minimum flow requirements mean the erosion of the reserve capacity that might otherwise be available for times of increased regional need and that cannot be provided by less flexible base load generators. This cumulative impact should not be lost on FERC during its evaluation.

CMP--22- CMP concurs with the DEIS conclusions and recommendations regarding dissolved oxygen issues at the Gulf Island - Deer Rips project. CMP agrees with the DEIS' characterization of the status of dissolved oxygen issues at the Gulf Island project. Specifically, the DEIS recognizes that discharges from pulp and paper manufacturing facilities located on the Androscoggin River upstream of the project have resulted in the accumulation of oxygen-demanding sediments in the Gulf Island impoundment which in turn has created low summer dissolved oxygen conditions. Thus, the dissolved oxygen problems in the impoundment are "are a result of many factors resulting from over 150 years of industrial development, and have been the responsibility of no one entity". (DEIS, Pg 4-55).

CMP--23- The DEIS also concludes that the oxygenation plant which was constructed and is operated by the Gulf Island Pond Oxygenation Partnership has been "very effective in improving dissolved oxygen conditions in the impoundment" and recommends that the long term effectiveness of the oxygenation plant should be monitored to determine whether additional remedial measures are required. CMP agrees. Three years of operational and water quality data clearly demonstrate that the oxygenation plant has been very effective in improving dissolved oxygen conditions in the impoundment, even under extreme high temperature and low flow conditions. The Partnership

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CMP--20- We believe our recommended 1,700 cs/1,400 cfs flow regime would provide minor to significant benefits to fishery resources in the lower Androscoggin River, with the level of benefit determined by species, lifestage, and the season. We also believe that these benefits would justify the moderate additional cost to the licensee of providing these flows.

CMP--21- Based on Central Maine's comments on the DEIS, and our discussion of the issue at the Section 10(j) meeting, we found that the Gulf Island impoundment would, at times, need to be fluctuated at a minimum of two feet to meet NEPOOL requirements for a weekly peaking facility, which is how Gulf Island-Deer Rips is currently classified. Because of NEPOOL's rating system, a single violation in the NEPOOL requirements may result in NEPOOL adjusting the status of Gulf Island-Deer Rips. Central Maine estimated the cost of losing the project's current status to be about $200,000 annually.

During the Section 10(j) meeting, Central Maine stated that it would attempt to maintain a one-foot fluctuation limit, but indicated that it could not guarantee that such a limit would be sufficient to meet NEPOOL requirements. Central Maine, consequently, requested that its one foot fluctuation restriction be viewed as a target fluctuation, with an allowance for up to a two-foot fluctuation to meet any unusual NEPOOL power requirement.

We recognize the environmental benefits of a strict one-foot fluctuation limit, but believe that any benefits derived from this restriction would not be commensurate with the additional significant cost that Central Maine would incur if the project's status were to change. Therefore, we agree with Central Maine's modified proposal, and have recommended a one foot target fluctuation from May 1 through June 30 in the FEIS.

CMP--22- Comment noted.

CMP--23- Comment noted.

currently monitors the effectiveness of the oxygenation plant as part of its routine, annual operation of the facility CMP proposes to continue to participate in the monitoring of the effectiveness of the oxygenation plant recognizing that continuing monitoring efforts is a responsibility of the Partnership and not any one entity

CMP--24- Finally, CMP agrees with the DEIS' objection to EPA's characterization of the oxygenation plant as a "temporary" measure, and to EPA's recommendation that CMP and the upstream paper companies be required to evaluate alternative measures for improving dissolved oxygen conditions in Gulf Island Pond. The DEIS concludes otherwise stating "[w]e do not believe that additional study of alternatives at this time is warranted, but preparation of a plan to study alternatives in the future might help to achieve EPA's long-term goal of improving water quality and restoring aquatic habitat in a more natural fashion." The DEIS further concludes that "EPA's recommendation that the dissolved oxygen issues at the Gulf Island impoundment be addressed jointly by the GIPOP Partnership in accordance with a common timetable and regulatory plan is reasonable."

CMP--25- On page 5-28 the DEIS recommends as follows: "Provide a plan to study alternatives other than the GIPOP facility to protect and/or enhance DO concentrations in the Gulf Island impoundment and the lower Androscoggin River." As stated above, CMP continues to object to EPA's characterization of the $2.4 million oxygen plant as a temporary measure *that may require additional remediation* Licensee feels strongly that given the success of the oxygenation project, there is no justification for requiring an additional study of alternatives.[7]

CMP--26- **Licensee is in general agreement with the DEIS recreation recommendations, but feels that it's cooperative approach with local entities is the most productive way to proceed.** Central Maine Power Company (CMP) has a long history of pro-active recreation management of it's licensed and unlicensed projects. In 1988, CMP formalized this pro-active approach by completing the planning portion of a corporate Recreational Facilities Plan. The plan was approved and endorsed by the State of Maine in March, 1989 The first project completed under the new plan was the construction of the Turner Bridge Boat Launch, at the Gulf Island Project, during the summer of 1988. Since that time, CMP has completed approximately 50 of the

[7] If, however, the Commission insists on including a license condition requiring a plan to study alternatives, Licensee, in the spirit of cooperation on which the GIPOP Partnership was founded, believes the plan should be developed jointly by the Partnership, as recommended by EPA. As proposed in our letter of July 19, 1995 to the Commission, we recommend inclusion of the following language in a new license for the Gulf Island-Deer Rips Project:

> Gulf Island Pond Oxygenation Partnership, shall cooperate in the formation of a study plan to evaluate alternatives to the oxygen injection system. The study plan shall be developed in consultation with the State of Maine and EPA and shall include a list of alternatives to be evaluated, the timing of the implementation of the study plan, and evidence of consultation with the State of Maine and EPA. The plan and results of any studies called for by the plan shall be submitted to FERC at the same times that they are submitted by all the other partners of the Gulf Island Oxygenation Partnership to EPA as part of the renewal of such partners' NPDES permits until EPA notifies the Gulf Island Pond Partners that in order to examine alternatives to the dissolved oxygen injection system, Licensee, as a partner of the further alternative analyses are no onger required.

RESPONSE TO COMMENTS

CMP--24- Comment noted.

CMP--25- We acknowledge Central Maine's objection to inclusion of a license condition that would require studying alternatives to the existing GIPOP facility. However, we continue to believe that such a recommendation is warranted, and are recommending to the Commission that an article be included in any license issued for Gulf Island-Deer Rips which would require such a plan be developed jointly by the GIPOP Partnership, as recommended by EPA.

CMP--26- Comment noted.

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original 100 recommendations laid-out by the plan. As with any dynamic land use plan, some of the recommendations have become obsolete or unnecessary at this time, but there are still viable issues that the plan recognizes and that CMP will act on, if there is a clear indication of demand and broad public support for proposed improvements

CMP--27- Since filing the hydro application on the Gulf Island - Deer Rips Project in December, 1991, and the subsequent receipt of comments on the application, CMP has attempted to review all of the recreational issues at the project in order to facilitate the relicensing process. Licensee's review of these issues included in-depth consultation with local interests including the Androscoggin Land Trust (ALT), Androscoggin Valley Council of Governments (AVCOG), staff from the cities of Lewiston and Auburn and local landowners concerned about the results of this process In addition, National Park Service (NPS) representatives took an acuve part in the process.

Actions taken by Licensee include attending and participating in ALT public training functions, regular consultation meetings with ALT, AVCOG and landowners, joint meetings with ALT and landowner representatives, attending and addressing city council meetings and providing some financial support for ALT's planning efforts. It should be noted that this project has generated a significant amount of controversy between NGO's, city governments and private landowners The issues and conflicts at the Gulf Island - Deer Rips project additionally attracted the attention of Maine's congressional delegation. Landowner complaints conveying suspicion of the federal relicensing system, the seemingly disregard for landowner rights and local fears of public invasion and recreational use of private abutting properties, prompted congressional correspondence to FERC, requesting information and investigation of these issues. CMP's response to this public backlash, was and still is, to attempt to broker realistic agreements between NGO's, city governments and private landowner groups, with regard to extensive facilities requested by NGO's versus actual needs and private landowner concerns. This initiative has worked reasonably well. Continued success will depend in great part, on the flexibility afforded the Licensee in the resulting license compliance articles.

CMP--27- Comment noted.

CMP--28- Since participating in these joint efforts, CMP and the combined participants, have come to some basic agreements which should provide solid ground for future negotiations. Three of the most important issues discussed were the rights of the public to access the resource, respect for private landowner rights and the need for clear identification of need prior to the installation of new and/or improved facilities.

As a result of this process, CMP has agreed to install canoe portage trails around both the Gulf Island and Deer Rips dams, provide for public access to the Deer Rips facility, provide for additional public access to the river along the Switzerland Road, and to proceed with the ALT in resolving issues at the Waterman Road site which will hopefully result in formal recreational access to the river at that site.

CMP--28- Concerning Central Maine's having agreed to: (1) construct canoe portage trails around both the Gulf Island and Deer Rips dams, (2) provide for public access to the Deer Rips facility, (3) provide additional public access to the river along Switzerland Road, and (4) consult with the Androscoggin Land Trust to resolve issues at the Waterman Road site which would lead to formal public access to the river at that site; see revisions to Sections 2.2.1.3. and 4.1.1.6. in the FEIS.

CMP--29- As a result of these efforts, CMP and ALT conducted the first open house/public tour of the Deer Rips facility on October 21, 1995. In the future, we anticipate two or three such activities per year, if the demand is there. CMP continues to cooperate with ALT and has agreed to provide funding for specific projects, such as brochures, publicly posted maps and a public

CMP--29- Comment noted.

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information/historical kiosk in the vicinity of the Deer Rips Project. It is Licensee's hope that FERC recognizes the benefits of this open and cooperative approach between Licensee and local entities and ensures its continuation through the licensing process.

Attachment 2 lists by page number Licensee's specific comments regarding the DEIS recreation conclusions.

CMP-30- Licensee feels that imposition of a decommissioning license condition is unwarranted. In Section 2.6, the DEIS states that "Commensurate with its decommissioning policy, the Commission will address project decommissioning and the proposed decommissioning trust fund in the licensing Orders for Gulf Island - Deer Rips." In the Commission's Policy Statement on Decommissioning (issued December 14, 1994), it is stated that "The Commission will not generically impose decommissioning funding requirements on licenses." The Policy goes on to say that, "The Commission will determine whether to impose funding requirements on a case-by-case basis." It is Licensee's assertion that the Gulf Island - Deer Rips project is not a candidate for the establishment of a decommissioning fund. Licensee takes that position based on the Commission's criteria of taking into account the condition and expected lifespan of the project, and the applicant's ability to fund a decommissioning action at the end of any license issued. The Gulf Island - Deer Rips project is an extremely well maintained project with no reason to expect a lifespan less than many decades. The only party to raise the issue of providing a decommissioning fund was the Conservation Law Foundation, and neither they, nor anyone else, provided any evidence that such a fund is necessary. Thus, following the Commission's own policy, it is clear that there is no need for the establishment of a decommissioning fund in the project license.

If you have any questions about these comments, please contact David Dominie at (207) 621-4427.

Sincerely,

F. Allen Wiley, P.E.
Director, Hydro Operations

cc: Alan Creamer
Service List

Attachment

u:\hydro\...\response.doc

CMP-30- As noted by Central Maine, the Commission's Policy Statement on Dam Decommissioning issued on December 14, 1994, states that the Commission will not generically impose decommissioning funding requirements on licensees. The Commission will determine whether to impose funding requirements on a case-by-case basis, at the time of licensing or relicensing. As stated in Section 2.6 of the EIS, the Commission's decision, in this case, will be considered within the context of any order issuing a license for the project; Central Maine's views, as presented in these comments, will be considered prior to any decision being reached.

Attachment 1

Specific Objections to DEIS Minimum Flow Conclusions

Specific Objections to the Following DEIS Minimum Flow Conclusions.

CMP--31- Page 4-69 DEIS "The 1,700 cfs minimum flow during the summer and fall periods would, with few exceptions, result in significant improvements in habitat in the lower Androscoggin River, particularly for adult brown trout."

This is not true. At Dresser's Rips which has been identified by MDIFW as the most significant area of potential brown trout habitat, 99% of the maximum available adult habitat is provided at a flow of 1,100 cfs. Adult brown trout habitat at Dresser's Rips decreases at flows of 1,400 and 1,700 cfs as recommended in the DEIS. Juvenile habitat at Dresser's Rips increases minimally (4%) between flows of 1,100 and 1,700 cfs, but stocked brown trout yearlings likely have habitat preferences which are closer to adults than juveniles, so this small increase in juvenile habitat would provide no real enhancement to the existing fishery.

CMP--32- Page 4-69 DEIS "This flow [1,700 cfs] would also improve conditions for anadromous fish and enhance the fish attraction to fishways located downstream of Gulf Island - Deer Rips.

These conclusions are completely unsubstantiated. To CMP's knowledge, there is no evidence in the record for this proceeding or elsewhere that demonstrates that attraction of migrating anadromous fish to fishways located downstream of the Gulf Island - Deer Rips project would be improved under an increased minimum flow. The fact is, successful attraction to fishway entrances has as much or more to do with the siting and design of the fishway entrance, and the direction and quantity of attraction flow provided in the fishway itself, than with river flows. In particular, upstream fishways are designed to provide sufficient fishway attraction flow so that fish can successfully locate the entrance of a fishway even in the face of high river flows. To date the general rule of thumb used by USFWS in designing fishways in Maine has been to utilize attraction flows of at least 3% of maximum generation flow of a station. The idea is that a fishway must provide sufficient flow so that the fish can find the entrance even in the face of competing high flows being discharged from the turbines. Under this theory it is hard to argue that fishway attraction would be improved under higher minimum flows. Indeed, attraction of fish to fishways may actually be adversely affected by increasing the minimum flow in the lower Androscoggin River.

CMP--33- Page 4-69 DEIS "The 1,700 cfs flow would also enhance attraction [of anadromous fish] to the river during the migration periods."

This statement is also completely unsubstantiated. There is no information that has been provided in this proceeding by fishery agencies or others that would suggest that attraction of anadromous fish to the Androscoggin River would be improved by increasing minimum flows. Also, this statement implies that attraction into the Androscoggin River is inadequate, or in some way not meeting the expectations of state fishery management agencies. If this is the case, CMP is unaware of it, and the DEIS provides no information demonstrating such a problem. There has been a documented decline in the run of anadromous alewife in the Androscoggin River, as recorded by fish counts made at the Brunswick fishway since a peak in 1989. However, as noted

RESPONSE TO COMMENTS

CMP--31- Your opinion has been noted. See our response to CMP's Comment Nos. 14, 15, and 16.

CMP--32- See our response to CMP's Comment No. 12.

CMP--33- Your opinion has been noted. See our revisions in Section 4.2.1.2. of the FEIS, where we more thoroughly describe the flow/fish attraction issue, including identifying any potential effects.

previously, this decline in the run has been attributed to the loss of three of the more significant ponds to alewife production in the lower Androscoggin basin. At the same time there has been a remarkable increase in the alewife run in the Kennebec River due to significant efforts to restore alewife to the Kennebec a feat which was accomplished primarily through out-of-basin stockings of alewife from the Androscoggin River to the Kennebec River, and more recently through stocking of returning Kennebec River alewife. Thus, there has been a decline in the Androscoggin run and an increase in the Kennebec alewife run, but this shift in alewife returns from the Androscoggin to Kennebec has nothing to do with river flows or the attraction of fish to one river over the other because of flows.

Also the DEIS fails to consider the timing of the alewife and shad runs, and its relation to river flows. In Maine, the vast majority of adult river herring and shad return to the rivers, including the Androscoggin in May and early June. During this period, river flows are very typically high, and would generally always exceed the recommended minimum flow of 1,700 cfs Thus, increasing the minimum flow during this period would likely have no affect on immigrating shad and herring.

CMP--34- Page 4-69 DEIS: "Migrating fish habitat could be affected by significantly altered flows resulting from peaking operation."

Neither the DEIS nor the USFWS has provided any evidence of the supposed adverse effects of fluctuating flows on migrating anadromous fish.

CMP--34- Your opinion has been noted. See our revisions in Section 4.2.1.2. of the FEIS, where we more thoroughly describe the flow/fish attraction issue, including identifying any potential effects.

CMP--35- Page 4-70 DEIS: "Given the current status of the anadromous fish restoration program for the lower Androscoggin River, we believe that flows for anadromous fish should be considered in developing a flow regime."

The DEIS has done a very poor job of characterizing the existing status of the anadromous fish restoration program. The only species of anadromous fish currently using the lower Androscoggin River in any numbers are alewife. And, as outlined above, the size of the alewife run has been shown to be more dependent on availability of suitable pond and lake spawning habitat than river flows. Shad and salmon are present in the Androscoggin River in only very small numbers. Moreover, due to limitations on stock availability, it is not likely that the numbers of these fish will increase significantly in the near future. This is particularly true for salmon, since the Androscoggin River is a very low priority for salmon restoration. The DEIS fails to recognize such considerations as status of restoration efforts, availability of stock and availability of suitable habitat are as important, if not more so, as river flows in the success of restoration of anadromous fish. Imposition of a minimum flow in a vacuum will do nothing to enhance restoration efforts.

CMP--35- Your opinion has been noted. See our response to CMP's Comment Nos. 4 and 5.

CMP--36- Page 4-70 DEIS: "We agree that optimizing American shad habitat is probably not warranted....Therefore, shad habitat would be adequately protected by maintaining bank-to-bank flow in the Run-Reach, which could be accomplished with Central Maine's proposed 1,100 cfs minimum flow."

CMP--36- Comment noted.

CMP concurs Shad habitat in the Run Reach is maintained and protected at sufficient levels at 1,100 cfs to support existing plans for shad restoration to the lower Androscoggin River Thus, increased minimum flows to 1,700 cfs during the anadromous fish migration period for shad are unwarranted

CMP--37- Page 4-70 DEIS "Atlantic salmon habitat in Dresser's Rips reach is considered priority habitat, which should be considered in determining an appropriate minimum flow regime for the lower Androscoggin River "

Atlantic salmon habitat in Dresser's Rips should be considered in evaluating appropriate flows for the lower Androscoggin River But recommendations on minimum flows for river now should also consider the current status of the Atlantic salmon run in the Androscoggin River, and the likelihood of seeing significant increases in salmon in the near future given the extremely low priority of the Androscoggin River for salmon stocking and restoration efforts. As noted previously, the DEIS fails to recognize that salmon population are unlikely to increase significantly in the near future, and that the 1,100 cfs minimum flow proposed by CMP is more than sufficient to support existing and future stocks of salmon.

CMP--38- Page 5-32 DEIS "Our recommended minimum flows would provide (1) moderately to significantly enhanced instream flows during anadromous fish migration periods."

This conclusion is not true. IFIM and habitat duration results demonstrate that there will be minimal habitat improvements for anadromous fish associated with increasing the minimum flow from Gulf Island - Deer Rips from 1,100 cfs to 1,700 cfs. However, in no case is this increase in habitat significant. In fact, the IFIM results demonstrate that for most anadromous fish species and lifestages modeled, incremental increases in habitat availability at 1,700 cfs versus 1,100 are very small (10% or less).

CMP--39- Page 5-34 DEIS "With regards to Atlantic salmon, we concluded in Section 4 2 1.2 [DEIS] that, while there are definitive, near term plans to restore salmon to the Androscoggin River, habitat conditions at Dresser's Rips, which is considered an important reach of the Androscoggin River below Lewiston Falls for salmon smolts and adult salmon fish opportunities, should be considered when setting a minimum flow because of its priority habitat status."

CMP disagrees. The Androscoggin River is the among the lowest priority rivers for salmon restoration in Maine. There is no definitive time at which any fishery management agency has said that it will initiate active Atlantic salmon restoration efforts on this river.

CMP--40- Page 5-35 DEIS: "[O]ur recommended project operations and flow regime, coupled with Central Maine's proposed ramping schedule, would, with few exceptions, result in significantly improved habitat conditions in the GI impoundment and lower Androscoggin River."

Licensee believes that given the IFIM results, the conclusion that increasing the minimum flow from 1,100 to 1,400 or 1,700 cfs seasonally would result in significantly improved habitat conditions is a gross exaggeration. Rather, such increases in minimum flow would provide only

RESPONSE TO COMMENTS

CMP--37- Your opinion has been noted. See our response to CMP's Comment No. 5.

CMP--38- Your opinion has been noted. See our response to CMP's Comment Nos. 3 through 12 and No. 34.

CMP--39- As previously noted (*see staff's response to CMP's Comment No. 4*), we evaluate the minimum flow issue within the context of existing fishery management objectives, and continue to support establishing a minimum flow that enhances Atlantic salmon habitat, as well as other anadromous and resident fishes (*see staff's response to CMP's Comment No. 5*).

CMP--40- See our response to CMP's Comment No. 20.

minor improvements to habitat conditions in the lower Androscoggin at the cost of a loss of 10,000 MWh on on-peak generation.

CMP-41- Page 5-35 DEIS: " Additionally, this type of flow regime [DEIS recommended seasonal minimum flows of 1,400/1,700 cfs] would meet the needs of improving habitat conditions for American shad, alewife, and Atlantic salmon, and enhancing the attraction to fishways located downstream of Gulf Island - Deer Rips, as well as generally enhancing attraction of anadromous fish to the Androscoggin River during the migration periods."

As noted previously, the broad conclusions set forth in this statement are not true. Given the current status of anadromous fish restoration efforts improved habitat conditions for alewife, shad and salmon are not warranted. Also, there is no evidence that increasing the minimum flow in the river will enhance attraction to fishways. In fact, just the opposite may be true, since increasing the river flows, will diminish the ratio of fishway attraction flows to total river flow. Finally, there is no evidence to suggest that increasing the minimum flow from Gulf Island - Deer Rips will enhance the attraction of anadromous fish into the Androscoggin River.

RESPONSE TO COMMENTS

CMP-41- See our response to CMP's Comment Nos. 4, 5, 8, 11, 12, and 34.

Attachment 2

Specific Comments to DEIS Recreation Conclusions

RESPONSE TO COMMENTS

Specific Comments to DEIS Recreation Conclusions

CMP–42- Page 2-12 DEIS. " investigate the feasibility of developing carry-in boat launch facilities on Gulf Island Impoundment in the vicinity of Waterman Road and on the Androscoggin River below Deer Rips."

Licensee has already begun the process of determining the feasibility of the Waterman Road site Working with the Androscoggin Land Trust (ALT), it has been decided that the site is indeed worthy of consideration as a public carry-in facility The prime issue of concern is gaining local landowner support for the project. The site is already being used by the public (on CMP land) but in order to expand use at the site it will probably be necessary to acquire some additional land at the site to meet shoreland setback requirements. ALT wishes this issue be resolved in a manner sensitive to local landowners, since ALT is dependent on landowner support for their programs. In this instance, Licensee feels that FERC should allow flexibility for CMP and ALT to work out the details on this site. Regular reports on progress would allow that flexibility and at the same time allow continuing consultation between the ALT, City of Auburn, local landowners, Maine Department of Conservation and Licensee. This tact would protect local landowner interests and at the same time guarantee continued investigation and negotiation on this site by Licensee. In the meantime, the site continues to be open to public use on an informal basis on CMP property.

CMP–43- Page 2-12 DEIS: " develop a conservation and trail plan for all Central Maine land abutting the project;"

The Licensee has been working with the ALT to develop a public access and trail plan for the project. The area of concentration has been within the Deer Rips development. The Licensee and ALT have reached agreement on a plan at Deer Rips which also addresses the concerns of local land owners. In addition, the Licensee has already been investigating concept plans for the Gulf Island development. In both of these instances it is imperative that the local landowners be given time to understand ALT's approach and what they are attempting to accomplish. ALT is aware that without landowner support, their efforts to develop a trail for the lower Androscoggin River will probably not succeed. As indicated in the above clarification, flexibility is key to these issues and in gaining the public support necessary to implement a workable public access plan. Again, instead of relying on a stringent compliance timetable, regular reports on progress will protect all the interests involved and continue to guarantee Licensee progress on this issue.

An additional clarification is needed on the bounds of the trail plan. The Licensee has consulted with ALT and have determined that there is confusion with regard to FERC plan requirements. In some cases staff indicates a plan will include all CMP property, in other instances only CMP property within 200 feet of the shore. ALT interpreted this to mean that only CMP property within 200 feet of the shore would be eligible for inclusion, their concern being that this did not take into consideration the lands already within the project boundary. To avoid further confusion the Licensee suggests the language, pertaining to what will be included in the plan be changed to "the plan shall include those lands already within the project boundary and any additional

RESPONSE TO COMMENTS

CMP–42- See our revisions in Section 2.2.1.3. and 4.2.1.4. in the FEIS.

CMP–43- The FEIS now reflects this new development pertaining to Central Maine's concerns.

CMP lands not within the project boundary but within 200 feet of the high-water elevation of the headpond."

This definition should be clarified throughout the document

CMP–44- Page 4-34 DEIS "Central Maine proposes to develop a land conservation and trail plan for the Gulf Island - Deer Rips area, however, no specifics of the plan have been provided."

Since comments have been received on the application, the Licensee has been working with local interests to develop concept procedural plans and in at least one instance have come to agreement for a trail plan for the Deer Rips development. As indicated in the previous clarification, CMP suggests the following language to clarify the extent of the conservation and trail plan. **The plan shall include those lands already within the project boundary and any additional CMP lands not within the project boundary but within 200 feet of the high-water elevation of the headpond.** This definition should be clarified throughout the document

CMP–44- See our response to CMP's Comment No. 43.

CMP–45- Page 4-80, DEIS "Land Trust et al. recommends that Central Maine place conservation easements on all land bordering the Gulf Island and Deer Rips impoundment's within 250 feet of the shoreline zone to preclude residential, commercial, or industrial use."

ALT did not recommend that all lands within 250 feet of the shore be included in conservation easements. They specified that only CMP properties within 250 feet be included in conservation easements. CMP agrees to the concept of including 200 feet of Company owned land within the scope of the land management plan, as FERC staff has suggested. However, the decision of dedicating specific parcels to conservation easements would necessarily be made a part of the planning and consultation process the plan would entail. It would be premature to automatically make the assumption that all CMP lands within the project boundary or within 200 feet of high water should be subject to conservation easements.

CMP–45- The 200 feet referenced in Section 4.2.1.5. of the DEIS, as it pertains to the Comprehensive Land Management Plan, is a generalized rule-of-thumb that the Commission uses when describing project boundaries. We agree that it would be premature to make the assumption that all Central Maine-owned lands within the project boundary, and within 200 feet of the project's shoreline, should be subject to conservation easements. Therefore, we have deleted the 200-foot reference from Section 4.2.1.5. of the FEIS.

CMP–46- Page 4-81 DEIS: "Central Maine proposes to investigate the feasibility of installing public access in the area below Deer Rips/Androscoggin No.3 when recreational demand dictates."

Licensee has been working with the ALT on a trail plan for the Deer Rips development. As part of the plan CMP has agreed to install a canoe portage trail around the Deer Rips dam and powerhouse. In addition to serving as a canoe portage trail, the trail section to the south of the powerhouse will double as angler access and as a carry-in site downstream of the Deer Rips dam. The river stretch below Deer Rips is also presently being served by a privately owned ramp in the Lewiston Falls Project, FERC No. 2302, and is covered by Article 409 of the Lewiston Falls Project License.

Licensee has been dealing with this issue in consultation with the private landowner and the Maine Department of Inland Fisheries and Wildlife (MDIFW). Present agreements between MDIFW and the Licensee involve a joint venture where MDIFW will acquire the site with negotiation assistance from CMP, CMP would design and improve the site for increased public access and MDIFW and CMP will work out an O&M agreement for the long-term management of the site

CMP–46- See our revisions in Section 4.2.1.4. in the FEIS.

This issue involves private negotiations with the landowner and FERC has given the Licensee the flexibility to regularly report on progress and on continued consultation with the MDIFW. The Licensee is hopeful that the landowner will make a decision on the sale of the site sometime this spring. If not, other alternatives will be examined.

CMP-47- Page 4-82 DEIS "Central Maine, however, should investigate the feasibility of installing the previously mentioned facilities in the future provided that there is an increase in the public's demand for such facilities."

CMP-47- See our revisions in Section 4.2.1.4. in the FEIS.

There have been changes in use at the Gulf Island - Deer Rips project since the application was filed in 1991. The Licensee has worked with the ALT, Androscoggin Valley Council of Governments, Cities of Auburn and Lewiston, local landowners and interested state agencies to take appropriate action with regard to these changes in use. The result of these actions are concept plans for other possibly needed facilities at the Gulf Island Project. These concept plans eliminate the need for additional feasibility studies in these areas. The major concern is having the necessary flexibility to broker agreements between the ALT and the local landowners. As stated earlier, the use of regular progress reporting requirements, rather than specific completion dates for facilities will allow the Licensee, the ALT and the city governments to work with and accommodate many local landowner concerns in the installation of these new or improved facilities. Also, additional information will soon become available thorough the 1996/1997 FERC FORM 80 results, studies for which will begin in March, 1996.

CMP continues to believe that many requested facilities are premature and would prefer to proceed with individual facility development on an as needed basis. It has been Licensee's experience that in order to succeed, a facility must have demand or existing use before it is installed or improved. In some cases this demand or existing use is evident (Waterman Road, portage trails, and Switzerland Road parking) and Licensee is directly addressing the issues. However, in other instances, such as multiple trails radiating out from the project, the demand is less certain.

In addition, the Licensee agrees with staff findings, that ALT's requests to include transmission corridors beyond the current project boundaries to provide additional trail routes is not within the legitimate scope of this relicensing. CMP currently has a trail program that provides over 300 miles of trails in Maine. To add trails in this area, an interested entity need only consult with CMP, the State Bureau of Parks and Land, and local abutting landowners to work out any concerns that are expressed over trail proposals. This process is currently in effect at CMP and is the proper mechanism for trail development outside of project boundaries.

CMP-48- Page 4-84 DEIS: "We conclude there is insufficient public use of the existing day-use facilities at the Gulf Island - Deer Rips Project to justify developing additional day-use facilities."

CMP-48- See our revisions in Section 4.2.1.4. in the FEIS.

In keeping with CMP's proactive approach to recreation, Licensee has determined that there has been some increase in demand at the project and is addressing the issue. To that end, CMP has worked with the ALT, city government and local landowners to address these issues. As a result, CMP has determined that a trail plan at the Deer Rips development, including a portage trail

which will double as angler access, parking and carry-in access on Switzerland Road, carry-in access at Waterman Road, and a portage trail around Gulf Island dam is within reason at this time. In addition, CMP has agreed that a conservation and trail plan on CMP project lands and other CMP lands within 200 feet of the project is feasible. The major concern that the Licensee has, is the necessity of retaining enough flexibility in the process to allow time for working out potential difficulties with the various parties impacted by new or improved public recreation facilities. The ALT has expressed similar concerns to CMP. This concern would be manageable if compliance articles in the license referred to progress reporting requirements rather than specific completion dates for the various facilities.

CMP--49- Page 4-86 DEIS: "We propose that Central Maine, in consultation with MDOC, NPS, the Androscoggin Land Trust, the Androscoggin Valley Council of Governments, the Conservation Law Foundation, and the cities of Lewiston and Auburn prepare a comprehensive land use management plan for Commission approval to protect environmental resources (including aesthetics and public access of the shorelands) within 200 feet of the project's shoreline."

The boundary of the land use plan should be defined as follows: **The plan shall include those lands already within the project boundary and any additional CMP lands not within the project boundary but within 200 feet of the high-water elevation of the headpond.**

CMP--49- See our response to CMP's Comment No. 43.

CMP--50- Page 5-29 DEIS: "Investigate the feasibility of developing a carry-in boat launch facility on the Gulf Island impoundment in the vicinity of Waterman Road and on the Androscoggin River below Deer Rips."

Please refer to comment No 1, of this section. In brief, feasibility studies should not be required at these facilities since it is already recognized that these sites are being used and will be used in the future. The major concern is retaining enough flexibility in the license compliance articles to *have adequate time to* work out potential difficulties with the various parties involved in the process. Regular reports on progress would be preferred over specific facility deadlines to be assured that landowner rights are respected in this process.

CMP--50- See our revisions in Section 5.4.1. in the FEIS.

CMP--51- Page 5-29 DEIS: "Develop a comprehensive land-use management plan for all Central Maine's land adjoining the project."

Please refer to comment No. 2, on pages one and two of this document.

This recommendation should read: **The plan shall include those lands already within the project boundary and any additional CMP lands not within the project boundary but within 200 feet of the high-water elevation of the headpond.**

CMP--51- See our response to CMP's Comment No. 43.

Attachment 3

Generation Comparison
Licensee Proposal/FERC Staff Recommendation

RESPONSE TO COMMENTS

Gulf Island FERC License
Comparison of CMP Proposal to FERC Staff Recommendation

Peak Hour Generation

CMP-52

Description	Gulf Is	Andro 3	Deer Rips	Station Monty	Canal	Brunswick	Total
CMP Proposal	68,317	13,538	17,466	67,110	2,949	37,227	201,127
FERC Staff	63,866	13,807	15,466	63,325	2,949	37,538	197,471
Δ from CMP to FERC Staff	(4,451)	269	(2,000)	(3,785)	-	311	(9,655)
Δ% from CMP to FERC Staff	-6.5%	2.0%	-11.1%	-5.6%	0.0%	0.8%	-4.7%

Off-Peak Hour Generation

Description	Gulf Is	Andro 3	Deer Rips	Station Monty	Canal	Brunswick	Total
CMP Proposal	52,864	14,377	10,728	56,775	4,407	54,963	194,114
FERC Staff	58,829	18,100	10,293	60,945	4,404	54,726	207,298
Δ from CMP to FERC Staff	5,965	3,723	(435)	4,170	(3)	(237)	13,184
Δ% from CMP to FERC Staff	11.3%	25.9%	-4.1%	7.3%	-0.1%	-0.4%	6.8%

Total Generation

Description	Gulf Is.	Andro 3	Deer Rips	Station Monty	Canal	Brunswick	Total
CMP Proposal	121,180	27,915	28,714	123,885	7,357	92,189	401,241
FERC Staff	122,695	31,907	28,280	124,270	7,353	92,263	404,769
Δ from CMP to FERC Staff	1,515	3,992	(2,434)	385	(3)	74	3,528
Δ% from CMP to FERC Staff	1.3%	14.3%	-8.5%	0.3%	0.0%	0.1%	0.9%

Results based on HEC5 model runs

CMP-52 Your energy generation table has been noted.

The following pages contain the service list for the comment letter. No response is required.

CERTIFICATE OF SERVICE
LOWER ANDROSCOGGIN ENVIRONMENTAL IMPACT STATEMENT
GULF ISLAND-DEER RIPS FERC NO. 2283

I David R. Dornuse, Senior Environmental Specialist for Central Maine Power Company, hereby certify that I have this day served copies of the foregoing document to the following parties of record and other interested people by United States mail, postage prepaid:

Eight copies regular mail, postage paid:

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Federal Energy Regulatory Commission
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2/16/96
DATE

DAVID R. DOMINIE
Senior Environmental Specialist

CONSOLIDATED HYDRO MAINE, INC.
SUBSIDIARY OF CONSOLIDATED HYDRO, INC.

February 16, 1996

Lois Cashell, Secretary
Federal Energy Regulatory Commission
Dockets Room, Room 1A, East
888 First Street, N.E.
Washington, D.C. 20426

Re: Marcal Hydroelectric Project (FERC No. 11482-ME);
Comments on Draft Environmental Impact Statement.

Dear Secretary Cashell:

Consolidated Hydro Maine, Inc. (CHMI) has reviewed the Draft Environmental Impact Statement (DEIS) for the Lower Androscoggin River Basin, issued on December 8, 1995, particularly with reference to our Application for Initial License for the Marcal Hydroelectric Project (FERC No. 11482-ME).

Our primary concern is the staff's conclusion that the Marcal Project should be operated *in a run-of-river mode*, despite repeated acknowledgments throughout the DEIS that CHMI's proposal - i.e., cycling with minimum flow and limited headpond fluctuation - would not adversely affect the local environment. We also disagree with portions of the economic analyses included in the DEIS, and in the staff's interpretation of the effect of run-of-river operations at Marcal on operations of the three downstream hydroelectric facilities (Hackett Mills, Upper Barker and Lower Barker).

COMMENTS ON ENVIRONMENTAL ANALYSIS

CHMI--1- The DEIS is ambiguous with respect to the staff's final recommendations for operating conditions at the Marcal Project. On page 5-44, it appears that the staff has recommended both run-of-river operation and a project minimum flow of 56 cfs, clearly two mutually exclusive operating conditions. In the following comments, we assume that the staff intended to recommend strict run-of-river operations only, as it is the more restrictive condition, and because there is no mention in the final recommendations of restrictions on headpond fluctuations, other than run-of-river operation.

CHMI--2- We do not agree that there is sufficient justification - either ecologic, economic or operational - to support the staff's apparent conclusion that the Marcal Project should be operated as run-of-river. First, no resource agency has recommended run-of-river operation; in fact, Interior and USFWS have supported CHMI's 56 cfs project minimum flow proposal, and Interior recommended the same in its final comments on the license application. The 56 cfs project minimum flow proposal is based on the USFWS's Aquatic Base Flow (ABF) regional minimum flow policy.

CHMI--3- Second, throughout the DEIS the staff repeatedly states that CHMI's proposed project minimum flow and headpond fluctuation regime would sufficiently protect environmental resources in the project area, including: soil stability along the impoundment shoreline (page 4-36); water quality (page 4-37); fish habitat in the impoundment (page 4-44); vegetation and wildlife habitat in the impoundment and downstream of the project (page 4-47); and aesthetic resources (page 4-49). In fact, the only justification for run-of-river operation is provided on page 4-39, wherein the staff attempts to link the results of CHMI's bypass minimum flow study to the

RESPONSE TO COMMENTS

CHMI–1- We disagree that run-of-river and a project minimum flow are two mutually exclusive operating conditions. In fact, such an operational scheme is commonly recommended by Interior (i.e., FWS) to satisfy flow requirements below projects during scheduled and/or unscheduled shutdowns. Nevertheless, we have revised our recommendations pertaining to the operational mode, including minimum flows, at Marcal.

CHMI–2- Based on comments submitted on the draft EIS and discussions at the project's 10(j) meeting, *we revisited the issue of project operations and revised our recommendations accordingly. [see Section 5.4.2. for our revised recommendations].*

CHMI–3- We acknowledge that the project's bypassed reach and the downstream, free-flowing river reaches are structurally different. We also recognize that one can not directly transfer flow versus habitat relationships between different river reaches, as is the case here. In fact, we made note of this on Page 4-39 of the DEIS. However, we assume that aquatic habitat will change to some degree with varying flow conditions, which we believe to be a reasonable assumption. Therefore, in the absence of reach-specific data, general conclusions about the *quality of aquatic habitat and flows* can be, and were, appropriately drawn from Consolidated Hydro's bypass minimum flow study. We modified our bypass flow recommendation in light of the discussions at the 10(j) meeting.

free-flowing reach of the Little Androscoggin River between Hackett Mills and Upper Barker. The habitat within the Marcal Project's bypass reach - ledge outcroppings and rapids - is a unique feature of the lower reach of the Little Androscoggin River and is not comparable in any way to the reach below Hackett Mills, which is predominantly a meandering, low-gradient (avg. = 3 ft per mile) stream with only occasional short riffles. Most of this downstream reach is actually more similar in character to the upper reaches of the Marcal Project's impoundment than it is to the project's bypass reach. Such slow-moving, backwatered habitats are less subject to changes in current velocity and depth due to variations in flow than are fast-water habitats.

CHMI--4- The staff also attempts to apply an outdated and coarse minimum flow method - the Tennant method - to compare downstream habitat conditions under various project minimum flow conditions (page 4-44). This method provides only a very rough rule of thumb at best, and can not be used to make definitive statements regarding the habitat quantity or quality in a particular river reach under specific flow conditions.

CHMI--5- It is clear from the discussion on page 2-31 of the DEIS that staff does not understand the low flow cycling operations at Marcal and their linkage to operations at CHMI's two downstream projects, Upper Barker's Mill and Lower Barker's Mill. Staff suggests on page 2-31 that run-of-river operation at Marcal would make more efficient use of the available water, based on the erroneous assumption that the Marcal Project generates at its maximum hydraulic capacity (560 cfs) during cycling operations, which would result in spillage at Lower Barker's Mill. This is not the case. As is described in the license application and in our additional information filing of November 17, 1994 (Item 23), the Marcal Project generally cycles only when inflows fall below its minimum hydraulic capacity (120 cfs), that it is generally run at or near its minimum hydraulic capacity during such operations, and the downstream projects are run in tandem with the releases from Marcal. CHMI's goal is to make the most efficient use of the available flows, thus no spillage is normally allowed to occur at the downstream projects.

As compared to CHMI's proposal, run-of-river operations would cause the Marcal Project to lose its capability to operate at inflows between 56 cfs (proposed project minimum flow) and 120 cfs. Similarly, each of the downstream hydroelectric projects - including Hackett Mills - would lose operating capability between 56 cfs and their respective minimum hydraulic capacities, since Marcal would no longer be able to provide the hydraulic "push" necessary to drive downstream operations under low flow conditions. In addition, the Upper Barkers Mill Project would lose valuable on-peak generation, which are otherwise made available by cycling releases from Marcal during low flow periods[1]. The economic impact of the staff's run-of-river recommendation is discussed further below.

CHMI--6- The staff concluded that the proposed bypass reach minimum flow of 20 cfs should be extended throughout the winter, to protect overwintering habitat for brook trout. As is discussed in the license application, such habitat in the bypass reach is limited to a single large pool, which provides an insignificant amount of overwintering habitat for trout in comparison to the adjacent Hackett Mills impoundment. This insignificant gain in habitat hardly justifies the $10,000 in lost revenues that would be incurred by the project, in comparison to our seasonal 20 cfs bypass flow proposal. The economic impact due to the staff's recommended increase in bypass minimum flows is discussed further below.

[1] We erroneously indicated in Item 7 of our April 13, 1995 Additional Information response that the Upper Barker's Mill Project does not possess a peaking power contract. The project's power contract does in fact provide for peak rates. All other statements in the Additional Information response, including average annual generation and value of project power, are correct.

RESPONSE TO COMMENTS

CHMI--4- We recognize that the Tennant Method is a somewhat old methodology for establishing minimum instream flows. However, the Tennant Method is a scientifically based, and accepted method for qualitatively characterizing the amount of flow needed to protect aquatic resources. Therefore, we stand by our use of the Tennant Method in this EIS.

While we agree that the Tennant Method can not be used to quantitatively describe flow/habitat relationships, we disagree that it can not be used to qualitatively describe flow benefits. In Section 4.1.2.3., we merely attempted to qualitatively describe the benefits to aquatic habitat of a 56-cfs minimum flow. In the absence of specific data for the free-flowing reaches in question, we believe that the Tennant Method was appropriate to use in this case.

CHMI--5- We have examined our spreadsheet computations line-by-line, and conclude that we incorrectly characterized what caused the various changes in the economic benefits for the run-of-river cases we studied. We had modelled the operation of Marcal exactly as you had described in your additional information filing of November 17, 1994; however, in the DEIS we misinterpreted the reasons for the results of the various cases in our run-of-river modelling. Detailed review of our studies show that the peaking operation of Marcal, when inflow is less than the minimum hydraulic capacity of the project, causes no spill at the downstream projects. This is because the peaking flows under such low-flow conditions are well below the maximum hydraulic capacity of the downstream projects. Further, our studies show that the only operation differences between any of the cases that affect the projects' economics are the proposed spills to the bypassed reach and project minimum flows at Marcal. We have revised the text in the FEIS accordingly.

CHMI--6- We acknowledge that overwintering habitat in Marcal's bypassed reach is limited primarily to a single large pool below the base of the dam. We also believe that aquatic habitat should be protected during the winter months.

In the DEIS, we stated that the biological needs of aquatic organisms are reduced during the winter months, but we did not suggest that a biological system would completely go dormant during this time period. We would be in error if we did not recognize that the biological system would continue to function during the winter months. In fact, the FWS's current ABF policy requires flows during the winter months to protect aquatic habitat. Our conclusions regarding winter flows is generally consistent with the FWS's views.

COMMENTS ON ECONOMIC ANALYSES

CHMI–7- Under Section 5 4 2 "Project Operation and Minimum Flows," the staff states that run-of-river operation and minimum flows would significantly affect the economics of the Marcal Project This is absolutely true However the significant negative economic impacts extend beyond the Marcal Project and in fact include Hackett Mills, and Upper and Lower Barker s Mill Additionally, the Upper Barker's Mill Project has a peaking contract which should be considered in the analysis as this is obviously impacted by these proceedings. The FERC states that the effects of run-of-river operation result in the "cumulative annual cost of about $20,000 at the four projects on the Little Androscoggin River." This statement is incorrect as the real effect is a levelized annual cost of $45,700 at the four projects. This is probably a result of the use of inaccurate assumptions used throughout the economic analysis for the DEIS These inaccurate assumptions, as detailed below, result in false economic values throughout the DEIS concerning the Marcal Project, as well as CHMI's two downstream projects.

CHMI–8- We also disagree with the staff's assessment of the economic impact of its recommendation to extend the proposed seasonal bypass minimum flow to year-round While we do not necessarily dispute the staff's energy loss calculations, we estimate that the increase in bypass minimum flows would result in a loss of approximately $10,000 on an annual levelized basis, or 5 times the staff's inaccurate estimate of approximately $2,000.

CHMI–9- The economic analysis is severely flawed as indicated in Table B-13. Annual costs and power values used for all four of the projects are inherently incorrect in that they all indicate a negative net benefit derived from energy production under the existing operating conditions If this were true, all projects would be un-financeable and an obviously poor investment. As this Base Case condition forms the basis for all other cases analyzed, it stands to reason that all other analyses are similarly flawed. As such, no conclusions can be accurately drawn from any economic analyses performed on the projects to date.

As stated above, several of the assumptions used in the economic analyses within the Lower Androscoggin River DEIS are grossly inaccurate as they relate to the Marcal Project:

- The Financing Period used is 20 years. The industry standard for independent power projects is typically 15 years, a term which is typically available to CHMI. Additionally, financing terms are always limited to the terms of the Power Purchase Agreement. In the case of the Marcal Project, there are 13 years remaining in the current PPA.
- The Escalation Rates for Construction and Operation and Maintenance were assumed to be 0%. This is extremely unlikely in the real world. Industry, and CHMI standard is to assume an escalation rate of 4%. This closely follows actual escalation figures for costs associated with construction and O&M and was in fact supplied to the FERC in our additional information filings dated November 17, 1994, and April 13, 1995.
- State and Local Taxes were assumed to be 3.05%. This is incorrect for CHMI's three projects; the State tax rate for all three projects is 6%, and the local tax rate is 10 55% for Marcal, 12.48% for Lower Barker's Mill and 6.83% for Lower Barker's Mill.
- CHMI's interest rates are higher than the 10% figure assumed in the analyses. CHMI's rate is actually 13%.
- Using a Discount Rate of 10% is unrealistic in a free-enterprise environment. CHMI's required rate for investment is 15%.

RESPONSE TO COMMENTS

CHMI–7- We acknowledge that if we were doing levelized long-term economic studies, we would show greater economic impacts associated with each of the various operational scenarios. However, we are following the Commission's policy of evaluating economics based on current conditions.

We also acknowledge that our studies do not evaluate the economics of each project in the context of its existing power sales contracts, which are affected by projected escalation, and were made under power market conditions different from those that currently exist. As the Commission acknowledges in the order issuing the Escanaba Project license, the studies do not evaluate the long-term economic benefits or financial feasibility of the projects.

CHMI–8- See our response to Comment No. 7.

CHMI–9- Changing the financing period from 20 years to 15 years would have little effect on the study results, and any effect would be to increase the project's annual cost, making the project appear less economical.

The combined state and local tax figure we used, 3.05 percent, is applied to total project investment, not income. It typically produces tax costs close to those derived by using the much larger state and local tax rates as applied to income after expenses. The 3.05-percent annual state and local tax rate for total project investment is based on national industry averages. There is no way for us to use income tax rates for private non-utility project owners unless such owners provide us with the details of their income, costs, and profits.

We use no escalation in our economic studies in accordance with the Commission policy of evaluating projects under current economic conditions. Our current-economic-condition studies of hydroelectric projects do not represent the long-term economic benefits or financial feasibility of the projects to their owners or proponents. In the real world and the future, as it unfolds, the projects shown by our snap-shot economic studies to be uneconomic, may very well be economic and feasible.

If we were to use a 13 percent cost of money for Consolidated Hydro's project's, rather than the current 10 percent industry average, it would make the project's appear even more costly. We use a discount rate equal to the cost of money, not to evaluate financial feasibility, but to account for the time value of money and the true effects of making expenditures now rather than in the future. However, since we are doing current economic analyses only, with no escalation, the effects of discounting are nullified--levelizing an already level string of payment or values produces the same string of payments or values.

Assuming current alternative energy values starting in 1995 would have an extremely negative impact on project revenue streams. While the staff did not have actual power purchase rates available to them to perform their economic analysis for the Marcal Project and the other three Little Androscoggin River projects, it should at least acknowledge the fact that such rates exist and have a significant impact on project economics. Furthermore, there is nothing in the DEIS that acknowledges the fact that CHMI supplied the FERC with net present values of the power revenues for all three CHMI projects on April 13, 1995.

MINOR COMMENTS

CHMI--10- • page 1-13 and Table 1-2: The Norway Project (FERC No. UL90-15-ME; capacity = 320 kW), a non-jurisdictional hydroelectric project owned and operated by CHMI, should also be noted. It is located in the town of Norway, Maine at the outlet of Pennesseewassee Lake and discharges to the Pennesseewassee Stream, a tributary of the Little Androscoggin River upstream of the Marcal Project. The Norway Project should also be shown on Figure 2-1.

CHMI--11- • page 2-2 (Table 2-1) and section 1.3.1.1 (p. 1-6): The EIS should note the presence of several non-jurisdictional storage dams on the mainstem of the Little Androscoggin River (e.g., Welchville Dam, in the Town of Oxford) and at the outlets of all major lakes and ponds within the Little Androscoggin basin. The existence of these dams has great consequences for the potential success of any anadromous fish restoration effort, particularly for alewives, as they block the free movement of that species into its prime spawning habitat. Thus, trap and truck is probably the only feasible method for restoring alewives to the Little Androscoggin basin.

CHMI--12- • page 2-6, last paragraph: The word "authorized" should be deleted as the project's capacity is not "authorized" by the Commission until the license is issued.

CHMI--13- • page 2-9, paragraph (1): The project features are listed from left to right looking downstream (or right to left looking upstream). Also note that one of the sluice gate openings is blocked with concrete and is no longer functional.

CHMI--14- • page 2-9, paragraph (4): The linkage between the generators and turbines is reversed, i.e., the generators are driven by the turbines, not the reverse as is stated in the DEIS.

If you have any questions regarding these comments, please do not hesitate to contact me or Kevin Webb at our Andover, MA office, at (508) 681-1900, extensions 1215 and 1207, respectively.

Sincerely,

Wayne E. Nelson
Director of Environmental Affairs

Consolidated Hydro, Inc.

cc: D. Pease, CHI
J. Bogart, CHI
M. Alessi, CHI
K. Webb, CHI

RESPONSE TO COMMENTS

CHMI--10- We have added the Norway Project to Table 1-2 and Figure 2-1. We have also included this project in our Section 1.4.4. discussion relative to existing hydropower facilities in the Little Androscoggin River Sub-Basin.

CHMI--11- Page 2-2 contains the basin map for the Androscoggin River Basin (Figure 2-1). Because of space limitations we did not add the storage reservoirs to the map. We also agree that the existence of the storage dams in the Little Androscoggin River Sub-Basin is important to the success of Maine's anadromous fish restoration program for the river system. Therefore, we have acknowledged the presence of these dams in Sections 1.3.1.1. and 1.4.4.

CHMI--12- The word "authorized" has been deleted from Section 2.1.2.1.

CHMI--13- The phrase describing the project in Section 2.1.2.1. has been changed to "...right to left, looking upstream...," and a noted about the sluice gate has been added as, "...(one gate is inoperable)...."

CHMI--14- In Section 2.1.2.1., the word "driving" has been changed to "driven by."

ANDROSCOGGIN LAND TRUST

February 18, 1996

Lois Cashell, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

re: FERC Project Nos. 2283-0005 and 11482-000

Dear Ms. Cashell:

Enclosed are an original and eight copies of the comments of the Androscoggin Land Trust, Androscoggin Valley Council of Governments, City of Auburn and City of Lewiston in response to the Draft EIS.

Thank you.

Sincerely,

Bonnie Lounsbury,
President, Androscoggin Land Trust
(207) 784-0956

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Relicensing the Gulf Island-Deer Rips Hydroelectric Project and Licensing the Marcal Hydroelectric Project in the Lower Androscoggin River Basin

FERC Project Nos. 2283-005 and 11482-000

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT OF THE ANDROSCOGGIN LAND TRUST, ANDROSCOGGIN VALLEY COUNCIL OF GOVERNMENTS, CITY OF AUBURN, AND CITY OF LEWISTON, MAINE

Introduction

The Androscoggin Land Trust, the Androscoggin Valley Council of Governments, and the Cities of Auburn and Lewiston, Maine, (referred to in the Draft EIS as "Land Trust, et al.") filed comments jointly in this proceeding in December of 1993, spoke at the scoping session in May of 1994 and filed comments in May of 1994 and answered a document request from the Commission in November of 1994. Our comments on the Draft EIS are in two parts: First, comments on each specific section of the Staff's recommended alternative, and second, additional information which has become available since the filing in May of 1994 that explains our comments, updates and corrects information in the Draft EIS.

Specific comments on the Staff's Recommended Alternative

Gulf Island-Deer Rips (Section 5.4.1)

(1) Water Resources (Section 5.4.1(1))

ALT-1- * Provide plans describing the methods for releasing required minimum flows and monitoring project operations

We concur.

ALT-2- * Provide a plan to study alternatives other than the GIPOP facility to protect and/or enhance DO concentrations in the Gulf Island impoundment and the Lower Androscoggin River

We concur.

ALT-3- * Continue Central Maine Power's partnership (for the duration of the license term or as long as the partnership exists) in the oxygen injection program on the Gulf Island impoundment, including funding responsibilities to operate and maintain the GIPOP facility.

We concur. However, CMP should be required not only to continue participation in the partnership, but to meet the current water quality standards of 6.5 ppm DO on a 30 day average and 5.0 ppm DO on an instantaneous basis, or any more stringent standard if that should be designated for the area during the license term. Gulf Island impoundment does not now meet water quality standards. For the last four years, since the GIPOP facility has been on line, the

ALT-1- Comment noted.

ALT-2- Comment noted.

ALT-3- In Section 3.3.1.2. we cited the results of a collaborative water quality study conducted by Boise-Cascade and International Paper from 1984 through 1989. In discussing the results of the paper company's water quality modelling efforts, we noted that the study concluded that no amount of discharge reductions by the paper companies would prevent DO in the Gulf Island impoundment from falling below the 5.0 mg/l standard.

We recognize that, on average, ten percent of the impoundment failed to meet the 5.0 mg/l oxygen standard over the past four years, and we also recognize the benefits of continuing to improve the DO and other components of water quality in the Androscoggin River. However, because of the significant amount of oxygen demand that currently exists in the Gulf Island impoundment, and other additional factors described in Section 3.3.1.2., it is unrealistic to assume that the entire volume of water in the impoundment will meet or exceed the state's DO standards in the reasonably foreseeable future.

We agree with the need to develop an operating plan for the GIPOP facility. We recommend that Central Maine develop such a plan in consultation with the MDEP, the FWS, and the three upstream paper companies involved in the GIPOP partnership [*see our response to MDEP's comment number 7*]. We also support possible adjustments to the GIPOP's operating schedule and/or possible changes to the volume of oxygen injected to the river.

following percentages by volume of the pond have not met that standard at some time during the summer:
1992 6%
1993 12%
1994 4%
1995 16%

In both 1994 and 1995 the worst water quality readings occurred in June. The plant did not begin operation until July. (Source of data, Barry Mower, Maine DEP, personal conversation with B. Lounsbury, 1/96, in response to written request for information) We recommend that CMP be required to develop and implement, in consultation with the Maine Department of Environmental Protection ("Maine DEP") an operating plan that meets the 6.5 ppm and 5.0 ppm standard at all times. That may necessitate extending the period during which the plant is on line and increasing the volume of oxygen. The system contains sufficient capacity to pump additional oxygen into the impoundment.

ALT-4- • Provide a plan and schedule for monitoring water quality, including DO in the Gulf Island impoundment, and DO and aquatic invertebrates in downstream areas affected by the operation of Gulf Island-Deer Rips.

We concur, but note that the water quality monitoring now conducted by CMP and the other GIPOP partners is not sufficient to determine the water quality throughout the impoundment. A valid sampling program requires, among other parameters, a monitor at the dam at the lower depths of the impoundment. CMP and the other GIPOP partners have not used such a monitor. As a consequence, for the last four years the Maine DEP has conducted its own sampling program in Gulf Island impoundment to collect adequate data to determine water quality. We recommend that CMP be required to develop and implement, in consultation with the Maine DEP, a monitoring program that replaces the Maine DEP program and provides adequate data to determine water quality.

(2) Fishery Resources (Section 5.4.1(2))

ALT-5- • Restrict downramping at Deer Rips [flows would be reduced from 5120 cfs to 1100 cfs, no faster than linearly over 20 minutes] to protect aquatic resources below the Deer Rips/Androscoggin No. 3 and Lewiston Falls developments.

We concur.

ALT-6- • Limit impoundment drawdowns in the Gulf Island impoundment to no more than 1 foot below normal full pond elevation from May 1 to June 30 and no more than 4 feet below normal full pond elevation from July 1 to April 30.

We concur.

ALT-7- • Provide a minimum flow of 1700 cfs from May 1 to November 30 and 1400 cfs from December 1 to April 30 for the enhancement of aquatic habitat below Gulf Island-Deer Rips and Lewiston Falls.

We concur.

ALT-4- We believe the existing water quality monitoring program that is part of operating and maintaining the GIPOP facility provides reasonably good data with respect to DO concentrations in the Gulf Island impoundment. However, we agree that a formalized water quality monitoring plan is needed as part of the GIPOP program. As part of our license requirements for the project, we recommend that Central Maine consult with the MDEP, the FWS, and the other entities of the GIPOP partnership in this regard. We believe this plan would be sufficient to monitor DO concentrations throughout the Gulf Island impoundment.

ALT-5- Comment noted.

ALT-6- Comment noted.

ALT-7- Comment noted.

ALT--8- * Reserve the Commission's authority to require the construction, operation and maintenance of fishways prescribed by the Secretary of the Interior pursuant to Section 18 of the FPA.

We concur.

(3) Recreation Resources (Section 5.4.1(3))

ALT--9- * Maintain the existing recreation facilities at Gulf Island-Deer Rips, which includes ensuring the continued operation of the trailered boat launch facility at the Turner-Greene bridge and the three island day-use picnic areas/two informal day-use areas located on the Gulf Island impoundment.

We concur.

ALT--10- * Investigate the feasibility of developing a carry-in boat launch facility on the Gulf Island impoundment in the vicinity of Waterman Road and on the Androscoggin River below Deer Rips.

We disagree with the Staff conclusion that there is insufficient public use of the Gulf Island impoundment to justify additional carry-in facilities and canoe portages. (See 4-82, 5-42). Sufficient demand exists to justify these facilities and obviate the necessity for CMP to spend any further money and time in demand studies. (See our discussion at pages...)

CMP has expressed to us its willingness to develop the recommended portages at Twin Bridges, Gulf Island and Deer Rips. This is in keeping, not only with demand, but also with the situation in regard to CMP's other dam sites, almost all of which provide portages. We have already worked with CMP to design a portage around the security fence at Deer Rips dam; CMP has designed a portage around Gulf Island dam and will be working with us to refine the plan. In addition, CMP has been negotiating, in collaboration with the Maine Department of Inland Fisheries and Wildlife ("Maine DIFW"), to acquire a site for a hard ramp boat launch in downtown Lewiston-Auburn just above the Lewiston Falls. When that site is developed, it will be possible to use the area as the upstream location of a portage around the Lewiston Falls. We recommend that the Commission require CMP to design and build portages around the rapids at Twin Bridges, around Gulf Island dam and around Deer Rips dam. We recommend that the Comprehensive Plan proposed in the Draft EIS address the location and design of a portage around Lewiston Falls.

CMP has also been investigating options for and issues related to development of a carry-in facility at Waterman Road. We recommend that CMP be required to continue its on-going review of the Waterman Road site in consultation with the Maine DIFW, the Maine Bureau of Parks and Recreation and with us.

ALT--11- * Expand the roadside parking area at the Deer Rips impoundment informal carry-in access site on Switzerland Road.

We concur. CMP has proposed a carry-in access on Switzerland Road with a small parking area and limited picnic facilities. We agree with this approach.

ALT--12- * Develop a comprehensive land-use management plan for all Central Maine's land adjoining the project.

ALT--8- Comment noted.

ALT--9- Comment noted.

ALT--10- The FEIS has been revisited accordingly (*see Sections 4.1.1.6., 4.2.1.4., and 5.4.1.*).

ALT--11- Comment noted.

ALT--12- a.) We have amended our previous recommendation to include under the plan only those lands within the project boundary and any additional lands belonging to Central Maine that, although not within the project boundary, are within 200 feet of the project's headpond elevations.

ALT–12-cont. We concur with the Staff recommendation to develop a comprehensive land use management plan. We do not agree with all the parameters of the plan outlined by Staff. We recommend that: a. the plan encompass all land within 200 feet of the project's shoreline. This is the Staff's recommendation (see 4-87.) b. the plan cover as well CMP's and Union Water Power Company's ownership on the Androscoggin south of the Deer Rips impoundment to Dresser Rips. This approach is consistent with the Commission's approach to the Draft EIS: a study of impacts in the Lower Androscoggin River Basin, not a study of impacts at each impoundment in geographic isolation. It is also the only approach consistent with the planning efforts described below (e.g. Androscoggin Greenways, Auburn's Comprehensive Plan, Lewiston's Comprehensive Plan for Parks and Recreation, downtown riverfront developments). CMP and/or Union Water Power own one or more small parcels of land at West Pitch in Auburn adjacent to the current West Pitch Park, an area important to the development of the downtown riverfront park system on the Auburn side. In Lewiston, Union Water Power and/or CMP own several acres at the site of the Monty Station, and small parcels at the canal crossings and outlets. All of these areas are critical to the development of Lewiston's downtown riverfront trail system. c. the plan include not only the protection of environmental resources but also aesthetics and public access. This is the Staff's recommendation (see 4-87). In our December of 1993 comments we recommended development of various specific trail segments and recreation enhancements. CMP is already working with us to design and implement several of these and we expect to continue that work during the pendency of this relicensing proceeding. We recommend that the schedule, design and other issues surrounding implementation of the recommended enhancements be addressed in the comprehensive plan. d. the plan include, as the staff has recommended, maps delineating the shoreland protective buffer zone area, the cost and method of acquiring (fee or less than fee) or otherwise protecting the various land parcels that comprise the buffer zone, provisions for allowable uses for the buffer zone lands, conditions to be specified for such allowable uses and any proposed permit system (with sample permit) (see 4-87). We recommend that the plan call for conservation easements on CMP's land as the primary protection mechanism. The terms of the easements should be consistent with both CMP's hydropower needs and with the plan's proposed land uses. e. the plan include a schedule for implementation, a program to fund implementation of the plan and a time frame to evaluate the effectiveness of the plan and need for updating. f. the plan be developed within 18 months of license approval.

ALT–13- * Periodically conduct recreation use monitoring studies (FERC Form 80), Recreation Use Assessment) in consultation with the resource agencies and evaluate the future need for additional recreation facilities to meet user demand.

We concur and recommend that the comprehensive plan incorporate the use of FERC Form 80 as one element of the scheduling and evaluation of plan implementation.

ALT–14- * Develop a schedule and computerized tracking system for implementing any proposed recreation improvements.

We concur and recommend that this be part of a comprehensive plan.

ALT–12-cont. Thus, we are now excluding private lands outside the project boundary from our recommendation (*see Section 4.2.1.5.*).

b.) We do not believe the benefits of requiring such a measure would justify what we believe to be a significant expense. Moreover, lands not associated directly with the hydropower facilities, or the operation of such facilities, are inappropriate to include as license requirements for the project. As an alternative, Central Maine's proposed Comprehensive Land Management Plan, which we endorse, may include lands outside the project's present boundary, should the parties developing the plan agree that such lands need to be incorporated.

c.) Comment noted.

d and e.) Details of the comprehensive land use plan -- its primary protection mechanism, the precise schedule for implementation, a program to fund the implementation of the plan, a time frame to evaluate the effectiveness of the plan, and need for updating the plan -- should be identified by Central Maine, in consultation with MDOC, NPS, the Androscoggin Land Trust, the Androscoggin Valley Council of Governments, the Conservation Law Foundation, and the Cities of Lewiston and Auburn; in accordance with the terms of any license issued for this project. These details should not be specified in advance of such consultations.

f.) We will recommend that any license issued for this project require the plan be developed within 18 months of license issuance.

ALT–13- Details of the comprehensive land use plan, including its use of the FERC Form 80, should be identified by Central Maine, in consultation with MDOC, NPS, the Androscoggin Land Trust, the Androscoggin Valley Council of Governments, the Conservation Law Foundation, and the Cities of Lewiston and Auburn; not specified in advance of such consultations.

ALT–14- See our response to ALT's Comment No. 13.

(4) Cultural Resources

ALT-15- * Implement the executed Programmatic Agreement to protect cultural resources at Gulf Island-Deer Rips.

We concur. In addition, we recommend that CMP develop a plan for sharing the information obtained through its archaeological work with scholars and responsible community organizations, such as the Native American appreciation organization Dawnland Alliance, without compromising the confidentiality of sites. The artifacts found and the information obtained are invaluable to scholars of Native American history and to others who wish to understand and appreciate their culture in this area.

ALT-16- **Other: Correction to Draft EIS**

We recommend that the staff revise the Draft EIS to reflect correctly our recommendation concerning conservation easements. On page 4-85 of the Draft EIS the correct recommendation is stated "That conservation easements be placed on all CMP land bordering the project impoundments that lie with the 250 foot shoreland zone." However, the Draft EIS at pages 4-80 and 5-41 states that providing a 250 foot wide buffer zone on all land within 250 feet of the two impoundments could require CMP to spend $3,040,000 to acquire the needed land rights. This does not reflect our recommendation since we made no recommendation that CMP be required to acquire all land within the shoreland zone.

Explanation of Comments

Since the public scoping session in May of 1994, our last time to respond to the wide range of issues presented by this proposed licensing, many developments have occurred that impact the recommendations in the Draft EIS and that have influenced our comments. These developments demonstrate increased public interest in the river and surrounding lands, continued commitment by the cities of Lewiston and Auburn to riverfront enhancement and substantial progress in working with CMP to achieve several goals of the Staff's recommended alternative. They also demonstrate the necessity of approaching relicensing on a regional basis since the activities and events are united by a common vision for the river. We summarize the developments below.

ALT-17- **Androscoggin Greenways Vision Map**

In May of 1995 the Androscoggin Land Trust published its Androscoggin Greenways vision map, representing a long term concept of the Greenway from Twin Bridges in Turner/Leeds, extending through Lewiston and Auburn south through Lisbon and Durham. (We mentioned the Androscoggin Greenways Project in our earlier comments filed in December of 1993 and May of 1994.) The map was developed through the efforts of the Androscoggin Land Trust and the members of the Androscoggin Greenways Steering Committee (including representatives of AVCOG, the cities of Lewiston and Auburn and the National Park Service Rivers, Trails and Conservation Assistance Program) who collected maps and plans and spoke to persons living in the riverfront communities

ALT-15- Stipulation I.A.4., of the Programmatic Agreement, provides for "educating the public on the archaeology of the State of Maine."

ALT-16- We believe that ALT's conservation easement recommendation has been accurately described in the FEIS. We recognize that ALT did not recommend Central Maine acquire all land within a 250-foot shoreland zone around Gulf Island-Deer Rips. In Section 4.2.1.5. of the DEIS, staff made this clear. We merely attempted to identify how much it would cost to purchase the land, and any associated dwellings, to provide evidence to support our recommendation that a plan be created to provide for shoreline protection. We did not intend to specify the exact amount of land that would need to be included in either a 250-foot-wide zone or a 500-foot-wide zone as recommended by ALT and the Conservation Coalition, respectively.

ALT-17- Comment noted.

begunning in the fall of 1993. The work culminated in a public visioning workshop in June of 1994, the results of which were distilled into the map attached as Exhibit A.

The Androscoggin Greenways area depicted on the map contains most of the area along the Androscoggin identified in the Draft EIS as the Lower Androscoggin River Basin and a portion of the Little Androscoggin. It shows existing public open space, trails or trail easements, and river access points and envisioned open space, river access points and trails. The envisioned open spaces are areas that are generally undeveloped now, a significant portion of which is owned by CMP. The envisioned trails are within public lands, along roads, railroads or utility rights of way or impoundment ownership, or in some cases, across private land. In those cases where trails could potentially cross private land, the degree of access (if any) remains completely within the control of each landowner. The envisioned river access points include CMP's proposed carry-in launches at Waterman Road and Switzerland Road and the hard surface boat ramp near the Lewiston Falls.

Since publication of the map, the Androscoggin Land Trust through its Androscoggin Greenways Committee has worked to implement the vision. Bud Newell of CMP serves on the Committee as does Julie Isbill of the National Park Service RTCA program who provides substantial project support.

The Androscoggin County Chamber of Commerce has enthusiastically endorsed the Androscoggin Greenways concept. The Chamber map of Lewiston-Auburn published in 1995 refers to greenways and the many activities occurring along or on the river. An excerpt from the narrative section of the map is attached as Exhibit B. In its 1996 "What We Stand For", the Chamber's action priorities for 1996, the organization adopted the following position in support of Greenways: "develop the Androscoggin River Greenway trail network between Leeds and Lisbon through the collaborative efforts of municipalities, private property owners, Central Maine Power and state and federal conservation and recreation agencies." Excerpts from "What We Stand For" are attached as Exhibit C.

City Planning and Riverfront Development in Downtown Lewiston-Auburn

ALT–18- The cities of Auburn and Lewiston have continued since our last comments to plan for and to develop the riverfront consistent with and in furtherance of the Androscoggin Greenways vision.

In July, 1995, Auburn's City Council adopted, upon recommendation of the Planning Board, a new Comprehensive Plan. The plan specifically endorses the preservation of open space along the Androscoggin River, development of trails near the river, and public access to the river. Excerpts from the Comprehensive Plan Goals, Policies and Strategies, and from the Comprehensive Plan Inventory are attached as Exhibit D.

Lewiston has just awarded a contract for the development of a master plan for the L & A Railroad Riverfront Park and trail system. The proposed trail system will bridge cross canal no. 1, owned by Union Water Power, to reach Heritage Park. Heritage Park is adjacent to the Lewiston Falls and separated from the Monty Station and Union Water Power Company's offices only by the Libbey Mill complex. The trail will also cross the tailrace by the Continental Mill. This

ALT–18- Comment noted.

area and its generating station is also owned by CMP.
Auburn has hired surveyors to determine the right of way of the L & A Railroad from the downtown Bonney Park to Washington Street in preparation for building a bicycle and pedestrian trail this year. This trail will connect to the Lewiston trail system using the railroad/pedestrian bridge as the hub of the new transportation network. Both the Lewiston trail system and the Auburn railroad trail are shown on the Androscoggin Greenways vision map.

Auburn's Parks and Recreation Department began several months ago to develop its ten year master plan. That plan will be coordinated with the city's comprehensive plan and with Androscoggin Greenways. The department manages key parks within the Androscoggin Greenways area, including the Bonney Park, Moulton Park and Pettengill Park.

Trail/river access development outside downtown Lewiston/Auburn

ALT-19- The Androscoggin Land Trust, working with a group of volunteers, spent the summer and fall evaluating the trail potential of the Bureau of Parks and Recreation land in Turner. This summer the Land Trust hopes to begin constructing a trail for non-motorized use. This area represents the largest block of publicly owned land within Androscoggin Greenways.

The Land Trust is also working with the Oxford Conservation Commission to establish a canoe trail along the Little Androscoggin from Oxford to the confluence with the Androscoggin in New Auburn. The Staff's recommendation for a boat launch and portage at the Marcal impoundment (FERC Project No. 11482-000) supports this project.

ALT-19- Comment noted.

Work with CMP

ALT-20- For more than two years the Androscoggin Land Trust has worked with CMP through the Androscoggin Greenways Committee to define and carry out the Androscoggin Greenways vision. After a year and a half of planning for public access at Deer Rips dam, CMP and the Androscoggin Land Trust hosted an Open House at the site last October. Representatives of the Dawnland Alliance told stories and demonstrated the use of artifacts of the Native Americans who had inhabited the area. CMP gave tours of the powerhouse. Within the near future CMP will install information kiosks that the Land Trust and Julie Isbill of the National Park Service RTCA program have helped to design and a pontoon bridge across a small cove linking the powerhouse site with the peninsula which CMP also owns. The Androscoggin Land Trust's fall newsletter featured our work with CMP at Deer Rips. A copy of the newsletter is enclosed as Exhibit E. We have also exchanged information with CMP regarding development of the Waterman Road site and will soon begin review of the plan that CMP has drafted for Gulf Island.

ALT-20- Comment noted.

Surveys on Preservation of Open Space and Recreational Use

ALT-21- During the spring of 1996, the Androscoggin Land Trust, working with students and a faculty member from the Bates College Economics Department initiated a study of Androscoggin Greenways benefits. The major focus of the study was determining use (e.g. recreation) and non-use (e.g. open space) values of Androscoggin Greenways using the contingent valuation method. We sent two

ALT-21- Comment noted.

surveys, one on open space, and one on recreation use, each of which used a hypothetical question pertaining to a parcel of land on Gulf Island Pond to test the respondents' willingness to pay. Five hundred open space surveys were sent to residents of Turner, Greene, Leeds, Auburn and Lewiston selected at random and in proportion to the population of each town relative to the entire population of the five towns. Two hundred seventy five surveys were sent on recreational use, again at random to residents of those same communities and another 275 surveys were sent to members of conservation groups and river events participants. The response rate for the open space survey was 18%; for the random resident recreational survey it was 30% and for the targeted resident recreational survey, it was 59%. The demographics of the survey respondents to both random surveys corresponded to the demographics of the community as a whole. The results of those surveys offer undeniable support for Androscoggin Greenways and the positions that we have taken in this proceeding: There is strong public support for preservation of open space along the Androscoggin; There is strong public support for increased recreational opportunity along the Androscoggin, in particular for non-motorized trails and non-motorized boating; There is continued concern with the water quality of the Androscoggin. The surveys and tabulated results are attached as Exhibit F.

ALT--22- **Riverfront Activities**

Organized riverfront and river activities in the area draw more people each year. The third annual Great Falls Balloon Festival in August achieved record crowds in the ten's of thousands. More than 100 teams entered the second annual downtown Great Falls Canoe Race in June. Racers in the professional class portaged around Lewiston Falls. The Triathon with its canoe segment on the river above Lewiston Falls to the Veterans Bridge continued to be popular. In May of 1995 the Androscoggin Land Trust organized a riverfront clean up at West Pitch, the mill pond for the Monty Station and Switzerland Road. We plan to organize a second clean up for May of 1996.

Conclusion

In December of 1993 we commented: "During the last decade, public and private efforts to return the river to its place as the focal point of this area after years of neglect have blossomed...[It is] our belief that CMP, because it enjoys the use of the public's natural resources, can and should play an essential role in this evolution." Two years later, these efforts continue to grow and CMP has begun to accept a key role in them. We urge the Commission to adopt our recommendations to continue that growth.

Dated: February 16, 1996

Respectfully submitted,

Bonnie Lounsbury
President, Androscoggin Land Trust

ALT--22- Comment noted.

~~Robert Thompson~~
~~Executive Director, AVCOG~~

Patricia A. Finnigan
City Manager - Auburn

Steven Levesque
Director of Community Development - Lewiston

Robert Thompson
Executive Director, AVCOG

RESPONSE TO COMMENTS

The following pages contain attachments to the comment letter. No responses are required.

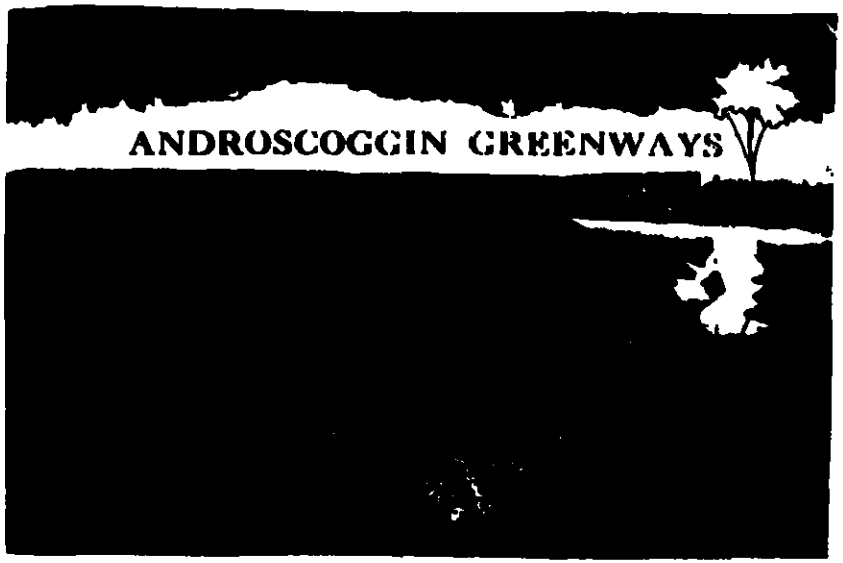

Exhibit A - Androscoggin Greenways Map

Welcome to Lewiston – Auburn... Cities o

Special Events and Attractions –

Recreation –

Culture and Arts –

Churches, Clubs and Organizations –

EXHIBIT C

Special Edition

1996 THE CHAMBER NEWS

"WHAT WE STAND FOR"

1996 ACTION PRIORITIES

The Androscoggin County Chamber of Commerce is committed to the region's long term economic vitality. Strengthening our local economy depends, in part, on a structure of state and local policies which are conducive to growth and development of our natural and human resource potential. It will also require the continued ability and confidence of the private sector to invest in production and service capacity that results in quality employment for local residents.

We applaud the bipartisan political environment in Augusta which produced substantial progress in 1995 and urge the Governor, Legislature and area local governments to set priorities in 1996 which will:

- Place the highest priority on quality education and workforce training as the key to building a strong economic future;
- Continue to streamline the regulatory environment to emphasize increased coordination among state and local government agencies;
- Thoughtfully reorganize State government by setting clear priorities which reward initiative by local governments and individuals;
- Continue to realign State tax policy toward a better mix of income, sales and property taxes and which imposes no new or hidden taxes;
- Maintain the integrity of recent workers compensation reforms and limit action on State health care initiatives in advance of reforms at the Federal level;
- Focus action toward increasing the already high level of intergovernmental cooperation between the cities of Lewiston and Auburn;

The Chamber's Board of Directors has unanimously approved the policy statements and action priorities outlined in this document and is committed to their implementation.

Stephen Costello
Chairman
Board of Directors

Peter Sassano
Division Chair
Business Advocacy

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The Board of Directors gratefully acknowledge the following members of the Chamber's Business Advocacy Committee for their assistance in preparing this document:

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Dick Albert	Frances Pendexter
Claude Castonguay	Larry Pollon
Lucien Costello	Cindy Quinlan
Dick LaRoche	Lisa Turcotte
Ron Lebel	Emery Thomas
Bob Newton	Leonie Wheeler

ENVIRONMENTAL AND NATURAL RESOURCE MANAGEMENT

Summary

Maine's natural resources are a source of economic strength and the foundation for the quality of life enjoyed by residents across the State. In our regional, agricultural lands, timber lots and the Androscoggin River not only provide employment, but recreational, tourism and scenic value as well. Economic growth and environmental quality can no longer be seen as mutually exclusive.

We believe that Maine can effectively utilize its unique natural resources and protect its environmental quality by developing and managing infrastructure systems to minimize harmful impacts on the environment, creating incentives for public and private investment in pollution prevention technologies, providing public access for recreational use of appropriate resources and focusing our regulatory systems on our most serious environmental risks in a predictable, cost-effective, and flexible manner.

Detailed Recommendations

Environmental Regulatory Reform

- advance the work of the Maine Environmental Priorities Project to provide a scientific, risk-based approach to establishing priorities for environmental regulation and preservation investments,
- encourage the development of non-regulatory solutions to achieving environmental outcomes which preserve Maine's natural resources and assure cost-effective public and private sector investments,
- streamline the State regulatory process by continuing to build the capacity for delegated local permit review and broadened use of the "permit by rule" system,
- limit the circumstances under which the Maine Legislature can impose environmental compliance standards or product packaging standards that are inconsistent with federal or prevailing national standards. State regulatory agencies should not be permitted to impose requirements beyond federal regulations without legislative consent,
- coordinate state and federal license reporting to eliminate costly duplication and bring clarity to overlapping federal, state and local regulatory jurisdiction,
- prevent the criminalization of penalties for violation of environmental laws which do not represent clear negligence and intentional endangerment of public health and safety,
- seek modification to the federal Clean Air Act Amendments of 1990 and the Safe Drinking Water Act to provide the State, municipalities and businesses with greater control, flexibility and resources to achieve our environmental goals in a manner that balances environmental risks with public and private funding resources.

Natural Resource Management

- develop and implement cost-effective action plans to improve the water quality of the Androscoggin River by addressing combined sewer overflows and non-point source pollution through the Cities of the Androscoggin Pollution Prevention Team and municipal efforts.
- monitor state and federal regulations on color standards, dioxin, chlorine utilization and other toxic discharges to balance the region's commitment to continuous improvement of the Androscoggin River's water quality with the economic impact of these regulations on Maine's paper industry.
- develop the Androscoggin River Greenway trail network between Leeds and Lisbon through the collaborative efforts of municipalities, private property owners, Central Maine Power and state and federal conservation and recreation agencies,
- maintain limitations on personal and corporate liability when private property, including farm land, is open for public recreational use,
- provide technical assistance to businesses and municipalities regarding waste disposal, recycling and reduction, utilization of substitute materials and other pollution prevention strategies,
- complete the process for selecting, permitting and constructing land fill for special waste (by private developer).
- encourage cooperative efforts by public and private interests to provide recreational access to publicly owned waterways.
- maintain state commitment to achieving 50% statewide recycling goal and continue state's waste management planning function.

Incentives for Environmental Protection

- preserve state pollution prevention tax credits that enable Maine's paper industries to plan and manage major capital investments in pollution abatement and prevention technology,
- continue state tax credits that encourage private sector investment in recycling including the expansion of resource recovery capacity, development of recycled products and packaging alternatives,
- utilize economic incentives for maintaining the character of viable agricultural land such as the sale of development rights, cluster housing bonuses and appropriate taxation of farm land based its agricultural value.

AUBURN TOMORROW
COMPREHENSIVE PLAN

Goals, Policies & Strategies

Adopted by the Auburn City Council

1995-2005

EXHIBIT D

RECREATION AND OPEN SPACE

Auburn has a well developed park and recreation system which includes a total of 417 acres There are 15 parks ranging in size from the half-acre Drummond Street Park to the 160-acre Mt Apatite Park In addition, school recreation facilities add another 195 acres to this resource for a total of 632 acres of public land devoted to outdoor recreation Indoor recreation is available at the Hasty Community Center in Pettengill Park, and at the Ice Arena and New Auburn Community Center Auburn's recreation facilities exceed the State's minimum standards There are a number of important efforts underway, such as the Androscoggin Riverwalk, to improve the City's open spaces Each builds on the notion that it is beneficial to the City to have walkways, trails, and in some cases bikeways, that link different parts of the City together by way of existing or new open space, park lands, or rights-of-way

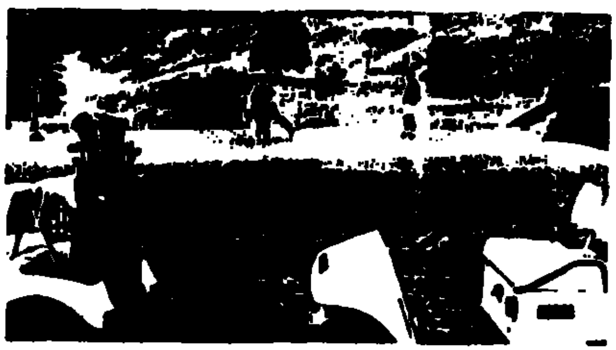
MUNICIPAL FINANCES

Between 1987 and 1993, the City's valuation rose from $467 million (at 55% of full value) to $970 million (at 100% of full value), for a gain of 108% The City's per capita valuation figure ($41,240), tax rate (23 85 mills) and per capita municipal revenue (1,477) are on a par with those of six comparison communities Except for 1990, total City revenues have exceed expenditures by amounts ranging from $11,000 in 1987 to a high of over $2 million in 1993 A major issue facing Auburn is that the residential component of the tax base has been growing faster than the non-residential component The typical single-family dwelling costs the City about $2 04 for every $1 00 raised in property taxes On the other hand, the non-residential sector of the community costs the City 29 cents for each $1 00 of taxes generated Residential growth creates a net drain on the tax base until its per unit value exceeds $180,000 It would take about $50 million in new non-residential investments to reduce the tax rate by $1 00 per $1,000 of assessed value

RECREATION, OPEN SPACE

GOALS:

1. Plan for long-term open space preservation and public access to open space.
2. Address park and recreation facilities needs in each neighborhood.
3. Preserve unique features of the natural environment.
4. Plan for the controlled use of the City's resources.



"From a standpoint of natural beauty, Auburn is in itself a park. Were we to know that the city would never be larger than it is today, that the surrounding woodlands would be as free to enjoy without trespass and that the boys could always use the old swimming holes, barely anything would be needed in the way of parks save perhaps an out-of-door meeting place "down town." We are, however, assuming that Auburn will grow continually. By the time the city can boast a population of fifty thousand, vacant lots in which children now play will be built up. The annoyance to farmers by townspeople overrunning their lands will be stopped by land posting and the woods and pasture land now so free to romp over and on which to picnic will be not for the next generation."

1919 Auburn Comprehensive Plan

POLICIES		STRATEGIES	RESPONSIBILITY/DATE
OVERALL COMMUNITY DEVELOPMENT			
1. Rural Land. Maintain the rural nature of the City's outlying areas.	A	Agriculture and Resource Protection District. Maintain the City's Agriculture and Resource Protection District so as to preserve the rural character of the City's outlying areas and to control unplanned growth.	Ongoing
2. Environmentally Sensitive Areas. Continue to protect environmentally sensitive areas.	A	Zoning. Continue current zoning controls which are aimed at protecting wetlands, floodplains, shorelands, and other sensitive areas from the adverse impacts of development.	Ongoing
	B	Habitat Protection. Provide for natural habitat protection in the selection of open space areas.	City Council, Ongoing
	C	Public Works Guidelines. Establish guidelines for public works activities to protect environmental quality.	Planning Staff, 1997
3. Preservation Techniques. Utilize a variety of means to acquire and preserve open space/recreational facilities.	A	Preservation Techniques. Continue to use zoning, leasing, acquisition, and tax incentives to preserve open space.	City Council, Ongoing
	B	Impact Fees. Explore the use of a recreational impact fee to meet recreational needs created by new developments, prepare recommendations for Council.	Planning Staff, 1997
	C	Recreational Requirements. Develop for Council consideration amendments to the City's ordinances to enhance open space/recreational facilities such as a requirement for bike racks in new developments, and pedestrian walkways/trails serving developments.	Planning Staff, 1996
4. Private Recreational Development. Encourage private recreational development and recreational/open space development activities so as to reduce City costs.	A	Financial Incentives. Make available low interest loans for privately owned recreational facilities. Consider other forms of financial assistance.	CDBG, Ongoing; Planning Staff, 1996
	B	Zoning. Continue to allow for a wide range of private recreational facilities.	City Council, Ongoing

POLICIES	STRATEGIES	RESPONSIBILITY/DATE
RECREATION/OPEN SPACE PLANNING		
1 Priorities. Establish recreation facility and open space preservation priorities on the basis of conservation and recreation value and scenic uniqueness.	A Open Space and Recreational Facilities Plan and/or planning process. Work with the Parks and Recreation Department to develop a master plan/planning process, for trails, bikeways, open space corridors, district park facilities and neighborhood park facilities.	Planning Staff, Parks and Recreation Staff, 1997
	B Capital Expenditures. Establish priorities for open space/recreation capital expenditures on an annual basis.	Recreation Advisory Board, City Council, Ongoing
OPEN SPACE CORRIDORS, BIKEWAYS, TRAILS		
1 Coordination. Continue to work with regional groups in the development of bikeways and trail systems.	A Regional Efforts. Continue to work with LACTS, CABPAC and the Androscoggin Land Trust on the development/preservation of open space corridors, bikeways, pedestrian ways and trail systems.	Planning Staff, City Council, Ongoing
2 Androscoggin River. Acquire river frontage on the Androscoggin River for public access and scenic preservation, focus acquisition on scenic river corridors.	A Capital Acquisition Fund. Establish a capital acquisition fund for the purchase of land and easements along the Androscoggin, Little Androscoggin and their tributaries. Encourage private donations of land, money and easements. Include consideration of large open space areas in the downtown. Utilize Federal and State funds to the maximum extent possible.	City Council, 1995-2000
	B Downtown Open Space. Acquire open space in the Downtown to support community activities.	Planning Department, City Council, 1995
3 Bikeways. Continue efforts to develop a bikeway system for recreation and as transportation, favor stream valleys, scenic roadways and abandoned rail rights-of-way for bike paths.	A Androscoggin Land Trust. Continue to work with the Androscoggin Land Trust to establish a full Auburn bikeway and pedestrian system within the Auburn-Lewiston area.	Planning Department, City Council, Ongoing
	B Capital Acquisition Fund. Establish a capital acquisition fund for the establishment of the Auburn portion of the bikeway system.	City Council, 1995

CABPAC

POLICIES	STRATEGIES	RESPONSIBILITY/DATE
4 Trails. Work with private groups and landowners to support trail systems.	A Partnerships. Work in partnership with snowmobile clubs, CMP and other groups and land owners to support trail systems on private land.	City Council, CABPAC, Ongoing
PARK AND RECREATIONAL FACILITIES		
1 Facility Improvements. In conjunction open space and recreation facilities plan/with the planning process, improve existing facilities and purchase additional facilities.	A Upgrading. Upgrade facilities rated as poor or fair so as to maximize their use.	Department of Parks and Recreation/City Council, 1996-2002
	B District Parks. Create district parks throughout the City with a range of facilities at each park.	Department of Parks and Recreation/City Council, 1996-2002
	C Bonney Hill. Purchase Bonney Hill to protect its future recreational use.	City Council, 1996
	D Other Parcels. Purchase, enhance and preserve unique parcels within the urbanized area for future parks development.	Department of Parks and Recreation, City Council, 1996-2002
	E Boating Facilities. Purchase land for, and encourage additional boating facilities and access to, the Androscoggin River.	Department of Parks and Recreation, City Council, 1996-2002
	F New Auburn. Establish additional park and recreational facilities in New Auburn.	Department of Parks and Recreation, City Council, 1996-2002

LOST VALLEY SKI SLOPE

POLICIES	STRATEGIES	RESPONSIBILITY/DATE
PARK AND RECREATION PROGRAMS		
1. Public Communications. Inform the community about recreation programs and facilities.	A Map. Publish a recreation facilities map.	Parks and Recreation Department, 1995
	B Displays. Establish displays at each park and recreation facility, include maps and information about park facilities and programs.	Parks and Recreation Department, 1995

POLICIES	STRATEGIES	RESPONSIBILITY/DATE
	C. Community Bulletin Boards. Utilize community bulletin boards to circulate maps and information about park facilities and programs.	Parks and Recreation Department, 1995
2. Additional Programs. Provide additional recreation programs.	A. Additional Programs. Establish additional programs for all age groups, including additional Senior Citizens facilities and activities without duplication of programs.	Department of Parks and Recreation, City Council, 1996
SCENIC VIEWS AND VISTAS		
1. Scenic Vistas. Incorporate scenic views with recreation opportunities, protect views at Mt. Apatite, West Pitch, Great Falls, Lake Auburn.	A. Ordinance Review. Review City ordinances and make recommendations to Council on whether additional regulatory provisions are needed to protect scenic views and vistas as seen from public places.	Planning Staff, 1995
	B. Androscoggin Views. Purchase dilapidated buildings in order to provide view corridors to the Androscoggin River, Little Androscoggin River.	City Council, 1998-2004
CULTURAL FACILITIES		
1. Performing Arts Center. Provide for a performing arts center.	A. Performing Arts Plan. Prepare a study on alternatives for a performing arts center.	Planning Board/City Council 1998
	B. Performing Arts/Recreational Facility. Consider the development of a centrally located megaplex for indoor and outdoor recreational facilities along with a performing arts center.	Planning Board/City Council 1998
2. Arts Program. Include arts programming in the City's recreational programs.	A. Recreational Program. Include in the City's recreational programs an arts program for all age groups.	Parks and Recreation Department, 1997
	B. Coordination. Coordinate with other local agencies that provide arts programs to eliminate duplication of effort.	Parks and Recreation Department, Auburn Public Library, 1997

FUTURE LAND USE MAP

48 North Auburn Village (North Auburn)

(Change from Low Density Residential to Village) There is a small, mixed use village here consisting of two churches, several small businesses, and a number of homes. A village district could allow a fishing related business, and a small store in an existing building, but, due to the proximity of the lake, no petroleum products. [illegible]

49 Lake Shore Drive Agriculture/RP (North Auburn)

(No Change) Tobias Driving Range is located in this area. This area is totally within the Lake Auburn watershed. Topography problems, and the lack of any infrastructure, make this area unsuitable for residential development.

50 Maple Hill Road Low Density Residential (North Auburn)

(No Change, but reduce Low Density Residential District to 400 feet each side of road) Low density residential development already exists along this road, and there is very little potential for additional growth.

51 Auburn Plains Agriculture/RP (Auburn Plains, North Auburn)

(Continue Agriculture/RP designation and change Low Density Residential District along Turner Road and Stone Road to 400 feet each side of road) The existing agricultural area is in the Lake Auburn watershed and is not suitable for residential development. The Turner Road change is based on the existence of a [illegible] cemetery, extensive wetlands, unsuitable topography, and the fact that [illegible] and [illegible] is also located in this area. The Stone Road change is based on the fact that Stone Road is a dirt road, it would support little additional residential development, and infrastructure costs would be too high.

52 Old Turner Road Low Density Residential (Auburn Plains)

(No Change but reduce Low Density Residential District to 400 feet each side of road) This area is currently characterized by low density residential development, including the 13 lot [illegible] Subdivision.

53 Waterman Road/Gulf Island Agriculture/RP (Auburn Plains)

(Continue Agriculture/RP designation and reduce Low Density Residential and Rural Residential along Turner Road to 400 feet each side of road) This is an existing agricultural area (Androscoggin [illegible]) comprised primarily of rolling topography. Central Maine Power owns most of the land. This area cannot easily be provided with services and because of the extensive provision of commercial [illegible] to the community, it would not be suitable for strip commercial development. Efforts are currently underway to [illegible] and bicycle facilities in this area.

54 Blanchard Road/Turner Road Low Density Residential (East Auburn, Auburn Plains)

(No Change but reduce Low Density Residential District to 400 feet each side of road) This area is currently a low density residential neighborhood with potential for several additional dwellings. This area [illegible] from the Oak Hill Road area, primarily because there is poor access from Oak Hill Road and therefore no potential for development.

FUTURE LAND USE MAP

55. North River Road Agriculture/RP (East Auburn, Auburndale)

[illegible]

56. Water District Agriculture/RP (East Auburn)

[illegible]

57. East Auburn Village

[illegible]

58. Central Maine Technical College Medium Density Residential (East Auburn, Gracelawn)

[illegible]

59. Gracelawn Road/Summer Street Agriculture/RP (Gracelawn, Lake Auburn)

[illegible]

60. Hotel Road/Lake Street Low Density Residential (Taylor Pond, Merrill Hill, Lake Street, Lake Auburn)

[illegible]

61. Park Avenue/Summer Street Low Density Residential (Lake Auburn, Gracelawn)

[illegible]

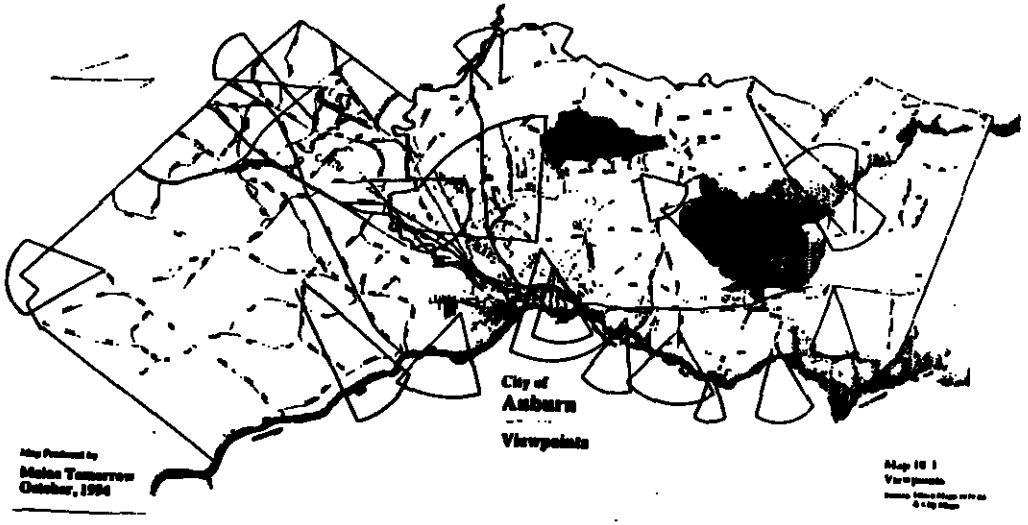
LONG RANGE PLANNING

GOALS

1. Keep the Auburn Comprehensive Plan up-to-date.
2. Make sure that all City land use ordinances reflect the goals, policies and strategies of this Plan.
3. Insure that public utility providers utilize this Plan to guide any line extensions.
4. Coordinate planning efforts with adjacent towns as appropriate.

"The densely built-up urban center of Auburn has all the problems of Maine manufacturing cities: dense housing, some of it deteriorated, obsolescent down town industrial and shopping sites, narrow streets, some fire hazards, some traffic and parking problems, and some surprises in beautiful trees and buildings."

19?? Auburn Comprehensive Plan



AUBURN TOMORROW

COMPREHENSIVE PLAN

Inventory

Adopted by the Auburn City Council

1995-2005

A number of important efforts to upgrade the city's open space have been undertaken recently or are underway. Each builds on the notion that walkways, trails and, in some cases bikeways, that link different parts of the city together by way of existing or new open space, parkland or rights-of-way, will be beneficial. The efforts include: the Mt. Apatite Multiple Use Plan, the Pettengill Park Master Plan, the Androscoggin Riverwalk, the Elf Woods project, Bonny Park, West Pitch Park, the L/A Bike/Pedestrian Trestle project and the CABPAC Plan. The essential characteristics of these projects are summarized in Table 8-3 below.

TABLE 8-3

SUMMARY OF OPEN SPACE PLANNING EFFORTS

Open Space/Park Project	Comment
Mt. Apatite Recreation Plan	Calls for the development of trails for hiking, mountain bikes, cross-country skiing, mineral/exploration.
Pettengill Park and Pettengill Woods Plan	Upgrades linear, neighborhood park; contains Hasty Community Center, 3 sports fields, Arena, playgrounds, tennis courts, pond.
Androscoggin Riverwalk	Plans call for a 2000 ft. long walkway to link Newbury Street neighborhood to downtown along waterfront.
Elf Woods Project	Planned by Edward Little High School students; provides trails, benches, etc., next to school.
Bonny Park	New neighborhood park, near completion, part of Riverwalk and Trestle project.
West Pitch Park	Overlooking Great Falls; planned improvements have been completed.
L/A Bike/Pedestrian Trestle Project	Proposed link between the twin cities on old railroad trestle; links downtown Auburn to Lewiston
CABPAC Plan	Still under development, this ambitious, farsighted plan is being prepared by an L/A Bicycle and Pedestrian Advisory Committee
Androscoggin Greenways	Plans call for a system of accessible green spaces along and connecting to the Androscoggin River (private effort being undertaken in cooperation with Auburn, Lewiston, Androscoggin Valley Council of Governments and the National Park Service).

Sources: Various Plan Reports and City Staff.

(For more on the CABPAC plan, refer to the Transportation section.) Proposed features that relate most directly to Auburn's open space and park planning in the CABPAC Plan and in the old (1984) Comprehensive Plan, include:

CABPAC

- a pedestrian bike trail along the railroad right-of-way from the old Railroad Trestle 1-1/2 miles southwest to Taylor Brook

1984 Plan

- a hiking trail along Taylor Brook from Court Street northwest to the outlet of Taylor Pond
- a hiking trail along Bobbin Mill Brook from the outlet on Lake Auburn southeast to the Androscoggin River
- a hiking trail along the Androscoggin, north from Bobbin Mill Brook to the Deer Rips Dam, along a power line
- a hiking trail from North River Road to Bobbin Mill Brook along the power line north of Stetson Road
- a pedestrian/bike trail along Spring Road on the west of Lake Auburn.

Overall, these trails and many of the new open space/park projects mentioned here, as well as some of the existing recreation facilities described in Table 3-3, are designed to interconnect so that accessibility is improved.

A bikeway system with charted routes and road improvements, including adequate signs, should be instituted to enable cyclists to travel in safety to recreational, work, school and shopping areas and to encourage bicycle use as a recreation and as a mode of transportation promoting better health, air quality and energy conservation.

Riverfront open space along the Androscoggin should be protected to preserve scenic views and provide public access to areas remaining in their natural state.

- 1984 Auburn Comprehensive Plan

RECREATION TRENDS

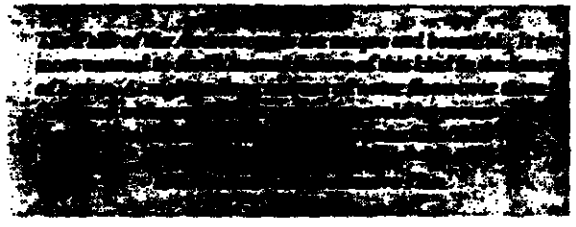
Over the past twenty-five years, Auburn has greatly expanded leisure opportunities for its citizens through acquisition of open space facilities development, and recreation programming.

Major developments have included the addition of Mount Apatite Park, acquisition of the Hasty Community Center, West Pitch Park, Bonney Park and riverfront development, construction of a little league baseball/soccer complex, improvements to Pettengill and Union Street Gully Parks, development of a track and field/soccer facility at Edward Little High School, construction of soccer/softball fields at the Auburn Middle School, Raymond Park, Elementary school(s) playground improvements, construction of the Pettengill Arena, and most recently, the construction of the New Auburn Community Center.

At present, a great deal of citizen energy is focused on increasing opportunities for bicycle and hiking recreation, through the CABPAC effort. Cycling, hiking and jogging are increasingly popular and CABPAC has been able to identify many locations where linear open space, appropriate for these activities is (or may be) available. Hence there is an effort to locate these facilities:

- on old railroad rights-of-way
- along utility line rights-of-way
- along rivers and streams, and
- on the shores of Lake Auburn.

Further, linkages to other trail systems and bicycle routes in adjacent towns is an important goal. These linear greenways mark a trend and parallel national efforts to place increased emphasis on inter-connected open space.



TAYLOR POND WATER QUALITY

Taylor Pond water quality has been monitored for over 50 years. Over that period, there has been a decline in the condition of this lake. Water clarity has been slightly below the average for Maine lakes, and phosphorus concentrations have been moderate to high for several years. Phosphorus concentrations have been sufficient to support algal blooms, although none have been documented to date.

Taylor Pond is considered to be at a very critical threshold. Any further decline in water quality could result in dramatic changes in the condition of this lake. In response to this threat, the Taylor Pond Association applied for and received two grants from the Maine DEP. One was to assess non-point source pollution problems in the 15 square mile watershed and the other to provide technical assistance and general information concerning non-point source pollution problems and lake water quality to the municipalities and land owners in the watershed.

The City of Auburn has also responded by adopting a Phosphorus Control Ordinance which is currently being rewritten for clarification and accuracy.

RIVER WATER QUALITY

The Maine Legislature has established four water quality classifications for the rivers of the State which include, in descending order, AA, A, B and C. Both the Androscoggin River and the Little Androscoggin River have been given a C rating. The statutory criteria for C waters, as set forth in Title 38 MRSA section 465, subsection 4, include the following:

4. Class C waters. Class C shall be the 4th highest classification.

A. Class C waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as a habitat for fish and other aquatic life.

B. The dissolved oxygen content of Class C waters may be not less than 5 parts per million or 60% of saturation, whichever is higher, except that in identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, that water quality sufficient for these purposes must be maintained. Between May 15th and September 30th, the number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 142 per 100 milliliters or an instantaneous level of 949 per 100 milliliters. The board shall promulgate rules governing the procedure for designation of spawning areas and consultation with affected persons prior to designation of a stretch of water as a spawning area.

C. Discharges to Class C waters may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

The Androscoggin River receives polluted waste from towns along its banks and from [illegible] paper mills from Berlin, New Hampshire, on down through its course. Despite substantial river cleanup efforts, including the 'Section 208' water resource program under the U.S. Environmental Protection Agency, the Federal Water Pollution Control Act, and State programs, the Androscoggin River does not meet State standards for its C rating. According to information obtained from Maine's Department of Environmental Protection, the principal reasons for not meeting the criteria of the C classification in Auburn include dioxins in the river, and high combined storm/sanitary sewer overflows near the sewage treatment plant.

The Little Androscoggin River meets the criteria of its C rating in all areas except where there are high concentrations of combined storm/sanitary sewer overflows near its confluence with the Androscoggin River.

FISH AND WILDLIFE AREAS

Within Auburn's 65 square miles are large tracts of undeveloped land and water areas totaling some 48 square miles. This represents nearly 76 percent of the City's total area. These and other areas provide habitat for fish and wildlife.

THE FISHERY

According to the regional fisheries biologist there is good to excellent fishing in Auburn. Lake Auburn, in particular, is a superb fishery and, with the cleaning up of the Androscoggin, the small mouth bass fishery is excellent. Runoff from the airport and agriculture is thought to have a negative impact on the fishery in some streams in South Auburn. Table 10-3 serves to summarize the situation.

Each parcel of land possesses a different "bundle" of characteristics that make it suitable for various uses. Components of this bundle included: accessibility, land characteristics, available support services and property rights.

Physical constraints that have affected and will continue exert primary influence over development in Auburn are: topography, wetlands, floodplains, gravel aquifers, soils and existing development.

1984 Auburn Comprehensive Plan

TABLE 10-3

THE AUBURN FISHERY

Pond, Stream or River	*Predominant Fish*	*Comment*
Androscoggin River	Small mouth bass, pickerel, brown trout, large mouth bass, American eel, brook trout, yellow perch, hornpout	Excellent small mouth bass fishery, minor pickerel, brown trout and large mouth bass fishery
Little Androscoggin River	Brook trout and brown trout.	Lower section is stocked with brown trout and brook trout.
Royal River/Moose Brook and other Five Auburn Streams	Brook trout and brown trout.	Stocking done west of Danville Junction.
Lake Auburn	Lake trout, salmon, small mouth bass, large mouth bass and white perch.	Known as an excellent fishery; trout up to 10 lbs.
Lake Auburn Outlet Stream	Brook trout and brown trout.	Best toward the Androscoggin River
Taylor Pond	Brook trout, small mouth bass, white perch.	Better access for fishing needed.

Source: Dick Arsenault, Regional Fisheries Biologist, Grey, Maine.

May 26, 1995

Dear Androscoggin County Resident:

In order to find out how people feel about the Androscoggin River, I am conducting a survey of Androscoggin County residents. The survey is part of a study being sponsored by Bates College. I would like to ask for your help with the study by filling out the enclosed survey.

Your household has been drawn from a random sample of Androscoggin County residents. In order to accurately represent the thinking of the people of the County, it is important that every questionnaire is completed and returned. This study is completely confidential! Your name will never be placed on the questionnaire.

The enclosed survey asks you how you feel about having undeveloped open space along the River. As you may know, there is some publicly owned land along the River in both Turner and Leeds. The 2,000 acres of State owned land in Turner preserves almost 5 miles of the shoreline and adjacent land. The public land in Leeds preserves almost 2 miles of shoreline. I would like to know how you feel about preserving additional land as open space along the River.

The results of this study will be available to state and local officials as well as interested citizens. You may receive a summary of results by writing "copy of results requested" on the back of the return envelope, and by printing your name and address below it. Please do not put this information on the questionnaire itself.

I would be most happy to answer any questions you might have. Feel free to write or call. You may contact me at (207) 777-7675, or by writing to Justin Shein, Box 709, Bates College, Lewiston, ME 04240.

Thank you for spending time on this project. I appreciate your participation.

Sincerely,

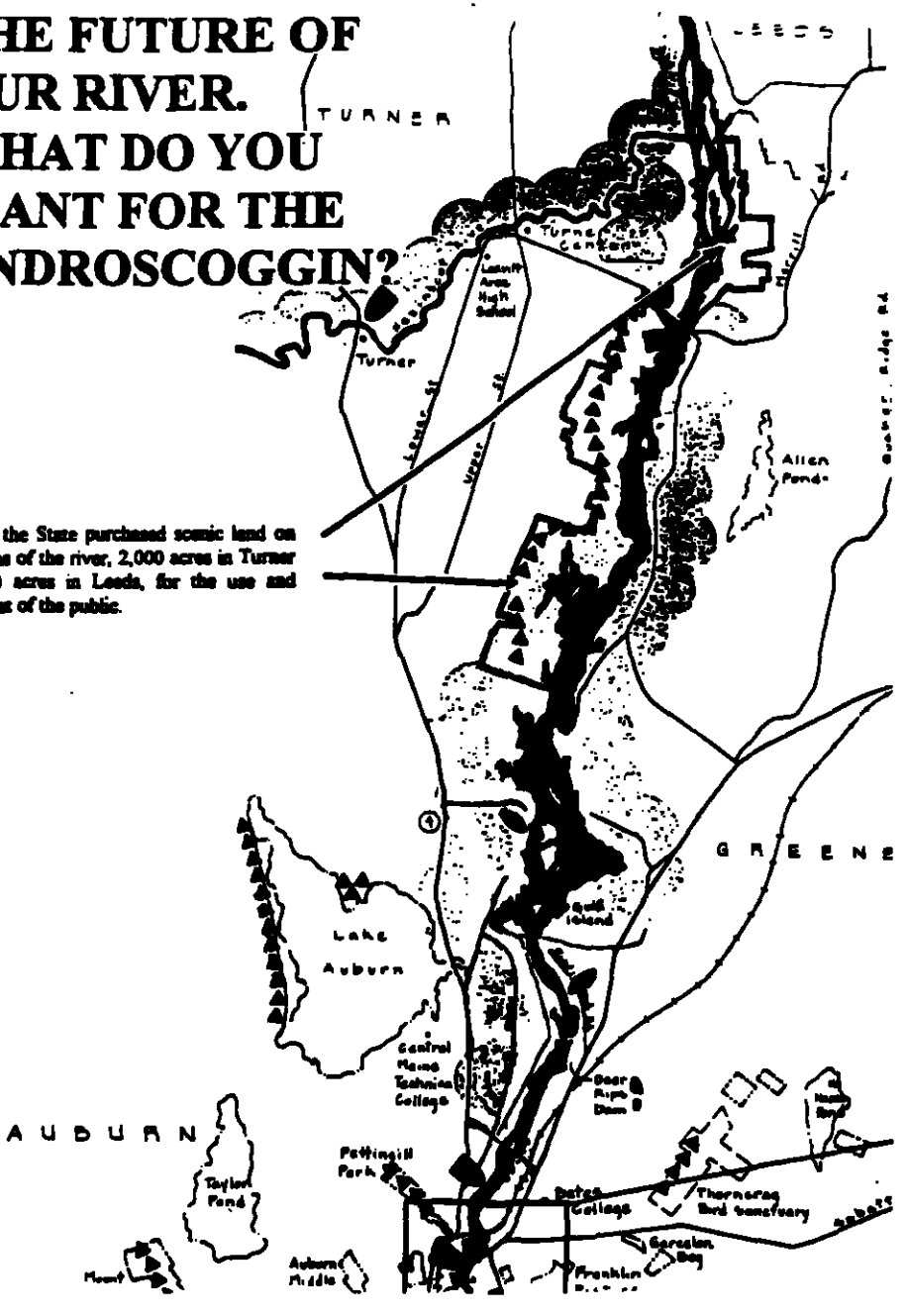
Justin Shein

EXHIBIT E

82

THE FUTURE OF OUR RIVER. WHAT DO YOU WANT FOR THE ANDROSCOGGIN?

In 1990 the State purchased scenic land on both sides of the river, 2,000 acres in Turner and 250 acres in Leeds, for the use and enjoyment of the public.



[illegible]

[illegible]

Q-1 [illegible] (Circle answer)

NEVER	FOUR TIMES A MONTH
ONCE A MONTH	EIGHT TIMES A MONTH
TWICE A MONTH	MORE THAN EIGHT TIMES A MONTH

Q-2 [illegible] (Circle answer)

NEVER	FOUR TIMES A MONTH
ONCE A MONTH	EIGHT TIMES A MONTH
TWICE A MONTH	MORE THAN EIGHT TIMES A MONTH

Q-3 [illegible] (Circle answer)

VERY IMPORTANT	NOT VERY IMPORTANT
SOMEWHAT IMPORTANT	NOT AT ALL IMPORTANT

Q-4 [illegible] (Circle answer)

NEVER	FOUR TIMES A MONTH
ONCE A MONTH	EIGHT TIMES A MONTH

Q-5 [illegible] (Circle answer)

VERY IMPORTANT
SOMEWHAT IMPORTANT
NOT VERY IMPORTANT
NOT AT ALL IMPORTANT
NEUTRAL

Q-6 How long have you lived in Androscoggin County? (Circle answer)

LESS THAN 2 YEARS
2-5 YEARS
6-10 YEARS
11-15 YEARS
MORE THAN 15 YEARS
SUMMER RESIDENT ONLY

Q-7 Do you consider yourself to be: (Circle answer)

VERY OUTDOORS ORIENTED
SOMEWHAT OUTDOORS ORIENTED
NOT VERY OUTDOORS ORIENTED
NOT AT ALL OUTDOORS ORIENTED

Q-8 Approximately how far do you live from the Androscoggin River? (Circle answer)

0-2 MILES	6-8 MILES
2-4 MILES	8-10 MILES
4-6 MILES	MORE THAN 10 MILES

Q-9 Approximately how far do you live from some other body of water such as another river, a lake, or the ocean? (Circle answer)

0-2 MILES	6-8 MILES
2-4 MILES	8-10 MILES
4-6 MILES	MORE THAN 10 MILES

[illegible]

Q-10 [illegible]

Reasons for Open Space:

Maintain the rural character of the area.	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Increase the amount of land available for recreation	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Increase the enjoyment of outdoor recreational activities.	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Create buffers between developed and less developed areas.	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Create open space around water bodies.	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Provide scenic beauty	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Protect unique landscapes	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Provide habitat for animals and plants.	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL
Promote tourism	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT VERY IMPORTANT	NOT AT ALL IMPORTANT	NEUTRAL

[illegible]

[illegible]

[illegible]

Q-11A [illegible] (Circle answer)

YES

NO

Q-11B [illegible] (Circle answer)

YES

NO

Q-11C [illegible] (Circle answer)

YES

NO

Q-11D [illegible] (Circle answer)

YES

NO

Q-12 [illegible]

[illegible]

Q-13 [illegible] (Circle answer)

No change

$5

$10

$20

$40

[illegible]

[illegible]

Q-14 "[illegible]" (Circle answer)

STRONGLY AGREE

AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

Q-15 "[illegible]" (Circle answer)

STRONGLY AGREE

AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

Q-16 "[illegible]" (Circle answer)

STRONGLY AGREE

AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

Q-17 "[illegible]" (Circle answer)

STRONGLY AGREE

AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

[illegible]

Q-18 What is your sex? (Circle answer)

MALE FEMALE

Q-19 What age category are you in? (Circle answer)

16-25 51-65

26-40 66 AND OVER

41-50

Q-20 [illegible]

Q-21 [illegible] (Circle answer)

LESS THAN HIGH SCHOOL [illegible]

SOME HIGH SCHOOL [illegible]

COMPLETED HIGH SCHOOL [illegible]

Q-22 [illegible] (Circle answer)

LESS THAN $15,000 [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible]

Table I.
Percent of time spent participating in outdoor on water recreational activities*

Times a Month					
Never %	Once %	Twice %	Four %	Eight %	More than Eight %
15.55	24.44	14.44	25.55	5.55	14.44

* This table corresponds to question 1 in the survey instrument.

Table II.
Percent of time spent participating in recreational activities on the shore or near bodies of water*

Times a Month						
Never %	Once %	Twice %	Four %	Eight %	More than Eight %	NA** %
11.11	26.67	17.78	23.33	7.77	12.22	1.11

* This table corresponds to question 2 in the survey instrument.
** In Tables II. & III., NA indicates the respondents who did not answer the corresponding question in the survey instrument.

Table III.
Percent of time spent participating in outdoor recreational activities that don't take place on or near water*

Times a Month						
Never %	Once %	Twice %	Four %	Eight %	More than Eight %	NA %
13.33	20.00	14.44	24.44	12.22	14.44	1.11

* This table corresponds to question 4 in the survey instrument.

Table IV.
Percent of respondents who believe it is important that the area around where they participate in water related outdoor recreation activities be open space*

Level of Importance			
Very %	Somewhat %	Not Very %	Not At All %
81.11	15.55	3.33	0.00

* This table corresponds to question 3 in the survey instrument.

Table V
Percent of respondents who believe it is important that the area around where they participate in non-water outdoor recreational activities be open space*

Level of Importance				
Very %	Somewhat %	Not Very %	Not At All %	Neutral %
81.11	12.22	4.44	1.11	1.11

* This table corresponds to question 5 in the survey instrument.

Table VI.
Length of Respondent Residency in Androscoggin County*

Number of Years					
Less than 2 %	2-5 %	6-10 %	11-15 %	more than 15 %	Summer Resident %
3.33	5.55	7.78	1.11	82.22	0.00

* This table corresponds to question 6 in the survey instrument.

Table VII.
Respondent's Perception of How Outdoors Oriented They Are*

Level of Outdoors Oriented			
Very %	Somewhat %	Not Very %	Not At All %
38.89	48.89	11.11	1.11

* This table corresponds to question 7 in the survey instrument.

Table VIII.
Distance Respondents Live From the Androscoggin River*

		Miles			
0-2 %	2-4 %	4-6 %	6-8 %	8-10 %	more than 10 %
58.89	25.55	10.00	4.44	1.11	0.00

* This table corresponds with question 8 in the survey instrument.

Table IX.
Distance Respondents Live From the Closest Body of Water Other Than the Androscoggin River*

Miles					
0-2 %	2-4 %	4-6 %	6-8 %	8-10 %	more than 10 %
28.89	31.11	15.55	11.11	5.55	7.78

* This table corresponds with question 9 in the survey instrument.

Table X.
Reasons for Open Space*

	Level of Importance					
Reasons For Open Space	Very %	Some-what %	Not Very %	Not At All %	Neutral %	NA** %
Maintain the Rural Character of the Land	63.33	28.89	3.33	1.11	2.22	1.11
Increase the Amount of Land Available for Recreation	46.67	41.11	8.89	0.00	2.22	1.11
Increase the Enjoyment of Outdoor Recreational Activities	45.55	46.67	2.22	0.00	4.44	1.11
Create Buffers Between Developed and Less Developed Areas	62.22	26.67	6.67	1.11	2.22	1.11
Create Open Space Around Water Bodies	58.89	30.00	7.78	0.00	2.22	1.11
Provide Scenic Beauty	62.22	33.33	1.11	0.00	2.22	1.11
Protect Unique Landscapes	72.22	24.44	1.11	1.11	0.00	1.11
Provide Habitat for Animals and Plants	77.78	20.00	2.22	0.00	0.00	0.00
Promote Tourism	22.22	41.11	25.55	7.78	2.22	1.11

* This table corresponds with questions 10 in the survey instrument.
** In Tables X.-XVII., NA indicates the respondents who did not answer the corresponding question in the survey instrument.

Table XI.
Percent of Respondents who Agree/Disagree
"The town should maintain open space by using local public funds to buy open space." *

Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	NA %
6.67	36.67	34.44	15.55	4.44	2.22

*This table corresponds to question 14 in the survey instrument.

Table XII.
Percent of Respondents who Agree/Disagree
"The town should maintain open space by asking the state for money to buy open space."*

Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	NA %
14.44	32.22	30.00	15.55	4.44	3.33

*This table corresponds to question 15 in the survey instrument.

Table XIII.
Percent of Respondents who Agree/Disagree
"The town should maintain open space by asking people with suitable land to voluntarily put their land into open space in exchange for lower property taxes."*

Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	NA %
26.67	40.00	23.33	7.78	2.22	0.00

*This table corresponds to question 16 in the survey instrument.

Table XIV.
Percent of Respondents who Agree/Disagree
"The town should have nothing to do with maintaining open space."*

Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	NA %
0.00	5.55	26.67	42.22	23.33	2.22

*This table corresponds to question 17 in the survey instrument.

Table XV.
Sex Distribution of Respondents*

Male %	Female %	NA %
52.22	46.67	1.11

* This table corresponds with question 18 in the survey instrument.

Table XVI.
Respondent Income Distribution*

In Thousands of Dollars						
less than 15 %	15-29.9 %	30-44.9 %	45-59.9 %	60-74.9 %	75 or more %	NA %
8.89	28.89	25.55	12.22	7.78	8.89	7.78

* This table corresponds with question 22 in the survey instrument

Table XVII.
Age Distribution of Respondents*

16-25 %	26-40 %	41-50 %	51-65 %	>65 %	NA %
2.22	36.67	24.44	20.00	15.55	1.11

* This table corresponds with question 19 in the survey instrument.

Table XVIII.
Percent of Respondents who have children under 18 living with them and the average number of children.

Have children under 18 living with them %	Average number of children under 18
34.44	0.73

* This table corresponds with question 20 in the survey instrument.

Table XIX.
Respondent Education*

Highest Level of Education					
Less Than High School %	Some High School %	Completed High School %	Some College %	Completed College %	Graduate Degree %
3.33	3.33	34.44	25.55	21.11	12.22

* This table corresponds with question 21 in the survey instrument.

Table XXII.
Respondents' Willingness To Pay to raise funds to purchase a 600 acre undeveloped piece of land in Turner to preserve for open space and be available for public use.*

Amount per year for the next five years	Willing to Pay %	Not Willing to Pay %	NA %
$5	78.89	20.00	1.11
$10	60.00	38.89	1.11
$20	40.00	58.89	1.11
$40	18.89	76.67	1.11
Average Max. WTP = $15.39 per year for next 5 years			

* This table corresponds to questions 11A-D in the survey instrument.

Table XXIII.
Reason for Placing a Limit on Willingness to Pay Value*

	Respondent %
It is more than I can afford	28.89
Open space is not that valuable to me	3.33
I should not have to pay for open space	17.78
Other	26.67
NA	4.44
Does Not Apply	18.89

* This table corresponds with question 12 in the survey instrument.

Table XXIV.
Additional Amount Respondent's Would Pay to Significantly Improve the Water Quality of the Androscoggin River.*

Mean WTP	$14.05

* This table corresponds to question 13 in the survey instrument.

June 23, 1995

Dear Recreation or Conservation Group Member:

In order to find out how people feel about open space and recreational opportunities in the area, I am conducting a survey of Androscoggin County residents. The survey is part of a study being sponsored by Bates College. I would like to ask for your help with the study by filling out the enclosed survey. After filling out the survey, please return it in the enclosed postage-paid envelope.

Your household has been drawn from a sample of recreation and conservation group members living in Androscoggin County. In order to accurately represent the thinking of recreationists and conservationists in the County, it is important that every questionnaire is completed and returned. This study is completely confidential! Your name will never be placed on the questionnaire.

The enclosed survey asks you how you feel about having increased open space and recreational opportunities along the Androscoggin River. As you may know, there is some publicly owned land along the River in both Turner and Leeds. The 2,000 acres of State owned land in Turner preserves almost 5 miles of the shoreline and adjacent land. The public land in Leeds preserves almost 2 miles of shoreline. I would like to know how you feel about enhancing the recreational facilities on existing public land as well as increasing the amount of public land along the River.

The results of this study will be available to state and local officials as well as interested citizens. You may receive a summary of results by writing "copy of results requested" on the back of the return envelope, and by printing your name and address below it. Please do not put this information on the questionnaire itself.

I would be most happy to answer any questions you might have. You may contact me by writing to Geoffrey Black, Department of Economics, Bates College, Lewiston, ME 04240.

Thank you for spending time on this project. I appreciate your participation.

Sincerely,

Geoffrey Black

June 23, 1995

Dear Androscoggin County Resident:

In order to find out how people feel about open space and recreational opportunities in this area, I am conducting a survey of Androscoggin County residents. The survey is part of a study being sponsored by Bates College. I would like to ask for your help with the study by filling out the enclosed survey. After filling out the survey, please return it in the enclosed postage-paid envelope.

Your household has been drawn from a random sample of Androscoggin County residents. In order to accurately represent the thinking of the people of the County, it is important that every questionnaire is completed and returned. This study is completely confidential! Your name will never be placed on the questionnaire.

The enclosed survey asks you how you feel about having increased open space and recreational opportunities along the Androscoggin River. As you may know, there is some publicly owned land along the River in both Turner and Leeds. The 2,000 acres of State owned land in Turner preserves almost 5 miles of the shoreline and adjacent land. The public land in Leeds preserves almost 2 miles of shoreline. I would like to know how you feel about enhancing the recreational facilities on existing public land as well as increasing the amount of public land along the River.

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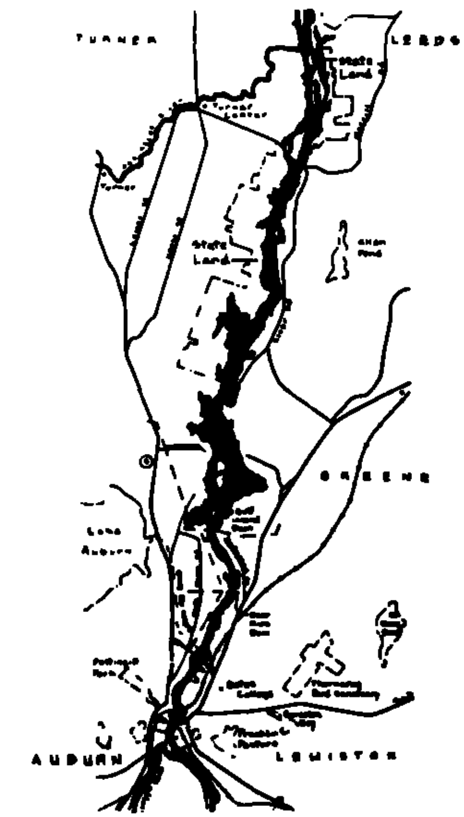
Thank you for spending time on this project. I appreciate your participation.

Sincerely,

Geoffrey Black

THE ANDROSCOGGIN RIVER ....
Recreation in Your Backyard



[illegible]

[illegible]

Q-1 How often, during an average month in the season, do you [illegible] (Circle answer.)

NEVER	THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH	MORE THAN SIX TIMES A MONTH

Q-2 How often, during an average month in the season, do you participate in activities on [illegible] (Circle answer)

NEVER	THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH	MORE THAN SIX TIMES A MONTH

Q-3 How important is it to you that the land around where you do the activities [illegible] (Circle answer.)

VERY IMPORTANT	NOT VERY IMPORTANT
SOMEWHAT IMPORTANT	NOT AT ALL IMPORTANT

Q-4 How often, during an average month in the season, do you participate in outdoor [illegible] (Circle answer)

NEVER	THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH	MORE THAN SIX TIMES A MONTH

Q-5 How important is it to you that the land where you do these activities [illegible] (Circle answer)

VERY IMPORTANT
SOMEWHAT IMPORTANT
NOT VERY IMPORTANT
NOT AT ALL IMPORTANT
NEUTRAL

Q-6 How long have you lived in Androscoggin County? (Circle answer.)

LESS THAN 2 YEARS
2-5 YEARS
6-10 YEARS
11-15 YEARS
MORE THAN 15 YEARS
SUMMER RESIDENT ONLY

Q-7 Do you consider yourself to be: (Circle answer.)

VERY OUTDOORS ORIENTED
SOMEWHAT OUTDOORS ORIENTED
NOT VERY OUTDOORS ORIENTED
NOT AT ALL OUTDOORS ORIENTED

Q-8 Approximately how far do you live from the Androscoggin River? (Circle answer)

0-2 MILES	6-8 MILES
2-4 MILES	8-10 MILES
4-6 MILES	MORE THAN 10 MILES

Q-9 Approximately how far do you live from the closest body of water other than the Androscoggin River? (Circle answer)

0-2 MILES	6-8 MILES
2-4 MILES	8-10 MILES
4-6 MILES	MORE THAN 10 MILES

[illegible] I would like to ask you about the types of outdoor activities in which you participate. [illegible] will provide information about the ways in which people enjoy the outdoors [illegible] the [illegible] of the river.

10. Please specify what types of outdoor activities you engage in and how often, on average, you do each activity. For [illegible] activities, estimate how often you do the activity during an average month in the season. Please circle ALL that apply.

a. Hiking, walking, or running
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

b. Fishing
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

c. Boating
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

d. Swimming
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

e. Picnicking or sightseeing
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

f. Birdwatching
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

g. Non-motorized boating such as canoeing, kayaking, or rafting
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

h. Motorized boating
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

i. Cross-country skiing
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

j. Snowmobiling
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

k. Camping
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

l. Hunting
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

m. Use motorized trail bikes or ATVs
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

Q-11 In addition to the activities listed, what other outdoor recreational activities do you enjoy? (Please LIST each activity and estimate how often you do each one during an average month in the season)

ACTIVITY — FREQUENCY (# times per month)

____

____

____

____

The Androscoggin River is [illegible] cleaner than it was even a few years ago. For example, the river is clean enough to support [illegible] and trout populations and people use the river for boating and fishing.

Q-12 Do you use the Androscoggin River or any of its adjacent lands for any recreational activities? (Circle answer)

YES — NO

(Go to Question Q-13)

(Q-12B) If you answered NO, would you consider doing so if the amount of public land was increased and/or the area had more boat launches and a more extensive trail system? Please circle YES or NO and then skip to Q-15 on the next page.

YES — NO

Q-13 In the Androscoggin River area, what types of outdoor activities do you engage in? How often, on average, do you do each activity? Please indicate only activities that you do on or near the Androscoggin River. For seasonal activities, estimate how often you do the activity during an average month in the season. (Circle ALL that apply)

a. Hiking, walking, or running
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

b. Fishing
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

c. Boating
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

d. Swimming
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

e. Picnicking or sightseeing
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

f. Birdwatching
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

g. Non-motorized boating such as canoeing, kayaking, or rafting
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

h. Motorized boating
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

i. Cross-country skiing
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

j. Snowmobiling
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

k. Camping
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

l. Hunting
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

m. Use motorized trail bikes or ATVs
NEVER — THREE TO SIX TIMES A MONTH
ONCE OR TWICE A MONTH — MORE THAN SIX TIMES A MONTH

Q-14 In addition to the activities listed, what other outdoor recreational activities do you enjoy along the Androscoggin River? (Please LIST each activity and how often, on average, you do each activity)

ACTIVITY — FREQUENCY (# times per month)

[illegible]

[illegible]

Q-15 If such a program is enacted, would you pledge $50 per year for the next five years? (Circle answer.)

YES NO

(Q-15B) If you answered YES, would you pledge $100 per year for the next five years? (Circle answer.)
YES NO

(Q-15C) If you answered NO, would you pledge $5 per year for the next five years? (Circle answer.)
YES NO

Q-16 If you answered NO to any part of the previous question, which of the following statements best describes your reason for answering NO?

It is more than I can afford.
Open space is not that valuable to me.
I should not have to pay for open space.
Other (please fill in your reason). ____________

[illegible]

Q-17 If such a program is enacted, would you pledge $10 per year for the next five years? (Circle answer.)

YES NO

(Q-17B) If you answered YES, would you pledge $20 per year for the next five years? (Circle answer.)
YES NO

(Q-17C) If you answered NO, would you pledge $5 per year for the next five years? (Circle answer.)
YES NO

Q-18 If you answered NO to any part of the previous question, which of the following statements best describes your reason for answering NO?

It is more than I can afford.
Open space is not that valuable to me.
I should not have to pay for open space.
Other (please fill in your reason). ____________

[illegible]

Q-19 What was your approximate family income from all sources, before taxes, in 1994? (Circle answer.)

LESS THAN $15,000	$45,000-$59,999
$15,000-$29,999	$60,000-$74,999
$30,000-$44,999	$75,000 OR MORE

Q-20 What is your sex? (Circle answer.)

MALE FEMALE

Q-21 What age category are you in? (Circle answer.)

16-25	51-65
26-40	66 AND OVER
41-50	

Q-22 Number of children under 18 that live with you? (If none, write "0") ____________

Q-23 Do you belong to any organized recreation or conservation group? (Circle answer.)

YES NO

Q-24 If you answered YES to the previous question, please specify which group(s)?

____________ ____________

____________ ____________

Q-25 What is the highest level of education that you have completed? (Circle answer.)

LESS THAN HIGH SCHOOL	SOME COLLEGE
SOME HIGH SCHOOL	COMPLETED COLLEGE
COMPLETED HIGH SCHOOL	GRADUATE DEGREE

Thank you for filling out this survey! [illegible]

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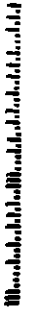
FIRST CLASS MAIL PERMIT NO. 10 LEWISTON, ME
POSTAGE WILL BE PAID BY ADDRESSEE

Androscoggin Recreational Survey
Bates College
2 Andrews Road
Lewiston, Maine 04240-9989

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS MAIL PERMIT NO. 10 LEWISTON, ME
POSTAGE WILL BE PAID BY ADDRESSEE

Androscoggin Valuation Project
Bates College
2 Andrews Road
Lewiston, Maine 04240-9989



June 27, 1995

A couple of days ago, a survey seeking your opinion on open space and recreational opportunities was mailed to you. Your name was drawn in a random sample of recreation and conservation group members living in Androscoggin County.

If you have already completed and returned the survey, please accept my thanks. If you have not please do so today. Only a small number of recreation and conservation group members were selected to participate in this study.

It is extremely important that you respond in order for the results to truly represent the opinions of recreation and conservation group members living in Androscoggin County. If by some chance you did not receive the survey, or it got misplaced, please call me at (207) 786-6084 or write to Geoffrey Block, Department of Economics, Bates College, Lewiston, ME 04240. I will mail another survey to you as soon as possible.

Thank you for spending time on this project. I appreciate your participation.

Sincerely,

Geoffrey Block

THE ANDROSCOGGIN RIVER...Recreation in Your Backyard
Survey Results

Table I.
Percent of time spent participating in outdoor on water recreational activities*

	Times a Month				
	Never	1-2	3-6	more than 6	NA**
Random Resident	20.73	31.71	24.39	21.95	1.22
Recreational Resident	19.20	27.81	25.83	25.16	1.99

* This table corresponds to question 1 in the survey instrument.
** In Tables I.-XXV.. NA indicates the respondents who did not answer the corresponding question in the survey instrument.

Table II.
Percent of time spent participating in recreational activities on the shore or near bodies of water*

	Times a Month				
	Never %	1-2 %	3-6 %	more than 6 %	NA %
Random Resident	12.20	42.68	25.61	18.29	1.22
Recreational Resident	7.28	34.44	29.80	27.81	0.66

* This table corresponds to question 2 in the survey instrument.

Table III.
Percent of time spent participating in outdoor recreational activities that don't take place on or near water*

	Times a Month				
	Never %	1-2 %	3-6 %	more than 6 %	NA %
Random Resident	6.10	35.36	23.17	35.36	0.00
Recreational Resident	5.96	25.16	23.18	45.03	0.66

* This table corresponds to question 4 in the survey instrument.

Table IV.
Percent of respondents who believe it is important that the area around where they participate in water related outdoor recreation activities be open space*

	Level of Importance				
	Very %	Somewhat %	Not Very %	Not At All %	NA %
Random Resident	52.44	37.80	6.10	3.66	0.00
Recreational Resident	70.86	23.84	1.99	0.66	2.65

* This table corresponds to question 3 in the survey instrument.

Table V

Percent of respondents who believe it is important that the area around where they participate in non-water outdoor recreational activities be open space*

	Level of Importance					
	Very %	Somewhat %	Not Very %	Not At All %	Neutral %	NA %
Random Resident	47.57	35.36	8.54	4.88	3.66	0.00
Recreational Resident	66.22	26.49	3.31	1.32	1.32	1.32

* This table corresponds to question 5 in the survey instrument.

Table VI. Length of Respondent Residency in Androscoggin County*

	Number of Years						
	Less than 2 %	2-5 %	6-10 %	11-15 %	more than 15 %	Summer Resident %	NA %
Random Resident	2.44	4.88	8.54	4.88	79.27	0.00	0.00
Recreational Resident	1.32	7.95	15.23	9.27	64.90	0.00	1.32

* This table corresponds to question 6 in the survey instrument.

Table VII. Respondent's Perception of How Outdoors Oriented They Are*

	Level of Outdoors Oriented				
	Very %	Somewhat %	Not Very %	Not At All %	NA %
Random Resident	19.51	67.07	13.41	0.00	0.00
Recreational Resident	57.61	34.44	6.62	0.00	1.32

* This table corresponds to question 7 in the survey instrument.

Table VIII. Distance Respondents Live From the Androscoggin River*

	Miles						
	0-2 %	2-4 %	4-6 %	6-8 %	8-10 %	more than 10 %	NA %
Random Resident	39.02	34.15	14.63	9.70	1.22	0.00	1.22
Recreational	54.97	25.83	11.92	2.65	1.32	1.32	1.99

* This table corresponds with question 8 in the survey instrument.

Table IX.

Distance Respondents Live From the Closest Body of Water Other Than the Androscoggin River*

	Miles						
%	0-2	2-4	4-6	6-8	8-10	more than 10	NA
Random Resident	26.83	21.95	25.17	10.97	9.76	6.10	1.22
Recreational	41.06	33.11	17.88	1.32	4.63	1.32	0.66

* This table corresponds with question 9 in the survey instrument.

Table X.

Types of Outdoor Activities Random Resident Respondents Engage in and How Often*

	Times a Month				
Recreational Activity	Never %	1-2 %	3-6 %	more than 6 %	NA %
Hiking, Walking, or Running	14.63	31.71	24.39	28.05	1.22
Swimming	24.39	32.93	18.29	24.39	0.00
Picnicking or Sightseeing	6.10	52.44	24.39	17.07	0.00
Birdwatching	58.54	23.17	8.54	9.76	0.00
Motorized Boating	58.54	20.73	13.41	7.32	0.00
Fishing	57.32	26.83	8.54	7.32	0.00
Hunting	84.15	2.44	6.10	7.32	0.00
Bicycling	62.19	21.95	8.54	6.10	1.22
Snowmobiling	79.27	9.76	4.88	6.10	0.00
Cross-Country Skiing	73.17	18.29	4.88	3.66	0.00
Camping	51.22	41.46	3.66	3.66	0.00
Non-motorized Boating	51.22	37.80	9.76	1.22	0.00
Use Motorized Trail Bikes or	92.68	4.88	1.22	1.22	0.00

* This table corresponds with questions 10a-10m in the survey instrument.

Table XI.

Types of Outdoor Activities Recreational Resident Respondents Engage in and How Often*

	Times a Month				
Recreational Activity	Never %	1-2 %	3-6 %	more than 6 %	NA %
Hiking, Walking, or Running	7.28	18.54	23.84	49.01	1.32
Bicycling	43.71	14.57	14.57	23.84	3.31
Birdwatching	37.09	27.15	11.26	23.18	1.32
Swimming	25.16	35.10	18.54	19.20	1.99
Picnicking or Sightseeing	8.61	51.65	19.20	17.88	2.65
Non-motorized Boating	40.40	26.49	15.23	15.23	2.65
Cross-country Skiing	44.37	24.50	15.23	13.91	1.99
Camping	42.38	46.36	3.97	5.30	1.99
Motorized Boating	63.58	23.84	7.95	3.31	1.32
Fishing	66.22	22.52	5.30	3.31	2.65
Hunting	88.08	3.97	3.31	3.31	1.32
Snowmobiling	91.39	3.97	1.99	1.32	1.32
Use Motorized Trail Bikes or	97.35	0.66	0.00	0.00	1.99

* This table corresponds with questions 10a-10m in the survey instrument.

Table XII.
Percent of Respondents Who Use the Androscoggin River or Any of its Adjacent Lands for Any Recreational Activities*

	Use	Don't Use	NA
Random Residents	25.61	74.39	0.00
Recreational Residents	39.73	58.28	1.99

* This table corresponds to question 12 in the survey instrument.

Table XIII.
Percent of Respondents That Do Not Use the River or its Surrounding Area But Would Consider Doing So if The Amount of Public Land Was Increased And/Or The Area Had More Boat Launches and a More Extensive Trail System*

	Would Use	Would Still Not Use	NA	DNA**
Random Residents	43.90	21.95	8.54	25.61
Recreational Residents	41.72	13.91	5.30	39.73

* This table corresponds to question 12B in the survey instrument.
** In Tables XIII-XV, DNA indicates that the question does not apply to the particular respondent.

Table XIV.
Types of Outdoor Activities Random Resident Respondents Engage in On or Near the Androscoggin River and How Often*

	Times a Month					
Recreational Activity	Never %	1-2 %	3-6 %	more than 6 %	NA %	DNA %
Picnicking or Sightseeing	6.10	18.29	1.22	1.22	0.00	73.17
Fishing	15.85	8.54	1.22	1.22	0.00	73.17
Birdwatching	17.07	6.10	2.44	1.22	0.00	73.17
Motorized Boating	17.07	7.32	1.22	1.22	0.00	73.17
Snowmobiling	20.73	2.44	2.44	1.22	0.00	73.17
Hunting	21.95	2.44	1.22	1.22	0.00	73.17
Hiking, Walking, or Running	9.76	12.19	3.66	0.00	1.22	73.17
Bicycling	19.51	6.10	1.22	0.00	0.00	73.17
Camping	20.73	4.88	1.22	0.00	0.00	73.17
Use Motorized Trail Bikes or	21.95	2.44	1.22	0.00	0.00	73.17
Swimming	24.39	1.22	1.22	0.00	0.00	73.17
Non-motorized Boating	14.63	12.19	0.00	0.00	0.00	73.17
Cross-Country Skiing	73.17	24.39	0.00	0.00	0.00	73.17

* This table corresponds to questions 13a-13m in the Survey instrument.

Table XV
Types of Outdoor Activities Recreational Resident Respondents Engage in On or Near the Androscoggin River and How Often*

	Times a Month					
Recreational Activity	Never %	1-2 %	3-6 %	more than 6 %	NA %	DNA %
Hiking, Walking, or Running	7.95	17.88	6.62	6.62	1.32	59.60
Non-motorized Boating	15.23	18.54	0.66	3.97	1.99	59.60
Birdwatching	19.87	11.92	2.65	3.97	1.99	59.60
Bicycling	20.53	8.61	5.30	3.97	1.99	59.60
Cross-Country Skiing	20.53	12.58	2.65	3.31	1.32	59.60
Picnicking or Sightseeing	21.19	11.92	2.65	3.31	1.32	59.60
Hunting	34.44	2.65	0.66	1.32	1.32	59.60
Fishing	31.79	5.30	0.66	0.66	1.99	59.60
Snowmobiling	37.09	0.66	0.66	0.66	1.32	59.60
Motorized Boating	33.77	4.63	0.66	0.00	1.32	59.60
Camping	33.77	5.30	0.00	0.00	1.32	59.60
Swimming	37.09	1.99	0.00	0.00	1.32	59.60
Use Motorized Trail Bikes or ATVs	39.07	0.00	0.00	0.00	1.32	59.60

* This table corresponds to questions 13a-13m in the survey instrument.

Table XVI.
Sex Distribution of Respondents*

	Male %	Female %	NA %
Random Resident	56.10	42.68	1.22
Recreational Resident	54.30	45.03	0.66

* This table corresponds with question 20 in the survey instrument.

Table XVII.
Respondent Income Distribution*

	In Thousands of Dollars						
	less than 15 %	15-29.9 %	30-44.9 %	45-59.9 %	60-74.9 %	75 or more %	NA %
Random Resident	13.41	23.17	25.61	17.07	9.76	4.88	6.10
Recreational Resident	5.96	14.57	23.84	17.22	14.57	23.18	0.66

* This table corresponds with question 19 in the survey instrument

Table XVIII.
Age Distribution of Respondents*

	16-25 %	26-40 %	41-50 %	51-65 %	>65 %
Random Resident	3 66	37 80	24 39	21 95	12.19
Recreational Resident	3 31	23 84	33 11	17 22	22 52

* This table corresponds with question 21 in the survey instrument.

Table XIX.
Number of Children Under 18 Living With Respondent*

	Children				
	0 %	1 %	2 %	3 %	4 %
Random Resident	63.41	18.29	14.63	3.66	0.00
Recreational Resident	65.56	10.60	17 88	4 63	1.32

* This table corresponds with question 22 in the survey instrument.

Table XX.
Percent of Respondents That Belong To Any Organized Recreation or Conservation Group*

	Member %	Not A Member %
Random Resident	10.97	89.02
Recreational Resident	79.47	20.53

* This table corresponds with question 23 in the survey instrument.

Table XXI.
Respondent Education*

	Highest Level of Education					
	Less Than High School %	Some High School %	Completed High School %	Some College %	Completed College %	Graduate Degree %
Random Resident	3.66	0.00	37.80	28.05	21.95	8.54
Recreational Resident	0.00	0.00	6.62	16.56	33.77	43.05

* This table corresponds with question 25 in the survey instrument.

Table XXII.
Respondents Mean Willingness To Pay for development of the undeveloped State owned land on the Turner side of the Androscoggin River (about 2,000 acres) to include such things as a trail system, picnic and camping spots and fishing and snowmobiling access*

	Random Resident	Recreational Resident
Mean WTP	$9 51	$17 48

* This table corresponds to question 15 in the survey instrument.

Table XXIII.
Reason for Placing a Limit on Willingness to Pay Value*

	Random Resident %	Recreational Resident %
It is more than I can afford	30 49	17 22
Open space is not that valuable to me	7 32	3.31
I should not have to pay for open space	23.17	9 61
Other	18.29	22.52
NA	8.54	10 60
DNA	12.19	37 75

* This table corresponds with question 16 in the survey instrument.

Table XXIV.
Respondents' Mean Willingness To Pay for the public to purchase 600 more acres of undeveloped land which is adjacent to the State owned land in Turner*

	Random Resident	Recreational Resident
Mean WTP	$7.22	$15.91

* This table corresponds to question 17 in the survey instrument.

Table XXIV.
Reason for Placing a Limit on Willingness to Pay Value*

	Random Resident %	Recreational Resident %
It is more than I can afford	29.27	11.26
Open space is not that valuable to me	9.76	4.63
I should not have to pay for open space	18.29	6.62
Other	23.17	23.84
NA	7.32	11.26
DNA	12.19	33.11

* This table corresponds to question 18 in the survey instrument.

ANDROSCOGGIN LAND TRUST
INCORPORATED

EXHIBIT F

Fall 1995

Calendar

Saturday, October 21, 10:00-4:00 Open House at Deer Rips Dam, Auburn. (At the end of Deer Rips Road, one mile north of the intersection of Stetson and North River Roads)

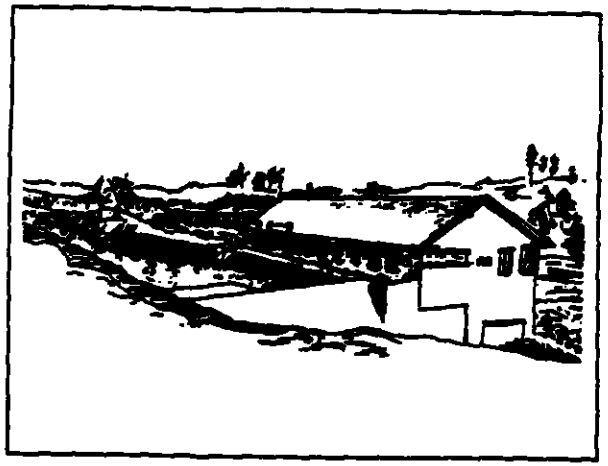
Thursday, October 26, 8:30-10:30 a.m. AVCOG. Clean Water Team meeting. For information, call Ron Dyer, 287-2811.

Thursday, October 26, 7:00-9:00 p.m. CMTC. Joint meeting of the Lewiston and Auburn Planning Boards for presentation of the Lewiston-Auburn Comprehensive Transportation Study (LACTS) Bicycle and Pedestrian Plan for the region. For information, call John Burke, LACTS, 784-3852.

Saturday, November 4, CMP offices, Augusta. 1995 Annual Maine Coast Heritage Trust Conference, "Land Conservation through Partnerships." For information, call Rupert Nelly, MCHT, 729-7366.

Wednesday, November 8, 6:00 p.m. Skelton, Taintor & Abbott. Androscoggin Greenways Steering Committee meeting. For information, call 784-0955.

Tuesday, November 14, 7:00 p.m. Androscoggin Land Trust Board meeting. For information, call 783-1074.



Deer Rips Powerhouse 1904

It takes no eye of prophecy or ear of imagination to fancy the day when the buzz of the dynamos will drown the music of Old Deer Rips and the tide diverted by this dam will be harnessed to the work of turning the wheels of the electric-cities of Lewiston and Auburn.
Lewiston Journal, October 1902

Open House at Deer Rips Dam

When W. S. Libbey and Henry Dingley built Auburn's Deer Rips dam in 1902-1904, the project captivated the public with its boldness. It was a story of pioneers in water power development, speculative and secret land acquisitions along the river, corporate mergers and aggressive product marketing. The project was the largest hydropower development in New England. Twenty five years later, Gulf Island dam-- a mile to the north-- dwarfed its output. Deer Rips, just two and a half miles above the Great Falls, became a secluded spot from which area residents could explore the river, fish (rumors of large trout brought fishermen to its canal this past summer), view the islands to the north, the river flows over the dam and the rapids below, and maybe even take a personal tour of the powerhouse in the company of the station's operator. About ten years ago, CMP, which acquired ownership of the dam in 1920, installed a gate on the access road to keep out "unauthorized persons." Now, nearly 100 years after its creation, Deer Rips is about to exhibit two hallmarks of the 21st century-- CMP plans to automate the station, controlling flows with a computerized dispatch system based at Gulf Island dam and CMP will install a security fence around the site. Deer Rips had been an anomaly--the only unfenced hydropower facility in the system.

For the past year and a half the Androscoggin Land Trust has been working with CMP to create the public access that residents had enjoyed previously. We are pleased that we have been able to find a way to accomplish that and at the same time address the concern of neighbors that unwelcome activity could occur if Deer Rips became a public park. On certain days during the year--to take advantage of the changes in seasons-- the gates will be open, the area staffed, and people welcomed to explore CMP's grounds and facilities. By appointment with CMP, groups can visit the area at other times. In addition, with the installation of the security fence, CMP will clear a canoe portage trail next to the fence for the intrepid canoeists who want to navigate the river, including its rapids.

The first Open House will take place on October 21 through the efforts of a committee that has worked all summer gathering anecdotes, warranty deeds, photographs, newspaper articles, and other information, melded this with their own knowledge of the area, and suggested ways to combine the fun of exploration with appreciation of the area's historical and natural resources. Thanks to: Walter Sargent, Jim Sargent, Joe Maloney, Claire Hackett, Carol Sargent, Bud Newell, Julie Isbill, Steve Drane and Nancy LeCompte. Using the information they gathered, Lisa Giguere has written a brochure on the history of the site.

For the future, look for a kiosk with information about the site, other brochures, and maybe even costumed historical figures wandering through the grounds during an open house.

On October 21:

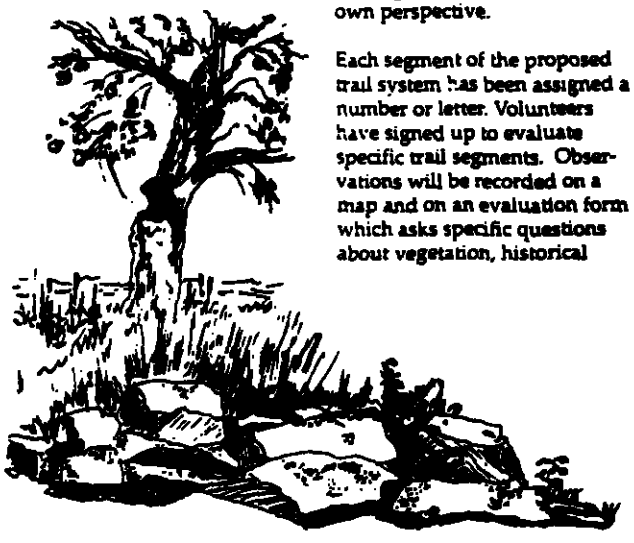
- Tours of the historic powerhouse and associated facilities led by CMP engineers.
- Edible plant identification walks led by Steve Drane, herbalist and specialist in plants used by Native Americans.
- Native American storytelling for children and adults led by Nancy LeCompte of the Dawnland Alliance.
- Picnic tables available.

President's Column

As individuals we have all asked ourselves at one time or another what we are doing with our lives. So, too, it is with organizations. The Androscoggin Land Trust has been a nonprofit tax exempt organizations since April 1991. Last spring, the Board decided that it was time to reevaluate our goals and set a direction for the next few years. Under the guidance of Nancy Coverstone, Extension education specialist, we met on several Saturday mornings and happily discovered both that we shared goals and that they were the goals adopted when the organization was founded nearly six years ago although the Board has changed in that time: To preserve significant lands for the present and future benefit of the people of Androscoggin County, to promote public understanding of the region's lands and natural resources, and to assist communities in balancing growth with preservation. To carry out these goals we are forming two committees, lands and membership/events/fund-raising. Each of these committees will develop a three year work plan to be presented to the Board in the near future. We will be asking members to join us on these committees. Then we will turn to the many people who have offered to help in some way and look for niches for each one. With these steps and others, we are ensuring that we are--as every land trust should be-- a permanent and responsible force for land conservation.

nies arising from use of unimproved lands and from buildings, roads, structures and waters 6 The immunity extends to landowners who charge a fee as long as the premises are not used primarily for commercial recreation and the user is not given an exclusive right to recreate on the premises 7 Landowners who are found immune may recover attorneys' fees from the claimant. The immunity does not cover 1 a landowner who causes injury due to willful or malicious failure to guard or warn against a dangerous condition 2. a landowner who charges a fee for commercial recreation and 3. landowners who are public entities.

adapted from remarks of Jeff Pidot, September 16, 1995



Androscoggin Riverlands: Trail Opportuniti

During the summer and continuing this fall the Androscoggin Land Trust and a group of volunteers have been evaluating the trail potential of the 2000 acres of state land in Turner.

After the land was purchased by the Land for Maine's Future Board in 1990, Bureau of Parks and Recreation staff laid out a proposed trail system. It is that system that we have been evaluating The ALT, through Gary Stellpflug and Julie Isbill, has been spearheading the evaluation in terms of hiking and cross-country skiing. Other user groups (mountain bicyclists, horseback riders, ATV riders and snowmobilers) have been invited to join us, using the same evaluation system but looking at the land from their own perspective.

Each segment of the proposed trail system has been assigned a number or letter. Volunteers have signed up to evaluate specific trail segments. Observations will be recorded on a map and on an evaluation form which asks specific questions about vegetation, historical artifacts, views etc The gathered information will be given to the Bureau of Parks and Recreation.

On July 8, people interested in participating in the evaluation met on the site to go over the process, get oriented to the site and brush up on some basic compass skills. Other than the main access trail, few trails currently exist. So it is a challenging task to bushwhack through the often dense vegetation to locate the proposed trails on the map. For that reason, the evaluating will continue through the fall to take advantage of cooler temperatures and fewer leaves. Once the field work is completed by Thanksgiving, all of the volunteer evaluators will convene to work out trail recommendations to the Bureau of Parks and Recreation.

Gary Stellpflug, with the assistance of Gen Pence and Jen Robitaille, who were then seniors at Oak Hill High School, began the trail evaluation last spring. Equipped with a map and compass, they explored the northern third of the property, finding cellar holes and stone walls, bewildering forests and rocky outcroppings. On June 28, Jen and Gen presented their work to the Greenways committee and others, using slides and a map they created. We have been inspired by their example and have taken up where they left off. If you are interested in participating, there is still work for you. Please call Gary Stellpflug at 388-2287, or Julie Isbill at 725-5028.

Trail evaluating is not the only activity taking place on the state land. No one can travel the main access road without encountering serious erosion caused by four wheel drive vehicles. In mid September the Bureau presented its ideas for addressing this situation at a meeting in the Turner Town office. With the $46,000 left in management funds from the Land for Maine's Future Board, the Bureau plans to: (1) make the first mile of road (to the second gate) passable to four wheel drive vehicles during non-mud season, primarily for hunters; (2) build one bridge and several rock fords ; (3) control erosion to the extent possible on the road from the second gate south; (4) install more boulders to deter unwanted vehicular use; (5) install signs that list allowed uses and increase enforcement against unauthorized uses; (6) reserve a few thousand dollars to continue the trail development work. When all the work is complete, it will be up to those who use and care for the future of the land to work with the state to prevent unauthorized use.

and Issues

Briefs: Our members and activities

Treasurer Lisa Dahlbeck attended a course sponsored by the Maine Association of Nonprofits on new federal accounting procedures for non-profits. She also participated in a discussion sponsored by Extension on developing educational programs on creating wildlife habitat.

Board member Ken Morrison offered advice and information to teachers on the possible role of land trusts in land use planning and wetlands conservation during a course offered by the Natural Resources Conservation Agency.

In June Greenways Committee member Bob Faunce spoke at a regional EPA conference in Boston, "The Right Route: Pollution Prevention and Transportation Planning in New England," on our Androscoggin Greenways project. Bob also represents Androscoggin Greenways on the transportation subcommittee for Lewiston's new Comprehensive Plan.

Greenways committee member and attorney Harold Skelton led a workshop on waivers and releases at the public access liability conference at Bates College.

Bonnie Lounsbury, President of the ALT, introduced the corporators of the Auburn library to Androscoggin Greenways through a slide show and comments at the Auburn Library Annual Meeting in September.

Vice President Jan Wiegman attended a County Colloquium for Androscoggin -Sagadahoc Extension to discuss ways that Extension personnel and organizations concerned with the protection of natural resources can share ideas, needs and approaches to natural resources management.

Jim Lysen, Lewiston s Planning Director, Jim McPhee, Auburn's Planning Director, and Bonnie Lounsbury led a tour of the downtown Lewiston-Auburn railroad area during the Great Falls Balloon Festival. Bonnie later led a tour for members of the Women s Literary Union Garden Club.

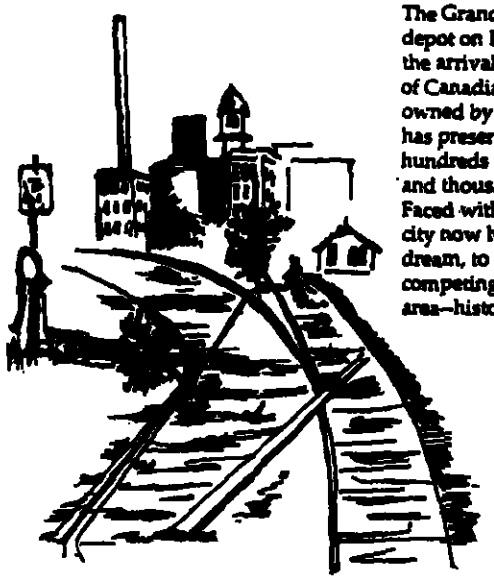
The ALT and The Department of Environmental Protection's Pollution Prevention Project (known locally as the Clean Water Team) cosponsored a canoe outing on Gulf Island Pond on August 19, featuring ideal weather and a picnic on one of CMP's islands.

Carrie Marsh of the Conservation Fund, toured downtown Lewiston-Auburn in mid-September and proclaimed our Androscoggin Greenways efforts one of the best projects she had seen in New England.

Joe Downey, Auburn's assessor, spoke at a recent joint meeting of the ALT and the Androscoggin Greenways committee to explain assessment of conservation land.

L & A Railroad Serves Downtown L-A Again

The last passenger train left the Grant Trunk depot on Lincoln Street in Lewiston 40 years ago, but the L & A Railroad land downtown is the hub of a new transportation system— for pedestrians and bicyclists. In November of 1994, the 1909 railroad bridge opened to pedestrians and bicyclists, the first such railroad bridge conversion in the state. Not only has it proved a model for local cooperation in design, but it has attracted hundreds of people. On a recent day, more than 300 crossed the bridge from dawn to dusk, many of them commuting to work. The success of the project—praised by both the Maine Department of Transportation which funded it through ISTEA monies (federal funds to promote projects that contribute to improving air quality and offer an alterative to highway building) and the Federal Highway Administration— has convinced MDOT to fund two additional projects that continue downtown redevelopment. MDOT has awarded Lewiston $345,000 ($69,000 of local match) to build a downtown riverfront trail from the bridge to Heritage Park, through the L & A Railroad Park, to the abandoned Maine Central line on Lincoln Street, and, if monies permit, along the railroad line to Gully Brook, through the park along the river to Porvin Park , and from there through Little Canada to the Maine Central line. MDOT has awarded Auburn $190,000 to continue the railroad trail from the bridge through Rodney Bonney Park, under Main Street, by Moulton Field to the Lower Barker Mill Dam, and eventually to Washington Street. This route following the L& A Railroad line is the central feature of the new LACTS Bicycle and Pedestrian Plan for Lewiston-Auburn, prepared by the Cities of the Androscoggin Bicycle and Pedestrian Advisory Committee, LACTS and Jane Lafleur as consultant. (The ALT has served on CABPAC since it formation in early 1993.) It is also the downtown focus of the trail system in the Androscoggin Greenways project.



Lewiston has just issued a request for proposals to design the riverfront system and, at the same time, to create a master plan for the L&A Railroad Park. The six acres of L& A Railroad land in Lewiston adjacent to the bridge is flat, open space with canals on the perimeter. Two years ago the city demolished the only remaining building of historic value—the Armour Meat Packing plant— and simultaneously removed most of the curved sidings which filled the area at the turn of the century. Fortunately, the most important building associated with the railroad still remains—albeit on private land. The Grand Trunk passenger depot on Lincoln Street was the arrival point for thousands of Canadian immigrants. It is owned by John Schott, who has preserved it through hundreds of hours of work and thousands of dollars. Faced with a clean slate, the city now has an opportunity to dream, to study the many competing interests in the area--historic railroad park, gateway to the Mill district, recreation area--, and to develop a public space that will benefit the city, complement Auburn's Bonney Park and enhance the area as a whole. The ALT has helped the city to develop the RFP and will remain involved.

Auburn's segment of the L&A Railroad line also traverses city park land. On the west side of Main Street, the railroad forms the southern boundary of Moulton Field, a bowl at the base of Great Falls School. This area, until 1947 the site of Roak's Greenhouses, has been a city recreation area for many years, little used and plagued by drainage problems and vandalism. That is changing. Several months ago the Parks and Recreation Department built a skateboard area at the far end of the field. Last year students in the regional high school gifted and talented program, under the direction of the ALT, created a master plan for Moulton Park. In addition to the skateboard area, they proposed an amphitheater notched in the hillside, picnic tables, scenic overlooks to the Little Androscoggin on the other side of the railroad track, an outdoor ice skating rink in winter, and various other amenities. With funding to build the railroad trail, some of these student ideas can be implemented. Once a trail with its downtown hidden gem--the Lower Barker Mill Dam-- opens, people will be able to enjoy the area once more. The ALT will remain actively involved in this project as well.

The L&A Railroad began in 1872 as a project to promote downtown business development. Local businessmen and politicians exhorted the community to support the construction of a 5.4 mile branch line to connect to the Grand Trunk at Danville in order to avoid Maine Central's tariffs for downtown service. Voters complied and the two cities came to own a railroad company governed by a board representing both. The L&A Railroad still owns the real estate. And, with local support for a new direction, the L&A Railroad land will once again foster downtown revitalization.

River Clean Up

As autumn leaves gather in the inlets of the Androscoggin River, it seems premature to anticipate the debris that spring runoff will deposit on the shore. But that is just what one student is doing. Jess Kemper, a member of the Androscoggin Greenways Committee and a senior at Lewiston High School, has already begun to organize a river clean up for National River Clean up Week, May 11-18, 1996. Under her enthusiastic direction last May, students from Leavitt Area High School, St. Dom's, Boy Scout Troop 116 and a few hardworking families collected rusted metal and other trash from Switzerland Road in Lewiston, West Pitch Park in Auburn and the bank of the Mill Pond behind the L.L. Bean parking lot in Lewiston. The Lewiston and Auburn Public Works Departments disposed of the trash. At the same time and with Jess' advice, Boy Scout Troop 150 in Leeds also collected trash from River Road in bags donated by the town.

For next year, Jess hopes the effort will grow geographically from Lisbon to Twin Bridges. She is looking for: Suggestions on locations for clean up (accessible spots that collect trash) and organizations and individuals willing to participate as organizers, supervisors, trash collectors. Please call her if you can help, at 783-0415.

Call 784-0955 or write P. O. Box 3145, Auburn, ME 04212 for a copy of the Androscoggin Greenways vision map.

The student Moulton Park plan and 3-d model are available in the offices of the Auburn School Department.

Thanks to Larry Gordon, Edward Little teacher, and students in the Edward Little Graphic Arts Department who printed this newsletter.

P O Box 3145, Auburn, Maine 04212

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The Androscoggin Land Trust, a nonprofit organization working to preserve significant lands for the people of Androscoggin County

Androscoggin Greenways, our effort to establish open space corridors, particularly along the Androscoggin River, linking Lewiston, Auburn and nearby river communities.

We need your support. Please become a member.
cut here----------

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I WOULD LIKE TO BECOME A MEMBER

Name_____
Street_____
Town _____ State _____ Zipcode _____
Telephone_____ Best time to call _____

Individual....$15 [ ]
Family.....$25 [ ]
Supporting...$50 [ ]
Sustaining....$100 [ ]
Other.....$_____

I would like to help with:
Community relations and education [ ]
Events.....[ ]
Land stewardship.....[ ]
Membership.....[ ]
Androscoggin Greenways...[ ]

Please mail this form to P.O. Box 3145 Auburn, Maine 04212

RESPONSE TO COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

95 FEB 21 PM 2:03

February 20, 1995.

OFFICE OF THE
REGIONAL ADMINISTRATOR

Lois D. Cashell, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

re: Relicensing the Gulf Island-Deer Rips Hydroelectric Project (FERC No. 2283-005) and Licensing the Marcal Hydroelectric Project (FERC No. 11482-000) -- Lower Androscoggin River Basin, Maine

Dear Ms. Cashell:

The Environmental Protection Agency - New England Region, in accordance with our responsibilities under the National Environmental Policy Act (NEPA), §309 of the Clean Air Act, and §404 of the Clean Water Act has reviewed the draft Environmental Impact Statement (DEIS) prepared by the Federal Energy Regulatory Commission (FERC) for the Lower Androscoggin river basin in Maine. The DEIS considers the environmental impacts from the relicensing of the Gulf Island-Deer Rips hydroelectric project and licensing of the Marcal hydroelectric project. EPA is an intervenor for both the Marcal project and the Gulf Island-Deer Rips project.

EPA's specific comments on the DEIS and the proposed projects follow.

Water Quality

EPA-1- The reach of the Androscoggin River encompassing Gulf Island Pond is cited on Maine's 303(d) list (a list of state waters not attaining water quality standards) because of dioxin contamination and low dissolved oxygen levels. Additionally, there is a consumption advisory for fish caught in this reach of the river due to elevated levels of dioxin in fish tissue.

EPA-2- According to the DEIS, FERC staff concurs with EPA's recommendation that the facility owner, Central Maine Power (CMP), be required to study a range of alternatives to oxygen injection to address the low dissolved oxygen levels in the Gulf Island impoundment. These study alternatives should include sediment containment or removal, alternative wastewater treatment, and changes in the operation of the Gulf Island project. FERC staff and EPA also recommend CMP conduct these investigations in concert with the three pulp and

EPA-1- Comment noted.

EPA-2- We continue to disagree with EPA's characterization that the GIPOP program is a temporary solution. Nevertheless, in Section 4.2.1.1., we recommend that Central Maine develop an alternatives study plan in cooperation with Boise-Cascade, James River, and International Paper. We stated that developing such a plan may help to reach EPA's long-term water quality goals. While we agree that this plan should be developed, we disagree with EPA's statement indicating that the plan should include specific remedial measures. We certainly agree that the measures identified by EPA may be possible solutions, but likely not the only solutions. The specific alternatives to be studied should be determined during Central Maine's consultations with EPA, MDEP, and other pertinent entities.

paper mills that discharge wastewater to the Androscoggin River. CMP would be required to implement the study recommendations.

EPA–3- The DEIS does not include a determination as to whether EPA's recommended schedule for preparation of this analysis will be made a requirement of CMP's license. As EPA has recommended in a previous correspondence with FERC (April 25, 1995 letter, Ronald G. Manfredonia to Lois D. Cashell), the license for the Gulf Island facility should include a requirement for CMP to prepare an alternatives study plan in consultation with EPA and the mills by March 31, 1998; the results of the study should be reported to FERC and EPA by March 31, 1999. These dates should be included in any FERC license issued to CMP for the Gulf Island-Deer Rips project to assure that the alternatives analysis is scoped appropriately and in a timely manner to meet the deadlines stipulated by the mill's National Pollutant Discharge Elimination System (NPDES) permit renewal schedules. Moreover, as NPDES permits are reissued every five years, EPA recommends that the final EIS prepared for this project, and any license issued by FERC for these projects, require CMP to work with the mills to update the alternatives analysis at each NPDES permit renewal stage. This condition would be enforced unless EPA notifies CMP and the mills that further alternatives analyses are no longer necessary.

EPA–4- EPA's recommendation (letter dated April 25, 1995) that the FERC operating license for Gulf Island-Deer Rips contain a specific reopener to facilitate incorporation of alternative operational measures was based on our concern that the preferred alternative operations be implemented in the most expeditious manner possible. EPA recommends the FEIS differentiate between the authorities and provisions of a specific reopener and the standard articles included in any license. EPA is particularly interested in differences in the procedural steps and the length of time required to effect a change in the license conditions.

Minimum Flow Releases

Gulf Island-Deer Rips

EPA–5- EPA supports the recommendations of the U.S. Fish and Wildlife Service on issues involving operating regimes and flows necessary to support fishery management goals downstream of the project (EPA December 22, 1993 Comments and Recommendations letter on the Gulf Island-Deer Rips Project - R. Manfredonia to L. Cashell).[1] The DEIS states incorrectly (page 2-36) that EPA did not provide specific comments on this issue. The FEIS should include a

[1] Fish and Wildlife Service flow recommendations for the Gulf Island - Deer Rips project are run of river for the period of May 1 to June 15 and 1700 cubic feet per second (cfs) for the period of June 15 to April 30.

EPA–3- We agree. In Section 5.4.1., we recommend that Central Maine develop and implement an alternatives study plan in accordance with EPA's April 28, 1995, letter. Therefore, we believe that our recommendation contained in the DEIS incorporates EPA's recommended schedule for preparation of a plan to study alternatives to the GIPOP facility by reference. Furthermore, we will recommend that the schedule for preparation identified by EPA be included in any license issued for Gulf Island-Deer Rips.

EPA–4- We recognize EPA's concern relative to a re-opener clause to facilitate incorporation of alternative operational measures in the most expeditious manner possible. Standard re-openers and specific re-openers provide a mechanism for federal and state fish and wildlife agencies, as well as any other public entity, to petition the Commission to investigate a particular issue at some point in the future. Moreover, there are no procedural differences between either type of re-opener; both require notice and an opportunity for a hearing. Because the process is the same for both types of re-openers, we see no cause for including a specific re-opener in any license for Gulf Island-Deer Rips. However, to address future DO enhancement measures at the project, we recommend, not only the preparation of an alternatives study plan, but the inclusion of standard language reserving the Commission's authority to require operational changes and/or other environmental enhancements at the project.

EPA–5- Comment noted. See revised text in Section 2.3.1.2. and Table 2-3.

statement that EPA supports the flow recommendations of USFWS.[2]

Marcal Project

EPA--6- Current baseline conditions do not include a minimum flow below Marcal. EPA supports CMP's proposal to provide year around minimum flow of 56 cfs, or inflow, whichever is less.

Wetlands

EPA--7- EPA's earlier comment letters to FERC on these projects stated our concerns about the impact water level fluctuations have on wetlands within the impoundments. EPA recommended that the impoundment fluctuations be limited to one foot throughout the year. FERC staff recommends that impoundment drawdown be limited to one foot between May 1 and June 30 and no more than four feet below normal full pond level. While FERC staff recommendations would provide greater benefit for wetlands than the current impoundment operations, EPA continues to support moderation of the impoundment water level fluctuations to better protect the impoundment wetland systems.

EPA--8- Thank you for the opportunity to review and comment on the Lower Androscoggin River Basin DEIS. Consistent with our national rating system, an explanation of which is attached, we have rated this project "Environmental Concerns - Insufficient Information" (EC-2). Please contact Steven John (617/565-3426) of my Office of Environmental Review if you have any questions about our comments on the draft.

Sincerely,

John P. DeVillars
Regional Administrator

cc: Service List

[2] For example, Tables 2-1 and 2-3 should be modified to reflect EPA's support of run of river flows from May 1 - June 15 and 1700 cfs from June 16 - April 30.

EPA--6- Consolidated Hydro is proposing a year-round project minimum flow of 56 cfs below Marcal, not CMP, or Central Maine.

EPA--7- We assume that EPA's comment refers to proposed and recommended operational changes at Gulf Island-Deer Rips. We are recommending that Marcal be operating with a one-foot impoundment fluctuation limit from May 1 through October 15 and two feet from October 16 through April 30. Our recommended operational changes at Marcal would moderate impoundment fluctuations at the project, and provide benefits to aquatic habitat and wetlands in the project impoundment.

EPA--8- On the basis of our responses to the comments above, we believe that EPA's concerns have been addressed, and that no further analysis is required.

The following page contains an attachment to the comment letter. No responses are required.

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION

Environmental Impact of the Action

LO--Lack of Objections
The EPA review has not identified any potential impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC--Environmental Concerns
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO--Environmental Objections
The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate
EPA believes that draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3--Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

STATE OF MAINE

DEPARTMENT OF ENVIRONMENTAL PROTECTION

[illegible] GOVERNOR

[illegible] COMMISSIONER

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[illegible] SSION

COMMENTS

February 21, 1996

Lois D. Cashell, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: LOWER ANDROSCOGGIN RIVER BASIN DEIS CC5
Gulf Island-Deer Rips Project, FERC No. 2283
Marcal Project, FERC No. 11482

Dear Secretary Cashell:

The Maine Department of Environmental Protection has reviewed the Draft Environmental Impact Statement (DEIS) prepared by the FERC staff with respect to the proposed relicensing of the Gulf Island-Deer Rips Hydro Project (FERC No. 2283) and the licensing of the Marcal Hydro Project (FERC No. 11482) located in the Lower Androscoggin River Basin in Maine (FERC/DEIS - 0100, dated December 1995).

We have the following comments on the DEIS (our comments are presented in order by page number).

MDEP--1- Page 1-12

Table 1-2 on page 1-12 is a list of the existing hydropower projects in the Androscoggin River Basin. The last project on the list, the Yarmouth Project (FERC No. 8417) is located on the Royal River, which is not part of the Androscoggin River Basin.

MDEP--2- Page 2-2

Figure 2-1 on page 2-2 shows the location of the Gulf Island-Deer Rips, Marcal and other hydro projects in the Androscoggin Basin. The Biscoe Fall Project (FERC No. 8411), located on the Little Androscoggin River upstream from the Marcal Project, is missing from the map.

Serving Maine People & Protecting Their Environment

RESPONSE TO COMMENTS

MDEP--1- The Yarmouth Project (P-8417) has been removed from Table 1-2. See revised table in Section 1.4.4.

MDEP--2- The Biscoe Falls Project on the Little Androscoggin River is a license exemption (FERC No. 9411), and has been added to Figure 2-1. See revised basin map in Section 2.1.1.1.

MDEP--3- Page 2-14

On page 2-14, the DEIS correctly states that Central Maine Power's request for water quality certification for the Gulf Island-Deer Rips Project is pending before the DEP. This request was last withdrawn and refiled by CMP on November 16, 1995. We currently plan to act on CMP's request for certification on or before the certification waiver deadline of November 16, 1996.

MDEP--3- We have modified the text in Section 2.3.1.1. to include the November 16, 1995, withdrawal and refiling date, and a discussion relative to the forum in which we anticipate addressing the Section 401 conditions.

MDEP--4- Page 2-21

In summarizing the comments of various interested parties, the DEIS states on page 2-21 that Trout Unlimited has recommended that FERC require a minimum flow of at least 1,700 cfs from the Gulf Island-Deer Rips Project to the Androscoggin River downstream. In a footnote commenting on this recommendation, the DEIS states that "Inflow to the headpond of Gulf Island does not fall below 1,950 cfs, therefore, a discharge of 1,700 cfs would never exceed inflow."

We believe that the footnote is incorrect. As correctly explained on page 2-5 of the DEIS, Union Water Power Company attempts to maintain a target flow from storage of between 1,550 and 2,500 cfs at Berlin, New Hampshire, in accordance with a 1909 Headwater Benefits Agreement. A flow of 1,550 cfs at Berlin equates to a flow of about 2,000 cfs at Gulf Island-Deer Rips.

However, the minimum flow of 1,550 cfs is a target only, and is maintained only if there is sufficient water in storage. During 1995, for example, spring run-off was low and the summer was hot and very dry, resulting in weekly average flows at Berlin approaching 1,300 cfs in September. At the same time, the flow at Gulf Island-Deer Rips was less than 1,300 cfs, with the river actually losing water between Berlin and Gulf Island due to evaporation, lack of surface and ground water recharge, and consumptive uses. Therefore, it is obvious that inflow to the Gulf Island headpond does fall below 1,950 cfs, albeit infrequently.

MDEP--4- The footnote relating to TU *et al.*'s recommended minimum flow of 1,700 cfs on a year-round basis was derived from their December 27, 1993, letter providing terms and conditions for the Gulf Island-Deer Rips Project. We appreciate the clarification that this statement is not entirely accurate. We have amended the footnote in question accordingly, and have revised Section 2.1.1.2. to more accurately reflect inflow to Gulf Island-Deer Rips.

MDEP--5- Page 2-22

On page 2-22, the DEIS correctly states that Consolidated Hydro's request for water quality certification for the Marcal Project is pending before the DEP. This request was last withdrawn and refiled by CHI on May 24, 1995. We currently plan to act on CHI's request for certification on or before the certification waiver deadline of May 24, 1996.

MDEP--5- We have modified the text in Section 2.3.2.1. to include the May 24, 1995, withdrawal and refiling date, and a discussion relative to the forum in which we anticipate addressing the Section 401 conditions.

MDEP--6- Page 3-7

Table 3-1 on page 3-7 lists the point source discharges of waste water on the Androscoggin and Little Androscoggin Rivers. Included in the list is an industrial discharge from Pejepscot Paper Company in Topsham, ME. We wish to report that this discharge, which was from a paper mill adjacent to the Pejepscot Hydro Project (FERC No. 4784), has been discontinued and is no longer licensed by DEP.

MDEP--6- We have deleted the reference to the Pejebscot Paper Company's discharge from Table 3-1.

MDEP--7- Page 3-22

In discussing water quality in the Gulf Island impoundment, the DEIS notes that the operation of the GIPOP oxygenation facility has improved dissolved oxygen (DO) levels in the impoundment. On page 3-22, FERC states that "about 95% of the impoundment's volume of water is above 5.0 mg/l," which is the applicable Class C water quality standard.

While we agree that operation of GIPOP has greatly improved DO levels in the impoundment, we do not agree that 95% of the volume of the impoundment is consistently meeting Class C standards. Sampling data from the past four years indicates that attainment of standards has ranged from a high of 96% to a low of 84% of the impoundment. We are continuing to evaluate the available data, and believe that much of the non-compliance could be avoided if operation of GIPOP started earlier in the summer season. We will address the issue of compliance with DO standards in our certification action.

MDEP--7- We do not dispute the data from the last four years that indicates 84 percent to 96 percent of the Gulf Island impoundment is attaining state water quality standards for dissolved oxygen. Our intent was to generally characterize the benefits derived from the GIPOP facility. We recognize that our statement may have been misleading. Therefore, we have revised Sections 3.3.1.2. and 4.1.1.2. to include a more detailed characterization of the impoundment's attainment status.

Furthermore, we concur with the MDEP's conclusion regarding a potential timing change for the operation of the GIPOP facility. According to the evidence in the record (i.e., the 1993 monitoring results), we found that the majority of the violations occurred during the early summer period, or late June and early July. Therefore, we recommend that Central Maine, as part of our recommended water quality monitoring plan, consult with the MDEP and the other entities of the GIPOP partnership about changes to GIPOP's operating schedule. See the revised text in Section 4.1.1.2.

MDEP--8- Page 3-25

In a discussion of the fishery resources in the Gulf Island-Deer Rips area, the DEIS states on page 3-25 that the Gulf Island impoundment was designated for warm water fisheries management by the Maine Department of Inland Fisheries and Wildlife in 1982. However, we note that, since that time, improvements in water quality have resulted in DIF&W initiating a brown trout stocking program in the impoundment. Thus, it would be more accurate to say that the pond has mixed warm water and cold water fishery management goals. We also point out that, under Maine's water quality classification system, Class C waters--including Gulf Island Pond--shall be of sufficient quality to support all species of fish indigenous to the receiving water. Various salmonids, which are cold water species, have been demonstrated to be indigenous to Gulf Island Pond.

MDEP--8- See our revisions to Section 3.3.1.3.

MDEP--9- Page 5-29

Beginning on page 5-28, the DEIS lists the conditions that constitute the FERC staff's preferred option for the relicensing of the Gulf Island-Deer Rips Project. Two of the recommended fishery resources conditions listed on page 5-29 read as follows:

> Limit impoundment drawdowns in the Gulf Island impoundment to no more than 1 foot below normal full pond elevation from May 1 to June 30 and no more than 4 feet below normal full pond elevation from July 1 to April 30
>
> Provide a minimum flow of 1,700 cfs from May 1 to November 30 and 1,400 cfs from December 1 to April 30 for the enhancement of aquatic habitat below Gulf Island-Deer Rips and Lewiston Falls

Because DEP has not yet approved water quality certification for the Gulf Island-Deer Rips Project, we are not in a position to discuss what minimum flow releases may be necessary to meet water quality standards below Gulf Island. However, as we point out above (see comment above, Page 2-21), there is no guaranteed minimum inflow to Gulf Island, and inflow may fall below both 1,700 cfs and 1,400 cfs. As a result, imposition of the second condition cited above, which requires minimum flows without regard to inflows, will result in impoundment drawdowns of more than 1 foot from May 1 to June 30 and more than 4 feet from July 1 to April 30, thus violating the first condition cited above. We suggest that, if restrictions on impoundment drawdowns remain a part of any recommended relicensing conditions, any required minimum flows should be stated as "x minimum flow, or inflow to the Gulf Island impoundment, whichever is less."

* * * * * * *

Thank you for this opportunity to comment on the Lower Androscoggin River Basin DEIS. Please direct any questions regarding these comments to Dana Murch of the DEP staff at 207-287-3901.

Sincerely,

Martha Kirkpatrick, Director
Bureau of Watershed Management

c\gulfdeis

MDEP--9- See our revised recommendation in Section 5.4.1.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

In Re Central Maine Power Company
Application for New License for the
Gulf Island Deer Ripe Project
FERC No. 2283-005

In Re Consolidated Hydro Maine, Inc.
Application for Original License
Marcal Hydroelectric Project
FERC No. 11482-000

COMMENTS OF AMERICAN RIVERS, APPALACHIAN MOUNTAIN CLUB, CONSERVATION LAW FOUNDATION AND MAINE AUDUBON SOCIETY ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE LOWER ANDROSCOGGIN RIVER BASIN HYDROELECTRIC PROJECTS

CC–1- American Rivers, Appalachian Mountain Club, Conservation Law Foundation and Maine Audubon Society (collectively the "Conservation Coalition")[1] submit the following comments on the Draft Environmental Impact Statement for the Lower Androscoggin River Basin Hydroelectric Projects in Maine (DEIS).

Preliminary Statement

CC–2- The DEIS describes in some detail a river changed and degraded over time by hydropower development and the associated industries built along its banks; a river altered through long-term, interrelated and cumulative environmental effects of low flows, intermittent and fluctuating flows, cumulative pollution, pollution trapped and resuspended, lack of fish passage and other factors that occur in combination and continue to affect the entire river ecosystem. The document touches on deleterious hydropower effects that originate at the Androscoggin River's northern headwaters, as well as project effects that stretch to the valuable marine estuary at the river's mouth.

The DEIS illustrates and resoundingly confirms a position long held by the members of the Conservation Coalition: all of the hydropower projects in the Androscoggin River Basin are vitally interconnected and should be examined in a single comprehensive, basin-wide environmental impact statement.

Although the Conservation Coalition members appreciate the effort the Commission has taken to combine the Lower Androscoggin River Basin projects into one EIS, the current DEIS continues to

[1] The Conservation Coalition notes that we represent a large coalition with a combined membership of well over 100,000, and would ask that the Commission expand its references to "CLF" in the DEIS to the "Conservation Coalition" to better reflect that fact.

RESPONSE TO COMMENTS

CC–1- We have revised the FEIS to include a reference to the Conservation Coalition, rather than CLF *et al.*

CC–2- We respond to the Conservation Coalition's points in our responses that follow.

stop short of the programmatic EIS necessary to effectively examine and help protect the Androscoggin River system. For example, the EIS admits to the importance of upstream facilities on the Androscoggin River, but does not include them in its cumulative impact analysis. The DEIS admits to the severity of dioxin and mercury in the Androscoggin River, but stops short of requiring the various hydropower relicensing applicants on the River to effectively study or mitigate the problem. The DEIS similarly fails to address the color, foam, turbidity issues of such pivotal concern to the public, because they are joint responsibility of all the hydropower operators in the Androscoggin River system, rather than the sole responsibility of CMP.

In bifurcating the Androscoggin River into two environmental analyses, the Commission has lost the opportunity for a comprehensive river plan to guide licensing decisions. By failing to address pivotal, cumulative ecological issues shared in common by upper and lower basin applicants, the resulting DEIS is seriously flawed.

The Conservation Coalition members appreciate the analysis of multiple projects and the consideration of project conditions from increased water flows to recreation enhancements. Many of the Staff recommendations represent significant steps in the right direction. However, certain aspects of the DEIS do not comply with the requirements of NEPA or the Federal Power Act, thus rendering the draft document inadequate as a key informational tool for hydropower licensing decisionmaking. Our comments will focus primarily in those areas:

1) The DEIS fails to present a comprehensive basin-wide analysis of the Androscoggin River Hydropower projects and river system, in violation of the FPA and NEPA.

2) The DEIS fails to analyze in a significant manner cumulative impacts of hydropower development on the Androscoggin River, including dissolved oxygen levels, dioxin and mercury levels, trapping and resuspension of toxins in impoundments, and cumulative foam, odor, etc.

3) The DEIS erroneously chooses present project conditions -- or worse -- as "baseline" information, and uses present operations as the "no action" alternative under NEPA, both in violation of federal law. The DEIS also fails to consider dam decommissioning in its NEPA analysis.

4) The DEIS fails to adequately address water quality impacts of hydropower development on the River, particularly in failing to study or remedy severe toxin problems because of multiple responsible parties, and in assuming that the

"GIPOP" oxygenation program is sufficient despite water quality data to the contrary.

5) The DEIS fails to explain adequately why it did not adopt the 10(j) flow recommendations of the USFWS, and fails to justify its recommendation on impoundment drawdowns, particularly in respect to wetlands.

6) The DEIS fails to expand the project boundary to adequately encompass the shorelands pivotal to compensate the public for hydropower development on its river, in violation of the FPA. The DEIS inscrutably ignores the outpouring of public support for recreation enhancements; and fails without justification to recommend creation of an environmental enhancement fund to support the shoreland protection necessary for the projects.

(7) The DEIS fails to comply with federal law by analyzing the energy alternatives as required under the Federal Power Act, thus fatally skewing the entire economic analysis and power/non-power benefit analysis of the project.

I. Geographical Scope of the EIS

a. NEPA and the FPA require a comprehensive, basin-wide Approach

CC-3- The Conservation Coalition has been consistent in its filings on the Headwaters storage dams, the filings on the Upper Androscoggin Basin Hydropower Projects, and the Scoping comments on the Gulf Island-Deer-Rips Projects, that the Hydropower projects on the Androscoggin River must be analyzed in a programmatic EIS under the National Environmental Policy Act, 40 CFR §§1508.18(b)(3), §1502.4(b). See CLF et al. Comments of December 22, 1993 and June 28, 1994 in this project, as well as the extensive filings of CLF et al. on record in Project Nos. 2422, 2326, 2327, 2311, 2300 2288, and 2287, and Docket No. UL94-1-001.

As indicated in our comments of June 28, 1994, our Coalition applauds FERC for including for review in this EIS several projects downstream of Gulf Island/Deer Rips and further commends the agency for also adding the projects on the Little Androscoggin River. Some of these projects are not in the "Class of '93" relicensing group, indicating that the Commission is willing to include projects based on ecosystem parameters rather than based on arbitrary and rigid geographical or license timetable guidelines.

Unfortunately, the Commission arbitrarily stops short of a truly comprehensive riverine -- and watershed -- approach, and the document's efforts are ultimately geographically too limited

RESPONSE TO COMMENTS

CC-3- Our analysis in the DEIS was consistent with the pertinent CEQ regulations. Section 1502.4(c) states that agencies "may find it useful" to evaluate proposals for "broad actions" geographically or generically. We believe that this language is far from mandatory. We also believe that such an analysis was included in the DEIS. Staff's evaluation (1) encompassed proposals for projects located in the Lower Androscoggin River Basin (i.e., the projects are geographically related), and (2) encompassed hydropower projects having similar environmental impacts, regardless of licensing status or jurisdictional status.

Section 1508.18(b)(3) of CEQ's regulations identifies the following federal action: [A]doption of programs, such as a group of concerted actions to implement a specific policy or plan; systematic and connected agency decisions allocating agency resources to implement a specific statutory program or executive directive. The issuing of hydropower licenses conforms to neither of these descriptions. Rather, it is the type of action identified by Section 1508.18(b)(4) as "approval of specific projects," which includes "actions approved by permit or other regulatory decision."

and scientifically too cursory. Such "partial comprehensiveness" is not ecologically complete or legally adequate.

CC-3-cont.

The Commission has continued to ignore CEQ regulations recommending that federal agencies prepare programmatic EISs for a groups of actions that are geographically or generically related, 40 CFR §1508.18(b)(3), §1502.4(b), as well as a recommendation from the Environmental Protection Agency that the benefits of a programmatic impact statement "argue strongly for the preparation of such a programmatic EIS" on the Androscoggin River. Letter from Elizabeth Higgins Congram, U.S. Environmental Protection Agency, Region 1, to R. Feller, FERC (November 23, 1992) on the Upper Androscoggin Projects.

In addition, the Commission continues to ignore what courts have termed a "central feature" or "the backbone" of the Federal Power Act: the requirement to take a comprehensive, basin-wide approach to relicensing. See, e.g., LaPlanne v. FERC, 842 F.2d 1063, 1073 (9th Cir. 1988); National Wildlife Federation v. FERC, 801 F 2d 1505 (9th Cir. 1986); see also CLF et al. Scoping comments of December 22, 1993 for further analysis.

Finally, the Commission ignores its own acknowledgment in the Upper Androscoggin proceedings that "a basin-wide approach is preferable," apparently continuing to believe that the three to five year delay (cited in the Upper Androscoggin record) for meaningful basin-wide analysis may be shortened by piecemeal and segmented review. See CLF comments on the Draft EIS for the Upper Androscoggin River Basin Hydroelectric Projects. Although theoretically faster, NEPA does not allow that meaningful environmental analysis be shortcircuited in this way.

CC-4

The record is replete with evidence of the comprehensive nature of the ecosystem and the need for more thorough riverine review. In particular, there is no question that the storage dams and hydropower projects along the entire length of the Androscoggin River are interrelated in operations and environmental consequences. Water flows needed to operate the Gulf Island-Deer Rips Project, for example, are provided through water management plans for six headwater storage reservoirs in Maine and New Hampshire. See Vol. I of the application at B-3, and CLF et al. comments of December 12, 1993 at 3. Moreover, CMP -- through its wholly owned subsidiary Union Water Power -- plays a major role in the regulation of those critical upper reservoirs. See CLF et al. December 12, 1993 comments at 3.

The DEIS fails to considers the upper reservoirs and the associated Androscoggin River Headwater Agreement although these upstream impoundments, through the agreement, control the flow of the Androscoggin River to benefit the projects under review as well as those in the Upper Basin. See for example, DEIS at 3-16, 3-17. The Commission thus bypasses an opportunity for

CC-3-cont. In any event, Section 102(2)(C) of NEPA, 42 U.S.C. § 4332(2)(C), requires preparation of an environmental impact statement "in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment." Thus, a "program" impact statement is not required by NEPA.

Finally, we did not ignore our own acknowledgement that "a basin-wide approach is preferable" (*we refer the reader to Section 1.3*). Further, we recognize the relationships between the headwater storage reservoirs and the downstream hydropower projects. However, there are no proposals for actions that staff can analyze. The statutory language "requires an impact statement only in the event of a proposed action" [*see Kleppe v. Sierra Club, 427 U.S. 390 at 401 (1975)*].

The Commission, in its August 1, 1994, order issuing licenses for seven projects located in the upper Androscoggin River, and in its February 20, 1996 order on rehearing of the August 1, 1994 order, outlines, in greater detail, the Commission's position relative to the NEPA compliance and basin-wide assessment issues.

CC-4 We do not dispute the fact that storage dams and hydropower projects along the entire length of the Androscoggin River are interrelated in operations and environmental consequences. In the DEIS we included an evaluation of the headwater storage reservoirs to the extent practical, and considered associated impacts where appropriate. We believe that to include a more extensive analysis, beyond the analysis in the DEIS, is not only unnecessary, but would also be impractical.

In an order issued on August 1, 1994, the Commission determined that the Upper and Lower Middle Dam Storage Projects are required to be licensed. Accordingly, the order required Union Water Power Company to file with the Commission either an amendment to an existing license or an application for a separate license(s) for those facilities. Since the issuance of the August 1, 1994 order, Union Water Power Company, federal and state resource agencies, Conservation Law Foundation, Appalachian Mountain Club, Trout Unlimited, and other stakeholders have been working together on an environmental assessment for the Upper Androscoggin River Storage Projects. Commission staff have also been involved in this process.

CC–4-cont. meaningful, comprehensive review of the interconnected riverine system, including all the water quality, fish and wildlife habitat, recreation, and aesthetics effects of these headwater regulations. It is indisputable that the basin water use management agreements cause severe impacts to the watershed resources. As the Coalition outlines in more detail in our December 22, 1993 comments at 4, the New England Rivers Basins Commission has identified fluctuating water levels in the headwater reservoirs caused by the river flow regime as contributing to reduced recreational use, harmed cold water fisheries, destroyed wetlands, waterfowl, and wildlife habitat. Androscoggin River Basin Overview, September 1981, at 119-121, 128-133, 141. Nowhere are these related environmental impacts in the headwaters region discussed in the DEIS.[2]

Studies conducted for CMP on Middle Dam/Richardson Lake also demonstrate that management of the Androscoggin headwaters to serve the downriver hydropower projects is causing adverse impacts to fish and wildlife habitat in the headwater impoundments because of fluctuating lake levels. See letter from Wendy Bley, CMP, to Gordon Russell, USFWS (October 3, 1989) with excerpts from WEP impact analysis; Letter from Gordon Beckett, USFWS, to CMP, (January 5, 1990). Nowhere in the DEIS are these related environmental effects discussed.

CC–5- The Commission's mandate is to assure the balanced use of the public's waters and adopt comprehensive plans for watersheds affected by hydropower. It can only do so by comprehensively examining the water regime and impacts along the length of the river system. Identified impacts must be quantified, detailed alternatives analyzed, and effective mitigation measures identified.

Because the DEIS fails to examine the entire Androscoggin River Basin, fails to include critical shoreline lands in a specific way, and fails to provide the detailed analysis and alternatives central to informed decisionmaking and NEPA compliance, it is clear that the current document in no way resembles a comprehensive or programmatic examination of the Androscoggin River, and thus fails to comply with both NEPA and the FPA. These issues are further discussed in the sections following.

CC–6- b. NEPA and the FPA require more Comprehensive Alternatives Analysis

[2] The DEIS does admit in one passing sentence, never further analyzed, that "flow regulation may also have had an adverse effect on waterfowl and recreation in the headwaters reservoirs." (DEIS at 3-17.)

RESPONSE TO COMMENTS

CC–4-cont. When the EA is completed, Union Water Power Company and the stakeholders, as well as the Commission, will be in a better position to determine the basin-wide, or cumulative, effects associated with alternative project operations on the environmental resources associated with the headwater storage reservoirs, and the developmental and environmental effects on downstream users and resources, including those at Gulf Island-Deer Rips. Any measures needed to ameliorate those impacts can be implemented through use of the re-opener process authority we will recommend the Commission reserve in any license issued for Gulf Island-Deer Rips.

In the interim, pending completion of the headwater storage reservoir environmental assessment, the extensive mitigation and enhancement measures that we are recommending in the FEIS would become part of any new license issued for Gulf Island-Deer Rips.

CC–5- See our response to CC's Comment Nos. 3 and 4.

CC–6- Gulf Island-Deer Rips operates as a weekly peaking facility, and passes the flows released by the upstream headwater storage reservoirs. The DEIS

CC-6-cont. In failing to consider the pivotal upstream flow agreements and facilities in its cumulative analysis, the DEIS fails to meaningfully consider the many cumulative impacts and alternative regimes possible for both water flows and water quality requirements along the Androscoggin River. The DEIS does not use the basin-wide HEC-5 model to reconsider water use allocation and whether there are better management plans that would protect the natural resources of the upstream impoundments while meeting the power needs at downstream projects. In taking this narrow, piecemeal view, the Commission fails to consider the full range of alternatives as required under NEPA.

The relationship of the various hydropower projects to each other, as well as the relationship of the headwater projects is complex and important; unfortunately, the Commission's piecemeal approach to the Androscoggin River basin once again precludes a reasonable range of project alternatives, both primary and secondary, as required under NEPA.

II. Cumulative Impacts

CC-7- The DEIS does attempt to reach somewhat beyond the narrow project boundary for analysis of cumulative impacts, but is hampered by geographical project scope and lack of available analysis, and ultimately falters in terms of meaningful recommendations whenever the project boundary is crossed. Additional flaws, such as using the environmentally damaging regime under review as the "baseline," instead of the natural river, combine to render the cumulative impact analysis marginal, at best. The analysis complies with neither the specific cumulative impact analyses requirements of NEPA, or with the FPA stricture to consider the whole river basin in the decisionmaking process.

CC-8- Although the DEIS establishes the geographic scope as downstream from river mile 41.1, the upstream analysis above that point is wholly inadequate. The Gulf Island-Deer Rip impoundment waters and the Lower Androscoggin River experience major water quality problems because of upstream reservoirs and pollution emanating from hydropower operators. Toxins exceed established health criteria exhibited by health advisories on the consumption of fish for both dioxin and mercury in the project boundaries. Dissolved oxygen (DO) problems in the Gulf Island Reservoir require the expensive injection of oxygen. There is uncertainty on whether aquatic life criteria are being met for macroinvertebrates.

These projects as well as the upstream reservoirs flood out riverine habitat, reducing the assimilative capacity of the river for oxygen demanding pollutants. As also noted on DEIS at 3-6,

CC-6-cont. acknowledged the role played by upstream headwater storage reservoir releases. However, in the DEIS, we analyzed only the existing flow release schedule from the headwater storage reservoirs because (1) there was insufficient information on the environmental resources associated with the headwater storage reservoirs and rivers; (2) it would have taken at least three years to develop the needed information by conducting appropriate environmental studies; and (3) the environmental benefits of imposing environmental enhancement measures without delay outweigh the benefits of conducting the additional studies, and imposing environmental enhancement measures at that time.

We admit that the DEIS failed to use the basin-wide HEC-5 model used by Central Maine in this proceeding. However, the HEC-5 operations model for the Androscoggin River only includes the headwater storage reservoirs, Gulf Island-Deer Rips, Lewiston Falls, and Brunswick. Because of this limitation, it would have been inappropriate to use this model in our analysis, as we would not have been able to model the system as a whole. With the model staff developed in house, we were able to model what was happening at all the projects on the lower river.

CC-7- The geographical area encompassing the "past, present, and reasonably foreseeable future actions" to be examined, pursuant to Section 1508.7 of the CEQ regulations, will vary with the federal action being considered in an EIS. Neither the CEQ regulations, nor the FPA, require that, for an environmental impact statement prepared to consider the licensing of any hydropower project on a river, the geographic scope of a cumulative impact analysis must constitute the entire river basin. Rather, a determination must be made in each case of the geographic area in which such other actions might occur that, in combination with the proposed action, could create cumulative effects.

CC-8- We recognize the relationships that exist between upstream development and the water quality and flow issues in the lower portion of the basin, and therefore, did not ignore the upstream storage reservoirs in considering cumulative impacts. Further, we do not believe that a more detailed analysis was necessary to evaluate the cumulative effects of the proposed projects, in conjunction with the storage reservoir operations and/or other hydro/non-hydro development, on resources in the basin. Proposed projects must be analyzed for their "incremental impact" when added to the effects of other actions, which requires, at a minimum, that we take other existing hydropower projects into consideration.

"These impoundments affect the river's water quality by acting as settling basins for oxygen-demanding pollutants, and by slowing the travel time of rivers waters."

CC–9- The FEIS needs to quantify the amount of riffle, rapid and waterfall riverine habitat which has been converted from the free-flowing riverine to lacustrine habitat in the whole basin and qualitatively assess how all the impoundments contribute to the DO problems. The FEIS should also better review and present many of the existing water quality models for the basin, such as those used in the allocation of expenses for GIPOP, to create a more through documentation of what role impoundments cumulatively play in reducing dissolved oxygen levels to sub-standard conditions.

CC–10- Similarly, the DEIS acknowledges that dams may both trap and affect the movement of sediments and attached toxins such as dioxin and mercury. But the DEIS fails to adequately assess the cumulative role both these and upstream dams play in the fate and transport of these toxins.

CC–11- Notably, the Commission erroneously decides not to require water quality enhancements beyond GIPOP because they would involve multiple hydropower owners beyond the one applicant involved in the current proceeding. In abdicating responsibility for studies or solutions that might be the shared responsibility of multiple hydropower operators, or that originated outside the narrow project boundary in question, the DEIS fails to study or otherwise address critical toxin issues either within project boundaries or basin-wide. The Commission decision to "encourage" the polluting parties to "cooperatively pursue discussions" (DEIS at 4-62) simply does not meet the more rigorous requirements of the FPA or of NEPA.

CC–12- As a result of these and other examples, there is little meaningful analysis of the direct, cumulative, and indirect impacts of (and alternatives to) the lower Androscoggin Hydropower Projects. Reference to upstream and downstream impacts is somewhat token and clearly limited by lack of relevant information.[3] Because of the geographically limited and inadequately analyzed review, the Commission cannot ensure that the relicensing is "best adapted to a comprehensive plan for improving...[the] waterway," as required by federal law.

[3] See, e.g., DEIS at 4-1, 4-2, 4-4, 4-5, etc: "While no specific data are available...we believe" (DEIS 4-53); "Lacking detailed information on these issues..." (DEIS at 4-33); "Given the lack of data..." (DEIS at 4-58.)

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CC–9- We have revised Section 3.2.1. to include a quantitative description of approximately how much of the Androscoggin River is currently impounded by dams. We've also added more discussion regarding the impoundments' potential effects on water quality in the river. We believe the FEIS, as currently written, adequately addresses the impoundments' contributions to the DO problem in the river [*see Sections 3.2.1., 3.3.1.2., 4.1.1.2., and 4.2.1.1.*]. The DEIS, in Section 3.3.1.2., also contained an extensive discussion relative to the water quality models developed for the river, including models developed by MDEP (Wasteload Allocation study), Boise-Cascade and International Paper, and Stetson-Harza.

CC–10- In Sections 3.2.1., 3.3.1.2., and 4.2.1.1. of the DEIS, we spend considerable time and effort outlining the toxin issue in the Gulf Island impoundment and other areas of the river, and describing any potential impacts that impoundments may have on their fate and transport. To more accurately describe contaminant levels in the Gulf Island impoundment and Androscoggin River, we revised Sections 3.3.1.3. and 4.2.1.1. to correct some inaccurate mercury information, as well as provide information about dioxin that previously had been lacking.

CC–11- While we believe the GIPOP facility is sufficient at this time, in the DEIS, we recommended that Central Maine, in consultation with the GIPOP partners, prepare an alternatives study plan to study alternatives to the GIPOP facility.

Gulf Island-Deer Rips does not produce, originate, or discharge dioxin and/or mercury into the Androscoggin River. These pollutants presumably originate from the operation of pulp and paper mills located upstream; the Commission does not regulate pulp and paper mills or their discharges. Regulation of the paper industry, including discharges, is the responsibility of EPA and MDEP. Our analysis responsibility lies in the potential of the hydroelectric facilities to affect, impact, or exacerbate the existing contaminant levels found in fish from the river, and presumed to be trapped in reservoir sediments. We do not believe that Central Maine should be solely responsible for environmental conditions beyond their control, nor would we recommend that such a requirement be made part of any license issued for Gulf Island-Deer Rips. To ensure that cumulative effects can be addressed in the future, including those related to toxic pollutants, we are recommending inclusion of a re-opener article in the project's license (*see the Commission's 1994 policy statement; 18 C.F.R. § 2.25*).

CC–12- With the correction of inaccurate information and the addition of information previously lacking, we believe the FEIS provides a good foundation to evaluate relicensing Gulf Island-Deer Rips in the context of the project being "best adapted to a comprehensive plan for improving ... [the] waterway."

III. Baseline Conditions, the No-Action Alternative, and Dam Decommissioning

CC-13- The DEIS erroneously defines the baseline for assessing relicensing impacts as existing conditions instead of pre-project conditions. In addition, the DEIS compounds this major flaw by assuming that the "no-action" alternative is the continued operation of the projects in question. These two assumptions fatally skew the DEIS analysis, and are contrary to the FPA, as amended by ECPA, and to NEPA.[4]

CC-14- Relicensing an existing hydroelectric project is not the "mere continuation of the status quo," but instead a new "irreversible and irretrievable commitment of a public resource," requiring new federal authorization. Confederated Tribes and Bands of Yakima Indian Nation v. FERC, 746 F.2d 466, 476.

> The decision to relicense is to be based on the same inquiry as original licensing, including a consideration of all relevant harms and benefits to public uses related to the project.

Id. As the Commission has acknowledged in other proceedings, "relicensing involves a new commitment of a public resources and presents an opportunity to strike a new balance between developmental and environmental interests." Upper Basin Androscoggin Order at 36. However, in neither the Upper or Lower Androscoggin River Basin EIS did the Commission undertake the same inquiry that it would for an original licensing.

In fact, the current DEIS often appears to assume that the "baseline" was the hydropower operations before recent improvements to operations, such the 1,000 cfs minimum flow, and the GIPOP oxygenation project. The existing project thus appears in the DEIS in a favorable environmental light because of this historical vantage point -- a vantage point that the Conservation Coalition would argue represents more "worst case scenario" than "baseline." For example, the DEIS notes in the water quality section that:

[4] The US EPA, in their role as experts on NEPA compliance, are on record with the Commission stating that baseline "should be the conditions that existed pre-project, before the construction of the hydro facilities....This baseline of pre-project conditions should also be used as the basis of the no action alternative analysis." EPA Scoping Comments on the Upper Androscoggin River Basin Project4, November 23, 1992.

CC-13- The Commission issued a comprehensive order issuing licenses for seven projects on the upper Androscoggin River on August 1, 1994 (68 FERC ¶ 61,177). In that order, the Commission addressed the issues of "baseline conditions"and "the no-action alternative" in considerable detail, which were subsequently upheld on rehearing (74 FERC ¶ 61,177.). In pertinent part, we summarize the Commission's previous determinations as follows:

Baseline conditions -- The Commission referenced its rulemaking to amend its relicensing rules (Regs. Preambles 1986-1990 ¶ 30,854 at p. 31,401), citing that any evaluation of the appropriateness of requiring enhancement measures is done in the context of today's environment and in relation to today's needs and problems, not in the context of the world as it existed 50 years ago.

No-Action Alternative -- In the relicensing context, defining a logical "no-action' alternative is difficult, because the Commission is legally required to take some action on an application for a new license (*see 16 U.S.C.* § 808.). Under the statutory scheme set out in the FPA, if the Commission does not act on an applicant's relicense application ..., the Commission is legally required to issue an annual license with the same terms and conditions as the existing license, ... Our definition of "no-action" as continued operation of the project under the same terms and conditions as the existing license simply reflects this statutory reality.

The Conservation Coalition has not raised, in its comments on the DEIS, any new contentions that were not previously raised and addressed in the proceedings for the upper Androscoggin River projects, or that would otherwise persuade staff to recommend to the Commission that its previous determinations should be reconsidered. Therefore, in the FEIS, we continue to support our prior definitions of project baseline and the no-action alternative.

CC-14- See staff's response to CC's Comment Nos. 13 and 27. Further, we recognize that relicensing involves a new commitment of a public resource, and presents an opportunity to strike a new balance between developmental and environmental interests. However, the question on relicensing is whether, based on weighing the relevant beneficial uses of the resource, and taking into account, among other things, appropriate measures to protect, mitigate, and enhance fish and wildlife, the resource should continue to be used for generation of hydroelectric energy. Taken in this context, we believe that the Conservation Coalition's arguments have little merit.

> Central Maine's existing minimum flow of 1,000 cfs has probably provided the greatest overall benefits to water quality. Flows above the 1,000 cfs are likely to provide benefits, but with diminishing returns.

(DEIS at 4-53.) Similarly, the DEIS fails to take effective measures to improve dissolved oxygen levels in the Gulf Island Deer Rip impoundment, concluding that: "We consider this [GIPOP] to be a significant enhancement measure at this time." DEIS at 4-51. In the area of fisheries, the DEIS concludes with similar perspective: "the continued operation of Gulf Island-Deer Rips would result in no adverse impacts to existing fish resources of the Lower Androscoggin River. With Central Maine's enhancements, however, both resident and anadromous fish would experience minor to significant improvements." (DEIS at 4-5.) Overall, this flawed starting point for environmental analysis pervades and skews the draft document.

CC-15- The "no-action" alternative similarly fails to consider natural river conditions:

> The no-action alternative would maintain the status quo and result in no change to the existing environment. The project would continue to operate under the terms and conditions of the existing license ..... Central Maine would not have to provide any environmental measures to enhance natural and cultural resource values.

(DEIS at 2-25.) The DEIS departs from the requirements of federal law in concluding that denying the license "would require a departure from the status quo." (DEIS at 2-26.) And the DEIS uses conjecture in place of data when it goes on to conclude that dam removal "would result in...possible significant environmental impacts. For example, dam removal could results in sediments accumulated behind the dams washed downstream, loss of wetlands, and loss of recreational opportunities...." (DEIS at 2-26.)

By defining "no action" as the current project (with no hook for environmental enhancements), and baseline as the current project (or arguably the project before the 1,000 cfs minimum flow and GIPOP were implemented), the DEIS frames relicensing as an environmental necessity in order to secure ecosystem enhancements. This reasoning undermines NEPA and the FPA and the clear requirement to consider new licenses and continued hydropower operation against natural river conditions.

In mis-defining the purpose of the no action alternative, the Commission misses the required opportunity to consider the possibility of license denial and dam decommissioning. The

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CC-15- See staff's response to CC's Comment No. 13. Further, for reasons set forth in the Commission's August 1, 1994, comprehensive order, we believe the approach taken in the DEIS is reasonable. The DEIS defined the no-action alternative as continued operation of the project under the same terms and conditions as those in the existing license. The DEIS also considers the alternatives of license denial and decommissioning, and explained why, in the particular circumstances of this case, these alternatives were not regarded as reasonable for purposes of NEPA and were, therefore, eliminated from further, detailed study. Because both possible approaches to the no-action alternative were appropriately considered in the DEIS, we believe the Conservation Coalition's argument lacks both merit and substance.

In Section 2.5 of the DEIS we focused on the negative effects that dam removal would have on environmental resources in the Androscoggin River. In the FEIS, we revised this section to include a discussion of any potential positive benefits of dam removal on resources in the river. However, we continue to support relicensing the projects with additional environmental enhancement measures, as we believe the adverse effects associated with dam removal would exceed any benefits gained from removal of the dams.

Conservation Coalition requests that the Commission consider dam decommissioning in the FEIS within the no-action alternative analysis. Under the FPA, and NEPA, denial of a license and decommissioning is a reasonable option that must be seriously considered as part of every licensing evaluation. The Commission has *no* basis for concluding that license denial is unreasonable before analyzing this option carefully in the EIS. Rather than concluding off-hand that dam removal would cause environmental degradation, DEIS at 2-26, the document should seriously analyze the important issues surrounding the decommissioning and removal of the dams.

CC-16- The Conservation Coalition urges the Commission to reconsider its position concerning baseline analysis and no action alternatives, beginning with the FEIS for the Lower Androscoggin Basin. We note that the temporal scope for the DEIS, as outlined in Section 1.3.1.2, suggests a discussion of the past, present, and future actions and their effects on water quality, resident and anadromous fisheries, wetlands and dependent wildlife, and hydroelectric generation. Although the DEIS does describe some of the broad historic changes that have happened on the Lower Androscoggin basin, it fails to describe the pre-project baseline. It is imperative that pre-project baseline be described here. Pre-dam water quality, fishery and aquatic macroinvertebrate habitat, wetlands, amount of free-flowing river and pre-regulation river flow should be better described in this section. The no-action alternative must be crafted using this and other information. A pre-project baseline provides the only means to determine what licensing conditions are needed to restore and give equal consideration to the natural resources affected by the Project. Federal law and common sense demand no less.

IV. Water Quality

CC-17- A. Dioxin and mercury levels

The DEIS acknowledges the role dams have in influencing the fate and transport of pollutants, e.g. DEIS at 1-8; 3-24. However, the document at the same time suggests that there is no evidence that pollutants like dioxin or mercury are affecting the fisheries. See e.g., DEIS at 5-40. The DEIS also suggests that data on dioxin are not available and that mercury levels never exceeded 0.05 ug/g. (DEIS at 1-26-3-27.) This is misleading and inaccurate. Mercury levels from Gulf Island Pond fish exceeded the federal standard of 1 ug/g in a number of samples and reached a high of 2.1 ug/g in the study cited in the DEIS. See Slocumb et al. 1985, Table 12. We refer the Commission for data on dioxin in fish from Gulf Island Pond to the Maine DEP (e.g. 1993 Dioxin Monitoring Program, State of Maine, March 1994, by Barry Mower).

CC-16- See staff's response to CC's Comment No. 13.

CC-17- We agree that the data we presented in Section 3.3.1.3. on mercury concentrations in fish from the Gulf Island impoundment is misleading and inaccurate. We erred in citing data from Slocomb *et al.* (1985); the data provided in the DEIS pertained to concentrations of silver and not mercury. In the FEIS, we revised the text in Section 3.3.1.3. to include the appropriate data on mercury. In this section, we also present data on dioxin levels in fish from the Androscoggin River, including the Gulf Island impoundment; the information was obtained from Maine's Dioxin Monitoring Program for the year 1994 (Mower, 1995).

CC–18- The fact -- acknowledged in the DEIS -- that public health advisories exist for these project waters testifies to the magnitude of this ecosystem and human health toxin problem. In 1994, the Maine Departments of Health and Environmental Protection issued a health Advisory warning pregnant and nursing mothers and children under eight not to eat fish caught from Maine's waters. Some experts in the field believe that these warnings do not go far enough. Personal communication, Dr. Beverly Paigen, contributing author to Dying From Dioxin, by Lois Marie Gibbs (South End Press, Boston, MA 1995).

Inscrutably, the DEIS cites to fisheries advisories for dioxin as a mitigation measure, DEIS at 4-61, rather than as evidence of a serious human and ecosystem health problem that should be addressed in this current proceeding.

CC–19- Moreover, the Commission assumes that "the Gulf Island dam, because it traps sediments laden with contaminants, may have a cumulative beneficial effect on water quality downstream." (DEIS at 4-61.) This reasoning is purely conjecture, based on no study, evidence or comparison with any alternatives.

CC–20- The Commission's reliance on conclusions drawn by Great Northern Paper (GNP) in their studies (FERC Project No. 2458) for licensing relative to the mercury issue is very misleading. (DEIS at 4-59.) It is true that GNP stated that their data supported the conclusion that differences in fish tissue mercury concentrations between fluctuating impounded and non-impounded lakes did not differ between trophic classes and that tissue concentrations were similar in forage versus bottom-feeding fish. However, a review of GNP's data by unbiased, third-party mercury expert, Dr. Terry Haines of the USFWS, revealed very obvious statistical differences between upper trophic class fish from impounded versus non-impounded reservoirs. GNP had failed to size-correct their samples before making the comparison, a standard protocol for any such analysis. We refer the Commission to the lengthy documentation our Conservation Coalition and the USFWS filed on this issue in FERC Project No. 2458.

CC–21- The Commission's bald reliance on applicant-sponsored assertions that have since been disproved is disheartening, at best. The DEIS analysis is particularly passive in this section, despite the remarkable severity of the problem. For example: "We are not aware of any sampling that has been conducted on impoundment sediments, the primary repository for relatively insoluble heavy metal compounds (DEIS at 3-24); "while we were not provided with any information on dioxin levels in the Androscoggin River...." (DEIS at 3-26); "we do not believe that the existing or proposed operation of Gulf-Island-Deer Rips has, or would, contribute significantly to mobilization of mercury and

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CC–18- In the State of Maine, as is the case in most states, public health advisories are issued as a way to notify the public of the potential health hazards of consuming fish taken from waters contaminated with high levels of pollutants. In the DEIS, we state that fish consumption advisories exist for fish taken from several locations on the Androscoggin River. This statement by no means implies that consumption advisories are a way to mitigate for any adverse effects associated with contaminants. Rather, such advisories are evidence of a human health risk that should be recognized. Consequently, in the DEIS, we spent considerable time building an extensive record on the issue (*the mercury data has been revised and information relative to dioxin levels has been added to the FEIS*), and discussing potential effects of mercury/dioxin contamination. We believe the existing record is adequate to draw conclusions, and recommend appropriate mitigative measures.

CC–19- While we cannot definitively prove that the existence of the Gulf Island dam has had a cumulative beneficial effect on water quality below the project, we believe there is evidence to suggest that the dam could have certain benefits to improving water quality in the lower Androscoggin River. Scientific evidence shows that contaminants bind with sediment in the water column, and ultimately settle to the bottom of the impoundment. Thus, the water passed through the project may contain lower pollutant levels as a result. This theory is supported by Maine's dioxin monitoring program (*see Section 3.3.1.3.*), where measured dioxin concentrations are lowest downstream from Gulf Island-Deer Rips.

CC–20- We recognize the Conservation Coalition's view, but question its relevance in this case. We did not rely on the conclusions drawn by GNP in their studies. We merely cited GNP's study as a source of information regarding the existence of mercury in a Maine watershed, and what, if any, impacts impoundment fluctuations have on mercury mobilization. In the DEIS, we cited a number of scientific studies that support our conclusions. Nevertheless, we have expanded Section 4.2.1.1. in the FEIS to include reference to Dr. Terry Haines's analyses.

CC–21- In preparing the DEIS, we did not solely rely on any applicant-sponsored assertions. We developed an extensive record pertaining to the contaminants issue, and carried out our own independent analysis. We acknowledge that the DEIS may have been somewhat inadequate, in that some information presented was incorrect and other important information was missing. We believe that by correcting the inaccurate mercury data and adding pertinent information on dioxin in the river, any inadequacies that may have existed in the DEIS have been corrected in the FEIS.

dioxin in the system." (DEIS at 4-52.)[5]

CC--21-cont.

Based on no independent literature review, only "limited water quality sampling" (DEIS at 3-23), and apparently even little basic curiosity, the Commission concludes that "there is little, if any, evidence at present to conclude that mercury and dioxin concentrations are significantly affecting the fish resources in Gulf Island impoundment or the Lower Androscoggin River." (DEIS at 5-40.) This entire section should be rewritten in the FEIS.

B. Resuspension of toxins in the impoundments

CC--22-

The Commission notes that "neither the dam nor Central Maine is responsible for producing the contaminants in question," DEIS at 4-52, and then proceeds to conclude that it "cannot require Central Maine to study mercury and dioxin in the Gulf Island impoundment in partnership with the other entities who are not part of the present licensing proceeding." (DEIS at 4-52.)

We adamantly disagree. This bizarre conclusion leaves the public and the ecosystem at risk from arguably the worst water quality and public health threat in the degraded Androscoggin River system.[6] Moreover, this conclusion implies that cumulative impacts in FERC licensing proceedings will remain unaddressed when more than one party is involved. FERC's new emphasis on basin-wide environmental analyses is only an empty gesture if that is the case.

The DEIS appears to forget that the toxins problem is a basin-wide problem at and below Berlin, New Hampshire and that hydroelectric dams play an important role in that pollution. Furthermore, all of the companies involved with the discharge of some of these pollutants including James River (now Crown Vantage) [FERC Project Nos. 2422, 2423, 2326, 2327, 2311, 23001],

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[5] The DEIS never explains this conjectural statement, even in light of such statements in the DEIS itself: "studies have shown that mercury may become more biologically active in impoundments, and there is growing evidence that the fluctuation of impoundment levels creates an environment that may enhance the methylation of mercury (Major and Carr 1991)." (DEIS at 3-24).

[6] "Water quality in the Lower Basin...continues to be relatively poor and periodically falls below its classification ..." (DEIS at 3-8.) "In classifying the Androscoggin River (including the impoundments) the Maine DEP and the Maine legislature indicate that the Androscoggin River continues to have water quality problems which are the direct result of the historic and continued use of the waterway for industrial purposes."(Id.)

CC–21-cont. *Furthermore*, we believe the Conservation Coalition's statement of "based on no independent literature review" is without merit. The DEIS, in Sections 3.3.1.2. and 4.2.1.1., contains an extensive review of literature pertaining to mercury and dioxin, and any potential environmental effects caused by the presence of these two pollutants, including the role impoundments and impoundment fluctuations may play in the fate and transport of such pollutants.

CC–22- The DEIS recognized the problem with pollutants in the Androscoggin River is a basin-wide problem, as well as the role that dams play in affecting water quality. In the DEIS we stated that neither the Gulf Island dam nor Central Maine is responsible for producing the contaminants in question. Therefore, Central Maine should not be solely responsible for addressing the contaminants problem in the river. We could recommend that Central Maine conduct a study to determine what, if any, impacts operating Gulf Island-Deer Rips is having on mercury and dioxin transport in the watershed, and identify any remedial measures that could be implemented to reduce project-specific impacts. We do not see the need for such a recommendation in this case.

The Commission cannot compel Central Maine to study this issue in partnership with other parties, because the Commission lacks jurisdiction over the other parties, where it pertains to license requirements for Gulf Island-Deer Rips. We agree that the Commission can coordinate licensing requirements for projects under its jurisdiction. However, in this case, the Commission lacks jurisdiction over the paper companies' activities. Hence, addressing the contaminants issue, from a cumulative effects perspective, would need to be a cooperative effort between regulatory agencies [*this approach was used to address the need for alternatives to the GIPOP facility*]. Moreover, there is no evidence that weekly peaking operation results in any significant resuspension of dioxin or additional methylation of mercury, nor is there any evidence to suggest that additional analysis might identify alternative project operations likely to reduce levels of mercury and dioxin at the project. There is no convincing argument that the limited amount of sediment surface area dewatered is affected by project operation. While background sediment samples could be useful in assessing potential mercury/dioxin contamination, we do not believe the burden of discovery should be borne by Central Maine, nor would we expect the results of such studies to identify solutions within Central Maine's responsibility.

Thus, we do not believe it is appropriate to require Central Maine to conduct costly background contaminant monitoring (*we estimate the costs to be between $21,000 to $255,000, depending upon the type of study*).

Boise Cascade [FERC Project No. 2333], and International Paper Company [FERC Project Nos 2375 and 8277] also operate all but two of the related FERC licensed hydroelectric dams upstream. The hydropower facilities are used to generate the toxic pollutants that are now showing up in the downstream impoundments.

CC–23- The Conservation Coalition members and the federal agencies (e.g. USDOI May 27, 1994 letter from Gordon Beckett to Lois Cashell) agree that a basinwide cumulative affects analysis is necessary under federal law.

Overall, the Commission has the responsibility to require the applicable hydropower operators along the Androscoggin River to study and mitigate the toxin problem in a format similar to that of GIPOP. The Commission has required toxin studies in other licensing cases, including Ripogenus (FERC No. 2572), Penobscot Mills (FERC No. 2458), St Louis River Basin (FERC Nos. 2360 and 2363). Based on the substantial evidence that toxins are present in these projects, the decision to dismiss the need the toxic study and mitigation in the DEIS is not supportable.

The Commission should require responsible applicants and hydropower operators on the Androscoggin Rivers to further study the possible resuspension of mercury and dioxin in the Gulf Island-Deer Rip impoundment and in the river basin. There is a considerable and growing body of evidence that the fluctuation of water levels may enhance the mobilization of mercury in the food chain, particularly in larger predators. In the Penobscot Mills Relicensing (FERC No. 2572) in Maine, the applicant was required to compare mercury concentrations in both "control" waterbodies and project reservoirs. Please see attachments to Conservation Coalition's June 28, 1994 comments on Scoping Document I for documentation on FERC Projects 2451, 2452, and 2468 in Michigan (Consumers Power Company obligations to develop and implement a water quality, fish contaminant and sediment monitoring program); and St Louis River Project in Minnesota (monitoring and remediation program required).

CC–24- The FEIS needs to require continued financial support by the applicant for sampling of toxins in fish during the course of the project license. This need is also recognized by the US Environmental Protection Agency. (DEIS at 5-40.) The view expressed in the DEIS, that alternative project operations to reduce the bioavailability of toxins is not known, cannot be supported in light of the clearly stated view of EPA that such alternatives must be developed. Moreover, the fact the Central Maine has not produced the contaminants in question is but a red herring on the path to toxic reduction: the GIPOP established a percentage share of cost of accountability and clearly further joint efforts can do the same. It is essential to note that upstream pollutant discharges of dioxin are being reduced and eliminated, meaning that dams will be an increasingly important

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CC–23- We agree that the Commission has some degree of responsibility where cumulative effects and cumulative impact analyses are concerned, and how such effects are addressed [*see the Commission's 1994 cumulative effects policy, Use of Reserved Authority in Hydropower Licenses to Ameliorate Cumulative Impacts (18 C.F.R. § 2.23.)*].

The Commission regulates the hydropower developments that provide a portion of the electricity needed to operate the pulp and paper mills. The Commission does not, and cannot, control the activities (i.e., discharges) of the paper companies, who are, and have been, the main contributors to the pollution problems in the Androscoggin River. Further, there is no guarantee that if we were to recommend, as a license condition, that Central Maine study mercury and dioxin in the Gulf Island impoundment and in the river basin that the paper companies and other hydro owners in the basin would cooperate, which we believe would be the most desirable and fair solution to the contaminant problem in the river.

We certainly agree that mercury and dioxin should be studied, and appropriate mitigation required, within a framework similar to the GIPOP partnership. This was the approach we advocated in the DEIS. However, because the Commission lacks jurisdiction over non-hydro activities on the river, the Commission is not in a position to establish this type of partnership, without the involvement of the EPA and MDEP.

CC–24- Neither Interior nor MDEP have made any specific recommendations related to mercury/dioxin monitoring in the vicinity of Gulf Island-Deer Rips or in the Androscoggin River [*either in the form of 10(j) recommendations or 401 conditions*]. Further, based on our own analysis of the information in the record, we do not believe that Gulf Island-Deer Rips has been linked to either the source or continued cause of any mercury and/or dioxin problems. Absent such information, any 10(j) recommendations from Interior, or any 401 conditions from the MDEP, we do not see the need to require Central Maine to provide financial support for sampling toxins in fish during the course of the project license.

We recognize that the project's 401 Certification may include certain conditions pertaining to mercury/dioxin monitoring in the Androscoggin River, and Central Maine's role and responsibility in monitoring these toxins. If conditions related to monitoring toxins in the river are included in the 401 Certification, we will address those conditions in any license order.

factor in how long dioxin problems will reside in the riverine system.

CC--25- The FEIS should further stipulate that the license for this project should be amended if studies show that there is a definitive link between project operations and the bioavailability of mercury or other toxins, similar to the Commission's conclusions in the Kennebec DEIS. See DEIS - Kennebec River Basin, ME (November 1995), FERC/DEIS-0097 at 4-8, 4-9, 4-11.

B. Dissolved Oxygen

CC--26- The DEIS discussion of the dissolved oxygen treatment partnership (GIPOP) is equally disheartening and fatally flawed. The Commission's conclusions (DEIS at 4-55) that GIPOP is an adequate solution is not in any way substantiated since non-compliance problems still exist. The existing data base shows that Gulf Island Pond fails to meet the state of Maine Class C water standards at least five to seven percent of the time. See Conservation Coalition Scoping Comments of June 28, 1994, citing to memo from Paul Mitnik, DEA to Gregg Wood, WRR (January 3, 1994). In the four years since GIPOP began, significant percentages of the pond, by volume, have not met that standard at some time during the summer: 6% in 1992, 12% in 1993, 4% in 1994, and 16% in 1995.

Overall, these figures reflect significant non-compliance with the "fourth and lowest classification assigned to fresh surface waters in the state of Maine." (DEIS at 3-8.) This severe water quality is the result of the extensive hydropower system on the Androscoggin River, and should not be dismissed so lightly in the hydropower relicensing process.

CC--27- Moreover, the state of Maine has yet to issue its 401 Water Quality Certification for this project, making the DEIS conclusion premature, at best. The Commission's conclusion that alternatives beyond GIPOP should not be considered (DEIS at 4-55) and that a re-opener clause should not be required (DEIS at 4-56) only acts to impede long-term resolution to a problem that is currently being addressed with a recognized temporary solution. See, for example, comments of Ronald G. Manfredonia, Chief Water Quality Branch, Region I, US EPA (December 22, 1993) to Lois D. Cashell.

The FEIS needs to correct this deficiency and require the applicant to undertake an alternatives study, and include a re-opener clause to accommodate the results. CMP should be required to meet the current water quality standards of 6.5 ppm DO on a 30-day average and 5.0 ppm DO on an instantaneous basis, or more stringent standards if specified by applicable agencies. A plan should be required for monitoring water quality, including DO in

CC--25- We agree that language of this nature is relevant, and should be included in the FEIS (*see our revised text in Section 4.2.1.1.*). We are recommending that a cumulative effects article, specific to the mercury and dioxin issue, be included in any license issued for the project. This approach is consistent with the Commission's 1994 policy statement on the use of reserved authority in hydropower licenses to ameliorate cumulative impacts (18 C.F.R. § 2.23), which ensures that cumulative effects will be addressed in the most efficient and appropriate manner.

CC--26- We have revised Sections 3.3.1.2. and 4.2.1.1. to include a more detailed characterization of the impoundment's attainment status. Further, staff's response to CC's Comment No. 27 describes our views about the adequacy of the GIPOP facilities and need for additional measures.

CC--27- We recognize that the state of Maine has not issued its 401 Certification for Gulf Island-Deer Rips, and that the Commission cannot issue a license for the project without a 401 Certificate. However, we question the relevance of the statement, because the NEPA process is not dependent upon the outcome of the 401 process. Rather, NEPA requires an independent analysis of the effects of a proposed action, and recommendations be made that are based on that analysis.

We also disagree with the Conservation Coalition's argument related to alternatives beyond GIPOP. In the DEIS, we stated "we do not believe that additional study of alternatives at this time is warranted." However, in the DEIS, we concluded that a plan to study alternatives to GIPOP in the future was warranted. In keeping with this conclusion, we recommended, in Section 5.4.1. of the DEIS, that "Central Maine develop a plan to study alternatives to the GIPOP facility in an effort to coordinate efforts ... ."

CC–27-cont. the Gulf Island impoundment, and DO and aquatic invertebrates in downstream areas affected by the operation of Gulf Island -Deer Rips. The water quality monitoring currently conducted by CMP and its GIPOP partners does not adequately determine water quality throughout the impoundment. For the past four years, the Maine DEPs has had to conduct its own sampling program in the impoundment in order to adequately determine water quality. We recommend that CMP be required to develop and implement a monitoring program, in consultation with Maine DEP and US EPA, that replaces the Maine DEP program and provides adequate data to determine water quality.

CC–27-cont. In addition to the alternatives study plan, we also recommend the inclusion of standard language reserving the Commission's authority to require operational changes and/or other environmental enhancements at Gulf Island-Deer Rips. Further, we recommend that any license issued for Gulf Island-Deer Rips include a requirement that Central Maine develop and implement a plan and schedule for monitoring water quality in the project area and in downstream areas affected by the project's operation, including DO and aquatic invertebrates. This plan would be developed in consultation with federal and state resource agencies, EPA, and MDEP.

VI. Water Flows and Reservoir Management

CC–28- The Conservation Coalition appreciates the great strides made by the Commission in outlining a preferred alternative that goes well beyond the original proposal of Central Maine Power at the Gulf Island-Deer Rips Projects. A minimum flow of 1700 cfs from May through November and 1400 cfs from December through April will clearly constitute an improvement to the riverine ecosystem over the current situation. However, we note that USFWS has recommended higher flows in its 10(j) recommendations, and deference should be given to the USFWS for recommendations regarding fish and wildlife resources. The DEIS' rationale for rejecting the USFWS recommendations on flows is unclear and sometimes obscure in its conclusions. See e.g., DEIS at 5-5 (concludes that DOI's recommended 1700 cfs flow might create adverse effects to wetlands). The Conservation Coalition supports the 10(j) recommendations made by USFWS and defers to and support the judgment of USFWS for necessary flow requirements to protect fish and wildlife resources and habitat in the Androscoggin River.

CC–28- In Section 4.2.1.3. of the DEIS, where it concerns Interior's proposed downstream flow requirements, staff concluded that a reduction in flow in the middle of the growing season could result in desiccation of any newly established wetland vegetation if the 1,700-cfs flow is considerably lower than run-of-river flows. We certainly do not dispute that increased flows are beneficial for wetland growth and productivity. However, our conclusion takes into account the possibility that month-to-month flows may be substantially different. Staff, therefore, recommended an alternative that would provide a consistent minimum flow during the entire growing season, which we believe provides a greater level of enhancement over Interior's recommended flow regime.

CC–29- The DEIS recommends that the Gulf Island impoundment be limited to one foot fluctuation from May 1 to June 30, compared to the June 15 date proposed by the applicant. However, we continue to support our original recommendation that impoundment drawdowns should be limited to one foot on a year-round basis. See Coalition Comments on Terms, Conditions and Comments dated December 22, 1993, and Comments on Scoping Document I dated June 28, 1994 for further detail and justification for our position. This recommendation is wholly consistent with the recommendations of the USFWS and the US EPA.

CC–29- Comment noted.

CC–30- We are particularly concerned that the applicant and the Commission disregarded the conclusions of the earlier Stetson-Harza study on wetland impacts that were jointly scoped by the applicant and the agencies. The Habitat Evaluation Procedure ("HEP") used in the study is an accepted scientific modelling technique developed by US FWS in cooperation with other agencies and interested parties. This study showed that a two to four

CC–30- We did not disregard the finding of the Stetson-Harza study that run-of-river could "result in the establishment of an additional 98 acres of emergent wetlands." In fact, we cited this finding in our discussion of the study (*see Section 4.1.1.4.*), as well as acknowledged that increasing minimum flows (i.e., flows similar to run-of-river) could potentially create new wetlands (*see Sections 4.1.1.4. and 4.2.1.3.*).

foot drawdown reduces potential wetland development by roughly 27%.

CC–30-cont.

Without basis, the Commission chose instead to accept the applicant's two "updated" studies which achieved more desirable results for the applicant (Eco-Analyst 1993, and Normandeau 1991). These studies were not scoped, reviewed, or accepted by the USFWS, the US EPA, or applicable state resource agencies to our knowledge. Moreover, as our Coalition pointed out in earlier comments, the Stetson-Harza study examined the potential wetlands development which might occur if the impoundment levels did not fluctuate, whereas the Eco-Analysts report is merely a descriptive field study which tries to evaluate the impact of current operations on existing wetlands.

Nonetheless, the DEIS arbitrarily and willingly accepts these applicant studies, which offer little more than generalized conclusions (e.g., "one foot fluctuation between May 1 and June 15, which is a critical time for seasonal growth for many submergent and emergent aquatic vegetation, may help to promote wetland vegetation growth." (DEIS at 4-27). The Draft fails to explain why it used these less directly applicable efforts to justify wetland effects under different future scenarios, nor why they neglected the Stetson-Harza study conclusion that run-of river mode could result in the establishment of an additional 98 acres of emergent wetlands. (DEIS at 4-27.)

CC–31-

The DEIS also fails to include any meaningful analysis on the impact to winter wetlands of the drawdowns recommended. We disagree, for example, with the DEIS conclusion that the impacts would not be different between CASE 10 and 11 relative to wetlands, because winter freezing and desiccation damage is greater during dewatered conditions. The Draft's recommendation of 1400 cfs for this period over the 10(j) recommendation of 1700 cfs is not justified in the DEIS and should be changed.

CC–32-

We question the use of studies whose only value appears to be to support the result favored by the applicant. FERC's ready acceptance of these "studies" despite the lack of agency participation in the design process adds a further cloud over an inexplicable decision, and appears an unfortunate step away from "unbiased science" in the relicensing process.

We recommend that the Commission rely on the jointly scoped wetlands studies prepared for this project, and correct the various inconsistencies and misleading generalized conclusions in the EIS on the important issue of wetlands protection and enhancement in the Androscoggin River basin.

VII. Shoreland Protection and Enhancement Fund

RESPONSE TO COMMENTS

CC–30-cont. We presented the conclusions for each of the three studies as information on which to base our analysis of the impacts associated with the various alternatives. We conducted our own independent analysis of the impacts associated with various drawdowns, and stated our conclusions. Staff's recommendation is ultimately the product of the Commission's need to balance competing resources (*see Section 5.4.1.*).

CC–31- We have added a discussion of wetland impacts associated with winter drawdowns to Section 4.2.1.3. Also, there is no difference between CASE 10 and CASE 11 in regards to winter drawdowns; both cases include a one-foot target fluctuation from May 1 to June 30 and a four-foot limit from July 1 to April 30.

Staff's recommendation to reduce the minimum from 1,700 cfs to 1,400 cfs during the winter months is based on the balancing of wetland values with other resources such as recreation and fisheries. Where non-developmental and developmental values compete, the Commission must resolve these issues in a manner that considers the needs of all competing resources. Such treatment does not necessarily result in their equal treatment or in the optimization of individual resources.

CC–32- See our response to CC's Comment Nos. 28 and 30.

CC-33- A. Shoreland protection is ecologically and legally necessary

Commission regulations provide for creation of project boundaries or buffer zones of sufficient size to ensure public access and recreational opportunities as well as preservation of aesthetics and other values:

> The Commission expects the licensee to assume the following responsibilities: (a) To acquire in fee and include within the project boundary enough land to assure optimum development of the recreational resources afforded by the project...such lands to be acquired in fee...shall include the lands adjacent to the exterior of any project reservoir plus all other project lands specified in any approved recreational use plan for the project.

18 C.F.R. §2.7 (emphasis added). Commission regulations also state that the "purchase of land will be included as part of the project cost." Id.

The DEIS recognizes that the Androscoggin River and the surrounding watershed lands are increasingly important for wildlife habitat and recreational purposes. For example:

> The land surrounding the impoundment is primarily undeveloped and is utilized extensively for informal recreation, including hunting, hiking, trapping, and nature study.

(DEIS at 3-34.)[7]

Adequate buffer zones around hydropower projects are essential because they provide an array of non-power benefits which would likely be destroyed by shoreline development. Buffer zones -- particularly vegetated buffers -- help protect aesthetic and scenic attributes, water quality and biological diversity. In addition, they provide wildlife habitat and corridors, flood

[7] See also, e.g., DEIS at XX: A 1989 study by Stetson-Harza concludes that fishing use in the Lower Androscoggin River is increasing because: "(1) improved water quality conditions has enhanced the availability of fish habituated and associated aquatic species, (2) as fisheries improve, additional anglers will be attracted to the fishery, and (3) Central Maine's existing boat launch at the Turner-Greene Bridge." Other sections of the DEIS suggest that improving water quality and decreasing odor, discoloration, and surface foam, as well as other factors, will continue to increase the value of the Lower Androscoggin basin as a recreational resource of some value.

CC-33- Comment noted.

regulation and streambank stabilization, recreational opportunities and public access.

Notably, the Cities of Auburn and Lewiston, the Androscoggin Land Trust, the Androscoggin Valley Council of Governments and other local activists have made it abundantly clear in the record that the Gulf Island-Deer Rips impoundment and surrounding lands are of pivotal importance to the local communities in the vicinity of the project area. Local officials have emphasized the ongoing, major planning effort by the communities to conserve shoreline values and provide for public recreation opportunities, listing bikeways, hiking trails, and snowmobiling opportunities around the reservoir. These relicensing participants have made it clear that CMP lands are a pivotal component of their Greenway Vision Plan. See DEIS at 3-41; also DEIS comments of Land Trust, et al, recently submitted. A recent open space survey reaffirmed the strong local and regional public support for increased recreational opportunity and land protection along the Androscoggin River. See Land Trust et al. DEIS comments and attachments.

CC-34- Despite the clear indication of the public interest in and need for increase shoreland protection as mitigation for Project relicensing, the DEIS appears surprisingly lukewarm about shoreland protection and recreational enhancements. The DEIS appears poised to allow consideration of these pivotal issues only in post license analysis in the form of a shoreland use management plan. The Commission appears in agreement with CMP that further study of many of the recreational enhancements already identified in the Androscoggin Greenway Plan is required. That would not be sufficient to satisfy the public demand or federal law. The DEIS suggests that improving water quality will quickly build a larger recreation constituency, and the public record in this project is abundantly full of evidence of public demand. The Shoreland and Recreation Plan must focus more on implementation of the recommendations of Land Trust et al, and less on how to further study this elusive "demand."

The recreational enhancements requested by local organizations and surrounding towns are well-documented in recent Greenway plans, recreational open space surveys, and the like. There has been a remarkable outpouring of interest and enthusiasm in protecting and enhancing the shoreland around the Gulf Island-Deer Rips impoundments. There is little more to be "studied," as recommended by the applicant, and acquiesced to by the Commission. See e.g., DEIS at 4-82, 5-42. The Commission should require CMP to work with local organization and applicable agencies towards a conservation and recreation shorelands plan that will be complete within a 12 month period and either tied to issuance of the license or covered in a reopener clause should the plan not meet the expectation of other involved parties. The Plan should include maps delineating the shoreland protective

CC-34- Central Maine, since filing its license application for the project, has had extensive discussions with the Androscoggin Land Trust and other local governmental and non-governmental entities regarding public access and various recreational facilities. As a result, Central Maine, in their comments on the DEIS, indicated that several items (i.e., canoe portages and public access), which were not part of their original proposal, are now being proposed. We concur with these changes, and have made the appropriate changes in the FEIS. Further, based on our current level of knowledge about Central Maine's proposed land use plan, we believe it is inappropriate to specify the specific measures of the plan beyond the general provisions we have included (*see staff's response to ALT's Comment No. 12 for a description of the measures*).

buffer zone area, the cost and method of acquiring or otherwise protecting the parcels, provisions for allowable uses for the buffer zone lands, conditions to be specified including any proposed permit system, as well as a description and operating mechanism for the environmental enhancement fund. (See below). The Plan should include a schedule for implementation, a program to fund implementation of the Plan, and a time frame to evaluate the effectiveness of the plan and to revise if necessary.

b. Project boundaries should be changed in the FEIS to include a 500-foot corridor and additional CMP lands

CC--35- FERC regulations call for project boundary widths of greater than 200 feet where additional lands are necessary for project purposes to protect resource values. Effective buffer zones in Maine are typically a minimum of 500 feet wide. See, for example, buffers for Allagash Wilderness Waterway (400 - 800 feet with 500 feet as average), the 500-foot wide buffer typical on the Appalachian Trail, and the 500-foot corridor maintained on portions of the West Branch and the East Branch of the Penobscot River near Moosehead Lake.

While a 200-foot buffer may be adequate to protect certain environmental attributes such as water quality, it is not wide enough to protect recreational, wildlife and aesthetic values. Adequate buffer zones are essential to preserve wildlife habitat. For example, in Maine, 50 percent (144 species) of the state's vertebrate wildlife species use riparian habitat along rivers and streams and 12 percent (75 species) "include riparian zones as part of their preferred habitat."[6] Although the scientific literature on riparian wildlife needs is still evolving, a review paper on riparian ecosystems found that:

> the area of riparian vegetation used most heavily by wildlife is that within 200 m (650 feet) of a stream or open water.[6]

Even local and state shoreland zoning laws include all land within 250 feet of the high water mark. DEIS at 3-4. And increasingly, the Commission is recognizing the importance of protecting at least a 250 foot buffer in New England projects where the development pressures are so widely recognized. For example, The recently released Kennebec River Basin DEIS recommends shoreland plans that would designate 250-foot no development zones:

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[6] Elliot, "Managing Riparian Habitat for songbirds, Raptors, and small mammals," in Proceedings of the Symposium on Riparian Zone Management, R&D Report No. 9, Canadian Forest Service. (Fredrickton, NB, Canada) at 71.

CC--35- The Commission, as a common practice, considers the need for project shoreline buffer zones. Sections 4.41(f)(7)(iii) and 4.51(i)(B) of the Commission's regulations emphasize the need to consider establishing a buffer zone of sufficient width to allow public access to project lands and waters, and to protect the scenic, public, recreational, cultural, and other environmental values of the impoundment shoreline. The regulations further stipulate, in Section 4.51(i)(B), that a project boundary for existing major projects should not be more than 200 feet (horizontal measurement) from the exterior margin of the impoundment, defined by the normal maximum surface elevation. Additional land may be included if needed for shoreline control, recreational access, or other environmental reasons. Because we do not believe that a licensee should be expected to purchase, and control use of, vast amounts of land within the basin, we are not recommending that Central Maine extend the project boundary for Gulf Island-Deer Rips an additional 300 feet to accommodate the 500-foot buffer recommended by the Conservation Coalition.

We agree that providing the CLF-recommended shoreland buffer zones would help to ensure that areas around Moosehead, Moxie, Wyman, Weston, Ft. Halifax and Messalonskee Projects would remain undeveloped during the term of a new license. Not developing these lands would protect the natural and cultural resources, wildlife habitat, and scenic qualities of project shorelands.

Project boundaries in the Gulf Island-Deer Rips Project should be similarly extended -- in this case back to 500 feet to reflect the needs of the Androscoggin River ecosystem, and to allow greatest flexibility and prioritization in pursuing willing seller easements over the course of the license period.

CC-36- In addition, the project boundaries should include all of the CMP lands and CMP islands within the watershed in question. For example, CMP and/or Union Water own one or more parcels of land adjacent to the current West Pitch Park, an area important to the development of the downtown riverfront park system on the Auburn side. In Lewiston, the applicant owns several key acres critical to the development of Lewiston's downtown riverfront trail system. There is no ecological or financial reason that the CMP lands within the broader watershed should not be protected for public benefits in return for the considerable private benefits received by the company from the public river resource. Indeed, CMP has a legal obligation to provide adequate protection to the public of these resources as part of the cost of a new license.

The 500-foot buffer zone plus all of the CMP lands and islands within the broader watershed should be managed only for public access, recreation, water quality, and wildlife benefits (with the exception of power lines, dams, etc.) Non-CMP lands within the 500-foot corridor should be purchased on a willing seller basis according to specified priorities established in the shoreland protection plan, and trough the use of the environmental enhancement fund created as a condition of the license.

CC-37- This shoreland plan should be specified in far more detail in the FEIS and the Commission should require the applicant to develop and implement a shoreland protection plan, to be filed for approval with the Commission before the commencement of project operations. This license requirement is supported in Commission regulations.[9]

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[9] The Commission's "Manual of Standard Special articles" (april 1992) further emphasizes the need for applicants to affirmatively protect project shoreline from development pressure through the establishment of a detailed management plan for the

CC-36- See our response to ALT's Comment No. 12.

CC-37- See our response to CC's Comment No. 34. Further, while we agree that there is potential for shoreline development, there is not enough evidence to show that the shoreline is in imminent danger of being significantly developed before the any license for the project would be issued.

C. The Commission should support the creation of an Environmental Enhancement Fund in the FEIS

CC-38-

CMP has utilized the Androscoggin River at this project for power generation for almost 90 years, starting with the operation of the Deer Rips facility. Over this period, CMP has controlled and temporarily diverted as much water as it could use and left little for in-stream non-hydropower purposes. The company and its shareholders have benefitted from the almost unconditional use of the river in this time and now appear unwilling to provide the public with mitigation plans commensurate with the value of this lucrative license.

Given the extensive interest in protecting watershed lands, and the admittedly increasing value of such lands, it seems odd that CMP would recommend only monitoring public use to determine the need for recreational improvements, "consider the need" for more carry-in access, and submit a recreational summary only every six years. (DEIS at 4-31.) These suggestions by the applicant seriously misjudge local interest in land protection and access as project mitigation, and the requirement to provide such measures. Although the Commission appears interested in the development of a Land Conservation and Trail Plan, at this time "no specifics of the plan have been provided" by the applicant as of yet, DEIS at 4-34, and the Commission admits only that such a plan "could" result in additional protection and enhancement for environmental resources. (Id.)

It is essential that the Commission support the creation of an environmental enhancement fund to make meaningful shoreland protection possible in the context of this project. The Commission disagrees with this recommendation, stating that "measures to protect shoreline areas" will be included in the project. (DEIS at 4-88.) But what will such measures entail?

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maintenance of a buffer zone:

> When a new license is issued for the continued operation of a project that (1) has a reservoir that could attract significant residential and commercial construction and (2) the licensee does not have a comprehensive land use plan, the DHR staff includes the following license article, requiring the licensee to develop and implement a management plan for the maintenance of a buffer zone around the reservoir shoreline.

Article 5.VI.4 Before the commencement of project operations, the licensee shall file with the Commission, for approval, a detailed management plan for the use of shoreline project buffer zone lands.

CC-38- See our response to ALT's Comment No. 12.

CC--39- CMP owns seven miles of frontage on the Gulf Island-Deer Rips impoundments within Auburn and Lewiston. (DEIS at 3-39.) And the State of Maine purchased an additional 2,00 acres of land at great cost in 1990. (DEIS at 3-40.)

Approximately 49 miles of shoreline are associated with the project. The project has high aesthetic value and tremendous public demand. How will additional land be protected as necessary to safeguard this valuable resource? It is doubtful that the state will be able to afford to purchase more land for permanent protection in the near future given current state and federal budgetary constraints.

Moreover, local shoreline zoning is notoriously fickle in the face of waterfront development pressures. See, e.g., CMP letter to the Commission on this Project, dated February 9, 1994 at 13: "policies and regulations change with changing interests, political pressures, the economy, and other forces." In addition, the Shoreland Zoning Act relied on by CMP imposes only minimal regulation on new construction; it is not intended and does not prohibit development in this 250 foot wide zone. Nor does the Act guarantee public access. Petitions to remove RP zones can occur at any time.

Although both CMP and the Commission appear sanguine about the security of shorefront lands in the Project areas, detailed studies reveal that their confidence is misplaced. For example, the multi-year Northern Forest Lands Study documented the increased demand for seasonal and year-round homes on Maine lakes and rivers once considered remote. This study concluded that the demand for lakeshore and river frontage lands is "insatiable," and concluded that:

> eventually every piece of unprotected lakeshore, river frontage and land adjacent to mountain areas will be subdivided, bought and built on...Although these trends are affected by economic cycles, they have never been reversed.[38]

CC--40- The quoted price of almost $2,000 per acre for shorefront lands in the project area suggest that real estate prices are already comparatively high, and that public pressure to develop the land will continue to grow. (Although this estimate appears quite high. Other EISs have cited $1000 per acre for similar land; the Coalition would appreciate more analysis of conservation easement and land purchase costs in the FEIS.)

CC--41- Our Coalition urges the Commission to reconsider the

[38] Harper, S.C., L.L. Falk, E.W Rankin, Northern Forest Lands Study, USDA Forest Service, Rutland, VT (Feb. 1992) at 9.

CC--39- We do not deny that the possibility of developing the project's shorelines exists. However, as stated in the FEIS, as well as in our response to comments on the DEIS, we do not believe that the Gulf Island-Deer Rips shoreline is in peril of significant development at this time. Because we have acknowledged the potential for development, we are recommending that a shoreline management plan be developed, and filed for Commission approval, in which specific parcels of land are designated for specific uses or nonuses, whichever is appropriate. We believe that by recommending such a plan be developed and implemented, that we are recommending shoreline protection measures above what the state of Maine already requires.

CC--40- The Commission, generally does not require the establishment of conservation easements, because we believe a licensee should not be responsible for land beyond that which is directly related to the operation of a project. We have acknowledged, however, the need for some form of shoreline protection and have recommended the development of a shoreline protection plan. We do not specify how a project's shorelines are to be protected, because we believe the best means to determine the most effective method of protection, as well as the specific amount of land to be protected, should be determined by those entities most familiar with the land and land-use values.

As stated in Section 4.2.1.5. of the FEIS, the value of the land we used in our discussion was obtained from Central Maine, as Central Maine was the only respondent to a request from staff to provide any information pertaining to land values in the area. In the absence of any other cost estimates, we chose to use those values submitted by Central Maine.

CC--41- The Commission does not routinely require the establishment of an enhancement fund. If, in the context of developing the Comprehensive Land

CC–41-cont. enhancement fund issue in the context of the FEIS, and to require that the applicant develop a shoreline enhancement fund for the purposes of purchasing conservation easements as lands become available over the course of the 30-year license. The funds should go to an entity such as the Androscoggin Land Trust, and monies spent according to priorities set out in the purpose document of the enhancement fund. For example, the funds should be spent only on lands that fit into a specified ecosystem protection scheme, e.g. lands that connect existing buffer lands like the State lands on Gulf Island. Such connector lands would have special recreational and/or wildlife value. Such priorities should be set out as part of the Shoreline Protection Plan required of CMP and crafted in coordination with applicable agencies and local organizations.

As the Conservation Coalition stated in its scoping comments of June 28, 1994, CMP has sold a number of land parcels adjacent to project boundaries since relicensing began. See Coalition scoping comments at 12 for more detail. By not retaining these lands and incorporating them into the project boundary, CMP is contributing to potential development around project impoundments. The environmental enhancement fund provides an alternative means for CMP to adequately protect shorelands in and around the Project area.

If FERC does not require CMP to contribute to such a Fund, the Commission will simply be alerting CMP and other applicants that selling off watershed lands in the pre-licensing stages is an effective way to circumvent the shoreland protection policies and requirements under federal law. Instead, the Commission should require that the Fund be established (perhaps the profits from CMP's recent sale of watershed lands could provide an immediate infusion of cash). The Conservation Coalition recommends that the Fund receive an amount equivalent to 10% of the revenues generated by the Project over the term of the license. A portion should be reserved for monitoring these easements and corridors.

The goal of the Fund should be $800,000 (1995 dollars), which at the estimated $1,684/acre for easements (DEIS at 4-86) would purchase roughly 475 acres, or 30 acres per shoreline mile with a 250-foot setback, or approximately 16 miles of shoreline protection.

CC–42- Although the Commission concludes that the Conservation Coalition has presented insufficient information in support of its shoreland recommendations, DEIS at 4-86, we would respectfully suggest that it is the DEIS that fails to support its conclusion that the lands are adequately protected, and fails to show such lands will be protected throughout the duration of the license. The Project boundaries should be expanded, current recreation demand acknowledged, and the enhancement fund required

CC–41-cont. Use Management Plan, the pertinent parties agree that the establishment of an environmental enhancement fund is appropriate, the Commission, depending upon the specific stipulations involving the use of the funds, generally would support such an agreement. Thus, we generally do not dictate to a licensee the method of protection, nor do we dictate the establishment of an enhancement fund to protect land-based resources and values. Rather, we believe that a licensee, the local governments and interest groups, and federal and state agencies familiar with the area are the appropriate entities to determine the specific provisions of any land use plan.

CC–42- See our response to CC's Comment No. 35.

of the applicant.

VIII. Alternative Energy Sources and Energy Efficiency

CC-43- NEPA and the FPA require the Commission to rigorously examine and give equal consideration to energy conservation as a least cost alternative to hydropower. This examination is critical as alternative power sources and energy conservation could allow the licensees to modify hydropower operations to enhance non-power values without unreasonable cost to the companies' power requirements.

We cannot agree with the Commission's decision to "eliminate from detailed analysis" in the DEIS this pivotal legal requirement and substantive option. (DEIS at 2-25.) The Commission rejected the energy alternatives on two flawed assumptions:

1) CHP has "an excellent record and national reputation in [DSM] " and must therefore have maximized energy efficiency within both its plant and its system. (DEIS at 2-27.)

2) The generating resources that are replaced by solar, wind, etc, are not hydropower but those with higher marginal costs, such as oil-fueled, natural-gas-fueled, and coal-fueled generating resources. "For this reason, load reduction, energy conservation, and wind power are not reasonable alternatives to...[hydropower].

First of all, the Commission continues to misstate the role that energy conservation is required to play under the Federal Power Act. A primary reason to carefully consider conservation is to accurately calculate the costs of alternative sources of power to replace hydropower losses due to flow modifications and other natural resource enhancements at the projects.

If expensive replacement power is used as the "false" least cost option, the EIS will dramatically overstate the cost of reducing hydropower generation to increase habitat flows and provide fish passage facilities. Because the DEIS fails to investigate the lower cost alternatives to hydropower, it does not accurately assess the true cost of nonpower enhancements in relation to the true benefit of hydropower. As a result, the Commission -- and the public -- have "no clear idea how to visualize the environmental harms"from the projects and whether the project benefits outweigh project harms.

The Commission rejects recommended flow alternatives, including 10(j) recommendations by US FWS because of the economic cost to the project. These enhancements were rejected, in large part, based on the high cost of replacement power asserted by the

CC-43- In the real world, load reduction and energy conservation measures do not displace relatively low-marginal-cost generating resources such as nuclear, solar, high-quality geothermal, and hydropower, except in very rare instances when those are the only resources operating. The generating resources that are displaced in actual practice are those with the higher marginal costs, such as oil-fueled, natural-gas-fueled, and coal-fueled generating resources. For this reason, load reduction and energy conservation are not true or reasonable alternatives to the operation of generating resources with low marginal operating costs. They can be considered as alternatives to only the highest marginal cost resources, or considered to the extent that they can effectively delay the date at which any new generating capacity would need to be constructed to serve power demands.

A simple example may help clarify this point. Assume a man needs 100 apples per week and has been buying them at 50 cents apiece. Assume further, that one store offers to sell the man 20 apples a week at ten cents apiece, and another store offers to sell the man 20 apples at eight cents apiece. What will the man do? Of course, the man will choose to minimize his costs and will take all he can get, up to 100 apples, at any per unit cost less than 50 cents. In simple terms, the cheaper apples are not mutually exclusive alternatives unless they more than displace the 50-cent apples; the apple purchaser has no need to choose between the eight- and ten-cent apples.

The various Regional Electric Reliability Councils (ERCs) of the country prepare and submit reports, titled "Regional Reliability Council Long Range Coordinated Bulk Power Supply Programs," to the U.S. Department of Energy (DOE) each year. These reports, known as DOE Code IE-411, contain, among other data, the forecast of annual energy requirements and the compound growth rate of the peak load for the next ten-year planning period. In the IE-411 reports, the utilities' load estimates are reduced by the projected amounts of energy conservation and load reduction that can be economically achieved by specific dates. Therefore, any economic or need-for-power studies based on the regional load/resource data in the IE-411 reports have fully considered all the reasonable, economical alternative load-reduction and conservation measures.

CC-43-cont. Commission as the least cost alternative to hydropower. The Commission's failure to consider energy efficiency and alternative supply options as the real least cost alternative renders the economic comparison of alternatives in the DEIS fatally flawed.

Second, there is no basis for the Commission's cursory assumption that energy conservation does not replace hydropower. Energy conservation can and does displace hydropower through planning and regulatory decisionmaking when it is determined that restoration of river values is in the public interest and justifies some limitation on hydropower generation. Energy conservation is a reasonable (albeit often only partial) alternative to the existing hydropower operations and may allow the Commission to reduce the impacts of dams on the river resource without harming a company's net energy requirement costs. See Affidavit of Paul Charnick, December 8, 1993, filed in Upper Androscoggin EIS record.

Third, the Commission is wrong in relying on CMP's "excellent reputation and national reputation" in the DSM arena. There is no question that CMP could increase the amount of conserved power it now acquires through existing DSM programs. In a proceeding before the Maine Public Utilities Commission, CMP witnesses testified that the company's DSM program was constrained at the moment due to low avoided costs. See Attached testimony of Philip C. Hastings, February 17, 1993 at 7. The company confirmed the view of the Conservation Coalition that CMP's DSM programs could change as demand, energy prices, and market factors change. One aspect of change that CMP could respond to are changes in the hydro system and acquire additional conserved power available to the company in its service territory which is technically feasible and available.

Energy efficiency improvements within the Androscoggin River paper mills and hydro facilities is another energy option simply dismissed out of hand by the Commission.

In making licensing decisions, FERC is required to balance a river's value as a power source with its value for other public uses. Crucial to reaching this balance is an accurate assessment of the cost of all feasible alternatives to current hydropower management. The Commission's position that conservation is an alternative to fossil fuels but not to hydropower generation results in a biased balancing process. The Commission's refusal to consider seriously the conservation alternative or energy efficiency improvements undermines the whole purpose and intent of the Federal Power Act.

CC-43-cont. The results of studies using the IE-411 data show the benefits of, and need for, projects to serve load that cannot be reasonably eliminated or reduced by load-reduction or energy conservation measures. Therefore, when economic studies are done based on the need for capacity and energy shown in the IE-411 or equivalent reports, no additional studies are needed to demonstrate that the proposed generating resources being evaluated would not displace more cost-efficient conservation or load-reduction measures.

Conclusion

We urge the Commission to incorporate our comments in the FEIS for the Lower Androscoggin River Basin Projects.

Dated: February 21, 1996

Respectfully submitted,

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**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

CENTRAL MAINE POWER CO., *et al* **Project No. 2283-005**
GULF ISLAND - DEER RIPS PROJECT

COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT OF TROUT UNLIMITED, MAINE COUNCIL OF TROUT UNLIMITED, ATLANTIC SALMON FEDERATION, AND MAINE COUNCIL OF ATLANTIC SALMON FEDERATION

Pursuant to the Federal Energy Regulatory Commission's ("FERC" or "Commission") Notice of Issuance of Draft Environmental Impact Statement ("DEIS") and a subsequent issuance of extension of comment period, Trout Unlimited, the Maine Council of Trout Unlimited, the Atlantic Salmon Federation, and the Maine Council of the Atlantic Salmon Federation (hereinafter "TU *et al.*") hereby submit their comments as follows:

<u>Minimum Flows, Impoundment Fluctuation and Fish Passage</u>

TU–1- Regarding rejection of TU *et al.*'s and Interior's recommendations for year-round minimum flows of 1,700 cfs and year-round limitation of 1 foot for impoundment fluctuations, Staff seems to have rejected these on an economic basis, saying that the "incremental benefits to fishery resources" would not be worth the $26,000 per year expense, based upon current annual operating costs, at page 5-38. There is no assertion that such recommendations are outside the scope of Interior's 10(j) authority, and, therefore, Staff had no basis in law to reject Interior's recommendation. The use of current operating costs is not a valid measurement of value in such calculations. Staff should reconsider their rejection of such recommendations, include them in the preferred alternative, and leave it to the licensee's discretion as to whether it wishes to accept a license containing such conditions. Such an approach would be in line with the Commission's current

RESPONSE TO COMMENTS

TU–1- We disagree with TU *et al.*'s interpretation of the Commission's authority under Section 10(j) of the FPA. Section 10(j) of the FPA requires the Commission to include license conditions, based on recommendations provided by the federal and state fish and wildlife agencies. Section 10(j) also states that the Commission may reject any such recommendations that it believes are inconsistent with the purposes and requirements of Part 1 of the FPA, or other applicable law. In the DEIS, we made a preliminary determination that Interior's minimum flow and impoundment fluctuation restrictions might be inconsistent with the comprehensive development and balancing requirements of Section 10(a) and 4(e) of the FPA. Staff consulted with the FWS, under Section 10(j), in an effort to resolve the differences.

We believe that TU *et al.* misunderstands the basis of the Commission's method of quantifying the incremental cost of the environmental enhancement proposals. We quantify the incremental cost of the environmental enhancement proposals as they affect the existing capacity of the project to generate electricity. This is not based on the cost of maintaining and operating the hydroelectric generating plant. The incremental cost of providing minimum flows and/or restricting impoundment fluctuations is the cost of providing replacement power for that which would be either lost or shifted to times of lower need as a result of the environmental enhancements. The estimated dollar amount is the loss in the on- and off-peak value of power that the project would incur for loosing the generation capability in exchange for providing minimum flow and/or impoundment fluctuation enhancements. We believe that this is a reasonable method of quantifying the incremental cost of the environmental enhancement proposals.

Staff revised their recommendation for impoundment fluctuations, in light of the comments received on the DEIS, and discussions with FWS at the Section 10(j) meeting.

efforts to deregulate the electric industry, allowing the market to determine the value of the project.

TU--2- As to Staff's rejection of TU *et al.*'s request for up and downstream fish passage and the above-mentioned flow conditions, TU refers Staff to the final EIS for the Ayers Island Project, FERC No. 2465, as to the approach taken regarding such issues when other projects' operations and facilities are a significant factor. The final EIS should recommend that when Atlantic salmon restoration becomes a priority for this part of the Androscoggin and fish passage has improved at downstream projects, then the licensee must install fish passage at this project and provide flows and impoundment fluctuation limitations as recommended by TU *et al.* and Interior. This must be set in the terms and conditions of this license.

Comments on Quality of DEIS

TU--3- In general, the quantitative information in the DEIS is helpful and the analyses leading to Staff's conclusions are provided. Staff appears to have made extensive efforts to fully evaluate both the environmental and economic impacts of various parties' recommendations. The appendix containing additional economic analyses, Appendix B, demonstrates consideration of a number of alternatives.

On the other hand, some areas of quality should be improved. There are a number of errors in referencing the reader to incorrect pages, *e.g.*:

TU--4- *2.3.1.2 at p. 2-16*

The DEIS notes that in their unopposed Motion to Intervene dated January 15, 1993, TU *et al. requested* that the Commission: (1) direct the applicant to

RESPONSE TO COMMENTS

TU--2- We disagree. It appears that TU *et al.* is drawing comparisons between two very different river systems. The Ayers Island Project (FERC Project No. 2456) is located on the Pemigewasset River in the Merrimack River Basin. The Merrimack river system has an active anadromous fish restoration program that is based on a formal comprehensive fishery restoration plan and formal agreements among federal and state resource agencies and private entities.

The Maine Atlantic Sea Run Salmon Commission issued an updated Atlantic salmon restoration plan for Maine rivers. The details of this updated plan are described in Section 3.2.2. Briefly, the status of the Atlantic salmon population in the Androscoggin River is described as "small, declining," and the goals for the river during the 1995-2000 planning period are to "maintain current numbers, increase in future." This plan indicates that the resource agencies continue to strive for increased population levels in the Androscoggin River, but the river continues to be low priority for active restoration efforts.

In the absence of any convincing evidence to the contrary, we continue to support the resource agency's position. We believe that consideration of fish passage at Gulf Island-Deer Rips should be deferred until such time that resource agencies deem installation of the facilities appropriate.

TU--3- Your opinion has been noted.

TU--4- As a point of clarification, TU *et al.*'s motion to intervene was a motion to intervene in opposition to licensing the Gulf Island-Deer Rips Project.

TU--4-cont. prepare an EIS; (2) hold an adjudicatory hearing in this matter; and (3) consolidate this proceeding with related application proceedings for eight other projects on the Androscoggin River. The DEIS states that, "We discuss this in Section 2.5." While it is not clear which of the three requests "this" refers to, Section 2.5 addresses none of them. Instead, Section 1.3 addresses TU *et al.*'s first and third requests in that it presents a discussion of both the Commission's decision to prepare an EIS and to not consolidate the various ongoing licensing proceedings, *i.e.*, not expand the scope of such an EIS. FERC has never responded to TU *et al.*'s request for an evidentiary hearing.

TU--4-cont. TU *et al.* is correct in stating that reference to preparing an EIS and consolidating licensing proceedings in the basin is made in Section 1.3. We have revised the text in Section 2.3.1.2. accordingly. With reference to an evidentiary hearing, we believe that the record of this proceeding, as it currently exists, including this FEIS, will provide the necessary comparative analyses to allow the Commission to evaluate the alternatives.

5.4.1 at p.5-40

TU--5- TU *et al.* requested a year-round minimum flow of 1,700 cfs at the Gulf Island/Deer Rips project. The DEIS notes that while Staff recommends such flow levels for May 1 to November 30, "However, for the same reasons discussed on Page 5-36 regarding Interior's flow recommendation, we are not adopting the 1,700 cfs minimum flow from December 1 to April 30." The reference should have been to pages 5-32 to 5-35.

TU--5- We agree. See revised text in Section 5.4.1.

TU--6- While these "proofing" errors may not be significant, they do make the DEIS more difficult to follow and put doubt in the reader's mind as to the accuracy of quantitative information and of analyses performed. TU *et al.* also recommend that Staff look to the Ayers Island final EIS for format, especially Appendix C, with actual copies of comments and corresponding Staff responses.

TU--6- Your opinion has been noted.

Thank you for your consideration of TU *et al.*'s comments. We appreciate the opportunity to participate in the relicensing process, and note that our members look forward to being actively involved with the implementation of the new license

terms and conditions for some years to come.

Respectfully submitted,

TROUT UNLIMITED, MAINE COUNCIL TROUT UNLIMITED, ATLANTIC SALMON FEDERATION, and MAINE COUNCIL ATLANTIC SALMON FEDERATION

By _____
Mona M. Janopaul
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February 21, 1996

CERTIFICATE OF SERVICE

I hereby certify that I have served on this 21st day of February, 1996, by first class mail, a copy of the foregoing pleading upon each person designated in the Secretary's service list for this proceeding.

_____
Mona M. Janopaul, Esq.

RESPONSE TO COMMENTS

United States Department of the Interior

OFFICE OF THE SECRETARY

March 1, 1996

REF FERC #2283-005, 11482
DEIS for Lower Androscoggin River Projects
ER 95 852

Ms Lois D Cashell, Secretary
Federal Energy Regulatory Commission
888 First Street, N E
Washington, D C 20426

Dear Ms Cashell

This is the United States Department of the Interior's (Department) review of the Draft Environmental Impact Statement for the Lower Androscoggin River Projects, located in Maine, and covering the following proposed actions: issuance of a new license for the Gulf Island - Deer Rips hydroelectric project, and issuance of an initial license for the Marcal Hydroelectric Project (currently unlicensed) We note that this DEIS was prepared by the Federal Energy Regulatory Commission staff pursuant to the National Environmental Policy Act based on the finding that the proposed licensing actions would have a significant impact on the quality of the human environment

The following comments are provided in three parts. First, we give an overall assessment of the adequacy of the DEIS in addressing issues of concern to this Department Attachment A is a section-by-section analysis of the DEIS Attachment B contains updated and/or modified recommendations and fishway prescriptions, that have been previously provided by the Department pursuant to Secs 10(j) and 18 of the Federal Power Act, respectively

GENERAL COMMENTS

DOI-1- The DEIS generally addresses most of the issues that were raised by the Fish and Wildlife Service during the scoping process (See letter, dated May 27, 1994, from Gordon Beckett, New England Field Office, to Lois Cashell) However, we disagree with the Commission's failure to coordinate this DEIS with the preparation of NEPA documents regarding other recent and ongoing licensing proceedings in the basin We also take issue with the Commission's continued definition of baseline conditions in the lower Androscoggin River basin as those existing today under current hydropower development, and with the view that the "no action" alternative involves continued operation of these facilities

DOI-1- See our response to CC's Comment Nos 3, 4, 5, 1,4 and 15.

Ms Lois D Cashell, Secretary

DOI--2- We do concur with certain recommendations in the DEIS, including those that call for modifying operations at both projects in order to improve fish and wildlife resources However, we believe that additional measures are needed to adequately and equitably protect and enhance those resources at these projects, and in downstream areas that are affected by their operation, as discussed in greater detail in Attachment A

Thank you for the opportunity to comment on this DEIS

Sincerely,

Andrew L Raddant
Regional Environmental Officer

DOI--2- For each project (i.e., Gulf Island-Deer Rips and Marcal), we have based our recommendations for instream/bypass minimum flows and impoundment operations on: (1) our analysis contained in the FEIS; and (2) pertinent information provided at, and discussions during, the Section 10(j) meeting held in Lewiston, Maine.

ATTACHMENT A.
SECTION BY SECTION ANALYSIS OF THE
DEIS FOR LOWER ANDROSCOGGIN RIVER PROJECTS

PURPOSE AND NEED

DOI–3- NEPA requires that an environmental impact statement contain a statement on the underlying purpose and need to which the agency is responding in proposing the alternatives, including the proposed action (40 CFR, Sec. 1502 13) This portion of the document is crucial in that it allows for the identification and subsequent evaluation of a proper range of alternatives.

The Lower Androscoggin River DEIS does not contain a clear description of the underlying "purpose and need", as required by NEPA. Although the DEIS describes the "action" as the potential issuance of new and initial licenses for the Gulf Island - Deer Rips and Marcal projects, respectively, and discusses how the document will be used to evaluate potentially significant environmental effects of the projects, the overall/basic project purpose(s) and need(s) are not well-defined.

The DEIS does paraphrase portions of Sections 4(e) and 10(a) of the FPA regarding the Commission's obligations for fish and wildlife and other non-developmental interests. However, this implies that there may be a variety of project purposes and needs, specific to the Lower Androscoggin River Basin. This portion of the DEIS should elaborate on what the specific needs and purposes are that should be addressed in order to ensure that comprehensive river basin development is achieved.

Need for Power

DOI–4- Power from the Gulf Island - Deer Rips and Marcal projects is currently used by the New England Power Pool (NEPOOL). Therefore, "need for power" that is discussed in the DEIS is a regional demand based on expected growth rate projections within the entire NEPOOL service area. The DEIS does not explain whether there is a need for power within Central Maine Power Company's service area, or more specifically within the Lower Androscoggin River Basin. We recommend that the Commission provide more detail on the use of the power that is generated at the hydroelectric facilities in the Lower Androscoggin River Basin, including information on local needs (i.e., within CMP's service area).

It is important that the Commission elaborate on local power needs in light of the fact that CMP is currently reducing its reliance on "non-utility generators" (NUGs) in Maine to lower its costs of purchased power. (For example, CMP recently purchased two small projects in the Saco River Basin and one on the Presumpscot River.) While we presume that this is being done primarily to lower rates for its customers, CMP's diminishing use of NUGs is also reducing the generating capacity that is available to NEPOOL. This would indicate a surplus of power, at least within CMP's service area, and perhaps throughout NEPOOL, contrary to the conditions that are portrayed in the DEIS.

DOI–3- We believe the statement provided in Section 1.1 of this EIS adequately states the underlying purpose and need to which the agency is responding.

In this case, Commission staff prepared the Lower Androscoggin River EIS in response to what we perceived to be significant environmental impacts associated with the relicensing and licensing proceedings in question. Section 1.1 clearly states that the FEIS assesses the impacts associated with the continued operation of Gulf Island-Deer Rips and Marcal, analyzes alternatives to the proposed projects, and makes recommendations to the Commission relative to issuing licenses for the projects.

We acknowledge that Gulf Island-Deer Rips and Marcal may have a variety of project purposes and needs. However, elaborating on the specific purposes and needs of the projects is not required to be included in the purpose and needs statement, but rather what is appropriate is identifying the purpose and need for which this EIS has been prepared. Hence, we believe the underlying purpose and need to which the agency *[in this case, the Commission]* is responding has been adequately defined.

DOI–4- Power from Gulf Island-Deer Rips and Marcal is used to serve loads within NEPOOL, as well as within Central Maine's power system. Since Central Maine regularly makes economy interchanges with other utilities within economic transmission distance, a discussion of a need for power to meet just Central Maine's loads, or to meet loads only within the river basin would serve no useful purpose.

The regional need for power portrayed in the DEIS is valid, because the data in the OB-411 reports, which we use to evaluate the regional loads, include the best information available on projected power purchases from all sources as well as self-generation by the utilities.

DOI-5- We also recommend that needs beyond increased generating capacity be included in this portion of the DEIS in order to satisfy the comprehensive development requirement (multiple beneficial public uses) contained in the FPA. The need to protect, restore and enhance fish and wildlife resources should also be identified at the outset of the document.

SCOPE OF THE EIS

DOI-6- The Commission has correctly expanded the geographical scope of the DEIS to include riverine and/or estuarine areas below the Gulf Island - Deer Rips and Marcal projects. However, as discussed in the FWS' May 27, 1994 scoping comments, the Commission should have addressed how it will meld the findings of this DEIS with what has recently been completed for the upper Androscoggin River (issuance of new licenses for seven operating hydroelectric facilities), and with what will be produced as a result of the ongoing licensing of the Riley-Jay-Livermore-Otis projects, just upstream from Gulf Island, and Union Water Power Company's storage dams (Upper and Middle Dam), located in the headwaters of the river basin. In order to truly address comprehensive development under Sec. 10(a) of the FPA, and to achieve balance among competing resource needs, the Commission must not use a piecemeal approach in its NEPA process for these projects.

DOI-7- We agree with the Commission's efforts to address cumulative effects of hydropower development in the Lower Androscoggin River Basin on resident and anadromous fish, wetlands, and other environmental values. However, a truer picture of cumulative impacts requires that the Commission analyze and describe conditions in the drainage as they might have existed prior to the development of any hydroelectric/storage dams. We request that the Commission describe those conditions in the FEIS.

PROPOSED ACTION AND ALTERNATIVES

DOI-8- The DEIS considers a range of alternatives that deal primarily with alternate operations of the hydroelectric facilities in the Lower Androscoggin River Basin. Given the regional need for power that is identified in the DEIS, the Commission should expand their consideration of alternatives to measures and locations outside of the Androscoggin River and State of Maine. This should include not only other hydroelectric facilities that currently are, or could be utilized by NEPOOL, but other types of electrical generating equipment, as well as conservation, that could be used, either singly or in combination to meet capacity demands.

Other Issues Involving Alternatives

DOI-9- 1. No Action Alternative. Under NEPA the Commission must include a "No Action" alternative in this and other EIS documents. According to the DEIS, the "no action" alternative involves the issuance of annual licenses for the Gulf Island - Deer Rips Project

RESPONSE TO COMMENTS

DOI-5- As indicated by the section's title, " Need for Power," the intent is to address the power generation requirements of Central Maine's service area and any additional regional power needs. Therefore, we will continue to present the information in the format which has evolved over the past two decades.

DOI-6- It is not our intent to discuss in great detail the findings of previous licensing proceedings in the Lower Androscoggin River EIS. Nor is staff obligated to describe how findings from future licensing proceedings would be melded with this, and other past licensing decisions. NEPA, at §1502.20, states that agencies are encouraged to tier their environmental impact statements to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for discussion at each level of environmental review. Further, NEPA states that tiering also may be appropriate for different stages of actions.

In this proceeding, Commission staff determined the appropriate scope for the environmental analysis to be the Lower Androscoggin River Basin, but did incorporate information for certain resources from other licensing proceedings and non-hydro related activities where relevant. We recognize that other licensing proceedings are on-going in the basin. Once the results from these proceedings become available, UWPC, International Paper, their stockholders, as well as the Commission, will be in a better position to address developmental and environmental issues in the basin. Any changes in the license conditions for projects included in this proceeding, or other projects included in previous proceedings, that would be required to achieve balance among competing uses in the basin, could be implemented through use of the re-opener authority described by staff in Section 1.3 of the EIS.

DOI-7- See our response to CC's Comment No. 16.

DOI-8- The DEIS compared a range of alternatives for the hydroelectric projects' current power operations to the primary alternative of power production by Central Maine's existing resources, because Central Maine is the licensee or power purchaser for all the projects being evaluated. The alternative costs of power production we used were based on Central Maine's avoided costs, as determined by its system production cost studies, which include the effects of conservation and load management on power production requirements.

DOI-9- See our response to CC's Comment No. 15.

for the next 30 to 50 years, with no change in current operations, including modifications to benefit fish and wildlife and other environmental values. Similarly, the Marcal Project would continue to operate without being licensed, even though the staff has previously found it to be under the Commission's jurisdiction.

The Commission also states in the DEIS that the no action alternative would maintain the status quo at the Gulf Island - Deer Rips and Marcal projects, and thus form the basis for comparing all other alternative actions. We disagree with this concept of baseline conditions, and strongly recommend that the Commission adopt as its "no action" alternative the without-project or no-project scenario so as not to lose sight of the cumulative effects of hydropower development throughout the basin, and to achieve a better balance among competing resource needs.

DOI–10- 2. Consideration of non-hydropower alternatives. The DEIS does not adequately discuss a variety of additional generational and energy-savings measures that could be used to meet regional capacity needs. Given that hydropower contributes only a small fraction of NEPOOL's total capacity needs, other means of producing power should be addressed in the DEIS. This includes not only conventional generating facilities that are currently in use in the region (i.e., nuclear and fossil fuel), but also emerging technologies such as windpower, which are presently being considered in Maine. The use of non-utility facilities (NUGs) should also be addressed in terms of satisfying regional energy needs. Finally, the DEIS should give serious consideration to conservation as an alternative to reducing the demand for any type of generating facility, hydroelectric or otherwise.

DOI–11- 3. Failure to consider denial of license applications. The DEIS states that no one has proposed license denial, decommissioning of facilities and removal of the dams at the Gulf Island - Deer Rips and Marcal projects, and therefore the Commission has no basis for recommending this alternative.

The DEIS goes on to state that dam decommissioning and removal could cause significant environmental impacts due to loss of sediments, wetlands, and recreational opportunities in the impoundments. While such impacts may or may not occur at the projects (the DEIS does no further analysis of the dam removal alternative), the Commission has ignored the fact that original construction of the dams and associated project works eliminated a variety of aquatic and terrestrial habitats (none of which has ever been mitigated). Dam removal could help restore some of the habitats and natural resources that have been eliminated for many years at these and other hydroelectric projects in the Basin.

DOI–10- Although not addressed individually, several different generation and conservation resources were considered in our studies, because various types of generation and conservation resources make up, and affect, Central Maine's avoided costs. Central Maine's avoided cost is the primary alternative to the projects as proposed; it is this cost we use in our economic evaluation of the various hydroelectric operation scenarios.

DOI–11- The FERC staff have always limited its evaluation of environmental impacts to reasonable alternatives. We acknowledge that dam removal would have environmental benefits (i.e., restoring a free-flowing river, enhancing water quality, unobstructed fish movement within the river, etc.). However, in this instance, it is intuitively obvious that the environmental disruptions and costs of dam removal would outweigh the benefits to be realized. We are confident that if any entity believed otherwise, they would have proposed dam removal, or proposed detailed studies and provided evidentiary support enumerating the benefits of dam removal in this instance, as has been done for other cases involving a variety of projects.

AFFECTED ENVIRONMENT

Anadromous Fish

DOI–12- The DEIS generally provides an accurate description of anadromous fishery resources within the Lower Androscoggin River Basin. However, some clarification is needed. On page 3-11 of the DEIS, the Commission refers to a determination by the FWS[1] that a fishlift is needed at the Marcal Project by 1999. While upstream fish passage measures are needed on the Little Androscoggin River, they will likely be designed primarily for river herring, which currently outnumber salmon. As discussed in the Department's comments to the Commission regarding the Marcal Project (letter from Andrew Raddant to the Commission, dated October 7, 1994), fish passage will require a comprehensive approach, addressing needs at all of the dams on the Little Androscoggin River.

DOI–12- We have revised the text in Section 3.2.2. to include a discussion of the current thinking relative to fish passage needs on the Little Androscoggin River.

DOI–13- The status of Atlantic salmon restoration in the Little Androscoggin River is also slightly different than what is described on page 3-11 of the DEIS. The Maine Atlantic Sea Run Salmon Commission (recently renamed as the Maine Atlantic Salmon Authority) has issued an updated restoration plan[2] in which the status of the salmon population in the Androscoggin River is identified as "small, declining". The updated plan gives as its goals for the river during the 1995-2000 planning period, "maintain current numbers, increase in future". Therefore, although salmon restoration priorities are not as high for the Androscoggin as in some other rivers in the state of Maine, the resource agencies continue to strive for increased population levels through habitat protection and other means.

DOI–13- We recognize the resource agencies current restoration goals for Atlantic salmon in the Androscoggin River Basin, and have revised our general status discussion accordingly (*see Section 3.2.2.*).

ENVIRONMENTAL CONSEQUENCES

Effects of Water Level Fluctuations on Wetlands and other Resources at the Gulf Island - Deer Rips Project

DOI–14- As acknowledged in the DEIS, the Department and others have recommended that the existing drawdown regime in the Gulf Island impoundment be reduced from four feet to one foot throughout the year in order to protect and enhance littoral zone habitat, wetlands, and associated wildlife. While the Commission staff apparently agree that a restriction in drawdowns during the period May 1 - June 30 would benefit certain resources (bass spawning and wetland growth), they

DOI–14- The benefits accruing from each of the proposed and recommended alternatives were addressed in the DEIS (*see Sections 3.3.2.4., 4.1.1.4., 4.2.1.3., and 5.4.1.*). In Section 4.1.1.4. of the DEIS we acknowledged that there was a potential for additional wetland development under a more "stable" fluctuation regime. However, because there was no determination made regarding the value of these wetlands for wildlife use, and because the existing wetland complex appears to be productive, we determined that the incremental benefits associated with either seasonal or year-round run-of-river operation, in consort with a one-foot drawdown (when appropriate), do not justify the significant additional cost that would result from implementing such alternatives.

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[1]U.S. Fish and Wildlife Service. 1989. Final environmental impact statement - restoration of Atlantic salmon to New England rivers (1989 - 2021). U.S. Department of the Interior, Newton Corner, Massachusetts. May 1989. 88 pp. + appendices.

[2]Maine Atlantic Sea Run Salmon Commission. 1995. Maine Atlantic Salmon Restoration and Management Plan, 1995 - 2000. ME Atl. Sea Run Salmon Commission. Bangor, ME. 24 pp + appendices.

DOI--14-cont. also conclude that extending the one-foot limit throughout the remainder of the year would in fact reduce wetland productivity and wildlife use.

We find the Commission's conclusions on wetland impacts at the Gulf Island - Deer Rips Project to be contradictory. According to the DEIS, the applicant's studies indicate that seasonal stability of water levels during the early part of the growing season (May 1-June 15) would help promote wetland growth (DEIS, p. 4-27). The staff apparently agree, and have recommended that the stable period be extended until June 30 (DEIS, p. 5-29). It does not follow, therefore, that continuation of the one-foot drawdown limit would adversely impact wetland growth and development. Additional studies by the applicant suggest that waterfowl and shorebirds avoid the drawdown zone as potential nesting habitat due to the instability (DEIS, p. 4-28). We would add that freshwater mussels and other relatively immobile aquatic organisms could not tolerate the unstable environment in the drawdown zone. Although the staff have concluded that there are abundant wetlands and demonstrated use by wildlife at the project under existing (i.e., four-foot drawdown) conditions, little effort was made by the staff to determine what would occur under an alternate drawdown regime. (Initial studies by the applicant into this issue concluded that limiting drawdowns would result in an additional 98 acres of wetlands -- DEIS, p. 4-27.) We would expect that the observed use by wildlife is at least partly due to the undeveloped nature of the impoundment shoreline, and not directly attributable to the existing drawdown regime.

Fish Passage Needs at the Marcal Project

DOI--15- The DEIS discusses the need for upstream fish passage facilities at the Marcal Project for anadromous fish, specifically Atlantic salmon (DEIS, p. 4.45). As discussed above ,fish passage measures will likely be required first for river herring at Marcal and other projects on the Little Androscoggin River, due to their greater numbers. As is the case at the other projects in the Lower Androscoggin River Basin where fishways have been constructed in recent years (Brunswick, Pejepscot, Worumbo), whatever is built to accommodate upstream runs of river herring will work for Atlantic salmon.

DOI--16- Regarding downstream passage facilities at Marcal, the DEIS states that the applicant has agreed to build facilities that meet FWS design criteria (DEIS, p. 4-45, 46). Although the Department anticipates providing its fishway prescription for downstream passage facilities following post-licensing consultation with the applicant (the DEIS states on p. 4-98 that final design of the facilities is to be determined through additional consultation with the agencies after the license has been issued), the FWS has identified several modifications to the plans that are included in the application. These include:

1. Reduced trashrack spacing. Unless an angled trashrack can be provided at the project (something that is unlikely at Marcal due to the short length of the forebay canal), similar to what was installed at the downstream Hackett Mills Project, it will be necessary to reduce clear spacing of the trashracks from 1.625 to 1.0 inches. The reduced spacing will help minimize entrainment of downstream

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DOI--14-cont. We also recognize that there are certain benefits associated with Interior's recommendation. We did not reject Interior's recommended impoundment fluctuation restriction solely on the basis of whether or not it would protect and/or enhance the littoral zone habitat, wetlands, and associated wildlife. As stated in Section 4.2.1.3. of the DEIS, Interior's recommended alternative affects other resources, and the decision to either adopt or reject the recommendation is made in Section 5.4.1.

DOI--15- See our response to DOI's Comment No. 12.

DOI--16- We will continue to view Interior's Section 18 Fishway prescription as a reservation of authority (*see Section 2.3.2.1. for the revised text*). Further we have revised our fish passage discussion in Section 4.2.2.2. to include Interior's comments regarding modifications to Consolidated Hydro's proposed downstream fish passage facilities.

migrants, and is consistent with what is now being prescribed at other projects This could be done by installing an overlay screen over the existing trashrack during the downstream migration period.

2. Relocated bypass entrance The fish bypass intake portal is located too far downstream from the end of the trashrack to be effective. In addition, the 17-foot-wide embayment at the bypass entrance will create an adverse flow field. In order to improve efficiency of the facilities, the bypass intake should be moved closer to the trashrack, eliminating the embayment.

3 Increased attraction flow. Due to the configuration of the bypass and location at the downstream end of the canal, we anticipate that the applicant's proposed 20 cfs attraction flow may not be sufficient to create a suitable flow field (between the trashrack and bypass). The attraction flow may have to be increased to approximately 40 cfs (three foot depth at the 30-in.-wide stop planks) at full generation for effective downstream passage. Up to 20 cfs of this flow could be recycled back to the forebay (via pumping) for power generation. The final attraction flow requirements would have to be determined by post-licensing effectiveness studies undertaken by the licensee.

4. Trash boom. A trash boom installed at the upstream end of the forebay canal would help minimize maintenance problems at the bypass intake.

5. Increased bypass pipe diameter. It may be necessary to increase the size of the fish bypass pipe from 24- to 36-in. diameter, or utilize an open flume, to accommodate the sluicing of debris and to handle the additional attraction flow.

DOI--17- We concur with the findings in the DEIS (p. 4-99) that there should be post-licensing monitoring of the effectiveness of the downstream fish passage facilities (and eventually upstream fishways as well) at the Marcal Project. Although the applicant proposes to build the downstream fishway according to FWS design criteria, each facility typically requires fine-tuning and other adjustments to maximize efficiency. Such modifications typically are identified during the course of, and following fish passage monitoring studies.

DOI--17- Your opinion has been noted.

STAFF'S CONCLUSIONS

DOI--18- We concur with the general finding in the DEIS that modification of the applicant's proposed licensing plans for the Gulf Island - Deer Rips and Marcal projects would benefit aquatic resources and associated public users. Given that the Androscoggin River is already heavily developed for hydropower, and has suffered extensive impacts (e.g., elimination of anadromous fish runs) due the construction and operation of hydroelectric projects, the Commission should view the incremental improvement of environmental conditions at, and below the Gulf Island - Deer Rips and Marcal projects as a way to help restore balance among competing resource needs in the

DOI--18- See our response to DOI's Comment No. 2.

basin.

Despite our general agreement with the Commission's proposed requirement of greater levels of protection and enhancement at the two projects, we believe that further improvements are needed to further benefit fish and wildlife resources. These additional modifications relate to instream flow releases and impoundment operation at one or both projects, and have already been addressed in the FWS' response to the Commission pursuant to 10(j) of the FPA[3].

[3]See letters, dated February 22, 1996 from Michael Bartlett to Lois Cashell, regarding fish and wildlife recommendations at the Gulf Island - Dear Rips and Marcal projects.

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The following page contains an attachment to the comment letter. No responses are required.

ATTACHMENT B:
REVISED SEC. 10(J) RECOMMENDATIONS AND SEC. 18 FISHWAY PRESCRIPTIONS

The Commission's regulations (18 CFR Subchapter B Part 4) allow for modification of recommendations and prescriptions previously provided by resource agencies pursuant to Sections 10(j) and 18 of the FPA, when the licensing proceeding involves preparation of a DEIS. Accordingly, we are providing the following modified recommendations and prescriptions for the projects covered in the DEIS for the Lower Androscoggin River Hydroelectric Projects.

Gulf Island - Deer Rips Project

Section 10(j) Recommendations

The information and analysis presented in the DEIS do not indicate a need to modify the FWS' recommendations pursuant to Section 10(j) of the FPA, as contained in the Department's December 15, 1993 letter to the Commission.

Section 18 Prescription

As identified in the Department's December 15, 1993 letter, authority is reserved for the Secretary of the Interior to prescribe fishways pursuant to Sec. 18 of the FPA. No additional fishway prescriptions are needed now for the Gulf Island - Deer Rips Project.

Marcal Project

Section 10(j) Recommendations

The information and analysis presented in the DEIS do not indicate a need to modify the FWS' recommendations pursuant to Section 10(j) of the FPA, as contained in the Department's October 7, 1994 letter to the Commission.

Section 18 Prescription

As discussed previously in Attachment A, the Department anticipates that it will be providing the Commission with a Sec. 18 fishway prescription as part of the post-licensing consultation on downstream passage measures at the Marcal Project. Until then, and for future upstream fish passage needs, authority is reserved for the Secretary of the Interior to prescribe fishways pursuant to Sec. 18 of the FPA.