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Presumpscot River Management Plan Steering Committee

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Fisheries Conditions, Issues and Options For the Presumpscot River

A Background Paper for the Development of A Plan for the Future of the Presumpscot River

(As distributed at the June 2002 Public Meetings)

Prepared for
the Casco Bay Estuary Project

by
the Presumpscot River Plan Steering Committee
with assistance from
Presumpscot River Plan Fisheries Subcommittee
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1. Introduction

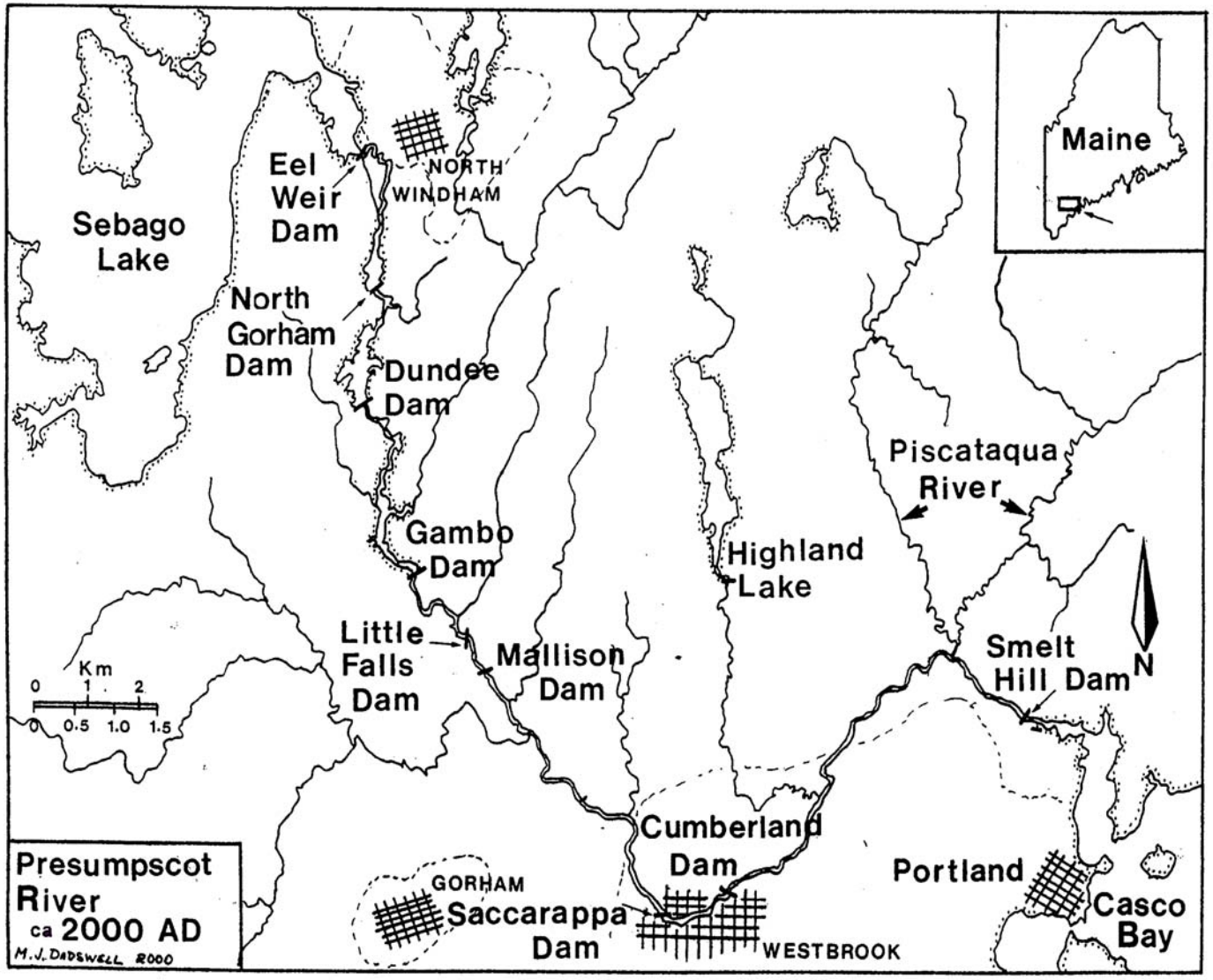
The Casco Bay Estuary Project (CBEP) is assisting the Presumpscot River communities and interested groups in developing a vision for the future of the Presumpscot River. The focus of this planning effort is the Presumpscot River corridor, from its origins at Sebago Lake, to its outlet in Casco Bay (Figure 1). Sebago Lake is Maine's second largest lake, and is the deepest lake in New England (maximum depth of 316 feet). It is also one of the State's highest quality lakes, and serves as the water supply for Greater Portland. The Presumpscot River flows approximately 26 miles from the present outlet of Sebago Lake to Casco Bay (2 miles below the I-95 bridge across the river). The total drop in elevation from Sebago Lake to Casco Bay is 267 feet. At one time, there were fourteen named falls on the river. Today, dams occupy or flood all but one of these sites (Steep Falls).

Fisheries management is one of the central issues in planning for the Presumpscot River. For the first time in over a century, the future of the Presumpscot River includes new possibilities for fish restoration. Water pollution on the river has been reduced with the development of water treatment facilities and SAPPI's elimination of its pulp mill. Further, if removal of Smelt Hill Dam (the head-of-tide dam at Presumpscot Falls) occurs as expected in the summer to fall of 2002, seven miles of the lower Presumpscot River will be restored to its original free-flowing condition, a condition that has existed for only a brief period since the current dam was built in 1898. A fish lift was added in the late 1980's when the dam was rehabilitated, but only remained in operation until 1996 when it was damaged in a major flood. Prior to the late 1800's, access to the lower Presumpscot River was sporadic; the first dam was built at Presumpscot Falls in 1732, but was washed out in 1751 (McLellan, 1903); another is documented in an early Fish Commissioner's Report as having been built in 1802, but was gone by 1852 (Atkins, 1867). There was no dam at the site as late as 1887 (Atkins, 1887). If the present dam is removed, a number of migratory fish species which are not suited to fish passage facilities, including sturgeon, striped bass, and rainbow smelt will be able to access the river above Presumpscot Falls for the first time since the late 1800's.

As part of the CBEP planning process, a Steering Committee composed of representatives of federal, state and local government agencies, conservation organizations and interests, and SAPPI Fine Paper, Inc. (formerly S.D. Warren Company), has been working cooperatively to develop an information base and has proposed management options to discuss at public meetings. This Background Paper presents an overview of the existing and potential resident and migratory fishes of the Presumpscot River, and has been prepared to provide a basis for public discussions regarding the future of fisheries of the Presumpscot River. It is largely focused on the Presumpscot mainstem, although it includes some information on the major tributaries, including Pleasant River and the Little River. It provides information that illuminates the potential for improving the resident fishery, restoring sea-run fish migrations, , the general benefits of a restored river, and the capital costs of measures identified as necessary for that restoration, which could include dam removal or construction of fishways.

The Steering Committee, in its efforts to define solutions for managing the river, is interested in the public's input. Overall, the Steering Committee has an objective of finding "win-win" solutions that address the diverse interests that have a stake in the future of the river. The public's ideas, concerns, and interests are welcomed as the Steering Committee considers the future of the Presumpscot River.

Figure 1 Map of the Presumpscot River



2. Existing Fisheries

A. Overview of Fish Species Inhabiting the Presumpscot River

The existing fisheries of the Presumpscot River include (1) an intensively managed trout and salmon fishery located primarily in the restored Eel Weir Bypass, the natural river channel below Sebago Lake, and in the tailraces below the downstream dams; (2) resident species, primarily bass, perch, and bullhead, found in the series of impoundments that characterize nearly 23 miles of the river below the Eel Weir Bypass (from the upper end of the North Gorham impoundment to the Smelt Hill dam); and (3) migratory species, principally eels, found in all the impoundments, and alewives, found seasonally in the river below the Cumberland Mills dam. See Table 1.

Introduced Species: The historical origin of all species present is uncertain. However, the following species were introduced most recently:

- brown trout
- smallmouth bass
- largemouth bass
- black crappie
- bridle shiner

Recreational Sport fisheries are comprised primarily of:

- landlocked Atlantic salmon
- brook trout
- brown trout
- smallmouth bass
- largemouth bass
- brown bullhead
- yellow perch

Table 1: Fish Species Present

COMMON NAME	SCIENTIFIC NAME
Resident Fishes	
Chain pickerel	*Esox niger*
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
Pumpkinseed	*Lepomis gibbosus*
Black crappie	*Pomoxis nigromaculatus*
Yellow perch	*Perca flavescens*
Brown bullhead (hornpout)	*Ameiurus nebulosus*
Golden shiner	*Notemigonus crysoleucas*
Bridle shiner	*Notropis bifrenatus*
Common shiner	*Luxilus* (formerly *Notropis) cornutus*
Fallfish	*Semotilus corporalis*
Banded killifish	*Fundulus diaphanus*
Fourspine stickleback	*Apeltes quadracus*
White sucker	*Catostomus commersoni*
Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Landlocked Atlantic salmon	*Salmo salar Sebago L*
Migratory Fishes	
American eel	*Anguilla rostrata*
Alewife	*Alosa pseudoharengus*
Blueback herring *	*Alosa aestivalis*
American shad *	*Alosa sapidissima*
Striped bass *	*Morone saxatilis*
Rainbow smelt **	*Osmerus mordax*
Atlantic Salmon ***	*Salmo salar*

* Likely but not known to be present; recent removal of the dam gates (2001) should allow access to the river above the dam for strong swimmers, per Tom Squiers, Maine DMR.
** Currently present only below Smelt Hill dam
*** Occasional reports of sightings below Cumberland Mills per Norm Dube, Atlantic Salmon Commission
Sources: Maine Department of Inland Fisheries and Wildlife and Maine Department of Marine Resources

Fish Stocking: MDIFW stocking programs maintain recreational fisheries for trout and landlocked salmon. These fisheries occur in the tailrace and bypass reaches associated with Eel Weir Dam, North Gorham Dam, Dundee Dam, and Mallison Dam. The Eel Weir bypass (approximately 1.25 miles in length), is located immediately below Sebago Lake, and is intensively managed for brook trout, although, landlocked Atlantic salmon, and to a lesser extent brown trout are also stocked. Up to 2,500 trout and salmon have been stocked annually in the Eel Weir Bypass reach. The other three bypass reaches, at North Gorham, Dundee and Mallison Falls dams, are managed primarily for brown trout and are stocked annually at much lower levels, typically 250 trout per reach.

Tributaries to the Presumpscot River including the Pleasant River (draining into the Gambo impoundment), Little River (draining into the Saccarappa impoundment), Mill Brook (draining from Highland Lake to the Smelt Hill impoundment), and the Piscataqua River (draining into the Smelt Hill impoundment), are stocked with brown trout and brook trout.

Migratory Species: Two species of fish presently utilize the Presumpscot River during a portion of their lives:

- American eels, which spawn in the ocean and migrate into rivers to mature to adulthood. Because some young American eels (elvers) can wriggle over or around dams, some eels are able to migrate up the river, ascending the dams to reach all the way to Sebago Lake. They are found in all the impoundments and reaches of the river; and

- alewives, which migrate upriver to spawning grounds in lakes and ponds, and return to sea to mature into adults. Construction of a fishlift at Smelt Hill Dam by Cumberland Power Company in the 1980s and of a fishway at the outlet of Highland Lake by the Department of Marine Resources in 1987 allowed alewives access to Highland Lake, their principal spawning area. After the 1996 flood, which rendered the fishlift inoperable, Central Maine Power, the current owner, stocked alewives into Highland Lake in 1997 and 1998 and opened gates in the Smelt Hill Dam in 1999-2001 to allow passage of anadromous species. In addition, the Department of Marine Resources stocked alewives in Highland Lake in 2000 and 2001 to maintain the population.

A remnant population of a third species, American shad, is also likely to be utilizing the river below the Smelt Hill dam. Shad were among the fish present and using the fish lift at the Smelt Hill dam when it was last operational in 1996. As with other rivers that are dammed at the head of tide but have sustained small runs of shad, including the Salmon Falls River, it is likely that a small remnant population continues to return to spawn in the Presumpscot River, utilizing the reach below the dam (per Tom Squiers, Maine DMR). This remnant population could provide the seed for a renewed run of shad on the river after the Smelt Hill dam is removed.

B. Relative Abundance and Condition of the Existing Fishery

(1) Overview:

The relative abundance and condition of Presumpscot River fish populations reflects the habitat suitability of the river. A number of factors that affect the habitat suitability are discussed in Section C below. Overall, because much of the river is impounded by low head dams[1] (see Table 2 and Figure 2), the river is neither well suited to riverine fishes (those, like trout and salmon that prefer cold, fast flowing well oxygenated shallow waters,), nor lake dwelling fish (those like bass, perch, pickerel, and bullheads that require more placid waters with rooted aquatic vegetation). The result is relatively low numbers of fish, comprised primarily of species adapted to the impounded environments, i.e. smallmouth bass, pumpkinseed, and yellow perch; and a small seasonal population of stocked brook trout, Atlantic salmon, and brown trout principally in the tailrace areas below the dams where conditions are more riverine.

(2) Assessments of Abundance and Condition

There are only a few studies documenting the abundance or condition of the fisheries in the Presumpscot River. In 1997, S.D. Warren Company contracted a study of the fisheries in the Dundee, Gambo, Little Falls, Mallison Falls, and Saccarappa impoundments, as part of its relicensing effort for those projects[2]. In 1997 the Maine Department of Inland Fisheries and Wildlife also issued a report on the Eel Weir Bypass fishery that had been formally initiated in 1992 with increased flow releases into this reach from the Eel Weir dam[3] dam at the outlet of Sebago Lake. Prior to these studies, the fisheries of the North Gorham impoundment were described in the 1991 application for a license for the North Gorham Project (FERC No. 2519-003), based on a general assessment of the fisheries in the upper Presumpscot River contained in the "State of Maine Statewide River Fisheries Management Plan" (June 1982) prepared by the state fisheries agencies (Department of Inland Fisheries and Wildlife, Department of Marine Resources, and the Atlantic Salmon Commission). In addition, the Maine Department of Environmental Protection and Maine Department of Inland Fisheries and Wildlife sampled the Smelt Hill Dam impoundment in 1989-1991, and documented the species present and their relative abundance. The more recent Smelt Hill Dam Environmental Restoration Study and Environmental Assessment by the US Army Corps of Engineers (January 2001) elaborates further on the fisheries and fisheries habitat conditions of the Smelt Hill dam impoundment. These studies are summarized below.

---

[1] The Dundee impoundment is an exception to this overall characterization in that it has areas with more depth (maximum depth of 44 feet).

[2] S. D. Warren Baseline Information on Fishery Resources, 1998, by Ichthyological Associates, Inc. and Duke Engineering Services; S. D. Warren Final Report, Upstream Migration of American Eels at the Presumpscot River Projects, 2000, by Kleinschmidt Associates.

[3] Brautigam, Francis. May 1997. Presumpscot River Eel Weir Bypass Fishery. MDIF&W, Fishery Interim Summary Report Series 97-4.

Fisheries in the Eel Weir Bypass: The following fish species were reported as part of the angler catch in the Eel Weir Bypass in 1995 and 1996: brook trout (75% of the catch); landlocked salmon (8.0%); smallmouth bass (7.8%); brown trout (5%); and others (4.2%) including white perch, chain pickerel, largemouth bass, yellow perch, lake trout, and sunfish (Brautigam, 1997). The report notes that mid-summer water temperatures are limiting for trout and salmon, as is the case for many southern Maine coastal rivers of this size. It also notes, that the lack of a smelt forage limits salmon growth potential in the Bypass. Although salmon have benefited from dropdowns of landlocked smelt from lakes into some rivers in Maine, this does not occur at the Eel Weir bypass primarily because the outlet of Sebago Lake is at the shallow Sebago Lake Basin, and there is only a very limited production of smelt in this basin.

Fisheries in the North Gorham Impoundment: In its 1991 application for relicensing the North Gorham Hydropower Project, Central Maine Power Company cited the State of Maine Statewide River Fisheries Management Plan (1982) in characterizing the fisheries of North Gorham Pond: "For that portion of the Presumpscot River including North Gorham Project waters, the study notes that the principal fishery is for smallmouth and largemouth bass, and identifies species composition, high natural reproduction, and habitat quality as this river stretch's fishery related attributes." Other species listed in the application as present in the impoundment include white perch, yellow perch, chain pickerel, bullhead, white sucker, fallfish, pumpkinseed sunfish, various minnows, and American eel. Landlocked salmon and trout also drop down into the North Gorham impoundment from Sebago Lake and the stocking at Eel Weir Bypass, and are present in the cooler seasons when water temperatures in the impoundment are within the range supporting salmonids (fall through spring).

Fisheries Characteristics from the Dundee Impoundment to Saccarappa Dam: The 1997 fisheries baseline survey of the Dundee, Gambo, Little Falls, Mallison Falls and Saccarappa impoundments conducted for the S.D. Warren Company (Ichthyological Associates, 1998) indicates:

- The dominant sport fisheries, in order of overall abundance, included pumpkinseed sunfish (38% of all sport fish species), smallmouth bass (32%), and yellow perch (16%).

- Coldwater species (salmonids) were collected or observed at the tailrace areas of the Dundee, Gambo, Little Falls, and Mallison Falls dams, and in the Little Falls impoundment. However, the numbers of salmonids found through electrofishing or rod and reel catch were quite limited. As noted above, brown and brook trout are stocked at a number of locations that could have contributed to the presence of salmonids in these impoundments, including tributaries to the Gambo and Saccarappa impoundments, and the tailraces below the Dundee dam, Mallison dam, and the upper end of the Gambo impoundment.

- Growth rates of smallmouth bass in the Dundee, Gambo, Little Falls, Mallison, and Saccarappa impoundments are low compared to other Maine waters: "Most smallmouth bass in these impoundments do not reach preferred length (280 mm) until age 4+. This is a full year later than what was observed for the Riley, Jay, Otis and Livermore impoundments on the Androscoggin River." (Ichthyological Associates, 1998 p. 33).

- The bass fishery in the Dundee, Gambo, Little Falls, Mallison, and Saccarappa impoundments was not found to include many older age class fish. "Smallmouth bass older than age 4+ were rare or non-existent in the catch for all impoundments." (Ichthyological Associates, 1998 p. 32). The study also states that the actual abundance of older bass in at least the Dundee and Gambo impoundments may be greater than what is indicated from the catch data.

Fisheries from below Saccarappa Dam to the Smelt Hill Dam: No fisheries studies exist for the Cumberland Mills impoundment. However, an effort to document eel populations below the Saccarappa Dam (Kleinschmidt Associates, 2000) also documented an assemblage of fish below the Saccarappa dam similar to that found in the Saccarappa impoundment. Below the Cumberland Mills dam, fish collected by the Maine DEP and Maine DIF&W using gillnets in 1989 and 1991 in the Smelt Hill impoundment (as cited by the US Army Corps of Engineers, 2001; Smelt Hill Dam Environmental Restoration Study) included American eel, black crappie, bullhead, fallfish, golden shiner, largemouth bass, pickerel, pumpkinseed, smallmouth bass, white perch, yellow perch, and white sucker. At the time of the sampling, the river was affected by pulp manufacturing effluent from the S.D. Warren mill upstream. The sampling effort noted a relatively low population of fish in the impoundment due to low oxygen conditions. Since then the pulping operation has ceased, water quality has improved, and it is expected that the numbers of resident fish has increased. In addition, with the removal of the gates in the Smelt Hill Dam in 2001, migrating fish, including river herring, shad and alewives, are likely present as far as the Cumberland Mills dam However, there is no recent data on the condition or abundance of the fish populations above the Smelt Hill dam.

(3) General Conclusions:

Based on the above assessments and local knowledge offered by regional fisheries biologist Francis Brautigam, the fisheries in the Presumpscot River can be described as follows:

- The Eel Weir Bypass supports a robust put-and-take trout and salmon fishery, as well as an assemblage of other fishes including lake trout (drop-downs from Sebago Lake) bass, perch, pickerel, sunfish.

- The North Gorham impoundment has a seasonal trout and salmon fishery (winter-spring) supported primarily from drop-downs of fish stocked in the Eel Weir Bypass; and a resident fishery of bass, perch, bullhead, sunfish, pickerel and minnows.

- The Dundee impoundment has well established, self-sustaining smallmouth bass and panfish populations, with some larger bass, yellow perch, and brown bullhead available to support a recreational fishery. It also supports a limited trout and salmon fishery in the winter and spring.

- The Gambo impoundment supports a more limited fishery for smallmouth bass and yellow perch.

- The three downstream impoundments (Little Falls, Mallison, and Saccarappa) provide lower quality habitat for many species of fish inhabiting these reaches of the Presumpscot River.

- Below the Saccarappa dam there is likely to be found the same assemblage of fish found above Saccarappa, except that below Cumberland Mills, some migratory fish (alewives, blueback herring, shad, striped bass) may be present as a result of the removal of the gates at the Smelt Hill dam. There is no information on the abundance or condition of the fish in this portion of the river.

- Eels are common in all of the impoundments.

C. Condition of Fisheries Habitats in the Presumpscot River

(1) Assessments of Fish Habitat on the Presumpscot River

There are few assessments of the fish habitat of the river. The 1997 baseline fisheries study (Ichthyological Associates, 1998) assessed the suitability of shoreline habitats for bass spawning in the five impoundments undergoing federal relicensing (the Dundee, Gambo, Little Falls, Mallison, and Saccarappa impoundments) and concluded the bass and panfish habitat in most of the impoundments was marginal. This study characterized bass habitat conditions in the five impoundments as follows[4]:

Dundee and Gambo Projects: A desirable variety of microhabitats are available due in part to the irregular shape and contour of these impoundments. Aquatic plant growth is established in the shallow backwaters and side channels. The Gambo impoundment is also capable of supporting a limited fishery for smallmouth bass and yellow perch.

Little Falls, Mallison and Saccarappa Projects: These three impoundments have less microhabitat variety due to their predominantly linear nature, with few coves and relatively uniform shoreline. Aquatic vegetation is sparse, limited primarily to a shoreline fringe of pickerelweed in the very shallow areas. Cover in the form of boulders is limited to the tailrace areas. The habitat for bass and panfishes in these impoundments is characterized as marginal.

[4] The study did not characterize the habitat conditions for coldwater species except to say "These impoundments do seem capable of supporting at least a put-and-take salmonid fishery in the vicinity of the project tailraces."

Table 2: Percent of Shoreline Suitable for Bass Spawning

Bass Spawning Habitat Rating	Dundee	Gambo	Little Falls	Mallison	Saccarappa
High Quality	15%	2%	0%	0%	2%
Medium Quality	22%	37%	32%	32%	19%
Low Quality	63%	61%	43%	48%	72%
Unsuitable	0%	0%	25%	20%	7%
Source: Ichthyological Associates, 1998					

(2) Habitat Factors

Existing fisheries habitat in the Presumpscot River has been influenced by a number of factors including

(a) development of dams on the river, including the dam controlling flows into the river from Sebago Lake, and eight downstream dams; these dams are impediments to fish movement and migrations, and have transformed most of the river to a series of riverine impoundments, and, in some cases, have diverted water away from the main stream channel, creating "bypasses;"

(b) the nature of the bottom sediments (substrate conditions); and

(c) discharges to the river from both point and nonpoint sources which have altered the water quality of the river.

a. Habitat Impacts from Dams:

Impediments to movements of aquatic species including, but not limited to, spawning migrations**:** Presently, there are 9 dams on the Presumpscot River, including, from its source at Sebago Lake. to its outlet at Casco Bay:

Table 3. Dams on the Presumpscot River

Dam	Miles from Casco Bay	Use	Owner	Comment
Eel Weir	26.0	hydropower project	SAPPI	outlet of Sebago Lake
North Gorham	23.65	hydropower project	FPL, LLC	
Dundee	21.87	hydropower project	SAPPI	
Gambo	18.63	hydropower project	SAPPI	
Little Falls	16.92	hydropower project	SAPPI	
Mallison Falls	16.37	hydropower project	SAPPI	
Saccarappa	10.8	hydropower project	SAPPI	
Cumberland Mills	9.6	process water/fire protection	SAPPI	
Smelt Hill	2.5	Inoperable	State of Maine	head-of-tide

The effects of these dams in limiting access to habitat are twofold:

- First, the dams are impediments to the upstream migration of sea-run fish that return to freshwaters to spawn (including Atlantic salmon, shad, and alewives). Young American eels also migrate into freshwaters to mature prior to returning to the sea to spawn. Some American eels are able to ascend over and around the dams, and are found in all of the impoundments; however, the Department of Marine Resources believes the number that are successful in migrating up the Presumpscot are much less than would occur naturally.

- Secondly, the dams have fragmented the river habitat for resident fishes, restricting movement of coldwater fish such as brook trout, and limiting options for finding coldwater refuges during summer low flow and high temperature conditions.

Alteration of river ecology by dams on the river. Dams have altered the ecology of the river as follows:

- The dams created a series of impoundments that replaced the natural pools, riffles, runs, and falls originally present in the river. Impoundments now occupy approximately 22 of the 26 miles from head of tide to Sebago Lake. In general, a change from riverine to impounded habitat increases water depth, reduces water velocity, reduces re-aeration potential, reduces light penetration, and increases retention of settleable solids (Maine DEP, Biomonitoring Retrospective, 1999 page 17). These physical changes coupled with the introduction of nonnative species have altered the original fish community.

- The impoundments are unable to function like a natural river, lake or pond, and as a result, the abundance and diversity of the benthic (bottom) organisms are diminished compared to a river, lake or pond.

  "In effect, the ponded area assumes some of the characteristics of a lake, but typically the ponded water volume has a much shorter retention time, as compared to a natural lake. Thus the riverine biological community is subjected to quasi-lake conditions for which they are not adapted. Lake dwelling organisms generally, also find run-of river impoundment conditions unfavorable. The short retention time precludes the possibility of development of a planktonic community, the typical food base of lakes. High flow volumes in spring and fall, experienced by the river are also reflected in riverine impoundments, frequently causing scouring of accumulated organic matter on the substrate, and partially restoring the riverine, mineral-based substrate. This constitutes a periodic disturbance of benthic habitat for typical lake dwelling organisms, resulting in lower production. Biological assessment of impounded benthic communities reveals that the detrimental effects of these unnatural conditions usually results in severe loss of both community structure and function. . . . This is reflected as reduced sample abundance and richness." (DEP, 1999, page 17).

Table 4 and Figure 2 show the extent to which fish habitat characteristics of the Presumpscot River have been changed from free flowing to a series of shallow impoundments.

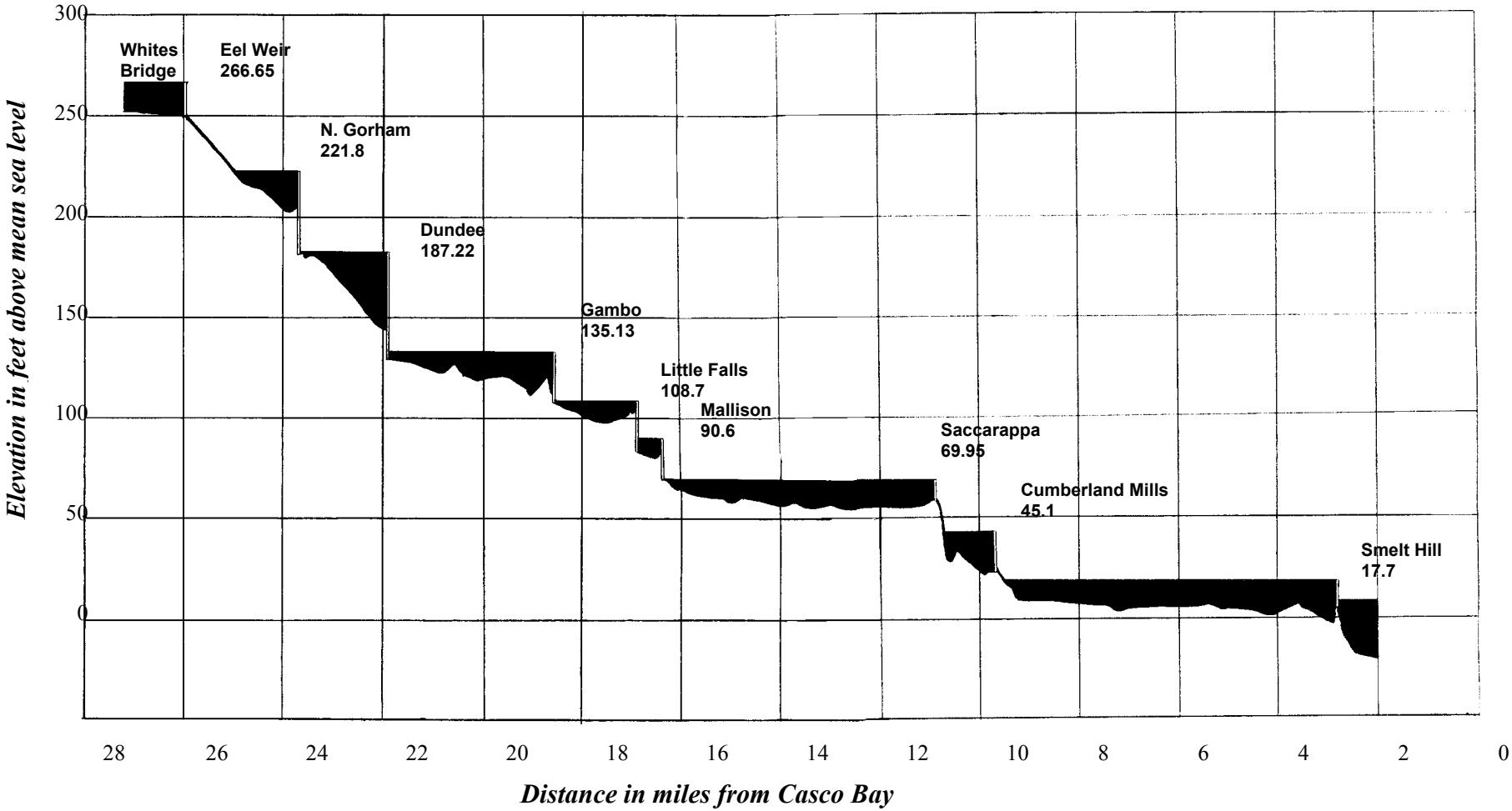
Table 4: Overview of Fish Habitat Characteristics by Reach on the Presumpscot River

Characteristic/ Aspect	Eel Weir Bypass (Eel Weir dam at Sebago Lake outlet to North Gorham impoundment)	North Gorham Impoundment	N. Gorham Dam to Dundee Dam	Dundee Dam to Gambo Dam	Gambo Dam to Little Falls Dam	Little Falls Dam to Mallison Falls Dam	Mallison Falls Dam To Saccarappa Dam	Saccarappa Dam To Cumberland Mills Dam	Cumberland Mills Dam to Smelt Hill Dam
Reach Length (miles): (see column headings)	1.25 miles	1.1 miles	1.77 miles	3.24 miles	1.71 miles	0.55 miles	5.53 miles	1.23 miles	6.85 miles
Impoundment Area Impoundment Depths	none none	98 acres max 23 feet	197 acres 10 – 44 feet	151 acres max 15 feet	29 acres 12 – 15 feet	8 acres max 9 feet	87 acres max 28 feet	31 acres max 20 feet	107 acres 26 feet at Smelt H. dam
Length impounded ~Length "free-lowing"[1]	none 1.25 miles	1.1 miles none	1.77 miles none	3.07 miles 875 feet	1.65 miles 300 feet	0.50 miles 300 feet	5.52 miles 300 feet	1.14 miles 475 feet	~ 6.53 miles ~1,700 feet
Natural Riverbed Profile Elevation Drop in (ft) [2] Average drop (ft/mi)	34 ft 27 ft/mi.	28ft 26 ft/mi/	56 ft. 32 ft/mi.	22 ft. 7 ft/mi.	22 ft. 13 ft/mi.	16 ft. 29 ft/mi.	40 ft. 7 ft/mi.	20 ft. 16 ft/mi.	20 ft. 3 ft/mi.

[1] Free flowing means not backwatered by the downstream impoundment; these lengths are, excepting the Eel Weir Bypass and the river immediately below the Cumberland Mills dam, areas of the river below dams where flows have been bypassed through diversions to downstream powerhouses, and hence they have much reduced flows, and at times, no flows.
[2] Drop in riverbed, in feet, from base of upper dam to base of lower dam.

Sources: S.D. Warren license applications for the Dundee, Gambo, Little Falls, Mallison Falls and Saccarappa Projects (1999); Initial Consultation Document for Eel Weir Project (S. D. Warren, 1999); and FEMA Flood Profiles for reach lengths based on locations of dams in miles from the confluence of Casco Bay as listed previously.

Figure 2 : Profile of the Presumpscot River



Note: Elevations at the top of each dam are shown next to the names of the dams.

Sources: *Federal Emergency Management Agency: Flood Insurance Study. Portland (1998), Falmouth (1984) Westbrook (1980), Gorham (1981), Windham (1981); and Portland Water District for elevations at White's Bridge.*
Prepared by: *Natalia Kassatova, Graduate Intern, Casco Bay Estuary Project*

b. Substrate (River Bottom) Conditions Affecting Fish Habitat

Significance: Substrate (the characteristics of the river bottom) is an important factor defining habitat conditions for fish. Several species of fish that presently or potentially could inhabit the Presumpscot River require or favor sandy, gravelly, or rocky bottom sediments for spawning. These include Atlantic salmon, brook trout, brown trout, and smallmouth bass. The kind of substrate used for spawning varies by species with Atlantic salmon using fist sized gravel, brook trout using pebble sized gravel, and smallmouth bass using a variety of substrates from sandy to small pebbles. Substrates are also important in determining the type and abundance of aquatic vegetation. Nutrient poor substrates will have less aquatic vegetation. A number of fish species are adapted to habitats with abundant aquatic vegetation, either as cover for rearing or for eggs to attach to. Pickerel and brown bullhead are among the fish that prefer habitats with robust aquatic vegetation.

Geologic Influences: The Presumpscot River is located in an area that was initially blanketed by glacial till composed of variable silty, gravelly sand with cobbles and boulders. The till in the lower part of the Presumpscot basin was subsequently buried under marine clay, called the Presumpscot formation, which was deposited 10,000 to 12,000 years ago when the land was depressed by the weight of the glaciers and the ocean flooded the area. Since then, portions of the river have eroded through the surficial and marine deposits to the till and glacial outwash deposits[5]. The composition of the substrates in the river vary, and generally contain more fine grained material and clay in the downstream areas than in the upstream areas where gradients are generally more consistently steep. The substrate sampling results reflect this general trend (see Table 5).

Studies: Four studies have documented substrate conditions from the Smelt Hill Dam to the Dundee Impoundment:

Ichthyological Associates & Duke Engineering Services (1998): S.D. Warren Company fisheries consultants recorded observations on substrate conditions during fish sampling and bass spawning surveys conducted in 1997 for the Dundee, Gambo, Little Falls, Mallison, and Saccarappa Projects. These observations, limited to areas less than 10 feet in depth, were qualitative, based on visual assessment and use of a wooden pole to probe the bottom. Overall, this study characterized the substrate in the shore areas out to a depth of 10 feet as predominantly clay. A limitation of this study, in addition to its qualitative nature, is that it did not extend across the full width of the impoundments, or include the deepest sections in many cases; hence, where the natural river channel was at depths greater than ten feet (all cases except Mallison), the results may not reflect the character of the original river.

Northern Ecological Associates, Inc (conducted Dec 2000 and April 2001): A second study was conducted for Friends of the Presumpscot River and American Rivers. This study sampled the substrate of the original river channel using a core

[5] See Maine Geological Survey Open-File reports No. 99-115 Surficial Geology of the Gorham 7.5 minute Quadrangle, No. 97-75 Surficial Geology of the North Windham 7.5 minute Quadrangle, and No. 97-66 Surficial Geology of the Portland West 7.5 minute Quadrangle.

sampler (sampling material to a depth of 1 to 2 inches), and included complete cross-sections of the three downstream SAPPI projects: Saccarappa, Mallison Falls, and Little Falls impoundments. The samples were then analyzed to determine the percent composition by weight of fine sediments (silt, clay, or fine sand – less than 2 mm in size), and larger grained sediments including gravel, pebble, and cobble. For the Little Falls and Mallison impoundments, this study found the substrate in deeper water, near the center of the impoundments, to be "gravel, pebble and cobble"; for these impoundments the shore areas were also characterized as rocky. The Saccarappa impoundment was characterized as predominantly silt and clay along the banks but 35-45% of sample weight within the lower portion of the Saccarappa impoundment were gravel and small pebbles in the reach below the Little River. "Sand was the dominant substrate at all three transects (in the lower Saccarappa impoundment), and there was a significant amount of gravel and pebble substrate in deeper water." Above the Little River, fines (mostly sand, not clay) were predominant on the banks, with sand and small pebbles in the center of the river in all but one of the samples in each cross section, and become progressively more gravelly in the furthest upstream sample (below the Mallison tailrace). A limitation of this study is that is does not report the extent to which gravel and pebble substrates are imbedded with fines, which is important in assessing the suitability of the substrate for salmonid spawning habitat.

Louis Berger Group, Inc. (conducted September 2000): As part of a dam removal study conducted for the Federal Energy Regulatory Commission, Louis Berger Group conducted a field survey of the Little Falls, Mallison Falls, Saccarappa, and Cumberland Mills impoundments, which consisted of seven transects at Little Falls, three transects at Mallison Falls, nine transects at Saccarappa, and 3 transects at Cumberland Mills. This study included both the original river bed and the area flooded by the impoundments. Each transect consisted of readings taken at four foot intervals across the width of the impoundment. The transects were spaced at 0.25 to 0.5 mile intervals. Substrate was characterized visually and through use of a long line rod or weighted line in deep locations. At least two bottom sediment samples were collected from each impoundment using a petite Ponar sampler. This study characterized the results as follows: "most of the surface sediments in the Little Falls, Mallison Falls, and upper part of the Saccarappa impoundment consisted of coarser-grained sediments, boulders, or bedrock, with limited amounts of finer grained sediments (silt/clay)." (Louis Berger Group, Inc. July 2001 at page 27).

Central Maine Power Company (1996): The sediment composition of the Smelt Hill dam impoundment has been analyzed in connection with plans to remove that dam. In 1996 CMP conducted an analysis of sediments in the vicinity of the dam, recently summarized in the Corps of Engineers Environmental Assessment for the Smelt Hill dam removal (Jan 2001). The sediments sampled at the Smelt Hill impoundment in the vicinity of the dam, contained predominantly medium sand, fine sand, and scoured bedrock. The remainder of the impoundment was not evaluated.

Table 5: Summary of Substrate Analyses for the Presumpscot River Impoundments

Impoundment	Ichthyological Associates & Duke Engineering, 1998 (shorelines to a depth of 10 ft or less of water)	Northern Ecological Associates, Inc. 2000 (5 samples spanning the original river channel at each transect location; two to three transects per impoundment)	Louis Berger Group, 2000 (every 4 to 8 feet at each transect location; up to 9 transects per impoundment)	Central Maine Power Company, 1996 (unknown number of samples)
Dundee	**Upstream end:** Clay mixed with some cobble and silt on the west shore; mix of sand/gravel/cobble on the east shore **Mid-reach:** Mix of sand/gravel/cobble on the west shore grading to clay off-shore; the large bays had predominantly clay substrate; **Downstream end:** Clay mixed with minor amounts of silt and cobble on the west shore	Not Sampled	Not Sampled	Not Sampled
Gambo	**Upstream end:** Mix of rock and sand, with cobble, bedrock, and gravel predominant. **Mid-reach:** Predominantly clay, with sand and silt noted on the east shore. **Downstream end:** Nearly entirely clay.	Not Sampled	Not Sampled	Not Sampled
Little Falls	**Upstream end:** Primarily sand, sometimes mixed with clay. Cobble/boulder along the east shore. **Downstream end:** nearly entirely of clay or clay mixed with silt	**Upstream area:** In deeper water, primarily pebble (86-96% by weight). Rocky substrate common also close to shore. Fine sediments (clay, silt, sand) sometimes mixed with gravel and pebbles, predominate on the banks. **Downstream area:** Fine sediments (5-13% silt/clay and 86-94% sand, by weight, in middle 3 of 5 samples across the river).	Hard substrates predominate throughout much of the impoundment, although sand and silt are common in the deeper midsection.	Not Sampled
Mallison Falls	**General:** primarily clay mixed with varying amounts of sand, gravel, and cobble; patches of bedrock and boulders.	**Upstream area:** Only shallow waters sampled; current too swift to sample deeper areas. **Downstream area:** ; Conclusion of NEA – deep water of "Mallison Impoundment is composed primarily of gravel, pebble and cobble" (FOPR suggested change). Rocky substrate common close to shore.	Hard substrates predominate (gravel, cobble, boulder, bedrock), although sand is common in many areas.	Not Sampled

Impoundment	Ichthyological Associates & Duke Engineering, 1998 (shorelines to a depth of 10 ft or less of water)	Northern Ecological Associates, Inc. 2000 (5 samples spanning the original river channel at each transect location; two to three transects per impoundment)	Louis Berger Group, 2000 (every 4 to 8 feet at each transect location; up to 9 transects per impoundment)	Central Maine Power Company, 1996 (unknown number of samples)
Saccarappa	**Upstream end:** primarily clay grading to sand or gravel offshore. **Mid-reach:** predominantly clay or sand, except at one transect where there was steeply sloping bedrock.	**Upstream end (above Little River):** significant amount of fine sandy sediment; gravel common and some small pebbles at the uppermost of the 2 transects. **Mid and Downstream areas**: New samples done in April 2001 in lower Saccarappa impoundment show fine sediments predominate along the banks, with gravel and pebbles present, accounting for 35-45% of sample by weight in three samples collected in deeper water near the center of the river". Fine sediments with silt and clay a significant portion, especially in the mid transect downstream of the Little River.	**Lower reach**: deepest section; sand, silt and clay. **Upstream area**: shallow; substrate dominated by sand with some gravel and cobble.	Not Sampled
Cumberland	Not Sampled	Not Sampled	**Upstream area**: Primarily cobble and boulder. **Mid-impoundment**: sand, silt, and clay. **Immediately above dam**: bedrock.	Not Sampled
Smelt Hill	Not Sampled	Not Sampled	Not Sampled	Scoured ledge with areas of fine to coarse sand immediately behind the dam.

Note: The results of these studies are not directly comparable because different standards were used to define categories of particle size.

c. Water Quality as an Influence on Fish Habitat

Maine State Water Quality Classification of the Presumpscot River: The State of Maine has classed the Presumpscot River, from the outlet of Sebago Lake to the confluence with the Pleasant River, as Class A (4.45 miles of river) and GPA (Dundee Pond, 1.7 miles in length). From the confluence of the Pleasant River to and including the tailwaters below the Saccarappa Project the waters are Class B (9 miles). Below the Saccarappa tailwaters to tidewater (below the Smelt Hill dam) the river is designated Class C (8.25 miles). Below the Smelt Hill dam to Casco Bay the river is designated Class SC (2.5 miles).

Class GPA, A and B waters must have dissolved oxygen (DO) concentrations at or above 7.0 parts per million (ppm) or 75 % saturation (whichever is higher); however, in order to ensure spawning and egg incubation of indigenous species in Class B waters, from October 1 to May 14, the 7-day mean DO concentration may not be less than 9.5 ppm and the 1-day minimum DO concentration may not be less than 8.0 ppm. The maximum concentration standards for *E.coli* bacteria for Class GPA and A is "as naturally occurs," or less than or equal to 194 MPN/100 milliliter (Most probable number). For Class B waters, maximum concentration standards for *E.coli* bacteria must remain at or below 427 MPN/100 ml. Class GPA, A and B waters must be suitable for water supply after treatment and disinfection, fishing, water-based recreation, industrial process and cooling water, hydropower, navigation, and fish and aquatic life habitat. Fish and aquatic life habitat must meet a criteria of "as naturally occurs" for Class GPA and A; and for Class B, the fish and aquatic life "shall be unimpaired," and "shall support indigenous species without detrimental changes to the resident biological community." However, existing hydropower impoundments that do not attain the aquatic life criteria for Class GPA, A or B must, at a minimum, meet Class C criteria.

Class C waters must have DO concentrations of at least 5 ppm or 60 percent saturation (whichever is higher) except for in identified salmonid spawning areas where water quality must be sufficient to ensure spawning, egg incubation, and survival of early life stages. *E. coli* concentrations must not exceed 949 MPN/100 ml. The aquatic life criteria for Class C waters is that the water must "support indigenous species and maintain the structure and function of the resident biological community."

Status of Water Quality and Effects on Fisheries, Sebago Lake to North Gorham Dam. This stretch of the Presumpscot River includes the Eel Weir Bypass and the North Gorham impoundment. The water quality of the Eel Weir Bypass supports a vigorous trout and salmon fishery, and has its source in Sebago Lake, the drinking water supply for Greater Portland.

In the North Gorham impoundment, water quality sampling was conducted in July 1986 and 1987 which showed that "even at relatively high temperatures and low flows, DO was above 90% saturation and 7 ppm both above and below the Project." (Maine DEP Water Quality Certification North Gorham Project, September 24, 1992). The impoundment is operated in run-of-river mode, with water levels maintained within one foot of full pond. The water quality is suitable for a

variety of indigenous and introduced species including bass and panfish; and supports trout and salmon during the fall, winter and spring.

Status of Water Quality and Effects on Fisheries from the Dundee Project to the Saccarappa Tailwaters. These waters have water quality that meets Class C standards for aquatic life: "support indigenous species and maintain the structure and function of the resident biological community." Dissolved oxygen concentrations meet Class A and B standards (7.0 ppm or greater) except near the confluence of the Pleasant River in the Gambo impoundment (S.D.Warren Company, Application for Subsequent License for Minor Water Power Project, January 1999, Table E.1.4-2). The Pleasant River is affected by a wastewater discharge from the Windham school, and non-point source pollution from agricultural uses. These sources elevate the sediment load and organic matter in this river which contribute to depressed oxygen levels. The phosphorus and chlorophyll a levels in the impoundments above Saccarappa Dam indicate these waters are moderately productive (mesotrophic) except for Saccarappa, which has levels in the highly productive range (eutrophic).

Water quality in this section of the river supports an assemblage of migratory and resident fishes, both indigenous (native) and introduced, including particularly American eel, bass, perch, sunfish and bullheads. Outside of any coldwater refuges that may exist near springs, temperatures are limiting for indigenous trout and salmon species. Native brook trout avoid waters with temperatures approaching 20 degrees centigrade, while the introduced brown trout and other species including sunfish, bullheads, and bass can tolerate warmer temperatures (and hence are often referred to as "warmwater fishes"). Temperatures monitored in the summer of 1997 showed temperatures in the impounded areas ranging from 22.0 to 24.3 degrees centigrade in the morning and 24 to 26.2 degrees centigrade in the afternoon. (S.D.Warren Company, Application for Subsequent License for Minor Water Power Project, January 1999, Table E.1.4-3

Monitoring of Dundee Pond in 1997 shows it also is suited to salmonid fisheries (trout and salmon) in the fall through spring, when water temperatures are cooler. Water temperatures are generally above 20 degrees centigrade in July and August, at all depths. Oxygen levels generally are between 7.0 mg/l and 9.7 mg/l at all depths, except in the summer when the deeper waters (below 8 meters) have slightly depressed levels (6.0 to 6.9 mg/l).

Status of Water Quality and Effects on Fisheries Below Cumberland Mills: The water quality of the river, particularly in the roughly 10 mile reach from the Cumberland Mills dam to the estuary, presently supports a variety of indigenous and introduced resident fishes, along with migratory fish including eels and alewives (since gates at the Smelt Hill dam have been opened to allow access to the river above the dam, although this access is still limited due to flow velocities). Water quality has improved since treatment plants were constructed in 1970's, and recently (since 1999), even more significant improvements have resulted due to the cessation of the pulping operation at the SAPPI (formerly S.D. Warren) mill in Westbrook. Effluent from the mill was noted by the DEP (Biomonitoring Retrospective, 1999) to be five to ten times greater in volume than any other discharge to the river, and prior to this change in mill operations, excessive loading of solids was the

primary reason the river below the mill failed to meet aquatic life standards. The high suspended solids in the effluent were the principal cause for the river failing to meet water quality criteria legislated for this river. The DEP predicted that discontinuing the pulping operation would eliminate the prevailing water quality problems in the Presumpscot River (Biomonitoring Retrospective, 1999, page 114). Although DEP has not monitored the river since the shutdown of the pulping operation, it is apparent that water quality has improved and there are plans to begin monitoring after the Smelt Hill dam is removed, expected in the summer to fall of 2002.

3. Historical Conditions for Fisheries in the Presumpscot River

Information on the historic fisheries of the Presumpscot River is drawn largely from secondary sources; that is sources that recount events second-hand, rather than first hand accounts. There are also a limited number of references available that offer any information on the very early history of the river (before 1800) when the river would have been unimpeded by dams. What is clear is that under original or natural conditions, the river fisheries were an important source of food for the native Americans living in the area. The following is a brief summary of information available on the historical conditions of fisheries in the Presumpscot River.

A. Historic Significance of the Presumpscot for Migratory Fish:

Early historical accounts are largely limited to controversies related to blockage of fish migrations caused by the construction of dams on the river. According to several sources (Fobes, 1894; McLellan, 1903) the first dam was constructed at the head of tide, Presumpscot Falls, in the 1730's. Dams at Saccarappa and Mallison Falls reportedly soon followed. According to published accounts, the dams caused public concern over the blockage of upstream migrations of fish, as well as protests by the Chief Polin of the Rockomeecook Tribe, who walked to Boston to confer with Governor Shirley about restoring fish to the river. There were several Indian settlements on the river, including one at Cumberland Falls. Indian settlements were located throughout Maine on rivers where fish congregated below falls and rapids on their ascent up the rivers to spawning grounds. Construction of dams and concerns over maintaining fish runs throughout the Commonwealth of Massachusetts (of which Maine was a part in the 1700's) prompted the enactment of laws in 1735-36 and 1741-42 requiring fish passages be installed at dams on all rivers. Apparently the fish passages on the Presumpscot River dams, if built, did not pass fish sufficiently, as Chief Polin is reported to have made a second trip to Boston and threatened to force the settlers out if the fish were not returned to the river. The first armed conflict between the Indians and the settlers along the Presumpscot River ensued, which was ended when Chief Polin was killed by the settlers in 1756.

The controversy continued after Chief Polin's death, as blockage of the river not only affected the Rockomeecook Tribe, it also eliminated a source of food for the early settlers and impacted Cod fishermen. Hence, on October 30, 1781 the selectmen of the towns of Gorham, and agents from the towns of Windham, Standish and Bridgton (which includes the Crooked River flowing into Sebago Lake), petitioned the Governor and Legislature of the Commonwealth of Massachusetts to "*appoint a Committee that shall cause*

good and sufficient fish courses to be made through the several dams on the river" to restore the fisheries to the river. They argued that restoring these fish runs was necessary to support the early settlers of the Plantations adjoining the stream,, stating "*a Plenty of fish coming even to their own doors would greatly contribute to their support.*" They went on to say that restoring the fish would also benefit cod fishermen "*For it is well known that the small fish running in shore for fresh water streams draw the Cod after them*."

B. Species Historically Utilizing the River, Abundance and Range

Historical accounts related to the original fisheries of the Presumpscot River include:

- The petition in 1781 to the Governor and Legislature of the Commonwealth of Massachusetts by the selectmen of the towns of Gorham, and agents from the towns of Windham, Standish and Bridgton to restore the fisheries to the river (see description above) stated that the Presumpscot River "*in times past has been remarkable for being frequented by Shad, Bass, Salmon . . .*" which had been present in the river in those towns: "*a Plenty of fish coming even to their own doors.*"

- Charles Fobes, in "The Story of the Presumpscot" included in the Collections and Proceedings of the Maine Historical Society, 1894, has this account: *"In October 1793 the proprietors of the dam at Great Falls [near the present site of the North Gorham dam] were found guilty of not keeping open a good and sufficient sluiceway for the passage of salmon, shad, and alewives as required by law and were subjected to a fine of six pounds per day for every day the way was closed."* [parentheses added]

- In the History of Gorham by Hugh McLellan, 1903, there is this account: *"Parson Smith in his journal says, November 8, 1734, 'I rode with my father to see the Colonel's great dam' [referring to the first dam at Presumpscot Falls]. . . It was here, and about this time, that the parson saw the large shoals of salmon ('an acre of fish, mostly salmon') and other fish, congregated below and stopped from going up the river . . ."* [parentheses added]

- Charles Atkins, in the Fish Commissioners Report of 1867, states: *"The Presumpscot was originally peopled with salmon, shad, alewives, and several other species. We have the testimony of Mr. James Lord, aged eighty –five, who lives near the Presumpscot Falls, to their abundance. The salmon were practically destroyed by the erection of the dam at the head of tide about 1802. That year they accumulated in unusual numbers below the dam in their attempts to pass it, and a great many were caught. The shad still run, in small numbers, as far as Cumberland Mills. Mr. Lord has fished for them with a dip-net at the falls and took twenty-five large shad in one day seven years ago; but last year only twelve. A great many used to be taken in weirs at the mouth of the river. Alewives are more abundant: in 1864 or 1865 twenty thousand of them were taken by one dip net at the falls."*

- Charles Atkins, in his report "The River Fisheries of Maine" included in a report from the United States Commission of Fish and Fisheries to the 47th Congress in 1887, says of the Presumpscot River: *"It was frequented by salmon, shad, and alewives, but seems to have been best adapted to salmon. All fisheries were practically extinguished early in the present century by a dam at the head of the tide. That dam was afterward abandoned, and alewives have since found a limited breeding ground, and although unable to ascend the river far, both shad and salmon have occasionally been found in it in recent years. All the dams now on the river, some seven in number, have been recently been provided with fishways, through which alewives do, and salmon may, ascend to Lake Sebago."*

C. Historic Accounts of the Natural Habitat Conditions of the Presumpscot River

The historic accounts on the natural habitat conditions of the river include:

- Charles Atkins, in the Fish Commissioners Report of 1867, states: *"In this vast reservoir [referring to Sebago Lake], the turbid water of the tributary streams deposits its sediment, and issues thence [the Presumpscot River] as a river of uncommon transparency, a character which is maintained for a long distance from the lake."* [parentheses added]

- In his report "The River Fisheries of Maine" included in a report from the United States Commission of Fish and Fisheries to the 47th Congress in 1887, Charles Atkins states: *"The Presumpscot is therefore a rapid river. It has remarkably clear water, and abounds naturally in gravelly rapids."*

- Charles Fobes, in "The Story of the Presumpscot" included in the Collections and Proceedings of the Maine Historical Society, 1894, describes the river: *"The fall is very gradual, there being on the river seventeen water powers about one mile apart with an average fall of less than 15 feet. . . No river in the state, except perhaps the Messalonskee, is as equable in its flow, the variation being not more than two feet. No drought seems to impair its efficiency, and the great extent of the lake at its head prevents any serious freshet."*

There were historically at least a dozen named falls and rapids on the Presumpscot River. Most were in the upper half of the river, from Mallison Falls to Sebago Lake. As noted by Fobes, at one time there were 17 water powers spaced about every mile on the river. The current dams are located at the sites of the greatest drop in elevation. It appears that the river's natural course was fast flowing in the upper reaches from Mallison Falls to Sebago Lake, with a more gradual drop over its course in the lower river except between Saccarappa Falls and Cumberland Falls (see also Table 4).

Named Falls on the Presumpscot River:

Eel Weir Falls (Wescott Falls)
Steep Falls
Middle Falls
Great Falls (present site of N. Gorham Dam)
Whitney Falls
Island Falls
Dundee Falls
Leavitts Falls
Gambo Falls
Little Falls
Mallison (Horse Beef) Falls
Saccarappa Falls
Ammonscongin (Cumberland) Falls
Presumpscot Falls (present site of Smelt Hill Dam)

4. Habitat Potential and Estimated Potential Runs for Restored Migratory Fisheries

Habitat Suitability for Migratory Fishes from Smelt Hill Dam to Cumberland Mills Dam: The Presumpscot River below Cumberland Mills dam is improving as habitat for migratory and resident fishes due to the water quality improvements resulting from reductions in pollutant discharges. Of particular importance is the cessation of discharges due to construction of waste treatment facilities (both by the City of Westbrook and by the paper mill, now SAPPI) and the cessation of pulping operations at the SAPPI mill in Westbrook. The potential removal of the Smelt Hill dam (summer/fall, 2002) will return the river below the Cumberland Mills dam to its original gradient. The Report by the Corps of Engineers indicates the river habitat in the two miles above the site of the Smelt Hill dam will consist of rocky riffle runs in the area closer to the dam, and pool riffle combinations further upstream, combined with quieter pool areas (US Army Corps of Engineers, Jan 2001, Main Report at page 32).

The Department of Marine Resources and the Atlantic Salmon Commission expect this area will provide habitat for migration, spawning, or growth for American shad, alewives, American eel, blueback herring, striped bass, Atlantic salmon, sea-run brook trout, sea-run brown trout, Atlantic sturgeon, rainbow smelt, and tomcod[6] although no actual habitat assessment has been completed.

[6] Presumpscot River Interim Goals for Fishery Management prepared by the Maine Department of Marine Resources, Maine Department of Inland Fisheries and Wildlife, and Maine Atlantic Salmon Commission, Jan 2001 (see Appendix C).

Habitat Suitability for Migratory Fishes above Cumberland Mills Dam: If access is provided to upstream habitats above the Cumberland Mills dam, through fish passage and/or dam removals, the DMR and the Atlantic Salmon Commission expect the Presumpscot River and its tributaries will provide habitat (for migration, spawning, or growth) for American eel, American shad, alewives, blueback herring, Atlantic salmon, sea-run brook trout, sea-run brown trout, and possibly striped bass.

Estimated Maximum Potential Migratory Fish Runs – Shad, Blueback Herring, and Alewives: The Department of Marine Resources has developed order of magnitude spreadsheet models for estimating the size of American shad, blueback herring, and alewife runs that could be supported by river and lake impoundment habitats. The models are based on the area of assumed habitat that becomes accessible, and are used to explore the impacts of dams and fish passage efficiency on fish abundance and restoration goals. **Table 6** shows the potential fish populations that could be sustained by the assumed habitat in the various reaches of the river up to the North Gorham dam, including three major tributaries, the Piscataqua River, the Little River and the Pleasant River (for shad and blueback herring), as well as Highland Lake (for alewives only) if there were no dams on the river. This represents the maximum expected population that could be sustained assuming 100% of the river habitat is suitable for these species, and given unimpeded access to the various sections of the river. **Table 6a**. presents an analysis prepared for the Federal Energy Regulatory Commission by the Louis Berger Group estimating runs of American shad and river herring for a limited stretch of the river, between Saccarappa Dam and Gambo Dam (MDMR's analysis reviews the potential for the entire river). The Berger estimates reflect two possible scenarios: removal of the three dams in the stretch of river being analyzed, or passage at the three dams. The return rates for American shad assumed by the Berger analysis, 25 to 142 returning shad per acre of river habitat, based on a 1979 report on the Connecticut River shad run, are similar to those used by Maine DMR. Both analyses used the experience on the Connecticut River to arrive at a return rate; however, the MDMR used a more recent set of figures (1983-2000, which ranged from 46 to 182 returning shad per river habitat area) and used the average of the range. The return rates assumed in the Berger analysis for river herring differ substantially from MDMR's, and are reportedly based on alewife production for a Maine lake. This return rate also differs substantially from MDMR's estimates for alewife return rates.

Estimated Potential Atlantic Salmon Spawning Habitat and Spawning Runs: The Maine Atlantic Salmon Commission (MASC) has developed estimates of potential salmon spawning habitat and capacity for utilization (number of spawning fish that could use the habitat) on the Presumpscot River from Smelt Hill dam to the Eel Weir dam, assuming passage is provided at all dams. **Tables 7 and 7a** show that the Presumpscot River, with all dams in place and adequate fish passage, could support about 386 spawners, which would produce 15,849 smolts and produce a return spawning run of 124 to 620 fish (depending on survival rates at sea). The available habitat, if all dams remain, is located primarily in the tributaries to the river, as the only mainstem area with suitable habitat with all dams remaining is in the Eel Weir Bypass. Tributaries with suitable habitat include the Pleasant River, Little River, Colley Wright Brook, Mill Brook and Piscataqua River). Table 7a. also shows estimates for the size of the spawning run assuming three dams are removed (Saccarappa, Mallison Falls, and Little Falls) and passage is provided at the remaining dams. Two estimates are provided for the dam removal scenario: estimates by the Berger Group, Inc., a consulting firm hired by the Federal Energy Regulatory Commission, and estimates by MASC.

Table 6
Maine DMR Estimates of Maximum Potential Spawning Runs[7] on the Presumpscot River
For American Shad, Blueback Herring, and Alewives

Location	Habitat (acres)	Average Shad Run[1] (98.8/acre)	Range of Shad Runs (46 – 182/acre)	Blueback herring[2] (600/acre)	Alewife[3] (235/acre)	Total
Smelt Hill to Cumberland	107	10,500	5,000 - 19,500	64,000		
Highland Lake	629				147,700	
Piscataqua River	23	2,300	1,000 - 4,200	14,000		
Subtotal below Cumberland Dam		**12,800**	**6,000 – 23,700**	**78,000**	**147,700[4]**	**238,500**
Cumberland to Saccarappa	31	3,100	1,400 – 5,600	18,800		
Saccarappa to Mallison Falls	100	9,900	4,600 – 18,200	60,200		
Little River	39	3,800	1,800 – 7,000	23,300		
Mallison Falls to Little Falls	11	1,100	500 – 2,000	6,600		
Little Falls to Gambo	32	3,100	1,400 – 5,800	19,000		
Gambo to Dundee	120	11,900	5,500 – 22,000	72,200		
Pleasant River	83	8,200	3,800 – 15,100	50,100		
Dundee to N Gorham Dam (riverine portion)	13	1,000	600 – 2,400	8,000		
Dundee to N Gorham Dam (impoundment)	191	19,000	8,800 – 34,800	114,000		
Subtotal above Cumberland Dam		**61,100**	**28,500 – 112,800**	**372,200**		**433,300**
Grand total		**73,900**	**34,500 – 136,500**	**450,200**	**147,700**	**671,800**

[1]Maine currently has no rivers with extensive runs of American shad, and historical information on run sizes is lacking, therefore run sizes must be estimated from information on restored runs in other rivers. In the past, DMR has used 111 shad/acre, based on the run of American shad in the Connecticut River in the early 1980's. DMR recently updated this number using the number of shad passing the Holyoke Dam (1st on the river) and the Turners Falls Dam (2nd on the river) for the years 1983 – 2000 and a GIS estimate of surface area for this river reach. Average shad production for the ~20 year period was 98.8 shad/acre (range 46 – 182).
[2] Based on estimates from the Connecticut River.
[3]Based on data from commercial alewife harvests on six Maine coastal rivers for the years 1971 – 1983.
[4] If alewives are able to reach Knight's Pond and Forest Lake, the total run size might approach 200,000 adult spawners.

[7] Maximum runs of spawning fish that could be achieved based on existing habitat conditions and assuming no losses from fish passage.

Table 6a.
Estimated Potential Spawning Runs above Saccarappa Dam to Gambo Dam on the Presumpscot River for American Shad, Blueback Herring, and Alewives

By Louis Berger Group, Inc. for the Federal Energy Regulatory Commission

With Fish Passage Installed	**Habitat (acres)**	**American Shad Returns[1] (25-142/acre)**	**Blueback Herring Returns[2] (1,700 per acre)**
Saccarappa Impoundment	127	3,175 – 18,034	215,900
Little River	24	600 – 3,408	40,800
Mallison Falls and Little Falls Impoundments	52	1,300 – 7,384	88,400
Totals	203	5,075 – 28,826	345,100
With Removal of Saccarappa, Mallison Falls, and Little Falls Dams			
Mainstem from Saccarappa Dam to Gambo Dam	131	3,275 -18,602	222,700
Little River	24	600 - 3,408	40,800
Totals	155	3,875 – 22,010	263,500

[1] Based on a study of American Shad returns to the Connecticut River published (cited as St. Pierre, 1979)
[2] Based on alewife production for a Maine Lake (cited as Walton, 1987).

Table 7.
Potential Atlantic Salmon Spawning Habitat Capacity and Smolt Production for the Presumpscot River By Reach, Assuming Adequate Fish Passage as Far as Eel Weir Dam

Management Reach	Habitat Units (100 square meters)	Spawning Habitat Capacity (# of spawning fish)	Smolt Production (and location of spawning habitat)
North Gorham – Eel Weir	726	53	2,178 (Eel Weir Bypass)
Dundee – North Gorham	0	0	
Gambo Falls – Dundee	1,026	75	3,078 (Pleasant River)
Little Falls - Gambo Falls	0	0	
Mallison Falls – Little Falls	0	0	
Saccarappa Falls – Mallison Falls	2,761	202	8,283 (Little River, Colley Wright Brook)
Cumberland Mills – Saccarappa	0	0	
Smelt Hill – Cumberland Mills	770	56	2,310 (Piscataqua River and Mill Brook)
Totals	5,283	386	15,849
Source: Maine Atlantic Salmon Commission			

Table 7a.
Estimated Atlantic Salmon Spawning Habitat and Size of Spawning Runs on the Presumpscot River With and Without Removal of Three Dams

Scenario	Habitat Units (100 sq. meters)		Estimated Adult Returns	
	Berger[1]	MASC[2]	Berger[1]	MASC[2]
Passage at all dams	N/A	5,283	N/A	124 - 620
Removal of Saccarappa, Mallison Falls, and Little Falls Dams, passage at others	2,276	7,485	34 - 102	206 – 1,030

[1] Berger estimates are based on habitat available in the mainstem only (which is very limited), and assume a survival and return rate of 0.5% to 1.5%.
[2]MASC estimates are based on habitat available in the tributaries, and assume only the Eel Weir bypass has suitable habitat in the mainstem; and assumes a 1% to 5% survival and return rate.

5. State Agencies' Draft Plan for Fisheries Management for the Presumpscot River

A Draft Fishery Management Plan for the Presumpscot River Drainage was prepared by the Maine Department of Marine Resources (MDMR), the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the Maine Atlantic Salmon Commission (MASC) in December 2001 (see Appendix 3). The Draft Plan states that it was prepared in response to the following changes within the Presumpscot River watershed: the probable removal of Smelt Hill Dam (located at the head-of-tide); the relicensing of six of the seven existing hydropower projects on the river; and improvements in water quality resulting from the closure of the pulping operation in Westbrook. These changes created a new opportunity for the restoration of diadromous[8] fish runs and the enhancement of warm water and coldwater recreational fishing opportunities.

The goals expressed in the Draft Plan reflect the management philosophies and desires of the three state fisheries agencies, which includes management within the physical and biological limits of habitat and its capacity to sustain the various resources. The Draft Goals document states:

> "The overall goal of the draft fishery management plan is to integrate the fishery management goals of the Maine Department of Marine Resources (MDMR), the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the Maine Atlantic Salmon Commission (MASC) so as to cooperatively manage the diadromous and resident fishes of the Presumpscot River for optimum habitat utilization, abundance and public benefit"

Fisheries management goals were listed for each agency by river reach. The following is a summary of agency management goals for the mainstem of the Presumpscot River. See Appendix C for goals for tributary waters.

The management plan goals contemplate restoration of migratory fish runs in phases, allowing the fisheries agencies to assess potential interactions between resident and migratory species and changes in fishing opportunities. During Phase 1, migratory fish would be restored as far as Gambo dam. If the three fisheries agencies agree, restoration would continue up the river in Phase 2.

[8] Collective term referring to anadromous (spawn in fresh water and spend most of their lives in the sea) and catadromous (spawn in the sea and spend most of their lives in fresh or brackish water) species.

PHASE I: Agencies recommend restoration to Gambo, then evaluation.

Smelt Hill Dam to Cumberland Dam

Species/Life Stages Management

- Migratory corridor for alewife, American eel, American shad, blueback herring, striped bass, adult Atlantic salmon and smolts, and possibly Atlantic sturgeon, rainbow smelt, sea-run brook trout, sea-run brown trout, and tomcod.
- Spawning habitat for American shad, blueback herring, and possibly rainbow smelt and tomcod; possible spawning and rearing habitat for Atlantic salmon; holding/resting for adult salmon; and growth habitat for American eel.

Recreational Fisheries

- Angling opportunities for sea-run fishes: American shad, striped bass, possibly rainbow smelt, sea-run brook trout, sea-run brown trout, and Atlantic salmon.
- Angling opportunities for resident warm water sportfish, consistent with existing habitat limitations, including smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.
- Managed (stocked) seasonal (spring) trout fishery possible in the future, contingent upon adequate public access.

Cumberland Dam to Saccarappa Dam

Species/Life Stages Management

- Migratory corridor for alewife, American eel, American shad, blueback herring, striped bass, adult Atlantic salmon and smolts, rainbow smelt, and possibly sea-run brook trout and sea-run brown trout.
- Spawning habitat for American shad, blueback herring; growth habitat for American eel.

Recreational Fisheries

- Angling opportunities for resident warm water sportfish, consistent with existing habitat limitations, including smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.
- Angling for American shad, rainbow smelt, striped bass, and possibly sea-run brook trout and sea-run brown trout.
- Managed (stocked) seasonal (spring) trout fishery possible in the future; contingent upon adequate public access.

Saccarappa Dam to Mallison Falls Dam

Species/Life Stages Management

- Migratory corridor for American eel, American shad, blueback herring, adult Atlantic salmon and smolts, and possibly striped bass, sea-run brook trout and sea-run brown trout.
- Spawning habitat for American shad, blueback herring; possible juvenile salmon stocking and rearing in bypass reach in absence of spawning habitat; holding/resting for adult salmon; growth habitat for American eel.

Recreational Fisheries

- Angling opportunities for American shad, adult salmon, and possibly striped bass, sea-run brook trout and sea-run brown trout.
- Managed (stocked) season-long (spring – fall), and possibly year-round, trout angling opportunities in the Mallison Falls tailrace and bypass for brook trout and brown trout.
- Angling opportunities for resident warm water sportfish, consistent with existing habitat limitations, including smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.

Mallison Falls Dam to Little Falls Dam

Species/Life Stages Management

- Migratory corridor for American eel, American shad, blueback herring, adult Atlantic salmon and smolts.
- Spawning habitat for American shad, blueback herring; possible juvenile salmon stocking and rearing in bypass reach in absence of spawning habitat; holding/resting for adult salmon; growth habitat for American eel.

Recreational Fisheries

- Angling opportunities for American shad, adult salmon.
- Managed (stocked) trout fishery possible in the future, contingent upon adequate public access.
- Angling opportunities for resident warm water sportfish, consistent with available habitat, including smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.

Little Falls Dam to Gambo Dam

Species/Life Stages Management

- Migratory corridor for American eel, American shad, blueback herring, adult Atlantic salmon and smolts.
- Spawning habitat for American shad, blueback herring; possible juvenile salmon stocking and rearing in bypass reach in absence of spawning habitat; holding/resting for adult salmon; growth habitat for American eel.

Recreational Fisheries

- Angling opportunities for American shad, adult Atlantic salmon.
- Managed (stocked) season-long (spring – fall), and possibly year-round, trout angling opportunities in the Gambo tailrace and bypass for brook trout and brown trout.
- Angling opportunities for resident warm water fisheries consistent with available habitat; includes smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.
-

PHASE II: Restoration may proceed for shad and blueback herring depending on evaluation and agency consensus

Gambo Dam to Dundee Dam

Species/Life Stages Management

- Migratory corridor for American eel, adult Atlantic salmon and smolts; and possibly American shad and blueback herring;

- Growth habitat for American eel; possible spawning habitat for American shad and blueback herring; possible juvenile salmon stocking and rearing in bypass reach in absence of spawning habitat; holding/resting for adult salmon.

Recreational Fisheries

- Angling opportunities for American shad, adult Atlantic salmon.
- Managed (stocked) season-long (spring – fall), and possibly year-round, trout angling opportunities in the Dundee tailrace for brook trout and brown trout.
- Angling opportunities for resident warm water fisheries consistent with available habitat; includes smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.

Dundee Dam to North Gorham Dam

Species/Life Stages Management

- Migratory corridor for American eel, adult Atlantic salmon and smolts. and possibly American shad and blueback herring
- Growth habitat for American eel; possible spawning for American shad and blueback herring; possible juvenile salmon stocking and rearing in bypass reach in absence of spawning habitat; holding/resting for adult salmon.

Recreational Fisheries

- Angling opportunities for adult Atlantic salmon and possibly American shad.
- Managed (stocked) season-long (spring – fall), and possibly year-round, trout angling opportunities in the North Gorham tailrace and bypass for brook trout and brown trout.
- Angling opportunities for resident warm water fisheries consistent with available habitat; includes smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.

North Gorham Dam to Eel Weir Dam (includes canal and bypass)

Species/Life Stages Management

- Migratory corridor for American eel, adult Atlantic salmon and smolts (bypass only)
- Growth habitat for American eel; possible Atlantic salmon spawning and rearing habitat (bypass only); and holding/resting/ for adult salmon (bypass only).

Recreational Fisheries

- Quality managed (stocked) recreational fishery for trout and salmon. The bypass is intensively managed for brook trout and landlocked salmon. Brook trout, landlocked salmon, and occasionally brown trout are stocked periodically throughout the fishing season, which extends year-round. Future stocking and management have not yet been determined. The "canal" is the subject of a recent experimental stocking of legal-size brook trout in an effort to provide a "general law" put and take spring fishery.
- Angling opportunities for resident warm water fisheries consistent with available habitat within the North Gorham Pond. Warm water sportfish include smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.

6. Legal Context

A. Related Laws and Regulations: A number of state and federal laws and regulations have a bearing on the future of the Presumpscot River. Most importantly these include laws and regulations address:

- General Water Quality Protection. The Maine Department of Environmental Protection at the state level and the Environmental Protection Agency at the federal level seek to protect water quality and aquatic life (Maine Waterway Development and Conservation Act, 38 MRSA §§ 630-636, and the federal Clean Water Act, P.L. (as amended) 33 USC. §1341 (1988));

- Federal Regulation of Hydropower Projects. The Federal Energy Regulatory Commission (FERC)licenses and regulates the operation of dams for hydroelectric power production, ensuring that public resource values (natural, cultural, and recreational) are protected (Federal Power Act as amended 16 USC 791a-825r). FERC is authorized[9] to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric power plants subject to its jurisdiction on the conditions:

  > "That the project adopted…shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in Section 4(e)…"

- State Regulation of Hydropower Projects. The Maine Department of Environmental Protection must certify compliance with the federal Clean Water Act before a federal license can be issued. Section 401(a) of the Federal Water Pollution Control Act (P.L. 92-500), as amended by the Clean Water Act of 1977, requires that any applicant for a federal license or permit to conduct any activity which may result in any discharge into the navigable waters of the Nation must obtain a certification from the affected State that the activity will comply with applicable State water quality standards. Under Section 401(d) of the Clean Water Act, the conditions attached to a State's water quality certification must become a condition of any federal license or permit issued for the activity. State and federal courts have held that (1) hydropower projects subject to licensing by FERC are subject to State certification under Section 401 of the Clean Water Act, (2) States should consider impacts on water quality both upstream and downstream from a

[9] Pursuant to the Federal Power Act (as amended by the Electric Consumers Protection Act of 1986 and the Energy Policy Act of 1992) and the U.S. Department of Energy Organization Act of 1977.

hydropower dam, and (3) States can regulate the impact of hydropower dams on designated uses, such as recreation and propagation of fish and wildlife.

- State and Federal Authority to Require Fishways. The Commissioner of the Maine Department of Inland Fisheries and Wildlife may require a fishway to be erected by the owners of any dam within inland waters to conserve, develop or restore anadromous fish resources (12 MRSA§ 7701-A). When there is a federal license, the U.S. Fish and Wildlife Service may prescribe fishways as well (Section 18 of the Federal Power Act);

- Regulating and Managing Fisheries. The Maine Department of Inland Fisheries and Wildlife provides regulatory oversight of harvesting and actively manages the state's freshwater fisheries (pursuant to 12 MRSA§ 7001, et. seq.). Maine's Department of Marine Resources regulates and conserves the state's marine resources, conducts and sponsors scientific research, and promotes the development of marine coastal industries (pursuant to 12 MRSA § 6001, et. seq.);

- Atlantic Salmon Restoration. In 1999, the 119th Maine Legislature enacted 12 MRSA§ 9901, creating the Maine Atlantic Salmon Commission. Subsection one of this law states:

  "1. Commission established purposes. The Atlantic Salmon Commission referred to in this Part as the "commission" is established to protect, preserve, enhance, restore and manage the Atlantic salmon and its habitat; to secure a sustainable recreational fishery in the state; and to conduct and coordinate all projects involving research, planning, management, restoration or propagation of the Atlantic salmon."

- Magnuson Stevens Fisheries Conservation Act. The New England Fisheries Management Council has declared the Presumpscot River "Essential Fish Habitat" for Atlantic Salmon under this Act.

- Ecosystem Restoration. The US Army Corps of Engineers is authorized to carry out an aquatic ecosystem restoration and protection project if the Secretary of the Army determines the project will restore the quality of the environment, is in the public interest, and is cost-effective (Section 206 of the federal Water Resources Development Act of 1996 (PL 104-303). The project must be owned by a state or municipality. The Corps is authorized to develop the plans and specifications for the project, draft required environmental assessments, serve as general contractor, and provide funds for its accomplishment (65% in the case of the Smelt Hill dam removal project).

B. **Status of Legal Proceedings**: With the exception of Cumberland Mills Dam, all the dams are components of hydroelectric power plants, and are licensed by the Federal Energy Regulatory Commission (FERC).

Smelt Hill Dam. The State of Maine and US Army Corps of Engineers are awaiting approval from the Federal Energy Regulatory Commission for removal of the Smelt Hill dam. The state has purchased the dam from the current owner, Central Maine Power Company. Removal of the dam, pending FERC approval, is expected to begin in July and be completed in November of 2002.

Cumberland Mills Dam. Cumberland Mills does not require a FERC license since it is not part of a hydroelectric system.

Saccarappa Project to Dundee Project FERC License Applications. Currently, SAPPI has hydropower relicensing applications pending before the FERC for the Saccarappa, Mallison Falls, Little Falls, Gambo, and Dundee Projects (filed January 22, 1999), and has submitted applications to the Maine DEP for a Water Quality Certification for compliance with the Clean Water Act. In accordance with the National Environmental Policy Act of 1969 and FERC's regulations, FERC staff reviewed these applications and prepared a Draft Environmental Impact Statement in which they analyzed the potential environmental impacts of four alternatives: (1) removal of the Little Falls, Mallison Falls, and Saccarappa Project dams; (2) removal of the Saccarappa Project dam only; and (3) removal of the Little Falls and Mallison Falls Project dams with passage at Saccarappa; and (4) retaining Mallison Falls, Little Falls, and Saccarappa dams, but with the installation of efficient fish passage facilities at all three dams. FERC will make the final decision on which alternative will be incorporated into the license articles, but must include any conditions attached to the State's water quality certification.

North Gorham Project FERC License. The North Gorham Project, owned and operated by FPL Energy Maine Hydro LLC, was licensed in 1993 for 30 years.

Eel Weir Project FERC License Application. SAPPI is also in the process of preparing a license application for the Eel Weir Project, including the Eel Weir Bypass section of the river. A draft Application was circulated for comment. The Application must be submitted to FERC by March 31, 2002. This license expires in 2004.

7. Fisheries Management Opportunities and Options

The Opportunity: As stated in the Introduction, for the first time in over a century, the future of the Presumpscot River includes new possibilities for fish restoration. Water pollution on the river has been greatly abated with the development of water treatment facilities and SAPPI's elimination of its pulp mill. Further, a number of migratory fish species will have unimpeded access to the lower Presumpscot River for the first time in over a century. If Smelt Hill Dam, located at head-of-tide, is removed, seven miles of the river will be restored to free-flowing conditions. This will allow migratory fish, either remnant populations from the Presumpscot or strays from other river systems, to recolonize the lower river as far as Cumberland Mills dam in Westbrook. Natural recolonization of American shad, alewife, Atlantic salmon, blueback herring, rainbow smelt, sea-run trout, striped bass, and tomcod could take years, because the number of returning fish may initially be small. Stocking programs for some species (shad, alewife, salmon) could speed the rate of their recovery. With full recolonization, the 7 miles of restored river (including access to habitat in the Piscataqua River and Mill Brook) could support runs of approximately 13,000 shad, 78,000 blueback herring, 20 – 100 Atlantic Salmon, and 150,000 to 200,000 alewives.[10]

If Smelt Hill Dam is removed, migratory fish will still be blocked from additional upriver spawning and nursery habitat by as many as eight dams (see Table 3). The lowermost six of these are owned by SAPPI Fine Paper, and include the Cumberland Mills dam, a non-hydropower dam, and five hydropower dams currently undergoing relicensing with the Federal Energy Regulatory Commission. The North Gorham dam is owned by Florida Power and Light (FPL). Restoration of migratory fish to the 16 miles of river beyond Cumberland Mills Dam is not possible unless passage is provided at the dams through the installation of fishways or by dam removal. As noted in Table 6, the Maine DMR estimates that the 14 mile stretch of the Presumpscot River above Cumberland Mills (as far up as the North Gorham dam[11]), including the Pleasant and Little Rivers, has the potential to support up to 61,000 additional shad and 372,000 additional blueback herring, as well as an unknown number of American eels and potentially other species. The Maine Atlantic Salmon Commission estimates that a run of 180 – 900 sea-run salmon could be established on the river and its tributaries above Cumberland Mills, including above the North Gorham dam (in addition to the estimated run below Cumberland Mills dam of 20 – 100 salmon).

From the perspective of maintaining economic opportunities while restoring the environment, the problem, and at the same time the opportunity, is finding a solution that allows the restoration of migratory fish to the river, while minimizing adverse effects to the SAPPI mill. Fish passage is costly, (capital costs in the millions of dollars), and removal of the dams, while generally less costly (on the order of $500,000 to $950,000), will reduce SAPPI's electrical generation capabilities. According to SAPPI, hydropower is the Westbrook Mill's lowest cost power source, and loss of any of the hydro-generation facilities will impact the Mill's operations:

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[10] The alewives migrate to Highland Lake to spawn; upper estimate assumes Knight's Pond and Forest Lake are also accessible; estimates for blueback herring include 14,000 utilizing the Piscataqua River; estimates for Atlantic salmon are based on habitat available on the Piscataqua River and Mill Brook.

[11] The state fisheries agencies have agreed not to recommend passage at the North Gorham dam except for American eel and Atlantic salmon (see Section 5).

"The Mill's ability to serve its own load requirements with hydropower at far below market rates, and in addition sell excess power at market rates, is critical to keep the Westbrook Mill's products competitive in the world marketplace."[12] Further, removal of the Cumberland Mills dam would require alternative measures for both process water and fire protection. An optimal solution, in terms of meeting a broad range of economic, social and environmental needs, would support the continued contribution of the SAPPI mill to the area's economy, while potentially yielding significant public benefits in terms of a having a restored river with a healthier and more productive fishery supporting a more diverse wildlife community, improved aesthetics, and new recreational opportunities for fishing, wildlife observation, canoeing and kayaking.

Options – An Overview: Several possible courses of action for management of the Presumpscot River to enhance fish resources are outlined below. When reviewing these, it is important to recognize that options 1 and 2 would not achieve the current management goals established by State and Federal agencies for fisheries' restoration on the Presumpscot[13]. Further, the Cumberland Mills Dam is not covered by the Federal Power Act, and, hence, is not subject to Federal jurisdiction by the Federal Energy Regulation Commission (FERC). This means it will not be covered by federal decisions on dam relicensing, and hence passage cannot be mandated by FERC. It is, however, covered by a statute (12 MRSA§ 7701-A) that authorizes the Commissioner of the Maine Department of Inland Fisheries and Wildlife to require fishways to be erected by the owners of any dam within inland waters to conserve, develop or restore anadromous fish resources. Hence it could be the subject of a separate proceeding addressing fish passage.

The options outlined here are included as a starting point for discussions on how the river could be managed to enhance or restore fisheries. These options are meant to cover the full spectrum of possibilities that the public is likely to inquire about regarding fisheries management on the River. The information previously provided in this report on the current condition of the fishery, together with the following information showing what it could be under different management options, is meant to encourage a dialogue on the topic of fisheries management.

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[12] Letter from Nancy J. Skanke, Counsel for S.D.Warren Company, to David Boergers, Secretary, Federal Energy Regulatory Commission, "Response to Agencies' and Non-Governmental Organizations Terms and Conditions Filings" dated April 18, 2001. At pages 17-18.

[13] Over the past several years the state and federal agencies have modified their stated goals and objectives for the Presumpscot River in response to changing conditions. As improvements in water quality were realized from the cessation of SAPPI's pulping operation, and as the removal of the Smelt Hill Dam developed from a possibility to a near certainty, the state and federal agencies shifted from a focus on limited actions for improved eel passage and minimum flows in bypass reaches, to one embracing restoration of a full range of migratory species.

Option 1 – No further action is taken beyond removing the Smelt Hill Dam

Description: Under this option, sea run fish would be restored to approximately 7 miles of the lower river below the Cumberland Mills dam after the Smelt Hill dam is removed (expected in the summer/fall of 2002). In addition, this would provide access to the Piscataqua River and Mill Brook, leading to Highland Lake.

Costs: Estimated costs of $1.1 million are to be paid by State and Federal funds and private donations.

Effects on Migratory Fish: Runs of a number of migratory fishes are expected to develop (see Table 8). These estimates are a compilation of a number of estimates. The Maine Department of Marine Resources has estimated runs of adult shad, alewife and blueback herring spawners resulting from Smelt Hill dam removal. The Maine Atlantic Salmon Commission has estimated potential Atlantic salmon runs on the Presumpscot. The Federal Energy Regulatory Commission contracted with Louis Berger Group, Inc. to evaluate the impacts of removing one or more of the following dams: Saccarappa, Mallison Falls, and Little Falls dams, versus fish passage at these dams. Their analysis did not address migrations resulting from the Smelt Hill dam removal.

Effects on Resident Fish: Above Cumberland Mills dam, in the impounded reaches (nearly 15 miles), the fisheries of the river would continue to be composed primarily of bass, perch, bullheads, and sunfish, and the productivity of these fish would continue to be compromised as a result of the nature of shallow river impoundments. A fall to spring fishery of trout and landlocked salmon in the Dundee and North Gorham impoundments would continue. It is assumed that the tailrace areas below the dams (less than ½ mile total), and the Eel Weir Bypass (1.25 miles) would continue to be stocked with trout and salmon. The Eel Weir Bypass has one of the highest levels of angling of any fishery in the State (between 4,000 and 6,000 angler trips per year [Brautigam, 1997]) because of the combination of stocking (approximately 5,000 brook trout, 400 landlocked salmon, and 200 brown trout per year) and its proximity to the State's major population center.

Consistency with State and Federal Management Goals: This option does not meet the goals and objectives of the State fisheries management agencies (DMR, IF&W, and MASC) as expressed in their December 2001 "Draft Fishery Management Plan for the Presumpscot River Drainage." (see Section 5 and Appendix C of this report). It also does not address the US Fish and Wildlife Services goals, as reflected in their filings to FERC prescribing fish passage on the dams below the Eel Weir Dam, provided passage is achieved at the Cumberland Mills Dam, and sufficient numbers of migratory fish return to the river.

Table 8: Estimated Migratory Fish Runs with Smelt Hill Dam Removed

Migratory Species	Estimated # Returning Adult Fish
American shad (including a run on the Piscataqua River)	6,000 – 23,700[1]
alewives (migrating through to Highland Lake, and possibly Forest Lake and Knights Pond)	150,000 – 200,000
blueback herring (including a run on the Piscataqua River)	78,000[2]
Atlantic salmon	23 – 115 (MASC)[3]
American eel **striped bass** (as far as Cumberland Mills)	increased numbers
and possibly **sea-run brook trout** (as far as Cumberland Mills) **sea-run brown trout** (as far as Cumberland Mills) **Atlantic sturgeon** (as far as Cumberland Mills) **rainbow smelt** (a far as Cumberland Mills) and **tomcod** (as far as Cumberland Mills)	unknown numbers

[1]Based on runs documented between 1983 and 2000 on the Connecticut River of 46 to 182 shad per acre of river habitat, (see also Table 6). The Berger Group, Inc., consultants to FERC, did not estimate shad runs below Saccarappa Dam.
[2] Estimate by Maine DMR based on estimates of 600 river herring/acre on the Connecticut River; the Berger Group did not estimate river herring runs below Saccarappa Dam.
[3] Estimated by the Maine Atlantic Salmon Commission (MASC); assumes Atlantic salmon will utilize habitat in the Piscataqua River and Mill Brook (production of approximately 2,310 smolts), with 1 to 5% returning as adult spawners. This estimate for Atlantic salmon does not assume any potential spawning habitat in the restored mainstem of the Presumpscot River. The Berger Group, Inc. estimated salmon restoration potential for FERC. However, this analysis did not estimate numbers of salmon for reaches of the river below Saccarappa Dam.

Option 2 – Smelt Hill Dam is removed and the resident fisheries are enhanced

Description: In addition to the fisheries resulting from the removal of the Smelt Hill dam under Option 1, above, enhanced management would result in increased stocking of trout in the tailrace areas below Dundee dam, Gambo dam and Mallison Falls dam. If fishing demand warranted it, the number of trout stocked could be doubled below Mallison and Dundee, from 500 to 1000; and possibly adding a stocking program at Gambo tailrace of up to 500 stocked trout. Activities could also be undertaken to enhance the resident fisheries for bass and pan fish. Unlike trout fisheries, in Maine bass fisheries are not enhanced by put and take stocking – and hatchery-raised fish are not even available in Maine. However, other enhancement techniques are possible. Such activities, which could be appropriate for the Presumpscot, could include enhancing the cover provided for these species in impoundments, *e.g.,* creating artificial reefs, adding submerged woody debris or large rocky rubble to littoral areas on river bottom areas.

Costs: The additional cost for increased trout stocking would be approximately $3,000 and would be part of the Maine Department of Inland Fisheries and Wildlife's budget (estimated increases in stocking and costs provided by Francis Brautigam, telephone call 3/21/01). Depending on the options chosen, the costs of measures to enhance the resident bass and pan fish fishery can range from inexpensive (*e.g.,* adding sections of trees to littoral areas) to very expensive (*e.g.,* adding large volumes of rocky rubble to the river bed). Costs could be borne by volunteers, government, industry, or some combination thereof.

Effects on Migratory Fish: Same as Option 1: the lower river, below the Cumberland dam, would become accessible to migratory fish with the expectation that substantial runs of these fish would be established over time.

Effects on Resident Fish: Under this option the Eel Weir Bypass reach would continue to provide exceptional fishing as described in Option 1. Additional stocking of trout would result in an enhanced seasonal fishery for stocked trout. Since the existing habitat is sparse and fragmented, the trout fishery would continue to depend on stocking and would not develop into a robust self-sustaining population. Some of the methods for enhancing bass and pan fish, *e.g.,* adding woody material, are only stable in areas where there is not significant flow, even during floods. Further, these methods can create boating hazards and add to the amount of debris carried down the river. No quantitative estimates are available for how much these actions would improve fish populations; however, the Maine DEP found that narrow riverine impoundments function neither as river or lake environments, and as a result the productivity of these systems is relatively low. Therefore, even if the cover present in the impoundments was enhanced by the activities outline above, there is a risk that the fisheries would be improved only marginally.

Consistency with State and Federal Management Goals: This option does not meet the goals and objectives of the State fisheries management agencies (DMR, IF&W, and MASC) as expressed in their December 2001 "Draft Fishery Management Plan for the Presumpscot River Drainage." (see Section 5 and Appendix C of this report). It also does not address the US Fish and Wildlife Services goals, as reflected in their filings to FERC prescribing fish passage on the dams below the Eel Weir Dam, provided passage is achieved at the Cumberland Mills Dam, and sufficient numbers of migratory fish return to the river.

Option 3 – Smelt Hill Dam is removed and sea run fisheries are restored

In addition to the removal of the Smelt Hill Dam, and potentially efforts to enhance resident fisheries in some areas, this Option involves active efforts to restore sea run fish. At present, three methods are used to restore access for sea run fish. These methods include:

- dam removal;
- providing fish passage at dams (fish ladders or fish lifts); and
- trap and truck efforts (trapping fish at a dam and transporting them upriver beyond dams without passage). However, this method is not considered by the responsible State and Federal agencies to be a viable long term option for restoring fish access on the Presumpscot. While trap and truck operations may have important short-term value (*e.g.,* to get runs of sea run fish reestablished before permanent access is provided), in general this methods can result in high mortality rates, effectiveness can be limited – particularly for species which are very abundant, operating costs can be high, and they require active and reliable efforts, in some cases over long seasons.

A. What would result from providing fish passage at up to 3 dams?

Description: In addition to the removal of the Smelt Hill dam, fisheries could be further restored by providing up and downstream fish passage for migratory species at up to three dams on the river. Most species will not be able to pass more than three dams in sufficient numbers to warrant passage beyond the third dam. The first three dams above Smelt Hill are the Cumberland Mills Dam, Saccarappa Dam, and Mallison Falls Dam. Fish passage is assumed to include fishways for upstream migrations of shad, blueback herring, and Atlantic salmon, a trap and truck facility at Saccarappa, a separate facility for upstream migration of eels, and downstream fishways serving all species except eels. Downstream eel passage would be provided by shutting down turbines at selected hours.

Costs: If passage was installed at the lowermost three dams - Cumberland Mills, Saccarappa, and Mallison Falls dams, it would likely cost 6 – 8 million dollars according to the US Fish and Wildlife Service (See also Appendix Table B-1). If fish did not ascend in sufficient numbers above the first dam to warrant passage at a second dam (if passage efficiency was75% or less) then the cost of this option would be approximately $1 million. These costs do not include power from diversion of flows to fish passage facilities or increased operating costs**.** Costs could be borne by industry, government, private donations, or some combination of these sources (industry may be the most likely source).

Effects on Migratory Fish: Estimates of the size of fish spawning runs resulting from installation of fish passage at up to three dams are provided below. The size of the fish runs depends on the success of the fishways in getting fish to spawning areas above the dams, or the efficiency of the fish passage facilities in passing fish over the dams into the upstream reaches. Not all fish that attempt

to negotiate a fish ladder or lift succeed. The US Fish and Wildlife Service designs fishways assuming a 90% efficiency rate (90% success rate). There are few studies that document actual efficiency. However, it is known that, for a variety of reasons, not all fishways are equally effective, with some of the older fishways installed during the last twenty years (when federal licenses began including requirements for fish passage) having proved to be particularly ineffective. Learning from these early efforts, the FWS has revised its fishway designs to improve passage success. The Maine DMR's "best guess" on the range of possible efficiencies is 75% (worst case) to 90% (design goal). The Maine DMR has computed estimates of shad, alewife and blueback herring spawning runs on the Presumpscot River based on estimated spawning habitat, using a 75% and 90% efficiency rate for both upstream and downstream passage facilities. These "order of magnitude" estimates are presented below.

Under the scenario assuming a 75% passage efficiency (the worst case scenario), the DMR models indicate that fish passage would not be effective at more than one dam; that is, it is expected that the run may not develop enough to warrant passage to areas above a second dam . At 90% efficiency, it is estimated that fish could be passed in sufficient numbers to warrant passage at three dams, at Cumberland Falls, Saccarappa Dam, and Mallison Falls dam. However, DMR indicates that the model is only indicative, and that a successful run may be established above more dams than indicated by the model. Reflecting this, the fisheries agencies have called for passage at all dams as far as Dundee dam, with passages constructed when the size of the spawning runs that actually develop in response to passage reach a certain threshold level. If the efficiency of the fish passages limits the restoration of migratory fish runs, then additional mitigation measures would be needed, including potentially, as mentioned above, trap and truck operations and dam removals.

The size of the Atlantic salmon run resulting from access to habitat as far as Little Falls dam is estimated below as a range reflecting two different analyses: (1) Analysis based on MASC estimates and assumptions; and (2) Estimates prepared by the Louis Berger Group for the Federal Energy Regulatory Commission. Neither of the estimates include the increased run that could develop through trap and truck operations from Saccarappa Dam to sites above Little Falls.

Effects on Resident Fish: Resident fisheries would not change appreciably since habitat conditions would remain unchanged above the Cumberland Mills dam.

Consistency with State and Federal Management Goals: This approach does not meet the goals and objectives of the State fisheries management agencies (DMR, IF&W, and MASC) as expressed in their December 2001 "Draft Fishery Management Plan for the Presumpscot River Drainage." (see Section 5 and Appendix C of this report). It also does not address the US Fish and Wildlife Services goals, as reflected in their filings to FERC prescribing fish passage on all the dams below the Eel Weir Dam, provided passage is achieved at the Cumberland Mills Dam, and sufficient numbers of migratory fish return to the river.

Table 9: Estimated Migratory Fish Runs with Fish Passages Installed on Up to Three Dams

Migratory Species Runs reaching Saccarappa dam with 75% passage efficiency and Little Falls dam with 90% passage efficiency	**Estimated # Returning Adult Fish**[1] Up to Saccarappa Dam	Up to Little Falls Dam
American shad (including runs on the Piscataqua and the Little River)	7,400 – 29,300	13,000 –56,500[2]
alewives (below Cumberland Mills, see above)	150,000 – 200,000	150,000 – 200,000
blueback herring (including a run on the Piscataqua and Little River)	96,800[3]	187,000[3]
Atlantic salmon (access up to Saccarappa Dam at 75% effic.; to Little Falls Dam at 90%)	23 – 115[3] (MASC)[4]; NA [5]	93 – 465 (MASC)[4] Negligible (Berger) [5]
American eel	increased numbers	increased numbers
striped bass (unknown extent of possible migration beyond Cumberland Mills)	unknown numbers	unknown numbers
and possibly: **sea-run brook trout**	unknown numbers	unknown numbers
sea-run brown trout	unknown numbers	unknown numbers
Atlantic sturgeon (below Cumberland only)	unknown numbers	unknown numbers
rainbow smelt (below Cumberland only)	unknown numbers	unknown numbers
tomcod (below Cumberland only)	unknown numbers	unknown numbers

[1] Assumes that at 75% efficiency, fish passage is warranted at only one dam (Cumberland Mills); at 90% efficiency, it assumes fish passages are warranted at Cumberland Mills dam, Saccarappa Dam, and Mallison Falls Dam.
[2] Based on figures used by the Maine DMR to estimate shad runs; from data collected between 1983 and 2000 on the Connecticut River showing 46 to 182 returning shad per acre of river habitat (see also Table 6). The Federal Energy Regulatory Commission (Draft Environmental Assessment for the Presumpscot River Projects, 2001) uses a range of 25 to 142 shad/acre based on outdated data on shad runs on the Connecticut River (as of 1979 based on a report by Louis Berger Group, Inc.). The above estimate is based on the most recent data.
[3] Estimate by Maine DMR based on estimates of 600 river herring/acre on the Connecticut River; the Berger Group/FERC used 1,700 river herring/acre based on *alewife* production on a Maine Lake (not included above).
[4] Estimated using the Maine Atlantic Salmon Commission (MASC) procedures; assumed habitat in tributaries only (Piscataqua River and Mill Brook below Cumberland Mills at 75% efficiency; including also the Little River and Colley Wright Brook at 90%); assumed 10% loss of smolts at each dam during downstream migration (5% at Cumberland Mills); assumed 1 to 5% survival of smolts return as adults,.
[5] The Berger Group, Inc. estimated salmon restoration potential for FERC (see DEA, [FERC, 2001]). This analysis did not estimate numbers of salmon for reaches of the river below Saccarappa Dam; and concluded that there would be negligible salmon habitat available with the dams in place and fish passage installed.

B. What would result from removing 3 dams and providing fish passage at up to 3 others?

Description: Removing 3 dams and providing fish passage at up to 3 others on the Presumpscot River could also restore runs of anadromous fish and improve runs of American eels. The lowermost dam (after three Smelt Hill dam is removed) is the Cumberland Mills dam at the SAPPI Mill. This is used for process water and fire control. A detailed evaluation of this dam would be needed to determine the best option for fish passage, while meeting SAPPI's needs. In other similar cases passage has been accomplished with a partial removal of the dam; this would be optimal for fish passage. If this were not feasible, a fish passage could be installed. Removing the three smallest dams would make the most sense in terms of minimizing loss of electrical power generation. This would include the Saccarappa Dam, Mallison Falls Dam, and Little Falls Dam, which are the next three above the Cumberland Mills dam. Fish passage could then be provided at Gambo Dam and Dundee Dam (in addition to Cumberland Mills Dam). This would include both upstream and downstream fishways, and a separate eel passage facility at each dam. Passage for Atlantic Salmon into the North Gorham impoundment and Eel Weir bypass would be provided by a trap and truck facility either at Dundee or Gambo dam. A downstream passage facility would also be provided at the North Gorham dam.

Costs: Removal of three dams on the lower river (Saccarappa, Mallison, and Little Falls) could cost on the order of $3 million. Costs for fish passage at Cumberland Mills, Gambo and Dundee, and downstream at N. Gorham are estimated to be in the range of $6 to $10 million, depending on whether upstream passage into the Dundee impoundment is provided through a fish lift or a trap and truck facility. However, if fish did not ascend in sufficient numbers above the first dam to warrant passage at a second dam (if passage efficiency was75% or less) then the cost of passage under this approach would be approximately $1 million. The total cost of removals plus passage for this scenario would be on the order of $4 million with 3 dams removed and passage at only one dam, and $9 million to $13 million with 3 dams removed and the full program of fish passage described above (see also Appendix Table B-1). These costs do not include power lost due to dam removals and to diversion of flows to fish passage facilities, or increased operating costs.

Effects on Migratory Fish: This approach would restore riverine habitat in certain sections of the river where impoundments are eliminated by dam removal. This would increase the habitat suitability for species such as American shad and river herring, and would result in larger runs of sea run fish, because substantially more habitat (particularly above Gambo dam) would become available. The following table shows the approximates size of the spawning runs that these measures would be expected to restore, by providing access to spawning habitat in the river and its tributaries as far as the Dundee impoundment and, for Atlantic salmon, the North Gorham impoundment and Eel Weir Bypass.

Effects on Resident Fish: Resident fisheries would adjust to a 7.5 mile increase in the availability of free-flowing riverine stretches as a result of dam removals. Combined with the river restoration resulting from the removal of the Smelt Hill dam, and the previously restored river at the Eel Weir Bypass, 16 miles of the total 26 mile length of river would be restored, providing increased habitat for trout and salmon. Habitat area for bass and other resident species could decrease, though habitat quality could improve as a

result of improved conditions for macro invertebrates and primary productivity from increased light penetration, and increased forage base from restoration of migratory fishes (more eggs and juvenile fishes).

Consistency with State and Federal Management Goals: This approach would meet the goals and objectives of the State fisheries management agencies (DMR, IF&W, and MASC) as expressed in their December 2001 "Draft Fishery Management Plan for the Presumpscot River Drainage." (see Section 5 and Appendix C of this report); and would address the US Fish and Wildlife Services goals, as reflected in their filings to FERC prescribing fish passage on all the dams below the Eel Weir Dam, provided passage is achieved at the Cumberland Mills Dam, and sufficient numbers of migratory fish return to the river.

Table 10: Estimated Migratory Fish Runs with Three Dams Removed and Fish Passages Installed on Up to Three Dams

Migratory Species (Runs reaching Gambo dam with 75% efficiency and N. Gorham dam with 90% efficiency; Atlantic salmon reaching the Eel Weir Bypass with trap and truck)	**Estimated # Returning Adult Fish**[1] Runs as far up as Gambo Dam	Runs up to N. Gorham Dam Atlantic salmon into Eel Weir Bypass
American shad (including runs on the Piscataqua and the Little River at 75% and additionally the Pleasant River at 90% efficiency))	15,700 –62,300[2]	34,500 – 136,500[2]
alewives (below Cumberland Mills, see above)	150,000 – 200,000	150,000 – 200,000
blueback herring (same distribution as American shad))	205,900[3]	450,200[3]
Atlantic salmon	102 - 508 (MASC)[4]; 34 - 102 (Berger)[5]	206 – 1,030 (MASC)[4] 34 - 102 (Berger)[5]
American eel	increased numbers	increased numbers
striped bass (unknown extent of possible migration beyond Cumberland Mills)	unknown numbers	unknown numbers
and possibly: **sea-run brook trout**	unknown numbers	unknown numbers
sea-run brown trout	unknown numbers	unknown numbers
Atlantic sturgeon (below Cumberland only)	unknown numbers	unknown numbers
rainbow smelt (below Cumberland only)	unknown numbers	unknown numbers
tomcod (below Cumberland only)	unknown numbers	unknown numbers

[1]` Assumes that at 75% efficiency, fish passage is installed at only one dam (Cumberland Mills) and Saccarappa, Mallison Falls, and Little Falls dams are removed, making habitat accessible up to the Gambo dam; at 90% efficiency, it assumes fish passage is installed at Cumberland Mills dam, Gambo Dam, and Dundee Dam; and Saccarappa Dam, Mallison Falls Dam, and Little Falls dam are removed.

[2]Based on figures used by the Maine DMR to estimate shad runs; from data collected between 1983 and 2000 on the Connecticut River showing 46 to 182 returning shad per acre of river habitat (see also Table 6). The Federal Energy Regulatory Commission (Draft Environmental Assessment for the Presumpscot River Projects, 2001) uses a range of 25 to 142 shad/acre based on outdated data on shad runs on the Connecticut River (as of 1979 based on a report by Louis Berger Group, Inc.). The above estimate is based on the most recent data.

[3] Estimate by Maine DMR based on estimates of 600 river herring/acre on the Connecticut River; the Berger Group/FERC used 1,700 river herring/acre based on *alewife* production on a Maine Lake (not included above).

[4] Estimated using the Maine Atlantic Salmon Commission (MASC) procedures; assumed habitat in tributaries only (not the mainstem), including (below Cumberland Mills) the Piscataqua River and Mill Brook, and (above Cumberland Mills), Little River, Colley-Wright Brook (for 75% scenario) plus Pleasant River, and Eel Weir Bypass for 90% scenario. Assumed 10% loss at each dam during downstream migration (5% at Cumberland); 1% to 5% of smolts reaching the sea return as adults.

[5]The Berger Group, Inc. estimated salmon restoration potential for FERC (see DEA, [FERC, 2001]) if the Saccarappa Dam, Mallison Falls Dam, and Little Falls Dam were removed and passage were provided at the Cumberland Mills dam (but not at the Gambo dam above Little Falls). This analysis did not estimate numbers of salmon for reaches of the river below Saccarappa Dam; assumed a return rate of 0.5% - 1.5%; assumed 1.76 miles of the mainstem would become suitable habitat, and 25% (10 miles) of the Little River, but not Colley-Wright Brook (which MASC considers habitat).

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APPENDIX A

FISHERIES PROFILES

Life Cycles and Habitat Requirements

Of

Migratory Fisheries of the Presumpscot River

APPENDIX TABLE A-1 : PRESUMPSCOT RIVER, MIGRATORY FISHERIES INFORMATION

Species	Habitat Specifications	
	Life Cycle	Spawning Habitat and Characteristics
American Shad (Alosa Sapidissima)	- Anadromous, spring spawners. - In the Connecticut, 63% of shad are repeat spawners, in the St. John, 73%. - Juveniles spend first summer in the river, move to brackish water in the fall; remain in ocean until mature (4-6 years for females). - Juveniles eat food in the water column, insects and crustaceans, juveniles are eaten by bass, American eels and birds.	- Substrate ranges from fine sand to coarse rubble and ledge, and even on silty or muddy bottom areas. - Spawn in river areas with current velocities of 1-3 feet per second (fps) at water depths ranging from 3-20ft, spawning begins at 12ºC (54ºF) and occurs in June and July in Canadian rivers. - Eggs hatch in 12-15 days at 11 – 15ºC (52 – 54 ºF). - Usually spawn in shallow water in main stem of rivers in moderate current. - Spawn far enough upstream for eggs to drift and hatch before reaching salt water. Low water temperature results in longer upstream migrations. - Shad eggs require 5 mg/l dissolved oxygen. - Depth is not critical for spawning; juveniles live between 0.9 and 4.9 m in the Connecticut River.
Blueback Herring (Alosa Aestivalis)	- Anadromous, spring spawners. - Feed primarily on zoo plankton. - In Nova Scotia, 75% of blueback herring are repeat spawners. - Juveniles emigrate from Maine rivers between mid-July and December in response to heavy rains, high water, and sharp drops in temperature. - Adults migrate downstream within 5 days of spawning.	- Prefer fast current over coarse rubble and ledge substrate. - Spawning begins at 14ºC. - Spawning occurs 3 to 4 weeks after alewives, June and July, in Maine.
Alewives (Alosa Pseudoharengus)	- Anadromous, spring spawners. - In Nova Scotia, 60% of Alewives are repeat spawners. - Feed primarily on zoo plankton. - Juveniles emigrate from Maine rivers between mid-July and December in response to heavy rains, high water, and sharp drops in temperature. - Adults migrate downstream within 5 days of spawning. - Survival rate of 0.01 percent of eggs deposited.	- Begin spawning at temperature of 10.5ºC; this generally occurs in May and June in Maine. - Select a wide variety of spawning sites, using standing water, oxbows, as well as mid-river sites, lakes and ponds. - Larvae is found in <2m shallow water.
American Eel (Anguilla Rostrata)	- Catadromous. - Spawning requirements are unknown	

Species	**Habitat Specifications**	
	Life Cycle	**Spawning Habitat and Characteristics**
Striped Bass (Morone Saxatilis)	- Anadromous, spring spawners. - Repeat spawners. - Annual migrations from S. Atlantic to New England after age 2 years. - 50% of all stock originates from Chesapeake Bay.	- Prefer a pronounced current and sand or gravel bottom. - Minimum current velocity needed to keep semi-buoyant eggs off bottom is 1ft/s. - Spawning begins at 55-65ºF; this generally occurs from April until June in the mid-Atlantic. - DO tolerance 3-20 mg/l; optimal 6-12 mg/l. - Turbidities above 500 mg/l lethal to striped bass larvae; TDS above 350 mg/l block spawning runs, avoid TDS > 180 mg/l.
Atlantic Salmon (Salmo Salar)	- Anadromous, fall spawners. - Migrate into freshwater in the spring, spawn in fall. - Young stay in streams generally 2-3 years in the Ungava Bay region of Canada, they stay 4-8 years. - When the young salmon reach a certain development state (smolts) they migrate downstream to the sea, triggered by water temperatures increasing in the spring, beginning at 5ºC and reaching full migration at 9-10 C. - Adults return to spawn after 2 years at sea. - May be repeat spawners if they survive the return to sea (mortality is high when they return to saltwater). - 5% of eggs deposited result in production of fry (stage emerging from the gravel). mortality rates are also high during emergence and dispersion. - Young (in freshwater streams) feed on invertebrate drift. In the sea they feed on other smaller fish and crustaceans. - Predators on young include eels, brook trout, larger salmon, herons, gulls, mergansers, cormorants, and other birds. - Require cool water at all stages of life, lethal temperature for juveniles is 32ºC; optimal growth at 15-19ºC. Mortality in adults at temperatures above 28ºC. - Salmon do not inhabit streams with less than 5mg/l DO. - PH less than 5.0 results in loss of salmon runs.	- Water depth over a redd averages 0.4m in Maine - Dissolved Oxygen (DO) concentrations should be at or near saturation; at least 6mg/1 for good development. Embryos require 6-7 mg/l DO. - Substrate has a particular composition consisting of fine and coarse sand, pebble, and cobble. - Spawn from mid October to mid November, when temperature ranges between 4.4-5.6ºC. - Optimum temperature for incubation is about 6ºC. - Eggs are buried in gravel 10-25cm deep at sties at the downstream end of riffles with water percolating through the gravel, or at upwellings of groundwater.

Species	**Habitat Specifications**	
	Life Cycle	**Spawning Habitat and Characteristics**
Atlantic Sturgeon (Acipenser Oxyrhynchus Oxyrhynchus)	- Anadromous, spring spawners. - Bottom feeder. - Feeds indiscriminately. - Prefer higher salinity water than shortnose sturgeon; regularly occurs in the ocean. - Atlantic Salmon from American waters travel to feeding grounds between Labrador and Greenland.	- Spawn in depths of 11-13m over a hard clay or gravel substrate; this occurs in late May, June, and early July in Gulf of Maine tributaries. - Spawn in flowing brackish or fresh water. - Eggs hatch in 94 hrs at about 20 C.
Shortnose Sturgeon (Acipenser Brevirostrum)	- Anadromous, spring spawners. - Most migratory activity occurs during the winter and spring; winter in the deep water in the lower parts of river and estuaries. - Spent fish move downstream soon after spawning in May and June in Maine. - Non-spawners may move upstream and overwinter there. - Females require in the range of 13 years to mature in the north; earliest spawning at 15 years in the St. John River. - Bottom-feeders. - Juveniles feed on benthic crustaceans and insect larvae; adults feed largely on mollusks and small benthic fish in estuaries; benthic crustaceans and insect larvae can be dominant in adult diets if other sources are lacking. - Reluctant to inhabit areas with salinity at level of open ocean; prefer less saline water. - Occur in depths of 2-10m in summer and 10-30m in winter.	- Fast flowing water and pools below dams, substrate of gravel, rubble, large boulders. - Spawning occurs in mid-May in the St. John River in New Brunswick.

APPENDIX B

FISHERIES MANAGEMENT OPTIONS

SUPPLEMENTAL TABLES

Table B-1:
Presumpscot River Dams:
Physical Characteristics, Generation, and Estimated Costs of Mitigation Options

Table B-2:
Potential Comparables for Dam Removal Costs

Table B-1: Presumpscot River Dams: Physical Characteristics, Generation Capacity, and Estimated Costs of Fisheries Restoration Options

Dam Name (Owner)	FERC License Number /Status	Avg. Net Head	Dam Height	Installed Generating Capacity	Estimated Fish Passage Cost[1]	Rough Estimate of Dam Removal Costs[2]
					Total Upstream and Downstream $million	**Total** Demolition & Removal/ Engineering, permitting EA/Studies
North Gorham	2519	34 ft	24 ft	2.25 MW	Downstream Only – $280,000 – $630,000	NA
Dundee	#2942	48 ft	44 ft	2.4MW	Eel Passage $130,000 Upstream (lift) $4.2 million Upstream (trap/truck) $800,000 Downstream $780,000	NA
Gambo	#2931	22 ft	24 ft	1.9 MW	Eel Passage $55,000 Upstream $1.795 million Downstream $720,000	NA
Little Falls	#2944	17 ft	14 ft	1 MW	Eel passage and denil fish ladder: $1.510 million Downstream passage $630,000 Convert ladder to fish lift: $1.075 million	$500,000 - $950,000
Mallison Falls	#2932	18 ft	14 ft	0.8 MW	Eel passage and denil fish ladder: $1.035 million Downstream passage: $520,000 Convert ladder to fish lift: $830,000	$500,000 - $950,000
Saccarappa	#2897	27 ft	12' W & 10' E	1.35 MW	Eel passage and denil fish ladder: $2.310 million Downstream passage: $410,000 Convert ladder to fish lift: $1.610 million	$500,000 - $950,000
Cumberland Mills	Non-hydro	NA		none	$1.3 million	NA

[1] Preliminary cost estimates by US Fish & Wildlife Service (01/17/02). For Saccarappa, Mallison, and Little Falls, includes converting the denil fish ladders to fish lifts when needed for larger runs. Does not include operation and maintenance costs, does not include replacement energy costs for generation lost during upstream migration. See following notes for more detailed description of Phase 1 and 2 costs for each dam.

[2] Does not include loss of the dam asset value to SAPPI; based on demolition costs from documented dam removal case studies, which ranged from approximately $200,000 to $550,000, and an estimated $300,000 to $400,000 for detailed engineering, and permitting costs including preparation of an Environmental Assessment and associated studies (see Table B-2). Note that the estimated total cost for removal of the Smelt Hill Dam is $1.1 million.

Table B-2: Dam Removals: Potential Comparables for Demolition/Removal Costs[1]

River/Dam (State) And Type of Construction	Height (ft)	Length (ft)	Year Built	Year Removed	Cost of Physical Removal	Prorated Cost for Physical Removal if Dam 350 ft Long[2]	Asset Acquisition Costs	Engineering, Permitting	Notes
Presumpscot River Smelt Hill Dam (Maine) A stone filled timber crib dam with a gatehouse building, damaged fish lift, and powerhouse building. (COE report).	15	300 (151 feet plus gate house and power house)	1898	Projected 2002	Estimated $408,000	$500,000	$415,000	$161,000 feasibility study; $92,000 plans/specs; $15,000 post demolition monitoring	Projected, not actual costs, from Corps of Engineers Smelt Hill Dam Environmental Restoration Study, January 2001. Total costs $1,091,000.
Kennebec River Edwards Dam (Maine) A capped timber crib dam with gatehouse and powerhouse.	24	917	1837	1999	$2,100,000	$470,000	NA	$800,000.	Pro-rated to 14 feet in height
Baraboo River Waterworks Dam (Wisconsin) Timber crib and concrete dam no powerhouse.	9	220	1848	1998	$213,000	$527,000	NA	NA	Deteriorated old mill dam. Pro-rated to 14 feet in height
Cannon River Welch Dam (Minnesota) Concrete construction? Powerhouse?	9	120	1890's; rebuilt in 1920's	1994	$46,000 ($48,800 in '98$)	$221,000	NA	NA	Pro-rated to 14 feet in height Deteriorated condition; inactive hydropower dam Used hydraulic hammer for removal.
Conestoga River Rock Hill Dam (Pennsylvania) (largest of 7 dams removed) Concrete construction? Powerhouse?	13	300	Early 1900's	1997-98	$110,000	$128,000	NA	NA	Abandoned dams, had been used for hydro power. Used hydraulic hammer for removal.

River/Dam (State) And Type of Construction	Height (ft)	Length (ft)	Year Built	Year Removed	Cost of Physical Removal	Prorated Cost for Physical Removal if Dam 350 ft Long[2]	Asset Acquisition Costs	Engineering, Permitting	Notes
Juniata River Williamsburg Station (Pennsylvania) Concrete dam, no powerhouse.	13	260	1922	1996	$150,000 ($159,135 in 1998$)	$214,000	NA	NA	Storage pond for cooling water for a coal fired electric plant. Used hydraulic hammer and heavy equipment to remove
Neuse River Quaker Neck Dam (North Carolina) Concrete dam, no powerhouse	7	260	1952	1997-98	$205,500	$553,000	NA	NA	Pro-rated to 14 feet in height. Storage pond for cooling water for a steam generating plant. Obsolete. Used wrecking ball and hydraulic hammer.

[1] Does not include engineering and permitting costs, or post or pre removal studies (archaeological, fisheries, benthic, sediments, etc…).
[2] Used to estimate potential costs for removal of Saccarappa (322'), Mallison (358') and Little Falls (330').

Sources: Case studies (except Smelt Hill) taken from "Dam Removal Success Stories" December 1999 by Friends of the Earth, American Rivers, and Trout Unlimited. Smelt Hill dam removal costs from Dana Murch at Maine DEP. Cost projections calculated by Land & Water Associates.

APPENDIX C:

Draft Fishery Management Plan
For the Presumpscot River Drainage

Maine Department of Marine Resources
Maine Department of Inland Fisheries and Wildlife
Maine Atlantic Salmon Commission

December, 2001

Draft Fishery Management Plan
For the Presumpscot River Drainage

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Introduction

In January 2001, the Maine Department of Marine Resources (MDMR), the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the Maine Atlantic Salmon Commission (MASC) completed a document entitled *Presumpscot River: Interim Goals for Fisheries Management*, which outlined management goals for important fishery resources that currently reside or historically resided in the Presumpscot River watershed. Species addressed in the document include alewife, American eel, American shad, landlocked Atlantic salmon, sea-run Atlantic salmon, Atlantic sturgeon, black crappie, blueback herring, brook trout, brown bullhead, brown trout, chain pickerel, largemouth bass, rainbow smelt, smallmouth bass, striped bass, tomcod, yellow perch, and white perch. The three state fisheries agencies developed the interim fisheries management goals in response to several changes within the watershed: the probable removal of Smelt Hill Dam (located at the head-of-tide), the relicensing of six of the seven existing hydropower projects on the river, and improvements in water quality resulting from the closure of the pulping operation in Westbrook. These changes created a new opportunity for the restoration of diadromous[14] fish runs and the enhancement of warm water and coldwater recreational fishing opportunities.

In September 2001, the three state fisheries agencies agreed to develop the interim document into a more comprehensive plan to guide future decisions on fisheries management in the Presumpscot River. The goals contained in this management plan reflect a balance between the disparate missions of the three agencies, and are based on considerable discussion to minimize potential areas of management conflict. They also reflect a desire to manage the fisheries of the Presumpscot River within the physical and biological limits of habitat and its capacity to sustain the various resources. This management plan includes agency recommendations for fish passage and other issues that must be addressed for the successful attainment of stated management goals

Description of Drainage

The Presumpscot River drainage extends as far north as Albany Township, however, this management plan addresses only that portion of the drainage from Sebago Lake to the head-of-tide, referred herein as the Presumpscot River. The Presumpscot River is approximately 24 miles long, drains an area of approximately 615 square miles, and flows through the towns of Standish, Gorham, Windham, Westbrook, Falmouth, and Portland. Nine dams are located on the Presumpscot River. Seven of the dams are components of active hydropower projects (Table 1), and are licensed by the Federal Energy Regulatory Commission (FERC). Cumberland Mills Dam is not associated with a hydropower project, and is not licensed by FERC. The Smelt Hill Project was rendered inoperable by a flood in 1996, and is now inactive.

Water Quality

Water quality within the Presumpscot River from the outlet of Sebago Lake to the confluence of Pleasant River is classified by the Maine Department of Environmental Protection (MDEP) as Class A and GPA. Water quality in the reach from the confluence of Pleasant River to Saccarappa Falls has been downgraded to Class B. The MDEP has further downgraded the water quality in the reach below Saccarappa Falls to tidewater as Class C.

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[14] Collective term referring to anadromous (spawn in fresh water and spend most of their lives in the sea) and catadromous (spawn in the sea and spend most of their lives in fresh or brackish water) species.

Fisheries Resources

Migratory fishes

Historically, the Presumpscot River supported large numbers of migratory fish. These included both anadromous species (alewife, American shad, Atlantic salmon, blueback herring, rainbow smelt, striped bass) and the catadromous American eel. Prior to the 1600s, the Aucoscisco Indians utilized these fish for food and fertilizer. However, construction of dams without fishways by European settlers, documented as early as 1739, interfered with the movement of the migratory species. The greatest impact probably occurred when a dam without a fishway was constructed at the head-of-tide in 1802, effectively blocking the anadromous species from nearly all spawning habitat. The Commissioners of Fisheries embarked on a statewide program of fishway construction in 1869, and by 1887 all the dams on the Presumpscot River had been provided with fishways. Over the next decade, the fishways fell into disrepair or were destroyed by high water and not replaced, and runs of anadromous fish were not reported in the Presumpscot River after 1900.

The Presumpscot River currently supports a sizeable population of catadromous American eel. In 1995 a commercial fishery for the juvenile (elver) stage of the American eel developed in Maine, and for the next three years the Presumpscot River below Smelt Hill Dam was heavily fished for elvers. In 1999, the State of Maine capped the number of elver licenses and reduced fishing effort (allowable gear) by about 79% because of concerns about the impact of the fishery. The same year, the market for elvers collapsed. The fishery has remained quiescent since 1999, and fishing pressure for elvers on the Presumpscot River has been negligible.

The lower reaches of the Presumpscot River currently support a run of anadromous alewives and a remnant population of American shad and perhaps rainbow smelt and tomcod. In 1987, MDMR constructed a fishway at the outlet of Highland Lake to allow alewives access to their principal spawning area, thereby enhancing the resource. Central Maine Power constructed a fishway at Smelt Hill Dam that became operational in 1990. The fishway provided access to the lower reaches of the river for alewives and American shad until 1996, when it was destroyed by a flood. After the flood, Central Maine Power either stocked alewives into Highland Lake (1997 and 1998) or opened gates in the dam (1999-2001) to allow passage of anadromous fishes. In addition, MDMR stocked alewives in Highland Lake in 2000 and 2001 to maintain the population.

Adult Atlantic salmon have sporadically been observed or caught in the Presumpscot River below Westbrook over the past few years. The origin of these fish is unknown. Juvenile salmon also have been observed in the Piscataqua River, primarily through electrofishing surveys conducted by the MDIFW. Limited access to the Presumpscot's remaining spawning and nursery habitat, located principally in tributaries, has prevented passive redevelopment of a sizeable Atlantic salmon run in the Presumpscot River.

Estimates of migratory fish populations

In order to design efficient fish passage facilities, the number of fish of each species produced in each river reach and the number of fish of each species that will use a facility must be estimated. The MDMR and the MASC typically make these estimates by multiplying fish production per unit area for each species by the total number of area units of aquatic habitat. Because of the assumptions made (described below), the values presented in Table 1 should be considered order-of-magnitude population estimates.

For many years, MDMR has used 235 fish/acre to estimate alewife production. This unit production value was developed from the commercial harvest in six Maine watersheds for the years 1971-1983. On the basis of these data, commercial yield was assumed to be 100 pounds/surface acre of ponded habitat.

This value is slightly less than the average of the lowest yield/acre for all six rivers and within the range of yields experienced in other watersheds. Assuming a weight of 0.5 pounds per adult, the commercial yield equals 200 adults/surface acre. The commercial harvest was assumed to represent an exploitation rate of 85%, because most alewife runs are harvested six days per week. Exploitation rates on the Damariscotta River, for example, ranged from 85-97% for the years 1979-1982. When commercial yield is adjusted for the 15% escapement rate, the total production is 235 adult alewives/acre.

Maine currently has no rivers with extensive runs of American shad or blueback herring and historical information on the size of populations produced by specific Maine rivers generally is lacking, because runs were greatly reduced or extirpated by dam construction beginning in the 1700s. Therefore, potential population sizes must be estimated from information on restored runs in other rivers. In the past, MDMR has used 111 shad/acre (=2.3 shad/100 yd^2), based on shad restoration in the Connecticut River during the early 1980s. MDMR's earlier estimates of shad production for the Presumpscot River (e.g. MDMR reply comments to FERC dated January 24, 2001) were based on 111 shad/acre of habitat. To determine whether this number remained valid, MDMR obtained counts of shad passed at the Holyoke Dam (1st) and Turners Falls Dam (2nd) on the Connecticut River for the years 1983-2000, and a GIS estimate of surface area for this river reach. The average shad production for the reach between the two dams for the 20 year-period was 98.9 shad/acre. Production estimates based on both values have been included in Table 1 for comparison, but MDMR recommends using production based on 98.9 shad/acre.

Use of 98.9 shad/acre for estimating production is further supported by historical information on commercial landings in Maine. A significant fishery for American shad existed in the freshwater tidal section of the Kennebec River and its tributaries after access to inland waters was obstructed by impassable dams at the head-of-tide. From 1896-1906 the average annual landings of American shad in the Kennebec River were 802,514 pounds. This represents 267,500 adult shad, assuming an average weight of three pounds per fish, and a commercial yield of 0.6778 shad/100 yd^2. If the exploitation rate ranged from 25-50%, then the total run from Merrymeeting Bay to Augusta (including tributaries) may have ranged from 535,000-1,070,000 shad. This represents a production of to 68-131shad/acre (equivalent to 1.4-2.7 adult shad/100 yd^2).

In the past, MDMR has not estimated production for blueback herring due to lack of data. However, MDMR recently consulted with Steve Gephard (CT DEP, Bureau of Natural Resources, Fisheries Division) to determine how production of blueback herring is estimated for Connecticut waters. In developing a management plan for the Thames River, the CT DEP estimated shad production, and then used a multiplier (7-8) to estimate blueback herring production. MDMR has further reduced the multiplier to a more conservative 6 (resulting in approximately 600 fish/acre).

Atlantic salmon smolt estimates are based on a production goal of three smolts per unit of habitat (one unit = 100 square meters of Atlantic salmon habitat). The spawning requirement is also habitat based and is derived from an egg deposition rate for optimal smolt production (240 eggs/unit), long-term fecundity rates for Maine Atlantic salmon (7,200 eggs/female), and a 50:50 sex ratio of returning spawners.

Spatially referenced datasets were obtained from the Maine Office of GIS (coastal waters, rivers, ponds, streams, dams), and were combined to estimate the surface area of aquatic habitat in each river reach (dam to dam), tributary, and lake or pond of the Presumpscot watershed. Production/area for each species was multiplied by the total area of appropriate habitat to obtain an order-of-magnitude estimate of total production. The estimate of aquatic habitat for the mainstem Presumpscot River is based on existing conditions, and does not take into account reductions in stream width (and therefore area) that would occur if one or more dams were removed.

Fish passage

Successful restoration and enhancement of diadromous species currently is hampered by the lack of upstream and downstream fish passage at all dams on the Presumpscot River. In January 1999, the US Army Corps of Engineers and the State of Maine, in partnership with non-governmental organizations, announced an initiative to remove the Smelt Hill Dam, located at the head-of-tide, and restore the aquatic ecosystem of the lower Presumpscot River. MDMR is in the process of obtaining a purchase and sale agreement for the property in order to submit an application to FERC and the Maine Department of Environmental Protection (MDEP) to surrender the hydropower project permit and to remove the dam. Removal of Smelt Hill Dam, anticipated to occur in the summer of 2002, is the impetus for restoration because it will allow diadromous species unrestricted access to seven miles of riverine habitat.

The second dam on the river, Cumberland Mills Dam, is located in inland waters and is not a FERC jurisdictional dam. Maine statute (12M.R.S.A §7701-A) authorizes the Commissioner of MDIFW to require a fishway by the owners, lessors or other persons in control of any dam within inland waters frequented by shad, salmon, sturgeon or other anadromous or migratory fish species in order to conserve, develop or restore anadromous or migratory fish resources.

The remaining dams on the river are hydropower projects licensed by FERC. Fish passage has been requested by the state (MDMR, MASC, MDIFW) and federal (USFWS) fisheries agencies and non-governmental organizations at the six projects currently being relicensed.

Resident species

Resident fish are those species that are able to fulfill their life history requirements within the river and its tributaries. The species listed below are known resident inhabitants of the Presumpscot River.

Chain pickerel	Brown bullhead (hornpout)	Fourspine stickleback
Smallmouth bass	Golden shiner	White sucker
Largemouth bass	Bridle shiner	Brook trout
Pumpkinseed	Common shiner	Brown trout
Black crappie	Fallfish	Landlocked Atlantic salmon
Yellow perch	Banded killifish	

Brook trout and landlocked Atlantic salmon are indigenous to the Presumpscot River drainage. Several tributaries to the Presumpscot currently support wild populations of brook trout, but there are essentially no self-sustaining populations of landlocked salmon in the Presumpscot. The historical origin of several other river fish is less certain, however, five species of nonnative fish were more recently introduced, including black crappie, smallmouth bass, largemouth bass, brown trout, and bridle shiner.

Existing recreational sportfisheries are primarily comprised of landlocked Atlantic salmon, brook trout, brown trout, smallmouth bass, largemouth bass, brown bullhead, and yellow perch. MDIFW stocking programs maintain recreational fisheries for trout and landlocked salmon, although wild brook trout produced in river tributaries, as well as stocked and wild landlocked salmon originating from Sebago Lake make a small contribution to the river fisheries. Fisheries for predominantly stocked trout and salmon occur in the tailrace and bypass reaches associated with Eel Weir Dam, North Gorham Dam, Dundee Dam, and Mallison Dam. The Eel Weir bypass, located immediately below Sebago Lake, is intensively managed for brook trout, although, landlocked Atlantic salmon, and to a lesser extent brown trout are also stocked. Up to 2,500 trout and salmon have been stocked annually in the Eel Weir Bypass reach. The other three bypass reaches that are the focus of current MDIFW stocking programs are managed primarily for brown trout and are stocked annually at much lower levels, typically 250 trout per

reach. Limiting environmental factors and available resources currently preclude opportunities to provide season-long recreational fisheries for native salmonid species in some river reaches. In these reaches management has favored more tolerant and available nonnative species like brown trout.

MDIFW will be able to manage for resident species as long as suitable minimum/maximum flow releases and adequate public access are provided where requested at key locations throughout the watershed. The development and enhancement of recreational angling opportunities for both resident and migratory fisheries is dependent on suitable minimum/maximum flows in the tailrace and bypass channels and mainstem river channel, as well as safe public access.

Management Goals, Objectives, and Strategies

The overall goal of the draft fishery management plan is to integrate the fishery management goals of the Maine Department of Marine Resources (MDMR), the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the Maine Atlantic Salmon Commission (MASC) so as to cooperatively manage the diadromous and resident fishes of the Presumpscot River for optimum habitat utilization, abundance and public benefit.

Management objectives (numbers) and strategies (letters) supporting the goal of the fisheries agencies are listed by reach below:

Phase I[15]
Reach 1: Smelt Hill Dam to Cumberland Mills Dam, including Forest Lake, Knights Pond, Piscataqua River, Highland Lake, and Mill Brook

1) Manage Reach 1 as a migratory pathway for alewife, American eel, American shad, Atlantic salmon (smolts and adults), blueback herring, striped bass, and possibly Atlantic sturgeon, rainbow smelt, sea-run brook trout, sea-run brown trout, and tomcod.
   a) Remove Smelt Hill Dam (anticipated to occur in the summer of 2002).
   b) Agencies will continue to consult with MDOT on fish passage through culverts.

2) Manage Reach 1 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 1 is estimated to be 12,800 American shad; 78,000 blueback herring; 147,700-200,000 alewife; 2,310 Atlantic salmon smolts and 56 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.
   b) Monitor juvenile or adult abundances of selected species as funding is available.
   c) Investigate access for alewife at Forest Lake and Knight's Pond.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for Striped Bass, ASMFC's Interstate Fisheries Management Plan for American shad and river herring, ASMFC's Interstate Fisheries Management Plan for American eel, and Amendment 1 to ASMFC's Interstate Fishery Management Plan for Atlantic sturgeon.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.

[15] Restoration of anadromous species will occur in phases, allowing the fisheries agencies to assess potential interactions between resident and anadromous species and changes in fishing opportunities. During Phase I, anadromous fish will be restored to Reach 5 (base of Gambo dam). If the three fisheries agencies agree, restoration will continue upriver as described.

4) Promote existing and potential commercial fisheries for alewife and American eel.

5) Promote existing and potential recreational angling opportunities for American shad; adult Atlantic salmon; striped bass; smallmouth bass; largemouth bass; chain pickerel; yellow perch; white perch; brown bullheads; black crappie; and possibly rainbow smelt, sea-run, and resident species of trout, which may include brook trout and brown trout in the mainstem.

6) Establish a seasonal recreational fishery for stocked trout in the mainstem.
   a) Management is contingent upon availability of adequate public access.
   b) Stock legal-size trout, utilizing those species and strains that provide good returns.

7) Manage the West Branch Piscataqua River and Mill Brook for diadromous species and wild brook trout. Enhance recreational trout angling opportunities.
   a) Augment natural recruitment of a small population of wild brook trout by stocking legal-size trout to meet angler use and provide season-long (spring-fall) trout angling opportunities.

8) Manage Forest Lake for diadromous species (American eel and possibly alewife), existing resident species, and establish a coldwater recreational fishery for trout.
   a) Management is contingent upon availability of adequate public boat access that is consistent with existing watercraft use
   b) Develop an annual stocking program to support a put, grow, and take fishery for trout. Brown trout would most likely stocked.

9) Manage Highland Lake for diadromous species (American eel and alewife), existing resident species, and maintain existing recreational fishery for stocked brown trout and landlocked salmon.
   a) MDMR will operate fish passage at Highland Lake from approximately April-November.
   b) Maintain existing annual stocking program, utilizing fall yearling landlocked salmon and brown trout to provide a put, grow, and take fishery consistent with habitat capabilities.
   c) Develop and maintain a quality fishery for smallmouth and largemouth bass.

10) No recreational management for resident species is planned for the East Branch of the Piscataqua River or Knights Pond.

Reach 2. Cumberland Dam to Saccarappa Dam

1) Manage Reach 2 as a migratory pathway for American eel, American shad, Atlantic salmon (smolts and adults), blueback herring, striped bass and possibly sea-run brook trout and sea-run brown trout.
   a) For American eel, upstream passage facilities at Cumberland Dam will be completed two years after Smelt Hill Dam is removed.
   b) For anadromous species, upstream passage facilities at Cumberland Dam will be completed two years after Smelt Hill Dam is removed. Assuming full restoration to the North Gorham Dam the upstream facility ultimately should be capable of passing a maximum of approximately 61,100 American shad and 372,200 blueback herring.
   c) Agencies will continue to consult with MDOT on fish passage through culverts.

2) Manage Reach 2 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 2 is estimated to be 3,100 American shad; 18,800 blueback herring; and 42 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.

b) Monitor juvenile or adult abundances of selected species as funding is available.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for Striped Bass, ASMFC's Interstate Fisheries Management Plan for American shad and river herring, and ASMFC's Interstate Fisheries Management Plan for American eel.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.
4) Promote existing and potential commercial fisheries for American eel.

5) Promote existing and potential recreational angling opportunities for American shad, adult Atlantic salmon, striped bass, smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, black crappie, and possibly sea-run brook trout, and sea-run brown trout.

6) Establish a seasonal recreational fishery for stocked trout in the mainstem.
   a) Management is contingent upon availability of adequate public access.
   b) Stock legal-size trout, utilizing those species and strains that provide good returns.

Reach 3. Saccarappa Dam to Mallison Falls Dam, including Inkhorn Brook, Little River, and Colley-Wright Brook

1) Manage Reach 3 as a migratory pathway for American eel, American shad, Atlantic salmon (smolts and adults), blueback herring, and possibly striped bass, sea-run brook trout and sea-run brown trout.
   a) For American eel, upstream passage facilities at Saccarappa Dam will be completed within two years of licensing and downstream passage measures[16] will be operational within 30 days of licensing.
   b) For anadromous species, upstream and downstream passage facilities at Saccarappa Dam will be completed two years after passage is available at Cumberland Mills Dam[17]. The upstream passage should be equipped with a trapping and sorting facility. Assuming full restoration to the North Gorham Dam the upstream facility ultimately should be capable of passing a maximum of approximately 58,000 American shad and 353,400 blueback herring.
   c) Agencies will continue to consult with MDOT on fish passage through culverts.

2) Manage Reach 3 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 3 is estimated to be 13,700 American shad; 83,500 blueback herring; 8,283 Atlantic salmon smolts; and 202 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.
   b) Monitor juvenile or adult abundances of selected species as funding is available.
   c) Maintain year-round leakage flow (13 cfs) at Saccarappa Dam.

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[16] On the basis of statewide eel harvest data, the fisheries agencies recommend an eight-week shutdown for eight hours each night. If the results of a three-year study conducted within the Presumpscot River indicate that the duration of the downstream migration is less than eight weeks on average, then the shutdown period can be reduced.

[17] Upstream and downstream passage for anadromous species will be completed concurrently. However, in the event that the fisheries agencies notify the project owner that a sustained annual stocking program of anadromous fish above a project has begun or will begin to occur within two years, the downstream passage at this project will be constructed within two years of the notification.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for Striped Bass, ASMFC's Interstate Fisheries Management Plan for American shad and river herring, and ASMFC's Interstate Fisheries Management Plan for American eel.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.

4) Promote existing and potential commercial fisheries for American eel.

5) Promote existing and potential recreational angling opportunities for American shad, adult Atlantic salmon, smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, black crappie, and possibly striped bass, sea-run brook trout, and sea-run brown trout.

6) Establish a year-round fishery for stocked trout in the Mallison Falls tailrace and bypass, or in the event of dam removal, any suitable free flowing reaches.
   a) Management is contingent upon availability of adequate public access.
   b) Stock legal-size trout, which may include brook trout and brown trout.
   c) Promulgate supporting regulations.
   d) Establish suitable year-round minimum flows at Mallison Falls Dam.
   e) Maintain / enhance MDIFW access for stocking.

7) Manage the Little River for diadromous species and wild trout. Enhance recreational trout angling opportunities.
   a) Augment natural recruitment of a small population of wild brook trout by stocking legal-size trout to meet angler use and provide season-long (spring-fall) trout angling opportunities.

8) Manage Colley-Wright Brook for diadromous species and wild brook trout and brown trout. Provide a recreational fishery for brook trout and brown trout commensurate with the small size of this tributary and based on results of the MDIFW stocking study.
   a) Augment natural recruitment of wild brook trout by stocking legal-size trout to meet angler use and provide season-long (spring-fall) trout angling opportunities.

9) No recreational management for resident species is planned for Inkhorn Brook.

Reach 4. Mallison Falls Dam to Little Falls Dam

1) Manage Reach 4 as a migratory pathway for American eel, American shad, Atlantic salmon (smolts and adults), and blueback herring.
   a) For American eel, upstream passage facilities at Mallison Falls Dam will be operational within two years of licensing and downstream passage measures[3] will be operational within 30 days of licensing.
   b) For anadromous species, upstream and downstream passage facilities at Mallison Falls Dam[4] will be completed two years after 2,960 American shad or 18,020 blueback herring are passed in any single season at the passage facility at Saccarappa. This number represents 20% of the estimated production of these species for the reach from Saccarappa Dam to Little Falls Dam. Assuming full restoration to the North Gorham Dam the upstream facility ultimately should be capable of passing a maximum of approximately 44,300 American shad and 269,900 blueback herring.
   c) Agencies will continue to consult with MDOT on fish passage through culverts.

2) Manage Reach 4 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 4 is estimated to be 1,100 American shad; 6,600 blueback herring; and 17 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.
   b) Monitor juvenile or adult abundances of selected species as funding is available.
   c) Seek year-round bypass flows of at least 63 cfs at Mallison Falls Dam.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for American shad and river herring, and ASMFC's Interstate Fisheries Management Plan for American eel.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.

4) Promote existing and potential commercial fisheries for American eel.

5) Promote existing and potential recreational angling opportunities for American shad, adult Atlantic salmon, smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.

6) Establish a year-round recreational fishery for stocked trout in the Little Falls tailrace and bypass, or in the event of dam removal, any suitable free flowing reaches.
   a) Management is contingent upon availability of adequate public access
   b) Stock legal-size trout, which may include brook trout and brown trout.
   c) Promulgate supporting regulations.
   d) Establish suitable year-round minimum flows at Little Falls Dam.
   e) Improve MDIFW access for stocking.

Reach 5. Little Falls Dam to Gambo Dam, including Black Brook

1) Manage Reach 5 as a migratory pathway for American eel, American shad, Atlantic salmon (smolts and adults), and blueback herring.
   a) For American eel, upstream passage facilities at Little Falls Dam will be operational within two years of licensing and downstream passage measures[3] will be operational within 30 days of licensing.
   b) For anadromous species, upstream and downstream passage facilities at Little Falls Dam[4] will be completed two years after 2,960 American shad or 18,020 blueback herring are passed in any single season at the passage facility at Saccarappa. This number represents 20% of the estimated production of these species for the reach from Saccarappa Dam to Little Falls Dam. Assuming full restoration to the North Gorham Dam the upstream facility ultimately should be capable of passing a maximum of approximately 43,200 American shad and 263,300 blueback herring
   c) Agencies will continue to consult with MDOT on fish passage through culverts.

2) Manage Reach 5 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 5 is estimated to be 3,100 American shad; 19,000 blueback herring; and 15 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.
   b) Monitor juvenile or adult abundances of selected species as funding is available.
   c) Maintain year-round leakage flow (26 cfs) at Little Falls Dam.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for American shad and river herring, and ASMFC's Interstate Fisheries Management Plan for American eel.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.

4) Promote existing and potential commercial fisheries for American eel.

5) Promote existing and potential recreational angling opportunities for American shad, adult Atlantic salmon, smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, and black crappie.

6) Establish a year-round fishery for stocked trout in the Gambo tailrace and bypass, or in the event of dam removal any suitable free flowing reaches.
   a) Management is contingent upon availability of adequate public access.
   b) Stock legal-size trout, which may include brook trout and brown trout.
   c) Promulgate supporting regulations.
   d) Establish suitable year-round minimum flows at Gambo Dam.
   e) Improve MDIFW access for stocking.

7) Fisheries agencies will begin evaluation of Phase I of the restoration program when 100 American shad, blueback herring, or 15 Atlantic salmon are passed into Reach 5. A second phase of restoration for American shad and blueback herring will not begin unless agreed to by MDMR, MDIFW, and MASC.

8) No recreational management for resident species is planned for Black Brook.

Phase II
Reach 6. Gambo Dam to Dundee Dam, including the Pleasant River and Little Sebago Lake

1) Manage Reach 6 as a migratory pathway for American eel, Atlantic salmon (smolts and adults), and possibly American shad.
   a) For American eel, upstream passage facilities at Gambo Dam will be operational within two years of licensing and downstream passage measures[3] will be operational within 30 days of licensing.
   b) For anadromous species, upstream and downstream passage facilities at Gambo Dam[4] will be completed two years after 620 American shad or 3,800 blueback herring are passed in any single season at the passage facility at Little Falls if all agencies agree to Phase II. This number represents 20% of the estimated production of these species for the reach from Little Falls Dam to Gambo Dam. Assuming full restoration to the North Gorham Dam the upstream facility ultimately should be capable of passing a maximum of approximately 40,100 American shad and 244,300 blueback herring.
   c) Agencies will continue to consult with MDOT on fish passage through culverts.

2) Manage Reach 6 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 6 is estimated to be 20,100 American shad; 122,300 blueback herring; 3,078 Atlantic salmon smolts; and 75 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.
   b) Monitor juvenile or adult abundances of selected species as funding is available.
   c) Seek year-round bypass flows of at least 40 cfs at Gambo Dam.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for American eel and possibly ASMFC's Interstate Fisheries Management Plan American shad and river herring.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.

4) Promote existing and potential commercial fisheries American eel.

5) Promote existing and potential recreational angling opportunities for smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, black crappie, adult Atlantic salmon, and possibly American shad.

6) Establish a year-round fishery for stocked trout in the Dundee tailrace and bypass, or in the event of dam removal, any suitable free flowing reaches.
   a) Management is contingent upon availability of adequate public access
   b) Stock legal-size trout, which may include brook trout and brown trout.
   c) Promulgate supporting regulations.
   d) Establish suitable year-round minimum flows at Dundee Dam.
   e) Improve MDIFW access for stocking.

7) Manage Pleasant River for diadromous species and wild trout. Enhance recreational trout angling opportunities.
   a) Augment natural recruitment of wild trout by stocking legal-size trout to meet angler use and provide season-long (spring-fall) trout angling opportunities.
   b) Continue to manage the reach between Route 302 and River Road as “catch-and-release”.

8) Manage Little Sebago Lake for existing resident species and American eel, maintain existing put-grow-take recreational fishery for brown trout , provide a quality recreational fishery for smallmouth bass and largemouth bass, and provide a recreational fishery for chain pickerel, yellow perch, white perch, and brown bullheads.
   a) Maintain existing annual stocking program, utilizing fall yearling brown trout to provide a put, grow, and take fishery consistent with habitat capabilities.

Reach 7. Dundee Dam to North Gorham Dam

1) Manage Reach 7 as a migratory pathway for American eel, Atlantic salmon (smolts and adults), and possibly American shad.
   a) For American eel, upstream passage facilities at Dundee Dam will be operational within two years of licensing and downstream passage measures[3] will be operational within 30 days of licensing.
   b) For anadromous species, upstream and downstream passage facilities at Dundee Dam[4] will be completed two years after 4,020 American shad or 24,460 blueback herring are passed in any single season at the passage facility at Gambo. This number represents 20% of the estimated production of these species for the reach from Gambo Dam to Dundee Dam. The upstream facility ultimately should be capable of passing a maximum of approximately 20,000 American shad and 122,000 blueback herring.
   c) Agencies will continue to consult with MDOT on fish passage through culverts.

2) Manage Reach 7 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 7 is estimated to be 20,000 American shad; 122,000 blueback herring; and 6 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.
   b) Monitor juvenile or adult abundances of selected species as funding is available.
   c) Seek year-round bypass flows of at least 57cfs at Dundee Dam.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for American eel and possibly ASMFC's Interstate Fisheries Management Plan American shad and river herring.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.

4) Promote existing and potential commercial fisheries for American eel.

5) Promote existing and potential recreational angling opportunities for smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, black crappie, adult Atlantic salmon, and possibly American shad.

6) Establish a year-round fishery for stocked trout in the North Gorham tailrace and bypass, or in the event of dam removal, any suitable free flowing reaches.
   a) Stock legal-size trout, which may include brook trout and brown trout.
   b) Promulgate supporting regulations.
   c) Maintain suitable year-round minimum flows at North Gorham Dam.

Reach 8. North Gorham Dam to Eel Weir Dam, including canal and bypass

1) Manage Reach 8 (bypass) as a migratory pathway for American eel and Atlantic salmon (smolts and adults).
   a) Request upstream and downstream passage for American eel and Atlantic salmon using reopener clause in license.

2) Manage Reach 8 for sustained production of resident and diadromous species consistent with habitat capabilities. Annual production of diadromous species in Reach 8 is estimated to be 2,178 Atlantic salmon smolts; and 53 adult Atlantic salmon.
   a) Identify and map habitat (e.g. spawning, nursery) for selected species as funding is available.
   b) Monitor juvenile or adult abundances of selected species as funding is available.
   c) Seek year-round bypass flows at North Gorham Dam.

3) Manage species in accordance with the Atlantic States Marine Fisheries Commission's Interstate Fisheries Management Plan for American eel.
   a) Implement all regulations, assessment, and reporting requirements found in ASMFC management plans.

4) Promote existing and potential commercial fisheries for American eel.

5) Promote existing and potential recreational angling opportunities for smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads, black crappie, and Atlantic salmon.

6) Continue to intensively manage the popular Eel Weir bypass reach for brook trout and landlocked salmon to provide a quality, year-round, high use recreational fishery for trout and salmon.
   a) Continued management is contingent upon availability of adequate public access. Stock legal-size landlocked salmon and brook trout of various sizes.
   b) Other species of trout may also be stocked, when available.
   c) Establish suitable year-round minimum flows at Eel Weir Dam.

Reach 9. Sebago Lake

1) Manage as a migratory pathway for American eel.
   a) For American eel, upstream passage facilities at Eel Weir Dam will be operational within two years of licensing and downstream passage measures will be operational within 30 days of licensing.

2) Manage for sustained production of resident species and American eel consistent with habitat capabilities.

3) Manage in accordance with the Atlantic States Marine Fisheries Commission's Interstate Fisheries Management Plan for American eel.
   a) Implement all regulations, assessment, and reporting requirements found in the ASMFC management plan.

4) Promote existing and potential commercial fisheries for American eel.

5) Provide a quality recreational fishery for an indigenous population of landlocked salmon and an introduced population of lake trout. Landlocked salmon are stocked annually to augment natural recruitment from the Crooked and Northwest rivers. The lake trout fishery is sustained entirely through recruitment from natural reproduction. The lake boasts a reputation for its world-class fishery, which is characterized by high angler use. The quality and condition of this fishery is critically dependant upon a healthy rainbow smelt forage base.
   a) Stock spring yearling landlocked salmon at a rate and frequency dictated by the availability and abundance of rainbow smelt.
   b) Implement measures to restore the rainbow smelt population.
   c) Promulgate supporting regulations.

6) Provide a quality warmwater fishery for smallmouth and largemouth bass, as well as secondary fisheries for cusk, white perch, lake whitefish, chain pickerel, brown bullhead, and black crappie.

Identification of Issues and Recommendations

The MDIFW is concerned that proposed stocking, possible natural reproduction, and/or sport fishery prohibition for sea-run Atlantic salmon may adversely impact current or proposed resident coldwater fishery management programs. Angling regulations for Atlantic salmon could unnecessarily impact popular, well-established resident fisheries by complicating species identification or forcing closure of certain stretches of the mainstem Presumpscot River or tributaries to protect sea-run Atlantic salmon. MDIFW is also concerned that sea-run Atlantic salmon could compete with resident coldwater fisheries for limited forage and seasonal habitat, reducing the effectiveness of MDIFW stocking programs designed to enhance trout angling opportunities.

In addition, the MDIFW has identified Forest Lake as a potential site of an alewife-coldwater fishery interaction concern, however, MDIFW does not object to the introduction of alewives into Forest Lake. A lack of suitable public boating access to the lake currently precludes MDIFW from stocking and managing for cold water sportfish. A coldwater fishery program could be initiated once public boating access is provided to the lake. If a program is initiated, MDIFW may request that MDMR reduce the alewife-stocking rate if it is determined that an abundance of sea-run alewives is adversely impacting resident sportfish forage populations.

The MASC is concerned about by-catch mortalities of sea-run Atlantic salmon in areas where MDIFW stocks large catchable-size salmonids. Potential negative interspecific interactions could occur where there are wild and/or stocked resident salmonids co-habiting with sea-run Atlantic salmon. The MASC is especially concerned with releases of non-endemic salmonids (e.g. brown trout and rainbow trout) as these species could negatively impact natural production of sea-run Atlantic salmon by competing for prey items and living space. Additionally, larger non-endemic salmonids could prey upon juvenile sea-run Atlantic salmon reducing populations of sea-run Atlantic salmon and compromising long-term survival to the smolt life stage.

The three agencies also considered potential impacts of non-native or undesirable species, such as gizzard shad and lampreys, if access is provided to upstream reaches of the Presumpscot River. The level of concern associated with this issue does not preclude the attainment of management goals identified in this document. The potential for negative interactions between resident fish and some non-native or undesirable species could occur in the following areas within the Presumpscot River drainage: Highland Lake, Forest Lake, Gambo impoundment, Dundee impoundment, North Gorham Pond, and Sebago Lake. Except for Sebago Lake, North Gorham Pond, and Dundee Pond, MDIFW concerns in the aforementioned areas can be addressed by adopting reasonable safeguards to minimize the opportunity for the introduction of undesirable species when addressing passage needs for migratory species identified in this document. MDIFW does not support upstream passage into Sebago Lake (except for American eels), and has additional concerns regarding passage into North Gorham and Dundee ponds.

Notwithstanding the aforementioned management concerns, there is agreement between the MDIFW, the MASC, and the MDMR that management issues will be resolved for the mutual benefit of all programs. The agencies agree to meet at least annually to review progress and foster continued interagency cooperation.

Table 1. Location and description of dams on the Presumpscot River.

Dam	Miles from Casco Bay	Description
Eel Weir Dam	26.0	FERC Project No 2984
North Gorham Dam	23.65	FERC Project No 2519
Dundee Dam	21.87	FERC Project No 2942
Gambo Dam	18.63	FERC Project No 2931
Little Falls Dam	16.92	FERC Project No 2941
Mallison Falls Dam	16.37	FERC Project No 2932
Saccarappa Dam	10.8	FERC Project No 2897
Cumberland Mills Dam	9.6	Non-jurisdictional (non-hydropower)
Smelt Hill Dam	2.5	Inactive project at head-of-tide

Table 2. Order-of-magnitude estimates of fish production by river reach, which includes production in tributaries and lakes/ponds.

Reach	Shad 98.9/acre	Blueback herring 600/acre	Alewife 235/acre	Salmon smolts	Salmon Adults[a]
8. North Gorham to Eel Weir				2,178	53 (5)
7. Dundee to North Gorham	20,000	122,000			(6)
6. Gambo to Dundee	20,100	122,300		3,078	75 (14)
5. Little Falls to Gambo	3,100	19,000			(15)
4. Mallison Falls to Little Falls	1,100	6,600			(17)
3. Saccarappa to Mallison Falls	13,700	83,500		8,283	202 (39)
2. Cumberland Mills to Saccarappa	3,100	18,800			(42)
1. Smelt Hill to Cumberland Mills	12,800	78,000	147,700[b]	2,310	56 (52)

[a] These numbers represent the spawning requirement, that is, the number of returning adult salmon needed to maintain the run; the number in parentheses is an estimate of the sport catch of salmon.

[b] If alewives are able to reach Knight's Pond and Forest Lake, the total run size might approach 200,000 adult spawners.