2003 ANNUAL REPORT OF THE

MAINE ATLANTIC SALMON COMMISSION

FOR THE PERIOD OF:
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COMPILED AND EDITED BY:

Patrick Keliher
Executive Director

Joan Trial
Senior Biologist

SALMON COMMISSION BOARD MEMBERS

Commissioner George Lapointe
Maine Department of Marine Resources
Chairman

Commissioner R. Dan Martin
Maine Department of Inland Fisheries and Wildlife,

Paul Frinsko, Esq.
At-Large, Public Member

This report details the work of the Maine Atlantic Salmon Commission. All data contained within this report is believed to be conclusive, however much of the commissions work remains "in progress" and as such changes may occur. Questions about this information should be referred to the Commissions Augusta, Maine office.

MAINE ATLANTIC SALMON COMMISSION

ASC, Augusta Office
323 State Street
172 State House Station
Augusta, Maine 04333
(207) 287-9972 Fax (207) 287-9975

ASC, Bangor Office
650 State Street
Bangor, Maine 04401
(207) 941-4449 Fax (207) 941-4443

ASC, Sidney Field Office
27 Lyons Road
Sidney, Maine 04330
(207) 547-5326 Fax (207) 547-4035

ASC, Jonesboro Office
Route 1A, PO Box 178
Jonesboro, Maine 04648
(207) 434-5920 Fax (207) 434-5923

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INTRODUCTION

The Maine Atlantic Salmon Commission (hereinafter referred to as the Commission) is the leader in salmon restoration efforts in Maine. Using the Salmon Conservation Plan as the rebuilding blueprint the Commission has focused its efforts on habitat identification and improvement, population assessments, and the stocking of distinct populations of wild Maine Atlantic salmon.

The population of wild Atlantic salmon remains critically low. At sea commercial harvest has all but been eliminated, but other causes of low survival have yet to be determined. While our partners continue to look at issues outside of Maine's control, the Commission continues its work with potential local threats such as agricultural water and pesticide use, aquaculture escapement, peat mining, and forestry practices that could affect salmon populations. The Commission remains committed to working with industry partners to insure best management practices are used and maintained.

The Commission's efforts, along with our private and federal partners, are continually being improved. From science to stocking to the identifying and protecting key salmon habitat, strides are being made that will benefit wild Atlantic salmon and the people of Maine.

2003 HIGHLIGHTS:

Habitat

What is undoubtedly the most aggressive river restoration project in the United States; the Penobscot Project was announced this past summer. The Salmon Commission will play a key role in assisting with science and habitat assessments as well as public outreach (see key restoration projects).

Phase one of the Machias River Habitat Protection Project closed on December 22nd. This project protected 210 miles of shoreline and prime habitat for Atlantic salmon by purchasing and placing conservation easements on nearly 25,000 acres. The Commission has the responsibility of managing the easement along the river and major tributaries that totals more than 18,000 acres.

Stocking

For first time since 1998, the Penobscot River sea-run broodstock collection target of 600 salmon was achieved due to an increase of salmon returning to Maine's largest river. This run hit a low of 535 salmon in 2000, but has increased to 1,114 salmon in 2003

After a long hiatus, related to managing an indigenous disease in river specific broodstock, the stocking of smolts and fry into the Pleasant River has resumed.

The Commission's staff coordinated the development of a Canadian St. John River strain egg source for the Dug Brook Hatchery (private) on the Aroostook River.

Population Estimates

In the Machias River system we recorded significant numbers of redds in Old Stream and Crooked River, two of the more important tributaries for salmon in the Downeast Region.

The Commission adopted a cutting edge statistical approach to estimating total juvenile salmon abundance in three Maine Rivers with Endangered Atlantic salmon populations.

Fish Passage

The Commission, using telemetry data on adult fish movements within the Penobscot, facilitated changes that enhanced fish passage time and overall efficiency at Great Works project.

The Commission remains active on several rivers to ensure that fish passage and/or dam removal projects move forward. The Penobscot and Kennebec drainages remain a key focus.

Science

The Commission continues to conduct substrate embeddedness surveys on the Downeast Rivers, concentrating on the Machias system. Embeddedness may affect productivity of the rivers and over-winter survival of juvenile salmon.

The Commission's work to better manage flows in the Dennys River for Atlantic salmon has allowed us to maintaining higher lake levels in Meddybemps Lake.

The Commission has begun work addressing the issue of low pH levels in Maine Rivers. For decades acid rain has been changing rivers in Maine. This change has had an effect on the survivability of salmon smolt. The ASC will be submitting legislation in the second half of the 121st session to address this issue.

These few issues, among the many addressed by the Commission, were selected as noteworthy for highlighting.

EXECUTIVE SUMMARY

Legislative Mandate

Maine State Statute established the Maine Atlantic Salmon Commission in 1999 [C.401, Pt. BB, § 8 (amd).]. This law replaced earlier legislation that formed the Maine Atlantic Sea-Run Salmon Commission in 1947 and subsequently the Atlantic Salmon Authority in 1995. The 1999 legislation structured the Commission with a three-member board comprised of the Commissioners of the Maine Departments of Inland Fisheries and Wildlife and Marine Resources and a third, at-large, member appointed by the Governor and subject to confirmation by the Senate. The Salmon Board appoints an Executive Director who is, in turn, responsible for hiring and managing all other Commission staff (see Title 12, Chapter 811: GENERAL PROVISIONS (HEADING: PL 1995, c. 406, @12 (new))

Purpose

The purpose of the Commission is to protect, conserve, restore, manage and enhance wild Atlantic salmon habitat, populations and sport fisheries within historical habitat in all waters (inland and tidal) of the State of Maine.

Management Focus

The Commission is responsible for Maine's Atlantic Salmon Conservation Plan (ASCP). Atlantic salmon habitat protection and enhancement programs are managed under the auspices of the ASCP.

The ASCP has been fashioned in the context of Maine's current comprehensive regulatory framework to protect salmon and its habitat, as well as a general scientific consensus that several driving forces in the decline of this species are beyond the jurisdiction of the State of Maine. The ASCP is designed to assure that Maine has taken all reasonable steps to assure successful restoration of wild Maine Atlantic salmon.

The current ASCP was to expire in 2003. The Commission's Board recently extended the ASCP for an additional two years. During this extension period the Board and staff will be developing an addendum to ensure they are up to date with current science and conditions.

On a parallel track to Maine's ASCP is the Federal Conservation Plan, currently awaiting approval at the Department of Interior. Upon approval, the Commission's staff and Board will review and determine the best management focus for the Maine plan to ensure that duplication is avoided and the individual plans compliment each other. The Maine Atlantic Salmon Conservation Plan will remain the Commission's operative guideline.

Partnerships

The Commission, to successfully achieve is mission, works side-by-side with local, state, national and international organizations and agencies to manage Maine' wild Atlantic salmon. The

following are the primary agencies and non-governmental organizations that the Commission works with on a day-to-day basis:

State:
Marine Resources
Inland Fisheries and Wildlife
Agriculture
Environmental Protection
Transportation
Conservation
State Planning Office

Federal:
US Fish & Wildlife
National Marine Fisheries

International:
North Atlantic Salmon Conservation Organization
International Joint Commission - St Croix Board
International Council for the Exploration of the Sea

Non-Governmental Originations: *
Atlantic Salmon Federation – Maine Council
Atlantic Salmon Unlimited
Coastal Mountain Land Trust
Downeast Salmon Federation
Fish Friends
Fishing in Maine
Friends of the Kennebec
Kennebec Chapter of Trout Unlimited
Maine Rivers
Passamaquoddy Indian Nation
Penobscot Indian Nation
Penobscot Fly Fishers
Penobscot Riverkeepers 2000
Pleasant River Fish & Game Conservation Assoc.
Pleasant River Hatchery
Project SHARE
Sheepscot Valley Conservation Assoc.
St. Croix International Waterway Commission
Trout Unlimited – Maine Council
Cove Brook Watershed Council
Dennys River Watershed Council
E. Machias Watershed Council
Machias Watershed Council
Narraguagus Watershed Council
Pleasant River Watershed Council
Sheepscot River Watershed Council
8 Rivers Roundtable
Dennys Sportsman's Club
Eddington Salmon Club
Penobscot Salmon Club
Saco River Salmon Club
Veazie Salmon Club

**All attempts were made to include all our partners.*

Funding

The Atlantic Salmon Commission is supported by several funding sources that enable it to focus on its mission of restoring wild Atlantic salmon:

General Fund Appropriation
FY 2003 (July 1 to June 30) $656,880

General fund appropriations support the monitoring, management, and enhancement activities of the Commission.

Recent adjustments to the Commission's budget resulted in a total loss of $40,278. This reduction included the loss of a critical staff position that supported our land and habitat conservation program and directly affected the Commissions' support of local Watershed Councils and a grant program that matched valuable Federal dollars.

National Oceanographic and Atmospheric Administration Grant (NOAA)
FY 2003 $1,183,788

The Commission, in collaboration with NOAA, assesses adult and juvenile populations, evaluate various stocking practices, study adult and smolt migration, and monitor water quality in Maine salmon rivers. Funds from the NOAA grant support staff and equipment that allow the Commission to continue this work.

National Fish and Wildlife Foundation (NFWF)
(onetime funding / federal appropriation)
FY 2000 $2,000,000

In 2000 the Commission received $2 million in non-lapsing Federal money. This funding enables the Commission to address issues identified in the Endangered Species Listing for Maine's Salmon. Approximately 80% of this money has been used.

Kennebec River Restoration Account
FY 2003 $30,000

Annual contributions from the KHDG agreement have enabled the Commission to monitor salmon activities and habitat on Maine's second largest River. The funds from this account are slated to expire in 2010.

The current annual budget for the Commission is $1,870,588. The State of Maine's General Fund Contribution makes up 41 percent of the Commission's annual budget.

ATLANTIC SALMON STOCKING PROGRAMS

The ASC has the responsibility for all Atlantic salmon stocking in Maine waters. The Commission does this in cooperation with two US Fish and Wildlife Service salmon hatcheries: Craig Brook National Fish Hatchery and Green Lake National Fish Hatchery. These hatcheries receive Atlantic salmon collected by the ASC from wild populations in Maine and hold or raise them for use as broodstock. Progeny of these fish are stocked by ASC at different ages.

Fry stocking on Ossipee River

The current salmon stocking program in Maine uses river-specific fish. Each river receives progeny of fish previously collected from the same river. This protocol is followed on the Sheepscot, Dennys, Narraguagus, Machias, East Machias, and Penobscot rivers. Atlantic salmon restoration in the Saco, Union, and St. Croix rivers is based on Penobscot River origin fish. At Craig Brook there are separate rooms where captured parr or smolts from the Downeast rivers are held through maturity when they are spawned. The embryos are reared to stock back into their natal rivers as fry, parr, or smolts. The adult fish are used as egg producers for one or more years, after which they too are returned to the rivers as kelts. The Penobscot River is the only river where eggs are taken from returning adults in addition to captive reared broodstock. Fry were the most numerous life stage of Atlantic salmon stocked into Maine rivers in the year 2002 (Table 1).

Table 1. Summary of Atlantic Salmon Stocked in Maine in 2002 from USFWS hatchery broodstock, Fish Friends programs, St. Croix IWC, Dug Brook Hatchery, and Saco Hatchery *.

River Name	fry	0+ parr	age 1 parr	age 1 smolt	adult
Aroostook	201,000	0	0	0	50 [1]
St. Croix	897			3,200	
Dennys	133,000	30,400	600	55,200	
East Machias	314,000	0	0	0	102
Machias	341,000	0	300	0	198
Pleasant	82,000	0	0	2,800	0
Narraguagus	491,000	0	0	0	178
Union	2,700	0	0	0	0
Penobscot	741,000	320,700	2,100	547,300	1,664
Sheepscot	323,000	0	0	0	70
Kennebec	42,000	0	0	0	0

**All numbers are provisional*
Numbers of fry are rounded to nearest 1,000.
Numbers of parr and smolts are rounded to nearest 100.
Adults are surplus brood fish from Craig Brook and are an actual count.

1. *These fish were captured on the St. John River and released into the Aroostook River as per standing agreements with DFO – Canada.*

Adult Atlantic salmon are collected by the ASC at a trapping facility in the Veazie Dam on the Penobscot River throughout the spring and summer season. The fish are held at Craig Brook until sexually mature, stripped and the embryos incubated. Some are sent to Green Lake where they will be raised either to the parr stage or the smolt stage for stocking into the Penobscot River. More than 400,000 smolts were stocked in the Penobscot River in spring 2002 (Table 1). Under our cooperative agreement with the USFWS, about 50,000 smolts per year are sent to New Hampshire to support restoration efforts in the Merrimack River. Penobscot River eggs are also used to produce fry that will be stocked into various upstream reaches of the watershed where they will grow for two years before they too will migrate to the ocean as smolts.

In addition to the USFWS hatcheries there are three satellite hatcheries operated by non-governmental Atlantic salmon organizations; Union River, Saco Salmon Club, Atlantic Salmon for Northern Maine. The Union and Saco Hatcheries receive embryos from the Penobscot captive broodstock at Green Lake. Atlantic Salmon for Northern Maine receives embryos from St. John River stock spawned in Canada. These are reared and stocked in the Aroostook River. The Federal hatcheries also provide eggs to schools as part of an educational program called Fish Friends that integrates the task of rearing and stocking Atlantic salmon fry into the science curriculum.

SALMON RESEARCH AND MANAGEMENT

Monitoring

The Atlantic Salmon Commission staff conducts routine monitoring of the abundance and status of juvenile (Table 2) and adult salmon (Table 3) in most of Maine's Atlantic salmon watersheds. Commission staff operates traps to monitor adult Atlantic salmon returns on the Penobscot, Narraguagus, Pleasant, and Dennys Rivers. Great Lakes Hydro, America operates a trap in the upper Penobscot drainage, Pennsylvania Power and Light operates one on the Union River, Florida Power and Light operates traps and lifts on the Saco River, DMR operates one on the Androscoggin River, and the St. Croix Waterway Commission operates one on the St. Croix. Redd counts (Table 4) are used to track spawning escapement.

Table 2. Summary of juvenile Atlantic salmon population densities (fish/120 yd^2) in Maine Rivers, 2003.

Year	River	Young-of-the -Year				Parr			
		Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
SITES with sufficient numbers of salmon to use multi-pass removal estimates									
2003	Dennys	0.0	1.3	8.1	22	0.1	3.2	7.4	24
	East Machias	6.2	9.4	52.8	8	0.0	5.3	17.2	8
	Machias	0.0	1.8	15.8	9	0.0	4.1	11.2	13
	Pleasant	0.0	3.4	65.4	8	0.0	2.2	6.9	8
	Narraguagus	0.0	3.1	14.7	31	0.1	2.1	9.8	32
	Sandy	72.6	72.6	72.6	1	0.0	0.0	0.0	1
	Saco	7.8	21.5	35.2	2	6.0	8.8	11.6	2
	Sheepscot	2.1	24.6	57.8	4	0.3	4.8	14.4	12
SITES where low numbers of salmon were estimated based on a single pass									
Year	River	Young-of-the -Year				Parr			
		Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
2003	Cove	0.0	0.0	0.0	3	0.0	0.0	0.0	3
	Ducktrap	0.0	0.0	0.0	2	1*	1*	1*	2
	Eaton	0.0	0.0	0.0	1	1*	1*	1*	1
	Felts	0.0	0.0	0.0	1	0.0	0.0	0.0	1
	Kenduskeag	0.0	0.0	0.0	16	2*	2*	2*	16
	N Br. Marsh	0.0	0.0	0.0	5	0.0	0.0	0.0	5
	Passagassawakeag	0.0	0.0	0.0	3	0.0	0.0	0.0	3
	S Br. Marsh	0.0	0.0	0.0	2	1*	1*	1*	2
	Sedgeunkedunk	0.0	0.0	0.0	1	1*	1*	1*	1
	St. Croix	0.0	0.0	0.3	15	0.0	0.1	3.7	15
	Togus, Bond Brooks	0.0	0.0	0.0	3	0.0	0.0	0.0	3

* indicates total number of salmon caught at the number of sites listed

Table 3. Return of sea run Adult Atlantic salmon to traps and weirs in 2003 as compared to previous years.

Drainage	1997	1998	1999	2000	2001	2002	**2003**
St Croix	28	41	13	20	20	20	**15**
Androscoggin	1	4	5	3	5	2	**3**
Dennys	0	1		2	17	2	**9**
Narraguagus	37	22	32	23	32	8	**21**
Penobscot	1355	1210	967	534	788	779	**1112***
Pleasant	1			3	11	0	**2**
Saco	28	28	66	49	69	47	**39**
Union	8	13	9	2	0	5	**1**
Aroostook	10	30	25	17	28	7	**2**
TOTAL	1468	1349	1118	654	968	871	**1204**

* Additionally 2 Green Lake National Fish Hatchery captive broodstock for 1114 total

Table 4. Redd counts in Maine rivers in 2003 as compared to previous years. Most river mainstems could not be surveyed for redds in 2003 because of high water.

Year	1997	1998	1999	2000	2001	2002	**2003**
Narraguagus	78	63	43	21	21	6	**5**
Dennys	35	32	23	60	72	0	**1**
Pleasant	1	9	0	1	3	0	**---**
East Machias	11	74	24	10	5	5	**1**
Machias	59	74	46	23	22	3	**21**
Ducktrap	2	9	29	2	0	0	**2**
Sheepscot	8	4	18	15	18	4	**2**
Cove Brook	4	5	0	1	0	0	**2**
Souadabscook	0	4	1	2	0	0	**---**
Kenduskeag				2	0	0	**3**

--- Counts were not made due to high water.

Research

Research on Atlantic salmon is directed at determining the causes of the precipitous decline in Atlantic salmon returning to Maine waters. Ongoing Commission research projects are aimed at determining survival among freshwater life stages and understanding the biological and environmental factors affecting survival.

The National Oceanic and Atmospheric Administration's (NOAA) salmon research in estuarine and marine waters focuses on he same questions. The two agencies conduct cooperative research designed to link freshwater rearing conditions and smolt emigration to better understand the biotic and abiotic factors affecting the freshwater-marine transition. Components of the cooperative projects are currently underway on the Pleasant, Narraguagus, Dennys, and Penobscot Rivers. These include: parr density and growth, basin-wide estimates of large parr; indices or estimates of smolt emigration smolt; smolt physiology, marine and estuarine smolt trawling, and smolt tracking through estuaries.

As part of this collaborative effort, the Commission is working with the Mitchell Center at the University of Maine to monitor water quality within Downeast rivers. This work is important background for studies of over-winter parr survival and smolt physiology.

The Commission is investigating the effects of physical habitat and hydrology on juvenile salmon survival. As part of this effort ASC is working with the United States Geological Service (USGS) to gage Atlantic salmon rivers and increase the data available to link hydrology, habitat, and juvenile production and survival. USGS is also conducting analyses of historic data to determine if the timing and duration of summer and winter low flow periods has changed over the last century.

Further, The Maine Atlantic Salmon Commission will be working with Kleinschmidt Energy and Water Resource Engineering of Pittsfield Maine, and Sevee and Maher Engineers, Inc. of Cumberland Center Maine to develop a better understanding of stream basin hydrology and its effects of on salmon habitat in the Narraguagus, Pleasant, and Machias Rivers. This study will catalog and assess existing ground and surface water, geologic, habitat, and climatic data within these watersheds. When completed, the study will serve as the beginning of an effort to develop surface-water and ground-water (SW-GW) watershed models. These models are tools for assessing the effects of surface-water and groundwater withdrawals, and the land use/land cover changes on river flows, groundwater, and salmon habitat within portions of the rivers.

The USGS Conte Anadromous Fish Research Lab is collaborating with the Commission, Penobscot Indian Nation, NOAA-Fisheries, and the University of Maine, on documenting the upstream migration of adult Atlantic salmon in the Penobscot River.

The research uses Passive Integrated Transponder (PIT) tag technology to gather data on movements of individual adult salmon that can be used to evaluate upstream movements and distribution of salmon within the drainage, the probability that fish are able to access spawning habitat, broodstock management, and the effectiveness of current juvenile stocking practices. In 2003, fish passage was improved at one of the Great Works based on behavior of fish in the fishway documented by the PIT tag study.

Recreational Fishing Management

In response to the illegal taking of Atlantic salmon, the Commission, working with the Department of Inland Fisheries & Wildlife (IF&W), had a section of the Narraguagus River below the ice control dam in Cherryfield closed to all fishing, by emergency action, from August 22, 2003 to the end of the open-water fishing season.

The Commission is sensitive to the fact that the listing of Atlantic salmon as and endangered species could affect recreational fishing for other species. To ensure that fishing for species other that Atlantic salmon is minimally impacted, the Commission is working with IF&W to promulgated the following rule: **Narraguagus River**. Closed to all fishing from the ice control dam to the railroad bridge in the town of Cherryfield, except from May 1 to June 10 a portion of river between two sets of red posts (at 100 feet below and 450 feet below the ice control dam) is open to fly-fishing. This rule will protect salmon that migrate to this area while allowing the continuation of the historic recreational fishery for shad.

The Commission will also be revisiting the closure of recreational salmon fishing on the Penobscot River. Salmon runs have improved over the past three years. This improvement has sparked the interests of many salmon anglers. Due to regulatory time frames it is not possible to open fishing in 2004.

Water Temperature Monitoring

In 2003, the Commission monitored water temperatures in 18 drainages across the state of Maine. The number of monitoring sites in the drainages varied according to individual project needs and availability of loggers (Table 1). We continued monitoring at some sites used in previous years, and we established new sites to provide more comprehensive coverage in some drainages.

Water temperatures were recorded at hourly intervals using digital temperature data loggers. All units were deployed in accordance with current Commission protocols.
(put table all on one page)

Table 5: Water temperature monitoring sites for Maine salmon rivers, 2003.

Drainage	Number of Sites
Aroostook	2
Cove Brook	3
Dennys	8
Ducktrap	2
East Branch Penobscot	3
East Machias	9
Kennebec	14
Kenduskeag	9
Machias	14
Marsh Stream	5
Mattawamkeag	3
Narraguagus	13
Passagassawaukeag	2
Penobscot	1
Piscataquis	6
Pleasant	5
Souadabscook	3
St. George	2

The objectives of the Commission's water temperature monitoring program include:

1. Providing insight as to how water temperature may be influencing the growth and survival of juvenile Atlantic salmon
2. Investigating water temperature at the reach level and identifying sections of rivers susceptible to critical water temperatures
3. Instituting and maintaining a systematic series of "index" sites for long term water temperature monitoring
4. Continuing to add to the existing time series of water temperature data

5. Monitoring temperatures at Commission fishways and adult fish weir traps.

Temperature data colleted in 2003 will be formatted, audited, and appended to a Microsoft Access water temperature archive database during the winter and spring of 2003-2004. Commission biologists will analyze the data to compare water temperatures at representative sites across years and within drainages including:

1. Days when the minimum daily temperature was greater than 22.5^{o}C, the temperature at which juvenile salmon stop feeding and the threshold temperature for handling adult salmon at our traps
2. Days when the temperature exceeded 27°C, the temperature at which juvenile fish may be expected to move to seek cooler temperatures

Temperature data collected in Maine salmon rivers will be available in spring of 2004.

Water Chemistry Monitoring

Salmon are potentially susceptible to changes in water quality caused by both natural fluctuations in chemical concentrations and climate as well as anthropogenic introduction of pollutants and land-use patterns. Non-point pollution is a factor as influenced by commercial logging operations in the salmon river watersheds. Acid rain has been implicated for both chronic and episodic acidification. Climate change is another potential factor affecting salmon, because salmon are at their southern limit already. Climate may also affect organic acidity.

A 2002 report to the Maine Atlantic Salmon Technical Advisory Committee titled "*Water Quality Issues as Potential Limiting Factors Affecting Juvenile Atlantic Salmon Life Stages in Maine Rivers*" stated a high likelihood that acidification from acid rain could be adversely affecting the restoration of Atlantic salmon in at least some Maine rivers. An Ad Hoc Committee on Water Quality made up of scientists from the Commission, Department of Environmental Protection (DEP), University of Maine, Penobscot Indian Nation (PIN), U.S. Fish and Wildlife Service (USFWS), United States Geological Survey (USGS), and Maine Department of Inland Fisheries and Wildlife (MDIFW) prepared this report.

In 2003, the Maine Atlantic Salmon Commission began collaborative efforts with the George Mitchell Center for Environmental and Watershed Research at the University of Maine (GMC) to investigate base-line and event driven chemical conditions that exist in Maine salmon rivers during different hydrologic conditions. The Mitchell Center has been involved for over 15 years in watershed research, developing new methods and operating under EPA QA/QC guidelines and reporting requirements. The Center has been the laboratory for EPA Long Term Monitoring in Maine since 1983, BBWM since 1987, EMAP-SW since 1991, and the state toxics monitoring program since 1996.

Maine Salmon Rivers pH Survey

The objective of the pH survey is to create a snap-shot in time of pH and ANC (acid neutralizing capacity) in Maine salmon rivers during the same hydrologic time period that will allow for intra-and inter-drainage comparisons of these water chemistry parameters. The Commission, with input from DEP, chose 67 sites from 12 Downeast and central Maine drainages, including all salmon rivers with endangered Atlantic salmon populations. The selected waters were sampled three times (spring,

summer, fall) during 2003, and each time was water collected during the same 8-hour time frame.

Samples were collected by personnel from the Commission, GMC, NOAA, DEP, and the Union River Watershed Coalition. The Commission provided funding to GMC for closed cell pH, air equilibrated pH, and ANC analysis. In addition, apparent color and conductivity were also measured, and those data were provided to us at no additional cost. Data from the fall sampling is still being analyzed by the GMC and will be released in the near future, at which time a final report summarizing the findings for the 2003 pH survey will be written.

Watersheds Project

The Commission watersheds project, coordinated by the GMC, is investigating the effects of land use on water chemistry in tributaries of the Union (relatively undisturbed) and the Narraguagus (managed forest land) Rivers through intensive sampling during events and base-flow conditions. This project will also incorporate data from a current Atlantic Salmon Acidity Project coordinated by Terry Haines (USGS-University of Maine) on the Narraguagus River, and data from the 2003 Commission pH survey.

Project objectives:

1. Compare Union and Narraguagus River tributary data from the 1985-1987 INSTUD Project (Haines et al. 1990) to data derived from this study to assess patterns in acid related water chemistry.
2. Compare data between the two watersheds to assess the effects of major land-use patterns on surface water chemistry. There has been more forestry activity in the Narraguagus watershed compared to the Union watershed.

In addition to a written report and summary graphics, all data will be available electronically to the agencies and entities concerned with salmon.

An informal objective, unfunded at present, is to make all the salmon-relevant information available in a GIS-searchable on-line database as part of the Mitchell Center's PEARL (http://www.pearlmaine.org/), the environmental database for Maine.

DEP/Volunteer Water Quality Monitoring in Downeast Watersheds

Beginning in 1999, Maine DEP and local watershed councils have collaborated in water quality monitoring of the Maine salmon rivers. DEP plays a leadership role in the planning studies and training volunteers affiliated with the local watershed councils. In 2003, monitoring activities were restricted to spring and fall when high flow events are likely to resulting in episodic acidification.

Spring pH values in the low to mid 5 range were observed in Tunk Stream, and the Pleasant, Narraguagus, Machias, and the East Machias Rivers. Similar low pH values were observed again in the fall in Tunk Stream, and the Pleasant and Narraguagus Rivers. A pH of 5.6 was observed on sample days for two consecutive weeks in the lower Narraguagus River in the fall. On several occasions, fall pH values below 5 were observed in the Western Little River, a tributary to the Pleasant. The timing of these low pH events coincides with some critical life stages for salmon, namely the smolt run in the spring and spawning in the fall. Low pH, low calcium, and high aluminum work synergistically to

create conditions that can be harmful for salmon and other sensitive species. The observed pH values were low enough and lasted long enough to contribute to harmful conditions. This volunteer project observed similar conditions last year (2002) but not in our worst drought year (2001). For more information about volunteer monitoring activity in Downeast watersheds please contact Mark Whiting, Maine DEP, Bangor, Maine at 207-941-4566 or by e-mail: mark.c.whiting@maine.gov.

Key Restoration Projects

Examples of Project Scale

Salmon conservation in Maine is a long-term project that needs to address variety of factors. While there are many limiting factors outside of Maine's boundaries, addressing probable limiting factors within Maine will facilitate salmon recovery. Described below are two projects that represent scale of projects in the recovery spectrum.

The Penobscot Project brings together private industry, government agencies and non-government organizations to restore New England's Second Largest River. This project will take over 10 years and cost over $50 million to complete. At the other end of the spectrum is the Sandy River Streamside Incubation Project. This project utilizes old discarded refrigerators and the effort of volunteers to raise salmon fry. By comparison, this project costs less that $600 per year per river (this does not include staff time and start up costs of less than $3,000).

Penobscot River Restoration Project

An unprecedented venture to rebalance hydropower production and the ecological importance of a river system took a giant step forward with the announcement of the Penobscot River Restoration project in October 2003. Conservation groups, the Penobscot Indian Nation, Pennsylvania Power and Light Corporation (PPL), the State of Maine (including the Commission) and the U.S. Department of Interior are partners in this landmark project, which endeavors to reconfigure hydropower facilities in the lower Penobscot River thereby opening more than 500 miles of habitat to sea-run fish.

As part of the implementation of the project, the Veazie and Great Works dams will be removed and a fish passage channel will be installed at the Howland Dam. Additionally, upgraded fish passage facilities will be installed at four other hydro projects.

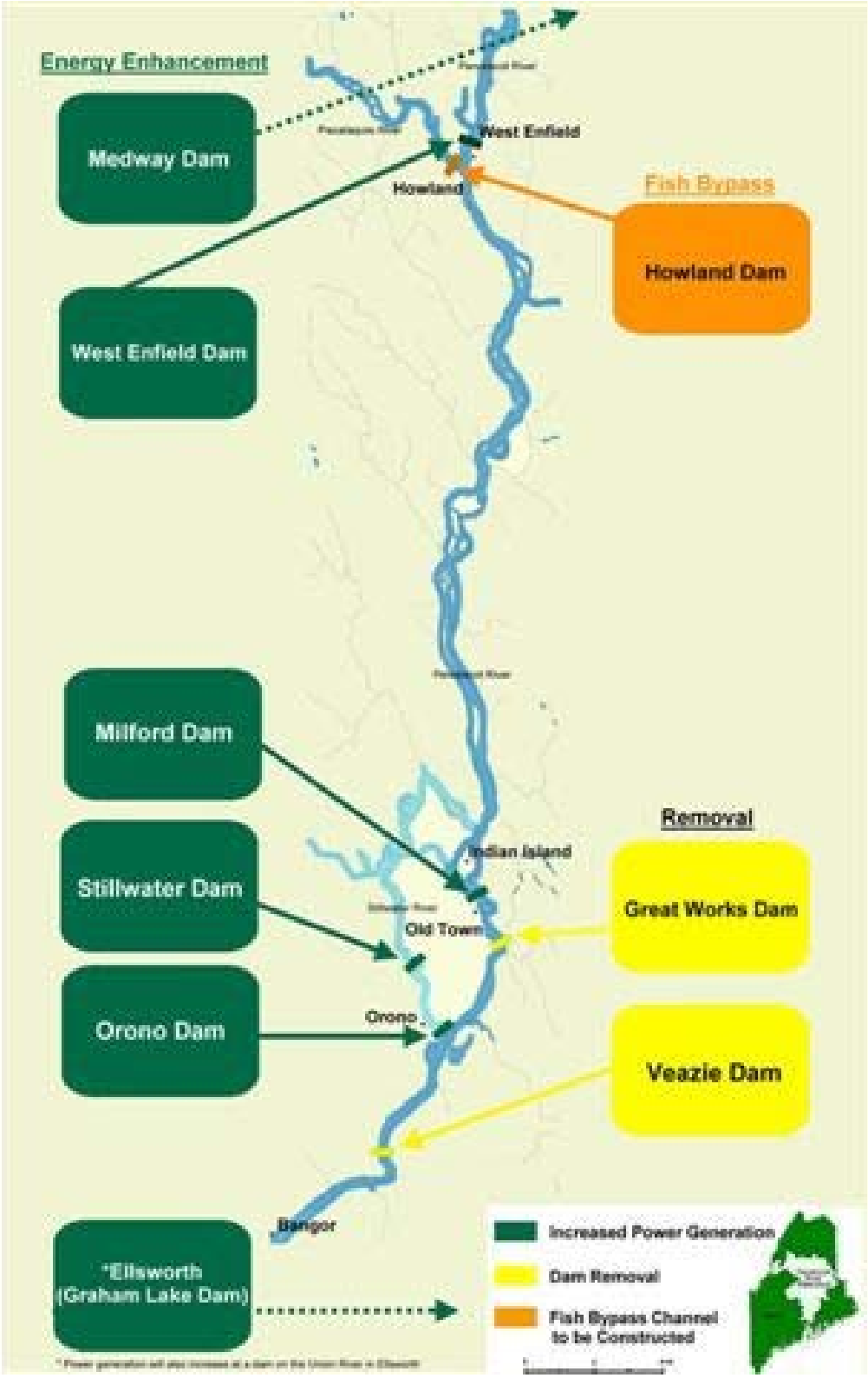
Commission staff participated in several work groups and at different discussion levels while providing input on the many issues surrounding the development of the conceptual agreement. Information was provided on dam removal effects on the Atlantic salmon resource, potential Atlantic salmon habitat gains, reduction of cumulative effects on upstream and downstream migrating salmon, upstream and downstream fish passage at the remaining dams, minimum flow allocations, establishment of mitigation funds, and the development of a fisheries white paper.

The Veazie Dam is the first to be removed as part of the Penobscot Restoration Project.

Multiple dams on the Penobscot River continue to impede the safe upstream and downstream passage of sea-run fish. The Penobscot Restoration Project is the first project that provides an essential ingredient for the successful restoration of Atlantic salmon as well as other species of native sea-run fish in the Penobscot – their ability to reach vast quantities of productive spawning and rearing habitat. To that end, this project will:

- reestablish the river's historic connection to the ocean, dramatically improving access to over 500 hundred miles of river habitat,
- allow several species including striped bass, Atlantic and shortnose sturgeon, and rainbow smelt to regain their entire historical habitat,
- improve access to hundreds of miles of river and dozens of lakes and ponds that historically provided habitat for American shad, alewife, blueback herring, and American eel,
- significantly improve adult Atlantic salmon's ability to reach vast quantities of productive spawning and rearing habitat in the Penobscot River,
- allow Atlantic salmon to regain half of their historical habitat in the river with just one dam passage, which will have a new fish lift installed,
- allow nutrients derived from sea-run fish to reach farther up river, and the natural flushing of sediments will reach Penobscot Bay, restoring a natural cycle to the river,
- The restoration of sea-run fish to the river will enhance the supply of food sources for a wide variety of fish and wildlife inhabiting the Gulf of Maine,
- restore the Penobscot Indian Nation's ability to obtain sustenance, cultural, and identity from the river that bears their name,
- allow PPL, under a reconfigured hydro generating system, the opportunity to maintain 90% of current power production.

Implementing this landmark project will take time. First, a final settlement agreement must be created. A not-for-profit corporation will receive a five-year option period to purchase the Veazie, Great Works, and Howland dams beginning on the date that the Comprehensive Settlement Agreement is signed. Removals and modifications would likely occur between 2006 and 2010 and after all necessary regulatory approvals have been received.



For more information of the Penobscot Project please visit: www.penobscotriver.org.

Streamside Incubation
A Low Tech, Low Cost Approach to Atlantic Salmon Restoration

During the winter of 2002 – 2003, staff from the Sidney office of the Maine Atlantic Salmon Commission tested the feasibility of streamside incubation as a method for volunteer groups to participate in Atlantic salmon restoration. Two types of flow-through incubators were constructed from discarded refrigerators. Three incubators were designed to hold egg filled Whitlock-Vibert boxes placed within an artificial channel and three were designed to hold eggs between layers of poultry nesting material.

Incubators were deployed prior to receiving eggs at three sites on two tributaries to the Sandy River. In February of 2003, a total of 43,496 eyed Atlantic salmon eggs, at approximately 38% development, were divided equally into each of the six incubators. At approximately 95% development, fry were removed from the incubators and enumerated to obtain hatching success. Hatching success ranged from 85% to 98% with an average of 90% for all six incubators.

Total operational cost for the project was $2,351. If the project were to continue for a second year, operational costs are estimated at approximately 30% of the initial investment. Total time spent on this project, not including traveling time, amounted to 1,355 hours. Total time for a second project year is also estimated at approximately 30% of the time spent during the initial year. High hatching success, time expended, and low cost makes this streamside incubator system a feasible approach for volunteers.

CONCLUSION

While the primary mission of the Commission is the restoration of Maine's wild Atlantic salmon, our secondary mission is the overall ecology of Maine salmon rivers.

Wild Atlantic salmon restoration has a long way to go in Maine, but positive steps are being taken. The preservation and enhancement of our rivers will greatly benefit the Commission's wild Atlantic salmon restoration efforts and simultaneously improve the habitat for and the populations of other anadromous species. Improved salmon river health will not only help with the primary mission of restoration, it will also aid in the social and economic picture for the State of Maine.

INDIVIDUAL RIVER REPORTS

The following reports highlight activities on specific rivers. Rivers not listed had minimal visits by Commission staff. *It is in **no** way meant to imply that the system has low or no value to wild Maine Atlantic salmon*.

AROOSTOOK RIVER

The Aroostook River is located primarily in Maine, but it is a tributary to the Canadian St. John River system, which enters the Bay of Fundy at the city of Saint John, New Brunswick. Management of Atlantic salmon in the Aroostook River is an international effort involving the Commission, the Canadian Department of Fisheries and Oceans (DFO), Maine Dept. of Inland Fish and Wildlife (MDIFW), New Brunswick Dept. of Natural Resources (NBDNR), and a non-government non-profit organization named the Atlantic Salmon for Northern Maine (ASNM).

1. Population Monitoring

Adult Trap Operations

Mactaquac Dam. The DFO operates a fish trapping and sorting facility on the St. John River at Fredericton, NB. The number of multi-sea-winter aged (MSW) salmon observed increased substantially over 2002 (743 vs.379) but remained far below the 5-yr mean (1655 fish). Returns of 1SW fish (1278) declined by nearly 50% compared to 2002 (2327), and were 69% below the 5-yr mean (4054).

Tinker Dam. The Tinker Dam is the gateway to the Aroostook River and is located five kilometers upstream from the confluence with the St. John River in New Brunswick, Canada. PDI Canada, Inc. operates a fish trapping and sorting facility as part of the Tinker Dam Hydro Project under an agreement with ASNM. The Tinker trap catch remained low in 2003 and only 2 salmon (1 MSW and 1 1SW) were captured and passed above the dam.

Electrofishing

An intensive electrofishing program was initiated in 2003 as part of a four-year research program to evaluate the fry-stocking program. The Commission established study areas on two adjacent tributaries, Munsungan and Mooseluek streams, in remote headwater areas targeted for fry stocking. Data collected at eight sites within the study area in 2003 are currently under analysis.

2. Population Enhancement

Stocking

Juvenile Salmon. Atlantic Salmon for Northern Maine. Inc. (ASNM) owns and operates the Dug Brook Hatchery (DBFH) in Sheridan, Maine to produce Atlantic salmon fry for the Aroostook River. The hatchery has traditionally received fertilized (eyed) salmon eggs from sea-run "St. John River

strain" salmon captured by the Canadian Dept. of Fisheries and Oceans (DFO) at the Mactaquac Dam fishway trap in Fredericton, NB. The DFO spawn and incubate the eggs at the Mactaquac Biodiversity Facility until the "eyed stage" is attained (usually early February). The eggs are tested in compliance with U.S. Title 50 fish health criteria and then imported by the ASNM to Dug Brook Hatchery to complete incubation and hatching. The ASNM stocks the non-feeding fry soon after hatching into the Aroostook River in accordance with Commission recommendations and permit requirements.

The production goal for the DBFH is 2 million fry annually, but the annual egg production available for the Aroostook program has averaged less than 10% of that (138,000 eggs) in recent years (Table 6.). Broodstock availability has been curtailed by elimination of the sea-cage broodstock program by ISA infection in 1997 and a concurrent decline in sea-run salmon returns to the St. John River.

Table 6. ASNM Dug Brook Hatchery Egg Importation History.

Year	Num.Eggs	Broodstock Origin
1996	500,000	St. John strain: sea-run adults returning to dam
1997	605,000	St. John strain: captive-reared in sea cages from MBF smolts.
1998	139,000	St. John strain: sea-run adults only (ISA eliminates sea-cage program).
1999	166,000	St. John strain: sea-run adults returning to dam
2000	0	Broodstock tested positive for IPN, no eggs imported.
2001	145,000	St. John strain: sea-run adults returning to dam
2002	126,000	St. John strain: sea-run adults returning to dam
2003 sea-run	115,000	St. John strain: sea-run adults returning to dam
2003 captive	131,000	St. John strain: captive-reared at hatchery from MBF smolts
2003 total	246,000	St. John strain, captive and sea-run combined total.
5-yr Avg.	**138,000**	**Sea-run broodstock only**, excluding year 2000.

[1] *In well water at Mactaquac*
Data via DFO Mactaquac.
[2] *MBF = Mactaquac Biodiversity Facility (hatchery)*

To compensate for the lack of sea-run broodstock and increase production at the DBFH, the ASNM developed a program with the DFO and the Commission to captive-rear broodstock at the MBF. The first eggs from the new captive-reared broodstock program were available in 2003 (Table 1.). The Commission is providing biological oversight and evaluation in addition to financial and technical assistance to ASNM in this endeavor.

Adult Salmon. DFO transported 49 sea-run grilse (41 male, 8 female) captured at the Mactaquac fish trap and released them above the Tinker Dam near the Maine-New Brunswick border as per standing agreement with ASNM

Broodstock Management

The strategy developed in 2000 to individually test all broodstock at Mactaquac for diseases and incubate eggs from each mating in isolated lots has been adopted as the standard operating practice for eggs destined for the Aroostook River. This procedure increases the likelihood that eggs will be available for importation to the Aroostook program. Spawning fluid samples collected at Mactaquac for disease testing by the Maine IFW Fish Health Laboratory were imported and transported by Commission staff in 2003 to prevent delays clearing customs that might jeopardize the integrity of the samples. The Commission coordinated the importation and statutory requirements with the US Customs Service and with several USFWS law enforcement and biological divisions.

The number of sea-run broodstock allocated for Aroostook egg production, typically 25 males and 25 females, was reduced by 24% in 2003 as a consequence of continued low adult returns to Mactaquac. A total of 19 MSW females were spawned with 19 males in November 2003 to produce an estimated 150,000 eyed-stage eggs for transfer to the ASNM Dug Brook Hatchery early in 2004. The DFO and IFW are currently conducting the required disease testing of all Aroostook/St. John broodstock spawned in 2003 and results are expected in early January. Two cohorts of the captive-reared adult broodstock were also available for spawning this fall, producing an estimated 400,000 additional eyed-stage eggs for stocking next year.

3. Habitat

Habitat Surveys

Detailed habitat surveys were completed for two headwater tributaries, Mooseleuk Stream and Munsungan Stream, in conjunction with research to evaluate the fry-stocking program. An exploratory habitat survey was also conducted on 37 km of another major tributary, the Big Machias River, to facilitate planning for future surveys and fry stocking.

Water Quality

Temperature data loggers were deployed at two sites in the Aroostook River drainage in 2003. One was placed in Mooseleuk Stream and one in Munsungan Stream to monitor temperature in fry stocking reaches. The loggers were deployed on June 17, 2003 and recovered October 24, 2003.

4. Fish Passage

Fish Passage Consultation and Review

The USFWS in consultation with the Commission is exploring options to obtain federal grants that may be applicable to repairs at the fishway at a dam on the Little Madawaska River. The impoundment created by the dam serves as the primary water source for the Loring property and is considered vital to the long-term development goals of the LDA. Transfer of dam ownership from the U.S. Air Force to the LDA was finalized in 2000

5. Public Meetings and Outreach

The Commission staff attended Aroostook River meetings with the Atlantic Salmon for Northern Maine organization and with the international St. John River Advisory Committee in St. John, New Brunswick.

COVE BROOK

Cove Brook is located on the northern edge of Waldo County whereas one of its small tributaries, Baker Brook, originates in southern Penobscot County. It is the smallest of all the listed salmon rivers in Maine. Cove Brook is a small tributary to the Penobscot River estuary located approximately 21 km below the Veazie Dam (head of tide). Cove Brook flows approximately 16.5 km from its headwaters and drains a watershed of only 24.6 square km in Winterport and Hampden. The National Marine Fisheries Service (NMFS) and the U. S. Fish and Wildlife Service (USFWS) listed the Atlantic salmon population in Cove Brook as endangered on November 13, 2000. The Commission staff conducted the following enhancement and management activities on Cove Brook in calendar year 2003.

1. Population Monitoring

Electrofishing

Juvenile salmon populations were surveyed by electrofishing at three sites on Cove Brook. The Pipeline and Back Winterport Road index sites, as well as the gravel pit area, all located in Winterport, were sampled in September. There were no young-of-year (YOY) salmon or parr found at any of these sites in 2003.

Redd Counts

There were two attempts to find redds in Cove Brook in 2003 (November 3 and December 3). Two redds and three digs were found on the second outing. Summer long low flows in Cove Brook likely limited access for adult salmon to upriver spawning grounds for most of the summer, but by the beginning of October water levels were sufficient for migration. On the November 3rd survey, there had been no spawning in the brook, but on Dec. 3 fresh activity was observed.

2. Habitat

Property Purchases or Conservation Easements

The Cove Brook Watershed Council, incorporated January 2001, completed their Watershed Management Plan during 2003 with funding provided by the Maine State Planning Office in Augusta. Copies can be acquired through the Cove Brook Watershed Council or the Commission.

Obstruction Surveys and Removal

Two obstruction surveys were conducted on Cove Brook during October to identify potential Atlantic salmon passage problems. One beaver dam was breached near the mouth of Baker Brook in

the mainstem of the brook. Higher than average flows in October and November, provided for adequate fish passage in the mainstem of Cove Brook.

Water Quality

The Commission recorded summer water temperatures on Cove Brook at three sites: gravel pit, Back Winterport Road, and Pipeline. One temperature logger disappeared mid way through the season and was most likely stolen. We also collected three water quality samples. These samples were taken during spring run off, summer low flows, and a fall rain occurrence. MDEP also collected water quality data from Cove Brook, consisting of storm water run-off and base flow water conditions. In addition to the summer collection of water temperature data, the Commission also anticipates collecting temperature data at one location during the upcoming winter months. All data are currently being analyzed.

3. Meetings

Commission biologists attended monthly Cove Brook Watershed Council meetings and participated in volunteer training activities as well as work plan preparations for the watershed management plan.

DENNYS RIVER

The Dennys River is located in eastern Washington County. Beginning at Meddybemps Lake it flows approximately 32 km to its confluence with Cobscook Bay in the Town of Dennysville. Cathance Stream is the only major tributary. The Atlantic salmon population was listed as endangered by the National Marine Fisheries Service (NOAA-Fisheries) and the U. S. Fish and Wildlife Service (USFWS) on November 13, 2000. The Commission conducted the following enhancement and management activities during calendar year 2003.

1. Population Monitoring

Adult Weir Operations

A weir, located at the head of tide in Dennysville, was operated from 8 May through 28 October 2003 to trap upstream migrating salmon for the purposes of evaluating the size of the wild run and to intercept escaped aquaculture fish. We captured a total of eleven salmon. Four one sea-winter salmon were captured. Of these, two originated from smolt stocking in spring 2002, one was an aquaculture suspect, and one was of unknown origin (escaped before being handled). In addition, 7 multi-sea winter salmon were captured. Of these, five originated from smolt stocking in the spring of 2001, one was a wild fish, and one was an aquaculture suspect that was mistakenly released upstream due to misreading the fish's scales. All fish, except one aquaculture suspect, were released upstream after measuring length, and taking scale and tissue samples. We sacrificed one suspect aquaculture fish captured in the

trap in accordance with Commission protocols. This salmon was photographed, weighed, measured, scale sampled, tissue sampled for genetics and disease, and evaluated for sexual maturity. The trapping operation was discontinued early due to unusually high flows associated with heavy rain events. Damage to the weir and water going over the weir made continued operation unsafe and impossible.

Electrofishing

We electrofished 25 sites in the Dennys River drainage, collecting population estimate data for juvenile salmon at 24 sites. The population estimate data collection efforts were structured around a Basin-wide Geographical Population Estimate (BGEST) sampling design. The drainage was divided into environmentally similar strata and electrofishing sites were randomly chosen within these strata. This approach allows us to more accurately estimate the juvenile population in the river and better evaluate the effects of environmental factors and management approaches on the juvenile salmon population.

The preliminary standing crop estimate of Atlantic salmon parr in the Dennys River was 4536 in 2003 with a basin-wide parr density of 2.9 parr/unit. However, in 2003, approximately 12% of the parr captured (576) were from a stocking of parr the previous fall. This indicates that production in the river is lower than the overall 2.9 parr/unit. Density of young-of-the-year (YOY) has been extremely low in 2001 (median 0.34 YOY/unit), 2002 (median 1.88 YOY/unit), and 2003 (1.8 YOY/unit) in spite of stocking fry and releasing mature adults in 2000 and 2001.
In addition to population estimates, we sampled 30 parr across three sites in the Dennys drainage, performing gill biopsies for PCB exposure analysis. These samples were shipped to Michigan State University for analysis.

Telemetry

We assisted NOAA-Fisheries by scanning with a VR-60 ultrasonic telemetry receiver for smolts tagged with ultrasonic pingers when we tended the smolt trap. We did not detect any pingers. This was to aid in interpreting data recorded by automated telemetry receivers.

Redd Counts

We conducted redd surveys in fall 2003 on the Dennys River. We counted one redd in the Stoddard Rips habitat. Spawning may have occurred later than normal due to unusually high water from the fall rains. Because of this, we may have missed some redds. Follow up surveys have not yet been conducted due to high water in the river.

Smolt Trapping

In 2001, the Commission began an effort to trap emigrating smolts in the Dennys River as the initial stage of evaluating a five-year smolt-stocking program in the Dennys. In 2001, two weir-based smolt traps (WBST) were used, The WBSTs were again installed in 2002, and the Commission used a five-foot rotary screw trap (RST) in the Dennys River. For 2003, WBST use was discontinued and only RST were used to capture smolts.

Our smolt trapping objectives are to establish index numbers of emigrating wild smolts, collect biological samples and data from emigrating hatchery and wild smolts, including lengths, weights and run-timing, and monitor the releases of hatchery smolts.

The USFWS and Commission stocked the Dennys River with 1+ smolts reared at Green Lake National Fish Hatchery (GLNFH) on April 28 and May 9 (Table 4.1). the numbers of smolts stocked are given in Table 7. Each stocking group was marked with a unique visual elastomer tag (VIE) allowing the performance of fish stocked at these times. The stocking sites were selected to evaluate the distance migrated. In addition, 16,522 and 33,400 0+ parr were stocked in the Dennys in fall 2001 and 2002 respectively. These fish were marked with a left ventral clip in 2001 and a right ventral clip in 2002.

Table 7. 2003 Smolt Releases in the Dennys River

Stocking Date	Stocking Location	River km	Mark Location	VIE Color	Fin Clip	Number Stocked
28-April	Robinson's Camps	4.07	Right Eye	Blue	Adipose	25,002
28-April	Meddybemps	35.40	Right Eye	Yellow	Adipose	3550
9-May	Robinson's Camps	4.07	Left Eye	Blue	Adipose	23,160
9-May	Meddybemps	35.40	Left Eye	Yellow	Adipose	3544
Combined*	Combined	--	both	both	Adipose	615
					Total	***55,871***

*smolts measuring < 150mm considered to be "spring parr" by GLNFH and counted separately.

Results

Commission staff tended the traps every day from 14 April to 1 June. We captured 963 smolts in the RST. Of these, 839 were from smolt stocking, 18 were of wild origin, 10 were from fall parr stocked in 2001, and 96 were from fall parr stocked in 2002 (Table 8). Hatchery smolt capture rates in the RST ranged from 0.5 % to 2.5 %. There was no significant difference in capture rates between smolts released at Meddybemps and smolts released at Robinson's Camps (Chi Square test for expected frequencies, $p > 0.25$), suggesting that smolts had similar survival rates among release sites.

Table 8: Rotary Screw Trap Captures in 2003

Smolt Stocking Location	Release Date	Origin	Stocking Life Stage	Capture Totals	Number Stocked	Capture Rate
NA	NA	Wild	NA	18	--	--
Robinson's Camps	28-April	Hatchery	smolt	128	25,002	0.005
Meddybemps	28-April	Hatchery	smolt	32	3,550	0.009
Robinson's Camps	9-May	Hatchery	smolt	588	23,160	0.025
Meddybemps	9-May	Hatchery	smolt	62	3,544	0.017

Unknown	Unknown	Hatchery	smolt	29	--	--
NA	Fall 2001	Hatchery	0+ parr	10	--	--
NA	Fall 2002	Hatchery	0+ parr	96	--	--
			Total	***963***		

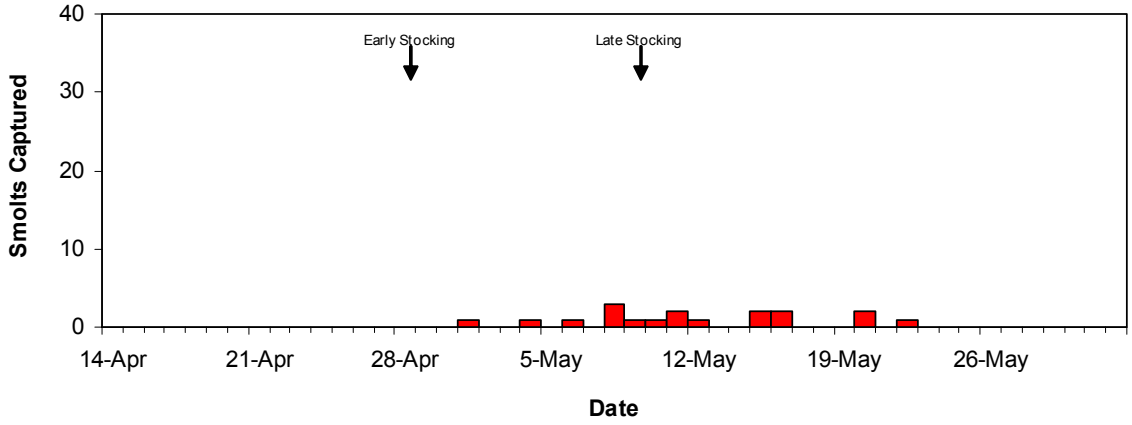
The median capture date for wild smolt was 11 May, with the first wild smolt captured on 1 May and the last on 22 May. Smolt from the 28 April release at Robinson's Camps were captured starting 29 April, with 1 May the median capture date, and the , the last fish seen on 11 May. The 9 May release at Robinson's Camps produced a median capture date of 11 May, with the first smolt captured on 10 May, and the last on 19 May. From the 28 April release at Meddybemps the first smolt was captured on 2 May, and the last on 21 May. While smolt from the 9 May release at Meddybemps were captured from 11 May, and the last on 20 May (Table 9).

Table 9. Temporal Distribution of Smolt Captures at the Rotary Screw Trap: 2003

Origin	Stocking Location	Release Date	First Capture	Median Capture	Last Capture
Wild	NA	NA	1-May	11-May	21-May
Fall Parr 2002	NA	NA	2-May	10-May	27-May
Hatchery	Robinson's Camps	28-April	29-April	1-May	11-May
Hatchery	Meddybemps	28-April	2-May	9-May	21-May
Hatchery	Robinson's Camps	9-May	10-May	11-May	19-May
Hatchery	Meddybemps	9-May	11-May	16-May	20-May

Wild smolts were captured over a protracted time period, while most hatchery smolts were captured within several days of their release (Figures 1-6). Smolts derived from fall parr had a migratory period similar to wild smolts. In 2001, smolts released at Meddybemps typically took one day longer to reach the RST than fish released at Robinson's Camps, suggesting that the trip from Meddybemps to Robinson's Camps took these fish approximately one day. Hatchery fish were released before and during the peak of the wild smolt migration. Wild fish movement did not seem to follow short-term trends in flow; however, the overall smolt run did follow seasonal declines in flow and all wild smolt captures occurred at water temperatures between 9 and 17° C. The mean daily flow is from the USGS gauge and is not adjusted for Cathance Stream.

Figure 1. Timing and Magnitude of Wild Smolt Captures (RST): 2003



Note changing vertical scale

Figure 2. Timing and Magnitude of Hatchery Smolt Captures (RST): 2003

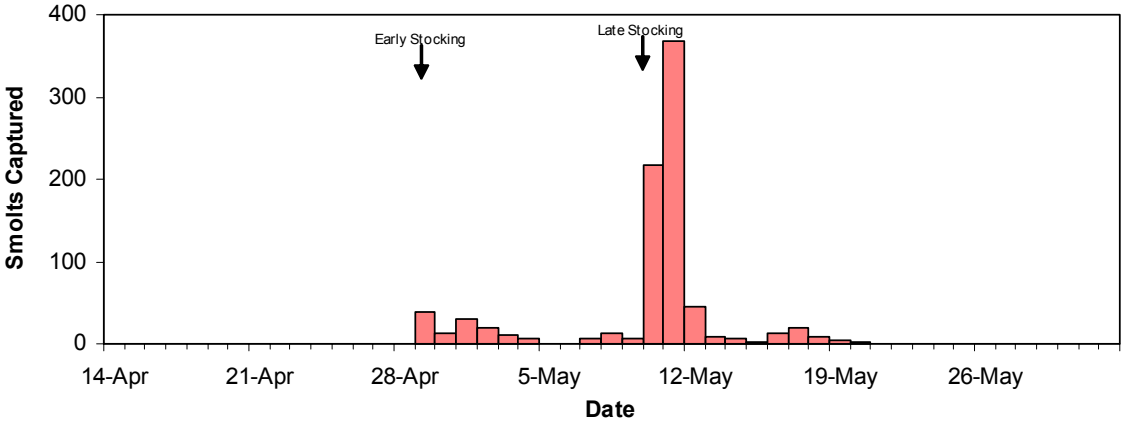


Figure 3. Water Temperature and Discharge During Smolt Trapping Operation: 2003

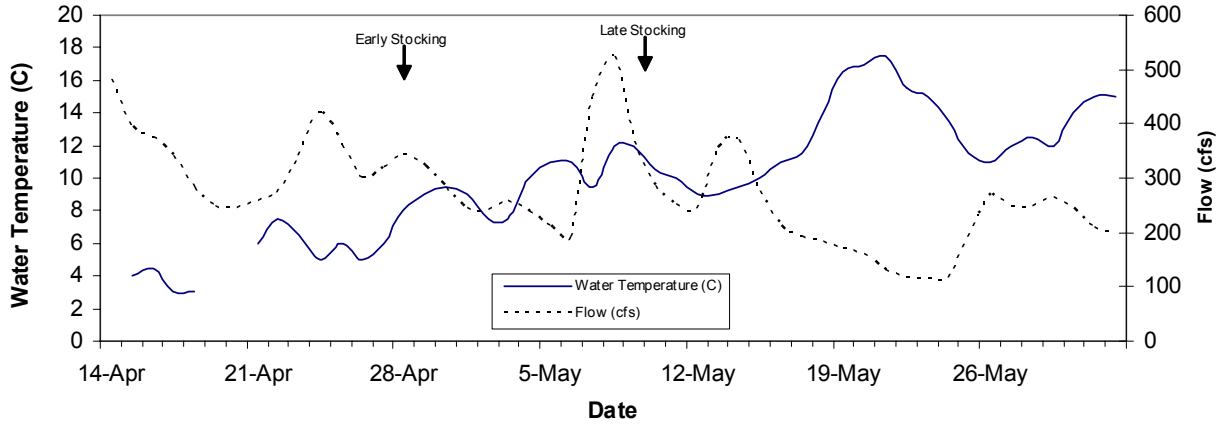


Figure 4. Magnitude and Timing of 2003 Smolt Captures originally stocked as Fall Parr.

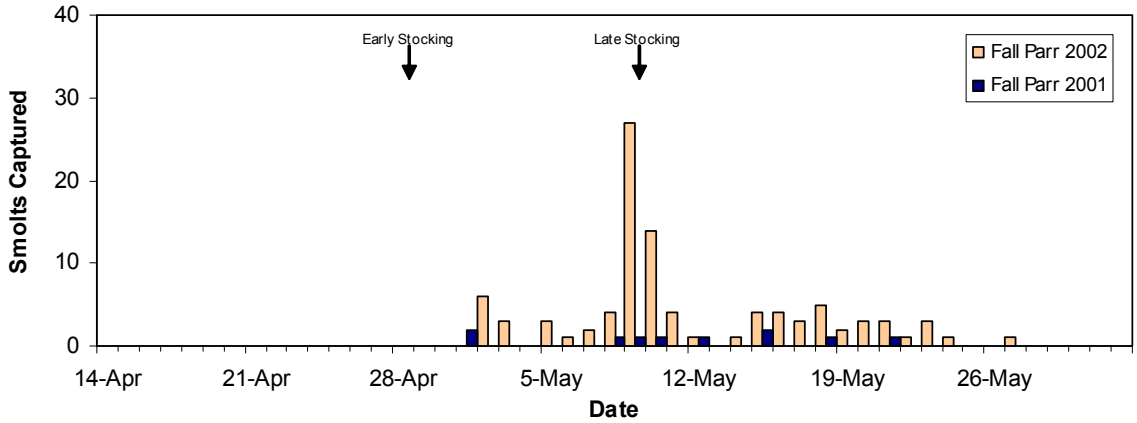


Figure 5. Magnitude and Timing of Captures from Robinson's Camps (km 4.07) Smolt Releases: 2003

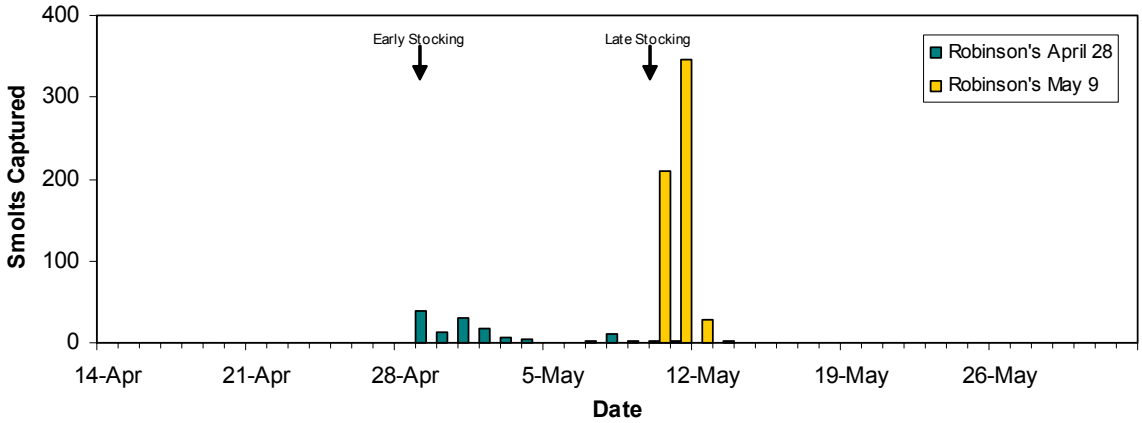
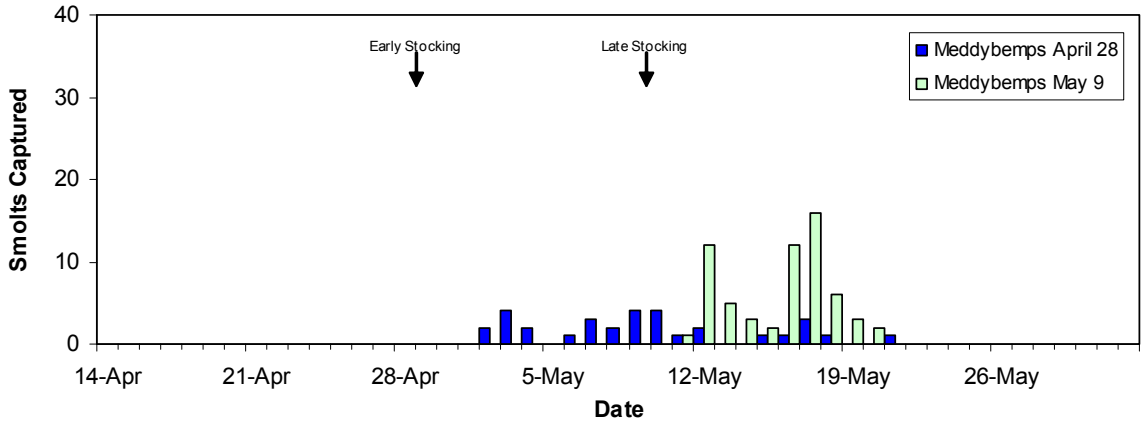


Figure 6. Magnitude and Timing of Captures from Meddybemps (km 35.40) Smolt Releases: 2003



Estimation of wild smolt population size:

We attempted to estimate the number of wild smolts emigrating from the Dennys River using two methods. Method one used the volumetric proportion of the river discharge sampled on a daily basis by the RST to expand the number of wild smolts captured. Using this method, we estimated the wild smolt population to be 1156 (Table10). Emigrating hatchery fish were also estimated by release group. The second approach modified the calculations to adjust for trap avoidance behavior based on captures of marked smolts. Comparing these estimates, it seems that survival rates for smolts stocked at Meddybemps were similar to those for smolts stocked at Robinson's Camps in spite of traversing 31 km of additional river.

Table 10. Population Estimates of Hatchery and Wild Smolts from the Volumetric Method

Smolt Stocking Location	Release Date	Origin	Stocking Life Stage	Population Estimate	Number Stocked	Estimate Adjusted for Trap Avoidance
NA	NA	Wild	NA	332	--	1,275
NA	2001	Hatchery	Fall Parr	184	--	707
NA	2002	Hatchery	Fall Parr	1,770	--	6,809
Robinson's Camps	28-April	Hatchery	smolt	2,520	25,002	9,691
Meddybemps	28-April	Hatchery	smolt	612	3,550	2,355
Robinson's Camps	9-May	Hatchery	smolt	10,429	23,160	40,110
Meddybemps	9-May	Hatchery	smolt	983	3,544	3,780
			Total	***16,830***	***55,256***	***64,728***

In 2003 we captured 96 smolts stocked as parr the previous fall compared to 23 in 2002. Approximately twice the number of fall parr was stocked in 2002 as in 2001. This difference is likely the cause of the increase in smolts derived from fall parr in 2003, and may have had a larger impact on wild parr. These data suggest that either wild smolts declined independently of fall parr, or there was an ecological interaction between wild parr and stocked fall parr that resulted in decreased numbers of wild parr. The interaction between fall parr and wild salmon should be investigated and management strategies adjusted if necessary.

2. Population Enhancement

Stocking

We stocked several life-history stages of salmon into the Dennys River including 55,244 smolts at two sites in Spring 2003, 133,00 fry distributed into appropriate habitat throughout the drainage in May, and 30,400 0+ parr at four sites in October.

Broodstock Collection

We collected 276 parr via electrofishing for transfer to the captive broodstock program at Craig Brook. All fish were weighed, measured, and sampled for scales and tissue (genetics).

3. Habitat

Substrate Embeddedness Survey

We initiated a survey of substrate embeddedness on the Dennys in 2002. Data has been compiled and analysis is underway. A detailed report will be available in spring of 2004. Initial calculations produce embeddedness measures ranging from 0.75 to 4.6, within the range reported by other researches.

Habitat Enhancement

Kleinschmidt and Associates completed an Instream Flow Incremental Methodology (IFIM) study on the Dennys in 2002. Using the IFIM, we have adjusted water releases at the Meddybemps dam to optimize salmon habitat and optimally manage the water budget of the system. This has resulted in an increased ability to hold water in the lake, as well as release optimal flows for Atlantic salmon. Our target for optimal salmon habitat throughout the drainage is 80 cfs at the USGS gauge on the Dennys mainstem. Although we were able to maintain this through much of the summer, the river fell below this level at times. However, we were generally able to provide better flows for the river than in the past, while maintaining higher lake levels. We are currently ahead of schedule for lake level and anticipate that the lake will be full by spring, allowing us to fully implement the water management regime in 2004.

Figure 7.

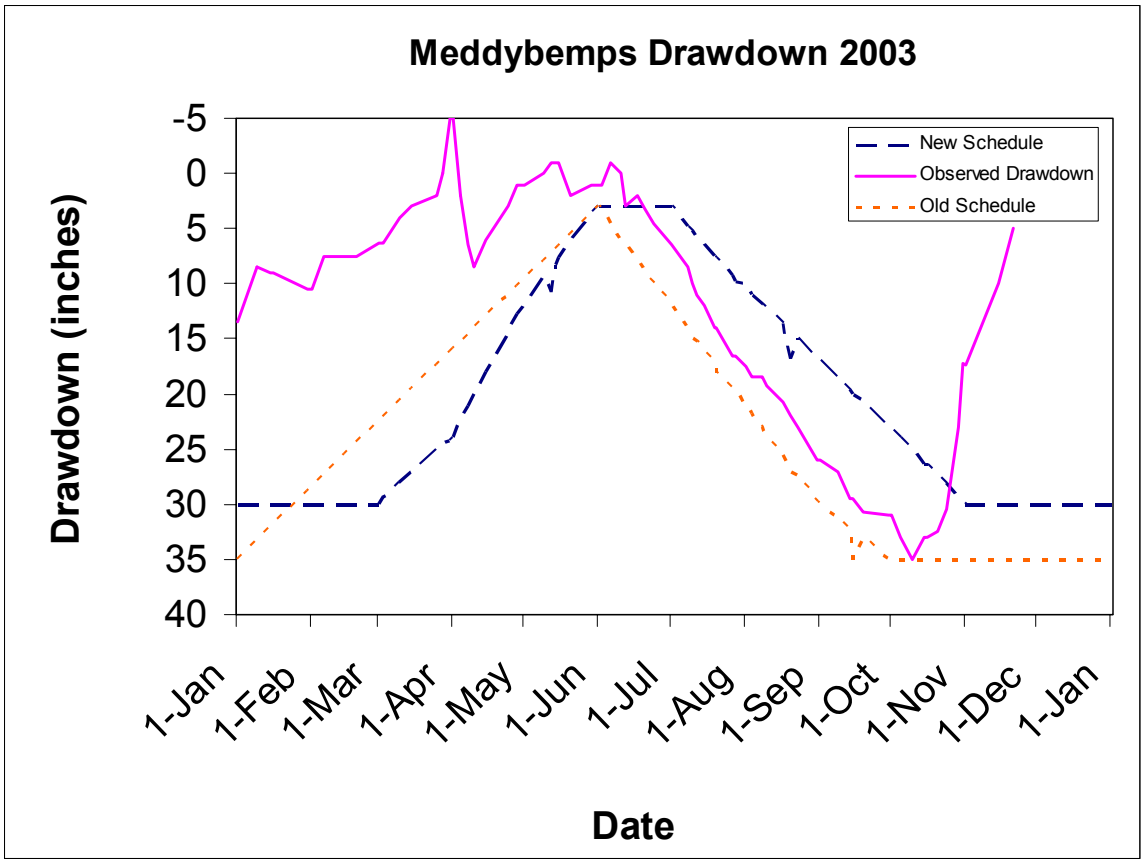
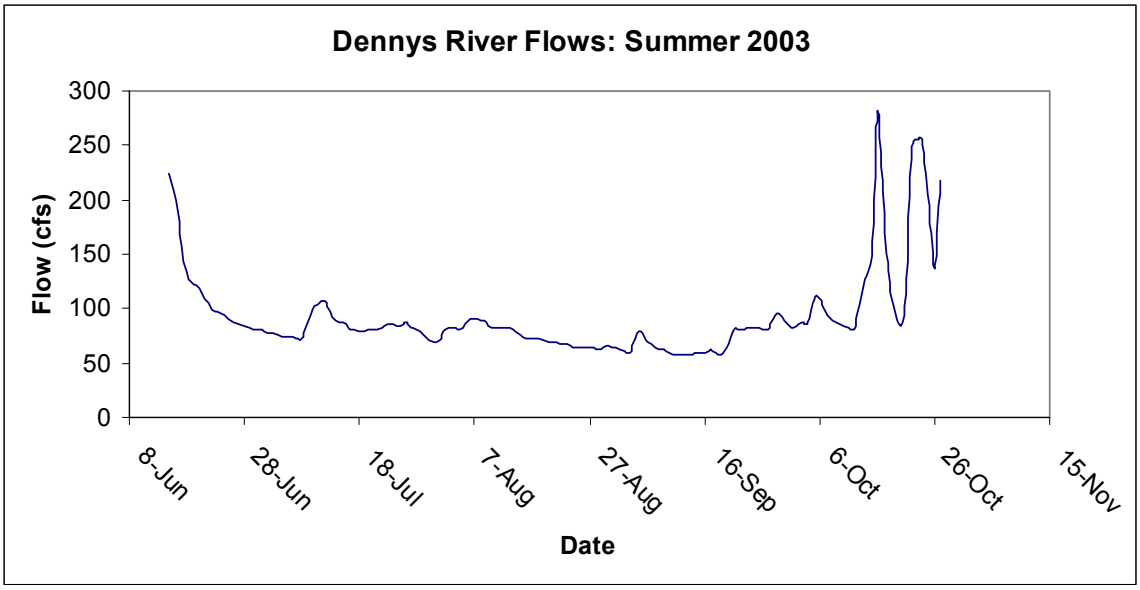

Meddybemps Drawdown 2003
Drawdown (inches)
-5
0
5
10
15
20
25
30
35
40
New Schedule
Observed Drawdown
Old Schedule
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
1-Jan
Date

Figure 8.



In 2003 we were able to greatly improve the lake levels (higher lake levels), but we were unable to meet the new rule curve. Although 2003 had abundant rain, Meddybemps Lake levels depend greatly on the timing of the rain. Specifically, lack of rain in summer months will result in low lake levels because Meddybemps Lake has limited water storage and inflow.

Property Purchases or Conservation Easements

The Commission owns and manages most of the riparian habitat along the Dennys River and Cathance Stream. This ensures the integrity of the streamside habitat along the Dennys River and will provide significant benefit to all fish and wildlife, particularly Atlantic salmon. A land management plan for these properties, based on a fully integrated public process, is available from the Commission. The plan will be implemented based on available funding.

Obstruction Surveys and Removal

We documented obstructions to fish passage while conducting redd counts in the fall. We did not record any fish passage problems on the main stem or lower Cathance Stream. We did not perform any obstruction removal in 2003.

The Commission is cooperating with, and monitoring, a study on the effects of beaver dams and beaver dam removal on Venture Brook, a tributary of the Dennys River that historically contained salmon habitat, but became largely inundated by beaver dams. Dr. Alan Lewis and Dr. Sherrie Sprangers at the University of Maine, Machias, are conducting this study. Students from the University removed four beaver dams on Venture Brook in Fall 2002, and conducted additional removal of these same dams in 2003. Prior to removal, and as follow-up monitoring, they took samples to estimate the load of fine sediments in the beaver impoundments, survey benthic macro invertebrate populations, and monitor water quality. In 2003, students from the University collaborated with the Commission's biologists to survey fish species in Venture Brook. This study is designed to run for several years.

Habitat Surveys

Habitat surveys on the Dennys River are complete and no new surveys were conducted in 2003. We re-surveyed Cathance Stream in 2002 because the original survey had errors in the spatial data. These data will be available in GIS in spring 2004.

4. Public Meetings and Outreach

The Commission's staff attended meetings of the Dennys River Watershed Council, Dennys River Sportsmen Club, Downeast Rivers Coalition, Downeast Salmon Federation and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the Dennys River watershed. The president of the Meddybemps Lake Association was briefed on lake levels and water management by phone and email.

DUCKTRAP RIVER

The Ducktrap River is located in Waldo County. It flows approximately 17 km from its source at Tilden Pond to its confluence with the lower Penobscot River estuary at Ducktrap Harbor in Lincolnville. Kendall Brook, Tucker Brook, and Black Brook are the only major tributaries. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) listed the Atlantic salmon population in the Ducktrap River as endangered on November 13, 2000. The Commission conducted the following enhancement and management activities on the Ducktrap during calendar year 2003.

1. Population Monitoring

Electrofishing

The two index sites on the Ducktrap River were sampled during September. No young-of-year (YOY) salmon were found but one parr was captured. Biological data (length, weight, scale sample for age determination) was collected from the one salmon parr sampled at the Rt. 52 index site.

Redd Counts

There was one attempt to document spawning in the Ducktrap River in the fall of 2003. On November 12, two redds and two digs were observed. However, no adult salmon were actually observed in the Ducktrap. In past years, brook trout had been observed digging redds, but high water levels this year made observation of the smaller digs unnoticeable. Summer long low flows in the Ducktrap likely limited adult salmon access to upriver spawning grounds until late fall when significant rains provided access throughout the fall season. It is entirely possible that there may have been more spawning above the Rte. 52 crossing. However, due to high water levels, lack of sunny days to observe spawning activity, and freezing temperatures, it was impossible to undertake further redd count surveys.

2. Habitat

Property Purchases or Conservation Easements

The Coastal Mountains Land Trust (CMLT) and Ducktrap Coalition completed one riparian land protection project during 2003. A total of 82% of the land along the river and 46% of the lands along Tucker Brook, Black Brook, and Kendall Brook are now in conservation easements. CMLT also advanced negotiations with four other landowners and anticipates some of these projects will be completed in 2004. The Ducktrap River Keepers continued to monitor the river corridor for land use conditions and general environmental quality.

Obstruction Surveys and Removal

Obstructions on the Ducktrap River were not a significant problem this year. One survey of the river was undertaken on October 20th and five beaver dams were breached in the upper portion of the watershed near Tucker Brook. Significant rains throughout the following weeks made other survey trips unnecessary.

Water Quality

Commission staff recorded summer water temperature on the Ducktrap River at two sites: below the Rte. 52 and the Dickey Mill Road bridges. MDEP also collected water quality data from the Ducktrap. In addition to collecting summer water temperature data, the Commission anticipates collecting temperature data at one location throughout the winter months. The Commission also collected water quality grab samples on July 29 and October 28. These data will be used to create a catalog of water quality data for future reference. Temperature data will be analyzed during upcoming winter months.

3. Meetings

The Commission staff attended several meetings of the Ducktrap Coalition.

EAST MACHIAS RIVER

The East Machias River is located in Washington County. Originating at Pocomoonshine Lake, it flows approximately 59 km to its confluence with the Machias Bay in the town of East Machias. Beaverdam Stream, Northern Stream, Seavey Stream and Chase Mill Stream are significant tributaries in the drainage. The Atlantic salmon population was listed as endangered by the National Marine Fisheries Service (NOAA-Fisheries) and the U. S. Fish and Wildlife Service (USFWS) on November 13, 2000. The Commission, in an effort to restore the salmon, conducted the following enhancement and management activities in calendar year 2003.

1. Population Monitoring

Adult Weir Operations

The Commission obtained State and Federal permits to install a salmon weir on the mainstem of the East Machias River at the Gaddis pool site, just upstream of the Route 1 Bridge. Local permitting issues delayed installation of that weir. Alternative sites have been chosen and landowner permission, site surveys, and preliminary design were begun in 2003. One site is located on the main stem East Machias at the Route 191 crossing. The other site is located within Chase Mill Stream a tributary that enters the river below the Route 191 crossing. Both sites are necessary to ensure aquaculture escapees are excluded from spawning areas in the watershed.

Electrofishing

We conducted multiple-pass depletion population estimates at eight sites within the East Machias drainage in 2003. Median density of parr was 5.3 parr/unit and median density of young-of-the-year (YOY) was 9.4 YOY/unit. This is higher than in 2002 when median parr density was 4.2 parr/unit and median YOY density was 5.5 YOY/unit.

Redd Counts

We conducted redd surveys of the East Machias River covering a majority of the available spawning habitat. We counted one redd, located in Chase Mill Stream. High water and poor visibility made complete surveys impossible and we were unable to visit at least two high-quality spawning areas. The number of redds is extremely low in areas we were able to survey. Possibly more spawning has occurred in areas that we were unable to survey

2. Population Enhancement

Stocking

We stocked approximately 314,000 fry into appropriate habitat throughout the drainage in May. Of these, we stocked 51,775 in minor tributaries because we had an abundance of fry. We consulted with Inland Fish and Wildlife biologists before stocking to avoid fish management conflicts. No smolts or pen-reared adults were stocked in the East Machias River this year.

Broodstock Collection

We collected 160 parr for use as captive broodstock. These fish were transported to Craig Brook National Fish Hatchery.

3. Habitat

Embeddedness Survey

We initiated a survey of substrate embeddedness on the Downeast salmon rivers in 2002. This method estimates the degree to which stream substrate has been filled in with fine sediments. High embeddedness (or low Interstitial Space Index "ISI") has been shown to be negatively correlated with salmonid populations, as well as other organisms such as insects. We re-measured embeddedness at the Munson bridge replacement site after bridge construction was finished. The data are compiled and will be analyzed and reported during the 2004 winter.

We analyzed embeddedness in the river above and below the Munson bridge site from before (2002) and after (2003) the bridge construction. The bridge replaced a ford where trucks and ATVs drove through the river. We found that upstream of the bridge there was no significant difference in embeddedness or ISI between years, but below the bridge we saw a statistically significant decrease in embeddedness and increase in ISI. This is what we would predict if the bridge itself made a positive difference in the habitat quality. We conclude that the installation of the bridge improved the substrate conditions in this area for salmon.

Obstruction Surveys and Removal

We documented obstructions to fish passage during other fieldwork. We did not record any fish passage problems on the mainstem, but we breached five beaver dams on Northern Stream prior to spawning season. Ensuing high water made beaver dam passage problems elsewhere unlikely.

4. Public Meetings and Outreach

The Commission staff attended meetings of the East Machias River Watershed Council, Downeast Rivers Coalition, Downeast Salmon Federation and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the East Machias River watershed.

KENDUSKEAG STREAM

Kenduskeag Stream drains an area of 554 square km west of Bangor and is the largest lower Penobscot River tributary. Atlantic salmon have been found in many of the cooler tributaries above Kenduskeag Village in recent years including French Stream, Black Stream, Pierre Paul Brook, Allen Stream, and Crooked Brook. The Commission, in cooperation with the USFWS, NMFS, MDIFW, PIN, USDA, and additional stakeholders, conducted the following enhancement and management activities in calendar year 2003.

1. Population Monitoring

Electrofishing

An extensive biomass index survey was conducted in support of a stream restoration project in a degraded stream reach. The biomass survey consisted of 16 200-foot sections, eight of which are located in a control section and eight in the restored area. Of the 16 sections, eight were electrofished. Each section had blocking seines positioned at the start and end of the section to eliminate fish immigration or emigration into or out of the section. In each section, all fish species caught were counted and a subsample of 30-60 fish of each species were weighed and measured. A total of 1,300 fall parr from Green Lake National Fish Hatchery were stocked in the sections with the fish spread equally throughout the 16 sections. The control section fish had their left ventral fin excised (LV mark) whereas the restored area salmon had their right ventral fin removed (RV mark). The fish were given a week to acclimate to their new environment after which one-run presence/absence surveys were undertaken. Approximately 80 fish were placed in each of the 16 sections with about 23 salmon caught in each of the eight control sections and 30 in five of the restored sections, or 330 total parr. Additionally, two parr from the 69 salmon sampled in 2002 were caught, each bearing an upper caudal fin clip (UC mark). This field season marked the beginning of a three-year project to study parr survival in a restored stream reach compared to a control area.

A seine is used to count parr on the Kenduskeag

Redd Counts

Four redd count surveys were conducted on the mainstem (October 4, 6, 17, and 18), each covering only portions of the spawning habitat in part because of the greater drainage area of the Kenduskeag and time constraints it took to cover large expanses of habitat. Most areas were sampled once, however, areas of known prior spawning activity were checked two times. Three redds were observed in the mid reaches of the mainstem. Surveys of spawning activity in the Kenduskeag were emphasized due to the fact that a number of adult salmon had been seen in the lower river over the summer. However, with little spawning observed, it is presumed many of these fish later returned to the Penobscot River to continue their upstream migration.

2. Habitat

Water Quality

Water temperature data were collected with thermograph units at nine sites. Thermographs were placed throughout the drainage starting at the northern most site: Millet Road (approximately 2.5 miles below Garland Pond in Garland); Fernald Road (the area where salmon parr were found); the confluence of French and Allen Stream; Beans Mills Road crossing (the start of heavy agriculture use); Corinth Road crossing; Covered Bridge; Kenduskeag Village; the end of Ohio Street in Glenburn; and Six Mile Falls. These sites were chosen in an attempt to gain a complete river temperature profile and to also identify areas of potential concern for high summer water temperatures. The upper river in Corinth is small and has greater canopy cover and spring water influences than the lower river. The lower Kenduskeag is wider and more exposed, allowing for significant daily fluctuations in temperatures. The lower river also has a greater agricultural use. Temperature data will be analyzed during winter 2003-2004 and will be available in late spring by contacting the Commission. We gathered three water quality samples: during spring run off, summer low flows, and fall rains. Data will be available upon request.

Obstruction Survey and Removal

During the fall of 2003, obstructions and beaver dam breaching was not conducted due to significant rainfall. Follow up surveys were conducted in late October to verify access to all the spawning areas with areas remaining free of obstructions for the entire fall.

Habitat Survey

In 2003, the remainder of the mainstem below Six Mile Falls was surveyed. Two significant tributaries were also surveyed: French Stream and Crooked Brook. Data are being analyzed over the fall and winter of 2003-2004.

Habitat Protection

A restoration project supported by NRCS, USFWS, NMFS, and ASC, has been in the planning stages since 2002. Some project work was undertaken over the summer of 2003 and will be finalized during the summer of 2004. A geomorphic assessment of a degraded stream reach was completed by the USFWS that will guide stream channel restoration at the old Bacon Mill site. A 25-foot bridge

crossing was replaced with a larger 65-foot bridge to eliminate a pinch point in the stream. The local Trout Unlimited Chapter also conducted tree plantings.

KENNEBEC RIVER

The Kennebec River is located in Somerset, Piscataquis, Kennebec, and Sagadahoc counties. It flows 222 kilometers (km) from its source at Moosehead Lake to the head of Merrymeeting Bay. Encompassed in its 15,540 sq. km basin, the Kennebec River has eight major tributaries along with numerous small streams. The river currently has a small population of Atlantic salmon confined to the portion of the river and its tributaries below the first impassable dam in Waterville. The Commission conducted the following management activities in calendar year 2003.

1. Population Monitoring

Electrofishing

We electrofished four sites in three tributaries: Bond Brook, Togus Stream, and Sandy River. All sites were evaluated using a single pass measured method except one site in the Sandy River where a three-pass depletion method was used. This data is still being complied. A summary can be obtained by contacting the Commission.

Redd Counts

The mainstem of the Kennebec River was not surveyed due to high water conditions. We did, however, complete one survey of Bond Brook, Togus Stream, and Sevenmile Stream between November 13 and December 5. No redds were found.

2. Habitat

Habitat Surveys

The ASC conducted Atlantic salmon habitat surveys in tributaries of the Kennebec River to determine the amount of potential habitat that exists for spawning and juvenile rearing in the basin. Partial surveys on the Sandy and Sebasticook rivers encompassed approximately 45 km of riverine habitat.

Temperature Monitoring

Eleven data loggers were deployed in Saddleback Stream, Mt. Blue Stream, Valley Brook, South Branch, Orbeton Stream, and the Sandy River to record summer river temperatures. A summary of these data can be obtained by contacting the Commission.

3. Meetings

Hydro Relicensing

Staff attended numerous meetings and field events associated with the hydro relicensings of the Lockwood (Florida Power and Light), Sandy River (Town of Madison), and Fort Halifax (Florida Power and Light) projects.

Highway and Bridge Projects

Staff attended interagency meetings sponsored by the Department of Transportation that discussed highway improvement projects located within the Kennebec River drainage.

Presentations

Staff presented a poster at the alewife festival held by the Kennebec Chapter of Trout Unlimited in Winslow.

Biological Assemblage Project

We attended meetings and supplied comments to Kleinschmidt Associates regarding a biological assemblage project conducted between Bingham and Merrymeeting Bay on the Kennebec River.

4. Research

Experimental Sampling

In collaboration with Kleinschmidt Associates, the Commission conducted electrofishing surveys on the mainstem Kennebec River between The Forks and Madison to evaluate the possibility of boat electrofishing as a method of obtaining population estimates for juvenile salmon in large river systems. The data is currently being analyzed.

Streamside Incubation

The Commission incubated 43,000 Atlantic salmon eggs in experimental streamside incubators in an effort to test the feasibility of streamside incubation as a low-tech and inexpensive method of Atlantic salmon restoration. The eggs were incubated on small tributaries to the Sandy River and the hatch-out fry were released into the mainstem Sandy River in Madrid. The report for this project is available upon request from the Sidney Office.

Commission biologist releases fry into the Sandy River, a key salmon tributary to Kennebec River drainage.

MACHIAS RIVER

The Machias River is located in Washington and Hancock Counties. The river originates in Fifth Machias Lake and flows approximately 98 km to its confluence with Machias Bay in Machias. Major tributaries include Old Stream, Mopang Stream, and the West Branch Machias River. The Atlantic salmon population was listed as endangered by the National Marine Fisheries Service (NOAA-Fisheries) and the U. S. Fish and Wildlife Service (USFWS) on November 13, 2000. The Commission conducted the following enhancement and management activities on the Machias River in calendar year 2003.

1. Population Monitoring

Adult Weir Operations

There is currently no adult trapping facility on the Machias. Planned construction of a counting and sorting weir and fish trap on the Machias River has been delayed. The adult population is primarily monitored via redd counts.

Electrofishing

Staff performed multiple-pass depletion population estimates at 13 sites in the Machias drainage in 2003. The median density of parr was 2.5 parr/unit (range 0.0 to 11.2 parr/unit) and median density

of young-of-the-year (YOY) was 1.8 YOY/unit (range 0.0 to 15.8 YOY/unit) at nine sites. This indicates a drop in the median density of parr and YOY from 2002 (3.8 YOY/unit and 3.4 parr/unit).

Redd Counts

Staff conducted redd counts in most of the spawning habitat in the Machias drainage and at the time of this report had counted 21 redds. This is a substantial increase from 2002, when only three redds were counted. Both Old Stream and the Crooked River had a significant return of spawners. Eight redds were recorded in Old Stream, twelve were recorded in the Crooked River, and one was recorded in the West Branch. High water this fall precluded performing redd counts in the mainstem. The redds found in Old Stream and the Crooked river may be the result of salmon homing to their natal stream, or of other fish seeking out smaller tributaries for spawning due to high water in the mainstem of the river. Nevertheless, this increase is encouraging.

2. Population Enhancement

Stocking

We stocked 341,000 fry into appropriate habitat throughout the drainage.

Broodstock Collection

Staff collected 285 parr and 25 YOY via electrofishing for transfer to the captive broodstock program at Craig Brook National Fish Hatchery (CBNFH). We collected the YOY in an area where we observed redds last year, and it was highly unlikely the fish in the area were a result of fry stocking. This allowed us to capture progeny derived from sea-run parents for use as broodstock.

3. Habitat

Habitat Surveys

The major waters of the Machias drainage have previously been completed. However, we re-surveyed the Crooked River, an important tributary of the Machias. When originally surveyed, numerous beaver dams that are no longer present greatly affected the survey results.

Habitat Preservation and Protection

The ASC has joined with The Nature Conservancy, the Department of Conservation, and International Paper to develop a permanent conservation easement along most of the main stem of the Machias River and several of its important tributaries.

Substrate Embeddedness Survey

We initiated a survey of substrate embeddedness on the Downeast salmon rivers in 2002 and completed a survey of Old Stream in 2003. This method estimates the degree to which stream substrate has been filled in with fine sediments. High embeddedness (or low Interstitial Space Index “ISI”) is

negatively correlated with salmonid populations, as well as other organisms such as insects. We measured embeddedness at eleven sites on Old Stream, the most productive tributary in the Machias drainage. The data reside in a database and will be included in analyses this winter.

Obstruction Surveys and Removal

Obstruction removals were conducted on Old Stream, Mopang Stream, and the Crooked River, where we breached 21 beaver dams. Eleven obstructions were removed from Old Stream, one at the inlet to Second Machias Lake, three from the Mopang and six on the Crooked River. Obstruction removal efforts were truncated due to unusually high water from fall rains.

4. Public Meetings and Outreach

The Commission's staff attended meetings of the Machias River Watershed Council, Downeast Watershed Coalition, Downeast Salmon Federation, and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the Machias River watershed.

MARSH STREAM

Marsh Stream is located in Waldo County. It flows approximately 48 km from its source at Upper Drake Pond to its confluence with the South Branch of Marsh Stream in Frankfort. The North Branch has only one major tributary, also named South Branch, which empties into the mainstem just upstream of the West Winterport Dam. There are a number of smaller tributaries as well as intermittent streams. The North Branch of Marsh Stream has two small hydro dams located in the towns of Frankfort and West Winterport. The South Branch of Marsh Stream has three tributaries: Colson Stream, Hawes Stream, and Carley Brook. The Commission, in an effort to restore salmon, conducted the following enhancement and management activities on Marsh Stream in calendar year 2003.

1. Population Monitoring

Electrofishing

Seven electrofishing sites were sampled within the Marsh Stream drainage. These seven sites were sampled in September, all during low water levels. Brief one-run surveys were used to cover large expanses of habitat to determine the presence or absence of juvenile salmon. Since no YOY or parr were found in the North Branch in 2002, only areas with spawning and riffle habitat were sampled in 2003. The South Branch of Marsh Stream (Colson Stream, Hawes Stream) was also sampled with only one hold over salmon from 2002 found. Smallmouth bass were found throughout the upper North Branch drainage. Largemouth bass were not sampled this year, but are know to be present in the river reach between Upper and Lower Drake ponds.

Redd Counts

No redd counts were conducted on either branch of Marsh Stream. The North Branch of Marsh Stream has not been known to have spawning activity for many years, so redd counts surveys are a low priority for this river. The South Branch has not had a habitat survey done so spawning areas are not known.

2. Habitat

Water Quality

The Commission recorded summer water temperatures on Marsh Stream at five sites: above the Railroad Trestle, below the West Winterport Dam, below the Monroe Center Falls, Monroe Village, and Crane Bridge. Additionally, water temperature data will be taken at two locations over the winter. All data will be analyzed during the winter months of 2003-2004 and information will be available from in early spring.

Marsh Stream Falls

3. Meetings

Staff attended meetings related to the removal of the West Winterport Dam as well as correspondence with the dam owner and other stakeholders.

4. Population Monitoring

Electrofishing

No electrofishing sampling was conducted on the Souadabscook this year due to time and manpower constraints and the significant effort needed on Kenduskeag Stream. Over previous years, few salmon were captured.

Redd Counts

There was one attempt to find redds on Souadabscook Stream in 2003, on November 19. Due to the significant amount of water from fall rains, staff were unable to find evidence of spawning activity as no redds were documented.

5. Habitat

Obstruction Surveys and Removal

During the fall of 2003, obstructions and beaver dam breaching was not conducted due to significant rainfall. Follow-up surveys were conducted in late October to verify access to all the spawning areas with areas remaining free of obstructions for the entire fall.

Water Quality

ASC recorded summer water temperature on Souadabscook Stream at three sites: below the Emerson Mill Road Bridge, Hampden Recreational Area, and at Laskey Lane. MDEP also collected water quality data from Souadabscook Stream. Water temperature data will also be recorded by the ASC at one location this winter. All data will be analyzed during the winter 2003-2004 and will be available in early spring.

Habitat survey

During the summer of 2003, habitat surveys were conducted on the upper reaches of the mainstem of the Souadabscook as well as the West Branch of the Souadabscook. Approximately 26 km of stream were surveyed on the mainstem from Etna Pond to the Manning Mill Road. On the West Branch, about nine km of habitat were surveyed from Rte. 69 to Hammond Pond. Data is being analyzed and should be available in the spring of 2004.

NARRAGUAGUS RIVER

The Narraguagus River is located in Washington and Hancock Counties. From its source at Eagle Lake in TWP 34MD, it flows approximately 78 km to tidal waters in Cherryfield and from there into Narraguagus Bay in Milbridge. The West Branch Narraguagus is its principal tributary. The Commission, in an effort to restore the salmon, conducted the following enhancement and management activities in calendar year 2002.

1. Population Monitoring

Adult Weir Operations

We operated a fishway trap at the Cherryfield ice control dam from May 1 through November 3 to trap upstream migrating adults to monitor the wild adult run and to intercept any escaped aquaculture fish that may enter the river. We captured 21 naturally produced sea-run salmon. We captured no salmon suspected to be aquaculture escapees in the Narraguagus River in 2003. This year's trap catch represents an increase of 13 salmon from the 2002 catch of 8 salmon and a decrease of 9 salmon from the 2001 catch of 30 sea-run salmon.

Electrofishing

Juvenile salmon populations were assessed in the Narraguagus River by using backpack electrofishing units. A primary objective of the electrofishing assessments is to estimate pre-smolt abundance in Narraguagus River rearing habitats upstream of the smolt trapping locations. When coupled with the following year's estimate of smolt emigration, we can estimate parr survival through the winter prior to smoltification. We have been working closely with NOAA (Dr. John Kocik) to analyze the available data sets and refine the estimates of the standing crop of pre-smolts in the year prior to emigration. NOAA manages the smolt trap data and computes the overwinter survival estimates for each cohort of emigrating smolts from the Narraguagus River.

The parr abundance data are incorporated into the BGEST model (Basinwide Geographic and Ecologic Stratification Technique) to continue a time series of large parr (ages 1+ and 2+) population estimates. ASC staff has been consolidating past Narraguagus River electrofishing trip data from multiple electronic sources into a MaineSalmon compatible database, using Microsoft Access2000. New basin-wide juvenile salmon population estimates will be computed for the Narraguagus River during the winter of 2003, using the most recent set of individual site estimates of juvenile salmon abundance for the years 1957-2003.

Juvenile salmon populations were sampled at 42 locations in 2003, which is similar to effort in previous years. Eight sites were located in tributaries to the Narraguagus River and the other sites were located on the mainstem. Of these, we obtained multiple run population estimates at 32 sites Other sites (n=10) were sampled with single pass electrofishing, due to the absence or very low density of parr (age -1) captured during the first run. Parr densities were variable among the sites sampled in the mainstem in 2003, with an absence of parr at some low quality sites, to a high of 5.03 parr/100 m^2. Parr densities in tributaries ranged from 0.71 parr/100 m^2 at Gould Brook and Spring River to 9.76 parr/100 m^2 at Baker Brook Mouth. Parr densities were generally less than 9.76 parr/100m^2 at all mainstem and tributary sites. Parr densities tend to be highest in riffle areas with small boulder and cobble substrates. Parr abundance in 2003 was generally lower than that observed in previous years, probably a result of resent drought conditions and the declining spawning escapement observed in recent years.

During the age-1 parr surveys, we also collected abundance data for age-0+ parr (YOY). YOY densities in tributaries to the Narraguagus River ranged from 0.24 parr/100 m^2 to 8.68 per 100 m^2. Densities were variable in mainstem sites ranging from the absence of YOY to 14.71 per 100 m^2.

Redd Counts

We conducted redd counts on the Narraguagus River mainstem and two of its tributaries. The West Branch Narraguagus, a major tributary to the Narraguagus, contains relatively little spawning habitat and is logistically impractical for redd counts. High water levels and ice formation in the river combined with bad weather limited the number of surveys and hindered the visibility during surveys. We counted 5 redds on the mainstem and 6 test pits during the 2003 surveys. All five redds and test pits were located in the waters downstream of Beddington Lake outlet (approximately 42 km upstream of tidal waters). No redds or test pits were observed in the two tributaries surveyed (Sinclair Brook and Gould Brook) or above the lake. This year's count is smaller than observed in 2002 (6 redds) and 2001 (24 redds), and represents less than 1% of what is needed to assure full habitat utilization.

2. Population Enhancement

Stocking

Staff assisted in the distribution of approximately 518,000 fry into the Narraguagus River in the spring of 2003. These fish were the offspring of wild parr collected as brood fish from the Narraguagus in previous years and reared to maturity at Craig Brook National Fish Hatchery by the U.S. Fish and Wildlife Service. They were distributed throughout the drainage in a manner designed to minimize interactions with naturally produced fry during their first year in the river.

Broodstock Collection

We collected a total of 264 large parr during the 2003 electrofishing trips (ages 1 and 2) for captive rearing as broodstock to supply eggs for future Narraguagus River enhancement purposes. These fish were collected from over 23 sites located throughout the drainage, and are believed to capture most of the genetic variability present within parr in the Narraguagus River. From these broodfish, we collected length, weight, scale samples for age and growth analyses, and tissue samples (a partial fin clip) for DNA fingerprinting of individual broodfish.

3. Habitat

Obstruction Surveys and Removal

While doing electrofishing surveys, we document several obstructions to fish passage. A number of beaver dams and debris jams were noted. However, while conducting redd counts in early November we noted that high water levels caused by several rain events removed the majority of these obstacles.

PASSAGASSAWAKEAG RIVER

The Passagassawakeag River is located the Waldo County towns of Waldo, Belfast, Morrill, Brooks, and Knox. It flows approximately 25 km from its source at Lake Passagassawakeag (Brooks) to its confluence with the Penobscot River estuary at Belfast Bay in Belfast. Wescott Stream is its only major tributary. ASC conducted the following assessment activity during calendar year 2003.

1. Population Monitoring

Electrofishing

In 2003, three electrofishing sites were sampled for juvenile salmon. No juvenile salmon were found at head of tide site (Doak Farm), at a location just above the Doak farm, and at the Rte. 137 bridge crossing.

Redd Counts

No redd counts were conducted on the Passagassawakeag River this year as weather conditions hindered our planned surveys.

2. Habitat

Water Quality

The Commission recorded summer water temperature on the Passagassawakeag River at two sites: Iron Bridge and Doak Farm. In addition to the summer collection of water temperature data, the ASC will also collect temperature data at one location throughout the winter months. All data will be analyzed during winter and spring 2003 – 2004 with information becoming available from the ASC in early spring.

PENOBSCOT RIVER

The Penobscot River is Maine's largest river system, drains an area of 8,570 square miles, and spans seven counties. Annual runs of 40,000 to 75,000 Atlantic salmon were possible prior to the 1800's but the current production potential for the river has declined to an estimated 4,000 to 11,000 adult fish, due to habitat loss and alteration. Major tributaries to the Penobscot River include the East Branch, West Branch, Piscataquis, Passadumkeag, and Mattawamkeag Rivers. In addition, four significant tributaries enter the tidal portion of the Penobscot River: Kenduskeag Stream, Souadabscook Stream, Cove Brook, and Marsh Stream. The National Marine Fisheries Service (NMFS) and the U. S. Fish and Wildlife Service (USFWS) listed the Atlantic salmon population of Cove Brook as endangered on November 13, 2000. The Commission, in cooperation with the USFWS, NMFS, MDIFW, PIN, USDA, and additional stakeholders, conducted the following enhancement and management activities in 2002.

1. Population Monitoring

Adult Trap Operations

Veazie Dam. We operated a fishway trap at the Veazie hydroelectric dam from May 12 through November 3 to capture upstream migrating adult Atlantic salmon. We measured and recorded biological data from returning salmon and retained a portion of the run for hatchery broodstock. We captured a total of 1114 adult salmon in 2002, an increase of 334 fish from the 2002 catch and the first time the trap catch exceeded 1000 fish since 1998. We collected scale samples from 616 salmon to estimate the age and origin structure of the run, and obtained non-lethal tissue samples from 772 fish for DNA analysis. Of the 1114 adults returning to the trap in 2003, 202 (18.1%) were one-sea-winter salmon (grilse) 903 (81%) were two-sea-winter salmon, and the remainder were repeat spawners. The proportion of 1SW fish of the total run fluctuates yearly, and while this year's rate is below the 25.6% average for the previous 16 years, it does fall within the observed range for this time period. Only 5.7% of the 2003 salmon run was determined to be of wild origin, which is similar to the 4.2 % observed for 2002. We captured no salmon suspected to be aquaculture escapees in the Penobscot River, and two salmon that had been previously reared at Green Lake National Fish Hatchery as captive broodstock. Of the 510 fish (MSW salmon and grilse) returned to the river above Veazie after capture in 2003, 143 were multi-sea-winter females. This represents approximately 4% of the spawning escapement required to meet the conservation target set for the Penobscot drainage.

Weldon Dam. The Great Lakes Hydro America, LLC (GLHA) continued operation of an Atlantic salmon trap at the fishway of the Weldon dam. The dam is located 60 miles upstream from Bangor and is the fifth and final mainstem dam encountered by salmon on their upstream migration. The trap was operated daily from June 19 through October 31. The 2003 trap catch (40 salmon) was less than half of the previous year's catch (40 salmon). The catch included 20 multi-sea-winter salmon and 20 one-sea-winter fish (grilse). All trapped fish were counted and permitted to swim from the trap without additional handling to minimize stress. Downstream fish passage studies were not attempted in 2002 and 2003, but are scheduled to resume in 2004.

Electrofishing

Penobscot River electrofishing surveys are usually among the last field assessments undertaken in the fall. Heavy and frequent rains in the autumn of 2003 limited our electrofishing to a single site in the upper Piscataquis River, which had abundant juvenile salmon. These fish are thought to be the result of annual releases of fry from the Craig Brook National Fish Hatchery.

Redd Counts

Annual redd count surveys are not usually conducted in the Penobscot watershed upstream of the Veazie dam due to the reliability of population data collected at the Veazie fishway trap, the relatively low spawning escapement, and the logistical challenges in locating small numbers of spawning salmon on such a large river. High water throughout the autumn spawning season made redd counts impractical on the Penobscot River in 2003.

2. Population Enhancement

Stocking

Approximately 737,000 fry were stocked into select reaches of the East Branch, Piscataquis, and Pleasant tributaries in May of 2002. We collect DNA samples from all salmon spawned at Craig Brook National Fish Hatchery, and this provides us with the opportunity to evaluate survival of salmon released in different sections of the drainage. A total of 547,000 smolts were stocked in 2003. A total of 321,000 parr was released in the spring and fall into the main stem Penobscot, Mattawamkeag, Piscataquis, and Pleasant Rivers as a stock enhancement measure. All parr were marked and distributed in manner that would minimize conflict with other management or research activities.

Broodstock Collection

The larger return of adult salmon to the Penobscot allowed us to meet broodstock collection targets for the first time in several years. We transported 605 adult salmon (41 grilse and 564 multi-sea-winter salmon) to Craig Brook National Fish Hatchery for use as broodstock. The broodstock collected in 2003 will provide eggs sufficient for full smolt production at Green Lake National Fish Hatchery and more than one million fry for release in the Penobscot drainage in the spring of 2003. All adult broodstock collected from the Penobscot River were tissue sampled for DNA analysis and marked with individually coded PIT tags, either at time of capture, or when sampled for diseases after transport to the hatchery. All of the 124 broodstock screened by the U.S. Fish and Wildlife Service for ISAV (infectious salmon anemia virus) tested negative. Despite the additional handling stress resulting from the disease sampling, pre-spawning mortalities among 2003 broodstock at Craig Brook NFH remained low (~1%). There was one trapping related salmon mortality at Veazie in 2003, which is typical of most years.

3. Habitat

Habitat Surveys

We undertook no habitat surveys in the Penobscot drainage in 2003.

Water Quality

Water temperature data loggers were deployed for varying lengths of time at 13 sites in the Penobscot basin. We deployed monitors at the Veazie fishway trap, and in the East Branch, Piscataquis and Mattawamkeag sub-drainages. These data will contribute to the time series dataset and be used to help assess habitat suitability and the potential impact of water temperature regime on the growth and survival of juvenile Atlantic salmon. Commission staff is in the process of standardizing data collection and data management procedures and preparing a comprehensive report on water temperatures in Maine rivers managed for Atlantic salmon.

Monitoring Fishways.

Effective fishway operation is essential for returning salmon to pass dams and access headwater spawning areas. Fishways were inspected on a routine basis in 2002 in conjunction with a PIT tag study, which required biologists to visit fishways twice each week to download data and maintain equipment. Fishways were inspected on a routine basis in order to ensure proper operation and confirm operator compliance with appropriate maintenance procedures. Inspections were routinely conducted at four dams in the Piscataquis (Howland, Browns Mill, Moosehead Manufacturing, and Guilford Industries), the Lowell Tannery Dam on the Passadumkeag, and five main stem Penobscot dams (Veazie, Great Works, Milford, West Enfield, and Weldon). Each site was inspected regularly in the course of downloading data from the PIT tag detection arrays. Improper fishway maintenance and operation practices were rare, relatively minor in nature, and were readily corrected by dam operators upon request.

Penobscot PIT tag Project

In 2003 we continued a cooperative research project among the Commission, USGS (Conte Anadromous Fish Research Center), U. S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the Penobscot Indian Nation (PIN). The study is investigating the temporal and spatial movements of Atlantic salmon during their upstream migration in the Penobscot River basin using PIT tags (Passive Intermittent Transponder). PIT tag antenna arrays and data loggers were installed at the entrance and exit of fishways at five main stem dams (Veazie, Great Works, Milford, West Enfield, and Mattaceunk) and three Piscataquis drainage dams (Howland, Dover-Foxcroft, and Browns Mills). In 2003 we released 506 salmon to the Penobscot River marked with PIT tags injected into the dorsal musculature. Commission contract personnel downloaded remote fishway PIT tag antenna data loggers twice weekly, imported data into a Microsoft Access relational database, and will be actively auditing and analyzing data for fish movement patterns during the winter months. Fish passage will be related to season timing, photoperiod, river flow, and temperature, along with final destinations tagged fish. The project's results so far have exceeded our expectations, and have yielded valuable data on the movements and distribution of salmon in the Penobscot drainage after they pass upstream of the Veazie Dam. We have also used this data to troubleshoot fish passage problems at the Great Works dam, and the owners used our findings to implement minor changes to the structure that enhanced fish passage for the remainder of the summer and autumn.

PLEASANT RIVER

The Pleasant River is located in Washington County. It originates in Pleasant River Lake and flows approximately 45 km to the head of tide in Columbia Falls. Tributaries include the Eastern Little River, Western Little River, and Bog Brook. The National Marine Fisheries Service (NOAA-FISHERIES) and the U. S. Fish and Wildlife Service (USFWS) listed the Atlantic salmon population as endangered on November 13, 2001. The ASC conducted the following enhancement and management activities on the Pleasant River in calendar year 2003.

1. Population Monitoring

Adult Weir Operations

The Commission operated a weir, located upstream of the Route 1 bridge, from May 8 to October 28 to trap upstream migrating adults for the purposes of evaluating the size of the wild adult run and to intercept suspected escaped aquaculture fish. Two salmon were trapped, one multi-sea winter female that was released upstream, and one multi-sea winter male that was misidentified at the weir as an aquaculture suspect and sacrificed. Further review of this fish's scales indicated that this fish was of wild origin. Weir operation was cut short when unusually high waters flooded the weir, rendering it inoperative and unsafe to tend.

Electrofishing

Staff has recently begun stocking the Pleasant River again, after having no fish available for a number of years. Therefore, the electrofishing data presented here is the first evaluation of recent stocking. We performed multiple-pass depletion population estimates at 8 sites in the Machias drainage in 2003. The median density of parr was 2.2 parr/unit (range 0.0 to 6.9 parr/unit) and median density of young-of-the-year (YOY) was 3.4 YOY/unit (range 0.0 to 65.4 YOY/unit). This is an increase over the number of parr (0.00 parr/unit) in recent years, when few parr were in the river. It is also in increase in YOY. In addition to conducting population estimates, we attempted to sample residualized smolts in June. These are smolts that remained in the river after stocking rather than migrating to sea. We sampled three areas and did not capture any smolts, indicating that relatively few smolts residualized after stocking.

Comparison of Fry Reared at Craig Brook National Fish Hatchery and Pleasant River Hatchery

During August of 2003 we surveyed eight sites via multiple pass electrofishing for 0+ and ≥ 1+ Atlantic salmon parr abundance in the Pleasant River drainage.

We chose sites based on the origin of stocked young of the year (YOY) salmon residing at each location. Fry stocked into Town Riffles and the Eastern Little River were raised at the Pleasant River Hatchery located in Columbia Falls, Maine. The fry stocked at Crebo crossing and Ben Allen Riffles were raised at Craig Brook National Fish Hatchery (CBNFH) in Orland, Maine. Spawning and initial incubation for all fish occurred at CBNFH. We compared the groups to determine if there were any differences in performance.

The Eastern Little River site yielded the most YOY, with 113 YOY captured, with a point density of 60 YOY/unit (100 m^2) and a condition factor (K-factor) of 1.37. Fifty YOY were captured at Crebo Crossing, with a point density of 13.23 YOY/unit and a the lowest condition factor (1.24) of the four sites. Seventeen YOY were captured at Ben Allen Riffles with a point density of 3.95 YOY/unit and a condition factor of 1.28. Finally, at Town Riffles 12 YOY were captured with a point density of 2.58 YOY /and the highest condition factor at 1.40. An ANOVA of the four sites illustrated no significant difference between sites for length ($p > 0.12$) or condition factor ($p > 0.22$) (Table 11).

Our conclusion was that rearing facility did not affect survival or condition factor after their first summer in the river.

Table 11. Summary of Densities and Condition Factors for Four Sites in the Pleasant River Drainage

Site	Fish Type	Density*	K-factor
Eastern Little River	Pleasant River Hatchery	60 yoy/unit	1.37
Crebo Crossing	CBNFH	13.23 yoy/unit	1.24
Ben Allen Rips	CBNFH	3.95 yoy/unit	1.28
Town Riffles	Pleasant River Hatchery	2.58 yoy/unit	1.40

* These densities were computed with a different method than those presented above, causing some small differences in population estimates.

Redd Counts

We have been unable to conduct a survey for redds in 2003 due to high water conditions. We will attempt to survey for redds in the spring if conditions allow. However, the expected number of redds is very small due to the fact that only one female is known to be in the river.

2. Population Enhancement

Stocking

Salmon were again stocked into the Pleasant drainage in 2002 after a period of years with no stocking. We stocked 42,000 fry reared at Craig Brook National Fish Hatchery and 9,500 fry reared at the Pleasant River Hatchery in appropriate habitat throughout the drainage. Fry from the Pleasant River Hatchery were stocked by Pleasant River Watershed and Downeast Salmon Federation staff. We also stocked 2,800 smolts in the lower Pleasant River.

Broodstock Collection

We collected 119 parr for broodstock at two sites in the Pleasant mainstem. We attempted to tag these fish with alphanumeric visual implant tags. However, tag retention was poor. Tagging broodstock will allow us to track broodstock by origin in the river system, which may become important as the broodstock program evolves.

3. Public Meetings and Outreach

ASC staff attended meetings of the Downeast Watershed Coalition, Downeast Salmon Federation, and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the Pleasant River watershed.

PRESUMPSCOT RIVER

The Presumpscot River is located in Cumberland County. It flows from its source, Sebago Lake in Windham, for 39 kilometers (km) before entering Casco Bay between Portland and Falmouth, draining approximately 1,593 sq. km. Throughout its length, the Presumpscot is heavily industrialized with nine dams obstructing fish passage on the river. Thanks to the recent removal of the Smelt Hill Dam in Falmouth, there is a seven-mile free flowing section below the Cumberland Mills Dam, in Westbrook, to tide water. Two major tributaries, Mill Brook and the Piscataqua River, enter the Presumpscot within this free flowing segment. The status of the Atlantic salmon resource in this river is currently unknown. In an effort to document available Atlantic salmon habitat in the lower river system, the Commission undertook the following management activities in the year 2003.

Upper reach of Presumpscot Falls on the Presumpscot River in Falmouth, Maine. These falls were underwater for more than 200 years, but thanks to the removal of the Smelt Hill Dam this section of river is now free flowing and allows unfettered fish passage.

1. Habitat

Habitat Surveys

The Commission surveyed the mainstem of the Presumpscot from the Cumberland Mills Dam to the remnants of the Smelt Hill Project. The survey encompassed approximately 11 km of riverine habitat. Habitat data are currently being analyzed.

2. Meetings

Hydro Relicensing

Staff attended numerous meetings and field events associated with the hydro relicensings of the Saccarappa, Mallison Falls, Little Falls, Dundee, Gambo, and Eel Weir projects. All projects are owned and operated by S.D. Warren.

Casco Bay Estuary Project

Staff attended and participated in meetings hosted by the Casco Bay Estuary Project designed to develop and institute a comprehensive watershed plan.

SACO RIVER

The Saco River watershed drains an area of 4,395 square kilometers (km) of which 2,253 square km are located in east-central New Hampshire and 2,142 square km in southwestern Maine (York and Oxford counties). The Saco River flows from its headwaters in the White Mountains of New Hampshire 64 km to the Maine border in Fryeburg were it flows an additional 137 km to the Atlantic Ocean in Saco and Biddeford. It has two large tributaries in Maine, the Ossipee and Little Ossipee rivers. The Saco River has a small Atlantic salmon population currently maintained by annual releases of hatchery stocks and limited natural reproduction. In an effort to manage and restore Atlantic salmon to the Saco River, the Atlantic Salmon Commission (ASC) and stakeholders conducted the following activities in calendar year 2003.

1. Population Monitoring

Adult Traps

Florida Power and Light (FPL) currently operate three fish passage-monitoring facilities on the Saco River. The Cataract fish lift, located on the East Channel in Saco, was operational from early May to late October. This year 12 salmon were lifted and passed into the Cataract headpond from this facility. On the West Channel between Saco and Biddeford, the Denil fishway-sorting facility was also operational from early May to late October. This facility passed 27 salmon into the headpond. A third passage facility at Skelton Dam was used to capture adult salmon for transport to the Ossipee River. FPL transported and released 24 salmon from this facility.

Electrofishing

The Commission sampled three sites on three tributaries in the Saco River drainage. All three sites were evaluated using two or three-pass depletion methods. A summary of this data can be obtained by contacting the Commission's Sidney office.

Redd Counts

No survey was undertaken due to high flows.

2. Population Enhancement

Stocking

In May, the Saco River Salmon Club (SRSC) and the Commission stocked approximately 496,000 Atlantic salmon fry in the Saco River drainage. Approximately one-half of the fry were stocked into the Ossipee River and the remaining fry were released into 24 tributaries. These fry were all produced from eyed eggs provided to the SRSC through the Commission's cooperative agreement with the U.S. Fish and Wildlife Service. In addition to fry stocking, 20,000 parr were released into the Ossipee River and 3,900 smolts were released into the mainstem Saco River.

3. Meetings

Saco River Salmon Club

The Commission staff attended monthly meetings in an effort to exchange information and keep informed on Club activities.

Saco River Coordinating Committee

The Commission staff attended meetings of the Saco River Coordinating Committee that addresses the status of anadromous fish restoration in the basin as well as the operation of the fish passage facilities at Cataract and Skelton projects.

Hydro Relicensing

The Commission staff attended meetings and site visits involving the relicensing of the Bar Mills Project.

SHEEPSCOT RIVER

The Sheepscot River drains portions of Kennebec, Waldo, and Lincoln counties. The mainstem, originating in West Montville, flows 55 kilometers (km) to the head of tide in Alna. The West Branch originates at Branch Pond and flows 24 km to its junction with the mainstem in Whitefield. The second largest tributary, the Dyer River, empties into the Sheepscot River estuary at the Town of Sheepscot. The National Marine Fisheries Service (NMFS) and the U.S. Fish & Wildlife Service (USFWS) listed the Atlantic salmon population in the Sheepscot River as endangered on November 13, 2000. ASC staff, along with various stakeholders, conducted the following enhancement and management activities in calendar year 2003 on the Sheepscot River.

1. Population Monitoring

Electrofishing

Twenty-six sites were electrofished by ASC staff to assess juvenile Atlantic salmon populations. Six sites were long term monitoring index sites whereas twenty sites were newly established under the Basinwide Geographic and Ecologic Stratification Technique (BGEST) methodology intended to estimate basinwide parr populations. A summary of this data can be obtained by contacting the Commission's Sidney office.

Redd Counts

To date, only one survey of the spawning habitat has been completed for the entire river. Two redds were found between Coopers Mills and Kings Mills.

2. Population Enhancement

Stocking

The Commission and USFWS stocked 323,000 river specific Atlantic salmon fry into the Sheepscot River during 2003.

Broodstock Collection

The Commission and USFWS collected 168 parr by electrofishing for transfer to the captive river specific brood stock program at the Craig Brook National Fish Hatchery.

3. Habitat

Obstruction Survey and Removal

Due to excessively high water, obstruction removals were not necessary in 2003.

4. Meetings

Watershed Councils

Commission staff attended monthly meetings of the SRWC and meetings associated with passage issues at the Coopers Mills Dam.

SOUADABSCOOK STREAM

The Souadabscook Stream is located in Penobscot County. It flows approximately 35 km from its source at Etna Pond in the towns of Etna and Carmel to its confluence with the Penobscot River in Hampden. Souadabscook Stream drains an area of 526 sq. km. Souadabscook Stream has a number of tributaries, the largest being the West Branch, Souadabscook Stream. Smaller tributaries include Wheeler Stream, Ward Stream, Black Stream, Harvey Brook, Tracey Brook, and Hill Brook. The Souadabscook had four small dams in the recent past: one hydro dam and three small flow control dams. Two of these smaller dams are still present with one having a slot cut into the small spillway to allow for a year round concentrated flow as well as fish passage. This dam is also used for an alewife trapping operation and an eel weir. The second dam is located above the Emerson Mill Road and is passable at normal flows. A hydro dam located directly under the Rte.1 Bridge crossing in Hampden and another low head dam used to store water above the Hampden Recreational area were removed in 1999. The Commission conducted the following enhancement and management activities on Souadabscook Stream in calendar year 2003.

1. Population Monitoring

Electrofishing

No electrofishing sampling was conducted on the Souadabscook this year due to time and manpower constraints and the significant effort needed on Kenduskeag Stream. Over previous years, few salmon were captured.

Redd Counts

There was one attempt to find redds on Souadabscook Stream in 2003, on November 19. Due to the significant amount of water from fall rains, staff were unable to find evidence of spawning activity as no redds were documented.

2. Habitat

Obstruction Surveys and Removal

During the fall of 2003, obstructions and beaver dam breaching was not conducted due to significant rainfall. Follow-up surveys were conducted in late October to verify access to all the spawning areas with areas remaining free of obstructions for the entire fall.

Water Quality

Staff recorded summer water temperature on Souadabscook Stream at three sites: below the Emerson Mill Road Bridge, Hampden Recreational Area, and at Laskey Lane. MDEP also collected water quality data from Souadabscook Stream. Water temperature data will also be recorded by the ASC at one location this winter. All data will be analyzed during the winter 2003-2004 and will be available from the ASC in early spring.

Habitat survey

During the summer of 2003, habitat surveys were conducted on the upper reaches of the mainstem of the Souadabscook as well as the West Branch of the Souadabscook. Approximately 26 km of stream were surveyed on the mainstem from Etna Pond to the Manning Mill Road. On the West Branch, about nine km of habitat were surveyed from Rte. 69 to Hammond Pond. Data is being analyzed and should be available in the spring of 2004.

ST. CROIX RIVER

The St. Croix is the easternmost river in the United States, and forms the Canadian-U.S. boundary from southern Aroostook to Washington counties. The East Branch from Vanceboro to Grand Falls flowage, and the main stem from there to Calais are the focus of current Atlantic salmon restoration efforts. The West Branch, which joins the East Branch to form the main river at Grand Falls Flowage, is intensively managed for inland game fish by IFW and not actively managed for Atlantic salmon. The production potential of the St. Croix is estimated to be between 900 and 2600 adult fish and the 10-year restoration goal is for a spawning escapement of 300 mature fish. The St. Croix International Waterway Commission (SCIWC), Canadian Dept. of Fisheries and Oceans (DFO), New Brunswick Dept. of Natural Resources (NBDNR), NOAA Fisheries, USFWS, IFW, DMR, the ASC, and other stakeholders cooperated with to conduct the following enhancement and management activities in 2003.

1. Population Monitoring

Adult Trap Operations

Milltown Dam. Adult salmon are monitored at a fishway trap operated by the SCIWC at the Milltown dam, near the head of tide. This facility provides an opportunity to enumerate and sample returning adults, collect broodstock, screen for ISAV (infectious salmon anemia virus), and prevent aquaculture escapees from entering the river. The Milltown trap catch was 15 sea-run salmon in 2003 and all were the product of juvenile stocking programs in previous years. Three of the 15 salmon died on site before they could be transported to the broodstock holding facility. Necropsy reports on these mortalities indicated severe gill damage, similar in appearance to the salmon mortalities observed at some aquaculture sites in 2003 coincident with an unusually large phytoplankton bloom late in the summer. Aquaculture escapees have been principal component of the trap catch since 1994 (the first year these data were reported) and accounted for over 70% (56 fish) of the total catch as recently as 2001. Only six aquaculture fish were observed in 2002, following complete depopulation of all Cobscook Bay salmon pens in US waters in 2001 to control the spread of ISA. Partial depopulations of the pens were required again in 2002, and only 9 aquaculture escapees were trapped in 2003. Complete biological data are recorded for all aquaculture escapees prior to their destruction.

Electrofishing

Electrofishing studies were conducted to document the occurrence and distribution of juvenile salmon recruitment associated with 2000 and 2001 spawning by captive-reared adult Atlantic salmon released into the St. Croix.

Abundant rainfall in 2003 resulted in high river flows that restricted the opportunity for effective electrofishing surveys. A dam controls river flow at Vanceboro, and the operator reduced flow from 900 CFS to 350 CFS to accommodate sampling expeditions on September 17-18. On those dates, the Commission, SCIWC, and ASF biologists conducted one-run surveys at 15 sites along a 26km section of the river (Table 2.).

A single YOY salmon, presumably a landlocked salmon based on the lack of sea-run salmon spawning escapement the previous year, was observed in 2003. Parr were absent at seven of the fourteen sites sampled, and densities were less than 1 parr per habitat unit (100 square meters) at all but one of the remaining sites. Genetic analysis of tissue samples collected from the parr may provide the opportunity to identify any landlocked salmon in the sample that would bias the assessment of the adult stocking program. Juvenile smallmouth bass were common at most sites and a total of 77 were captured.

Various factors may influence the numbers of juvenile salmon observed in these surveys, including the possibility that parr select for deeper, stronger rapids inaccessible to backpack electrofishing crews. Parr densities in such areas were not assessed. River flows were altered (lowered) dramatically immediately prior to electrofishing (to enable safe access by survey crews) and may have affected juvenile salmon distribution and sampling results.

Redd Counts

No adult salmon were stocked or released into the St. Croix River in 2003. High rain fall and flow management constraints on the St. Croix resulted in high flows during the entire redd count window. Redd counts to document spawning by landlocked salmon (which may introduce bias electrofishing results) were not attempted due to the high flows.

Smolt Trapping

The SCIWC sampled smolts with angling captures at the Milltown bypass and headpond, and with a RST deployed at Haycock Rips. Flood conditions interfered with 2003 sampling efforts, especially with RST deployment and operation, but 177 smolts were captured and sampled. The 2003 smolt data are being analyzed by the SCIWC and NMFS and a report will be available from those agencies.

2. Population Enhancement

Juvenile Salmon

Since 1996 all sea-run salmon captured at the Milltown trap have been retained for broodstock. Broodstock is held in onsite holding tanks pending pathology screening (ISAV, etc.), and then transported to the DFO Mactaquac Biodiversity Facility for spawning. All fish have tested negative for

ISAV since screening was initiated in 2000. Fry produced from these broodstock are returned in the spring to the Milltown dam site, reared in onsite tanks until fall, and released as 0+ age parr. In 2003 a total of 16,779 parr were released, compared to a record high of 124,000 parr in 1997. Smolt stocking has typically ranged from 20,000 to 50,000 smolts annually. Declining returns to the Penobscot River, the primary parent stock for the St. Croix enhancement program, and the decommissioning of the Saint John Hatchery have greatly reduced the availability of smolts (and parr) in recent years. Only 4,000 smolts were released in 2003 in conjunction with the RST research program.

Adult Salmon

There was no adult Atlantic salmon spawning escapement in the St. Croix in 2003. All salmon captured at the Milltown trap were retained for broodstock and there was no experimental adult stocking program in 2003.

3. Habitat

A variety of water quality monitoring activities were undertaken by the SCIWC and will be reported as available.

4. Fish Passage

Alewives remained the focus of fish passage issues on the ST. Croix in 2003. Alewives are a native species of the St. Croix ecosystem and may play an important role as a "diversionary" prey item in reducing depredation of migrating salmon smolts. Alewives have been denied access to Spednik Lake since 1987 at the request of IFW. The IFW were concerned that high alewife abundance might be contributing to the concurrent declines observed in the Spednik Lake smallmouth bass *Micropterus dolomieui* population. In 1991, Fisheries agencies agreed to also close the Grand Falls fishway (for three years), later extending the closure for an additional year to facilitate ongoing research. The Maine State Legislature passed legislation in 1995 to keep the Spednik Lake, Grand Falls, and Woodland fishways closed to alewives indefinitely, thus eliminating access to 99% of the alewife-spawning habitat. By 2000, the run had declined to fewer than 9,000 alewives. In response to this decline the St. Croix Fisheries Steering Committee, which includes an ASC representative, reached a compromise for reopening the fishways but with a conservative spawning escapement of 90,000 alewives (4 fish/acre) above Grand Falls. The Maine State Legislature considered and rejected legislation to reopen the Grand Falls and Woodland fishways in 2001. The USFWS voiced opposition to closure of these fishways, which were constructed with contributions of USFWS funds, and felt that it violated the terms of the fishway construction grants. In November 2002, the USFWS acknowledged that their 25-year vested interest in the dams had expired and operation of the fishway was at the discretion of the state. The DFO has responded by trapping and trucking alewives, as available, from the Milltown trap to spawning habitat in the Woodland headpond dam since 2001. Due to continued poor returns, the number of alewives trucked has been only a small fraction of the 90,000 recommended by fisheries biologists. In 2003, less than 7,000 alewives were trucked to up river-spawning habitat. A total of 60 alewives were sacrificed for disease testing; all tested negative for pathogens of concern. A report commissioned by the International Joint Committee (IJC) to summarize and review the available scientific literature regarding potential biological interactions between alewives and small mouth bass has been drafted and should be finalized in 2004.

ST. GEORGE RIVER

The St. George River is located in Waldo and Knox counties. It flows from its source, Lake St. George in Liberty, for 56 kilometers (km) to Thomaston and Warren. The entire river has recently become accessible to anadromous fish with the removal of the Sennebec Dam in 2002. The status of the Atlantic salmon resource in this river is currently unknown. In an effort to document available Atlantic salmon habitat and presence of Atlantic salmon, the Commission undertook the following activities in the year 2003.

1. Population Monitoring

Electrofishing

The ASC sampled one site using a single pass measured method in the section of the St. George River below Sennebec Pond. No Atlantic salmon were found

Redd Counts

Due to excessively high water, redd counts were not conducted.

2. Habitat

Habitat Surveys

The ASC, with help from members of the St. George Trout Unlimited Chapter, conducted Atlantic salmon habitat surveys of the entire mainstem St. George River to determine the amount of potential habitat that exists for adult spawning and juvenile rearing in the basin. The surveys encompassed approximately 42 km of riverine habitat.

Temperature Monitoring

Two temperature loggers were deployed in the St. George River to monitor temperatures over the summer. A copy of this data can be obtained by contacting the Commission Sidney office.

New ruffend ramp fish passage system on the St. George River insured that lake levels were not lost, yet fish passage was preserved

TUNK STREAM

Tunk Stream is located in Hancock and Washington Counties. It originates in Tunk Lake and flows approximately 26 km to Gouldsboro Bay in Steuben. Spring River Lake is another major lake in the drainage. The Atlantic salmon population is believed to be extinct. Salmon were present in Tunk Stream at least through the 1980s. The proximity of Tunk Stream to the Narraguagus River, as well as other Downeast salmon rivers, and its history as a self-sustaining salmon river, make it a candidate for experimental introductions. Tunk Stream lies within the Distinct Population Segment defined in the 2000 Endangered Species Act listing of Maine Atlantic salmon. However, Tunk Stream was not one of the eight rivers specifically listed. The Commission conducted the following enhancement and management activities on Tunk Stream in 2002.

1. Habitat

Habitat Survey

The Commission completed a habitat survey of the entire length of the main stem of Tunk Stream in 2002. Processing these data revealed a small missing section that we re-surveyed in summer 2003. The data have been processed and will be included in the habitat GIS habitat database in 2004.

Future management or research will depend on knowledge of the habitat in Tunk Stream. This habitat survey will be useful in future decision-making regarding Atlantic salmon management in Tunk Stream.

2. Public Meetings and Outreach

Staff attended meetings of the Downeast Watershed Coalition, Downeast Salmon Federation, and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the Tunk Stream watershed.

UNION RIVER

The Union River is the 19th largest river in Maine, draining 500 square miles of Hancock and Penobscot Counties before entering the sea in downtown Ellsworth. During the 1980's Atlantic salmon management in the Union drainage consisted of an annual smolt stocking and adult broodstock collection program. This program was discontinued after 1990, due to a lack of resources and unfavorable results. The current Union River salmon management program is a cooperative effort between the USFWS, the Pennsylvania Power and Light Company (PPL), Union River Association and the Commission. The following management activities were undertaken in 2003.

1. Population Monitoring

Adult Trap Operations

Ellsworth Dam. The Ellsworth dam is 65 feet in height and is not equipped with an upstream fishway. The current dam owners, PPL, provide fish passage by trapping fish below the dam and transporting them in tank trucks to upriver release sites. The trap is owned by the Commission but is operated in from mid-May to mid-June by commercial fishermen who are permitted to harvest a portion of the alewives entering the trap. The alewife run in 2003 was considered average in size and PPL successfully transported the target-spawning escapement (104,000 alewives) to upriver spawning areas. No salmon were captured during the alewife harvest in 2003.

The primary objective of operating the Union River trap-and-truck salmon program is to transport returning adult salmon upriver past two impassable dams and into suitable spawning habitat where they may contribute to juvenile recruitment. Secondary objectives include collection of biological data and monitoring of marked recaptures from study groups. The Commission's standard protocol dictates that Trap-and-Truck operations for salmon must be suspended to reduce fish-health risks when the water temperature at the release site exceeds 22°C. The Commission recommended that trapping (but not trucking) should continue when river temperature exceeded the 22°C threshold at the Union trap in 2002 and again in 2003 to gain insight into trapping success and fish behavior during periods of high river temperature. The only salmon captured in 2003 occurred at a water temperature of 23°C. Biological data were collected from the fish and it was immediately returned to river. Analysis of those data indicated that the fish was the product of the 1999 parr stocking. Unfortunately the fish did not return to the trap during cooler periods and could not be recaptured and transported above the dam into appropriate spawning areas. No aquaculture escapees were observed in the Union River in 2003.

2. Population Enhancement

Stocking
Juvenile Salmon.

The Union River Salmon Association (USA) modified the hatchery water filtration system in 2002 prior to receipt of salmon eggs in an effort to correct problems that resulted in 100% fry mortality in 2001. Eyed eggs were received from the GLNFH and were successfully incubated until hatch. Unfortunately, all fry died with 48 hours of hatching. Results from necropsies performed by IFW fish health experts implicated high bacteria levels and an inadequate water filtration. Water samples were collected from within the hatchery, and from the adjacent Union river where the hatchery intakes are located. Dissolved iron levels in both samples exceeded the acceptable threshold for hatchery production water. The USA is currently evaluating alternative water sources for the hatchery. The Commission will withhold providing salmon eggs in future until the USA facility has proven to be suitable for hatching eggs and holding fry in satisfactory condition. The USA continued to make progress in resolving water quality issues at the hatchery in 2003 and the new system may be ready for a trial run in 2004.

For more technical information about the rivers listed above our other salmon rivers in the State call the ASC, Bangor office.

ATLANTIC SALMON COMMISSION ADVISORY PANEL

The executive director, with the approval of the board, shall designate panels of advisors to meet periodically to assist in the development of plans and programs for the protection, preservation, enhancement, restoration and management of Atlantic salmon for each of the river basin complexes that represent the historic range of Atlantic salmon in the State.

To date the Advisory Panel (AP) has been underutilized. The new executive director has begun to rectify this problem. The members have been contacted and vacancies will be filled. The first meeting of the AP will be held in early February of 2004. From this point the AP will meet a minimum of three times annually. Additional meetings shall be called as needed by the Executive Director or ASC Board.

The following individuals have agreed to participate on the AP:

First Name	Last Name	Organization Name	Address	City
GARY	ARSENAULT	EDDINGTON SALMON	648 STREAM RD	WINTERPORT
JOHN	BANKS	DEPT OF NATURAL RES	6 RIVER RD	INDIAN ISLAND
MIKE	BUTLER	COVE BROOK WC	261 STILLWATER AVE	OLD TOWN
KEN	CASTNER	SACO SALMON CLUB	12 ANNES WAY	KENNEBUNK
SCOTT	DICKERSON	DUCKTRAP COALITION	101 MT BATTIE STREET	CAMDEN
JO	EATON	PENOBSCOT RIVER	33 HOWARD ST	OLD TOWN
TIM	FOSTER	VEAZIE SALMON CLUB	87 SHIRLEY ROAD	OLD TOWN
MIKE	HERZ	SHEEPSCOT VALLEY C A	PO BOX 274	ALNA
BOB	HINTON	DENNYS RIVER W C	54 BOARDMAN ST	CALAIS
BILL	NICHOLS	12 SPRUCE ST	CUMBERLAND	FORESIDE
GREG	PONTE	ANDROSCOGGIN W C	86 MEAD POINT ROAD	WEST
GARY	SEWELL		262 LAKE ROAD	MONTICELLO
DONALD	SPRANGERS	E MACHIAS WATERSHED	HCR 69 BOX 16	E MACHIAS
TOM	WHITING	TROUT UNLIMITED	PO BOX 218	CAMDEN
BARBARA	WITHAM	UNION SALMON ASSOC	61 BIRCHLAWN DRIVE	LAMOINE
GERRY	ZEGERS	MACHIAS W C	26 BROADWAY	MACHIAS

Contact Information

SALMON BOARD MEMBERS

Roland D. Martin, Commissioner
Dept. of Inland Fisheries & Wildlife
41 SHS, Augusta, ME 04333-0041
(207) 287-5202 Fax: 287-6395
E-mail: : r.dan.martin@Maine.gov

George LaPointe, Commissioner (Chair)
Dept. Marine Resources
21 SHS, Augusta, ME 04333-0021
624-6553 Fax: 624-6024
E-mail: george.lapointe@Maine.gov

Paul Frinsko, Public Member
PO Box 9729, Portland, ME 04104-5209
H: (207) 839-3878 / W: (207) 774-1200
E-mail: pfrinsko@bersteinshur.com

SALMON COMMISSION STAFF

Atlantic Salmon Commission Main Office
323 State Street
172 State House Station
Augusta, ME 04333-0172
287-9972 Fax: 287-9975

Patrick C. Keliher, Executive Director
Home: 926-5594 E-mail: Patrick.Keliher@Maine.gov

Karen Bickerman, Secretary …. 287-9972
E-mail: karen.bickerman@Maine.gov

Atlantic Salmon Commission Sidney Office
270 Lyons Road
Sidney, ME 04330
547-5326 Fax: 547-4035

Paul Christman, Fisheries Biologist …. 547-5326
E-mail: paul.Christman@Maine.gov
Cell: 557-9169

Kevin Dunham, Biology Specialist …. 547-5328
E-mail: Kevin.dunham@Maine.gov

Dan McCaw, Conservation Aide
(w) 941-4460

Atlantic Salmon Commission Jonesboro Office
Route 1A, PO Box 178, Jonesboro, ME 04648
434-5920 Fax: 434-5923

Greg Mackey, Fishery Scientist …. 434-5920
E-mail: greg.Mackey@Maine.gov

Ernie Atkinson, Fishery Biologist …. 434-5920
E-mail: ernest.atkinson@Maine.gov

Mike Loughlin, Biology Specialist …. 434-5920
E-mail mike.loughlin@Maine.gov
207-638-2258

Atlantic Salmon Commission Bangor Office
650 State Street
Bangor, ME 04401
941-4449 Fax: 941-4443

Joan Trial, Senior Biologist …. 941-4452
E-mail: joan.trail@Maine.gov

Ken Beland, Fisheries Scientist …. 941-4486
E-mail: ken.beland@Maine.gov

Norm Dube, Fisheries Scientist …. 941-4453
E-mail: Norm.Dube@Maine.gov

Randy Spencer, Fisheries Biologist …. 941-4454
E-mail: randy.spencer@Maine.gov

Peter Ruksznis, Fisheries Biologist …. 941-4487
E-mail: peter.ruksznis@Maine.gov

Mitch Simpson, Fisheries Biologist …. 941-4464
E-Mail: mitch.simpson@Maine.gov

Justin Stevens, Biology Specialist
E-mail: Justin.stevens@Maine.gov

Richard Dill, Biologist I …. 941-4487
E-mail: Richard.dill@Maine.gov

Heidi Morgan, Secretary …. 941-4449
E-mail: heidi.morgan@Maine.gov