Diadromous Fish
+ Dams

Report to the Joint Standing Committee on Marine Resources and the Joint Standing Committee on Natural Resources

in response to Resolve Chapter 109 (LD 1528, LR 1911)

Prepared by the Departments of Marine Resources & Environmental Protection

January 30, 2008

Resolve Chapter 109 (LD 1528, LR 1911) required the Department of Inland Fisheries and Wildlife (DIFW), the Department of Marine Resources (DMR), and the Department of Environmental Protection (DEP) to :

- review and update their plans for passage of native diadromous fish;
- develop a proposed water quality standard that defines a fish kill; and
- evaluate the processing of petitions filed with the Board of Environmental Protection (BEP) to reopen hydropower licenses.

This report presents the findings and recommendations of this work for the first two matters to the Joint Standing Committees on Marine Resources and Natural Resources. The BEP is presenting its report on the petition process under separate cover.

Recommendations

- Implement the identified priority projects for fish passage (DMR)
- Maintain the current water quality standard for protection of aquatic life (DEP)

Section 1. DMR review of statewide fish passage efforts

Maine's waters are home to 12 species of native diadromous[1] fishes, each of which has specific habitat requirements. The historical ranges of commercially harvested species were fairly well documented by Maine's first Commissioners of Fisheries. Shortnose sturgeon and Atlantic sturgeon spawned only in the Kennebec and Penobscot rivers. Populations of Atlantic tomcod, rainbow smelt, and striped bass were more widely distributed along the coast, but generally did not migrate above the head-of-tide. Most watersheds had runs of alewife, American eel, American shad, Atlantic salmon, and blueback herring, and in large rivers these fish traveled almost 100 miles from the ocean. Sea lamprey and sea-run brook trout were not harvested commercially, and their historic ranges were not described. By the time the Commissioners of Fisheries were appointed in 1867 most runs of diadromous fishes were greatly reduced or extirpated. The historical abundance of these fishes will never be known with certainty, but larger watersheds generally produced larger runs of fishes.

According to the DEP there are 146 hydropower projects encompassing 179 dams on Maine's waters[2]. One hundred and three projects (136 dams) are Federal Energy Regulatory Commission (FERC) approved projects that operate under a license or an exemption, 20 are inactive projects of which five have been removed, and 23 are FERC nonjurisdictional projects (Appendix 1). Not all hydropower dams are within the known or assumed historical ranges of Maine's diadromous fishes. Only two hydropower dams are within the historic range of shortnose sturgeon, Atlantic sturgeon, Atlantic tomcod, rainbow smelt, and striped bass. Approximately 45% of the hydropower dams (81) are within the historic range of alewife,

[1] Diadromous is a collective term for anadromous and catadromous fishes, species that migrate between the sea and fresh water. Anadromous fishes like the alewife spawn in freshwater, but spend most of their life in the sea. Catadromous fishes like American eel spawn in the sea, but spend most of their life in fresh water, brackish water, or coastal water.

[2] Department of Environmental Protection. 2007. Hydropower projects in Maine January 1, 2007.

American shad, and blueback herring; 53% (95) are within the historic range of Atlantic salmon, and 65% (116) are with the historic range of American eel.

Maine's waters also contain more than 662 nonhydropower dams and many thousands of culverts that can impact diadromous fishes. DMR has identified the nonhydropower dams that impact diadromous fishes in some watersheds (e.g., Kennebec River), but has not done this on a statewide basis. DMR typically partners with federal agencies, conservation groups, and municipalities to provide passage at nonhydropower dams. The location of culverts in the State's waters and the number that impact diadromous fishes currently is unknown. However, the USFWS has initiated a pilot project to map and assess culverts in the Penobscot River drainage, and DMR received a grant in 2007 to assess threats, including nonhydropower dams and culverts, to rainbow smelt populations along Maine's coast.

In the 1970s when water quality in large rivers was very poor, DMR attempted to enhance or restore populations of anadromous fish by constructing fishways at 18 dams in coastal watersheds (Table 1). DIFW and the Atlantic Salmon Commission installed fishways at eight additional dams, and 15 fishways were either privately constructed or the owner is unknown (Table 1). DMR staff conducts numerous site visits each year to inspect and clean the fishways, and in the past five years has collaborated with U.S. Fish and Wildlife Service (USFWS) and the Department of Transportation (DOT) to begin major repairs to several of them. The effectiveness of these fishways, which primarily pass alewives, has not been tested.

DMR began focusing on fish passage and anadromous fish restoration in large watersheds in the 1980s when water quality had significantly improved, and the licenses of a cohort of hydropower projects began to expire. One of the first fishways to be constructed as part of a relicensing was at the Brunswick Project on the Androscoggin River, completed in the spring of 1983. During the consultation process the Licensee and resource agencies identify the species that will be impacted by the hydropower project or develop study plans to identify the species. The licensee proposes actions to reduce or eliminate impacts, and the resource agencies provide comments on these actions. FERC ultimately determines which actions will be required in the license, although it must include conditions set on projects through Section 401 of the Clean Water Act and Department of the Interior fishway prescriptions. Prior to 1995, Maine and other east coast states did not request passage for American eel during the licensing process.

The federal licensing process provides the best opportunity for state agencies to obtain fish passage, but the licenses for hydropower projects in a watershed usually expire randomly over an extended period of time. State and federal agencies can be placed in the situation of recommending fish passage at upriver projects when passage is not available at downstream projects, as was the case with Edwards Dam in the 1980s. The relicensing process often leads to comprehensive settlement agreements that encompass multiple projects, provide for sequential fish passage, eliminate the need for extensive litigation, and sometimes provide funding for restoration programs. State fisheries agencies expend considerable time and effort in the development of these agreements. Obtaining passage at hydropower projects within historic diadromous fish habitat remains a priority for DMR, because these dams are located on the mainstems of large rivers and impact the greatest number of diadromous fishes.

Table 1. Fishways at nonhydropower dams in Maine. Fishways that will be repaired under a cooperative agreement between USFWS and DMR are indicated by an asterisk.

Site name	Owner	River/Stream	Passage type
Jones Pond	DMR	Scarborough Marsh	Alaskan steeppass
Highland Lake	DMR	Presumpscot River	Denil
Elm Street	DMR	Royal River	Denil
Bridge Street	DMR	Royal River	Denil
Philips Lake	DMR	Orland River	Alaskan steeppass
West Bay Pond	DMR	West Bay Pond	Denil
Flanders Stream*	DMR	Flanders Stream	Denil
West Harbor Pond	DMR	West Harbor Pond	Alaskan steeppass
Bristol	DMR	Pemaquid River	Denil
Blackman Stream 1	DMR	Penobscot River	Vertical slot
Blackman Stream 2	DMR	Penobscot River	Denil
Pitcher Pond	DMR	Ducktrap River	Denil
Pleasant River Lake	DMR/DIFW	Pleasant River	Alaskan steeppass
Pleasant River	DMR	Pleasant River	Denil
Gardner Lake	DMR	East Machias River	Denil
Cathance Lake	DMR	Cathance Stream	Alaskan steeppass
Meddybemps Lake 1*	DMR	Dennys River	Alaskan steeppass
Boyden Lake	DMR	Boyden Stream	Denil
Great Works	DIFW	Cathance Stream	Alaskan steeppass
Coopers Mills	DIFW	Sheepscot River	Denil
Pennamaquan Upper*	DIFW	Pennamaquan River	Denil
Pennamaquan Middle*	DIFW	Pennamaquan River	Denil
Pennamaquan Lower*	DIFW	Pennamaquan River	Denil
Bog Brook Flowage	DIFW	Narraguagus	Alaskan steeppass
Cathance Stream	ASC	Cathance Stream	Denil
Meddybemps Lake 2	ASC	Dennys River	Denil
Walker Pond	Unknown	Bagaduce River	Cement sluice
Dedham Falls	Unknown	Orland River	Denil
Wight Pond	Unknown	Bagaduce River	Breached dam
Long Pond Stream 1	Unknown	Long Pond Stream	Pool
Long Pond Outlet	Unknown	Long Pond Stream	Pool&Weir
Long Pond Stream 2	Unknown	Long Pond Stream	Denil
Long Pond Stream 3	Unknown	Long Pond Stream	Rock Pool
Stetson Pond	Stetson	Stetson Stream	Alaskan steeppass
Orland Dam	Champion Paper	Orland River	Alaskan steeppass
Alamoosook Lake	Champion Paper	Orland River	Denil
Toddy Pond	Champion Paper	Orland River	Pool&Weir
Dyer Long Pond	Saltonstal	Sheepscot River	Denil
Winnegance Lake	DOT/Bath	Kennebec River	Denil
Center Pond	Phippsburg	Kennebec River	Denil
Nequasset Lake	Bath Water Co	Kennebec River	Pool & chute

DMR has made significant progress in providing fish passage for diadromous fishes throughout the State. Since 1980, upstream and downstream fish passage has been provided or is a license requirement at 54 hydropower dams, which impacts access to more than 1000 miles of habitat. When fully restored this amount of accessible habitat should produce millions of adult fish. In addition, DMR maintains fish passage at 18 nonhydropower dams along the coast, provided fish passage in the Kennebec watershed at five nonhydropower dams and is working on a sixth site, and has partnered with various groups to provide passage at two nonhydropower dams in the Penobscot watershed. DMR staff also consults with DOT on all road projects that may impact diadromous fish passage.

Just four hydropower projects will undergo relicensing in the next 10 years, thus freeing staff to revisit fish passage at licensed projects where problems are known to exist. Because passage will be pursued outside of the licensing process, termed "reopening" the license, DMR will have to compile site-specific evidence that passage or passage improvements are needed. Ideally the hydropower owner would agree to voluntarily comply with a request from DMR for improved fish passage. In the event that the hydropower owner refuses to provide fish passage, further legal action available to DMR depends on the articles in the federal license. Projects with fish passage issues need to be prioritized, because reopening a license places the burden of proof on the resource agencies, the outcome is not certain, and extensive litigation may be required.

DMR's priorities in the upcoming five years are to:

1. implement the Kennebec River settlement agreements;
2. obtain passage at Pioneer and Waverly (Kennebec watershed);
3. obtain passage at Webber Pond (Kennebec watershed);
4. implement the Penobscot River settlement agreement;
5. implement the Saco River settlement agreement;
6. implement the Union management plan;
7. obtain passage at Cumberland Mills on the Presumpscot River;
8. reopen passage on the St Croix River to alewife;
9. comment on proposed tidal projects;
10. provide technical assistance for Damariscotta fishway repair;
11. document the need for improved fish passage at the Brunswick Project and meet with the Project owner to discuss voluntary improvements; there is a standard license article that reserves FERC's authority to reopen a license for the conservation and development of fish resources.
12. document the need for eel passage at the North Gorham Project and meet with the Project owner to discuss voluntary provision of passage; there is a license article that reserves the authority of the Secretary of the Interior to prescribe fishways.
13. document the need for eel passage at the Messalonskee projects and meet with the Project owners to discuss voluntary provision of passage; there is a license article that reserves the authority of the Secretary of the Interior to prescribe fishways.

No implementing legislation is required. The Federal Power Act governs the relicensing of hydropower projects, and the courts have held that the Federal Power Act pre-empts most State regulations of hydropower projects. One of the few exceptions is the authority of the State to set conditions on projects through Section 401 of the Clean Water Act. In the future, it will be DMR policy to request a State reopener clause at all projects within the historic range of diadromous fishes. At nonhydropower dams, State law, 12 MRSA §6121 and §7701, gives the Commissioners of DMR and DIFW, respectively, the authority to require fish passage for anadromous or migratory fish.

Major impediments to further improving fish passage for diadromous fishes are DMR's small staff (7 full-time people prior to merging of Stock Assessment Division with the Atlantic Salmon Commission), the cost of fishways, and the lack of funding. There are many sources of federal funding for fishways, but most require 50:50 nonfederal match.

Rivers with Hydropower Projects

Piscataqua River: low restoration priority

Four FERC licensed hydropower projects (6 dams), four FERC exempt projects, and one FERC nonjurisdictional project are located within assumed diadromous fish habitat (Fig. 1). A large tidal project has been proposed for the lower Piscataqua River at Portsmouth. Alewife, shad, and blueback herring historically may have stopped at the steep gradient between Lower Great Falls and Mast Point dams, and salmon and eels may not have passed the gradient above North Rochester. A Denil fishway, eel ramp, and downstream bypass at the South Berwick dam pass alewife and American eel. Effectiveness studies are being conducted by the owner.

This is a low priority river because it is a small watershed with limited habitat that is obstructed by a large number of dams, and there is no funding for restoration. The next five dams that require passage (Rollinsford, Lower Great Falls, and Somersworth projects) are licensed until 2021-2022.

Mousam River: low restoration priority

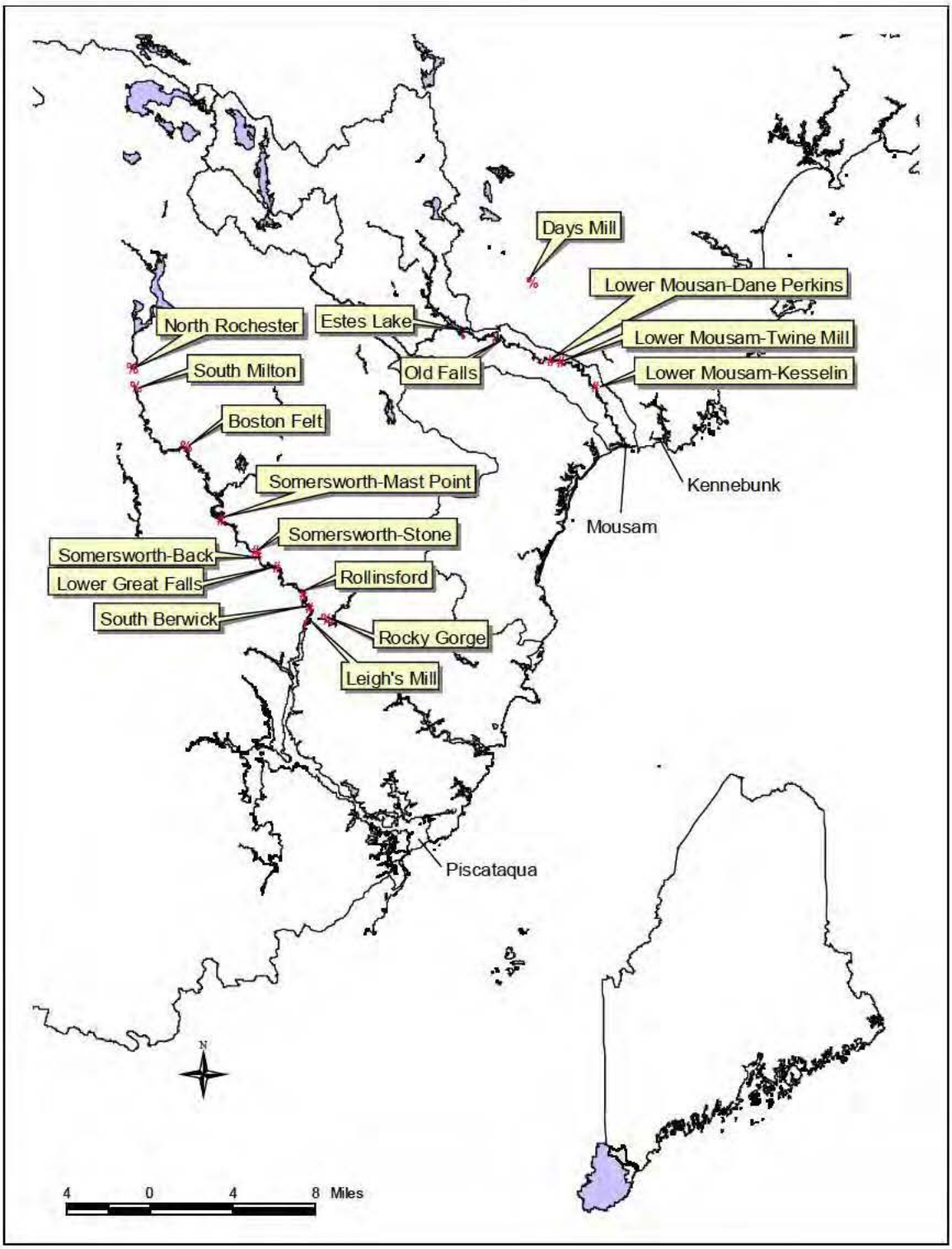
One FERC licensed hydropower project (3 dams) and two FERC nonjurisdictional projects are located on the mainstem of the Mousam River (Fig. 1). Historically, the Mousam was primarily an Atlantic salmon river, although alewife and American shad were also present. The historic upstream limits of these species is not known.

This is a low priority river, because it is a very small watershed with limited habitat that is obstructed by a large number of dams, and there is no funding for restoration. There is no fish passage at the Lower Mousam Project, which is licensed until 2022.

Kennebunk River: low restoration priority

One FERC exempt hydropower project (Days Mill) is located on the mainstem (Fig. 1). It does not have any upstream or downstream fish passage. There is no readily available information on the diadromous species that historically inhabited the river and their distribution within the watershed. This is a low priority river because it is a very small watershed, there is no funding for restoration, and the single hydropower dam may be located beyond the historical range of diadromous fishes.

Figure 1. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the Piscataqua River, Mousam River, and Kennebunk River (1:450,000 scale).



Saco River: high restoration priority: High

Six FERC licensed hydropower projects (9 dams, 3 without turbines) and one FERC exempt project are located on the mainstem. In addition, one FERC licensed project (2 dams) and one FERC exempt project are located on tributaries (Fig. 2)

A multi-species fisheries management plan for the Saco River was adopted in 1982. The plan calls for the restoration of alewife, American shad, and blueback herring to the Bonny Eagle impoundment, and restoration of American eel and Atlantic salmon to the Swans Falls impoundment.

A 1994 settlement agreement provided a schedule for anadromous fish passage at the five lowermost dams (Cataract and Skelton projects). Alewife, Atlantic salmon, and blueback herring pass these dams, but American shad do not use the fishlocks at the Spring Island and Bradbury dams. Shad are currently trapped at the East Channel Dam, transported a short distance, and released in the Spring Island and Bradbury impoundment. Alewife, shad, and blueback herring that use the Skelton fish lift are passed upstream, and Atlantic salmon are trucked to upriver spawning habitat.

A 2007 settlement agreement provides a schedule for fish passage at the remaining dams owned by FPL Energy (Table 2), a schedule for effectiveness testing, a schedule for improvements at the Spring Island or Bradbury dam so American shad can pass, funding for raising salmon smolts and fry, funding for resident fish assessment in impoundments, and funding for outreach and management.

Table 2.

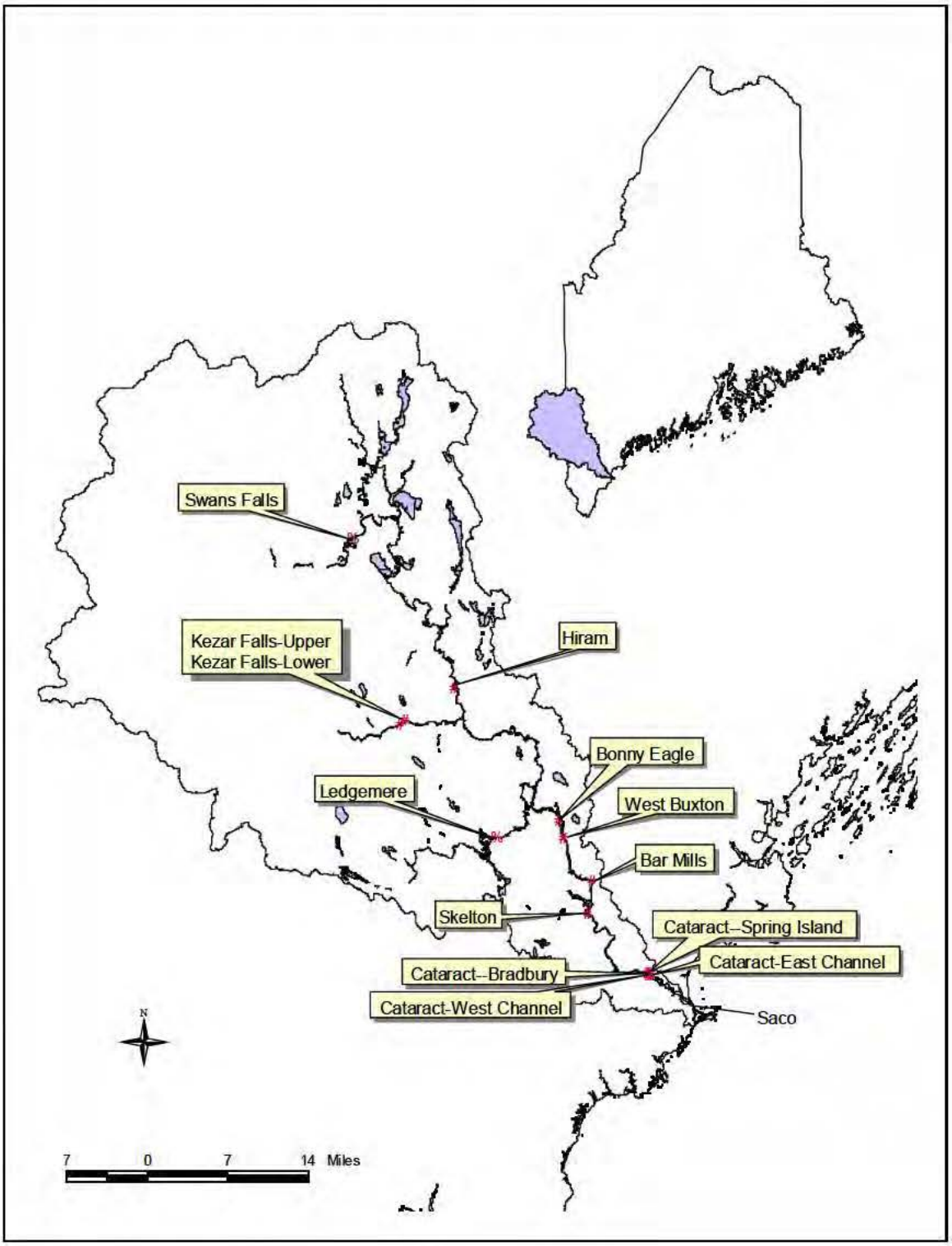
Project – Dam	Upstream eel	Downstream eel	Upstream anadromous
Cataract - East Channel, West Channel	6/1/2008	9/1/2011	fishlift, Denil
Cataract - Springs Island, Bradbury	6/1/2010*	no turbines	fishlocks
Skelton	6/1/2012	9/1/2024	fishlift
Bar Mills	6/1/2014	9/1/2026	5/1/2016
West Buxton	6/1/2016	9/1/2028	5/1/2019
Bonny Eagle	6/1/2018	9/1/2030	5/1/2022
Hiram	6/1/2020	9/1/2032	5/1/2025

*upstream eel passage at either Springs or Bradbury

Implementation of the 2007 settlement agreement for the Saco River, the fourth largest watershed in the state, is a high priority for state and federal fisheries agencies. There are no impediments to implementation, which will require consultation on study plans, review of study results, development of an annual report, and planning of restoration activities during an annual meeting. Pursuant to the settlement, FPL Energy initiated downstream effectiveness studies for alewife and shad at the Cataract Project in 2007.

The state and federal resource agencies and FPL Energy produce an annual report on fisheries activities in the watershed.

Figure 2. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the Saco River (1:800,000 scale).



Presumpscot River: high restoration priority

One FERC inactive project (Cumberland Mills) and seven FERC licensed projects are located on the mainstem (Fig. 3). In 2003 a coalition of state and federal resource agencies and conservation groups removed an eighth hydropower project (Smelt Hill) that was rendered inoperable by a flood in 1996. The Eel Weir Project currently is undergoing relicensing. The North Gorham Project, which does not have fish passage, is licensed until 2034.

With one exception the Saccarappa, Mallison Falls, Little Falls, Gambo, and Dundee projects have operational upstream and downstream eel passage, and the licenses contain schedules or triggers for the installation of anadromous fish passage in two phases (Table 3). At the end of Phase 1 the resource agencies will assess the progress of anadromous fish restoration, and determine if Phase 2 should be initiated. Downstream eel effectiveness studies were stopped after one year, because the agencies prefer a study that includes Eel Weir, which is not yet licensed. Upstream eel effectiveness studies were conducted in 2007.

Table 3.

Project – Dam	Upstream eel	Downstream eel**	Upstream and downstream anadromous
Phase 1			
Saccarappa	2 ramps	shutdowns	2 years after passage at Cumberland Mills
Mallison Falls	ramp	shutdowns	2 years after trigger number passed at Saccarappa
Little Falls	delayed*	shutdowns	2 years after trigger number passed at Saccarappa
Gambo	ramp	shutdowns	NA
Dundee	lift	shutdowns	NA
Phase 2			
Gambo	ramp	shutdowns	2 years after trigger number passed at Little Falls
Dundee	ramp	shutdowns	2 years after trigger number passed at Little Falls
Saccarappa	ramp	shutdowns	increase capacity of upstream passage
Mallison Falls	ramp	shutdowns	increase capacity of upstream passage
Little Falls	lift	shutdowns	increase capacity of upstream passage

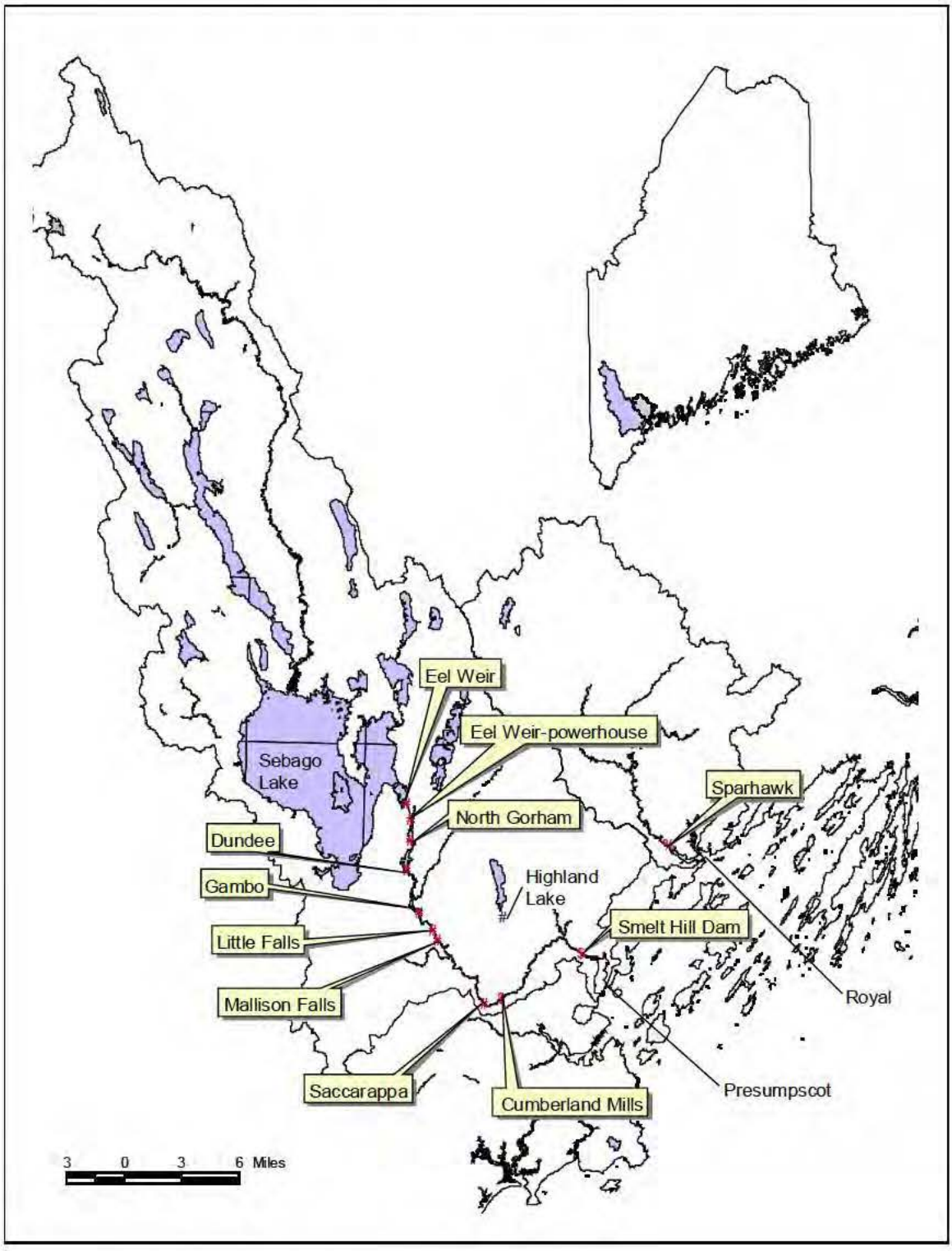
* Upstream eel passage at Little Falls has been delayed, because few eels have been seen at the dam.
** No generation (shutdowns) for 8 hours each night for eight weeks in the fall; eels exit over spillways.

A multi-species fisheries management plan was drafted by the state fisheries agencies in 2001. The plan calls for passage to enhance American eel from the head-of-tide to Sebago Lake and passage to restore alewife, American shad, blueback herring and Atlantic salmon to the Little Falls impoundment (phase 1) and possibly to the Dundee impoundment (phase 2).

Obtaining fish passage at Cumberland Mills is a high priority for DMR, because it would trigger upstream anadromous fish passage and enhance upstream eel passage. State and federal resource agencies and conservations groups have entered into a preliminary settlement agreement with the owner, S.D. Warren, to provide passage at Cumberland Mills, and a final agreement is expected within three months.

DMR owns and operates a fishway at Highland Lake dam (Fig. 3). The dam was damaged by high water in 1996, and passage was diminished after the Town of Westbrook reconstructed the dam. DMR has completed three projects to improve passage, and intermittently stocked the lake with alewives between 1987 and 2003. The stocking established a natural run, whose size is being assessed by DMR.

Figure 3. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in Presumpscot and Royal rivers (1:600,000 scale).



Royal River: low restoration priority

One FERC exempt hydropower project is located at the head-of-tide on the mainstem (Fig. 3). There is no readily available information on the species that historically inhabited this river or the extent of their upriver habitat, but there are currently small populations of alewife, American shad, and blueback herring that use the lowermost fishway, and American eel elvers are harvested at the mouth of the river. DMR owns and operates two Denil fishways in the lower river, one at the hydropower project and one at the next dam upriver. A steep gradient between the two dams appears to prevent the upstream passage of most anadromous fish. There is a downstream bypass channel at the hydropower project, but no upstream eel passage.

This is a low priority river, because it is a small watershed that may not have been extensively used by diadromous fish historically.

Androscoggin River: moderate restoration priority

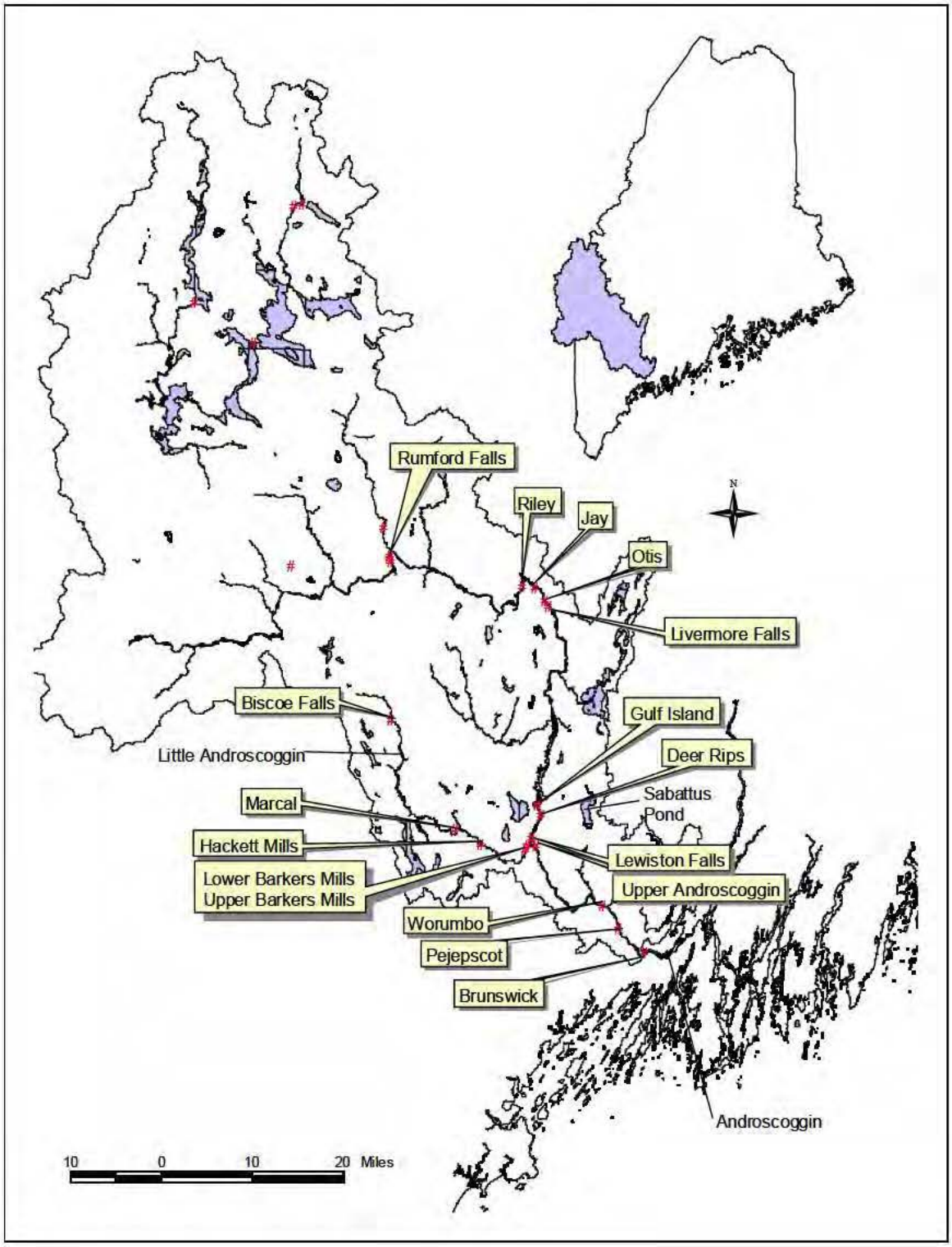
Eight FERC licensed projects (12 dams) are located on the mainstem between the head-of-tide and Rumford Falls, which is believed to be the historical upstream limit of American eel and Atlantic salmon (Fig. 4). The upstream limit for alewife, American shad, and blueback herring on the mainstem was Lewiston Falls. An additional five FERC licensed projects on the Little Androscoggin River are located within historic habitat of all five diadromous species. Upstream anadromous fish passage is available at the Brunswick (vertical slot fishway), Pejepscot (fishlift), and Worumbo (fishlift) projects. However, American shad do not use the vertical slot fishway at Brunswick for reasons that are not understood, and a requirement for effectiveness testing was not included in the license.

Providing fish passage on the Androscoggin, the third largest watershed, is a moderately high priority for DMR, but there are a number of significant impediments. The primary impediment is lack of passage for American shad and American eel at the Brunswick Project, the first dam on the river. Passage for American eel was not requested when the project was licensed, and the fishway as built was designed to pass American shad as well as the other target species. Because the Brunswick Project license does not expire until 2026, the license would have to be reopened to remedy the passage issues. Obtaining immediate fish passage on the mainstem projects above Worumbo and on the Little Androscoggin would also require reopening the existing licenses. Licenses for the mainstem dams expire between 2026-2048 and those on the Little Androscoggin expire between 2019-2037.

There are two impediments to alewife restoration in the Androscoggin River: nonhydropower dams without fishways that prevent adults from reaching spawning habitat and an anti-alewife sentiment that has prevented DMR from stocking alewives in historic habitat. In response to complaints from lake associations and property owners, DIFW has often refused to allow DMR to stock or continue stocking alewives in inland waters. For example, DMR stocked Sabbattus Pond from 1983-1985 to establish a run, was refused permission to stock from 1986-1997, and subsequently regained permission to stock the pond in 1998. DMR has not pursued fish passage at nonhydropower dams in the watershed because of the general lack of public support.

DMR produces an annual report on fisheries activities in the watershed.

Figure 4. Location of FERC licensed (circle), FERC Exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the Androscoggin River (1:1,000,000 scale).



Kennebec River: high restoration priority

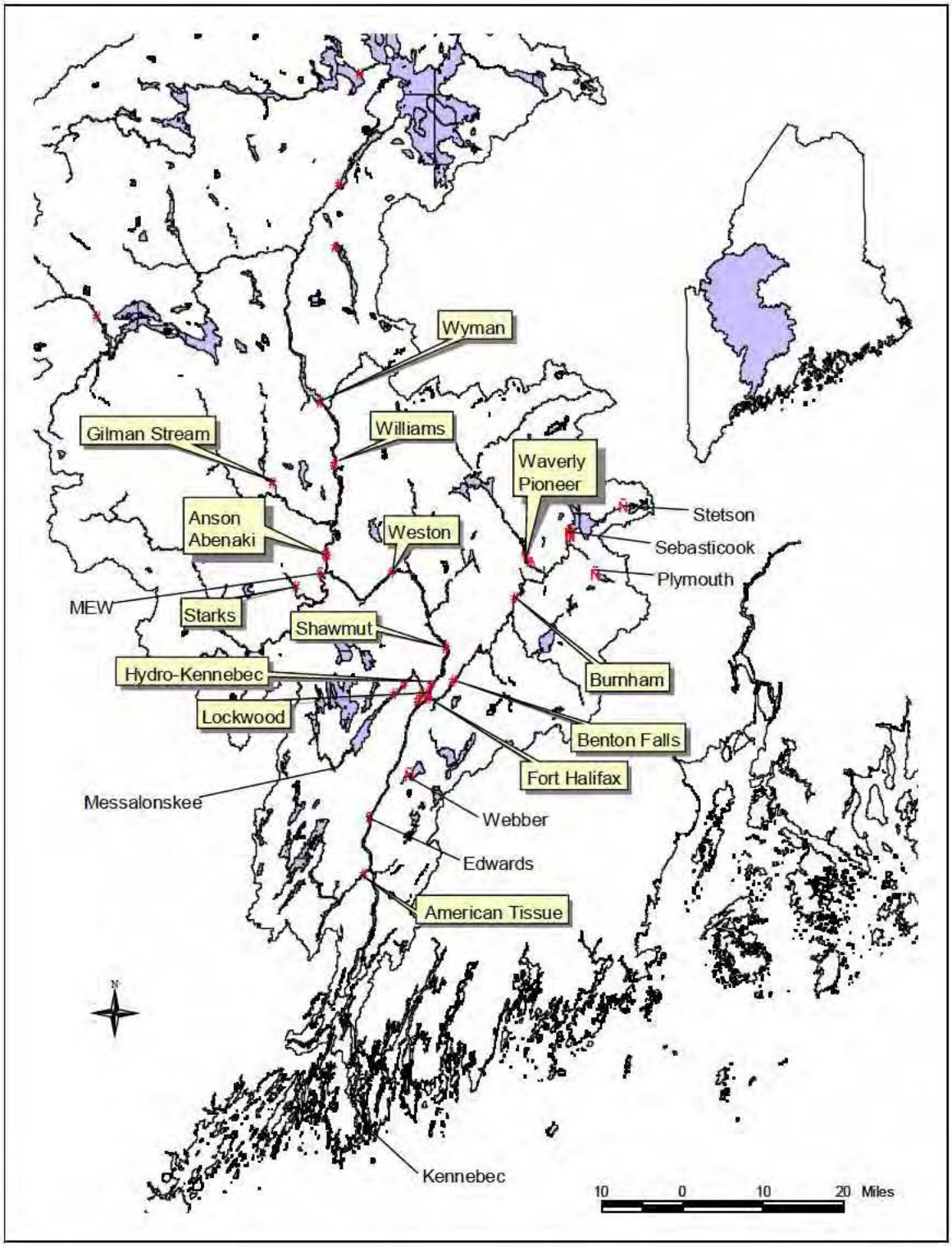
Ten FERC licensed hydropower projects (10 dams) in the Kennebec River watershed are within the historical range of alewife, American shad, and blueback herring (clupeids); 17 projects (17 dams) are within the historic range of Atlantic salmon; and 20 projects (23 dams) are within the historical range of American eel (Table 4; Fig. 5). Two dams in the watershed, Edwards and Madison Electric Works (MEW), have been removed. A large tidal project recently was proposed for the outlet of Merrymeeting Bay. A multi-species management plan for the Kennebec watershed was adopted in 1993.

Table 4.

	Clupeid	Salmon	Eel	Anadromous passage		Eel passage	
Project (dam)	range	range	range	upstream	downstream	upstream	downstream
Edwards	yes	yes	yes	removed	removed	removed	removed
Lockwood	yes	yes	yes	fishlift	racks/bypass	ramp	racks/bypass
Hydro-Kennebec	yes	yes	yes	trigger	curtain/bypass	ramp	curtain/bypass
Shawmut	yes	yes	yes	trigger	racks/gate	ramp	racks/gate
Weston	yes	yes	yes	trigger	racks/gate	ramp	racks/gate
Abenaki		yes	yes	trigger	trigger		screen/bypass
Anson		yes	yes	trigger	trigger	ramp	screen/bypass
Williams		yes	yes				
Wyman		yes	yes				
Gilman Stream		yes	yes				
MEW	yes	yes	yes	removed	removed	removed	removed
Starks	yes	yes	yes				
Fort Halifax	yes	yes	yes	pump	racks/bypass	ramp	racks/bypass
Benton Falls	yes	yes	yes	fishlift	racks/bypass	ramp	screen/bypass
Burnham	yes	yes	yes	fishlift	screen/bypass	ramp	screen/bypass
Pioneer	yes	yes	yes				
Waverly Avenue	yes	yes	yes				
Automatic			yes				
Messalonskee							
(Union Gas)			yes				
(Rice Rips)			yes				
(Oakland)			yes				
(Messalonskee L)			yes				
American Tissue	yes		yes		notch/pool	ramp	screen/gate

DMR has signed three settlement agreements to implement fish passage in the Kennebec River watershed, and the provisions of the agreements have been incorporated into the 401 Water Quality Certification and the federal license of each project. A 1986 settlement agreement between DMR and the Kennebec Hydro-Developers Group (KHDG, owners of the Lockwood, Hydro-Kennebec, Shawmut, Weston, Ft. Halifax, Benton Falls, and Burnham projects) provided funds to restore alewife and American shad above Edwards Dam in exchange for delays in fish passage at the seven projects. A 1998 settlement between KHDG, state and federal resource agencies, and conservation groups provided for the removal of Edwards Dam, a schedule or triggers for installation of fish passage at the seven KHDG projects, and additional funds for restoration. A settlement between Madison Paper Company, state and federal agencies, and conservation groups provided for passage at the Anson and Abenaki projects and funding for salmon stocking.

Figure 5. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the Kennebec River (1:1,200,000 scale). Five dams on Messalonskee Stream are not labeled.



In addition to the two dams that have been removed, fish passage is available or is a license requirement at 10 projects (Table 4). American Tissue does not have fish passage requirements in its license, but the owners voluntarily installed downstream passage for eel and alewife and upstream passage for eel. Anadromous passage at Hydro-Kennebec, Shawmut, and Weston is triggered by the passage of specific numbers of American shad at downstream projects; anadromous passage at Anson and Abenaki is triggered by Atlantic salmon stocking in project waters. Following consultation with the fisheries agencies in the summer/fall 2007, FPL Energy made major changes to the attraction water intake pipe for the Lockwood Project fishlift to fix the problem of reduced attraction water.

Effectiveness testing of fish passage is in various stages (Table 5). Results of these studies are filed with FERC by the project owners, presented at the annual meeting, and summarized in the annual Kennebec River Restoration Project report. Study results are usually available in March for the preceding year.

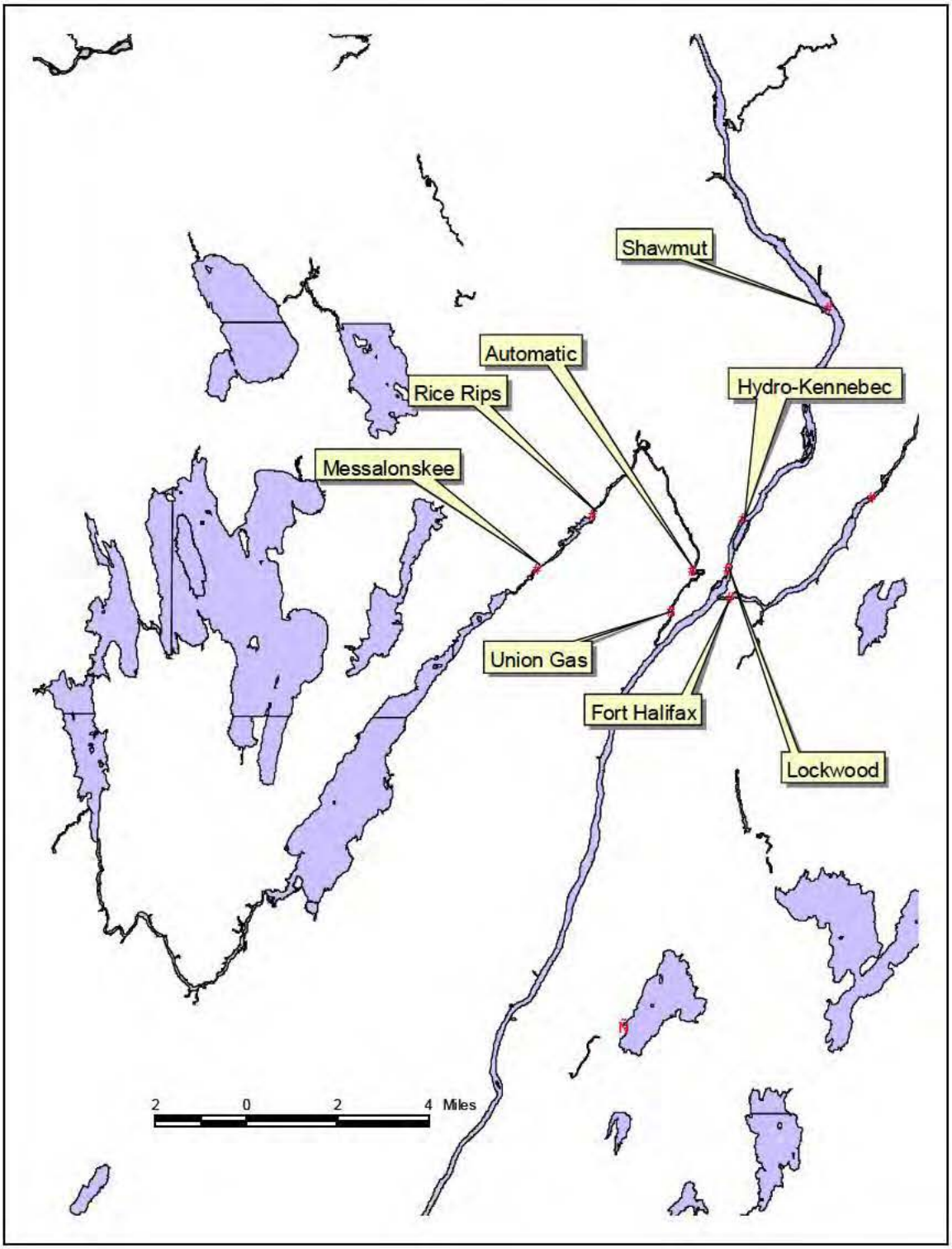
Table 5.

Project/dam	Upstream eel	Downstream eel	Upstream anadromous	Downstream anadromous
Lockwood	2008, 2009	2007 telemetry	2008	2007 telemetry
Hydro-Kennebec	completed	2007 video, sonar	after installation	2007 video, sonar
Shawmut	2006, 2007	2007 telemetry	after installation	after installation
Weston	2007, 2008	2008 telemetry	after installation	after installation
Abenaki		2007 PIT tag	after installation	after installation
Anson		2007 PIT tag	after installation	after installation
Fort Halifax	counts			
Benton Falls	counts	visual	2006-2008	completed
Burnham	2008	visual	2006-2008	2007 tag-recapture
American Tissue	not required	not required		not required

Between 1999 and 2003, DMR partnered with three towns (Newport, Plymouth, and Stetson) and numerous sponsors to install upstream anadromous fish passage at the Sebasticook Lake Dam ($392,000), Plymouth Pond Dam ($122,000), Pleasant Lake (Stetson) Dam ($57,000), and breach the Guilford Dam ($237,000). Passage at these nonhydropower dams triggered upstream anadromous passage at the Benton Falls Project and the Burnham Project. In the last two years, DMR has been working with the Webber Pond Association and other partners to provide passage at the Webber Pond Dam.

Fish passage on the Kennebec River is DMR's highest priority. DMR consulted with the KHDG on a number of effectiveness studies in 2007 and with FPL Energy and USFWS to improve passage for American shad at the newly constructed Lockwood fishlift. Obtaining fish passage at the Pioneer and Waverly dams is the next logical priority. The USFWS is developing fish passage prescriptions for these projects in consultation with DMR. Gilman Falls and Starks are FERC exempt projects, but impact little habitat. Licenses for the remaining projects do not begin to expire until 2017 (Williams in 2017, American Tissue in 2019, Wyman in 2036, Automatic in 2036, and Messalonskee in 2036). Reopening the licenses for the Automatic and Messalonskee would make a large amount of historic eel habitat accessible (Fig. 5b).

Figure 5b. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in Messalonskee Stream (1:235,000 scale).



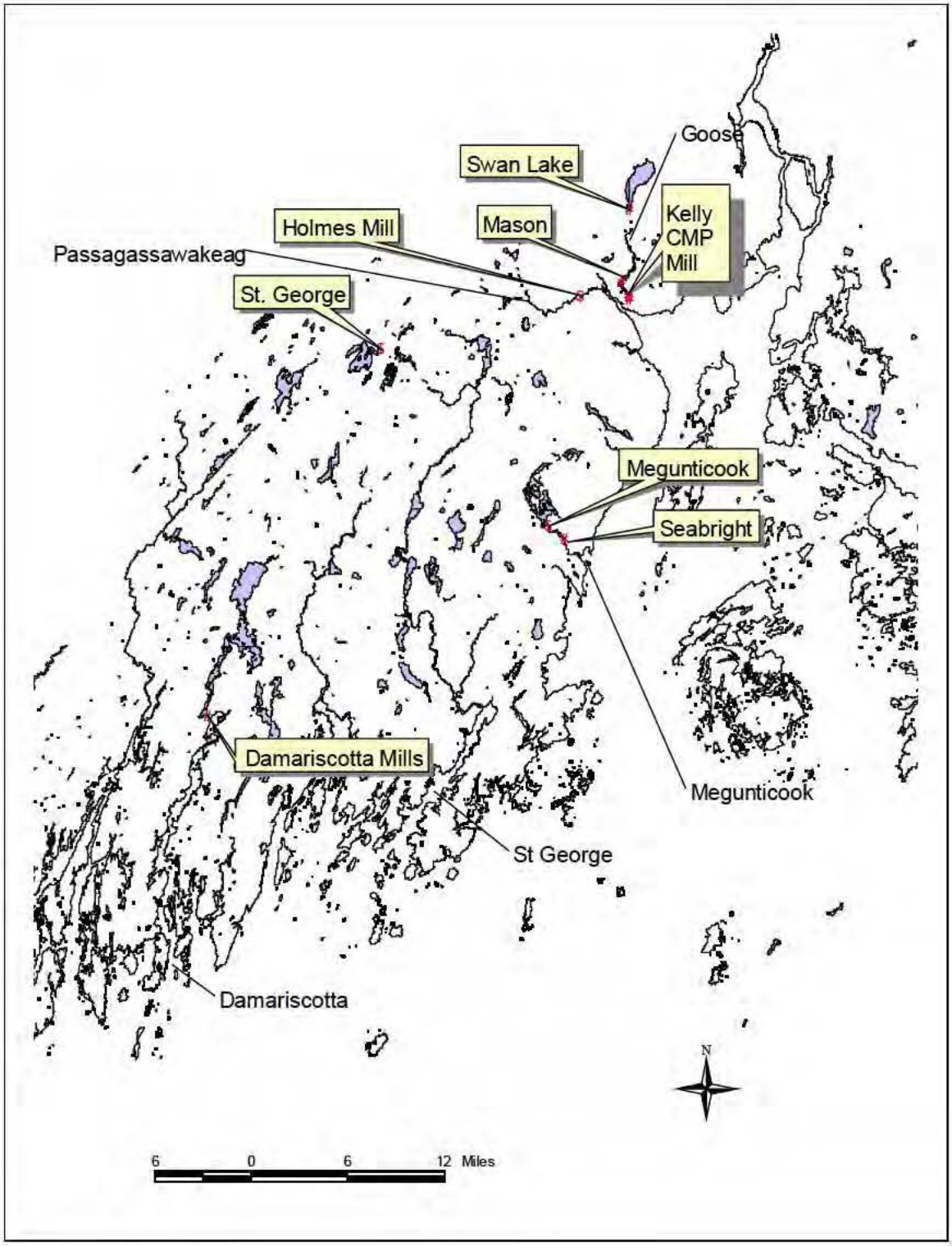
Damariscotta River: high restoration priority

One FERC licensed hydropower project is located at the head-of-tide on the Damariscotta River (Fig. 6). A 200-year old pool-type fishway provides upstream passage for alewife and American eel. The project ceases generation from July 1-November 30, and the fishway serves as a downstream passage for both species. The Towns of Nobleboro and Newcastle are repairing the fishway, and DMR and USFWS staff are providing technical assistance. This project is a high priority for DMR, because the alewife run once served as a source of broodstock for restoration in the Royal River, Androscoggin River, and Kennebec River.

St. George, Megunticook, Passagassawakeag, and Goose rivers: low restoration priority

One FERC inactive hydropower project is located in the upper reaches of the St. George River; one FERC licensed hydropower project and one FERC inactive project are located on the Megunticook River; and one project (5 dams) is located on the Goose River (Fig. 6). All of the projects are presumed to be within historical American eel. At this time these are low priority watersheds because they are small. In addition, the Goose Project is licensed until 2020, and would have to be reopened for immediate passage.

Figure 6. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the Damariscotta River, St. George River, Megunticook River, Goose River, and Passagassawakeag River (1:700,000 scale).



Penobscot River: high restoration priority

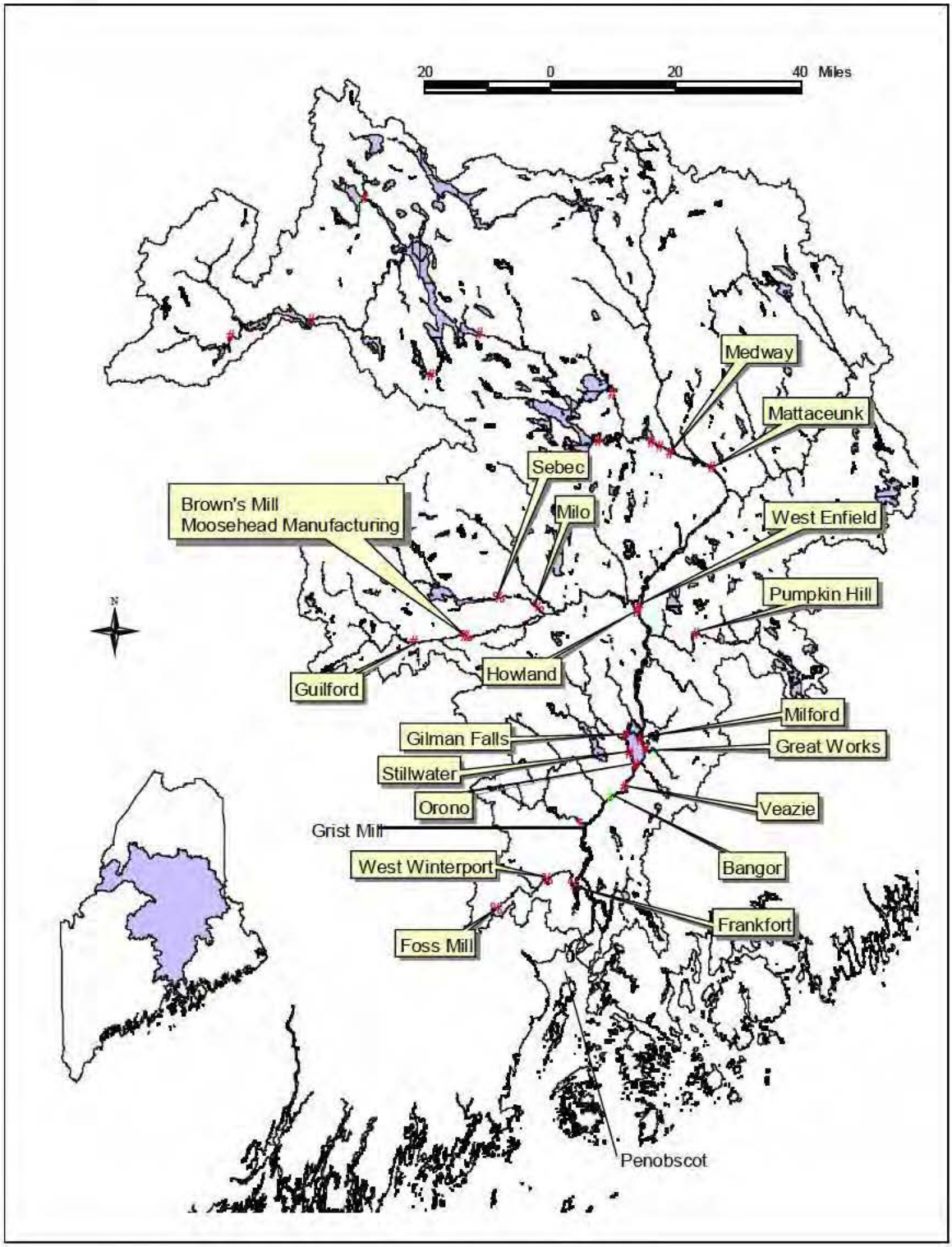
There are 17 FERC licensed hydropower projects (20 dams) within the historical range of diadromous fishes in the Penobscot River basin (Fig. 7). Thirteen of the dams have upstream anadromous fish passage, and 10 have a structure or measures for downstream passage (Table 6). Effectiveness studies for Atlantic salmon have been conducted at several projects, but no studies have been conducted for other species. Upstream passage effectiveness for salmon at Veazie, Great Works, and Howland dams can be very low, depending on flow conditions. Bangor Dam has been breached, and Grist Mill dam was removed in 1998. A large tidal project has been proposed for the channel to the west of Verona Island in Bucksport.

Table 6.

Subdrainage/Project/Dam	Upstream passage type	Downstream passage type
Penobscot		
Bangor	breached	breached
Veazie	vertical slot	guidance-behavioral-operational
Great Works	2 Denils	guidance-behavioral-operational
Milford		
Milford	Denil	guidance-behavioral-operational
Gilman Falls (no turbines)	Denil	
West Enfield	vertical slot	bypass
Mattaceunk	pool-and-weir	guidance-behavioral-operational
Stillwater		
Orono	none	none
Stillwater	none	guidance-behavioral-operational
Piscataquis		
Howland	Denil	guidance-behavioral-operational
Brown's Mill	Denil	guidance-behavioral-operational
Moosehead Manufacturing	Denil	none
Guilford Dam	Denil	none
Milo	none	none
Sebec	none	none
Passadumkeag		
Pumpkin Hill	Denil	bypass
West Branch		
Medway	eel ramp	sluice-bellmouth weir
Marsh Stream		
Frankfort	Denil	none
Foss Mill	none	none
West Winterport	none	none

The most significant obstacles for diadromous fishes are the two lowermost dams on the mainstem, Veazie Dam and Great Works Dam. Removal of these dams will allow Atlantic sturgeon, shortnose sturgeon, rainbow smelt, and Atlantic tomcod free access to Milford, the first impassable natural barrier above head of tide and the historical upstream limit for these species. In addition, removal of these dams and improvements to fish passage at Milford and Howland will significantly improve the chances of restoring or enhancing populations of alewife, American eel, American shad, Atlantic salmon, blueback herring, sea lamprey, and striped bass by eliminating or reducing any inefficiency, delay, and mortality associated with fish passage.

Figure 7. Location of FERC licensed (circle), FERC Exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the Penobscot River (1:1,500,000 scale).



A 2004 settlement agreement between PPL Corporation, state and federal resource agencies, and six conservation groups allows for the purchase of Veazie, Great Works, and Howland dams, removal of Veazie and Great Works, installation of a naturalistic bypass at Howland, installation of state-of-the-art fish passage (fishlift) at Milford, and upstream and downstream eel passage at Milford, Orono, Stillwater, and West Enfield. Purchase of the three dams is expected to occur in 2008.

DMR drafted a multi-species management plan for the Penobscot River basin in 2007. The plan envisions the restoration of Atlantic sturgeon, shortnose sturgeon, rainbow smelt, and Atlantic tomcod to Milford; restoration of alewife, American eel, American shad, Atlantic salmon and blueback herring to historical habitat above Mattaceunk on the mainstem, above Guilford on the Piscataquis, and above Pumpkin Hill on the Passadumkeag. A public comment period on the management plan was held on December 13, 2007. Medway is not part of the 2004 settlement, however, it was the first project in Maine to have upstream and downstream eel passage. Effectiveness testing of downstream passage has been delayed because of a lack of eels for study.

Implementation of the 2004 settlement agreement for the Penobscot, the largest watershed, is DMR's second highest priority. Consultation and studies for upstream eel passage have been completed, and the passages will be installed in 2008. The current lack of funding for removal of the dams, construction of the Howland bypass, and diadromous fish restoration are impediments.

Union River: moderate restoration priority

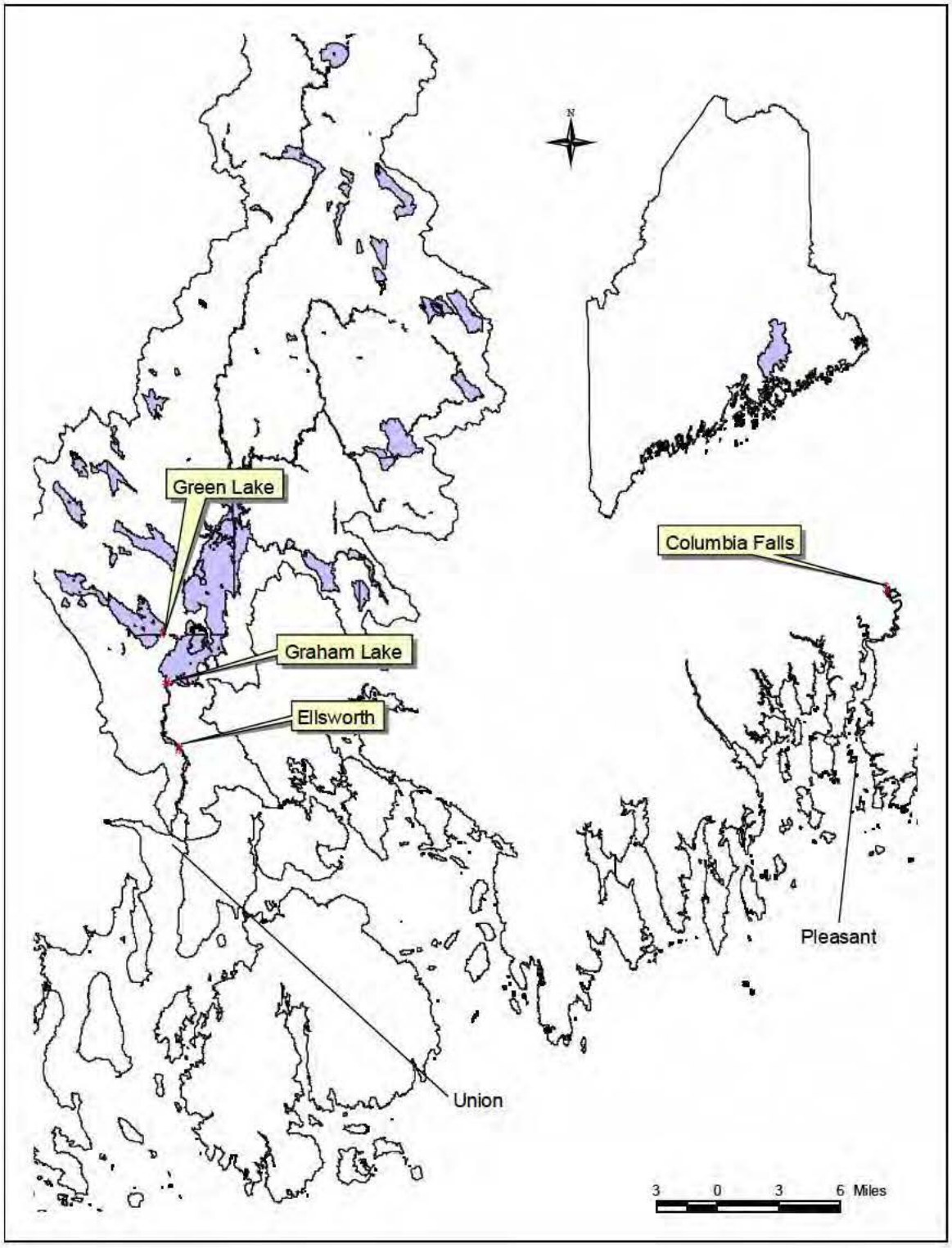
There are two FERC licensed projects in the watershed. Graham Lake dam, a water storage structure without turbines, is part of the Ellsworth Project (Fig. 8). The Ellsworth Project was licensed in 1987, and contained an article requiring the Licensee to develop a plan and schedule for (anadromous) fish passage installation. The Licensee and the Department of the Interior were unable to agree on a plan, a legal battle ensued, and in 1996 the US Court of Appeals for the District of Columbia vacated FERC's order requiring the Licensee to comply with the prescription. After the court decision, the Licensee, state and federal agencies, and other interested entities developed a management plan that was filed with FERC in 2000. Pursuant to that plan, the license was revised to include 1) evaluating impacts on smallmouth bass of stocking alewives in Graham Lake, 2) determining annual alewife escapements needs to achieve restoration goals, 3) collecting and updating information on salmon habitat in the watershed, and 4) evaluating upstream and downstream fish passage needs at the Ellsworth Project and determining the need for additional fish passage for American eel. The Ellsworth Dam is equipped with a fishlift/trap-and-truck facility that allows for the capture and upriver transport of alewife and Atlantic salmon and a downstream passage facility, but not an upstream eel passage.

This has been a moderate priority watershed, primarily because of time and personnel constraints. USFWS and DMR will work with the licensee to provide interim upstream eel passage during the next assessment cycle.

Pleasant River: low restoration priority

The one FERC inactive project on the Pleasant River (Fig. 8) was removed, and the watershed is now accessible to diadromous fishes. With the exception of Atlantic salmon, fish populations should be able to increase naturally without further intervention.

Figure 8. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the Union and Pleasant rivers (1:500,000 scale).

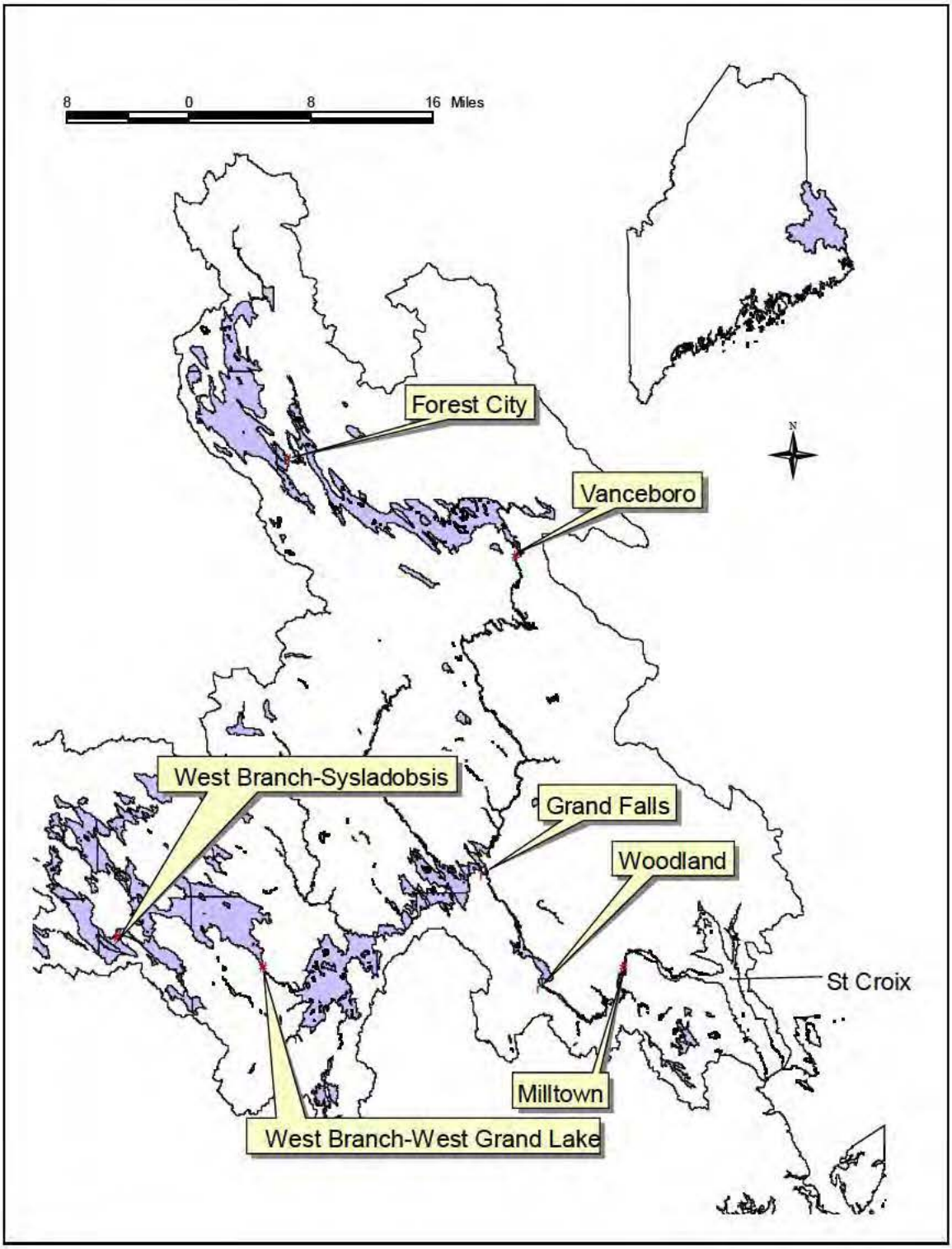


St Croix River: moderate restoration priority

Three FERC licensed projects (4 dams) and three FERC nonjurisdictional projects (3 dams) are located within historic habitat of alewife, Atlantic salmon, and American eel on the St. Croix. Milltown is a Canadian hydropower project. The Milltown, Woodland, Grand Falls, and Vanceboro projects have upstream anadromous fish passage, although the fishways at Woodland and Grand Falls dams were required to be configured to prevent the passage of alewife by 12 M.R.S.A §6134. The Forest City and West Branch projects are currently undergoing relicensing, and DMR has requested upstream eel passage and the right to request anadromous fish passage in the future. Downstream passage has not been requested, because these are water storage dams without turbines and migrants can exit via gates that pass minimum flows.

The major impediment to fish passage in this watershed is 12 M.R.S.A §6134.

Figure 9. Location of FERC licensed (circle), FERC exempt (square), FERC inactive (triangle), and FERC nonjurisdictional (star) projects in the St Croix River (1:800,000 scale).



Section 2. Definition of fish kill

The Resolve directs the Department of Environmental Protection to develop a water quality standard that sets out what are acceptable levels of a fish kill at different types and sizes of dams, based on the biological requirements of the many species of diadromous fish involved. This new water quality standard is envisioned by the Resolve "to the maximum extent possible, (to) enhance[s] the State's ability to require fish passage at licensed and unlicensed dams…" The Committee was concerned in its deliberations that existing language in certain permits was needlessly affecting the state's authority to require fish passage.

The biological staff of the Department of Environmental Protection, in consultation with other state natural resource agency staff and following review of existing state and federal law, spent time this summer and fall attempting to draft definitions of a fish kill that would meet the intent of the Resolve. Following extensive discussion on several different proposals, staff from DEP and the DMR agreed that such a standard would not materially assist the Department in requiring fish passage. Staff found, in fact, that such a new standard was not necessary and could actually diminish the State's current ability to require operational changes or fish passage. This may at least partially explain why no other states have enacted such a water quality standard for fish kills.

The agencies are therefore not recommending such a standard for the following reasons:

- The existing standards in law at 38 MRSA §465 require that licensing decisions and the operation of hydroelectric projects protect aquatic life, which includes diadromous fish species. *In S.D. Warren Co. v. BEP*, 2005 ME 27, the Maine Supreme Judicial Court upheld the Department's authority to condition FERC licenses with, among other things, fish passage requirements. However, this decision did not require the Department to include such passage in every certification. Decisions regarding whether and when fish passage facilities should be required as part of a water quality certification for a given dam are made in the context of information on fishery management goals, migratory fish restoration plans, habitat suitability and availability, and current status of fish passage. These decisions, which are made in consultation with state and federal fisheries management agencies, run the full spectrum from not requiring fish passage, to leaving open the opportunity to require fish passage at a later date, to establishing a schedule for the future installation of fish passage, to requiring the immediate installation of fish passage.These species will not gain further protection from a further refined or specified definition of a fish kill.
- A water quality standard that quantified or further described a fish kill would not give the state more authority to reopen existing water quality certificates issued under Section 401 of the Clean Water Act that do not have a specific reopener clause for fish passage.
- Similarly, such a standard would not enhance the state's authority with the Federal Energy Regulatory Commission (FERC) in a petition request on a standard reopener clause in a FERC license.
- It would be virtually impossible to craft a standard that would capture the many, many different situations envisioned without opening the door to arguments *ad infinitum* about numbers, populations, or circumstances. Ironically, the endless rounds of debate would eliminate the value of the Department's professional judgment and possibly narrow rather than enhance our authority. This outcome is directly contrary to the intent of the Resolve.

As the agencies noted to the Committee in its deliberations on LD 1528, there are no dam facilities that can be operated without incurring some incidental mortality of fish species. However when observed and documented mortalities occur that are not incidental, the Department of Environmental Protection has made decisions and taken action that has resulted in the installation of fish passage or operational changes at facilities to halt the mortalities. A different, or quantified water quality standard would not change, and could actually diminish, the Department's ability in this regard.

Appendix 1. Definitions[3]

FERC APPROVED PROJECTS

FERC approved hydro projects operate under the terms of a license or an exemption.

LICENSE (L): Licenses are issued under the Federal Power Act for the development or continued operation of non-federal water power projects. Licenses are valid for a maximum of 50 years. Under FERC's regulations, a licensee must file to relicense a project no later than 2 years prior to the license expiration date. When a license expires, FERC may deny license renewal, may issue a new license to the original licensee or a new licensee, or may recommend to Congress that the United States acquire the project. If action has not been taken by the license expiration date, the project will operate on an annual license until relicensing action is taken.

EXEMPTION (E): Exemptions from the licensing provisions of the Federal Power Act are issued in perpetuity for the development of non-federal water power projects having a capacity of 5,000 KW or less and utilizing an existing dam or natural water feature. Exemptions are subject to conditions imposed by fish and wildlife agencies

INACTIVE FERC PROJECTS

Inactive FERC hydro projects are projects that at one time were approved by FERC but for which renewal of the project license has been subsequently denied or the project license or exemption has been subsequently revoked, surrendered or otherwise terminated. In most cases, the approved project was never built. In a few cases, a previously constructed and operating project has been shut down due to economic or environmental considerations.

FERC NON-JURISDICTIONAL PROJECTS

Non-jurisdictional projects are those that have been found to not be subject to FERC jurisdiction under the terms of the Federal Power Act.

A non-federal hydroelectric generating project must be licensed if it: (1) is located on a navigable water of the United States; or (2) occupies land of the United States; or (3) utilizes surplus water or water power from a government dam; or (4) is located on water which are non-navigable but over which Congress has Commerce Clause jurisdiction, project construction occurred on or after August 26, 1935, and the project affects the interests of interstate or foreign commerce.

FERC does not have jurisdiction if a project is constructed, operated and maintained in accordance with the terms of a valid federal permit issued prior to June 10, 1920. A storage reservoir is subject to licensing if it is part of a complete unit of hydropower development and any part of the development is subject to licensing.

[3] Department of Environmental Protection. 2007. Hydropower projects in Maine January 1, 2007.