SACO RIVER
FISHERIES ASSESSMENT AGREEMENT

FPL Energy Maine Hydro LLC

Cataract Project (No. 2528)
Skelton Project (No. 2527)
Bar Mills Project (No. 2194)
West Buxton Project (No. 2531)
Bonny Eagle Project (No. 2529)
Hiram Project (No. 2530)

FEBRUARY 2007

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1.0 INTRODUCTION

The *Saco River Fish Passage Agreement* dated May 24, 1994 and *Annex 1: Assessment Process and Criteria* dated January 20, 1995 (collectively, the "1994 Agreement") settled licensing issues relating to anadromous fish passage at seven hydroelectric projects on the main stem of the Saco River.

In consideration of, and consistent with, the 1994 Agreement, the Parties have herein agreed upon a schedule for installing upstream and downstream anadromous fish passage measures at the FPL Energy Maine Hydro LLC ("FPL Energy") Saco River hydroelectric projects.

The 1994 Agreement did not require measures to be developed for passage of American eel along the Saco River, nonetheless, the Parties have agreed upon upstream and downstream eel passage measures to be incorporated into this Agreement for the FPL Energy Saco River hydroelectric projects.

The measures detailed in Section 4 of this Agreement are "off-license" agreements and are not being submitted to FERC for inclusion as License Conditions.

The measures detailed in Section 5 of this Agreement shall be submitted to FERC for inclusion as License Conditions for the respective projects.

The Parties agree that the measures contained in Section 5 of this Agreement conclude the assessment process under the 1994 Agreement.

The Parties agree that this settlement agreement is supported by substantial evidence in the record of the proceeding, and that this settlement is in the public interest.

The Parties agree that this settlement satisfies Licensee's fish passage and fish management obligations at Licensee's Saco River hydroelectric projects for the term of this Agreement as stated in Section 1.3 herein.

The USFWS and NMFS believe that the protective fish measures in this settlement are an exercise of their authorities under the Federal Power Act, and further explain that they enter into this settlement expressly stating that they have statutory obligations to act on behalf of agency trust resources that cannot be circumscribed or bargained away in a settlement.

The Parties agree that this settlement agreement constitutes an integrated set of bargained-for terms, and that the Agreement therefore stands as a whole as further explained in Section 2.6 herein.

1.1 Parties

This Saco River Fisheries Assessment Agreement ("Agreement") dated as of February, 2007, is made and entered into by and among the following entities who shall, except as otherwise noted, be referred to hereafter as a "Party" and collectively as "Parties":

- FPL Energy Maine Hydro LLC ("FPL Energy" or "Licensee");
- U.S. Fish and Wildlife Service ("USFWS") exercising the delegated authority of the Secretary of the U.S. Department of the Interior under the FPA;
- National Marine Fisheries Service ("NMFS") exercising the delegated authority of the Secretary of the U.S. Department of Commerce under the FPA;
- Maine Atlantic Salmon Commission ("MASC");
- Maine Department of Marine Resources ("MDMR");
- Maine Department of Inland Fisheries and Wildlife ("MDIFW");
- Saco River Salmon Club ("SRSC");
- Atlantic Salmon Federation ("ASF");
- Maine Council of the Atlantic Salmon Federation ("MC-ASF"):
- Saco River Hydro LLC; and,

- New Hampshire Fish and Game Department.

1.2 Terms of Agreement

This Agreement shall become effective upon execution by all of the Parties except that Sections 4 and 5 of this Agreement shall be implemented and binding upon all the Parties only after the Federal Energy Regulatory Commission ("FERC") issues a Final FERC Order approving, in all material respects, the terms and provisions of Section 5 of this Agreement and such order becomes effective.

The Agreement shall terminate, unless extended by the Parties, on January 31, 2038.

1.3 Purpose and Scope of Agreement

This Agreement relates to six FERC-licensed hydroelectric projects owned by FPL Energy on the Saco River: the Cataract Project (No. 2528); the Skelton Project (No. 2527); the Bar Mills Project (No. 2194); the West Buxton Project (No. 2531); the Bonny Eagle Project (No. 2529); and the Hiram Project (No. 2530) ("Projects"). The scope of this Agreement does not include the Saco River upstream of the Hiram Project impoundment, excluding specifically the Saco River in New Hampshire.

The purpose and objectives of this Agreement are threefold:

- To establish the timing and the nature of fish passage measures to be taken at the Projects for anadromous fish (excepting those measures already implemented under the 1994 Agreement);
- To establish the timing and the nature of fish passage measures to be taken at the Projects for catadromous fish; and,
- To establish other measures to enhance the restoration of fish populations in the Saco River.

The Parties agree that implementing the measures in Sections 4 and 5 herein will satisfy Licensee's fish passage and fish management obligations at the Projects for the term of this Agreement, except where action by the USFWS or NMFS is necessitated by:

a. A substantive change in statute or regulation;
b. The listing of an applicable species under the Endangered Species Act ("ESA"), except to the extent addressed in Section 2.4 (Measures Relating to Potential Listing of American Eel Under the Endangered Species Act);
c. A change in Project operation or works that will have a material adverse effect on the effectiveness of a fishway required under this Agreement; or
d. A determination by either USFWS or NMFS that, based upon the best scientific and commercial data available and after considering economic impacts to the Project(s), the failure to take a particular action will result in that service's inability to fulfill a statutory or regulatory obligation.

Any action taken by the USFWS or NMFS under a) through d) above shall preserve the letter, spirit, implementation, and schedules of this Agreement to the greatest extent possible. The Parties will negotiate in good faith under Section 2.9, Dispute Resolution, to resolve, prior to implementation whenever practicable, any disagreement regarding any such proposed fisheries agency action.

1.4 Effect on Future Relicensing

In addition to the Bar Mills Project currently undergoing relicensing, the Hiram, West Buxton, and Cataract Projects will undergo relicensing during the term of this Agreement. This Agreement will continue to be in effect in those proceedings, and the Parties agree not to take any position therein inconsistent with this Agreement. Reservations of authority by the U.S. Departments of Interior or Commerce to prescribe fishways under Section 18 of the Federal Power Act during the relicensing of these projects shall not be considered inconsistent with this Agreement, nor shall the

prescription or requirement by either Interior or Commerce of the measures and schedules contained in Section 5 of this Agreement.

1.5 Conventions and Definitions

The Parties agree that the following conventions and definitions shall have the meanings so noted throughout this Agreement.

- "Assessment Report" shall mean an Assessment Report, Saco River Fish Passage Assessment Plan as described in Task 8 of Annex 1 of the 1994 Agreement.
- "Endangered Species Act" or "ESA" shall mean the federal Endangered Species Act of 1973, 16 U.S.C. 1531 et. seq.
- "Energy Policy Act of 2005" shall mean Public Law 109-58.
- "FERC" or "the Commission" shall mean the Federal Energy Regulatory Commission or its successor.
- "Final FERC Order" shall mean the issuance of a FERC order, including any subsequent orders by FERC on rehearing or the courts on administrative appeal, that approves and does not materially change or modify the measures in Section 5 of this Agreement. For the purposes of this Agreement, a Final FERC Order is effective upon expiration of the period legally allowed for filing for rehearing or appeal, or upon resolution of such rehearing or appeal, whichever is later.
- "Final Prescription(s)" shall mean the filing of final prescriptions for the Bar Mills Hydroelectric Project No. 2194 by USFWS and NMFS which conform to the applicable terms and provisions of Section 5 of this Agreement.
- "Fish passage facility" shall mean a single device or structure that serves as a Fishway. Examples of a fish passage facility include, but are not limited to, a Denil fishway, a steeppass fishway, a fish lift, a downstream bypass sluiceway, and an upstream eelway.
- "Fish passage measure" shall mean any action or system that is intended to provide for or improve fish passage at a Project, including but not limited to a fish passage facility or project operational procedures.

- "Fishway" shall have the meaning assigned to it by Congress in the Energy Policy Act of 1992, Section 1701(b).
- "FPA" shall mean the Federal Power Act, 16 U.S.C. § 791 *et seq.*
- "License Conditions" shall mean enforceable conditions of a FERC license or related FERC order.
- "Licensee" shall mean FPL Energy Maine Hydro LLC or any successor to the licenses of any of the Projects.

2.0 GENERAL AGREEMENTS OF THE PARTIES

2.1 Parties to Support Agreement and Regulatory Processes

The Parties agree to support this Agreement, and the *2000 – 2005 Assessment Report, Saco River Fish Passage Assessment Plan* (see Attachment A), in any proceedings before the FERC or other regulatory bodies related to the matters addressed herein. Such support shall include, but not be limited to: a) submittal of this Agreement to FERC by FPL Energy as an Offer of Settlement under 18 CFR §385.602 (Rule 602) in the Bar Mills relicensing proceeding; b) submittal of this Agreement to FERC by FPL Energy to effectuate the license changes contemplated at the other Projects by this Agreement; c) filing of Final Prescriptions for the Bar Mills Hydroelectric Project No. 2194 by USFWS and NMFS which conform to the applicable terms and provisions of Section 5 of this Agreement; d) modification of fish passage recommendations for the Bar Mills Project by the MDMR, MDIFW and MASC to conform to the applicable terms and provisions of this Agreement; and e) submittal of a request by FPL Energy to withdraw without prejudice the January 11, 2006 *Requests for Trial-Type Hearing and Proposals for Alternative Conditions Bar Mills Project; FERC Project No. 2194.*

Such support by the Parties shall include good faith efforts by each Party to expedite any National Environmental Policy Act ("NEPA") activities that may be undertaken by the FERC, as well as any other regulatory approvals that may be needed to implement the terms and provisions of Section 5 of this Agreement. With respect to the obligations addressed herein, the Parties agree not to propose or otherwise communicate, encourage or assist others to propose or communicate to the FERC or to any other federal or state regulatory or resource agency with jurisdiction directly related to the regulatory processes contemplated herein, any comments, recommendations, certification, or license conditions other than those consistent with the terms of this Agreement.

2.2 Filing Schedule

FPL Energy will, within 30 days of execution of this Agreement by all Parties, submit the Agreement to FERC as an Offer of Settlement under Rule 602 for the Bar Mills Project fish passage issues. At all of the other Projects FPL Energy will submit the Agreement and request that the FERC issue an order or orders integrating the terms and provisions of Section 5 of this Agreement as License Conditions for each applicable Project. FPL Energy will concurrently file with FERC the *2000 – 2005 Assessment Report, Saco River Fish Passage Assessment Plan*, due under the 1994 Agreement and included herewith as Attachment A.

The USFWS and NMFS will, within 30 days of execution of this Agreement by all Parties, replace their modified prescriptions and submit to FERC Final Modified Prescriptions for the Bar Mills Hydroelectric Project, included herewith as Attachment B.

The MDMR, MASC and MDIFW will, within 30 days of execution of this Agreement by all Parties, submit to the FERC and Maine Department of Environmental Protection if applicable, letters supporting this Agreement and withdrawing any prior fish passage recommendations for the Bar Mills Project relicensing that are not consistent with this Agreement.

Each Party will, within 45 days of execution of this Agreement by all Parties, submit to FERC letters of full support for the Offer of Settlement.

2.3 Measures Relating to the Energy Policy Act of 2005

FPL Energy agrees that it will, contemporaneously with the submittal of Final Prescriptions for the Bar Mills Project by USFWS and NMFS, withdraw without prejudice the *Requests for Trial-Type Hearings and Proposals for Alternative Conditions for the Bar Mills Project; FERC No. 2194*, submitted to the U. S. Departments of Commerce and Interior on January 11, 2006. Nothing in this Agreement shall be

construed to limit the ability of FPL Energy to seek an agency hearing or to propose alternatives, as provided for under the Energy Policy Act of 2005 and its regulations, to prescriptions filed by Interior or Commerce that are not consistent with, or are beyond the scope of, Section 5 of this Agreement.

2.4 Measures Relating to Potential Listing of American Eel Under the Endangered Species Act

The Parties understand that the Federal Government is reviewing the status of the American eel (*Anguilla rostrata*) pursuant to its responsibilities under the ESA. As of the date of this Agreement, the American Eel is not listed as threatened or endangered under the ESA. All Parties agree that this Agreement offers cognizable benefits to American eel. Accordingly, the USFWS and NMFS agree that, at the request of Licensee, they will use good faith efforts to assist Licensee to obtain appropriate documents under the ESA, such as a Candidate Conservation Agreement with Assurances, or a permit issued under the ESA. In the event that Licensee applies for instruments to provide for the lawful incidental take of American eel, the USFWS and NMFS agree to fully acknowledge and recognize in those instruments the benefits of the protective measures for American eel set forth in this Agreement.

2.5 Rehearing and Judicial Review

The Parties agree that none of them will file or support a request for rehearing or reconsideration of any FERC order issued in response to the filing(s) to be made under this Agreement, unless said order contains conditions that materially alter, condition, omit, or add to the terms of Section 5 of this Agreement, except for requests for clarification of unclear language or for correction of simple and apparent error, or requests concerning matters outside the scope of this Agreement.

In the event that any Party decides to file a request for rehearing or reconsideration in accordance with the terms of this provision, it will, at the earliest practicable time, provide written notice of its intention to do so to all the other Parties. If the request concerns matters within the scope of this Agreement, the other parties will then support the request to the extent reasonably possible. Thereafter, if any Party, following the issuance of a FERC order on rehearing that does not correct the deficiencies of the initial order or otherwise materially alters, conditions, omits, or adds to the terms of Section 5 of this Agreement, elects to file a petition for judicial review with respect to matters within the scope of this Agreement, the other Parties will support such a petition to the extent reasonably possible. The Parties recognize that participation by USFWS and NMFS in such judicial review is dependent on approval by the U.S. Department of Justice, and participation by State agencies is dependent on approval by the Attorney General of their State.

2.6 Enforceability and Withdrawal Rights

The Parties have entered into this Agreement with the express expectation that FERC will not contravene the provisions of Section 5 herein and will issue one or more Final FERC Orders that integrate the terms and provisions of Section 5 of this Agreement into the License Conditions for the applicable Projects. If, in making its decisions, the Commission determines that any of the provisions contained in Section 5 are not within its jurisdiction to enforce, the Parties request that the Commission expressly and clearly notify the Parties of this in its order. If the Commission does not expressly identify any of the provisions contained in Section 5 as outside its jurisdiction, in reliance thereon, the Parties will proceed as though each of the provisions in Section 5 are enforceable by the Commission.

The agreement of the Parties depends upon the Commission, and, to the extent required, the Maine Department of Environmental Protection (MDEP), issuing an order(s) that does not materially modify, condition, omit or add to any of the measures identified in Section 5.

A Party that considers itself to have been materially and adversely affected by any change made to the provisions of Section 5 of this Agreement by the Commission and / or MDEP shall provide written notice of this to the other parties within 30 days and shall therein state whether it intends to withdraw from this Agreement. For a period of forty-five days from the date of a Party's notice of intent to withdraw from this Agreement, the Parties will use a dispute resolution process and make a good faith effort to resolve any materially adverse issues arising from the FERC and / or MDEP order. During this process the other Parties must provide timely written notification to all other Parties whether the withdrawal of the affected Party would cause them to withdraw as well.

A Party may seek rehearing or reconsideration on the FERC action to meet the FERC procedural time limits, however, any request for rehearing, reconsideration, or judicial review under this section 2.6 shall be withdrawn if agreement is reached on modifying the Agreement to be consistent with the FERC order.

If the Parties do not reach agreement on resolving the issues or modifying the Agreement to be consistent with the Final FERC Order and / or MDEP order, and the affected Party has sought administrative relief through a rehearing of the FERC order and / or MDEP order, without success, then it may withdraw from the Agreement, and shall not be bound thereafter. Other parties may also choose to withdraw if they have timely notified all other Parties that withdrawal of the affected Party will necessitate their doing so.

If Licensee, USFWS or NMFS withdraws from this Agreement, the Agreement shall immediately become null and void. If the Agreement is rendered void in this manner, thereafter this Agreement shall have no force and effect and the Parties shall in any subsequent administrative or judicial proceedings take the position that this Agreement is not available to support the Commission's or MDEP orders.

2.7 License Amendments

Licensee may not seek any amendment of any Project license that would, if granted, be materially inconsistent with the terms of this Agreement, unless the Parties have previously agreed to amend this Agreement, pursuant to the procedures of Section 2.8, Fisheries Assessment Agreement Amendments.

2.8 Fisheries Assessment Agreement Amendments

The Parties agree that nothing in this Agreement is intended to limit or restrict the ability of any Party to seek an amendment to this Agreement. Any Party proposing an amendment to this Agreement shall provide all Parties with written notice of the proposed amendment. The other Parties shall then have 60 days to respond with objections, approvals, or requests for further discussion and consultation. After such notice and consultation, if all Parties either concur with or do not object to the proposed amendment, the Party making the proposal shall secure the agreement, in writing, of all Parties, except as described below. No amendment shall be effective that is not reduced to writing and signed by the Parties, except as described below. Licensee shall file any amendment to Section 5 of this Agreement with the FERC.

The failure to obtain the signature to an amendment of any Party that is no longer in existence at the time of a proposed amendment, or that declines to answer a proposal in any way within 60 days of written notice, shall not prevent the other Parties from amending this Agreement.

2.9 Dispute Resolution

The Parties will endeavor to resolve in good faith any dispute that may arise in carrying out this Agreement, using a consensus process which may include meetings between the Parties with a facilitator. The intent of the Parties is to maintain the spirit of cooperation and understanding that led to this Agreement and the 1994 Agreement.

2.10 Successors and Assigns

This Agreement shall be binding on the Parties and on their successors and assigns.

2.11 Agency Appropriations

Nothing in this Agreement shall be construed as obligating any federal, state, or local government to expend in any fiscal year any sum in excess of appropriations made by Congress, state or local legislatures or administratively allocated for the purpose of this Agreement for the fiscal year or to involve the USFWS, NMFS, or any state agency in any contract or obligation for the future expenditure of money in excess of such appropriations or allocations.

2.12 Establishes No Precedents

The Parties have entered into this Agreement with the explicit understanding that all offers of settlement and the discussions relating thereto are privileged, shall not prejudice the position of any Party or entity that took part in such discussions and negotiations, and are not to be otherwise used in any manner in connection with any other proceedings. The Parties understand and agree that this Agreement establishes no principles or precedents with regard to any issue addressed herein or with regard to any Party's participation in future relicensing proceedings of projects that are outside the scope of this Agreement.

2.13 Incorporation of Attachments

The 1994 Agreement and this Agreement, including its Attachments, constitute the entire agreement between the Parties with respect to their subject matter.

2.14 Governing Law

This Agreement shall be construed and governed in accordance with the Federal Power Act and Federal Law, for those portions of the Agreement within the jurisdiction of FERC. The remainder shall be construed and governed by the laws of the State of Maine, without regard to Maine's conflict of law principles. This does not imply that any of the Federal agencies are hereby consenting to state court jurisdiction, or waiving hereby any defense of sovereign immunity not already waived by statute.

2.15 Multiple Counterparts

This Agreement may be executed in two or more counterparts, each of which is deemed an original but all constitute one and the same instrument.

2.16 Compliance with Law

The performance by the Parties of this Agreement will be subject to all applicable statutes and regulations.

2.17 No Waiver

No failure by a Party, at any time, to enforce any right of remedy available to it under this Agreement shall be construed to be a waiver of such Party's right to enforce each and every provision of this Agreement in the future. Any waiver of any rights under this Agreement must be provided in writing.

2.18 Authority

By executing this Agreement, each Party makes the following representations, warranties and covenants:

a. Good Standing. With regard to the non-governmental Parties, such Party is duly organized, validly existing and in good standing under the laws of the state or in which it is organized, formed, or incorporated, as applicable; that it is qualified to do business in the state or states in which the Party is located; and that it has the corporate power and authority to own its properties and to carry on its business as now being conducted;
b. Authority. Such Party has the right, power and authority to enter into this Agreement, to become a Party hereto and to perform its obligations hereunder; and that this Agreement is a legal, valid and binding obligation of such Party, enforceable against such Party in accordance with its terms;
c. No Conflict. The execution, delivery and performance of this Agreement does not violate or conflict with the organizational or formation documents, or bylaws or operating agreement, of such Party, or any judgment, license, permit, order, material agreement or instrument applicable to or binding upon such Party or any of its assets.

2.19 Adjustment of Financial Amounts

Except where otherwise specified herein, all financial amounts committed to in Section 4 of this Agreement are in 2006 dollars, and shall be adjusted in later years according to the Gross Domestic Product: Implicit Price Deflator as published by the U.S. Department of Commerce.

3.0 MEASURES WITH RESPECT TO THE 1994 FISH PASSAGE AGREEMENT

This Agreement is complementary to, and serves to clarify and supplement the roles of certain Parties who are involved in, the 1994 Agreement. Further, this Agreement addresses some issues with respect to the Projects that were not addressed in the 1994 Agreement. To the extent that this Agreement affirmatively amends portions of the 1994 Agreement, the Parties hereby agree to those amendments. The portions of the 1994 Agreement not amended by this Agreement remain in full force and effect.

3.1 Fisheries Assessment Report

The Parties agree that the diadromous fish passage measures and studies set forth in Section 5 of this Agreement are consistent with the recommendations set forth in the *2000 – 2005 Assessment Report, Saco River Fish Passage Assessment Plan*. *See* Attachment A.

3.2 Fisheries Assessment Process

The Parties agree that the Assessment Process and Assessment Reports under Annex 1 to the 1994 Agreement are concluded and that no further Assessments or Assessment Reports are required. Nonetheless, Licensee and USFWS, NMFS, MDMR, MASC and MDIFW agree that there will be a meeting in March annually to review fish passage operational data from the previous year, draft an annual report, and develop an operational plan for the upcoming year. The fish passage operational data should include the number of fish passed daily (by species), the number and timing of lifts made each day, daily water and air temperature data, and other related fishway operational information.

3.3 Interim Downstream Passage of Anadromous Fish at Hiram

The Parties agree that the interim downstream passage requirements for anadromous fish at the Hiram Project under Paragraph 4 of the 1994 Agreement are hereby amended in their entirety by Section 5.3.a.1. of this Agreement.

3.4 Permanent Downstream Passage of Anadromous Fish at Hiram

The Parties agree that the permanent downstream passage requirements for anadromous fish at the Hiram Project under Paragraph 16 of the 1994 Agreement are hereby amended in their entirety by Section 5.3.a.2. of this Agreement.

4.0 MEASURES NOT REQUIRING FILINGS WITH THE COMMISSION

The initial payments of funds agreed to under this section will be made after the Final FERC Order materially approving the terms and provisions of Section 5 of this Agreement becomes effective. The initial payments will be made within 60 days of the effectiveness of the Final FERC Order, including any subsequent rehearing or administrative appeals. Unless otherwise stated below, the remaining annual payments will be made by February 28 in each applicable year. In case of transfer of any of the Projects' license, Licensee may assign a pro rata share of these obligations to the new licensee.

4.1 Funds to Support Fisheries Management and Restoration

Licensee agrees to support various Saco River Basin fisheries management and restoration activities which may include, but are not limited to: developing or populating a database system to track annual fisheries research and management information; surveying and enhancing fisheries habitat and fish access to habitat; assessing fisheries populations; developing and implementing a geographic-referenced database of sampling locations and their associated data; and/or other fisheries management activities. Licensee agrees to fund such activities by up to an aggregate of $10,000[1] per year for ten years, according to the schedule below.

The MDIFW and Licensee shall, in consultation with MDMR and MASC, develop and agree upon a plan for the implementation of fisheries management and restoration activities under this section. Such agreement shall not be unreasonably withheld. The plan will be developed by January 2009. Unless the plan includes an alternative schedule of activities and funding, Licensee will fund the plan activities by up to $40,000 in 2010. Thereafter, Licensee will fund plan activities by up to $10,000 per year for six years. In no case shall such schedule or plan advance the funding schedule or

[1] Funding may be by in-kind contributions of services by Licensee if approved by MDIFW.

require the total funding by Licensee under this section to be increased beyond that anticipated above.

4.2 Funds to Support the Saco River Salmon Club

Licensee agrees to pay a one time grant of $25,000 to the Saco River Salmon Club. Such funds will be expended by the SRSC for annual rearing and stocking of Atlantic Salmon fry at its hatchery as part of the overall restoration goals for the Saco River.

4.3 Saco River Salmon Enhancement Fund

Licensee agrees to establish a Salmon Enhancement Fund ("Fund") for the Saco River. This Fund shall be established as an account at an accredited financial institution to the joint credit of the MASC and Licensee. If this account bears interest, that interest shall be part of the Fund and treated no differently than funds deposited by Licensee. Licensee agrees to contribute $50,000 annually to this fund until permanent upstream passage measures for anadromous species are provided and operational up to and through the Bonny Eagle Project (see Section 5.3.b.1 of this Agreement for operational dates).

Monies in the Fund may be expended only upon joint approval of the USFWS, MASC and Licensee, which approvals shall not be unreasonably withheld. Expenditure for the raising and stocking of Atlantic salmon parr or smolt requires approval by no less than two of the three entities. Expenditure for other measures requires the approval of the three entities. The Fund may only be used to enhance, through various measures, the production and return of Atlantic salmon to the Saco River. The USFWS, MASC and Licensee shall consult annually with the Parties regarding measures to be undertaken with the Fund but the approval of the other Parties is not required.

Those monies in the Fund that are not expended annually for salmon enhancement measures will remain with the Fund to be used for future salmon enhancement measures

on the Saco River. Notwithstanding the above, monies remaining in the Fund 24 months after the date that permanent upstream fish passage facilities/measures for anadromous species are provided and operational at the Bonny Eagle Project shall become available for use by Licensee at its sole discretion.

4.4 Funds to Support Public Education

Licensee agrees to provide five payments of up to $5,000 per year to develop and implement a public education program promoting the cooperative fisheries management and fisheries restoration efforts on the Saco River. The Parties agree that the funding does not necessarily need to be provided in consecutive years and will jointly determine in which years the expenditures will be made. Exceptions to the above schedule to delay a single year's funding by up to one year or combine it with the funds for the following year may be requested by consensus of the Parties, which request will not be unreasonably denied by Licensee, however, in no case shall such request require the total funding by Licensee under this section to be increased beyond that anticipated above. Notwithstanding the above, Licensee will not be required to expend funds under this section beyond the year 2016. The Parties agree that the development and implementation of the public education program will be a cooperative joint effort by the Parties.

4.5 Reporting Requirements

Each Party receiving or directing the expenditure of funds for projects associated with this Section 4 shall provide a written status report at the annual SRCC meeting. The status report shall include the project(s) undertaken, total funds expended for that year, full reports of data gathered and analyses conducted, results and recommendations as appropriate and conceptual plans for future project funding as appropriate.

5.0 FISHERIES MANAGEMENT MEASURES

5.1 Provisions Relating to All Fish Passage Facilities Agreed to Herein

a. Design Review – Plans and designs for each permanent fish passage facility agreed to herein will be reviewed in accordance with Section 7 of the 1994 Agreement and the current FERC license requirements for each applicable Project.

b. Shakedown Period – Once each new fish passage facility is constructed under this Agreement, Licensee will operate each fish passage facility for a one-season "shakedown" period to ensure that it is generally operating as designed and to make minor adjustment to the facilities and operation. At the end of the shakedown period, Licensee shall have a licensed engineer certify that the facility is constructed and operating as designed in all material respects. Licensee will provide the USFWS, NMFS, MDMR and MASC as appropriate with a copy of the as-built fishway drawings as submitted to FERC, along with the licensed engineer's letter of certification. All design drawings or as-built drawings determined to be Critical Energy Infrastructure Information under FERC guidelines shall, if retained by the USFWS, NMFS, MDMR or MASC, be held as confidential files that are not available to the public without prior written authorization from Licensee, unless required to be released by operation of law.

c. Effectiveness Studies - Licensee agrees to conduct effectiveness studies following the shakedown period of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures required under this Agreement. In the event that the facilities or measures as initially implemented are not effectively passing the target species, Licensee agrees to make, in consultation with the USFWS, NMFS, MDMR and MASC, reasonable, cost-effective, adjustments to the facilities or measures in an effort to improve fish passage effectiveness. "Reasonable, cost-effective, adjustments" shall mean such adjustments to the facilities or measures, as initially implemented, to improve the fish passage effectiveness towards desired levels, but in no event

shall the aggregate cost of such adjustments exceed 5% of the initial capital cost of that fish passage facility or measure, or of the significant modification of an existing fish passage facility, as applicable. The "initial capital cost" will include capital costs expended on the fish passage facility or measure up to the date of certification. This provision shall not apply to the Springs and Bradbury fish passage facilities or measures, which are addressed separately herein.

All effectiveness studies of upstream fish passage facilities conducted pursuant to this Section shall use the following criteria:

- Study goals: Document upstream passage effectiveness of all newly constructed fishways at the Bar Mills, West Buxton, Bonny Eagle, and Hiram projects as applicable.
- Study initiation and duration: Studies will be initiated during the passage season following the facility shakedown period**,** and carried out for up to three years for each species. Initiation of studies for each species will depend in large part on the availability of suitable numbers and types of fish (i.e. that have been imprinted to move upstream of the project being studied).
- Study design: Details on the design of upstream passage effectiveness studies are to be determined through consultation between Licensee and the USFWS, NMFS, MDMR or MASC as appropriate.

d. Fishway Operating Procedures - Licensee will, in consultation with the USFWS, NMFS, MDMR and MASC, draft and maintain a standard set of written Fishway Operating Procedures for each of its Projects on the Saco River. These Fishway Operating Procedures will include general schedules for routine maintenance, procedures for routine operation, procedures for monitoring and reporting on the operation of each fish passage facility or measure, procedures for annual start-up and shut-down, and procedures for emergencies and Project outages significantly affecting fishway operations. Copies of these Fishway Operating Procedures, and any revisions made during the term of this Agreement, will be sent to the USFWS, NMFS, MDMR and MASC.

5.2 American Eel Management Measures

Licensee will provide permanent eel passage measures at its Saco River Projects according to the following schedule. The schedules set forth in this section for the development and implementation of upstream and downstream eel passage measures may be delayed following consultation with and agreement by the USFWS, NMFS, and MDMR that eels are not yet sufficiently abundant to require passage or to provide enough data to allow for a determination of the type or location of eel passage measures.

PROJECT	UPSTREAM EEL PASSAGE OPERATIONAL DATE[2]	DOWNSTREAM EEL PASSAGE OPERATIONAL DATE
Cataract – East and West Channel Dams	June 1, 2008	September 1, 2011
Cataract – Springs or Bradbury Dam	June 1, 2010	n/a
Skelton	June 1, 2012	September 1, 2024
Bar Mills	June 1, 2014	September 1, 2026
West Buxton	June 1, 2016	September 1, 2028
Bonny Eagle	June 1, 2018	September 1, 2030
Hiram	June 1, 2020	September 1, 2032

a. Upstream Eel Passage Measures

1. The Parties agree that an upstream eel passage facility will be required at only one location at each of the Projects, except at the Cataract Project where a facility may be required at both the West Channel Dam and East Channel Dam.
2. Licensee agrees to provide an upstream eel passage facility at either the Springs or Bradbury dam. Licensee may elect to either i) study, in consultation with the applicable Fishery Agencies, which dam is the most appropriate location for a facility, or ii) install an upstream facility at both dams.

[2] Annual installation and operation dates may be modified by Licensee based on river flows and the ability to safely access the site.

3. In the year before initiation of an upstream eel passage facility at a Project, Licensee will conduct a study to establish where at the Project the passage should be located. Licensee will present the results of this study to USFWS, NMFS and MDMR and obtain their concurrence with the choice of location, which concurrence shall not be unreasonably withheld. If it is the consensus of USFWS, NMFS, and MDMR that insufficient numbers of eels are present to require a fishway or to determine the location of an upstream eel fishway, those agencies may elect to delay the requirement to install passage facilities until adequate numbers of eels are present or a fishway location can be determined.

b. Downstream Eel Passage Measures

1. Licensee will provide engineering and /or operational plans for permanent downstream eel passage measures to MDMR, USFWS and NMFS for consultation by February 28 of the year in which downstream eel passage measures are scheduled at a given Project.
2. An efficiency goal of 90% has been targeted at each Project for permanent downstream eel passage measures, subject to confirmation through testing or other appropriate measures, that the goal is reasonably achievable and scientifically valid. This goal may be revised following consultation with and consensus by and between Licensee and the USFWS, NMFS and MDMR.
3. Interim Downstream Eel Passage Measures. If, in the interim period prior to implementing permanent downstream eel passage measures at the various projects, downstream eel passage measures are needed under certain circumstances at a specific Project to reduce significant adult eel mortality from downstream turbine passage, Licensee agrees to undertake the following measures during the passage season for that year, 1) open an existing fish sluice or other gate at the Project to provide an unimpeded passage route, and 2) reduce generation if necessary to reduce the

calculated hydraulic approach velocity to the turbine intake(s), thereby reducing the potential for impingement or entrainment of eels. The implementation of these measures will be initiated as described below by the confirmed observation[3] of more than 50 adult eel mortalities per night at a given Project ("trigger number"). Subject to any license conditions, these measures will be implemented as follows:

A. Licensee will routinely monitor the tailrace of one project from September 15 through November 15 annually for adult eel mortalities. The Skelton Project will initially serve as the indicator site for the Projects; routine monitoring will be instituted at Bar Mills and each subsequent upstream Project the 10th year after upstream eel passage has been installed at the subject Project.

B. Routine monitoring will occur once per week at the applicable Project. The monitoring will consist of visual observations of the tailrace area conducted from the shore or from watercraft.

C. Licensee will report any observed eel mortalities greater than the trigger number to the MDMR within 24 hours of the observation, or, if on a weekend, by the next business day. Licensee will clear dead eels from the tailrace when practical and safe to do so.

D. If observed mortalities during the routine monitoring are greater than the trigger number, then the monitoring frequency at the affected Project tailrace will be increased to once per weekday and once per weekday monitoring will be initiated at the next upstream Project.

[3] If eel mortalities in excess of 50 per night at a Project are reported by others, then that observation must be confirmed by either MDMR or Licensee personnel before measures under the interim downstream passage protocol are required.

E. Subsequently, if additional observed eel mortalities at the Project:

i. are less than the trigger number for 5 days, then routine weekly monitoring may resume.

ii. continue to be greater than the trigger number, Licensee will implement controlled spillage at the subject Project by the 3rd night following the observation of the trigger number. Controlled spillage will consist of opening a gate to pass approximately 4% of actual turbine flow for up to eight hours per night (a lesser quantity or duration of spillage may be allowed based upon studies or a demonstration of effectiveness). The controlled spillage and weekday monitoring for the Project will continue for 5 nights.

F. If additional observed eel mortalities during the above 5-night spillage period:

i. are less than the trigger number, then normal operation and weekly monitoring may be resumed on the 6th day.

ii. continue to be greater than the trigger number, Licensee will continue the controlled spillage and will, by the 3rd night following the observation of the trigger number, implement reduced nighttime generation at the affected Project such that the calculated hydraulic approach velocity to the turbine intake(s) is approximately 2 feet per second (fps) or less during the controlled spillage hours. The controlled spillage, reduced generation and once per weekday monitoring for the Project will continue for 5 nights.

G. Subsequently, if daily monitoring continues to show eel mortalities greater than the trigger number at a Project, Licensee, USFWS, NMFS or MDMR may initiate discussions to define further cost effective interim measures for reducing adult eel mortality at that

Project. These measures may include additional spillage or generation reductions. If the USFWS, NMFS or MDMR and Licensee cannot agree upon the implementation of additional interim measures, then they will follow the dispute resolution process of Section 2.9 of this Agreement.

H. In no case shall interim downstream passage measures be required at a particular Project for more than eight hours per night for more than two weeks per season.

I. The need for interim downstream monitoring and passage measures will cease at a given Project once permanent downstream eel passage is implemented at that Project.

J. The MDMR, USFWS, NMFS and Licensee may, by consensus, agree to modify the above interim protocol or measures.

4. Notwithstanding the above, the Parties agree that the only downstream eel passage measures required at Springs and Bradbury dams will be via routine gate operation or spillage.

5.3 Anadromous Fish Management Measures

In addition to the general requirements set forth in Section 5.1 above, the following are requirements specific to Atlantic salmon, American shad, alewife, and blueback herring.

a. Downstream Passage Measures at Hiram

1. Licensee shall not be required to institute any additional downstream fish passage measures at the Hiram Project until permanent downstream fish passage measures are operational at Hiram pursuant to this section.

2. Permanent downstream fish passage measures for Atlantic salmon (the only anadromous species needing downstream passage at the Hiram Project) shall be operational by the earlier of:

A. April 15 following two (2) years after Licensee receives written notification of the commencement of scheduled annual stocking of juvenile Atlantic salmon in the Saco River watershed above the Hiram Dam pursuant to a written agency-approved Atlantic salmon stocking program to be developed by USFWS, NMFS, MASC or New Hampshire Fish and Game Department, which establishes a stocking program to develop a permanent run of Atlantic salmon above Hiram, but in no case earlier than April 15, 2017; or

B. The operation of permanent upstream fish passage facilities for Atlantic salmon at the Hiram Project.

b. Permanent Upstream Passage Facilities

1. Licensee will provide a single permanent upstream anadromous fish passage facility at each of the Projects according to the following schedule. The schedules set forth in this section for the development and installation of upstream anadromous fish passage facilities may be delayed contingent upon the returning numbers of the target species, and following consultation with and agreement by the USFWS, NMFS, MASC and MDMR as appropriate.

PROJECT	OPERATIONAL DATE
Bar Mills	May 1, 2016
West Buxton	May 1, 2019
Bonny Eagle	May 1, 2022
Hiram	May 1, 2025[4]

[4] Provided that such facility is necessary based upon the status of salmon restoration at that time.

2. Licensee will, 18 months prior to the planned construction of each upstream passage facility, submit conceptual designs for approval by the USFWS, NMFS, MASC and MDMR, and will subsequently file functional design drawings with the Commission for approval. The Parties agree that the design goal for each of these facilities is that they be as effective at passing sufficient escapement numbers of the target species as a single standard Denil-type fishway. The approval by the USFWS, NMFS, MDMR and MASC of conceptual designs that meet this goal will not be unduly withheld. Any disputes over the conceptual designs will be resolved through the Section 2.9 dispute resolution process.
3. The Parties agree that Licensee will not be required to install more than one upstream fish passage facility at each of the Bar Mills, West Buxton, Bonny Eagle or Hiram Projects during the term of this Agreement.

c. Atlantic Salmon Management Measures

Licensee agrees to continue to trap adult Atlantic salmon at either the Cataract or Skelton fishway, and truck these fish to release sites in the Maine portion of the Saco River basin until such time as permanent upstream fish passage measures are operational at each of Licensee's Saco River projects (see Section 5.3.b.1. of this Agreement for operational dates). The release (location and numbers of fish) will be carried out in accordance with the annual operations plan developed through the SRCC planning process.

d. Alewife and Blueback Herring Management Measures

Licensee agrees to continue to trap adult alewife and blueback herring at either the Cataract or Skelton fishways, and truck these fish to release sites in river reaches below the Hiram Project until such time as permanent upstream passage measures are operational at the Bar Mills, West Buxton and Bonny Eagle projects (see Section 5.3.b.1. of this Agreement for operational dates). The release (location and numbers of fish) will

be carried out in accordance with the annual operations plan developed through the SRCC planning process.

e. American Shad Management Measures

1. Licensee will attempt to improve American shad passage at the Springs Island Dam according to the following:

A. When adult shad returns at the Cataract fish passage facilities (East and West channels combined) reach 3,000 fish per year for two consecutive years, then Licensee will perform an engineering study / design for facility and / or operational modifications to improve shad passage at Springs Island Dam.

B. When adult shad returns at the Cataract fish passage facilities (East and West channels combined) subsequently reach 5,000 fish per year for two consecutive years, then Licensee will implement the modifications within 2 years, or will implement the modifications in 2014 (to be operational in 2015), whichever is sooner. (In the latter case, the above study / design would be conducted in 2012.)

C. The modifications considered and agreed upon to attain effective passage for American shad may include facility modifications of the existing Springs / Bradbury Dam lock and lift systems and / or operational modifications.

2. If Licensee and the USFWS, NMFS and MDMR cannot agree by June 1, 2012 that the above measures provide effective[5] upstream passage for American shad, then Licensee agrees to install a single Denil-type fishway at the location of the Springs Island Dam fish lock and lift according to the

[5] For purposes of this Agreement, effective upstream passage is defined as allowing for sufficient upstream spawning escapement.

schedule in 5.3.e.1., above, and in general accordance with the attached concept plan. *See* Attachment C.

3. The Parties agree that no additional anadromous fish passage facility or operational modifications beyond those agreed to above will be required at the Springs / Bradbury dams during the term of the this Agreement. If effectiveness testing of the Denil fishway demonstrates that the Springs Island dam is not passing shad effectively, then Licensee and the Parties agree that trap and truck operations will be used to supplement the above measures to pass additional shad past the Springs / Bradbury dams.

4. Licensee agrees to continue to trap adult American shad at either the Cataract or Skelton fishways, and truck these fish to release sites in river reaches below the Hiram Project until such time as permanent upstream passage measures are operational at the Bar Mills, West Buxton and Bonny Eagle projects (see Section 5.3.b.1. of this Agreement for operational dates). The release (location and numbers of fish) will be carried out in accordance with the annual operations plan developed through the SRCC planning process.

5.4 Studies

a. Licensee agrees to conduct a three-year study of Atlantic salmon kelts to determine/examine downstream passage routes at select Saco River sites.

- Phase one will be a desktop study to determine which Projects have the most potential to delay/affect kelt passage.
- Phase two will be to study the passage routes at no more than two selected Projects.
- The study will be conducted in the spring (3 months) using 20 to 30 fish per year and yield the equivalent information of a radio-telemetry study. The salmon kelts will be supplied by a federal hatchery at no cost to Licensee. If sufficient numbers of salmon kelt are not timely provided to

Licensee at no cost, Licensee shall have no further obligation to undertake a kelt passage study until such time as a sufficient number of kelt are made available.

Licensee agrees to submit a draft study plan to the USFWS, NMFS, and MASC by April 2009, and to begin the study by spring 2010.

b. Licensee agrees to conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras and rotary screw traps, or similar methods) at the Cataract Dam, during the summers of 2007 and 2008. In the event of unusual environmental conditions, the USFWS, NMFS and MDMR in consultation with Licensee may agree to delay the study.[6]

c. Licensee agrees to conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras and rotary screw traps, or similar methods) at the Skelton Dam, during the summers of 2009 and 2010. In the event of unusual environmental conditions, the USFWS, NMFS and MDMR in consultation with Licensee may agree to delay the study.

d. Licensee agrees to conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras and rotary screw traps, or similar methods) sequentially at the Bar Mills, West Buxton and Bonny Eagle projects beginning the year after 6 adult clupeids per acre of impoundment (approximately 1,580 fish at Bar Mills; 790 fish at West Buxton; and 2,080 fish at Bonny Eagle) are passed or stocked above the specific project. If the USFWS, NMFS and MDMR determine that the numbers of clupeids returning to the lower Saco River (Cataract and Skelton impoundments) during the planned study year are insufficient to stock those lower

[6] The purpose of the semi-quantitative studies of clupeid passage under this Agreement will be to document the general effectiveness of the fish passage measures but will not necessarily quantitatively measure the percentage or total numbers of fish passed. The studies will consider clupeids as a group of similar species.

impoundments, then the studies anticipated in this section may be postponed upon mutual agreement between Licensee and the USFWS, NMFS and MDMR.

e. Licensee agrees to compile the existing studies of downstream anadromous fish passage effectiveness at each of the Projects into one compendium or summary report for submittal to the FAAC within two years of a Final FERC Order approving this Agreement becoming effective.

f. Licensee will conduct a three-year study of downstream eel migration timing and routes at the Cataract Project from 2008 through 2010.

g. All studies contemplated herein will be developed in consultation with NMFS, USFWS, MASC, MDIFW, or MDMR as applicable. Results will be submitted to FERC by Licensee after study completion; NMFS, USFWS, MASC, MDIFW, or MDMR as applicable will be asked for comment on the results, which comments will be submitted to FERC with the study results.

h. Licensee agrees to conduct an electro-fishing survey of smallmouth and largemouth bass populations in the West Buxton impoundment in 2007 and to provide standard bass population data to the MDIFW by March 31, 2008 before introduction of alewife into the impoundment or upstream waters occurs.[7]

i. Licensee agrees to conduct an electro-fishing survey of smallmouth and largemouth bass populations in the Bonny Eagle impoundment in 2008 and to provide standard bass population data to the MDIFW by March 31, 2009 before introduction of alewife into the impoundment or upstream waters occurs.

[7] The sample data provided for each bass survey will include sample date and location, habitat type, sampling depth, gear type, time and duration of the sample and prevailing weather conditions. The standard bass population data (population descriptive metrics) reported will include number of bass collected during the sampling, species (largemouth or smallmouth), catch per unit effort, weight and length, condition factor, and population age structure and growth rates using scale samples for all Age 1+ bass. Licensee will provide the USFWS, NMFS, MDMR, MASC and MDIFW with numeric abundance data for other species collected during the above bass population survey.

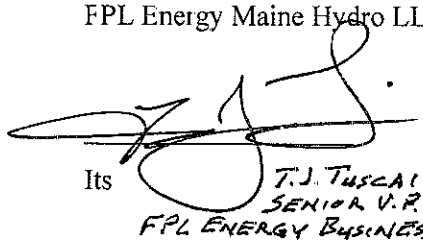
j. Licensee agrees to conduct an electro-fishing survey of smallmouth and largemouth bass populations in the Lake Arrowhead impoundment in 2009 and to provide standard bass population data to the MDIFW by March 31, 2010 before introduction of alewife into the impoundment occurs.

Signatures on following page(s)

6.0 SIGNATURES

We, the undersigned, having the authority to bind our respective Parties, agree to the terms and provisions of this Agreement, and will represent and support this Agreement in applicable proceedings before the FERC and other regulatory bodies:

FPL Energy Maine Hydro LLC



Its Date

U.S. Fish and Wildlife Service

Its Date

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

Its Date

Maine Department of Inland Fisheries & Wildlife

Its Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Its Date

Atlantic Salmon Federation

Its Date

Maine Council of the Atlantic Salmon Federation

Its Date

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FPL Energy Maine Hydro LLC

_____ _____

Its Date

U.S. Fish and Wildlife Service

3/12/07

_____ _____

Its MICHAEL J. BARTLETT Date
SUPERVISOR
NEW ENGLAND FIELD OFFICE

National Marine Fisheries Service

_____ _____

Its Date

Maine Atlantic Salmon Commission

_____ _____

Its Date

Maine Department of Inland Fisheries & Wildlife

_____ _____

Its Date

Maine Department of Marine Resources

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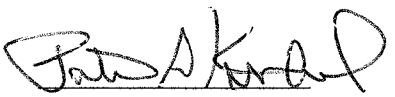

3/12/07

Its Reg. Administrator NER Date

Maine Atlantic Salmon Commission

_____ _____

Its Date

Maine Department of Inland Fisheries & Wildlife

_____ _____

Its Date

Maine Department of Marine Resources

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_____ _____

Its Date

U.S. Fish and Wildlife Service

_____ _____

Its Date

National Marine Fisheries Service

_____ _____

Its Date

Maine Atlantic Salmon Commission

2/09/07

Its Executive Director Date
PATRICK KELIHER

Maine Department of Inland Fisheries & Wildlife

_____ _____

Its Date

Maine Department of Marine Resources

_____ _____

Its Date

Saco River Salmon Club

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Its Date

National Marine Fisheries Service

_____ _____

Its Date

Maine Atlantic Salmon Commission

_____ _____

Its Date

Maine Department of Inland Fisheries & Wildlife

Roland D. Martin Its Commissioner February 12, 2007 ~~Date~~

Maine Department of Marine Resources

_____ _____

Its Date

Saco River Salmon Club

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Atlantic Salmon Federation

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Maine Council of the Atlantic Salmon Federation

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Its Date

Maine Atlantic Salmon Commission

_____ _____

Its Date

Maine Department of Inland Fisheries & Wildlife

_____ _____

Its Date

Maine Department of Marine Resources

Its Commissioner 9 Feb 2007

Date

Saco River Salmon Club

_____ _____

Its Date

Atlantic Salmon Federation

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Its Date

Maine Council of the Atlantic Salmon Federation

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Its Date

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Its Date

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National Marine Fisheries Service

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Its Date

Maine Atlantic Salmon Commission

_____ _____

Its Date

Maine Department of Inland Fisheries & Wildlife

_____ _____

Its Date

Maine Department of Marine Resources

_____ _____

Its Date

Saco River Salmon Club

Mark R. Wardwell 2/12/2007

Its VICE-PRESIDENT Date

Atlantic Salmon Federation

_____ _____

Its Date

Maine Council of the Atlantic Salmon Federation

_____ _____

Its Date

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Its Date

Maine Department of Inland Fisheries & Wildlife

_____ _____

Its Date

Maine Department of Marine Resources

_____ _____

Its Date

Saco River Salmon Club

_____ _____

Its Date

Atlantic Salmon Federation

Its Vice President 3/6/07 Date

Maine Council of the Atlantic Salmon Federation

John Burrows 3-6-07

Its Maine Coordinator Date

Saco River Hydro LLC

John N. Webster 2/9/07

Its MANAGING PARTNER Date

New Hampshire Fish and Game Department

Its Date

Saco River Hydro LLC		New Hampshire Fish and Game Department	
_____	_____	_____	2-9-07
Its	Date	Its Executive Director	Date

ATTACHMENT A

2000 – 2005 ASSESSMENT REPORT, SACO RIVER FISH PASSAGE ASSESSMENT PLAN

FINAL ASSESSMENT REPORT
SACO RIVER FISH PASSAGE ASSESSMENT PLAN
2000 - 2005

prepared in accordance with the:

1994 SACO RIVER FISH PASSAGE AGREEMENT

and the

1995 ANNEX 1: ASSESSMENT CRITERIA

by

FISHERIES AGENCY ADVISORY COMMITTEE

on behalf of

SACO RIVER COORDINATING COMMITTEE

December 2006

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Table of Contents

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List of Acronyms

ASMFC	Atlantic States Marine Fisheries Commission
CFS	Cubic Feet per Second
CMP	Central Maine Power Company
ESA	Endangered Species Act
FAAC	Fisheries Agency Assessment Committee
FERC	Federal Energy Regulatory Commission
FMP	Fishery Management Plan
FPL Energy	FPL Energy Maine Hydro LLC
GLNFH	Green Lake National Fish Hatchery
GOM DPS	Gulf of Maine Distinct Population Segment
MASC	Maine Atlantic Salmon Commission
MASRSC	Maine Atlantic Sea Run Salmon Commission
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
NASCO	North Atlantic Salmon Conservation Organization
NGOs	non-governmental organizations
NHDFG	New Hampshire Department of Fish and Game
NMFS	National Marine Fisheries Service
SRCC	Saco River Coordinating Committee
SRSC	Saco River Salmon Club
TAC	Technical Advisory Committee
USEPA	US Environmental Protection Agency
USFS	US Forest Service
USFWS	US Fish and Wildlife Service

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1.0 Program Overview

The *Saco River Fish Passage Agreement* dated May 24, 1994 (1994 Agreement) was signed by 17 parties[1] to settle licensing issues relating to fish passage at seven hydroelectric projects on the main stem of the Saco River. The Agreement included specific deadlines and design criteria for upstream and downstream fish passage facilities at the Cataract (including the east and west channels and the Springs and Bradbury dams) and Skelton Projects. It also required the development of assessment criteria to be used in future assessments to determine the need for timing and design of interim and permanent upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram, and Swans Falls projects[2].

The state and federal agencies developed, in consultation with the other signatories, assessment criteria which are contained in *Annex 1: Assessment Criteria of the Saco Fish Passage Agreement* (Annex), dated January 20, 1995. The Annex also outlines an assessment process based on a four-year cycle of planning, data collection, and evaluation. An assessment plan is prepared at the beginning of the cycle, annual reports are prepared each year of the cycle, and an assessment report is completed at the end of the cycle. Typically, the Fisheries Agency Assessment Committee (FAAC)[3] prepares the 4-year assessment report and plan, and makes recommendations for the Saco River Coordinating Committee (SRCC)[4] to review, revise and accept by consensus. The first cycle began in 1996, and ended with the first assessment report in 1999. The second cycle began in 2000 and ends with this present assessment report. The extended time frame of this cycle is directly a result of facilitated discussions per the process outlined in the Annex.

As described in the Annex, this assessment report is designed to answer the following questions:

1. Are the management goals and objectives stated at the beginning of the four-year assessment cycle still current?
2. What is the present status of anadromous fish populations on the Saco River?

---

[1] American Rivers Inc.; Atlantic Salmon Federation; Central Maine Power Company (CMP); City of Biddeford; City of Saco; Maine Atlantic Sea Run Salmon Commission (MASRSC); Maine Council of the Atlantic Salmon Federation; Maine Council of Trout Unlimited; Maine Department of Inland Fisheries and Wildlife (MDIFW); Maine Department of Marine Resources (MDMR); Maine State Planning Office; National Marine Fisheries Service (NMFS); New Hampshire Department of Fish and Game (NHDFG); Saco River Salmon Club (SRSC); Swans Falls Corporation; Trout Unlimited ; U.S. Fish and Wildlife Service (USFWS).

[2] Permanent upstream "fish passage facility", as used in this report, shall mean a single device or structure that serves as a fishway. Examples of a fish passage facility include, but are not limited to, a Denil fishway, a steeppass fishway, or a fish lift.

[3] Per the 1995 Annex to the 1994 Agreement, the FAAC comprised of representatives of the Maine Atlantic Salmon Commission (MASC, formerly Maine Atlantic Sea Run Salmon Commission), MDMR, MDIFW, USFWS, NMFS, U.S. Forest Service, and NHDFG.

[4] The SRCC is comprised of the signatories to the 1994 Agreement. CMP is replaced by FPL Energy Maine Hydro LLC (FPL Energy), the current owner of six of the seven hydroelectric projects, and the MASRSC is now the MASC.

3. Is progress toward the management goals and objectives being made?
4. Is the rate of progress as expected?
5. What conclusions can be drawn regarding the need, timing and design for constructing new upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls projects?

Furthermore, the assessment report also:

1. Considers the availability and accuracy of necessary data to respond to the assessment criteria and support conclusions in the report using the best available data to the greatest extent possible.
2. Demonstrates that all the assessment criteria, defined in year one of the assessment cycle, have been addressed to the fullest extent practicable.
3. Develops specific conclusions regarding the need for and timing of upstream fish passage facilities.
4. Develops as part of the report, specific plans for future upstream fish passage measures.

In addition, this report serves to provide supporting documentation for a broader range of issues relating to upstream and downstream fish passage and fisheries management on the Saco River that are not part of the assessment process required in Annex 1 to the 1994 Agreement.

2.0 Saco River Coordinating Committee Meetings

During the second assessment cycle the annual meetings of the SRCC were held on May 2, 2000; March 21, 2001; March 20, 2002; and March 25, 2003 at the Department of Marine Resources office in Hallowell, Maine. Objectives of the meetings were to:

1. Review the current program goal and objectives
2. Identify key problems
3. Define assessment criteria
4. Review study results from the previous calendar year
5. Develop a work plan for the current calendar year
6. Develop format, process, and content of annual reports
7. Develop format, process, and content for final assessment report

On February 23, 2004, the FAAC issued a draft 2000 – 2003 Final Assessment Report which included recommendations for permanent upstream passage at Bar Mills, the consideration of eel passage in future assessments, and measures to address other management needs. At the April 2004 annual Saco River Coordinating Committee meeting, FPL Energy Maine Hydro,

LLC (FPL Energy) indicated they wanted to initiate facilitated discussions to begin the next phase of the assessment cycle. Facilitated discussions, as part of the process outlined in the 1995 Annex, were intended to help the parties come to consensus on the recommendations in the draft Final Assessment Report. The facilitated discussions for this assessment report did not include all signatories to the 1994 Agreement. Although invited, representatives from the U.S. Forest Service, State of New Hampshire, local municipalities, and some non-governmental organizations (NGOs) were not involved in the facilitated discussions. (All parties that did participate in the facilitated discussions were signatories to the 1994 Agreement.) Facilitated discussions held in June 2004 led to the identification of fisheries management issues on the Saco River. This step effectively initiated separate but parallel negotiations to improve overall fish passage in the Saco River basin. Between September 2004 and October 2006, the parties held numerous facilitated meetings to develop a comprehensive strategy for addressing both short-term and long-term fish passage and fisheries management measures. Although the US Forest Service and the State of New Hampshire did not participate in the facilitated discussions, they did, as members of the FAAC, participate in the preparation of this assessment report.

3.0 Applicability of Current Management Goals and Objectives

During the January 20, 2000 meeting the SRCC reviewed the management goals and objectives in the 1987 *Saco River Strategic Plan for Fisheries Management* (1987 Management Plan), which had been adopted for the 1996-1999 cycle. The SRCC determined that the goals and objectives remained valid for the 2000-2003 cycle. No changes to the goals and objectives occurred during the facilitated discussions, except that American eel passage issues were discussed at length among the parties.

3.1 Management Goals

Manage all sport and commercial fish species of the Saco River for optimum habitat utilization, abundance, and public benefit. Objectives are listed by designated river reaches (Figure 1).

3.2 Management Objectives

Reach I. River mouth to Upper York (West Channel) Dam, Saco-Biddeford, Maine.

1. Manage Reach I as a migratory pathway for Atlantic sea-run salmon, American shad, sea-run alewives, blueback herring[5], and American eels.
2. Re-establish a spawning population of rainbow smelt.
3. Manage the striped bass resource in accordance with the Atlantic States Marine Fisheries Commission's *Interstate Fisheries Management Plan for Atlantic Striped Bass*.

[5] Blueback herring were not listed under the Management Objectives for Reaches I, II, III, and IV in the 1987 Management Plan and specific suitable habitat was not evaluated in the Saco River watershed. However, the 1987 Management Plan does note the historic presence of blueback herring in the Saco (p. 2-4).

4. Promote existing and potential commercial fisheries for alewives, American shad, and American eels.
5. Promote existing and potential recreational fisheries for American shad, Atlantic salmon, rainbow smelt and striped bass.

Reach II. Upper York (West Channel) Dam, Saco-Biddeford to Skelton Dam, Union Falls, Maine.

1. Manage Reach II as a migratory pathway for Atlantic sea-run salmon, American shad, sea-run alewives, blueback herring, and American eels.
2. Manage Reach II for sustained production of Atlantic salmon, shad, alewives, and eels consistent with habitat capabilities.
3. Establish a recreational fishery for salmon and trout consistent with habitat capabilities.
4. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.

Reach III. Skelton Dam, Union Falls to the confluence of the Little Ossipee River, East Limington, Maine.

1. Manage Reach III as a migratory pathway for Atlantic sea-run salmon, American shad, sea-run alewives[6], blueback herring, and American eels.
2. Manage this reach for sustained production of trout, Atlantic salmon, American shad, alewives, and eels consistent with habitat capabilities.
3. Establish recreational fisheries for trout and Atlantic salmon consistent with habitat capabilities.
4. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.

Reach IV. Confluence of the Little Ossipee River, East Limington to Hiram Dam, Hiram, Maine (includes Little Ossipee River).

1. Manage Reach IV, including the major tributaries (Little Ossipee and Ossipee Rivers), for sustained production of Atlantic sea-run salmon, trout, American shad[7], sea-run alewives, blueback herring, and American eel consistent with habitat capabilities.
2. Manage Reach IV as a migratory pathway for Atlantic salmon.

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[6] Sea-run alewives were inadvertently omitted from the Management Goals and Objectives for Reach III (page 5-2) in the *1987 Saco River Strategic Plan for Fisheries Management*. The Reach Description (beginning on page III-1) and Table 2-5 do, however, include production estimates for American shad for Reach III.

[7] American shad were inadvertently omitted from the Management Goals and Objectives for Reach IV (page 5-2) in the *1987 Saco River Strategic Plan for Fisheries Management*. The Reach Description (beginning on page IV-1) and Table 2-5 do, however, include production estimates for American shad for Reach IV.

3. Establish fisheries for trout and salmon in key high-use areas of the Saco and Ossipee Rivers.
4. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.

Reach V. Hiram Dam, Hiram to Swans Falls Dam, Fryeburg, Maine.

1. Establish a recreational fishery for trout in the Fryeburg area.
2. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.
3. Manage Reach V as a migratory pathway for and production by Atlantic salmon.

Reach VI and VII. Swans Falls Dam, Fryeburg, Maine to the confluence of the Ellis River, Bartlett, New Hampshire.

1. Consult with the New Hampshire Department of Fish and Game (NHDFG) and the U.S. Forest Service (USFS) to participate in inter-agency compacts to develop an interstate Atlantic salmon restoration program.
2. Continue interstate agency cooperation to prevent introductions of undesirable species.

4.0 Key Problems and Issues

During the January 20, 2000 meeting the SRCC reviewed the key problems and issues identified during the first assessment cycle. From the original list, three items were deleted and one item added. The new list includes (not in order of priority):

1. Cumulative impacts of dams, including those from turbine mortality, upstream and downstream passage efficiency.
2. Availability of wild and hatchery stocks (fish, fry, or eggs), both river specific and generally.
3. Availability of staff and resources (e.g., inadequate evaluation, monitoring, and program coordination).
4. Inadequate knowledge or uncertainty regarding physical and biological parameters in the river.
5. Impacts of other sources of mortality, including marine losses, angling, predation, etc.
6. Insufficient spawning escapement.
7. Low marine survival.
8. Land use and development practices, point and non-point source pollution.
9. Conflicts with other fishery programs.

10. Periodic low flows and high temperatures.
11. Commercial exploitation of fish stocks in Maine.
12. Lack of an interstate Atlantic salmon restoration program.
13. Upstream passage for American eel.

"Inadequate minimum flows or excessive high flows" was deleted because it had been addressed during the first assessment cycle. Also deleted were "Control of in-river exploitation of fish stocks" because a recreational fishery for Atlantic salmon has been prohibited in the Saco River since 1999 under MASC Board rules[8] and "Need for a permanent location for the Saco River Salmon Club Hatchery" because a location was acquired.

In the 1999 Assessment Report, the FAAC recommended that upstream passage for American eel be added to the list. Although upstream passage for eels was not specifically addressed in the 1994 Agreement, eels were included as a species to be considered for management and restoration in the 1987 Management Plan. The SRCC, with the exception of FPL Energy, was in favor of including "Upstream passage for American eel" to the list of key problems and issues.

5.0 Assessment Criteria

During the January 20, 2000 meeting the SRCC decided to maintain the assessment criteria that were used in the first assessment cycle. However, three criteria indicated by asterisks in the list below were not addressed in this Assessment cycle. The criteria are:

1. Trends in population size and biological characteristics
2. Level of recent releases and future plans
3. Fish passage efficiency
4. Turbine mortality
5. Degree of attrition due to multiple barriers (upstream and downstream)
6. Habitat suitability and production estimates
7. Degree and location of salmon fallback*
8. Comparison of Saco River with other rivers
9. Evidence of limiting factors (deferred)*
10. Effectiveness of trap and truck
11. Availability of staff*
12. Interagency coordination

[8] Maine Revised Statutes Annotated: Title 12, Chapter 11, §9902

6.0 Fishes of the Saco River

6.1 Resident Species

The Saco River watershed supports a diverse array of warmwater and coldwater resident fish species (Table 1). Of these species, several are managed for recreational fisheries. The Maine Department of Inland Fisheries and Wildlife (MDIFW) stocks brook trout, brown trout, lake trout, and landlocked Atlantic salmon in the Saco River watershed. Many of the colder streams have native populations of brook trout and naturally reproducing populations of brown trout. The 1987 Management Plan for the Saco River outlines the habitat suitability throughout the drainage for brown trout and brook trout. Between the Cataract Project and the New Hampshire border, an estimated 149,136 units of brown trout habitat and 15,038 habitat units of brook trout habitat have been identified. The NHDFG stocks brook trout, brown trout, and rainbow trout in lakes, rivers, and streams of the Saco River watershed. The NHDFG also stocks landlocked Atlantic salmon in several major lakes. Habitat units for these species have not been mapped in New Hampshire.

The Saco River drainage contains many cold-water tributaries suitable for salmonid management; however, until recently much of this habitat had not been assessed to determine the quality or quantity of these areas. In response to this need for information, MDIFW undertook a comprehensive review of existing inventory information to identify Saco River tributaries that support important trout fisheries. MDIFW developed a computerized database of available resident stream fishery data in support of this effort.

Stocking of trout in Maine has increased recently, largely in response to new, expanded year-round fishing initiatives. A year-round open water fishing season was established in 2002 on the Saco River in an effort to provide expanded fishing opportunities in more heavily populated southern Maine. Additional stockings of brook and brown trout throughout the drainage have been undertaken to support this initiative; however, the following four areas have been a focus of recent increased stocking: below Skelton and Hiram dams, Limington Rapids, and the Bonny Eagle bypass channel.

Historically, Atlantic salmon and brook trout co-existed within the Saco River watershed. However, the potential interactions between Atlantic salmon and brook trout within the Saco River drainage are not thoroughly understood. Previous research by others investigating interactions between these co-occurring indigenous salmonids suggests inter-specific competition for habitat may be limited in some systems due to habitat partitioning, although juvenile salmon may displace brook trout in certain habitats[9]. The MDIFW has, however, observed considerable habitat overlap between stocked juvenile salmon and wild brook trout in smaller tributaries within the Saco River drainage, suggesting a lower incidence of habitat partitioning than reported elsewhere[10]. Therefore, MDIFW initiated a small study to evaluate potential interactions and effects of stocking Atlantic salmon fry into two brook trout streams. The project was implemented and required considerable investment of resources,

[9] Gibson et al 1993, Sayers 1990, Dickson and MacCrimmon 1982, Bult et al 1999.
[10] F. Brautigam, MDIFW, personal observations

and for a number of reasons, the project was not finished. Recent progress with MASC in resolving these interaction issues has eliminated the need for study continuation.

The overall goal for the Saco River Restoration Program is to manage all sport and commercial fish species of the Saco River for optimum habitat utilization, abundance, and public benefit. To successfully accomplish this goal, continued interagency coordination is essential to minimize potential conflicts among fishery programs.

6.2 Diadromous Species

The Saco River in southern Maine supports a number of diadromous[11] fish species, including Atlantic salmon, American eel, American shad, alewife, and blueback herring. All diadromous species would benefit from effective upstream and downstream fish passage to reach suitable habitat and avoid impacts associated with turbine entrainment during out migration.

The installation of upstream fishways at the Cataract Project (the Springs and Bradbury dams) and the Skelton Project in accordance with the 1994 Agreement has provided anadromous fish volitional access to riverine habitat up to the Bar Mills dam. The availability and use of a trap and transport program has also provided access to the river reaches above Bar Mills. Re-colonization and utilization of the formerly inaccessible habitat by anadromous species has progressed, as demonstrated by information in the 1999 Assessment Report and the data in this assessment report, showing that the populations returning to the Saco River have increased or become established since 1993[12]. Permanent fish passage facilities providing access to habitat upstream of the Bar Mills, West Buxton, and Bonny Eagle hydropower projects will further the restoration progress being made.

The restoration of diadromous species provides wide ranging ecological benefits for an array of aquatic, terrestrial, and avian species. Various life stages of alewife, blueback herring[13], shad, and salmon feed on smaller organisms (plankton, zooplankton, small fish, etc.); conversely, various life stages of these species are forage for numerous larger species (cormorants, marine mammals, predatory fish, etc.). As such, these species also play a role in transferring nutrients through the food web and among freshwater, marine, and terrestrial ecosystems[14].

The presence of a small number of American eels has been documented above each of the main stem dams[15]. Currently, specific passage measures are not required along the Saco River for safe, timely, and effective passage of eels, and the provision of passage measures to

[11] The term *anadromous* refers to fish which migrate from the sea to freshwater to spawn, such as Atlantic salmon. The term *catadromous* refers to fish which migrate from freshwater to the sea to spawn, such as American eel. The term *diadromous* covers both anadromous and catadromous and simply refers to fish that migrate between the sea and freshwater for spawning and development.

[12] 1996-1999 Final Assessment Report, Saco River Fish Passage Assessment Plan. December 1999. Fig. 2, p. 10

[13] Alewife and blueback herring often are collectively referred to as "river herring," because they are difficult to distinguish from each other during fish passage. Typically alewives are numerically dominant in Maine waters.

[14] Amendment 1 to the Fishery Management Plan for Shad and River Herring. 1999; Facey and Van Den Avyle 1987, Mullen et al. 1986, Weiss-Glanz et al. 1986, Daine et al. 1984

[15] Chris Yoder, Midwest Biodiversity Institute, personal communication.

move juveniles upstream and adults downstream would benefit the restoration of this catadromous species to the river.

6.2.1 Atlantic salmon

The anadromous Atlantic salmon has a relatively complex life history which includes: upstream migration of adults to spawn in natal rivers; various stages of juvenile development in freshwater and estuarine systems (eggs, fry, parr, smolts); extended residence of some post spawn adults (kelts) in natal streams; and out-migration into the open ocean by both sub-adult and adult individuals[16]. The run timing and biological characteristics of adult salmon returns to the Saco River are typical of most of Maine's salmon rivers. Returning adults are primarily early-run from May to July (Table 2) and most (76%) have spent two or more winters at sea (Table 3). Smolts generally out-migrate from the drainage between mid-April and mid- June. Kelts typically migrate out of the system in the late fall/winter or during the following spring freshet.

The 1987 Management Plan for the Saco River outlines the habitat suitability and production estimates throughout the drainage for Atlantic salmon. The MASC has estimated that there is a total of 14,665 units of Atlantic salmon habitat within the Saco River for the State of Maine; a partial habitat survey has identified an additional 10,269 habitat units in New Hampshire[17,18]. The majority of quality salmon habitat (>98%) in the Saco River Basin is upstream of the Bonny Eagle Project (Figure 1), with approximately 50% of the habitat between the Little Ossipee River confluence with the mainstem Saco and the Hiram Dam[19]. Above the Hiram Dam, approximately 90% of the mainstem habitat suitable for spawning and rearing of Atlantic salmon is located in New Hampshire.

During the course of this assessment cycle (2000-2005), three life stages (fry, parr, and smolts) were released into various parts of the Saco River watershed within the state boundaries of Maine (Tables 4 and 5a-f). Smolts were generally released in the mainstem portion of the river below the Skelton Project. Parr have been released in several locations including the mainstem above Bonny Eagle and within the Big Ossipee River. Fry releases occurred primarily in small tributaries with some releases in the mainstem and larger tributaries such as the Big Ossipee River.

Each year since it's inception in 1980, the Saco River Salmon Club (SRSC), a volunteer organization, has been actively involved in the restoration of Atlantic salmon on the Saco River. The SRSC is the primary organization raising and releasing salmon fry into the Saco River watershed. The SRSC receives up to 700,000 Penobscot F_2 origin eyed eggs annually from the Green Lake National Fish Hatchery (GLNFH). The eggs are incubated at the SRSC hatchery until mid-May when river and hatchery temperatures are similar enough to allow for release. The MASC develops the stocking recommendations and, in cooperation with the SRSC, releases each cohort into appropriate habitat in Maine. The SRSC has conducted

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[16] Daine et al. 1984. See also Maine Atlantic Salmon Restoration and Management Plan, 1995-2000. Atlantic Sea Run Salmon Commission, Bangor, Maine. August 1995. 55 p.

[17] One habitat unit = 100 square yards of habitat

[18] 1987 Management Plan.

[19] 1987 Management Plan. Table 2-5. Page 2-15.

habitat surveys with technical assistance from the MASC. Data has been utilized by the MASC to adjust Atlantic salmon stocking rates in the surveyed streams. The U.S. Fish and Wildlife Service (USFWS) coordinates with the MASC to stock other juvenile life stages (parr, smolts) into the mainstem Saco. In some years up to 35,000 smolts have been stocked (Table 4). Smaller groups of smolts (≤ 400) have been released by the hydroelectric operators while testing efficiencies of downstream bypass passage facilities. MASC currently does not fully stock all available Atlantic salmon habitat in Maine above Hiram Dam. To date, the NHDFG has not initiated a salmon stocking program in the available Atlantic salmon habitat in New Hampshire upstream of Swans Falls.

Between 1997 and 2005, the MASC, USFWS, the licensee, and SRSC members conducted assessments of juvenile survival in selected tributaries stocked with Atlantic salmon fry reared at the SRSC Hatchery. In addition, MASC staff, in cooperation with the MDIFW, collected information on potential salmon and brook trout interactions on Ten Mile Stream between 2000 and 2004, and Shepards River between 1998 and 2003; both sites are large tributaries to the Saco River above the Hiram dam. (As mentioned above in Section 6.1, Resident Species, this specific study was not completed.) All sites were sampled using standard electrofishing gear and techniques, and numbers of all salmonids present were estimated[20].

6.2.2 American Shad

American shad is a highly migratory coastal species that returns to natal rivers for spawning. The spawning migration begins at the end of May, peaks in June, and declines in early July (Table 6). There does not appear to be a specific distance upstream that adults must migrate before spawning. However, a number of studies have shown that, in large river systems, spawning adult shad prefer upstream spawning sites, their eggs and fry are subjected to net downstream transport by the river flow, and juvenile fish tend to grow older and larger before they reach the estuary[21]. Post-spawn adults return to sea immediately, generally from late June through August. Juveniles migrate downstream in the fall.

The 1987 Management Plan for the Saco River outlines the habitat suitability and production estimates throughout the drainage for American shad. All the approximately 90,868 units of suitable habitat are in Maine waters. The reach from the Cataract dam to the Bar Mills dam contains 46% of this habitat. The reach from the Bar Mills dam to the Bonny Eagle dam contains 19% of this habitat. The reach above the Bonny Eagle dam is approximately 34% of the suitable shad habitat.

6.2.3 River Herring (alewife and blueback herring)

Similar to American shad, alewife and blueback herring spend much of their lives at sea, returning to natal rivers to spawn. The spawning migration occurs primarily in May (Table 7), similar to other Maine rivers. While overlap in the timing of migration between alewives and bluebacks can be considerable, alewives generally return to the rivers first. Alewives spawn in lakes, ponds, and backwaters while blueback herring prefer rivers and streams.

[20] Zippin 1958.
[21] Chittenden 1969; Marcy 1976; Limberg 1996; Bilkovic et al. 2002.

Adults emigrate in June and July after spawning, and juveniles emigrate from July to November. Alewife and blueback herring provide numerous ecological benefits for the river, estuary, and nearshore ecosystem. Alewife and blueback herring are a forage species for many important larger predatory fish, including Atlantic salmon, Atlantic cod, bluefish, striped bass, American eel, and large and smallmouth bass[22].

The 1987 Management Plan for the Saco River outlines the habitat suitability and production estimates throughout the drainage for alewives. Of the 6,134 acres of suitable spawning habitat, 77% is above the Bonny Eagle Project (Table 15; Fig. 1). The majority of the alewife habitat, 3,700 acres or 60% of the total, is located in Ossipee Lake in New Hampshire which is not currently available due to management constraints and lack of access past the outlet dam.

6.2.4 American Eel

The catadromousAmerican eel is panmictic (single spawning site and complete mixing of the gene pool at each spawning), with all adults spawning in the Sargasso Sea[23]**.** American eel eggs hatch into a transparent, protracted larval stage, called "leptocephali." Leptocephali drift and swim with the ocean currents for several months before changing shape to resemble miniature, transparent eels. These "glass eels" or "elvers" enter Atlantic coast waterways beginning in January in Florida and late March in Maine. Some eels remain in saline or estuarine waters for all or part of their lives, while others migrate into freshwater and take up residence in rivers, streams, lakes, and ponds. Migration into freshwater may continue for many months or years[24]. Elvers and small juvenile eels have been documented migrating upstream past obstacles, such as dams, by clinging to rough wetted surfaces and wiggling up and over the obstacle[25]. Colonization of the upper reaches of a river may continue by the older, but still juvenile, individuals called "yellow eels." However, as juvenile eels grow to a larger size, they lose their ability to successfully climb the wetted surface of obstacles to access upstream habitat[26].

American eels are long lived and can remain in freshwater for more than 24 years before reaching sexual maturity, with some remaining as long as 40 years. As sexual maturity begins, yellow eels metamorphose into the sub-adult "silver eel" and begin the out-migration back to the Sargasso Sea where maturity is attained prior to spawning and subsequent death. Downstream movement generally starts for the silver eels with the onset of the fall rainy season and escalates until colder temperatures begin. In a study of four Maine rivers, American eels were found to migrate between ages 8 – 27 years, with the majority outmigrating at age 9-15 years for males and 12 – 20 years for females[27].

Suitable habitat for eels has been identified throughout reaches II – VI of the Saco River drainage, as identified in the 1987 Management Plan. Declines in the catches of American eel in the United States since the 1980s and in some fisheries independent assessments

[22] Collette and Klien-MacPhee 2002, Creaser and Perkins 1994, Ross 1991, Loesch 1987
[23] ASMFC 2000(a). Interstate Fishery Management Plan for American Eel.
[24] American eel (*Anguilla rostrata*) Species Management Plan. November 1996.
[25] American Eel Migration Study, Final Report. FPL Energy December 2004
[26] Facey and Van Den Avyle 1987
[27] Oliveira and McCleave 2000

prompted the Atlantic States Marine Fisheries Commission (ASMFC) to adopt the Interstate Fishery Management Plan for American Eel (eel FMP) in April of 2000. The eel FMP recognizes that declines in the American eel stock along the northeastern U.S. Atlantic coast are attributed to a combination of causes including commercial harvest, pollution, changes in oceanic currents, and the effects of dams and hydropower facilities[28]. Consequently, one objective of the eel FMP is to protect and enhance American eel abundance in all watersheds where they occur by providing access to inland waters for the juvenile glass eel, elvers, and yellow eel, along with adequate escapement to the ocean for pre-spawning adults.

Recent declines in American eel also prompted a petition to the National Marine Fisheries Service (NMFS) and the USFWS pursuant to provisions of the Endangered Species Act, asserting that the status of the American eel is in need of federal protection. The USFWS published in the Federal Register their preliminary 90-day finding that the petition presented substantial scientific and commercial information, indicating that listing the American eel may be warranted[29]. Following publication of the finding, the federal government initiated a formal status review to determine if listing the species is warranted and whether significant remedial measures are necessary. This status review is currently ongoing. Therefore, based upon the concern for American eel stocks along the east coast and the stock status in the Saco River, conservation measures are considered in this report.

7.0 Existing Upstream Passage of Diadromous Fish Species

7.1 Upstream Passage for Anadromous Species

To date, five upstream fish passage facilities for anadromous species have been installed on the lower Saco River. FPL Energy currently owns and operates the facilities, which includes facilities for identifying, enumerating, and transporting upstream migrants. In 1993, fishways became operational at the lower two Cataract Project dams - a Denil fishway with a counting window at the west channel dam (henceforth "west channel fishway") and a fish lift with a counting window and trapping facility on the east channel dam (henceforth "east channel fish lift"). Fish that use the west channel fishway can only be passed into the Cataract headpond, but fish that use the east channel fish lift can be passed into the Cataract headpond or trapped and transported upstream for release. In 1997, a fish lock was installed at each of the two upper Cataract Project dams (henceforth "Springs/Bradbury fish locks"). Fish using the Springs/Bradbury fish locks are passed into the impoundment. Neither fish lock is equipped with a counting window or trapping facility. The fish lift at the Skelton Project dam (henceforth "Skelton fish lift") became operational in late summer 2001[30,31]. It is equipped with a counting window and trapping facility, so fish either can be passed into the Skelton headpond or trapped and transported upstream.

Starting in 2002, the MASC and FPLE implemented Atlantic Salmon Trap Operating and Fish Handling Protocols at the Cataract and Skelton projects to prevent handling stress for adult Atlantic salmon at fish handling facilities during elevated river temperatures (> 22 ^{o}C)

[28] ASMFC 2000(a). See also EPRI 2001, Haro et. al. 2000.
[29] 70 Fed.Reg. 38849 (July 6, 2005)
[30] 2001 Springs and Bradbury Fish Locks Report.
[31] 2002 Skelton Fishway Report

[32]. In 2003, the protocols resulted in the cessation of the Skelton fish lift operations on June 24. That year, the upstream migration of American shad was delayed compared to previous years, and began 17 days later than average (50% of the run passed eight days later than average, and 75% of the run passed four days later than average) based on 11 years of passage data at the Cataract Project. Therefore, the cessation of lift operations based on the Protocols precluded American shad from accessing available habitat upstream of the Skelton Project[33]. In 2004, in an effort to minimize potential fish passage issues, FPL Energy placed a camera above the Skelton fish lift that would allow operators to view fish entering the fish lift hopper[34]. Subsequently, the Protocol was revised and, at elevated river temperatures the operators can pass American shad upstream and release Atlantic salmon back into the tailrace without handling.

FPL Energy staff conducts all fish passage and fish counting operations. A description of the fish passage facilities and operations can be found in FPL Energy's 2005 fish passage reports[35].

7.2 Upstream Passage for Catadromous Species

Currently, there are no specific eel passage measures required or implemented at any of the projects along the Saco River.

8.0 Monitoring Results

Fish passage data for each of the species were collected by the licensee and reported annually to the SRCC. Analysis of the data for the assessment report was conducted by the FAAC. The data (non-transformed and log-transformed) were analyzed for normality using a Shapiro-Wilk Goodness-of-Fit test. Both data sets had significant values indicating some degree of normality. The log-transformed data had more normally distributed histograms, more randomly distributed residual plots and smaller standard deviations. Therefore, the log-transformed data were used in the final statistical test. Long-term trends in population changes were evaluated statistically using a linear regression (SYSTAT 7.0.1: GLM) of the log transformed data. A linear regression is a statistical technique for finding the best linear relationship between two variables; in this case, log of population versus time. For these data, a regression slope significantly different from zero indicates that the population is increasing if the slope is positive and decreasing if the slope is negative; a slope that is not significantly different from zero means that there is no detectable change in the population.

8.1 Atlantic salmon

8.1.1 Upstream Passage

A total of 535 adult Atlantic salmon have passed the two lower Cataract Project fishways since 1993 (Table 2; Figure 2). Returns range from a low of 19 in 2004 to a high of 69 in 2001, with a median return of 39 fish. The majority (74%) of fish return in June and July,

[32] 2003 Skelton Fishway Report
[33] 2003 Skelton Fishway Report
[34] 2004 Skelton Fishway Report
[35] 2005 Springs and Bradbury Fish Locks Report; 2005 Skelton Fishway Report

and 75% have spent two or more years at sea (Table 3). Approximately 41% of returning salmon at the Cataract Project use the west channel fishway, and 59% use the east channel fish lift. Based on scale samples and dorsal fin scores collected since 1993, the majority of returning salmon are from smolt releases (82%); the remaining 18% of adult returns have originated from fry stocking or natural spawning. However, due to recent changes in smolt stocking, the FAAC anticipates the proportion of returning adults that originate from fry stocking will increase. Since returning adults generally spend two or more years at sea, a significant increase in the proportion of wild origin returns from increased fry stocking and/or natural spawning occurring after 1999 would not be expected until 2003 and beyond. The proportion of returns of fry stocking or wild origin for 2002 was 10.6%. Between 2003 - 2005, the proportion of returning salmon from fry stocking or wild origin ranged from 32% to 46.2%.

The disposition of returning Atlantic salmon has changed as fish passage in the drainage has become operational. Between 1993 and 2000, salmon either passed upstream into the Cataract headpond (73%) or were trapped and trucked to the Big Ossipee River (27%). All fish had the opportunity to spawn naturally. Beginning in 2001, all Atlantic salmon passed into the Cataract headpond are allowed volitional access to the Skelton dam. Those that use the Skelton fish lift are trapped and trucked to the Big Ossipee River (Table 8); to date 55% of all salmon counted at the lower Cataract fishways have volitionally used the Skelton fish lift. In recent years, a small number of redds – depressions in gravel where spawning occurs - have been observed in the lower mainstem (below Skelton), Swan Pond Brook, and in the Big Ossipee River, presumably indicating that salmon have spawned in several areas of the Saco drainage.

Linear regression was used to determine the slope of the regression of the number of returning adult salmon on year of return. The linear regression analysis indicated the slope was not significantly different from zero (logsalmon= -0.016(year) + 36.016; N=13; F-ratio 0.253; P=0.625) indicating the salmon population has not significantly increased or decreased since 1993 (Figure 3).

8.1.2 Downstream Passage

FPL Energy operates permanent downstream fish passage facilities at Bonny Eagle, West Buxton, Bar Mills, Skelton, and Cataract hydroelectric projects. Downstream passage route studies utilizing Atlantic salmon smolts were conducted at Cataract in 1994, at Skelton and Bonny Eagle in 1997, at West Buxton in 1997 and 1999, and Bar Mills during 1997, 2001, and 2003[36]. At most of the projects FPL Energy modified an existing sluice to provide a bypass conduit as permanent downstream passage.

Studies were conducted at each hydro station to evaluate bypass facility utilization by smolts and overall downstream passage efficiency[37]. In general, studies were conducted under

[36] RMC Environmental Services March 1995; Normandeau Associates, Inc. August 1998; Normandeau Associates, Inc. December 1999; Normandeau Associates, Inc. January 2000; Normandeau Associates, Inc. and FPL Energy Maine Hydro, LLC. May 2002; Normandeau Associates, Inc. and FPL Energy Maine Hydro, LLC. March 2004.

[37] Downstream bypass fish passage efficiency is defined as the proportion of fish passing by means other than the

various operating and spill conditions. Bypass facility efficiency was variable depending on site-specific conditions at the time of the smolt migration. For the Cataract Project, downstream passage efficiency ranged from 29% under no spill conditions to 88% under spill conditions (7% through the East Channel bypass sluice and 81% via the West Channel spillway).[38] At the Skelton Project, 64% and 100% of the smolts utilized the bypass facility under no spill conditions (two tests) and 97% bypassed the powerhouse under spill conditions (11% via the bypass facility, 86% via the spillway). Bypass efficiency was 64% at the West Buxton Project under no spill conditions with 200 cfs of water routed through the bypass facility and flow induction devices operating at the surface along the upstream face of the forebay curtain wall. At the Bonny Eagle Project, 91% and 93% of the test smolts utilized the bypass facility (200 cfs) under no spill conditions. At Bar Mills, several tests were conducted under various station operating scenarios, river conditions, and with and without a floating trash boom guidance device. With a bypass facility flow of 120 cfs and a guidance device installed, use of the bypass sluice was 62% and 79%, respectively, under spill and no spill conditions.

Smolt survival studies were conducted at Bar Mills and West Buxton in conjunction with the efficiency studies. Studies at Bar Mills indicate immediate survival through the turbines of up to 88%[39]. The licensee calculated the Bar Mills project downstream passage survival rate at 95% for the 2003 study conditions. Similarly, immediate survival through the turbines at West Buxton was observed at 85% – 97%[40]. The licensee calculated the West Buxton project downstream passage survival rate at 96% for the 1999 study conditions.

An important Atlantic salmon life stage for which the effectiveness of downstream passage facilities has not been evaluated is kelts. Adult salmon trapped at the Skelton fishway are transported to upriver release sites in the Big Ossipee River - above five mainstem hydro projects – for spawning. After spawning, kelts typically migrate out of the system in the late fall/winter or during the following spring's freshet. Those that overwinter reside in larger mainstem habitat (e.g., deadwaters). It is important that kelts have a safe, timely, and effective downstream passage route past these hydro projects. Kelts that do return to the river as repeat spawners are predominantly females with a higher fecundity than maiden spawners[41].

While no empirical downstream passage studies have been conducted yet at Hiram, several analyses have been performed. Based on the flow data for Hiram, USFWS engineers estimated that achieving smolt passage efficiency in the range of 50% to 60% via project spillways during the emigration period requires flows in the range of 4,800 cfs, which is approximately twice the turbine hydraulic capacity. This is based upon an assumption that smolt are distributed directly proportional to the amount of flow going over/through the various passage routes. This method has been used and accepted for this type of preliminary

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turbines (e.g. spill or a bypass facility).

[38] Licensee currently opens a spillway gate during the migration season to pass salmon smolts.

[39] For specific test conditions see studies cited in footnote #38

[40] For specific test conditions see studies cited in footnote #38

[41] Baum, E. 1997

analysis at other hydropower projects. On average, flows greater than or equal to 4,800 cfs will occur 40% of the time in April, 30% of the time in May, and about 5% of the time during the first two weeks of June (Table 9). At the request of the SRCC, FPL Energy conducted a desktop turbine entrainment evaluation based on field studies conducted at projects with turbine specifications similar to Hiram. This evaluation, and a separate analysis by the resource agencies, estimated that, of the fish that travel through turbines, the average rate of immediate survival ranged between 74 - 87% for projects with turbine specifications similar to Hiram.

8.1.3 Level of Historic and Recent Hatchery Releases

Stocking of hatchery Atlantic salmon fry, parr, and smolts in the Saco River drainage has been highly variable due to a number of factors (Table 4). During this time, the MASC and SRSC have made requests to the Maine Atlantic Salmon Technical Advisory Committee (TAC) for hatchery fish to be released into the Saco River[42]. In years when there was sufficient hatchery production, the TAC approved the request and fish were stocked. For many years (1975-1991) the Saco River received fry, parr, and smolts (totaling 626,900) from the USFWS hatcheries in support of this restoration effort[43]. Beginning in 1992, the USFWS committed to stocking approximately 20,000 smolts into the Saco River annually. The average annual smolt stocking between 1993 and 2000 was 18,189 fish (range 5,100-35,200). After 2000, the TAC reduced the number of Penobscot River smolts that could be stocked outside the Penobscot drainage due mainly to declining returns of adult salmon to the Penobscot River. Smolt stocking on the Saco River has since declined to an average of 2,960 fish (range 400-5400) over the last five years.

In 1990 the SRSC started construction on their first salmon hatchery in Bar Mills. After completion in 1991, the SRSC began requesting F_2 generation eggs, which members could raise to the fry stage at the club's hatchery and then release into appropriate habitat. In 1997, the SRSC completed construction of their new hatchery presently located at the Marblehead boat launch in Biddeford, Maine. Additional modifications to the new hatchery building were completed in 1999, increasing egg incubation capacity up to 1.2 million. In order to compensate for decreased smolts from the USFWS, the SRSC began requesting more eyed eggs, up to 750,000 in recent years. Eyed-eggs obtained from the GLNFH are hatched and reared to the fry stage at the SRSC Hatchery.

Between 2000 and 2005, a total of 2,638,705 Atlantic salmon fry were stocked throughout the drainage (Tables 4 and 5 a-f). Annual fry stocking by the SRSC, which began in 1991, generally increased until 1999 then began to level off between 2000 and 2004 with a slight decrease in 2005 due to mortalities that occurred at the SRSC hatchery prior to stocking (Table 4). After 2005, a shift in eyed-egg allocations from the GLNFH F_2 domestic broodstock production led to decreased availability for other programs outside of the

[42] The TAC provides technical advice and guidance for the Maine Atlantic salmon program; it operates under a cooperative agreement between several agencies: MASC, USFWS, NMFS, Penobscot Indian Nation, MDIFW, and the University of Maine.

[43] U.S. Atlantic Salmon Assessment Committee. Annual Report of the U.S. Atlantic Salmon Assessment Committee. Report No. 18 – 2005 Activities. Gloucester, Massachusetts. February 27 – March 2, 2006. Prepared for U.S. Section to NASCO.

Penobscot River. Overall, the Saco River restoration effort has received fewer fish due to broader programmatic changes in the distribution of Penobscot River origin juveniles.

In general, hatchery-reared salmon smolts are stocked in the mainstem of the Saco River, while parr and fry are stocked in tributaries. No life stages are stocked below the Cataract Project or in the mainstem between West Buxton and Bonny Eagle because of lack of nursery and rearing habitat (Tables 5 a-f). In recent years, smolts have primarily been stocked in the mainstem between the Cataract Project and the Skelton Project to minimize passage at dams (Tables 5 a-f). Fry are stocked in several areas, but most are released in nursery/rearing habitat in tributaries located between the Cataract Project and the Skelton Project, between the Bonny Eagle Project and Hiram Project, and above the Hiram project (Tables 5 a-f). Recently, more effort has been placed on identifying suitable juvenile rearing habitat in the lower tributaries below the Skelton project to increase fry stocking in the lower portions of the drainage.

8.1.4 Habitat Suitability and Production Estimates

Densities of parr and fry were surveyed between 1997 and 2005 using standard electrofishing techniques over the entire Saco drainage where salmon fry are released (Table 10a). In 2001 and 2002, the MASC sampled at least once in each tributary or stream reach where releases took place to document survival and production. In some years, fewer sites have been sampled, but at a minimum standard sites are surveyed in order to maintain consistency. The data indicate almost all release sites and streams support juveniles. When water conditions permitted, spawning surveys were conducted to document wild Atlantic salmon spawning. Spawning surveys over the past several years have found redds in the Big Ossipee River where adults were released and in the mainstem and tributaries downstream of the Skelton Project. Spawning occurring below the Skelton Project is by adults that were passed at the Cataract fishways and have volitionally migrated only to the upper end of the Springs/Bradbury impoundment to habitat below Skelton. Given the size of the Saco River drainage, it is also possible that wild spawning is occurring in areas not surveyed.

8.2 American shad

8.2.1 Upstream Passage

A total of 18,719 adult American shad have been passed at the Cataract Project from 1993 to 2005 (Table 6). Annual returns for the first generation (1993-1997) ranged from 399 to 1,104 fish, while returns for the second generation (1998-2002) generally increased, ranging from 1,014 to 4,994 fish (Table 6; Figure 4). American shad return to the Saco River from late May to early August, but the majority migrate upstream in June and use the east channel fish lift (Table 6). In 2005, the lack of generation at the Cataract Project and very high river flows (Table 11) likely contributed to the low shad returns. Because the Cataract unit was out of service, all water was passed through spill gates or over the spillway, resulting in flows that did not attract fish to the entrance of the fish lift. In addition, fishways were shut down when stream flows exceeded those for which the fishway was designed (river flows above 11,000 cfs). As a result, the east channel fish lift and the fish locks at the Spring Island and Bradbury dams were shut down from May 1-May 6 and from May 26-June 2; the Skelton

fish lift was shut down from May 1-May13 and from May 26-June 2[44].

American shad that pass the lower Cataract dams were either passed upstream into the Cataract impoundment, trucked upstream and released into the Springs/Bradbury impoundment due to low passage efficiency for this species at the locks, or transported to the Waldoboro hatchery for use as broodstock (Table 12). From 1993-1996, approximately 15% of the returning shad were passed into the Cataract impoundment and 85% were trucked upstream and released in the Springs/Bradbury impoundment. Between 1997 and 2001, 31% of the returning shad were passed into the Cataract impoundment in order to assess the efficiency of the fish locks at the Springs and Bradbury dams, and 9% were used for broodstock.

The number of American shad that use the Springs and Bradbury fish locks has remained very low despite numerous studies conducted between 1997 and 2002 to improve passage[45]. Underwater video cameras were used annually from 1997-2002 to monitor the locks, a shad fallback study was conducted in 1999, a radio-telemetry study was conducted in 2000, various operational measures were tested in 2001 (deep gate flow adjustments, lighting), and structural modifications were made in 2002. Despite these studies, combined passage efficacy at Springs and Bradbury dams is less than 5% (<5% of the shad passed into waters above the Cataract East and West Channel dams passed through the fish locks at the Springs and Bradbury dams) [46]. The reason for low shad passage efficiency remains unknown; therefore, American shad captured at the east channel fish lift continue to be trucked around the Springs and Bradbury dams as an interim measure.

A total of 75 American shad have been passed at the Skelton fish lift since its first full operational year: none in 2002, three in 2003, 72 in 2004, and none in 2005. In 2003, American shad were starting to move upstream when the fish lift was shut down to prevent the handling of Atlantic salmon at high temperatures; a protocol was subsequently developed by FPL Energy and the agencies to avoid a similar situation in the future. Low passage numbers in 2005 are probably a reflection of high flows and low passage numbers at the Cataract east channel fish lift.

Linear regression was used to determine the slope of the regression of the number of returning adult shad on year of return. For the analysis, shad returns were log-transformed. One outlier was removed (4,994 shad in 1999) to eliminate extreme variability, thereby allowing a better analysis of the long-term trend. The linear regression analysis indicated the slope (logshad=0.063(year) – 119.371) was not significantly different from zero (N=12; F-ratio =3.772; P=0.081). The shad population has not significantly increased nor decreased since 1993 (Figure 5).

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[44] The 2005 upstream fish passage season was poor in most Maine rivers due to extended periods of very high flows and cool water brought about by unusually high precipitation during May and June.

[45] See the annual Springs and Bradbury Fish Locks Reports for the years 1997 – 2003.

[46] Fish passage efficiency studies are those in which the number of tagged fish successfully passing through a fishway is compared to the number of tagged fish released at the entrance. We define passage efficacy as the number passing at a fishway compared to the number passing at the previous fishway.

8.2.2 Downstream Passage

Downstream passage studies have not been conducted for American shad, alewife, or blueback herring (collectively "alosines").

8.2.3 Level of Recent Stocking Releases

Shad restoration on the Saco River is primarily passive, and relies on safe, timely, and effective upstream and downstream fish passage for adults and juveniles. Stocking of pre-spawned adults into suitable habitat is sometimes used to establish a population that is imprinted on a body of water prior to installation of fish passage. Stocking of fry into the Saco River has not been an intended part of the restoration effort on the Saco River. However, from 1997-2001 a total of 1,059 adult American shad were collected from the Cataract Project by the licensee and transferred by the Maine Department of Marine Resources (MDMR) to the Waldoboro shad hatchery for use as broodstock for the restoration program in the Kennebec River (Table 12), which is funded by the Kennebec Hydro-Developers Group. Most of the resulting fry were stocked in the Kennebec River basin, but some were stocked in the Saco River to compensate for the removal of adult spawners (Table 13). Use of Saco River fish as broodstock for the Kennebec River was discontinued when other sources of broodstock became available for the Kennebec River and the fishery agencies could no longer fund the stocking of shad in the Saco River.

8.3 River herring (alewife and blueback herring)

8.3.1 Upstream Passage

A total of 243,597 alewives and blueback herring have been passed at the Cataract Project between 1993 and 2005 (Table 7). Annual returns for the first generation (1993-1996) ranged from 831 to 9,820 fish; returns for the second generation (1997-2000) ranged from 2,137 to 31,070 fish; and for the third generation (2001-2004) from 20,198 to 66,890 fish (Figure 6). River herring generally returned to the Cataract Project between May and July, with the greatest number arriving in May (Table 7); returns in May are primarily alewife and those in June are primarily blueback herring. Low returns in 2005 may be attributable to the fact that the Cataract Project turbine was out of service and there were very high river flows that cause the fishways to shut down (see discussion under Section 8.2.1 for American shad).

Disposition of returning adult river herring in the Saco River has varied over the years. Between 1993 and 2001, 42% of the adults were passed upstream into the Cataract impoundment, 6% were transported one mile to the Springs/Bradbury impoundment, and 52% were transported nine miles upstream to the Skelton impoundment. After the Springs and Bradbury fish locks were demonstrated to be effective for passing alewife, returning adults have been passed into the Cataract impoundment and allowed to migrate upstream volitionally as far as the Skelton dam. Since the Skelton fish lift became fully operational in 2002, river herring have been allowed to migrate upstream using the Cataract, Springs and Bradbury, and Skelton fishways.

A total of 50,040 river herring have used the Skelton fish lift since its first full year of operation: none in 2001; 11,582 in 2002; 14,411 in 2003; 24,047 in 2004; and none in 2005. Of the river herring passed at Cataract East and West Channel fishways in 2002, 2003, and

2004, approximately 57%, 53%, and 76%, respectively, were passed at the Skelton fish lift (Tables 14 and 15).

Linear regression was used to determine the slope of the regression of the number of returning adult river herring on year of return. River herring returns were log-transformed, and one outlier was removed (390 in 2005). The resulting regression (logriverherring=0.298(year) – 585.613) was significantly different from zero (N=12; F-ratio = 19.660; P=0.001), indicating that river herring populations have significantly increased since 1993 (Figure 7).

8.3.2 Downstream Passage

Downstream passage studies have not been conducted for alosines.

8.3.3 Level of Recent Stocking Releases

The restoration of river herring is primarily passive, and relies on safe, timely and effective upstream and downstream fish passage for adults and juveniles. However, sometimes stocking of adults is used to create a population that is imprinted on a body of water prior to installation of fish passage. For instance, river herring were stocked above the Skelton Project between 1995 and 2001, prior to operation of the fish lift at the Skelton Project. Trap and truck operations to stock river herring in upstream habitat is available at the FPL Energy Cataract and Skelton Projects. Its use for transporting herring has been limited to date.

8.4 American eel

8.4.1 Trends in Population Size

Passage of American eels at each project on the Saco River is an issue of concern. American eels are included in the 1987 Management Plan. State and federal resource agencies recognized the importance of eels in the ecosystem and acknowledged the need for attention to the population by including American eel in the first Assessment Report[47]. Objectives of that assessment plan included managing river reaches I, II, and III (encompassing the Cataract, Skelton, Bar Mills, West Buxton, and Bonny Eagle projects) as a migratory pathway for American eels.

Abundance data for eels in the Saco River watershed is limited. A survey conducted as part of the Bar Mills Project relicensing (Eel Survey) indicates few eels are present above the Bar Mills Project[48]. Also noted in the Eel Survey was evidence of upstream movement of juvenile eels. Monitoring documented that small numbers of juvenile eels were leaving the aquatic environment to pass through areas of leakage or ascend the face of the dam during their upstream migration in the summer. In addition, a small number of adult eels were documented migrating downstream in the fall. A 2006 river-wide survey conducted for the U.S. Environmental Protection Agency (USEPA) indicated that there are eels present in relatively low numbers above all of the main stem dams on the Saco River, and that more

[47] 1996-1999 Final Assessment Report, Saco River Fish Passage Assessment Plan. December 1999. p. 15

[48] American Eel Migration Study, Final Report. December 2004

eels were collected in the lower reaches of the river than farther upstream[49].

8.4.2 Management of American Eel

Management of American eels is guided by the ASMFC Interstate Fisheries Management Plan for *American Eel Fisheries Management Plan* (2000). Goals of the Eel Management Plan are to maintain and enhance the abundance of American eels in inland and coastal waters, and contribute to the viability of the American eel spawning population. One objective is to provide adequate upstream passage and escapement to inland waters for elvers and older juvenile eels, as well as ensure adequate downstream passage and escapement to the ocean of pre-spawning adult eels.

9.0 Evaluation of Data under the Assessment Criteria

During the January 20, 2000 meeting, the SRCC decided to maintain the 12 assessment criteria used in the first assessment cycle. Trends in population size, level of releases and future plans, fish passage efficiency, habitat suitability and production estimates, comparison of the Saco River with other river systems, degree of attrition due to multiple barriers, effectiveness of trap and truck, and turbine mortality are the criteria addressed in this assessment. Biological characteristics are discussed by species in Section 6.0, *Fisheries of the Saco River,* and are not repeated here. Degree and location of salmon fallback, evidence of limiting factors, availability of staff, and interagency coordination have not been specifically addressed in this cycle.

9.1 Trends in Population Size

9.1.1 Atlantic salmon

Homewater returns of Atlantic salmon to the Saco River have fluctuated since 1993, but exhibited no overall trend. As stated in section 8.1.1, increases in the proportion of adult returns from stocked fry or natural reproduction were not expected to occur until 2003 or beyond. Historically, less than 18% of adult returns have originated from Saco River fry stocking and/or natural spawning. During this assessment cycle, the proportion of returns of wild origin salmon ranged from a low of 7.2% in 2001 to a high 46.2% in 2003. It is encouraging to note that over the last three years (2003-2005), 32% to 46.2% of the adult returns were from Saco River fry stocking and/or natural spawning. Also encouraging was the observation of a small number of Atlantic salmon redds in both the lower mainstem Saco River below the Skelton facility and in the Big Ossipee River, indicating that some adults are spawning. No data are available to indicate successful production of fry at these sites. Additional monitoring is needed to determine the extent of spawning and level of success for Atlantic salmon in these and other reaches of the Saco drainage. Given similar stocking rates, Atlantic salmon returns to the Saco River are expected to be similar in magnitude to those observed in recent years.

9.1.2 American shad

American shad have experienced modest, though not statistically significant, gains in the

[49] Chris Yoder, Midwest Biodiversity Institute, personal communication.

population since fishways became operational at the Cataract Project in 1993. This is indicated by the positive slope of the regression equation of returning adults by year (Table 6; Figure 4). Assessment of passage efficiency at the Springs/Bradbury fish locks from 1998 to 2001, when 23-57% of the returning adults were passed into the Cataract headpond, probably contributed to the low rate of increase. These fish did not use the fish locks, and were confined in 3% of the impoundment spawning habitat. As a potential result, survival of juvenile shad during the study may have been reduced because of competition for resources. Subsequent returns for this generation may have been affected. Although shad utilizing the east channel fish lift currently are trucked above the Springs/Bradbury fish locks, those that ascend the west channel fishway are restricted to the small amount of spawning habitat below the Springs and Bradbury dams. This passage problem may be one factor limiting shad restoration efforts.

9.1.3 River herring

River herring have experienced the greatest returns of the target species, with an average overall rate of increase at 29% since 1993. With the exception of 2005, a year when extreme high water flows occurred during the upstream migration season, river herring populations have generally increased since 1993 (Table 7; Figure 6).

9.2 Level of Recent Releases and Future Restoration Plans for Diadromous Species

Two species of migratory fish have been stocked in the Saco River, Atlantic salmon and American shad. Salmon have been stocked annually since 1982 with the most intense stocking occurring in the 1990's. Since 2000, the level of releases for a variety of salmon life stages has fluctuated. Among the life stages stocked, fry and smolts have been utilized most regularly (Table 4). The majority of habitat accessible for stocking throughout the drainage in Maine, as designated in the 1987 Management Plan, is stocked by the MASC and the SRSC. Observed increases in the proportion of wild origin adult salmon returning to the Saco River likely are due to increased fry stocking. Based upon results to date, the Saco River FAAC has determined that the management goals and objectives of the Atlantic salmon restoration program for the Saco River are valid. It is anticipated that salmon stocking will continue and that future releases of the various Atlantic salmon life stages into Maine waters will be similar to or increase in numbers compared with stockings undertaken in recent years.

Shad were stocked in the Saco River to a limited degree during the 1990's. MDMR collected shad from the Saco River for broodstock primarily to supplement restoration efforts on the Kennebec River that are funded by a group of hydropower owners. Some of the fry produced from this effort were stocked into the Saco to compensate for the removal of adults. This practice was discontinued after the 2001 season because broodstock are currently available from other river systems. The MDMR has no plans to continue releases of shad fry in the Saco River due to lack of funds. All returning adult shad on the Saco River will be allowed passage to available upstream habitat for natural spawning.

9.3 Habitat Suitability and Production Estimates

The location of suitable habitat for various life stages and production estimates for Atlantic salmon, American shad, and river herring are identified in the 1987 Management Plan (see

Section 3.0). The habitat characterizations and production estimates in this plan remain the basis for the restoration goals and objectives.

Assessment of juvenile densities in three tributaries stocked with Atlantic salmon fry suggest that densities of fry and parr and the growth and survival of Atlantic salmon in the Saco River appear to be comparable to or higher than many other Atlantic salmon rivers in Maine, including many of Gulf of Maine Distinct Population Segment rivers[50] (Table 10b).

Approximately 97% of the American shad spawning habitat between the Cataract Project and the Skelton project is above the Springs and Bradbury dams; the remaining 3% is between the Cataract dams (East Channel Dam and West Channel Dam) and Springs and Bradbury. While the existing trap and truck program provides adequate interim passage past these dams for shad, the MDMR, USFWS, and NMFS conclude that the rate of restoring the American shad population could be enhanced by improving access to upstream spawning and nursery habitat, specifically by addressing ineffective upstream passage at Springs and Bradbury for shad.

Between 1999 and 2004, the number of river herring passed at the lower Cataract dams has approached or exceeded 34,000 fish, which is the spawning escapement needed to sustain production in the Cataract and Skelton impoundments (Table 7; Table 15) corrected for passage efficiency, which is assumed to be 90%. Therefore, the FAAC has determined that sufficient numbers of river herring are being passed at the Cataract East Channel and West Channel dams for sustained production of river herring in the Cataract and Skelton impoundments consistent with habitat capabilities.

9.4 Fish Passage Efficiency

Downstream passage bypass efficiency for smolts has been evaluated at Cataract, Skelton, Bonny Eagle, West Buxton, and Bar Mills (see section 8.1.2). Bypass efficiencies were variable depending on the project and test conditions. Downstream bypass passage efficiency at hydroelectric projects on the mainstem Saco River have not been tested for the kelt life stage of Atlantic salmon or for juvenile and post-spawned river herring and American shad.

As discussed in Section 8.2.1, the efficiency of shad passage at the existing fishway locks at the Springs and Bradbury dams remains low despite the efforts to identify problems and implement remedial measures. Evaluation of potential passage impediments should be continued and corrections implemented.

[50] The Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon was listed as endangered under the Endangered Species Act (ESA) in 2000. The GOM DPS includes all naturally reproducing wild populations and those river-specific hatchery populations of Atlantic salmon having historical river- specific characteristics found north of and including tributaries of the lower Kennebec River to, but not including, the mouth of the St. Croix River at the U.S.-Canada border (50 CFR Part 17.11(h) and 50 CFR Part 224.101). The current GOM DPS for Atlantic salmon includes the following rivers: Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot rivers, and Cove Brook. Atlantic salmon, including captive populations at Craig Brook National Fish Hatchery and GLNFH, having historic river-specific characteristics derived from these eight rivers are fully protected under the ESA.

9.5 Turbine Mortality

All of the licensee's projects below Hiram have downstream passage measures which provide a bypass around the turbine units. These measures were designed in consultation with the fisheries agencies and have been field tested for Atlantic salmon smolts (see Sections 8.1.2 and 9.4). Most of these consist of gates and bypass sluices that route downstream migrants past the powerhouse. Additionally, depending on river conditions at the time, migrants also pass on spillage over the dams and through the spillway gates. Some percent of smolts was observed to pass through the turbines. Therefore, the licensee conducted turbine survival studies. Smolt survival studies conducted on Saco River projects indicate immediate survival through the turbines were as high as 88% at Bar Mills and 85% and 97% for West Buxton[51]. In response to these results, the USFWS noted that survival rates at West Buxton declined as gate setting increased, and that the studies were not conducted at the highest gate setting. The USFWS further stated that higher mortality might be observed under normal flow conditions and with a greater number of fish passing the project. The USFWS further commented that, for the Bar Mills study, delayed mortality and long-term effects beyond the holding period used were not considered in the evaluation.

Recent studies and turbine passage models developed by the Department of Energy (Franke et al., 1997) have been reviewed by the SRCC. A review of this material estimates that, of the fish that travel through turbines, the average rate of immediate survival ranged between 74 - 87% for projects with turbine specifications similar to Hiram. (see discussion in section 8.1.2).

9.6 Effectiveness of Trap and Truck Operations

In conjunction with the installation of a new fish lift at the Cataract Project in 1993, trap and truck was initiated to provide access to and utilization of upstream habitat before permanent fish passage facilities were constructed at upstream hydropower projects. The Skelton fish lift was installed in 2001 and allowed fish to either be trapped at Cataract, or passed through to Skelton where they could be trapped and transported, if desired. Trap and truck operations have been a necessary part of the restoration effort to date in maintaining anadromous populations in the Saco River, and will remain so until permanent fish passage facilities are in place through the Bonny Eagle Project. In its 13 years of operation, the trap and truck operations have transported 200 adult salmon (Table 8) and 12,981 adult shad (Table 12) into the Saco River system. River herring access suitable spawning habitat by utilizing existing fish passage through the Skelton Project. To date, the fisheries agencies have determined that annual trucking of river herring above the Bar Mills Project has not been needed. However, based on the rate of recent returns, the need to utilize trap and truck for passage of river herring above Bar Mills may be necessary in future years to allow herring to exploit additional river reaches that provide suitable nursery habitat (Tables 14 and 15).

Trap and truck operations have been useful as an interim passage measure in developing and maintaining the returning runs that now exist. However, studies and assessments conducted on other river systems have identified limiting factors to this method of fish passage that

[51] Normandeau Associates, Inc. and FPL Energy Maine Hydro, LLC. May 2002; Normandeau Associates, Inc. January 2000.

make it less desirable to the FAAC than permanent fish passage facilities. During trap and truck operations, handling of fish could result in migration delay, stress, dropdowns, and post release mortality[52]. While these factors have not been studied specifically on the Saco River, the FAAC considers that these factors may occur to some extent. Therefore, based upon what the FAAC considers best available information, the FAAC has concluded that trap and truck as a long-term fish passage measure may be less desirable and potentially less effective than permanent fish passage facilities. Nonetheless, trap and truck operations are a necessary and adequate interim upstream passage measure prior to operation of permanent fish passage facilities.

9.7 Degree of Attrition Due to Multiple Barriers

9.7.1 Atlantic salmon

The degree of attrition due to multiple barriers encountered by downstream migrating Atlantic salmon has not been fully ascertained at this time but based upon previous studies and literature, some level of attrition is expected to occur on the Saco (see Section 8.1.2)[53]. Downstream bypass and survival studies have been completed for Atlantic salmon smolts at several projects below Hiram. Compiling the information and results from these previous downstream efficiency studies into a single document would provide a comprehensive summary of effectiveness and efficiency throughout the system.

No evaluation of upstream passage above Skelton has been conducted because all salmon captured at the Skelton Project are currently trucked to the Big Ossipee River. Downstream studies for kelts have not been conducted.

9.7.2 American shad and river herring

The presence of multiple barriers on a river system has a potential cumulative effect on migration efficiency. Current data for alosines are limited for the Saco River, and the full extent of attrition is not known for downstream migration through all the mainstem projects below Hiram. Studies evaluating movement and behavior of shad and river herring were conducted at the Cataract Project. No studies have been conducted on the downstream migration of juvenile shad or river herring on the Saco. Likewise, no studies have been conducted or required of the licensee to evaluate attrition of American shad or river herring passing upstream through the Cataract, Springs Bradbury, and Skelton fishways. Therefore, the degree of attrition due to multiple barriers encountered by upstream and downstream migrating American shad and river herring on the Saco River cannot be fully ascertained at this time.

It is worth noting that annually increasing returns of river herring indicate sufficient downstream alewife escapement is occurring to promote continued increases in this stock. Therefore, attrition that may occur does not appear to negatively affect the river herring restoration efforts to date.

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[52] Bernard et. al. 1999; Marshall et. al. 1994; Susquehanna River Anadromous Fish Restoration Committee January1983, February 1987, and February 1988.

[53] Ferguson et al. 2005; Larinier 2001; New England Fisheries Management Council 1998; Parrish et al. 1998

9.7.3 American eel

Low numbers of eels were observed in the USEPA funded Index of Biological Integrity fish assemblage survey[54] and the 2002 Eel Survey on the Saco River. Contributing factors for low abundances in general may include limited recruitment, predation, restricted access to suitable growth habitat, mortality resulting from turbine entrainment, and alterations in habitat and water quality. These factors have not been studies on the Saco River. Fulfillment of the objectives of recent state and federal management plans for American eels will require safe, timely, and effective upstream and downstream passage at each project in order to successfully complete their life cycle[55]. Due to the lack of information pertaining to the American eel stock in the Saco River, the degree of attrition due to multiple barriers encountered by upstream and downstream migrants cannot be evaluated at this time.

9.8 Comparison of the Saco River with Other Rivers

It is difficult to compare fish abundances and rates of increase in the Saco River to other rivers on the east coast because each restoration program varies in longevity, management methods, limiting factors, bio-productivity, and habitat area. For instance, the Susquehanna River program annually stocks millions of American shad fry, while other large river systems (e.g., the Connecticut River) do not stock shad, and the Penobscot River program has been stocking approximately 500,000 – 750,000 Atlantic salmon fry, parr, and smolts from the mid-1970's to the 1990's, and more than 1,000,000 of the various juvenile Atlantic salmon life stages since 2000. Stocking rates of juvenile salmon to the Saco have been on the order of 300,000 - 400,000 in recent years. Returns of Atlantic salmon to the Saco River have been lower than expected and variable, similar to what other systems of various sizes have experienced (Table 16), but also higher than many other Maine salmon rivers. As discussed above (Section 9.3), juvenile salmon density in the Saco River appears to be similar to that of other Maine rivers for which monitoring data exist.

American shad returns on the Saco River and elsewhere are variable, but have not been consistently supported by stocking efforts such as on the Susquehanna River. The number of river herring returning to the Saco River appears to be proportionally better than other larger systems such as the Connecticut River, which has experienced drastic reductions in the river herring population between 1993 and 2003. River herring adult abundance trends on the Saco appear to qualitatively mirror those from the Androscoggin and Kennebec rivers, two other Gulf of Maine rivers for which some data are available.

10.0 Status of Diadromous Fish Populations in the Saco River

The current status of diadromous populations is mixed. River herring populations are increasing annually. Aside from anomalous weather years and the anticipated returns from those year classes, it may be reasonable to assume that river herring populations will continue to increase until all accessible habitat managed in the Saco River watershed for this species is utilized. American shad populations had initial gains from 399 in 1994 to 1,374 in

[54] C. Yoder, MBI, Columbus, Ohio, personal communication.

[55] American Eel (*Anguilla rostrata*) Species Management Plan. November 1996; ASMFC 2000(a); See also ASMFC 2000(b), (2001), (2002), (2004).

1998 (returns of 4,994 were observed in 1999 and have not approached this number since) and annual adult numbers have generally fluctuated broadly around 1,300 individuals since 2000; however, the shad population has, overall, experienced moderate, though not significant, increases over the years. Atlantic salmon have experienced the least gains. Atlantic salmon returns continue to be low in number and continue to fluctuate greatly (Table 2), exhibiting a slight, though not significant, decreasing trend (Figure 3). The current restoration efforts (e.g., stocking efforts and targeted release of returning adults in the Big Ossipee River) are necessary for maintaining the population. Further gains in restoration of the salmon population will rely on increased stocking efforts and access to suitable habitat.

American eel were not considered in the 1994 Agreement and, therefore, restoration efforts in the Saco River drainage have been negligible for this species up to this point in time. Although no time series is available to measure changes in recruitment or abundance, limited data indicate few adults are in the system. Improving access to growth habitat could facilitate restoration of this species to the river and realizing the ecological benefits of this species.

11.0 Progress Towards Goals and Objectives

The FAAC has determined that, while the 1987 management goals have not been achieved, progress toward goals and objectives is being made in several river reaches (Table 17). Permanent fish passage facilities at Cataract and Skelton Projects were installed in support of managing Reach II (including Cataract East Channel Dam, Cataract West Channel Dam, Springs Island Dam, and Bradbury Dam) as a migratory pathway and for sustained production of anadromous species. Total river herring returns exceeded their estimated escapement numbers for the Cataract impoundment from 2002 – 2004 (Tables 14 and 15). American shad returns have been slowly increasing. Upstream passage continues to be problematic for shad at the Springs and Bradbury fish lock facilities. Trap and truck operations remain a necessary interim passage measure until permanent improvements are instituted at the locks. Upstream passage effectiveness for American eels at the Saco River dams is unknown. Downstream passage efficiency of juvenile alosines and adult eels at the Cataract dams has not been studied.

Installation of a fish lift at the Skelton Project in 2001 was implemented in support of managing Reach III (including Skelton, Bar Mills, West Buxton, and Bonny Eagle dams) as a migratory corridor and for sustained production of anadromous species. Total river herring returns in 2004 exceeded estimated escapement for both the Cataract and Skelton impoundments (Tables 14 and 15). However, upstream passage effectiveness for American eels at all four dams is unknown. Downstream passage efficiency of juvenile alosines at the Skelton Dam and adult eels at all four dams has not been studied.

Activities to address the management objectives for Reach IV and Reach V remained unchanged for this assessment cycle. Juvenile Atlantic salmon are stocked through much of the Maine portion of the watershed and adult salmon continue to be trucked to the Big Ossipee River for spawning in support of maintaining a sustainable population. Changes to these activities are dependent on achieving management goals in Reaches II and III.

No restoration activities have taken place in Reach VI or VII. The current license exemption for Swans Falls (which demarks the beginning of Reach VI) calls for upstream passage facilities to be completed no sooner than 2011. Given the lack of restoration efforts in this reach, this schedule could be modified according to the terms and conditions of the Swans Falls' license exemption if, among other circumstances, upstream passage facilities at Hiram are not constructed before 2011. The 1994 Agreement indicates that the need, design, and schedule for upstream passage at Swans Falls will be determined by the assessment process and further stipulates that upstream passage at Swans Falls may be scheduled for simultaneous completion with Hiram. Downstream passage for Atlantic salmon at Swans Falls (and Hiram) hinges on the presence of juvenile or adult fish via annual production stocking (as defined in the 1994 Agreement), trucking, or volitional passage, and subsequent natural reproduction[56]. The 1994 Agreement contemplates interim and/or permanent downstream passage at all dams above which anadromous fish have passed or have been stocked or trucked. Further, the 1994 Agreement stipulates permanent downstream passage at Swans Falls will be provided no more than two years from the commencement of annual production stocking above the dam.

12.0 Rate of Progress and Conclusions

The overall rate of progress towards reaching restoration goals, as indicated by population gains towards target escapement numbers, is relatively slow but positive.

12.1 Atlantic salmon

The annual returning adult Saco River salmon stock has remained relatively small and unchanged since 1993. The number of salmon fry, parr, and smolt stocked annually has varied significantly. Historically, approximately 82% of the net 1993-2000 returning adults were derived from smolts of hatchery origin, while over the last three years, 2003-2005, 32% to 46.2% of the adult returns were attributed to fry stocking and/or natural reproduction. Based on available MASC survey information, there is evidence of limited in-river spawning, but stocking is currently relied upon to maintain or enhance the smolt output required to increase adult returns. MASC nursery habitat surveys indicate that the density of juvenile salmon (specifically parr) is consistent with that of other similar Maine rivers, suggesting that survivorship of hatchery reared fry stocked into available nursery habitat is comparable to other stocking efforts statewide. Although there are out-of-basin influences on salmon returns, it is likely that continued stocking and natural reproduction will contribute significantly to improving adult returns on the Saco River.

The FAAC has concluded that: 1) increasing juvenile salmon stocking, 2) sequentially implementing permanent upstream fish passage from Bar Mills through Swans Falls, and 3) downstream passage at Hiram and Swans Falls will help reach management goals.

Data that would be helpful in evaluating future progress and needs specific to salmon include quantifying natural reproduction of Atlantic salmon, determining juvenile Atlantic salmon habitat utilization, and determining the extent of inter-specific competition with resident

[56] Per the 1994 Agreement, stocking or trucking are dependent on the participation of appropriate state and federal Fisheries Agencies in Maine and New Hampshire including the NHDFG and the USFS.

salmonids (i.e., indigenous brook trout and the ecologically similar exotic brown trout).

12.2 American shad

The annual size of the returning adult American shad stock has increased, though not significantly, since 1993. This population relies on natural reproduction of returning fish, with no hatchery-supplemented fry stocking. Existing upstream fish passage conditions at Springs-Bradbury are not optimal, and improvements to an existing fishway may enhance the ability of the population to exploit spawning and nursery habitat above the Springs Bradbury dams.

The FAAC has concluded that actions improving access to spawning and nursery habitat would benefit stock management goals. This includes: 1) improving upstream American shad passage at the Springs dam fish lock, 2) trapping and trucking American shad into the upper reaches of the Springs Bradbury impoundment until permanent shad passage improvements are instituted at the Springs dam fish lock, 3) sequentially implementing permanent upstream fish passage from Bar Mills through Bonny Eagle to promote further adult access to spawning and nursery habitat, and 4) assessing downstream passage at all applicable sites.

12.3 River herring

River herring stock abundance has generally experienced net increases annually such that target escapement numbers were reached for the Cataract and Skelton impoundments in 2004. Recruitment to the population is from natural reproduction of adults. Further increases in river herring stock can be achieved by providing access to river reaches upstream from Bar Mills. However, the most significant potential additional rearing habitat exists in Lake Arrowhead, Maine, and Ossipee Lake, New Hampshire. Fishery management and interagency data review must occur prior to stocking these lakes.

The FAAC has concluded that the river herring stock appears to be capable of expanding. Actions that promote access to additional spawning and nursery habitat would benefit stock management goals in those reaches where there are no unresolved fishery management conflicts. In the interim, some additional upstream mainstem habitat can and should be exploited in the future. During annual review meetings, the FAAC will determine 1) the need for trucking river herring into upstream habitat until permanent passage is implemented through Bonny Eagle, and 2) assessing downstream passage at all applicable sites.

Data concerning smallmouth bass populations in certain water bodies slated for future alewife introduction would also inform inter-specific management decisions. A database combining the body of studies and monitoring data produced by fishery agencies and licensee during the life of the 1994 Agreement would also assist fishery managers by providing a concise and readily accessible source of data.

12.4 American eel

American eel is a panmictic migratory species that has come under increased fishery management interest in recent years. Recruitment to the watershed is dependent on elvers arriving in the estuary and ascending to freshwater habitat. Although American eel stock abundance and migration in the Saco River is not monitored, available data documents the

following: (1) a small number of juvenile eel migrate upstream at least as far as Bar Mills, (2) a limited number of adult eels emigrate in the fall, and (3) eels exist throughout the river but in decreasing upstream abundance.

The FAAC has concluded that enhanced access to upstream rearing habitat should benefit eel stock abundance in the Saco River. The FAAC recommends providing upstream passage at each dam sequentially. To allow adult eels to contribute spawners to the panmictic population, the FAAC recommendation is to subsequently provide sequential downstream passage at each dam once sufficient time has elapsed for newly recruited eels to grow to maturity.

13.0 Recommendations

Based on the analysis of monitoring results from 2000 – 2005, an evaluation of these data under the assessment criteria and in the context of data from the previous assessment cycle, the FAAC offers the following recommendations for upstream fish passage, and concludes that the results of implementing the recommendations will adequately protect the resources:

1. The lack of effective upstream passage for American shad at the Springs and Bradbury fish locks should to be addressed before the population exceeds capacity to trap-and-truck. The licensee should perform a study evaluating potential passage improvements at the Springs Island dam and fish lock and implement modifications, as appropriate, to be operational no later than 2015.

2. Trap and truck operations for American shad and river herring should be employed on an interim basis, as necessary, until permanent upstream fish passage is operational through the Bonny Eagle Project. Once permanent fish passage is operational at Bonny Eagle, shad and river herring will have access to all mainstem habitat below Hiram. Trap and truck operations for Atlantic salmon should continue on an interim basis until permanent upstream fish passage is operational through Hiram.

3. Based on the existing fisheries management activities and fish passage measures in the lower Saco, specifically the upstream passage issues at the Springs and Bradbury dams for shad, the availability of trap and truck as an interim management strategy, the safe handling protocols for Atlantic salmon, and implementation of recommended management and restoration activities throughout the watershed, operation of permanent upstream passage for anadromous species at Bar Mills can be delayed until no sooner than 2016.

4. Once permanent upstream fish passage at Bar Mills is operational, installation of permanent upstream fish passage for anadromous species should occur sequentially at each of the upstream dams and be operational within three (3) years of passage at the downstream project - the approximate generation time for river herring. (West Buxton – 2019, Bonny Eagle – 2022, and Hiram – 2025). These dates may be delayed following consultation with and agreement by the USFWS, NMFS, MASC, and MDMR, as appropriate.

5. The *Atlantic Salmon Trap Operating and Fish Handling Protocols* have been modified to adapt to observed conditions for shad. However, the agencies and licensee need to maintain operational flexibility, particularly for shad passage. The practice of interagency and licensee communication and coordination to modify operational procedures at the Skelton fish lift to accommodate late shad runs (see Section 7.1 for background), and other fish passage concerns, should be continued.

6. Upstream passage at Swans Falls should occur concurrent with upstream passage implementation at the Hiram Project.

The four-year assessment process was specifically designed to develop consensus on the need, timing, and design for new upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram, and Swan Falls projects. Additionally, the FAAC recommends the following fisheries management measures and concludes that their implementation, combined with the preceding recommendations, will further the Saco River restoration goals and enhance the fishery resources of the watershed:

(a) Based on the observed increases in the proportion of adult Atlantic salmon returns from stocked fry or natural reproduction, stocking of various juvenile life stages of Atlantic salmon is recommended.

(b) Upstream passage measures for American eel should be implemented at each facility in two-year intervals beginning with the Cataract Project and extending sequentially up to the Hiram Project. This is intended to enhance access to available rearing habitat for juvenile eels.

(c) Downstream passage measures for American eel should be implemented at each project beginning with the Cataract Project. The Cataract Project should implement downstream passage three years after upstream passage is operational. This phased approach provides time to study the timing and duration of the downstream migration season. Downstream passage at projects upstream of Cataract may be delayed 12 years after installation of upstream passage, as it represents the duration it takes female American eels to start to mature and out-migrate in Maine waters. Interim downstream measures, including monitoring and use of protective measures if mortality above a predetermined level be observed, should be implemented during this 12 year period.

(d) Given current management practices upstream of Hiram and based on the best available information concerning the risks to salmon smolts passing downstream, additional downstream passage measures at the Hiram project are not currently needed. Based upon the schedule set forth in recommendation #4 above, permanent upstream passage at Hiram will be operational by 2025, provided it is necessary, based upon the status of salmon restoration at that time. Permanent downstream passage must be operational coincident with the operation of permanent upstream fish passage facilities at the Hiram site. However, smolts derived from future stocking efforts above Hiram will benefit from the implementation of permanent downstream fish passage measures prior to 2025. Given that it will take a number of years to

develop and implement an expanded agency approved stocking program, it is reasonable and beneficial to schedule implementation of permanent downstream fish passage measures no sooner than 2017. If fish are not being stocked above Hiram pursuant to a written, agency approved Atlantic salmon stocking program by 2017, permanent downstream fish passage measures may be delayed until two years after the program is implemented, or until permanent upstream passage is operational at Hiram (whichever is earlier).

(e) Permanent upstream passage at the Swans Falls Project should be implemented concurrent with construction of upstream passage at the Hiram Project.

(f) A three-year study to determine downstream passage routes of salmon kelts at selected FPL Energy hydroelectric projects should be conducted to complement the previously completed downstream passage studies for smolts.

(g) Semi-quantitative downstream passage effectiveness studies should be implemented or completed for alosines, as needed, at each project.

(h) Results from all previously conducted downstream bypass efficiency studies should be compiled into a single set of documents for review.

(i) Information on the timing and environmental triggers for out-migration of American eel should be collected for the lower basin.

(j) The fishery agencies should maintain a sub-committee including MDIFW, MDMR, and MASC to address the issue of species interaction and conflict as restoration of anadromous species progresses. While progress has been made among the agencies to resolve conflicts, the issue of potential species interactions remains unresolved. This committee should consider the existing agreement between the MDIFW and MASC[57].

14.0 Plan for Future Fish Passage

Plans for future fish passage and management measures were contemplated during the facilitated discussions that occurred between 2004 and 2006. Specific fish passage and management measures agreed upon by the SRCC, based on the data and recommendations outlined above, are contained within the 2007 Saco River Fisheries Assessment Settlement Agreement (2007 Agreement). In general, the plans for future passage propose an orderly and logical approach to the restoration efforts that will continue the existing interim trap and truck measures for anadromous species while fisheries management issues are addressed, followed by permanent passage measures for the migratory runs. For the anadromous species (salmon, shad, and river herring) permanent upstream fish passage facilities are scheduled to be installed sequentially at Bar Mills, West Buxton, Bonny Eagle, and Hiram starting in 2015. Passage for shad at the Springs and Bradbury locks will be addressed. Permanent downstream passage facilities for anadromous species exist at all of the projects

[57] MASC – MDIFW Interaction Issue Resolution Annual Work Plan for the Saco River Watershed. August 2006

below Hiram and have been tested for juvenile salmon passage effectiveness. The 2007 Agreement schedules downstream efficiency studies for the other species and life stages sequentially. Permanent downstream passage facilities for salmon are scheduled at the Hiram Project for no sooner than 2017 while the appropriate fisheries agencies develop a stocking plan.

The 2007 Agreement provides for mainstem passage for the catadromous American eel up through the Hiram project. Upstream passage facilities will be provided at each project sequentially beginning in 2008. Downstream passage measures will be provided at the lowermost project, Cataract, in 2011 and then sequentially at the other projects based on maturation rates for eels in Maine waters[58].

Fish passage data collected in 2004 and 2005 are added in this final report and further supports the provisions of the 2007 Agreement. The 2007 Agreement will be filed with the Federal Energy Regulatory Commission (FERC) as an Offer of Settlement on the Bar Mills relicensing proceedings and for inclusion as license conditions for the Cataract, Skelton, West Buxton, Bonny Eagle, and Hiram projects. The 2007 Agreement also outlines additional fisheries management activities addressing the above listed management recommendations for the Saco River watershed within the state of Maine.

The SRCC believes the recommendations provided above and the provisions of the 2007 Agreement meet the goals of the Assessment Process and Assessment Reports under Annex 1 of the 1994 Agreement. Therefore, no further Assessment Reports are required. Nonetheless, the SRCC agrees to continue annual meetings in March to review fish passage operational data from the previous year, draft an annual report, develop an operational plan for the upcoming year, and evaluate the progress toward the restoration and management goals.

15.0 Availability and Accuracy of Data to Support Conclusions

All fish passage data were collected by FPL Energy at their facilities. The protocol for handling and counting fish collected at the fish lifts is described in the Springs and Bradbury and Skelton annual reports. Changes to these protocols were made in consultation with the FAAC. Fish counts were made readily available to the SRCC and are considered accurate by the FAAC.

Conclusions for Atlantic salmon are based on: 1) counts made by FPL Energy at the Cataract and Skelton fish passage facilities; 2) juvenile salmon population abundance estimates obtained through standard electrofishing catch multi-pass depletion population estimation metrics; 3) redd counts from visual observations undertaken by MASC, USFWS, and FPL Energy of salmon spawning activity; and 4) stocking data provided to the agencies by the SRSC.

Conclusions for American shad and alewife are based on counts made by FPL Energy at the Cataract and Skelton projects, and on estimates of productivity and spawning escapement

[58] Oliveira and McCleave 2000

made by MDMR using habitat area. Productivity and escapement estimates are based on long-term harvest records on several Maine river systems (for river herring, primarily alewife), on a 20-year record of fish passage on the Connecticut River (for American shad), and on mapped habitat area. MDMR routinely makes productivity and escapement estimates for river systems with restoration programs.

Tables

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Table 1. Freshwater fishes as reported in the 1987 Saco River Strategic Plan for Fisheries Management.

Common Name	Scientific Name
Banded killifish	*Fundulus diaphanous*
Black crappie	*Pomoxis nigromaculatus*
Blacknose dace	*Rhinichtys atratulus*
Blacknose shiner	*Notropis heterolepis*
Bridle shiner	*Notropis bifrenatus*
Brook stickleback	*Culaea inconstans*
Brook trout	*Salvelinus fontinalis*
Brown bullhead	*Ictalurus nebulosis*
Brown trout	*Salmo trutta*
Burbot	*Lota lota*
Chain pickerel	*Esox niger*
Common shiner	*Notropis cornutus*
Creek chub	*Semotilus atromaculatus*
Creek chubsucker	*Erimyzon oblongus*
Fallfish	*Semotilus corporalis*
Finescale dace	*Phoxinus neogaeus*
Golden shiner	*Notemigonus crysoleucas*
Lake chub	*Couesius plumbeus*
Lake trout	*Salvelinus namaycush*
Lake whitefish	*Coregonus clupeaformis*
Landlocked salmon	*Salmo salar*
Largemouth bass	*Micropterus salmoides*
Longnose sucker	*Catastomus catastomus*
Ninespine stickleback	*Pungitius pungitius*
Northern redbelly dace	*Phoxinus eos*
Pumpkinseed	*Lepomis gibbossus*
Rainbow trout	*Salmo gairdneri*
Slimy sculpin	*Cottus cognatus*
Smallmouth bass	*Micropterus dolomieui*
Threespine stickleback	*Gasterosteus aculeatus*
White perch	*Morone Americana*
White sucker	*Catostomus commersoni*
Yellow perch	*Perca flavescens*

Table 2. Monthly trap catches of Atlantic salmon at the Cataract Project, Saco River, Maine between 1993 – 2005.

Year	May	June	July	August	Sept.	Oct.	Nov.	Total
East Channel Fish Lift								
1993	0	9	6	0	0	0	0	15
1994	0	5	0	0	0	0	0	5
1995	3	8	0	0	5	2	0	18
1996	0	23	8	1	0	1	0	33
1997	1	10	4	0	1	0	0	16
1998	0	6	5	0	0	0	0	11
1999	1	22	0	1	0	0	0	24
2000	1	21	7	0	1	0	0	30
2001	7	18	4	2	1	0	0	32
2002	0	10	1	0	0	0	0	11
2003	2	10	0	0	0	0	0	12
2004	1	5	1	1	0	0	0	8
2005	0	5	0	0	0	0	0	5
Subtotal:	16	152	36	5	8	3	0	220
West Channel Fishway								
1993	0	5	7	1	14	11	0	38
1994	0	5	1	6	6	0	0	18
1995	1	10	1	0	3	1	0	16
1996	2	14	2	2	0	1	0	21
1997	0	6	3	1	1	1	0	12
1998	0	5	10	0	2	0	0	17
1999	6	23	3	4	2	4	0	42
2000	2	10	2	3	1	2	0	20
2001	1	13	15	0	7	1	0	37
2002	4	25	0	0	2	5	0	36
2003	0	21	1	0	5	0	0	27
2004	1	1	8	0	1	0	0	11
2005	2	7	10	0	1	0	0	20
Subtotal:	19	145	63	17	45	26	0	315
Total (Both Fish Passageways)								
1993	0	14	13	1	14	11	0	53
1994	0	10	1	6	6	0	0	23
1995	4	18	1	0	8	3	0	34
1996	2	37	10	3	0	2	0	54
1997	1	16	7	1	2	1	0	28
1998	0	11	15	0	2	0	0	28
1999	7	45	3	5	2	4	0	66
2000	3	31	9	3	2	2	0	50
2001	8	31	19	2	8	1	0	69
2002	4	35	1	0	2	5	0	47
2003	2	31	1	0	5	0	0	39
2004	2	6	9	1	1	0	0	19
2005	2	12	10	0	1	0	0	25
Grand Total:	**35**	**297**	**99**	**22**	**53**	**29**	**0**	**535**

Table 3. Sea age at maturity of Atlantic salmon returns to the Saco River, Maine between 1993 - 2005. (SW = sea winter; RS = repeat spawner)

	Hatchery Origin				Wild Origin				Total				Grand
Year	**1SW**	**2SW**	**3SW**	**RS**	**1SW**	**2SW**	**3SW**	**RS**	**1SW**	**2SW**	**3SW**	**RS**	**Total**
1993	4	48	0	1	0	0	0	0	4	48	0	1	53
1994	6	17	0	0	0	0	0	0	6	17	0	0	23
1995	0	34	0	0	0	0	0	0	0	34	0	0	34
1996	11	39	1	3	0	0	0	0	11	39	1	3	54
1997	5	23	0	0	0	0	0	0	5	23	0	0	28
1998	9	7	0	0	4	7	1	0	13	14	1	0	28
1999	10	11	0	0	12	31	2	0	22	42	2	0	66
2000	31	15	0	0	0	4	0	0	31	19	0	0	50
2001	15	49	0	0	0	5	0	0	15	54	0	0	69
2002	3	37	0	2	3	2	0	0	6	39	0	2	47
2003	2	19	0	0	2	16	0	0	4	35	0	0	39
2004	3	10	0	0	4	4	0	0	5	14	0	0	19
2005	5	12	0	0	1	7	0	0	6	19	0	0	25
Total:	**104**	**321**	**1**	**6**	**24**	**76**	**3**	**0**	**128**	**397**	**4**	**6**	**535**
%	19.4	60.0	0.2	1.1	4.5	14.2	0.6	0.0	23.9	74.2	0.7	1.1	100.0

Table 4. Releases of hatchery-reared Atlantic salmon in the Saco River drainage, Maine between 1982 and 2005.

YEAR	Number of Salmon Stocked				GRAND
	FRY	PARR (0+)	PARR (1+)	SMOLT	TOTAL
1982	-	47,100	-	-	47,100
1983	-	-	-	20,300	20,300
1984	-	-	-	5,100	5,100
1985	-	-	23,600	5,100	28,700
1986	-	-	10,000	35,200	45,200
1987	-	-	69,800	22,000	91,800
1988	47,000	-	-	25,100	72,100
1989	-	37,800	49,600	9,900	97,300
1990	-	30,100	47,800	10,600	88,500
1991	111,000	-	-	10,300	121,300
1992	154,000	50,200	400	19,800	224,400
1993	167,000	-	-	20,100	187,100
1994	190,000	-	400	20,000	210,400
1995	376,000	-	-	19,700	395,700
1996	-	45,000	-	20,000	65,000
1997	97,000	63,300	-	20,200	180,500
1998	431,000	50,000	-	21,300	502,300
1999	688,000	47,000	-	20,100	755,100
2000	516,020	48,200	-	22,600	586,820
2001	371,000	-	-	400	371,400
2002	532,000	-	-	4,100	536,100
2003	500,790	20,000	-	3,572	524,362
2004	402,050	-	-	5,400	407,450
2005	316,845	-	18,000	1,700	336,545
Total	4,899,705	438,700	219,600	342,200	5,900,577

Table 5a. Atlantic salmon stocking by management reach of the Saco River drainage, Maine, during 2000.

Management Reach	Reach Description	Location	Life Stage		
			Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	0
		Tributaries (7)	54,600	0	0
		Reach Subtotal:	54,600	0	0
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	15,400	0	0
		Reach Subtotal:	15,400	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	22,600
		Tributaries (2)	0	0	0
		Reach Subtotal:	0	0	22,600
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	185,675	48,200	0
		Reach Subtotal:	185,675	48,200	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	260,345	0	0
		Reach Subtotal:	260,345	0	0
	Subtotals	Mainstem	0	0	22,600
		Tributaries	516,020	48,200	0
		Grand Totals:	516,020	48,200	22,600

Table 5b. Atlantic salmon stocking by management reach of the Saco River drainage, Maine, during 2001.

Management Reach	Reach Description	Location	Life Stage		
			Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	0
		Tributaries (7)	7,210	0	0
		Reach Subtotal:	7,210	0	0
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	2,800	0	0
		Reach Subtotal:	2,800	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	400
		Tributaries (2)	0	0	0
		Reach Subtotal:	0	0	400
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	45,800	0	0
		Reach Subtotal:	45,800	0	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	85,500	0	0
		Reach Subtotal:	85,500	0	0
	Subtotals	Mainstem	0	0	400
		Tributaries	141,310	0	0
		Grand Totals:	141,310*	0	400

* Additional fry were stocked; incomplete data due to loss of stocking trip data sheets.

Table 5c. Atlantic salmon stocking by management reach of the Saco River drainage, Maine, during 2002.

Management Reach	Reach Description	Location	Life Stage		
			Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	4,100
		Tributaries (7)	14,200	0	0
		Reach Subtotal:	14,200	0	4,100
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	8,200	0	0
		Reach Subtotal:	8,200	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	0
		Tributaries (2)	0	0	0
		Reach Subtotal:	0	0	0
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	165,410	0	0
		Reach Subtotal:	165,410	0	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	344,190	0	0
		Reach Subtotal:	344,190	0	0
	Subtotals	Mainstem	0	0	4,100
		Tributaries	532,000	0	0
		Grand Totals:	532,000	0	4,100

Table 5d. Atlantic salmon stocking by management reach of the Saco River drainage, Maine during 2003.

Management Reach	Reach Description	Location	Life Stage		
			Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	4,100	0	3,233
		Tributaries (7)	96,900	0	0
		Reach Subtotal:	101,000	0	3,233
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	44,700	0	0
		Reach Subtotal:	44,700	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	339
		Tributaries (2)	9,200	0	0
		Reach Subtotal:	9,200	0	339
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	300,070	20,000	0
		Reach Subtotal:	300,070	20,000	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	45,820	0	0
		Reach Subtotal:	45,820	0	0
	Subtotals	Mainstem	4,100	0	3,572
		Tributaries	496,690	20,000	0
		Grand Totals:	500,790	20,000	3,572

Table 5e. Atlantic salmon stocking by management reach of the Saco River drainage, Maine during 2004.

Management Reach	Reach Description	Location	Life Stage		
			Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	5,400
		Tributaries (7)	65,200	0	0
		Reach Subtotal:	65,200	0	5,400
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	27,200	0	0
		Reach Subtotal:	27,200	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	0
		Tributaries (2)	7,500	0	0
		Reach Subtotal:	7,500	0	0
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	251,600	0	0
		Reach Subtotal:	251,600	0	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	50,550	0	0
		Reach Subtotal:	50,550	0	0
	Subtotals	Mainstem		0	5,400
		Tributaries	402,050	0	0
		Grand Totals:	402,050	0	5,400

Table 5f. Atlantic salmon stocking by management reach of the Saco River drainage, Maine during 2005.

Management Reach	Reach Description	Location	Life Stage		
			Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	1,700
		Tributaries (7)	67,000	0	0
		Reach Subtotal:	67,000	0	1,700
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	48,200	0	0
		Reach Subtotal:	48,200	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	0
		Tributaries (2)	7,300	0	0
		Reach Subtotal:	7,300	0	0
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	18,000	0
		Tributaries (16)	162,645	0	0
		Reach Subtotal:	162,645	18,000	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	31,700	0	0
		Reach Subtotal:	31,700	0	0
	Subtotals	Mainstem	0	18,000	1,700
		Tributaries	316,845	0	0
		Grand Totals:	316,845	18,000	1,700

Table 6. The number of American shad counted passing upstream at the Cataract Project, Saco River, Maine between 1993 - 2005.

Year	Total	East Channel Fish lift						West Channel Fishway				
		May	June	July	August	Subtotal	%	May	June	July	Subtotal	%
1993	882	0	731	144	1	876	99.3	0	3	3	6	0.7
1994	399	0	297	98	0	395	99	0	2	2	4	1
1995	580	79	437	55	0	571	98.4	1	8	0	9	1.6
1996	837	2	446	351	11	810	96.8	0	22	5	27	3.2
1997	1,104	0	740	277	52	1,069	96.8	0	34	1	35	3.2
1998	1,374	575	668	127	0	1,370	99.7	2	2	0	4	0.3
1999	4,994	682	3,489	363	0	4,534	90.8	439	21	0	460	9.2
2000	1,326	0	871	178	3	1,049	79.3	0	271	3	274	20.7
2001	2,570	1089	772	115	0	1,976	76.9	189	402	3	594	23.1
2002	1,014	74	455	278	0	807	79.6	1	203	3	207	20.4
2003	1,227	0	933	166	0	1,099	89.6	7	121	0	128	10.4
2004	1,668	3	1,510	126	0	1,639	98.3	0	15	14	29	1.7
2005	744	0	738	0	0	738	99.2	1	2	3	6	0.8
Total	18,719	2,504	12,087	2,278	67	16,933		640	1,106	37	1,783	

Table 7. The number of river herring (alewife and blueback herring) counted passing upstream at the Cataract Project, Saco River, Maine between 1993 - 2005

Year	Total	East Channel Fish lift					West Channel Fishway				
		May	June	July	Subtotal	% of Total	May	June	July	Subtotal	% of Total
1993	831	0	778	52	830	99.9	0	1	0	1	0.1
1994	2,240	1,647	313	0	1,960	87.5	89	191	0	280	12.5
1995	9,820	5,021	1,883	0	6,904	70.3	2,867	49	0	2,916	29.7
1996	9,162	3,514	5,501	0	9,015	98.4	69	78	0	147	1.6
1997	2,137	1,114	734	4	1,852	86.7	0	285	0	285	13.3
1998	16,078	14,705	104	0	14,809	92.1	208	1,061	0	1,269	7.9
1999	31,070	17,991	1,166	0	19,157	61.7	10,950	963	0	11,913	38.3
2000	25,136	4,008	19,104	0	23,112	91.9	519	1,505	0	2,024	8.1
2001	66,890	31,772	10,144	0	41,916	62.7	23,300	1,674	0	24,974	37.3
2002	20,198	1,727	17,622	0	19,349	95.8	382	467	0	849	4.2
2003	26,772	22,536	0	0	22,536	84.2	4,202	22	0	4,224	15.8
2004	32,823	31,904	391	0	32,295	98.4	528	0	0	528	1.6
2005	390	229	154	2	385	98.7	5	0	0	5	1.3
Total	243,597	136,168	57,894	58	194,120		43,004	6,417	56	49,477	

Table 8. Number of adult Atlantic salmon captured and transported to the Big Ossipee River, Maine, by month, year, and fish passage trap location.

Cataract Project (East Channel Fish Lift)							
Year	**May**	**June**	**July**	**August**	**September**	**October**	***Total***
1993	0	0	0	0	0	6	6
1994	0	4	0	0	0	0	4
1995	3	8	0	0	5	1	17
1996	0	16	7	0	0	1	24
1997	1	10	0	0	0	0	11
1998	0	4	4	1	0	0	9
1999	1	5	0	0	0	0	6
2000	2	11	0	0	1	0	14
Subtotal:	**7**	**58**	**11**	**1**	**6**	**8**	**91**
Skelton Project							
Year	**May**	**June**	**July**	**August**	**September**	**October**	**Total**
2001*	0	0	0	0	13	18	31
2002	0	13	0	0	6	7	26
2003	0	12	0	0	12	0	24
2004	0	5	0	0	12	0	16
2005	0	6	0	0	5	0	11
Subtotal:	**0**	**36**	**0**	**0**	**48**	**25**	**109**
Grand Total:	**7**	**94**	**11**	**1**	**54**	**33**	**200**
%	**3.5**	**47.0**	**5.5**	**0.5**	**27.0**	**16.5**	**100.0**

* Skelton fishway operational September 2001

Table 9. Pro-rated mean of mean daily flow (cfs) values for each day during the months of April, May, and June at the Hiram Project*.

Day of Month	April	May	June
1	3723	4880	2283
2	3942	4765	2263
3	4122	4662	2212
4	4199	4604	2141
5	4244	4552	2038
6	4437	4475	1974
7	4495	4360	1890
8	4552	4205	1807
9	4540	4096	1743
10	4507	3967	1723
11	4533	3845	1710
12	4552	3800	1678
13	4610	3710	1678
14	4662	3646	1704
15	4681	3562	1710
16	4713	3479	1704
17	4797	3376	1723
18	4861	3266	1743
19	4970	3176	1710
20	5067	3061	1659
21	5112	2977	1601
22	5125	2926	1530
23	5163	2861	1466
24	5208	2810	1415
25	5266	2771	1382
26	5221	2688	1357
27	5157	2604	1325
28	5048	2527	1273
29	5009	2450	1247
30	4958	2392	1241
31		2328	

*Drainage area at the Hiram Project is 832 sq. mi. and hydraulic capacity of the Project's turbines is 2,380 cfs. Hiram Project flows are based on pro-ration of flows measured at USGS gage 01066000, Saco River at Cornish, Maine; period of record is 90 years (06/04/1916-09/30/2005); drainage area is 1,293 sq. mi. To determine flows at the Hiram Project, flows measured at the Cornish gage were adjusted by a factor of 0.643.

Table 10a. Densities of juvenile Atlantic salmon per habitat unit (1 unit = 100 m^2) in the Saco River drainage observed during stream sampling between 1997 – 2005.

	Young-of-Year				Parr			
Year	Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
1997	5	11	17	3	-	-	-	-
1999*	8	96	197	5	1	2	3	5
2000	7	57	141	7	0	18	49	7
2001	1	31.2	118	15	2	20	54	15
2002	0.0	11.3	78.7	9	0.0	3.5	14.5	9
2003	2.1	21.5	35.2	2	6.0	8.8	11.6	2
2004	0	2.2	7.35	4	1	4.3	11.8	4
2005	0	0	2.1	4	0	0	11.2	4

* Environmental conditions did not allow for electro-fishing in 1998.

Table 10b. Juvenile Atlantic salmon population densities (fish/100 square meters) based on multiple electrofishing estimates in Maine rivers for 2005.

River System	Young-of-Year				Parr			
	Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
Dennys	0.0	5.5	20.7	23	0.0	2.4	10.6	25
East Machias	0.0	6.0	28.6	6	0.0	8.4	20.1	7
Machias	0.0	2.8	30.3	9	0.0	5.7	22.3	10
Pleasant River	1.5	24.8	29.6	3	0.7	5.0	18.6	3
Narraguagus	0.0	3.2	26.4	38	0.0	2.5	15.3	36
Cove Brook	0.0	0.0	0.0	3	0.0	0.0	0.0	3
Ducktrap	0.2	5.1	30.8	4	2.0	6.5	12.6	4
Sheepscot	0.0	2.3	46.7	28	0.0	2.7	23.6	25
Mooseleuk Stream (Aroostoock)	0.3	0.3	3.2	3	7.8	2.8	5.3	2
Piscataquis River (Penobscot)	9.4	10.5	17.9	4	0.1	8.1	13.5	4
West Branch Piscataquis River (Penobscot)	45.6	45.6	45.6	1	0.4	7.8	7.8	1
Pleasant River (Penobscot)	0.3	0.3	0.3	1	0.0	0.1	0.1	1
West Branch Pleasant River (Penobscot)	0.2	0.2	0.2	1	0.0	0.4	0.4	1
Souadabscook Stream (Penobscot)	0.0	0.0	0.1	3	0.0	0.0	0.0	3
West Branch Souadabscook Stream (Penobscot)	0.0	0.0	0.0	3	0.0	0.0	0.0	3
Kenduskeag Stream (Penobscot)	0.0	0.0	0.0	31	0.0	0.2	11.4	30
Marsh Stream (Penobscot)	0.0	0.0	0.0	3	0.0	0.0	0.0	3
South Branch Marsh Stream (Penobscot)	0.0	0.0	0.0	3	0.0	0.7	1.5	2
Felts Brook (Penobscot)	0.0	0.0	0.0	1	0.0	0.0	0.0	1
Pierre Paul Brook (Penobscot)	0.0	0.0	0.0	1	0.0	0.0	0.0	1
Sedgeunkedunk Stream (Penobscot)	0.0	0.0	0.0	1				0
Passagassawakeag River	0.0	0.0	0.0	3				0
Sandy River (Kennebec)	0.0	4.3	30.6	13	0.6	3.5	6.7	11
Bond Brook (Kennebec)	0.0	0.0	0.0	1	0.0	0.0	0.0	1
Avon Valley Brook (Kennebec)	10.9	10.9	10.9	1	0.0	0.0	0.0	1
Saco River	**0.0**	**1.0**	**2.1**	**2**	**3.7**	**4.9**	**6.2**	**2**

Table 11. Surface water discharge measured at USGS gage 01066000 located on the Saco River at Cornish, ME, and estimated at the Skelton Project by FPL Energy. The US Geological Survey gage is located above the Bonny Eagle Project, and normal range is based on 88 years of record.

Year	Location	Discharge (CFS)	
		May	June
2000	Cornish	4,593	1,901
2001	Cornish	4,381	2,475
2002	Cornish	4,254	2,614
2003	Cornish	4,090	2,001
2004	Cornish	3,457	1,825
2005	Cornish	7,720	4,650
2005	Skelton Project	9,069	5,528
Normal Range	Cornish	3,540-6,960	1,520-3,100

Table 12. Allocation of adult American shad captured at the Cataract Project's East Channel fishway in the Saco River, Maine between 1993 and 2005.

Year	Cataract impoundment	Bradbury/Springs impoundment	Waldoboro Shad hatchery	Total
1993	35	849	0	884
1994	216	173	10	399
1995	68	507	0	575
1996	73	761	0	834
1997	210	834	60	1,104
1998	518	678	178	1,374
1999	1,071	3,522	401	4,994
2000	410	769	144	1,323
2001	1,327	967	276	2,570
2002	557	457	0	1,014
2003	128	1,099	0	1,227
2004	0	1,627	0	1,627
2005	0	738	0	738

Table 13. American shad broodstock collection and fry stocking in the Saco River, Maine between 1997 and 2001.

Year	Number of broodstock collected	Number fry released	Release location
1997	60	-	-
1998	178	503,730	below Bar Mills
1999	401	151,774	below Bar Mills
2000	144	259,090	below Bar Mills
2001	276	313,560	below Bar Mills
Total	1,059	1,228,154	

Table 14. Comparison of the number of river herring (alewife and blueback herring) passing upstream at the Cataract and Skelton projects, Saco River, Maine between 2002 - 2005.

Year	Total herring passed at Cataract Project	Total herring passed at Skelton Project	% of herring entering Skelton impoundment
2002	20,198	11,528	57.1
2003	26,760	14,411	53.8
2004	32,801	25,047	76.4
2005	388	0	0

Table 15. River herring production and escapement estimates by reach for Saco River, Maine.

Habitat	Surface area (acres)	Production at 235/acre	Spawning escapement at 35/acre	Surface as % of total	Reach
Ossipee Lake	3,700	869,500	129,500	0.60	4
Arrowhead Lake	1,005	236,175	35,175	0.16	4
Bonny Eagle Impoundment	252	59,220	8,820	0.04	3
West Buxton Impoundment	125	29,375	4,375	0.02	3
Bar Mills Impoundment	215	50,525	7,525	0.04	3
Skelton Impoundment	417	97,995	14,595	0.07	3
Cataract Impoundment	420	98,700	14,700	0.07	2
TOTAL	6,134	1,441,490	214,690		

Table 16. Atlantic salmon, American shad, and river herring passage in east coast rivers, 1983-2005.

	Susquehanna River, PA		Connecticut River, MA			Merrimack River, MA			Saco River, ME			Androscoggin River, ME			Penobscot River, ME		
	Conowingo Dam		Holyoke Dam			Lawrence Dam			Cataract Dam			Brunswick Dam			Veazie Dam		
Year	Shad	River herring	Shad	River herring	Salmon	Shad	River herring	Salmon	Shad	River herring	Salmon	Shad	River herring	Salmon	Shad	River herring	Salmon
1983	413	567	528,185	454,242	25	5,629	4,700	114	--	--	1	2	601	20	--	--	799
1984	167	337	500,000	480,000	66	5,497	1,800	115	--	--	2	1	2,650	94	--	--	1,451
1985	1,546	7,142	480,000	630,000	285	12,793	23,000	213	--	--	60	0	23,895	25	--	--	3,020
1986	5,195	9,149	350,000	520,000	280	18,173	16,000	103	--	--	37	0	35,471	80	--	--	4,125
1987	7,667	6,218	280,000	360,000	208	16,909	77,000	139	--	--	40	0	63,523	27	--	--	2,341
1988	5,146	15,244	200,000	340,000	72	12,359	361,000	65	--	--	38	0	74,341	14	--	--	2,688
1989	8,218	5,500	350,000	290,000	80	7,875	388,000	84	--	--	19	0	100,895	19	--	--	2,752
1990	15,719	10,083	360,000	390,000	188	6,013	254,000	248	--	--	73	0	95,574	185	--	--	2,953
1991	27,229	31,737	520,000	410,000	152	16,098	379,000	332	--	--	4	0	77,511	21	--	--	1,578
1992	25,721	38,509	720,000	310,000	370	20,796	102,000	199	--	--	--	0	45,050	15	--	--	2,233
1993	13,546	9,198	340,000	103,000	169	8,599	14,000	61	877	831	53	0	5,202	44	--	--	1,650
1994	32,330	2,926	180,800	31,766	263	4,349	89,000	21	399	2,224	21	1	19,190	25	--	--	1,042
1995	61,650	103,438	190,295	112,136	151	13,857	33,425	34	587	9,820	34	3	31,329	16	--	--	1,342
1996	37,100	3,000	276,289	56,300	260	11,322	51	76	837	9,163	54	2	10,198	38	--	--	2,045
1997	103,870	376,146	299,448	63,945	199	22,586	403	71	1,104	2,130	28	2	5,540	1	--	--	1,355
1998	46,481	6,248	311,704	11,170	298	27,891	1,632	123	1,374	15,581	28	5	25,177	5	--	--	1,210
1999	69,712	140,980	196,549	2,760	154	56,465	7,898	185	4,994	31,070	66	88	8,909	6	--	--	969
2000	153,546	38,517	228,859	10,593	77	72,800	23,585	82	1,323	25,136	50	88	9,551	4	--	--	532
2001	193,574	316,523	281,299	10,628	40	76,717	1,550	83	2,570	66,890	69	26	18,196	5	--	--	787
2002	108,001	2,111	374,548	1,939	34	54,586	526	56	1,014	20,198	47	11	104,520	2	--	--	780
2003	125,135	551	288,623	1,552	43	55,620	10,607	147	1,227	26,762	39	7	53,732	3	--	--	1,114
2004	112,786	191	191,555	151	51	--	15,051	129	1,627	32,801	19	--	113,868	12	--	--	1,320
2005	72,822	4	116,511	534	147	--	99	34	738	388	25	--	25,846	10	--	--	985

Table 17. Activities implemented between 1993 and 2005 addressing the goals and objectives of the 1987 Management Plan.

River Reach	Restoration Goals	Activities Toward Management Objectives	Species of Benefit	Management Objectives Achieved	Remaining Issues
Reach II - Upper York (West Channel) Dam, Saco-Biddeford to Skelton Dam, Union Falls, ME.	Migratory path and sustained production of salmon, shad, river herring, and eels; establish a commercial and recreational utilization of select species.	Installation and operation of fishways at the Cataract East and West Channel Dams and the Springs and Bradbury Dams (1993 - 1997)	Atlantic salmon, American shad, river herring	Migratory path established to the Skelton Dam for salmon, shad and herring. Escapement returns of river herring observed in 2002 – 2004.	American shad continue to have problems passing the Springs and Bradbury Dams; passage for American eels.
Reach III - Skelton Dam, Union Falls to the confluence of the Little Ossipee River, East Limington, ME.	Migratory path and sustained production of salmon, shad, river herring, and eels; sustained production of trout; establish a commercial and recreational utilization of select species.	Installation and operation of a fish lift at the Skelton Project (2001).	Atlantic salmon, American shad, river herring	Migratory path established to the Bar Mills Dam for shad and herring; downstream path for all anadromous species; escapement returns of river herring observed in 2004 for Reaches II and III.	Permanent upstream passage facilities at the Bar Mills, West Buxton, and Bonny Eagle projects; evaluation of downstream passage effectiveness for clupeids at each project; passage for American eels.
Reach IV - Confluence of the Little Ossipee River, East Limington to Hiram Dam, Hiram, ME (includes Little Ossipee River).	Migratory pathway for salmon; sustained production of salmon, trout, shad, river herring, and eels; establish a commercial and recreational utilization of select species.	Stocking of juvenile and adult Atlantic salmon.	Atlantic salmon	Annual stocking of juvenile and adult salmon; downstream path for salmon.	
Reach V - Hiram Dam, Hiram to Swans Falls Dam, Fryeburg, ME.	Migratory pathway and sustained production of salmon; establish recreational trout fishery in the Fryeburg area; establish a commercial and recreational utilization of select species.	Stocking of juvenile Atlantic salmon.	Atlantic salmon	Annual stocking of juvenile salmon.	Permanent upstream fish passage facilities at the Hiram Dam; evaluation of downstream passage efficiency at Hiram; passage for American eels.
Reach VI and VII - Swans Falls Dam, Fryeburg, ME to the confluence of the Ellis River, Bartlett, NH.	Consult with the NHDFG and USFS to develop an interstate Atlantic salmon restoration program; continue interstate agency cooperation preventing introductions of undesirable species.	No activity during this or previous assessment periods.			

Figures

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Figure 1. Map of Saco River watershed and hydropower projects.

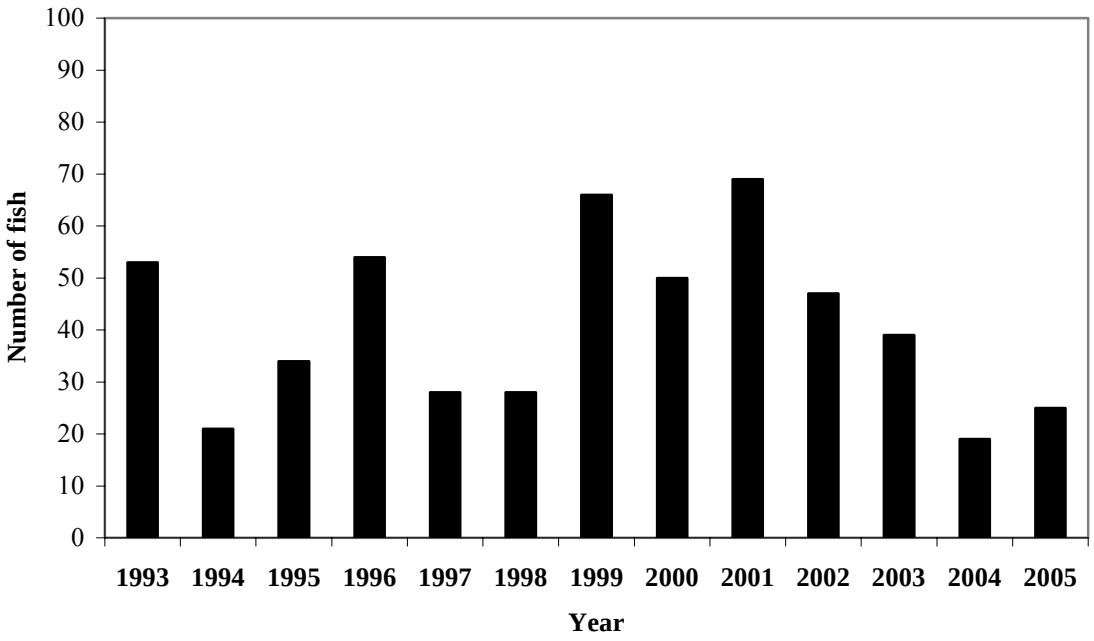

Figure 2. Annual passage of Atlantic salmon at the Cataract Project from 1993 - 2005.

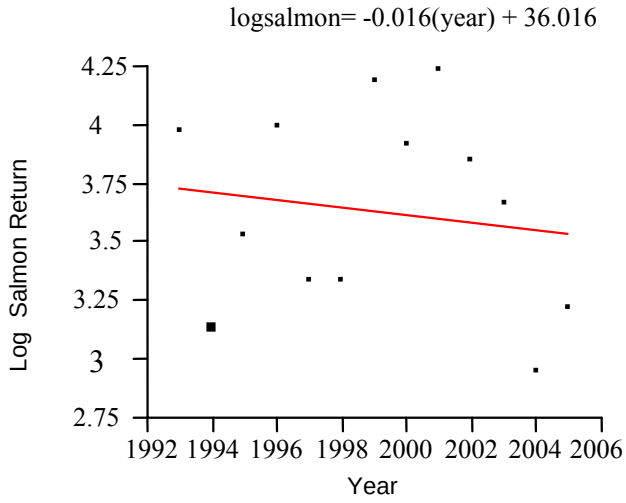

Figure 3. Scatter plot for the linear regression analysis of Atlantic salmon returns at the Cataract Project from 1993 - 2005.

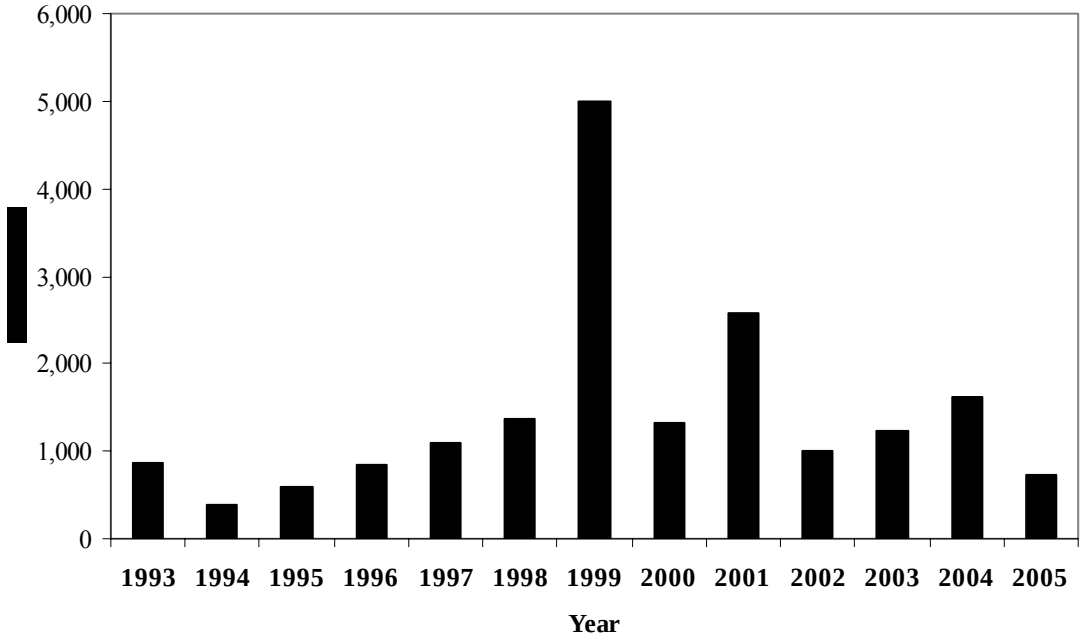

Figure 4. Annual passage of American shad at the Cataract Project from 1993 - 2005.

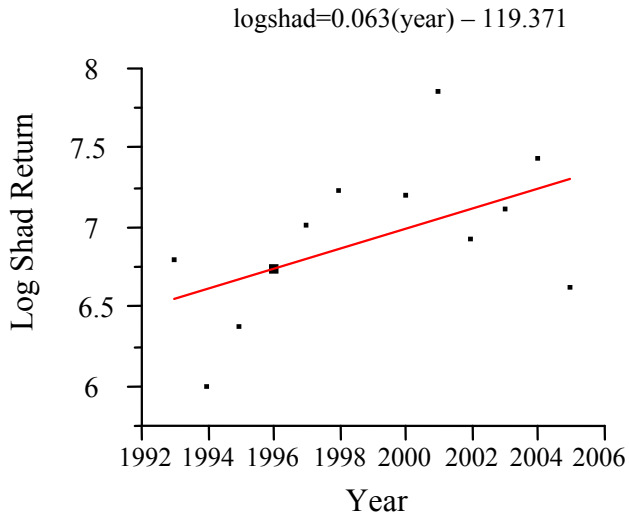

Figure 5. Scatter plot for the linear regression analysis of American shad returns at the Cataract Project from 1993 – 2005, excluding 1999.

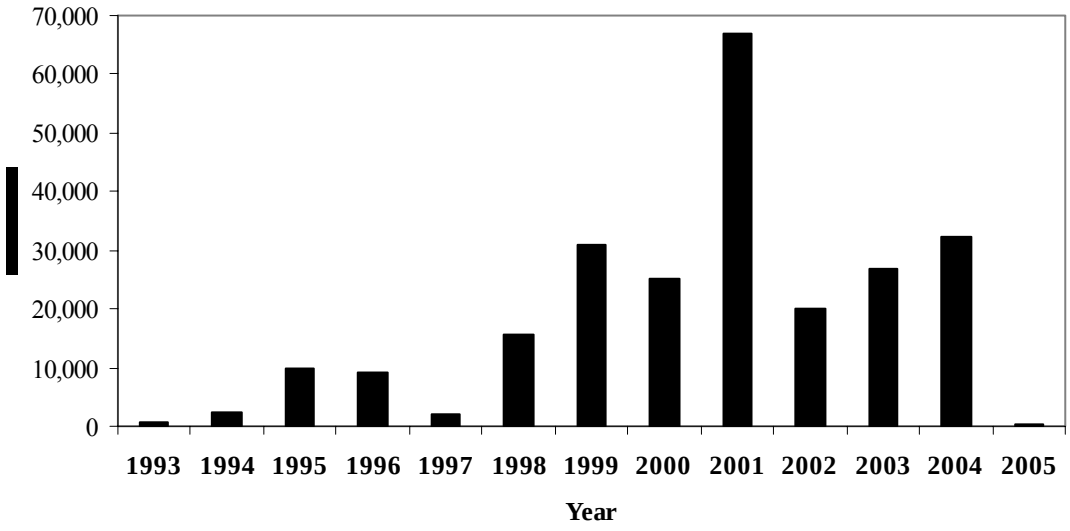

Figure 6. Annual passage of river herring at the Cataract Project from 1993 - 2005.

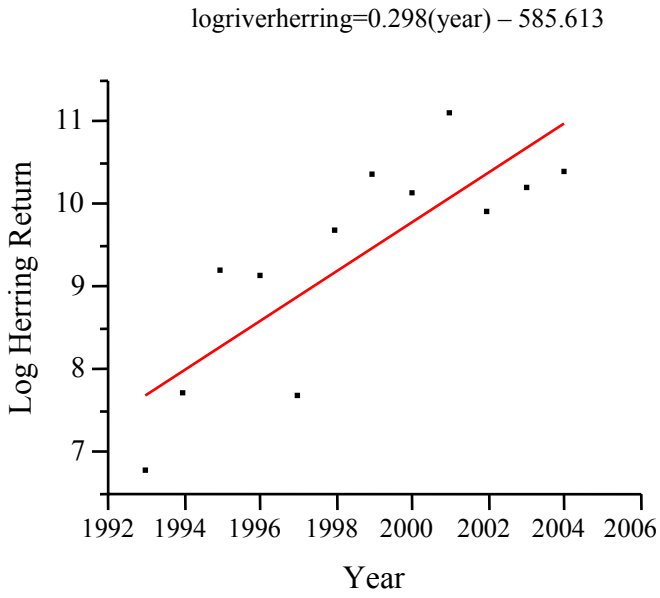

Figure 7. Scatter plot for the linear regression analysis of river herring returns at the Cataract Project from 1993 - 2004.

Management Plans and Reports

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Saco River

2005 Springs and Bradbury Fish Locks Report: A Report on the Operation of FPL Energy's Springs and Bradbury Fish Locks, Saco River, Maine. FERC No. 2528. FPL Energy Maine Hydro LLC. March 2006.

2005 Skelton Fishway Report: A Report on the Operation of FPL Energy's Skelton Fishway, Saco River, Maine. FERC No. 2527. FPL Energy Maine Hydro LLC. March 2006.

2004 Springs and Bradbury Fish Locks Report: A Report on the Operation of FPL Energy's Springs and Bradbury Fish Locks, Saco River, Maine. FERC No. 2528. FPL Energy Maine Hydro LLC. March 2005.

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ASMFC. 2002 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for American Eel (*Anguilla rostrata*). American Eel Plan Review Team.

ASMFC. 2001 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for American Eel (*Anguilla rostrata*). American Eel Plan Review Team.

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ATTACHMENT B

DRAFT FINAL MODIFIED PRESCRIPTIONS FOR THE BAR MILLS HYDROELECTRIC PROJECT

Reservation of Authority to Prescribe Fishways

In order to allow for the timely implementation of fishways, including effectiveness measures, NOAA Fisheries/USFWS requests that the Commission include the following condition in any license it may issue for the Bar Mills Project:

> Authority is reserved by the Commission to require the licensee to construct, operate, and maintain, or provide for construction, operation or maintenance of, such fishways as may be prescribed during the term of this license by the Secretary of the Interior/Commerce under Section 18 of the Federal Power Act.

Prescription for Fishways

Pursuant to Section 18 of the Federal Power Act, as amended, the Secretary of the Department of Commerce/the Department of Interior, as delegated to NOAA Fisheries/USFWS, exercises his authority to prescribe the construction, operation and maintenance of such fishways as deemed necessary for the Bar Mills Project.

To ensure the timely contribution of the fishways to the ongoing and planned anadromous and catadromous fish restoration and enhancement program in the Saco River, the following are included and shall be incorporated by the Commission into any license issued for this project pursuant to Section 1701(b) of the 1992 National Energy Policy Act (Pub. L. 102-486, Title XVII, 106 Stat. 3008), and the Energy Policy Act of 2005 (Pub. L. 109-58).

A. Fishways and/or fish passage measures shall be implemented, constructed, operated, and/or maintained by the Licensee, or provided for by the Licensee, to provide safe, timely and effective passage for Atlantic salmon, American shad, blueback herring, alewife and American eels as summarized below and as detailed in the 2007 Agreement..

B. General Provisions for New Fish Passage Facilities or Measures

1. Design Review

   Plans and designs for each permanent fish passage facility shall be reviewed by USFWS/NOAA Fisheries in accordance with Section 7 of the 1994 Agreement and Section 5.1.a of the 2007 Agreement.

2. Shakedown Period

   Once each new fish passage facility is constructed, the Licensee will operate each fish passage facility for a one-season “shakedown” period to ensure that it is generally operating as designed and to make minor adjustments to the facilities and operation. At the end of the shakedown period, the Licensee shall have a licensed engineer certify that the facility is constructed and operating as designed in all material respects. The Licensee will provide USFWS, NOAA Fisheries, MDMR, and MASC as appropriate with a copy of

the as-built fishway drawings as submitted to FERC, along with the licensed engineer's letter of certification[1].

3. Effectiveness Studies

The Licensee shall conduct effectiveness studies of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures. In the event that these facilities or measures as initially implemented are not effectively passing the target species[2], the Licensee shall make, in consultation with the USFWS/NOAA Fisheries MDMR and MASC as appropriate, reasonable, cost-effective adjustments to the facilities or measures in an effort to improve fish passage effectiveness[3]. Studies shall be initiated during the passage season following the facility shakedown period, and carried out for up to three years for each species. Initiation of studies for each species will depend in large part on the availability of suitable numbers and types of fish. Details on the design of upstream passage effectiveness studies shall be determined after consultation between the Licensee and the above agencies as appropriate.

4. Fishway Operating Procedures

The Licensee shall, consistent with safe working practices, keep the fishways in proper working order and shall maintain fishway areas clear of trash, logs, and material that would hinder passage. Routine maintenance shall be performed sufficiently before a migratory period such that fishways can be tested and inspected, and will be operational during the migratory periods.

In consultation with the USFWS/NOAA Fisheries, MDMR and MASC, the Licensee shall draft and maintain written Fishway Operating Procedures (FOPs) for the Bar Mills Project. These FOPs will include general schedules of routine maintenance, procedures for routine operation, procedures for monitoring and reporting on the operation of each fish passage facility or measure, and schedules for procedures for annual start-up and shut-down, and procedures for emergencies and Project outages significantly affecting fishway operations. Copies of these Fishway Operating Procedures, and any revisions made during the term of the license, will be sent to the USFWS, NOAA Fisheries, MDMR and MASC.

The Licensee shall meet with USFWS/NOAA Fisheries, MDMR and MASC in March annually to review fish passage operational data from the previous year, draft an annual report, and develop an operational plan for the upcoming year. The fish passage operational data should include the number of fish passed daily (by species), daily water and air temperature data, and other related fishway operational information.

1 See the 2007 Agreement for further details.

2 Atlantic salmon, American shad, blueback herring, alewife, and American eel.

3 See the 2007 Agreement for further details.

5. Timing of Seasonal Fishway Operations:

Once installed, permanent fishways shall be maintained and operated by the Licensee to maintain fish passage during the upstream and downstream migration periods for Atlantic salmon, American shad, blueback herring, alewife, and American eel (Table 1)[4].

Table 1. Upstream and downstream migration periods for species covered in this Prescription for Fishways.

Species	Upstream Migration Period	Downstream Migration Period
Atlantic salmon	May 1 – October 31	April 1 – June 30 (smolts and kelts) October 15 – December 31 (kelts)
American shad	May 15 – July 31	July 15 – November 15 (juv.) June 1 – July 31 (adult)
Alewife and Blueback herring	May 1 – July 1	July 15 – November 15 (juv.) June 1 – July 31 (adult)
American eel	May 15 – September 15	September 15 – November 15 (at night)

6. Project Access

The Licensee shall, upon prior written notice by the USFWS/NOAA Fisheries, provide authorized personnel of the USFWS/NOAA Fisheries and other agency-designated representatives, reasonable access to the project site and pertinent project records for the purpose of inspecting the fishways.

7. Filing Consultation

The Licensee shall include with filings to the Commission associated with fishway designs and effectiveness study plans and reports, the following documentation of consultation: (1) copies of agency comments and recommendations on the completed plan or report after it has been prepared and provided to the agencies, and (2) specific descriptions of how these comments and recommendations are accommodated by the plan or report. The

4 The specified migration dates are based on known information regarding run timing on the Saco and other Maine rivers. Any of the operating schedules during these migration periods may be modified during the term of the license based on migration data, new information, and in consultation with the USFWS/NOAA Fisheries, MDMR, MASC and the Licensee. Upon request of Licensee, the actual dates of operation may be varied somewhat in any given year in response to river conditions, maintenance requirements, or annual variability in fish migration patterns, with the approval of USFWS, NOAA Fisheries, MDMR and MASC as appropriate.

Licensee shall allow a minimum of 30 days for the USFWS/NOAA Fisheries, MDMR and MASC as appropriate, to comment and to make recommendations before filing the plan or report with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons for not accepting the recommendation as well as including any available supporting information.

C. American Eel Passage Measures

1. Permanent Upstream Eel Passage Measures

The Licensee shall provide an upstream eel passage facility in one location at the Bar Mills Project by June 1, 2014[5]. Prior to initiation of an upstream eel passage facility at Bar Mills, the Licensee shall conduct a study to establish where at the Project the eel fishway should be located[6]. The Licensee shall present the results of the study to NOAA Fisheries, the USFWS and MDMR and obtain their concurrence with the choice of location. Development and implementation of upstream eel passage measures may be delayed following consultation with and agreement by NOAA Fisheries, the USFWS, and MDMR that eels are not yet sufficiently abundant to require passage or to provide enough data to allow for a determination of the type and location of upstream eel passage measures.

2. Permanent Downstream Eel Passage Measures

The Licensee shall provide permanent downstream passage measures for American eel by September 1, 2026[7]. The Licensee shall provide engineering and/or operational plans for permanent downstream eel passage measures to the NOAA Fisheries, USFWS and MDMR for consultation by February 28, 2026. Development and implementation of downstream eel passage measures may be delayed following consultation with and agreement by NOAA Fisheries, USFWS, and MDMR that eels are not yet sufficiently abundant to require passage or to provide enough data to allow for a determination of the type and location of downstream eel passage measures.

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5 Recent surveys have documented the presence of eel above and below the Bar Mills dam in low numbers. As part of the 2007 Agreement, the Licensee will install and operate eelways at downstream dams beginning in 2008. Implementing upstream passage at Bar Mills in 2014 will allow time for the eel stock to increase, thereby increasing the potential utilization of the eelway once installed**.**

6 Juvenile eels migrating upstream could be concentrated in any number of locations within the project area below the dam. Conducting a study to determine the area of heaviest concentration will allow placement of the eel fishway in a location that maximizes its utilization.

7 The timing for implementing permanent downstream eel passage measures at Bar Mills is appropriate based on the following factors: (1) few eels were observed in the river upstream of Bar Mills at present, (2) upstream passage will be operational by 2014, increasing recruitment of juvenile eels upstream of the dam, and (3) initiating permanent downstream passage 12 years after upstream eel passage becomes operational should coincide with the expected start of maturation and out migration of those eels first recruited in 2014.

3. Interim Downstream Eel Passage Measures

Beginning the tenth year after permanent upstream eel passage has been installed at Bar Mills, the Licensee shall monitor for eel mortality below the dam weekly from September 15 through November 15 as explained in the 2007 Agreement[8]. If a confirmed observation of greater than 50 eel mortalities per night occurs at the Project, then the Licensee shall initiate the interim downstream eel passage protocol provided in Section 5.2.b.3. of the 2007 Agreement[9].

D. Permanent Upstream Anadromous Fish Passage Facilities

1. Design Criteria

The license shall provide a single[10] permanent upstream anadromous fish passage facility at the Bar Mills Dam to be operational by May 1, 2016[11]. This schedule may be delayed contingent upon the returning numbers of the target species, and following consultation with and agreement by NOAA Fisheries, USFWS, MDMR and MASC. The permanent upstream fishway at Bar Mills shall be designed to be as effective at passing sufficient escapement numbers of the target species as a single standard (4-ft. wide) Denil-type fishway designed to be operational at river flows up to 9,000cfs.

2. Design Review

The Licensee shall, 18 months prior to the planned construction of the upstream fish passage facility, submit conceptual designs for approval by the NOAA Fisheries, USFWS, MASC and MDMR, and shall subsequently file functional design drawings with the Commission for approval.

8 Interim downstream passage monitoring is necessary because (1) eels were collected in the Saco River at sites above the Project and (2) there is variability in maturation age of eels. Therefore, monitoring for eel mortality below the Bar Mills dam and instituting interim measures if necessary would reduce mortality of those eels migrating downstream prior to 2026.

9 This measure is part of a watershed-wide approach to address interim downstream passage of American eels. As such, monitoring for eel mortalities prior to implementation of permanent passage measures will be used to implement interim protective measures at Bar Mills and elsewhere if necessary.

10 Given site configuration, the Department of Commerce and the Department of the Interior originally prescribed a tailrace fishway and a spillway fishway. However, attraction of salmon, shad and herring to the tailrace is most likely and would likely provide more consistent attraction to fish.

11 See Sections 8 and 9 of the 2000-2005 Assessment Report for monitoring data and a discussion supporting the timing for installing and operating a permanent upstream fish passage facility for anadromous species.

E. Downstream Anadromous Fish Passage Facilities

1. The Licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad and river herring[12]. The Licensee shall conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras, and rotary screw traps, or similar methods) beginning the year after 6 (six) adult clupeids per acre of impoundment (approximately 1,580 fish)[13] are passed or stocked upstream of the Bar Mills Project. If the NOAA Fisheries, USFWS and MDMR determine that the numbers of clupeids returning to the lower Saco River (Cataract and Skelton impoundments) during the planned study year are insufficient to stock those lower impoundments, then the studies may be postponed upon mutual agreement between the Licensee and the USFWS/ NOAA Fisheries and MDMR.

   The Licensee shall develop the effectiveness study plans in consultation with the USFWS/NOAA Fisheries and MDMR. Results will be submitted to the USFWS/NOAA Fisheries and MDMR for review and comment, and the Licensee shall include any comments received with the results filed with the Commission.

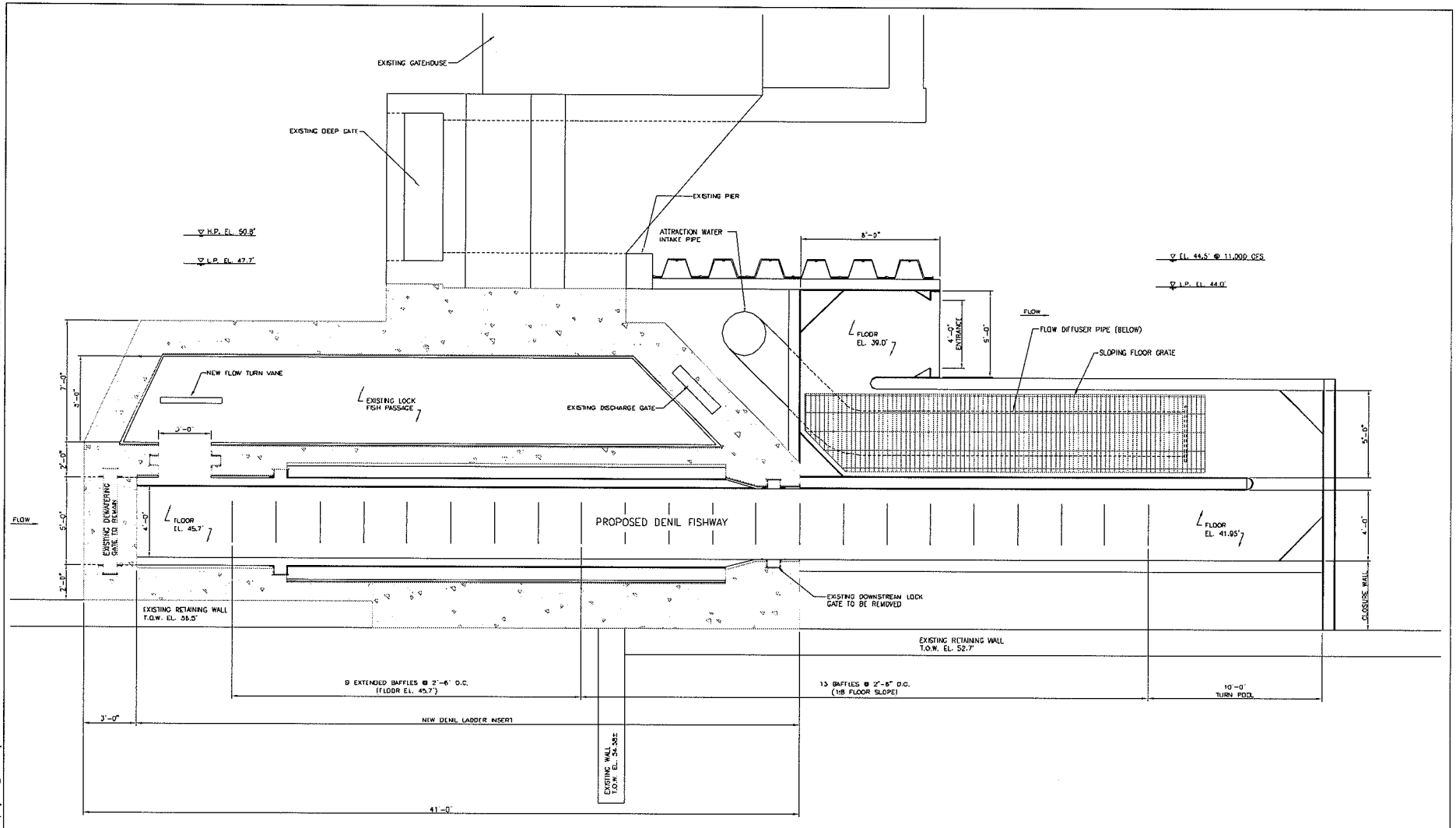
2. The Licensee shall conduct a kelt study at Bar Mills if Phase I of the study stipulated under Section 5.4(a) of the 2007 Agreement determines that the Bar Mills Project has a high potential to delay/affect kelt passage. If Bar Mills is identified as one of the two selected projects, the Licensee shall conduct a three-year study to examine downstream passage routes of salmon kelts. If Bar Mills is chosen as a study site, the Licensee shall submit a draft study plan to the NOAA Fisheries, USFWS and MASC by April 2009, and begin the study by spring of 2010.

12 To date, effectiveness studies of the existing downstream passage facility at the Bar Mills Project have been conducted for salmon smolts only. See the Downstream Passage data and discussion in Sections 8 and 9 of the 2000-2005 Assessment Report.

13 Due to their small size, and vulnerability to handling, juvenile clupeids are more difficult to quantitatively assess than salmon smolts. Using six clupeids per acre of impoundment as a trigger to initiate studies should ensure adequate production to make it practical to provide an acceptable number of fish for evaluation for purposes of this type of study.

ATTACHMENT C

CONCEPTUAL DESIGN – DENIL FISHWAY – SPRINGS ISLAND DAM



DENIL INSERT PLAN
3/8"= 1'-0"

No.	Revision	Date
		AS SHOWN
		635-012
		2005
		AJN
		AJN
		SR
		11-03-08

FPL ENERGY MAINE HYDRO, LLC
AUGUSTA, MAINE

SPRINGS ISLAND DAM
FERC NO. 2528

CONCEPT PLAN
SPRING ISLAND DAM - DENIL FISHWAY

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ATTACHMENT A - DECEMBER 2008