

# DIADROMOUS FISH HABITAT PROTECTION AND RESTORATION PROJECTS IN MAINE

Supported by USFWS GULF OF MAINE COASTAL PROGRAM  
in cooperation with other federal, state and NGO partners, 1998 - 2007



Photo credit: S. Lary, USFWS



Photo credit: D. Watts



Photo credit: USFWS

This briefing includes projects supported by the following USFWS-linked funding sources:

**NFWF Maine Habitat Restoration Partnership Grant**

**NFWF Maine Atlantic Salmon Conservation Fund**

**USFWS Region 5 Challenge Grant Program funds**

**USFWS Region 5 Ecological Services funds**

**Recovery Land Acquisition Grants**

**North American Wetland Conservation Act Grants**

**National Coastal Wetland Conservation Act Grants**

**1124 funding to support Gulf of Maine Coastal Program staff**

**1124 funding to provide project funds**



compiled by USFWS Gulf of Maine Coastal Program  
July, 2007

## TAKE-HOME MESSAGES:

1. **Gulf of Maine Coastal Program (GOMCP) is collaborating with conservation partners to implement cooperative conservation projects and to protect and restore priority diadromous fish habitat in Maine.**

- GOMCP completes all of its diadromous fish protection and restoration work by working in close coordination with many conservation partners (i.e. state agencies, NGOs, private landowners, corporate interests).
- Two of six permanent employees at GOMCP direct significant time toward protecting riparian habitat and improving river connectivity for all 12 species of native diadromous fish. One employee offers technical expertise in GIS, fluvial geomorphology and riverine functions on priority Atlantic salmon rivers, while the other employee offers technical expertise in diadromous fisheries ecology and coastal riverine restoration for Maine's diverse diadromous fish assemblage. Both biologists are well-known and respected amongst all of the key diadromous fish partners statewide; they both work with diverse partners to ensure effective prioritization and coordination of diadromous fish habitat efforts. In addition, the other four employees at GOMCP provide support in GIS and database management, administration and outreach functions related to diadromous fish protection and restoration. **Over the last decade, GOMCP has been actively involved in partnerships to complete more than 135 on-the-ground projects that benefit diadromous fish. These projects have led to the permanent protection of 86,191 acres and 424 miles of riparian corridor, and restored more than 10,000 acres and 1,363 river-miles. Gulf of Maine Coastal Program has accessed \$11.5 million in USFWS and NFWF funds, matched 2:1 with non-federal funds.**
- GOMCP is actively implementing the Regional Director's Strategic Fish Passage Program for Region 5, because our partnership work involves habitat inventory and prioritization, implementation, outreach and monitoring.
- GOMCP works with partners to identify and implement diadromous fish activities at biologically high priority sites, where landowners are willing, and where conservation partners can help support community-based restoration and protection initiatives.
- GOMCP works towards the restoration of all 12 native diadromous fish species and their required habitats in coastal Maine watersheds.
- Diadromous fish activities at GOMCP include diverse restoration approaches -- removing tidal restrictions and dams, repairing and renovating old fishways, installing new fishways, controlling erosion from nearby uplands (i.e. gravel pit remediation, riparian plantings/fencing), designing and installing appropriately sized and located culverts and bridges, providing temporary "loaner bridges" to timber operators to minimize permanent road construction activities over streams, providing support to aquaculture and blueberry operators to develop and implement BMPs.
- Funding provided through GOMCP supports key activities not funded by other conservation partners (i.e. preliminary feasibility studies, planning and design work, outreach and monitoring).
- Diadromous fish habitat protection activities at GOMCP utilize multiple FWS-linked funding sources to permanently protect riparian habitat through fee and easement

acquisition (i.e. Large and Small NAWCA Grants, National Coastal Wetland Grants, RLAG grants and NFWF grants).

- GOMCP and partners approach diadromous fish activities at multiple levels, including but not limited to on-the-ground implementation. GOMCP has provided funding and technical support for:
  - a. conducting educational/outreach activities,
  - b. building capacity of locally-based NGOs,
  - c. monitoring,
  - d. compiling existing biological data in an organized framework for partners to access and use,
  - e. conducting inventories to identify high priority sites for future projects,
  - f. conducting applied research to support and inform future projects,
  - g. working with aquaculture and blueberry farmers to develop and implement BMPs, and
  - h. supporting the Penobscot River Restoration initiative with funding and strategic advice.

## **2. Restoring and protecting Maine's 12 native species of diadromous fish in Maine rivers creates biologically productive inland watersheds and a healthy Gulf of Maine for many trust species and for people.**

A protected riparian corridor with free fish passage benefits fish, waterbirds, other wildlife and people. Wooded riverbanks shade the river to maintain cool water temperatures and keep dissolved oxygen concentrations up. Trees drop leaves that nourish the river and support the base of the food chain. Occasionally, riverbank trees fall into the river to provide the habitat structure and diversity that fish and other aquatic animals depend on. Removing barriers helps create effective passage and supports the restoration and growth of native fish populations and other wildlife. A river that supports fish -- a river that effectively passes fish, that has clean water, and that has healthy riparian buffers is a river that also supports the rest of the plants and animals that make the river whole. Restoring populations of all 12 species of diadromous fish will nourish everything in the rivers -- from the tiniest aquatic invertebrates to bigger fish, beaver and otter, black ducks, warblers and heron, osprey, eagles and people.

Maine rivers that support native searun fish also help support vibrant and productive estuarine and open ocean communities throughout the Gulf of Maine. When searun fish are restored and return to the ocean in huge numbers, they will provide forage for other commercially and recreationally important fish (i.e. Atlantic salmon and groundfish), for seabirds and marine mammals. It's all part of an amazing cycle of life, because rivers linked to the ocean serve as rich and flowing arteries that nourish rivers, estuaries and open ocean throughout the Gulf of Maine watershed.

## SUMMARY of ACCOMPLISHMENTS:

Gulf of Maine Coastal Program and partners have completed 134 individual restoration and protection projects statewide focused on diadromous fish, including the following:

	Habitat protection	# of dam removals	# of fishway repairs and/or installations	Other restoration activities	Total river-miles	Total lake acreage	Total riparian buffer acreage	Total funds contributed through GOMCP	Total cost
Habitat protection*	66	----	----	----	424	Not documented	86,192	\$9,970,017	\$28,433,479
Habitat restoration	69	11	18	40	1363	10511	----	\$928,178	\$4,177,480

Note: This table was completed in October, 2006. Other projects are currently pending.

\* These figures only include acreages and funds expressly provided for diadromous fish corridors. These figures do not include most NAWCA and Coastal Wetland Grants that also protect riparian habitat for diadromous fish. These figures also do not include coastal salt marsh restoration projects that improve passage for diadromous fish.

# Gulf of Maine Coastal Program Diadromous fish habitat protection and restoration

Working with federal, state and local partners, using a voluntary, collaborative approach, and by providing biological and technical expertise, we have helped bring nearly \$11 million in U.S. Fish and Wildlife Service (FWS) and National Fish and Wildlife Foundation (NFWF) funds to support diadromous fish restoration and protection in Maine in the last decade. Almost \$10 million has been used to permanently protect 86,192 acres and 424 miles of riparian corridor for Atlantic salmon and other diadromous fish. Approximately \$1 million has been used to restore more than 10,000 acres and 1,383 river-miles, conduct habitat assessments, and support applied research and other activities that benefit diadromous fish. Conservation partners have provided almost \$22 million in matching contributions. Together, we have completed priority habitat protection projects at 66 sites and restoration activities at 65 sites – ranging in size from landscape-scale riparian corridor projects to locally-based projects that provide watershed-wide natural resource values.

**KEY**

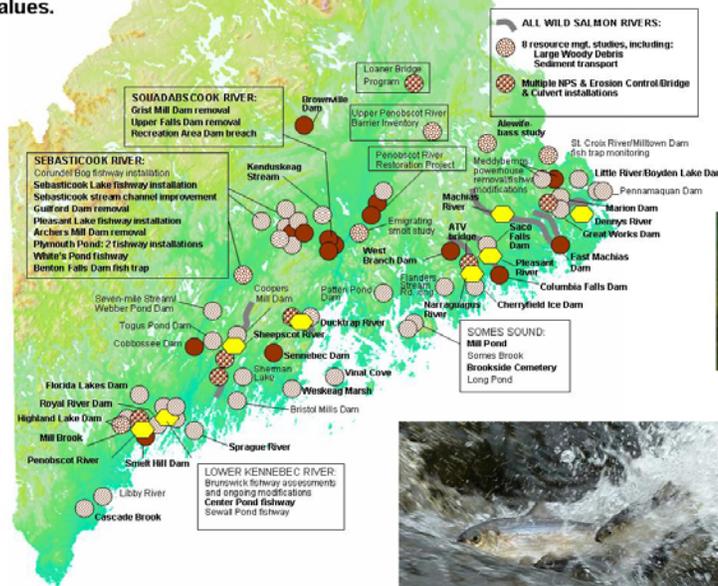
**WILD ATLANTIC SALMON RIVERS**

**RIVER RESTORATION PROJECTS**

- DAM REMOVAL or BREACH
- FISHWAY RENOVATION or INSTALLATION
- EROSION CONTROL or BRIDGE/CULVERT INSTALLATIONS
- FISH TRAP INSTALLATION, STUDIES, &/OR HABITAT ASSESSMENT
- STREAM HABITAT IMPROVEMENT

● HABITAT PROTECTION PROJECTS

**BOLD TEXT** = completed project  
**NORMAL TEXT** = ongoing project (planning and/or monitoring)



## **LIST of KEY GOMCP PARTNERS**

**All of our accomplishments happen in tandem with other conservation partners: A more comprehensive list would include more than 70 additional partners.**

### **Federal government**

Other U.S. Fish and Wildlife Service offices

Regional Office: Fisheries, Endangered Species, Migratory Bird and Federal Aid

Maine Field Office

Diadromous Fisheries Stewardship Office

USDA - Natural Resources Conservation Service

NOAA - Fisheries

EPA - Casco Bay Estuary Partnership

### **State government**

Maine Dept. of Marine Resources

Maine Atlantic Salmon Commission

Maine Dept. of Inland Fisheries and Wildlife

Maine State Planning Office - Land for Maine's Future Program

Maine Dept. of Conservation

Maine Forest Service

### **Non-government organizations**

National Fish and Wildlife Foundation (Maine Atlantic Salmon Conservation Fund and Maine Habitat Restoration Partnership)

Fish America Foundation

Coastal Conservation Association

Maine Rivers

Kennebec Coalition

Atlantic Salmon Federation

Trout Unlimited

The Nature Conservancy

Maine Coast Heritage Trust

Sheepscot Valley Conservation Association

Ducktrap Coalition

Downeast Salmon Federation

Downeast Rivers Land Trust

Cove Brook Watershed Association

Saco River Salmon Club

Maine Corporate Wetland Restoration Partnership

Project SHARE

Penobscot River Restoration Trust

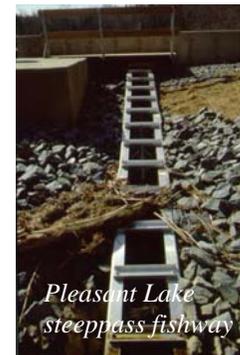
Individual projects engage the participation of many more organizations, including Maine tribes, land trusts, watershed councils and associations, municipalities, colleges and universities, other state agencies, NGOs, timberland owners and managers, agricultural (blueberry) landowners, aquaculturalists, environmental consulting firms, and private foundations.

**EXAMPLES (see pages 7-14):**

- **Implementation**
  - Restoration**
    - Sebasticook projects**
    - Somes Pond - Long Pond watershed**
    - Penobscot River Restoration Partnership**
  - Protection**
    - Machias River corridor**
- **Prioritization and habitat assessment**
  - Barrier inventory**
  - Diadromous fish coverages/Atlantic Salmon Atlas**
- **Project design and development**
  - Flanders Stream**
  - Coopers Mill**
- **Applied research**
  - Woody debris**
  - St. Croix River Alewife Interaction Study**
- **Capacity building of local watershed associations**
  - Project SHARE**
- **Coordinating with industrial landowners**
  - Timberland loaner bridge program**
  - BMPs for blueberry growers and aquaculture**
- **Pre- and post- restoration monitoring**
  - Highland Lake**
  - St. Croix River/Milltown Dam**

## Implementation: Sebasticook River fish passage restoration

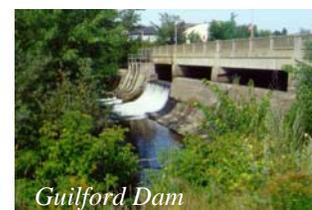
The five projects described below are individually important, but most significant when understood in the context of the Lower Kennebec River Comprehensive Hydropower Settlement Accord agreed to as part of the regulatory process leading to the removal of Edwards Dam on the mainstem Kennebec River. As part of the FERC order to remove Edwards Dam, state and federal agencies, non-governmental agencies and the Kennebec River Hydropower Developers Group (KHDG) signed the Accord which contained provisions for the removal of Edwards Dam, identified fish passage needs at upriver dams, established a timetable for fish passage installation, and provided some (but not all) funds to Maine Dept. of Marine Resources to support four of the five fisheries restoration projects described below. Together, these five projects, completed through nonregulatory voluntary partnerships, have been key projects in the larger effort to restore diadromous fish throughout the Sebasticook River watershed, the largest tributary of the Kennebec River.



According to the terms of the Settlement Accord, completion of four river restoration projects at non-hydro dams in the upper watershed - Pleasant Lake, Plymouth Pond, Guilford Dam and Sebasticook Lake --

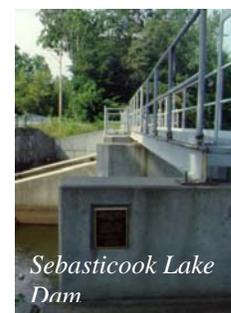


would trigger installation of passage at two downstream hydro dams (Benton Falls and Burnham) on the mainstem Sebasticook. The Accord also required state-of-the-art fish passage (or dam removal) at Fort Halifax by 2003. All of the upstream projects have been completed, and an additional abandoned dam at Archers Mill was also discovered and removed. Fish passage at Fort Halifax has been delayed for years with appeals, but now the hurdles to removing Fort Halifax Dam seem to have disappeared. Once Fort Halifax Dam is gone, diadromous fish will have free access to 28 river-miles and 8,000 acres of lake habitat. This restoration effort will create the largest spawning and nursery habitat area for alewife in the state (19,000 acres) and will



potentially produce 4.5 million adult alewives annually in the 946 sq. mile Sebasticook River watershed. In addition, this restoration effort will create 1,400 acres of American shad spawning and nursery habitat, capable of producing 155,000 adult shad annually. Other diadromous fish that will benefit from this Sebasticook River restoration effort include blueback herring, striped bass, rainbow smelt, Atlantic and shortnose sturgeon, Atlantic salmon, sea lamprey and American eel, which all historically utilized the watershed. In total, USFWS Gulf of Maine Program provided \$129,550 of the \$628,370 to provide fish passage at:

- **Pleasant Lake outlet dam, Stetson:** An Alaskan steppass fishway provides access to 768-acre Pleasant Lake and provides annual production capacity for 180,000 juvenile alewives.
- **Archers Mill Dam removal, Stetson:** This forgotten 19<sup>th</sup> century relic was removed, allowing access, even at low flows, to Pleasant Lake.
- **Plymouth Pond Dam fishway installations, Plymouth:** Two fishways provide access for spawning and rearing alewives on 480-acre Plymouth Pond, providing habitat for an estimated 16,800 returning adult alewives and the capacity to produce 112,800 juvenile alewives annually.
- **Guilford Dam removal, Newport:** Removing the dam restored 0.5 river-miles of riparian habitat, and also provided access to the Sebasticook Lake Dam fishway.
- **Sebasticook Lake Dam fishway, Newport:** This fishway opened fish passage to 4,288-acre Sebasticook Lake, a major alewife spawning ground, with an estimated juvenile production of 1,007,680 alewives.



## **Implementation: Somes Sound - Long Pond fish passage restoration**

Alewife, American eel and sea lamprey runs play an integral role in local traditions, but four degraded fishways located at low head mill dams resulted in drastic declines in annual fish runs in the Somes-Long Pond watershed on Mt. Desert Island, Maine, adjacent to Acadia National Park. This partnership project, designed in several phases, will restore alewife and other diadromous fish species. Upon completion, the project will improve diadromous fish access to 1,032 surface acres of lake habitat and one mile of riverine habitat.



In FY05, GOMCP provided fisheries restoration and planning expertise to partners. USFWS Region 5 Fish Passage Engineers developed conceptual designs for the first dam at the request of GOMCP, and GOMCP reviewed and commented on the proposed design. In FY06, GOMCP helped implement Phase I, including: 1) repairing the deteriorated fishway located at the first dam at Somes Sound, 2) monitoring fish runs through the fishway for a second year to develop effective management strategies for restoration and establish self-sustaining harvest levels, 3) restoring the fishway at the third upstream dam, and 4) initiating planning and design work to re-establish fish passage at the two remaining dams in the watershed. The partners, with outreach assistance from GOMCP, also installed a wayside exhibit at a heavily visited site near the Somes Pond fishway. To date, GOMCP has provided \$97,525 in support of this watershed fish passage restoration project through multiple funding sources - USFWS Fish Passage Program, USFWS-NFWF Maine Habitat Restoration Partnership, and GOMCP 1124 project funds. GOMCP will continue working with partners to restore fish passage at the two remaining dams in the watershed.

## Implementation: Penobscot River Restoration Partnership



The Penobscot River drains over 8,500 square miles in north central Maine and provides the largest freshwater input into the Gulf of Maine. Historically, the fish and wildlife of the Penobscot River thrived in a complex system of connected inland waterways and wetlands to the Penobscot Bay estuary. The migration of sea-run fish spawning inland each year as well as the return of adult and juvenile fish to the sea provided abundant food to the people and wildlife of the river, and contributed important nutrients into both freshwater and saltwater systems.

Today, passage for 11 species of sea-run fish on the Penobscot are impeded by dams. An unprecedented collaboration between PPL Corporation (dam owner), the Penobscot Indian Nation, state and federal agencies, and six conservation groups, has led to an Agreement to complete a landscape-scale restoration initiative by re-establishing fish passage through the purchase of three Penobscot dams from PPL Corporation, removal of the two dams closest to the sea -- Veazie and Great Works -- and decommissioning and constructing an innovative fish bypass at the Howland Dam. Together, these three projects will restore fish passage and other natural river functions for an estimated 500 river-miles, while maintaining hydropower generation. Freshwater fish, bald eagles, wading birds, seabirds and oceanic populations of groundfish in the Gulf of Maine, coastal estuaries, and inland waters of the Penobscot all stand to benefit from revitalized searun fish populations.

Shortly after the Agreement was signed, GOMCP provided initial funds through the Maine Atlantic Salmon Conservation Fund to help catalyze federal involvement with the Penobscot River Restoration Partnership. Subsequently, GOMCP has cooperated with Regional and national efforts to provide technical assistance and additional FWS funding. To-date, the FWS has provided several million dollars in support of the Partnership, by providing funds from the National Coastal Wetland Grant program, the Maine Atlantic Salmon Conservation Fund and Endangered Species Recovery funds.

## Implementation: Machias River corridor habitat protection:



The Machias River is one of eight rivers in Maine that harbor federally listed Atlantic salmon. GOMCP, working in concert with other USFWS offices, and accessing funds from Endangered Species Recovery Funds (\$2 million), MASCF(\$1.5M), North Cape Oil Spill (\$450K) and NAWCA (\$1 million), has permanently protected 59,792 acres with fee acquisition and conservation easements - including 284 miles of lake, river and stream shoreline and 86% of the Atlantic salmon habitat in the Machias watershed. Other conservation partners have raised an additional \$15.45M to acquire this riparian corridor, which will permanently protect high value habitat for federally listed Atlantic salmon, as well as other native fish and wildlife that depend on healthy riparian corridors.

The Machias River Project connects to other state and private conservation lands, creating a total landscape of 443,465 acres of ecologically and economically significant lands and waters, protected as ecological reserves, stream and lakeside buffers and sustainably managed forests.

### **Prioritization and habitat assessment: Barrier inventory**

GOMCP is actively involved in a large pilot project in the upper Penobscot River watershed to conduct an inventory of bridges and culverts at road-crossings, as well as dams and natural obstructions that may



limit fish passage. GOMCP has been at the forefront in developing inventory protocols, building partnerships, providing funding through the NFWF-USFWS Maine Atlantic Salmon Conservation Fund, coordinating training and managing the database. Partners in this initial effort including Maine Forest Service, Maine Atlantic Salmon Commission, Project SHARE and Atlantic Salmon Federation. Data collection begins in this 2007 field season, with four technicians hired with MASCF funds we are providing to Maine Forest Service. Ultimately, GOMCP hopes that the inventory

methodology will be adopted and applied statewide to identify potential high priority diadromous fish restoration sites.

### **Prioritization and habitat assessment: Statewide diadromous fish coverages and Atlantic Salmon Atlas for surveyed rivers**

In FY06-07, GOMCP played the lead role in collating the best available fisheries data from diadromous fish experts and existing fisheries management reports, and then developing detailed GIS coverages for all 12 species of diadromous fish in Maine -- American eel, rainbow smelt, alewife, blueback herring, American shad, sea lamprey, shortnose and Atlantic sturgeon, striped bass, Atlantic tomcod, and sea-run brook trout, and Atlantic salmon. The GIS data, which identifies historic and current distribution for all diadromous species, will fill an important data gap and benefit coast-wide conservation efforts. This project represents a critical step in identifying Coastal Focus Areas of Ecological Significance - for future habitat protection and restoration efforts associated with *Beginning with Habitat*, Maine Coast Protection Initiative, and multiple USFWS-linked funding sources. Data will also provide fisheries biologists with an important tool for identifying and prioritizing diadromous fish restoration opportunities.

GOMCP, with the support of a contractor funded through the NFWF-USFWS Maine Atlantic Salmon Conservation Fund also played a pivotal role in developing detailed maps of Atlantic salmon spawning and rearing habitat along 16 surveyed rivers in Maine. Maps and data contained in the Atlas, available in ArcMap and PDF formats, provide helpful tools for Atlantic salmon researchers and resource managers involved in fish stocking and habitat restoration, and for land trusts focusing on habitat protection. Readily retrievable information from the Atlas, combined with technical expertise from GOMCP staff and other partners has been used to identify, prioritize and catalyze habitat restoration and protection opportunities that support Atlantic salmon recovery.



## Project design and development: Flanders Stream fish passage

The Town of Sullivan and Maine Dept of Marine Resources initiated this project to protect and enhance the cultural and economic link to the fishery by restoring native sea-run fish populations such as alewife, blueback herring, American eel, sea lamprey and brook trout to historic spawning and nursery habitat in the Flanders Stream drainage. The undersized U.S. Route 1 road/stream crossing is owned by the Town and has negative impacts on sea-run fish migration by restricting upstream and downstream migration. The U.S. Fish and Wildlife Service (Engineering Division) has provided assistance by collecting elevations and developing a conceptual design for a rock ramp at the site. GOMCP continues to be actively involved in providing biological/technical support and funding needed to develop a final fish passage design and to conduct planning activities that are required for permitting. Once this project is completed, 537 acres of lacustrine habitat will be reopened to diadromous fish access and approximately three miles of river located upstream of Frenchman Bay in downeast Maine will be restored.



## Project design and development: Cooper's Mill fish passage

Cooper's Mills Dam is owned by the Town of Whitefield and it partially obstructs fish passage to prime spawning habitat for Atlantic salmon on the Sheepscot River, one of the federally listed rivers. During periods of low flow, the water level in the mill pond drops below the intake of the fishway due to leakage through the dam, and poor maintenance of the fishway. The Town has resisted efforts to remove the dam for two reasons: 1) to preserve a pond that the fire department uses, and 2) to

maintain a site used for commercial alewife harvest. Nonetheless, the Town is willing to consider options for removal in order to restore an estimated 25 miles of upstream fish passage. This project demonstrates the significant investment in staff time and funds needed to develop restoration design options and reach consensus amongst multiple stakeholders in order to implement high priority fish passage projects.

A grant from the NFWF-USFWS Maine Atlantic Salmon Conservation Fund paid for a nationally recognized engineering firm to do an "alternatives analysis" to evaluate options and provide a "preferred alternative" for improving fish passage at Cooper's Mills. As part of the assessment work, GOMCP completed channel and impoundment surveys, commissioned a dam safety inspection, hydrological analysis and fire protection water supply analysis - in order to inform the planning process for fish passage design. In addition, GOMCP used MASCF funds to commission a respected state fisheries biologist to conduct a literature review and write a paper regarding the valuable role native sea lamprey play in the Sheepscot River watershed. For the "alternatives analysis," GOMCP played a key role in assisting a steering committee assess and capture all the relevant issues, develop a scope of work for the feasibility studies, provide the plan to the public for further input, develop a final RFP, follow the progress of the feasibility studies, and then work with stakeholders to develop a final agreement on what should be done at the site. For the sea lamprey paper, GOMCP also contributed significant time in reviewing and editing early drafts.

In FY06, the assessment work was completed and presented to town. Local residents raised additional concerns regarding cost estimates and options for hydropower generation. Discussions continue with the Town regarding the Town's preferred alternative for fish passage. GOMCP and partners remain optimistic that fish passage will ultimately be installed at Cooper's Mill.

### **Applied research: Large Woody debris**

Large Woody Debris (LWD) has been identified as an essential habitat element in salmonid streams and is frequently used in habitat restoration efforts throughout New England and the Pacific Northwest.

Unfortunately, we know little about the importance of LWD for Atlantic salmon in Maine. To help fill this knowledge gap, the Gulf of Maine Coastal Program is coordinating a three-part program of applied research to evaluate the past, present, and future role of LWD in Maine salmon rivers. This research includes: 1) developing and applying an LWD model based on region-specific forest and stream conditions, and designed to predict the loading rates of LWD under alternative management and forest condition scenarios, 2) analyzing habitat



inventory data and developing LWD inventory protocols, in order to assess association between LWD and other important aspects of Atlantic salmon habitat, and 3) designing, implementing, and monitoring experimental LWD additions in selected reaches. In 2005 and 2006, assessments by Gulf of Maine Coastal Program staff have been conducted on the Ducktrap, Sheepscot, Narraguagas, East Machias and Machias Rivers.

### **Applied research: St. Croix River Alewife Interaction Study**

In sections of northeastern Maine there has been a widely held, but scientifically unsubstantiated belief that alewife restoration interferes with a well-established and recreationally significant non-native bass fishery. GOMCP provided funding \$10,000 through the NFWF-USFWS Maine Habitat Restoration



Partnership, as well as technical biological support through participation on a Scientific Advisory Committee. The Committee oversaw the design, implementation and distribution of a study headed by Maine Rivers to examine the interaction of alewife and bass in the St. Croix River watershed. Representatives on the committee include NOAA, Fisheries and Oceans (DFO)-Canada, New Brunswick Department of Natural Resources, Maine Department of Marine Resources, Maine Department of Inland Fisheries and Wildlife, St. Croix Waterway Commission, Trout Unlimited, and Maine

Atlantic Salmon Commission. The research led to two final reports: "St. Croix River Alewife-Smallmouth Bass Interaction Study." and "Genetic Analysis of Freshwater and Anadromous Alewife." The first report involved: 1) a comprehensive literature review of existing research on the topic, 2) identification of knowledge gaps in our current understandings, and 3) field research to help fill those gaps. This research replaced unsubstantiated claims with credible scientific information, contributing reliable science to restoration and management decision-making that will ultimately be needed to restore declining diadromous fish populations in the St. Croix River watershed.

## Capacity Building of local watershed association: Project SHARE

In the past 7 years, GOMCP has provided \$363,000 to support the work of Project SHARE in working with large timberland managers to re-establish river connectivity and reduce NPS impacts within listed Atlantic Salmon watersheds in downeast Maine. Funds provided by GOMCP and the Maine Atlantic Salmon Conservation Fund have been used to pay the salary and expenses of Project SHARE's Executive Director. The Executive Director supports direct costs of restoration work (i.e. materials and contractors) by conducting critical tasks directly related to on-the-ground restoration (i.e. landowner outreach, site plan development, project management, fundraising and post-construction monitoring).



## Coordinating with industrial landowners: Timberland loaner bridge program

An important, but often overlooked element of diadromous fish restoration programs, is limiting the construction of future barriers. GOMCP is working with the Maine Forest Service (MFS) to fund and manage the distribution and use of temporary crossing structures through a loaner program in partnership with Maine Sustainable Forestry Initiative (SFI) member companies. Temporary crossings typically have lower installation costs, do not require long-term maintenance, and when removed and closed out properly, retain natural stream bed conditions and stream bank integrity. In 2006, GOMCP provided funding to the Maine Forest Service to purchase two temporary stream crossing structures and manage the distribution and use of the temporary crossings. MFS is promoting the program through a series of educational workshops where forest practitioners receive training on proper installation and use of the temporary structures. Two structures are currently available and were used extensively throughout the Downeast Atlantic salmon drainages in FY06. GOMCP intends to provide additional funds in FY07 so that MFS can purchase a third temporary bridge. Already, loaner bridges have prevented the construction of thousands of feet of access roads and eliminated the need for construction of permanent road crossings. Loaner bridges will be used 5-10 times annually, and have an expected lifetime of more than 15 years. Therefore, loaner bridges eliminate the need for installation of hundreds of culverts.



## Coordinating with industrial landowners: BMPs for blueberry growers

Maine is the largest producer of wild blueberries, and most of the crop is concentrated in downeast Maine, where listed Atlantic salmon watersheds are concentrated. Wild blueberries are particularly susceptible to drought, and historically, many commercial growers pumped water directly from streams and rivers in a way that directly impacted Atlantic salmon habitat. In 2003, nearly 40 water pumps were identified that created potential problems for salmon. With the help of NFWF-USFWS Maine Atlantic Salmon Conservation Fund and the overwhelming support of blueberry growers who provided 50% of the cost, spring-fed ponds and wells were dug to create new water sources that do not negatively impact Atlantic salmon's riverine habitat. Management plans have also been developed for cost-effective and efficient irrigation. This win-win program has led to the elimination of all of the pumps that pulled water directly from streams and rivers.



## **Pre- and post restoration monitoring: Presumpscot River / Highland Lake**

In 1936, a dam owned by the City of Westbrook was built at the outlet of Highland Lake, cutting off native sea-run alewives, as well as some American eel and sea lamprey from their historic spawning and nursery habitat. More than 50 years later, in 1988, Maine Dept. of Marine Resources constructed a concrete denil fishway at the dam to allow adult alewives to pass upstream to spawn in Highland Lake and to allow adult and juvenile alewives to move downstream to the Gulf of Maine. During a southern Maine flood in October 1996, the old Highland Lake Dam breached, the fishway was destroyed, and the downstream channel was degraded and over-widened. A new dam and fishway were constructed in 2000, but they did not work effectively at passing alewives.



After several years of detailed planning and fundraising, the existing fish ladder has been renovated, and the stream channel has been restored at the outlet to 640-acre Highland Lake. GOMCP was actively engaged in all aspects of this project, which involved renovating the fishway, restoring the degraded stream channel, and implementing a monitoring project. With fish passage restored from the ocean to Highland Lake, fisheries biologists expect that Highland Lake will now produce an estimated 150,000 adult and 1,000,000 juvenile alewives annually.

GOMCP helped the Maine Department of Marine Resources fund post-restoration monitoring by installing an electronic fish counter, an important tool for post-restoration monitoring. University interns were hired to maintain and download the counter daily. The counter is located at the upstream exit end of the fish ladder and directs fish through PVC tubes, where they are counted before swimming into the lake to spawn. This important monitoring effort is critical to provide accurate data on the alewife run and assist the Maine Department of Marine Resources to manage and restore the fishery.

## **Pre- restoration monitoring: St. Croix River/Milltown Dam**

The St. Croix International Waterway Commission, under agreement with the Maine Department of Marine Resources and the Canada Department of Fisheries & Oceans operate the Milltown fishway and research trap on the St. Croix River for the spring alewife run. The Commission counts inbound alewives seven days/week during the run, according to methodology agreed by Maine Department of Marine Resources (DMR) and Fisheries & Oceans Canada (DFO). All fish not included in sampling activities are released alive above the trap or held live for DFO transfer, as specified by that agency. GOMCP has provided \$17,500 total from FY04-07 to collect, analyze and submit data annually in order to document the ongoing and precipitous decline of the St. Croix River alewife population since the recent State Legislature-mandated closure of the federally-funded fishways. GOMCP has also contributed funding toward the installation of a new trap used by the St. Croix International Waterway Commission for monitoring fish passage. Prior to closing the fishway, the annual run of alewives had grown to approximately 2 million fish. The run is now only a shadow of its former abundance; a remnant population is currently being maintained with a small-scale trap and truck operation. The long-term data being collected clearly documents the steady and steep decline in the St. Croix River's alewife population and will be essential in taking future steps to restore the alewife run.