Draft Fisheries Management Plan for the Lower Androscoggin River, Little Androscoggin River and Sabattus River

September 2017

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Photo: Androscoggin River Watershed Council - PO Box 1541 - Bethel, ME

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Introduction

This fisheries management plan, jointly developed by the Maine Department of Marine Resources (MDMR) and the Maine Department of Inland Fisheries (MDIFW), focuses on four sections of the Androscoggin River: the tidal portion from Merrymeeting Bay to Brunswick Dam ("Androscoggin River estuary"), the mainstem Androscoggin River from Brunswick Dam to Lewiston Falls ("lower Androscoggin River"), the Little Androscoggin River to Snows Falls, and the Sabattus River/Little River tributaries. The reach from Lewiston Falls to Rumford Falls is mentioned, but no management actions are recommended at this time.

The goal of this management plan is to protect, conserve, and enhance the fisheries resources of the Androscoggin River for their intrinsic, ecological, economic, recreational, scientific, and educational values and for use by the public. This plan is a "living document" designed to guide future actions by MDMR and MDIFW, and provide other stakeholders with the information needed to gain a better understanding of these valuable resources.

This management plan incorporates pertinent information from past and present Androscoggin River and State of Maine anadromous fish management plans. It includes a description of the river and the species of fishes it supports. Proposed management actions are listed for each section of the river, and in some cases, timelines are proposed. The Appendix contains a list of referenced plans and supporting documentation.

Description of Drainage

The Androscoggin River, Maine's third largest river, is an interstate waterway with a drainage area of 3,530 square miles above tidewater (Figure 1). Approximately 80% of the drainage is located in Maine and 20% in New Hampshire. The Androscoggin River is 178 miles long, and joins the Kennebec River at Merrymeeting Bay. The combined waters travel another 20 miles before reaching the Gulf of Maine.

The Androscoggin River has a steep gradient, dropping more than 1,500 vertical feet from its origin at Lake Umbagog to tidewater, an average descent of 7.74 feet per mile. Five major cascades in the drainage (Great Falls, Lewiston Falls, Rumford Falls, Snow Falls, and Biscoe Falls) historically formed natural barriers for groups of diadromous[1] fishes (Figure 1). Atlantic Sturgeon, Shortnose Sturgeon, and Rainbow Smelt likely did not pass beyond Great Falls in Brunswick. On the mainstem Androscoggin River, Lewiston Falls stopped the upstream migration of Alewife, American Shad, Blueback Herring, Striped Bass and perhaps Sea Lamprey, while Rumford Falls was a barrier to Atlantic Salmon (Foster and Atkins 1868). On the Little Androscoggin River, the upstream migration of Atlantic Salmon was stopped at Snows Falls (Foster and Atkins 1868). Biscoe Falls, the only other natural falls on the Little Androscoggin River identified by DeRoche (1967), may have been the upstream limit of

[1] Diadromous is a general term referring to a fish that migrates between the ocean and freshwater at least once during its lifetime. Diadromous fish that spawn in freshwater are termed "anadromous" while those that spawn in the ocean are termed "catadromous." Alewife, American Shad, Atlantic Salmon, Shortnose Sturgeon, Atlantic Sturgeon, Atlantic tomcod, blueback Herring, Rainbow Smelt, Sea Lamprey, sea-run brook trout, and Striped Bass are anadromous species, while the American Eel is catadromous.

Alewife, Blueback Herring, and American Shad. The historical upstream limit of the American Eel in unknown. However, MDIFW has documented the presence of this species in the last 35 years in lakes and ponds above both Rumford Falls and Snow Falls.

The geographical range of this management plan encompasses three major tributaries and 17 lakes and ponds with a surface area of at least 25 acres (Figure 2). The Sabattus River and Little River enter the Androscoggin River at Lisbon, and the Little Androscoggin River enters at Auburn. Five lakes and ponds are located in the Sabattus River drainage (Sabattus Pond, Little Sabattus Pond, No Name Pond, Sutherland Pond, and Loon Pond) and 12 are located in the Little Androscoggin River (Upper Range Pond, Middle Range Pond, Lower Range Pond, Taylor Pond, Whitney Pond, Marshall Pond, Hogan Pond, Tripp Pond, Worthley Pond, Thompson Lake, Pennesseewassee Lake, and Little Pennesseewassee Lake (Figure 2).

Land and water development

Historically, land and water development within the mainstem Androscoggin River and its tributaries mirrored development in many New England rivers. The river was initially used as a route for exploring interior portions of the watershed. European colonization of the lower Androscoggin River occurred in the mid-1700s. Settlers constructed the first dam on the river at Lewiston Falls shortly after 1770 in order to power a gristmill. In 1797, a similar dam was constructed on the Little Androscoggin River. During the 1800s, textile, paper, tanneries and hydropower companies were the dominant business groups established along the river. These industries would later have severe impacts on water quality during the mid-1800s through the mid-1900s.

Until the early 1800s, the Androscoggin River was used for log drives and provided mechanical power for small gristmills and sawmills. In 1835, a paper authored by Leammi Baldwin of Boston called *Water Power in Maine* stated "…the Androscoggin is equal to any eastern river in the U.S. in terms of power production." He later prophesized that the Androscoggin River would become a great industrial center. Shortly after, shoe and textile mills began operation in Lewiston.

The Androscoggin River valley lacked the large tracks of white pine forest found in the Kennebec River basin. Instead, fir and spruce forests dominated the area, and the most serious threat to the river came from these great resources. These forests provided high quality softwood trees prized for wood pulp used to produce paper. In 1877, the Forest Fiber Company began making paper in Berlin, New Hampshire. At that time, processing the wood fibers during the paper-making process required sulfur. By the 1940's, the Berlin Mill and others were pumping an estimated 6,000 tons of waste liquor into the headwaters of the Androscoggin River, along with tons of insoluble waste each week. Construction of the Gulf Island Dam in 1926-27 increased problems by reducing river flows and impounding a large section of river where dissolved oxygen levels plummeted and solid wastes settled. Low dissolved oxygen levels remain a problem at this site today.

In 1930, the pulp and paper mills along the river financed a survey of Maine's five industrial rivers by Dr. C.L. Walker of Cornell. The Androscoggin River was surveyed from July to

October in 1930, and the results were reported to the governor in March 1931. The report stated that the river was severely polluted. By the 1940's, impacts of several decades of pollution were being felt all along the river. The river would not freeze during winter, paint was peeling from homes and area businesses, and people were having difficulty breathing. In 1940, Central Maine Power paid a Boston engineering firm, Metcalf and Eddy, to conduct a second survey of the river, but its results were never made public. Because of public outcry, the Maine Sanitary Water Board was formed in 1941. That same year, the Board hired the engineering firm of Metcalf and Eddy to resurvey the river. The resulting February 1942 report stated that 96% of the pollution was directly related to pulp and paper mills, and a minor share resulted from textile wastes (Jones 1975). In 1942, the State of Maine established the Androscoggin River Technical Committee to address these problems. Court ordered agreements resulted in progressively reduced weekly limits of combined waste discharge from the mills. The Kraft paper process, developed in the 1960s, also eliminated or greatly reduced the sulfur from the pulp making process and eliminated sulfite discharges into the river. The last sulfite mill on the Androscoggin River closed in 1966. Congress passed the Water Quality Act in 1965, followed by the Clean Water Act in 1972. Since the early 1970's, water pollution abatement efforts have resulted in dramatic improvements in water quality in the lower Androscoggin River.

Water quality

All surface waters lying within the boundaries of the State that are in river basins having a drainage area greater than 100 square miles that are not classified as lakes or ponds are classified in Title 38 §467. Water quality in the Androscoggin watershed ranges from AA (best) to C (worst). Most of the surface waters within the historical range of Maine's diadromous species are Class C.

Androscoggin River, main stem, including all impoundments.

- From the Maine-New Hampshire boundary to its confluence with the Ellis River - Class B.
- From its confluence with the Ellis River to a line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction - Class C.

Little Androscoggin River, main stem.

- From the outlet of Bryant Pond to the Maine Central Railroad bridge in South Paris - Class A.
- From the Maine Central Railroad bridge in South Paris to its confluence with the Androscoggin River - Class C.

Little Androscoggin River, tributaries - Class B unless otherwise specified.

- Outlet of Thompson Lake in Oxford - Class C.
- Andrews Brook in Woodstock - Class A.
- Black Brook in Woodstock - Class A.
- Cushman Stream in Woodstock - Class A.
- Meadow Brook in Woodstock - Class A.
- Bog Brook and tributaries in Minot, Oxford and Hebron - Class A.

Androscoggin River, Upper Drainage; that portion within the State lying above the river's most upstream crossing of the Maine-New Hampshire boundary - Class A unless otherwise specified.

- Cupsuptic River and its tributaries - Class AA.
- Kennebago River and its tributaries except for the impoundment of the dam at Kennebago Falls - Class AA.
- Rapid River, from a point located 1,000 feet downstream of Middle Dam to its confluence with Umbagog Lake - Class AA.
- Magalloway River and tributaries above Aziscohos Lake in Lynchton Township, Parmachenee Township and Bowmantown Township - Class AA.
- Little Magalloway River and tributaries in Parmachenee Township and Bowmantown Township - Class AA.
- Long Pond Stream in Rangeley - Class AA.
- Dodge Pond Stream in Rangeley - Class AA.

Androscoggin River, minor tributaries - Class B unless otherwise specified.

All tributaries of the Androscoggin River that enter between the Maine-New Hampshire boundary in Gilead and its confluence with, and including, the Ellis River, and that are not otherwise classified - Class A.

- Bear River - Class AA.
- Sabattus River from Sabattus Lake to limits of the Lisbon urban area - Class C.
- Webb River - Class A.
- Swift River, and its tributaries, above the Mexico-Rumford boundary - Class A.
- Nezinscot River, east and west branches above their confluence in Buckfield - Class A.
- Wild River in Gilead, Batchelders Grant - Class AA.

Barriers and Fishways

Man-made barriers have been present throughout the Androscoggin River drainage for over 200 years. The first dam was constructed on the mainstem at Lewiston Falls shortly after 1770, and records indicate a similar dam was built on the Little Androscoggin River in 1797. Great Falls, located at the head-of-tide in Brunswick, was occupied by a series of dams and in 1807, one of the dams caused Alewife and American Shad runs to decline sharply, but it did not prevent the passage of Atlantic Salmon that were able to leap over the dam. However, subsequent dams were higher and insurmountable. As a result, Atlantic Salmon were no longer caught at Lewiston after 1815, and were extirpated above tidewater in 1844.

At least 26 barriers currently are within the geographical range of this management plan (Table 1). These include eight federally licensed hydropower projects, one nonjurisdictional hydropower project, and 17 nonhydropower dams of which two are breached. An additional seven hydropower dams occupy the upper Androscoggin River from Lewiston Falls to Rumford Falls.

Androscoggin River - Brunswick Project

The Brunswick Project Dam, located at the head-of-tide, is the first barrier encountered by upstream migrants. In 1980 the U.S. Fish and Wildlife Service developed conceptual drawings for a vertical slot fishway for the Brunswick Project that was designed to pass 85,000 American Shad and 1,000,000 alewives annually. The upstream passage facility was one of the first vertical slot fishways designed to pass American Shad on the east coast, and was a scaled-down version of a fishway located on the Columbia River. Redevelopment of the Brunswick Project and construction of the fishway was completed in 1983. The completed fishway was 570 feet long, and consisted of 42 individual pools with a one-foot drop between each pool. Downstream passage consisted of a 12-inch pipe located between two turbine intakes.

When the Federal Energy Regulatory Commission (FERC) issued a license for the Brunswick Project in 1979, it did not require efficiency studies for the upstream and downstream passage facilities. To date, the ability of the upstream passage facility to provide safe, timely, and effective passage has not been evaluated for any species. However, the effectiveness of the downstream passage facility for passing Atlantic Salmon smolts was tested in three years (2013-2015) as required by the Interim Species Protection Plan (ISPP). Freshwater discharge was above normal in 2013 and 2014 and was normal in 2015[2]. The average survival of downstream migrating Atlantic Salmon smolts at the Brunswick Project was 87.2% with a range of 82.8-94.9% (NMFS 2017).

Currently, the factor limiting successful American Shad restoration to the Androscoggin River, and perhaps restoration of other diadromous species, is the lack of effective passage at the Brunswick Project. Neither the vertical-slot fishway at the Brunswick Project Dam nor a similar one at the Rainbow Dam on the Farmington River in Connecticut has proven to be successful at passing American Shad. Visual observations, underwater videography, and radio telemetry studies conducted at the Brunswick Project by MDMR in cooperation with the U.S. Fish and Wildlife Service have shown that American Shad swim past the fishway entrance repeatedly, but rarely enter it. Furthermore, the few shad that enter the fishway rarely ascend beyond the turning pool (pool 23), and fish that reach the exit often have significant scale loss. Analysis of tag return data indicates lower than expected numbers of alewives successfully navigate the fishway.

Androscoggin River - Pejepscot Project

The Pejepscot Project Dam is the second barrier on the Androscoggin River. An automated fishlift, constructed in 1987, provides upstream passage at this site from May 15 through November 1. Fish are automatically crowded and lifted at least every two hours from 8:00 AM to 4 PM. The capacity of the Pejepscot fishlift matches the capacity of the Brunswick fishway, i.e., 85,000 American Shad and 1,000,000 Alewife annually. Downstream passage is provided by two 18-inch diameter pipes extending from the powerhouse intake to the tailrace. Both anadromous species and freshwater species use the fishlift to ascend the mainstem of the Androscoggin River.

[2] Discharge for the study period that was below the 25th quartile for the period of record (1929-2016) is termed "below normal", discharge between the 25th and 75th quartiles is termed "normal", and discharge above the 75th quartile is termed "above normal".

Several studies of fish passage effectiveness have been conducted at the Pejepscot Project, but often in years when flows have been abnormally high or low. The effectiveness of the upstream fish passage facility was evaluated for adult Alewife in 1991 and 1992 when discharge was below normal. The average efficiency calculated from the number of Alewife released at Brunswick and the number passing through the Pejepscot fishway was 70% with a range of 49-100% (Topsham Hydro Partners 1992, 1993). The effectiveness of the downstream passage facility was evaluated for juvenile Alewife from August 12 through October 11, 1996 when discharge was slightly above the median. The mean raw efficiency was 22% (range 15-41%) and the mean efficiency adjusted for tagging mortality was 49% (range 14-149%)(Topsham Hydro Partners 1997). The effectiveness of the downstream passage facility for passing Atlantic Salmon smolts was tested successfully in two years. Discharge was above normal in 2014 and normal in 2015. The mean survival of downstream migrating Atlantic Salmon smolts at the Pejepscot Project was 88.8% with a range of 86.3-91.39% (NMFS 2017).

Androscoggin River - Worumbo Project

The Worumbo Project Dam, the third barrier on the Androscoggin River, has a fishlift that became operational in 1988. The automated Worumbo fishlift operates in conjunction with the Pejepscot fishlift, i.e., operational dates are the same, but the lift operates one hour later than the Pejepscot fishlift. The capacity of the Worumbo fishlift is the same as the two downstream facilities (85,000 American Shad and 1,000,000 Alewife annually). Downstream passage at Worumbo is provided by a 24-inch pipe extending from the powerhouse intake to the tail water. An upstream passage facility for American Eel, the only one in the Androscoggin River watershed, was installed at the Worumbo Project after the spillway was repaired in 2011.

Several studies of fish passage effectiveness have been conducted at the Worumbo Project, but often in years when flows have been abnormally high or low. The effectiveness of the upstream fish passage facility was evaluated for adult Alewife from 1991 through 1993 when discharge was below normal. The average efficiency calculated from the number of Alewife passed at the Pejepscot Project or released below the Worumbo Project and the number passing through the Worumbo fishway was 20% with a range of 8-67% (Miller Hydro Group 1993, 1994, 1995a). The effectiveness of the downstream passage facility was evaluated using marked adult and juvenile Alewife in 1994 during a period of normal discharge. The mean raw efficiency for adults was 8% with a range of 4-10%, and the mean raw efficiency for juveniles was 7% with a range of 0-30% (Miller Hydro Group 1995b). The effectiveness of the downstream passage facility for passing Atlantic Salmon smolts was tested in three years (2013-2015) as required by the ISPP. Freshwater discharge was above normal in 2013 and 2014 and was normal in 2015. The mean survival of downstream migrating Atlantic Salmon smolts at the Worumbo Project was 86.7% with a range of 70.7-95.8% (NMFS 2017).

Little Androscoggin River Dams

None of the seven dams in the mainstem of the Little Androscoggin River nor the multiple dams located in its tributaries currently provide upstream fish passage. The lack of upstream passage at these projects is the most significant obstacle to successful restoration of anadromous fish to the Little Androscoggin River. Historically, approximately 77% of Alewife spawning habitat

(lakes and ponds), 30% of American Shad and Blueback Herring spawning habitat, and 92% of Atlantic Salmon spawning habitat within the geographical scope of this management plan was located above these projects. Interim downstream passage currently is provided at the four licensed hydropower projects (Table 1), because MDMR stocks Alewife into three upstream ponds (Taylor Pond, Marshall Pond and Lower Range Pond). The Lower Barker's Mill Project is currently being relicensed, and state and federal resource agencies are consulting with the Licensee regarding fish passage facilities and minimum flows. The remaining three projects will undergo relicensing between 2023 and 2037 (Table 1). However, License Article 408 for the Marcal Project requires installation of upstream passage for anadromous fishes after the MDMR and Maine Atlantic Salmon Authority (now part of MDMR) produce a fishery plan for the Little Androscoggin River.

Sabattus River Dams

None of the five dams on the Sabattus River are used for power generation, and none currently provide upstream or dedicated downstream passage for anadromous fish. A sixth dam was breached during a flood event in 2012. In the spring of 1998, MDMR resumed stocking Alewife in Sabattus Pond. Approximately 300 three-year-old fish returned to the Sabattus River during the spring of 2001. Each year since 2001, adult Alewife have entered the Sabattus River because of the ongoing stocking program, but without upstream passage these fish remain at the base of the lowermost dam (Juliette). Interim trapping and trucking operations from the Brunswick fishway will need to continue to perpetuate the run, until other strategies are developed to permanently address up and downstream passage.

Species Occurrence, Abundance, and Management

Diadromous species

Historically 12 species of native diadromous fishes were found in the Androscoggin River and its tributaries (Table 2; Figure 1). The historical range of species that were harvested is fairly well known, while the range of others is less certain. Atlantic Sturgeon, Shortnose Sturgeon and Rainbow Smelt likely did not pass beyond Great Falls in Brunswick. On the mainstem Androscoggin River, Lewiston Falls stopped the upstream migration of Alewife, American Shad, Blueback Herring, Striped Bass and perhaps Sea Lamprey, while Rumford Falls was a barrier to Atlantic Salmon (Foster and Atkins 1868). On the Little Androscoggin River, the upstream migration of Atlantic Salmon was stopped at Snows Falls (Foster and Atkins 1868). Biscoe Falls, the only other natural falls on the Little Androscoggin River identified by DeRoche (1967), may have been the upstream limit of Alewife, Blueback Herring, and American Shad. The historical upstream limit of American Eels in unknown. However, MDIFW has documented the presence of this species in the last 35 years in lakes and ponds above both Rumford Falls and Snow Falls.

Prior to dam construction, Alewife, American Shad, Blueback Herring, Atlantic Salmon, and American Eel were very abundant in the Androscoggin River. However, in 1807 a low-head dam was constructed at the head-of-tide on the Androscoggin River that caused Alewife and American Shad runs to decline sharply. Atlantic Salmon were able to leap over the low head

dam and continue upstream. Construction of higher, insurmountable dams caused their complete extinction above tidal waters in 1844.

After dams confined migratory species to the tidal portion of the river, severe water pollution virtually eliminated these remnant populations. Alewife and American Shad that continued to reproduce in the six-mile stretch of river below Brunswick supported significant commercial fisheries until the late 1920's. By the early 1930s, severe water pollution from upstream industries and municipalities had caused the demise of these commercial fisheries. Efforts to abate water pollution began in the early 1970s, and resulted in the dramatic improvement of water quality in the Androscoggin River. The improved water quality coupled with nearly 40 years of active fisheries management by MDMR have allowed stocks of anadromous fish to expand to a point where recreational fisheries for American Shad, Rainbow Smelt, and Striped Bass exist in the Androscoggin River estuary.

MDMR initiated an anadromous fish restoration program in the Androscoggin River in 1983 when upstream and downstream fish passage was installed at the Brunswick Project Dam and was anticipated at the next two upstream projects. Passage was constructed at the Pejepscot Project Dam in 1987 and at the Worumbo Project Dam in 1988. Passage at all three projects resulted from recommendations made by State and federal resource agencies during the federal relicensing process.

MDMR biologists operate the trapping facility that is located at the upstream end of the Brunswick Project fishway. When fish reach the top of the fishway, fixed grating guides them past a viewing window and into a 500-gallon capacity fish hoist (trap). The hoist raises fish to overhead tanks where staff sort fish and either load them into stocking trucks, sluice them upstream into the headpond, collect biological samples, or return exotic species, such as carp or white catfish, to the river below the dam.

MDMR uses both active and passive methods of fish restoration in the Androscoggin River. Restoration of Alewife and American Shad has been accomplished by actively stocking these fish into historic habitat, while restoration of Atlantic Salmon is accomplished by allowing returning fish to pass upstream and spawn naturally.

Alewife

Alewife spawn in lakes, ponds, and deadwater areas of rivers and streams. Historically they utilized five lakes and ponds within the Sabattus River drainage and 10 located within the Little Androscoggin River drainage (Table 3; Figure 2). In this plan we have assumed that the species was unable to access Penneseewassee Lake and Little Penneseewassee Lake because of existing natural barriers. Approximately 23% of historical lake/pond spawning habitat is within the Sabattus River drainage, while 77% is within the Little Androscoggin drainage. Alewife currently are unable to access any of these historic spawning habitats, because of intervening dams without fishways that exist on rivers and many lake outlets. The impoundments created by hydropower dams may provide some spawning habitat, but it likely is less productive than natural lakes and ponds.

Alewife restoration in the Androscoggin watershed was initiated in 1983 when the Brunswick fishway became operational. Because the species was extirpated from waters above the Brunswick Project, MDMR primarily used adult fish taken from the Royal River as broodstock for the lower Androscoggin River. By 1987, the number of Alewife returning to the Brunswick fishway was nearly 26,000 individuals, and MDMR subsequently used fish trapped at the fishway for broodstock. Since 1983 the number of Alewife using the fishway has ranged from 601 to 170,191 fish (Figure 3).

MDMR currently passes Alewife into the Brunswick Project headpond, and also stocks eight lakes and ponds (Sabattus Pond, Little Sabattus Pond, No Name Pond, Loon Pond, Sutherland Pond, Taylor Pond, Marshall Pond, and Lower Range Pond) at the rate of 6 fish/surface acre of spawning habitat. Data collected at the Pejepscot and Worumbo fishlifts confirms that Alewife continue their upstream migration; however, spawning success in the hydropower impoundments on the main stem Androscoggin is low and does not contribute significantly to the returning adult population.

American Shad

American Shad utilize the mainstem of rivers for spawning. Historically they spawned in the Androscoggin River from Merrymeeting Bay to Lewiston Falls, and in the Little Androscoggin River from its confluence with the Androscoggin River to Biscoe Falls (Table 4). American Shad presently do not utilize these historic spawning areas, primarily because fewer than 10 individuals use the Brunswick Project fishway in most year. In addition, the intervening dams on the Little Androscoggin River currently do not have upstream fish passage.

Between the 1930s and the 1980s there was little evidence of American Shad spawning in the Androscoggin River estuary. After the Brunswick fishway was completed, MDMR initiated a restoration program for American Shad in the lower Androscoggin River in 1985. Pre-spawn American Shad from in-state (Cathance and Androscoggin rivers) and out-of-state (Merrimack and Connecticut rivers) sources were stocked into spawning habitat below Lewiston Falls for nearly 25 years (Table 5). Between 1999 and 2008, MDMR also stocked hatchery-reared shad fry into these waters (Table 5). The capture of American Shad eggs between the Brunswick Dam and the railroad bridge (located 0.8 miles downstream) in 2005 and 2006 and the presence of a recreational fishery for American Shad in this area demonstrate the presence of a spawning population.

Ineffective passage at the Brunswick Project Dam is the major impediment to restoration of American Shad to the lower Androscoggin River. The number of American Shad that utilize the fishway each year is small, despite the nearly 8,000 adults and 5.5 million fry that have been stocked into historical spawning/nursery habitat above the Brunswick Project, and the estimated 1,000 adults (or more) that swim past the fishway each year. A comparison of river discharge and all fish passage data clearly shows that American Shad only enter the fishway when discharge is at or below the station hydraulic capacity. Because adults will not or cannot use the Brunswick fishway, they are unable to access approximately two-thirds of historical shad spawning and nursery habitat on the mainstem Androscoggin (Table 4). The remaining historical spawning habitat is located above one to six dams on the Little Androscoggin River.

Blueback Herring

Like American Shad, Blueback Herring utilize the mainstem of rivers and tributaries for spawning. Historically they spawned in the Androscoggin River estuary, the lower Androscoggin River from Great Falls to Lewiston Falls, and the Little Androscoggin River to Biscoe Falls (Table 4). Blueback Herring have been observed spawning below the Brunswick Project, but biological samples collected at the Brunswick fishway indicate no Blueback Herring use the fishway to reach historical spawning areas. In 2016, MDMR began stocking Blueback Herring into the Androscoggin River. Adults captured at the Lockwood Project fishlift in the Kennebec River are released into the Pejepscot Project headpond.

It is not clear whether ineffective passage at Brunswick or some other factor is the major impediment to restoration of Blueback Herring to the Androscoggin River. Because adults will not use or cannot use the Brunswick fishway, they are unable to access approximately two-thirds of historical Blueback Herring spawning and nursery habitat on the mainstem Androscoggin (Table 4). The remaining historical spawning habitat is located above one to six dams on the Little Androscoggin River.

Atlantic Salmon

Foster and Atkins (1867) reported that Atlantic Salmon ascended as far as Rumford Falls on the mainstem and as far as Snows Falls on the Little Androscoggin River. Lack of fish passage currently prevent this species from reaching historical habitat in the Little Androscoggin and on the mainstem above Lewiston Falls. Removal of a non-hydropower dam in the Little River in 2009 by multiple stakeholders[3] provided access to a small part of the species' historical habitat (Table 6).

The amount of natural reproduction occurring in the Androscoggin watershed is not known. Adult Salmon are passed upstream at the Brunswick fishway after being counted, measured, and having a scale sample taken (Table 7). Fisheries agencies do not currently monitor salmon passage at the Pejepscot and Worumbo fishlifts, but a radio telemetry study (Pasterczyk et al. 2012) and video monitoring from 2007 through 2016 found that some salmon pass Worumbo. In past years, electrofishing surveys have discovered juvenile Atlantic Salmon utilizing nursery habitats in Little River. Periodic biological surveys of this tributary indicate Atlantic Salmon and trout utilize this habitat to some degree, but habitat quantity and quality on the Little River has not been assessed in recent years. DMR currently does not stock any salmon life stages in the Androscoggin. Local school programs raise a limited number of Atlantic Salmon fry and release them into the Little River in May, but these fish probably make little or no contribution to the returning population.

In 2009 the National Marine Fisheries Service and the U. S. Fish and Wildlife Service expanded the existing Distinct Population Segment of Atlantic Salmon to include the Androscoggin River.

[3] Atlantic Salmon Federation, Maine Council-Atlantic Salmon Federation, Androscoggin River Alliance, Maine Department of Marine Resources, U.S. Fish and Wildlife Service, NOAA Fisheries, Miller Industries, Inc., Stantec Consulting Services, Inc., Gulf of Maine Council on the Marine Environment, Shaw Brothers Construction, Inc. and the Natural Resource Conservation Service.

All of the Atlantic Salmon that occur in the Androscoggin River are now federally listed as endangered under the Endangered Species Act, and the habitat they occupy is federally listed as Critical Habitat.

American Eel

The American Eel is a catadromous species that spawns in the Sargasso Sea. Juveniles can use a variety of habitats (estuaries, lakes, ponds, rivers, streams, and marshes) to grow to adulthood, which may take up to 30 years in Maine. During a 2003 boat electrofishing survey of the Androscoggin River, Yoder (2009) documented American Eel in the Androscoggin River estuary and the Androscoggin River to the Deer Rips impoundment.

The hydropower projects within the scope of this fisheries management plan were licensed before state and federal resource agencies recommended upstream and downstream passage for American Eel or had design criteria for these facilities. Facilities designed for anadromous species are ineffective for American Eel. To date, only the Weston Project has upstream passage designed for American Eel, which was installed in conjunction with the repair of the dam.

Shortnose Sturgeon

The Shortnose Sturgeon was listed as endangered on March 11, 1967, and was subsequently listed as endangered throughout its range with enactment of the Endangered Species Act (ESA) in 1973. Shortnose Sturgeon attain a maximum length of about 120 cm, a maximum weight of 24 kg, and a maximum age of 50-60 years. Adult Shortnose Sturgeon are similar in appearance to similar-sized juvenile Atlantic Sturgeon with which they co-occur. The two species can be distinguished by the ratio of mouth to the bony interorbital width.

Shortnose Sturgeon are known to spawn in only two river systems in Maine, the Androscoggin River and the Kennebec River. In the Androscoggin River, spawning has been documented in the area between Brunswick Dam and the railroad bridge. Shortnose Sturgeon spawn over a variety of hard substrates (gravel, cobble, rubble, or ledge) in mid-spring (late April through early June).

Atlantic Sturgeon

The Gulf of Maine (GOM) Distinct Population Segment (DPS) of Atlantic Sturgeon was listed as threatened under the ESA in 2012. At the same time, the New York Bight DPS, Chesapeake Bay DPS, Carolina DPS, and South Atlantic DPS of Atlantic Sturgeon were each listed as endangered under the ESA. Atlantic Sturgeon can attain a maximum length of 4.26 m, a maximum weight of more than 364 kg, and a maximum age of 60 years.

Atlantic Sturgeon also are known to spawn in only two river systems in Maine, the Androscoggin River and the Kennebec River. In the Androscoggin River, spawning has been documented in the area between Brunswick Dam and the railroad bridge. Atlantic Sturgeon spawn over a variety of hard substrates (gravel, cobble, rubble, or ledge) in mid-summer (mid-June through mid-July).

Striped Bass

Two distinct groups of Striped Bass occupy the Androscoggin River estuary: a large mixed stock of fish from southern spawning populations (Chesapeake Bay, Delaware River, Hudson River) that migrate into Maine's waters to feed, and a much smaller restored native population that spawns somewhere in the Kennebec River or Androscoggin River. A recreational fishery for Striped Bass occurs downstream of the Brunswick Dam.

Although some Striped Bass, primarily juveniles, swim up the Brunswick Project fishway, MDMR currently does not pass them into the Brunswick Project headpond. The existing downstream passage routes at the Brunswick Project (spillway, turbines, and downstream passage pipe) would likely not be safe, timely, or effective.

Rainbow Smelt (anadromous)

The range of Rainbow Smelt on the Atlantic Coast of the United States has been contracting over the last century. Historically Rainbow Smelt were found from Chesapeake Bay to Labrador but are now only found east of Long Island Sound. Rainbow Smelt are a small, short-lived anadromous fish that occupy near-shore coastal waters and typically spawn in the spring in coastal rivers immediately above the head-of- tide in freshwater. However, the species also spawns in the mainstem Androscoggin River. MDMR biologists have observed Rainbow Smelt spawning along the outer wall of the Brunswick Project fishway.

Sea Lamprey

The Sea Lamprey is an anadromous fish that is native to coastal North Atlantic watersheds. The adults enter rivers and streams in spring to spawn. Unlike other anadromous species, they do not home to their natal waters to reproduce. Females lay their eggs in shallow, excavated depressions (nests) in fast moving water. After hatching, the larval Sea Lamprey remain in the nest for 4-5 days during which time they develop gills, pigmentation and buccal hood and become known as ammocoetes. The ammocoetes drift downstream, burrow into the mud, and remain in the substrate for 4-8 years where they filter feed on planktonic drift. Eventually, they emerge from their burrows and metamorphose into transformers, the migration life stage which is similar to the final adult form. The number of Sea Lamprey that annually ascend the Brunswick fishway was low for many years (0-28 individuals between 1999 and 2011), but has increased recently (19-240 individuals since 2012).

Freshwater species

The MDIFW has responsibility for managing fish that complete their life cycle entirely within freshwater. During a recent boat electrofishing survey of the mainstem Androscoggin River, Yoder (2006) identified 27 species of "nonmigratory freshwater" fish that occurred in the nontidal portion of the river (Table 2). Two additional nonmigratory species (Common Carp and White Catfish) were found only in the estuary. MDIFW records indicate that additional freshwater species including landlocked Alewife occur elsewhere in the drainage (Table 2). Both warmwater and coldwater fishes occupy suitable habitats within the drainage. Some

freshwater species are native, others are native to Maine but not to the watershed, and some are nonnative species that have been introduced. The composition of the freshwater fish community is similar to neighboring rivers in southern-central Maine.

Eight species, including landlocked Atlantic Salmon, Brook Trout, landlocked Rainbow Smelt, Lake Trout, Rainbow Trout, Brown Trout, Smallmouth Bass, and Largemouth Bass are of particular interest, and are actively managed for recreational sport fisheries by MDIFW. The first four species are native to Maine and the latter four are not. Native species are a priority focus of MDIFW management, where conditions allow for successful management. However, ongoing illegal and unauthorized introduction of both native and nonnative fish in the Androscoggin River drainage (and other drainages in southern-central Maine), and resulting negative interactions, as well as other anthropogenic factors have complicated and compromised efforts to successfully manage for some native sportfish. Consequently more tolerant species of nonnative trout are stocked to provide desirable recreational cold water angling opportunities which contribute to Maine's recreational freshwater fishery valued at $371,829 in 2011 (USFWS 2011).

Active stocking of hatchery raised trout and salmon is necessary to sustain most cold-water fisheries within headwater lakes and ponds. Generally, these lakes and ponds provide very good adult habitat, but lack suitable spawning and nursery streams required to support natural reproduction for salmonids. River and stream stocking of legal-size trout supports both seasonal and season-long fisheries where angler exploitation exceeds recruitment from wild stocks.

The MDIFW has developed detailed statewide management plans for all major freshwater sportfish, as well as some species of "minor" importance. These statewide plans provide guidance regarding the development of water-specific management goals and objectives. These statewide plans may be viewed on MDIFW's web site (www.mefishwildlife.com).

Landlocked Atlantic Salmon

Landlocked Atlantic Salmon are indigenous to Maine, but are not native to the Little Androscoggin River drainage, including the three headwater lakes where they are annually stocked. Management on these three waters is detailed below.

Thompson Lake supports a regionally significant sport fishery for landlocked salmon, second in importance to the fishery provided in Sebago Lake. The lake is stocked annually with sublegal size salmon in the spring. Existing recreational fishing regulations support the development of a multi-age class fishery. The adult salmon population is monitored annually in the fall with trap nets. Annual data collection supports timely management decision-making regarding stocking levels, regulations, and other management needs on this important fishery. Thompson Lake also supports a secondary sport fishery for a self-sustaining. introduced population of lake trout (togue). The success of both fisheries, in particular the salmon fishery, is critically dependent upon a sustainable and abundant supply of landlocked Rainbow Smelt forage.

Tripp Lake supports a predominantly put-and-take fishery for legal salmon (retired hatchery brood) that are stocked in the fall. A lack of abundant landlocked Rainbow Smelt precludes

stocking smaller sublegal spring yearling salmon with any expectation of reasonable growth. This water is also managed for stocked brown trout, which are not as dependent upon landlocked Rainbow Smelt for acceptable growth and survival.

Pennesseewassee Lake (also known as Norway Lake) also supports a predominantly put-and-take fishery for legal (retired hatchery brood) and near legal size (fall yearlings) salmon that are both stocked in the fall. The lack of abundant landlocked Rainbow Smelt has precluded stocking smaller sublegal spring yearling salmon with any expectation of reasonable growth. This water is also currently stocked annually with fall yearling landlocked Rainbow Trout. A population of non-native landlocked Alewife recently established as the result of an illegal introduction.

Landlocked Rainbow Smelt

Populations of landlocked Rainbow Smelt occur in Taylor Pond, No Name Pond, Thompson Lake, Pennesseewassee Lake, Little Pennesseewassee Lake, and the Range ponds. Smelt may also be present in other waters, but their presence has not been recently documented. Landlocked Rainbow Smelt are indigenous to Maine and provide an important source of forage for native and non-native sportfish. They also support recreational hook-and-line and spring dipnet fisheries. In addition, landlocked Rainbow Smelt are harvested commercially and sold to anglers as bait. Fish that may compete directly or indirectly with smelt are a significant management concern, particularly in lakes where cold-water fisheries depend upon smelt as an important source of forage or where existing recreational or commercial fisheries are present. Smelt populations are managed consistent with the Department's smelt management priorities for use as forage fish, recreational harvest, and commercial harvest. There is considerable public pressure to manage smelt resources for a variety of different user groups and to increase smelt populations to satisfy various recreational and commercial interests.

Depleted populations of smelt have, in some instances, been restored or enhanced by transferring eggs collected from other land-locked populations. However, the introduction of new species of fish that compete with and prey upon smelt is believed to be the leading cause in the collapse and loss of smelt populations in southern Maine, and in most of these waters smelt restoration is not feasible.

Togue (Lake Trout)

An introduced, wild, self-sustaining togue population resides in both Middle Range Pond and Thompson Lake. Togue prefer areas of deep cold water found in both lakes and provide a popular recreational fishery in both waters. An abundance of landlocked Rainbow Smelt, particularly in Thompson Lake, sustains these robust fisheries.

Rainbow Trout

Stocked recreational fisheries exist in the Little Androscoggin River, Middle and Upper Range Ponds, and Pennesseewassee Lake. All these waters are heavily fished by recreational anglers and the presence of a quality Rainbow Trout fishery is at least partially responsible for generating the level of public use. Stocking Rainbow Trout into Pennesseewassee Lake played a

key role in redeveloping a quality coldwater fishery. Additional opportunities to enhance recreational angling by stocking Rainbow Trout may be expanded to other waters in the lower Androscoggin River drainage where existing efforts to produce acceptable coldwater fisheries are unsuccessful and where consistent with MDIFW stocking policies regarding the management of this nonnative fish.

Brown Trout

Recreational fisheries for stocked Brown Trout exist in several tributaries to the Androscoggin, including the Little River, and the Little Androscoggin River, as well as several ponds, including Middle, Upper, and Lower Range Ponds, Tripp Lake, Little Pennesseewassee Lake, and Worthley Pond. Like Rainbow Trout, Brown Trout are not native to Maine, and as a result stocking and management is restricted, and subject to MDIFW stocking policies. Brown trout can survive and grow in waters unable to support native trout and salmon.

Smallmouth Bass and Largemouth Bass

Both Smallmouth and Largemouth Bass are widespread throughout the lower Androscoggin River drainage. Most lakes and ponds in the drainage support both species of bass. Smallmouth Bass were introduced to Maine waters in 1869 and Largemouth Bass arrived in the late 1800's. Maine's Fisheries Commissioners supported the earliest introductions of bass in southern and central Maine. While "authorized" introductions accounted for some of the bass introductions, the vast majority resulted from illegal, unauthorized introductions by the public.

Fishing for Smallmouth and Largemouth Bass has become increasingly popular with anglers. A recent survey conducted by MDIFW (2010 unpublished) revealed that Smallmouth Bass are a preferred fish by nonresident anglers. Smallmouth and Largemouth Bass, although not native, are considered a traditional fishery in parts of Maine where they have been established for some time. These long-established, self-sustaining populations are managed by the MDIFW using various resource assessment strategies and appropriate regulations.

Generally, bass provide very popular, long-standing sport fisheries in the lower Androscoggin River drainage, particularly in most of the headwater lakes and ponds and the Androscoggin River, and to a lesser extent the main stem of the Little Androscoggin River. Some of these fisheries are known to provide bass of large size quality and are actively managed by MDIFW.

Smallmouth and Largemouth Bass are also considered an invasive fish where new populations establish outside their "historical" distribution. These new populations are not afforded the same management considerations and regulatory protections afforded to "historical populations".

Northern Pike

Northern Pike are an invasive fish that have more recently been established, providing a recreational fishery in the Androscoggin River, including the tidal section of the river below Brunswick Dam. Pike are also present in several headwater ponds including Sabbatus Lake, Little Sabattus Pond, Taylor Pond, and No Name Pond. Pike are generally characterized by large

size and their popularity amongst anglers is on the rise. Pike are not actively managed by MDIFW

Brook Trout

Wild Brook Trout are indigenous throughout the lower Androscoggin River drainage, and are particularly abundant in the smaller tributaries that flow into the Androscoggin and Little Androscoggin rivers. When seasonal water temperatures are not limiting wild Brook Trout may be found in the Androscoggin and Little Androscoggin rivers. Unfavorable seasonal water temperatures in both rivers discourage development of successful season-long sport fisheries for wild Brook Trout. The annual stocking of legal-size, less temperature sensitive Brown Trout and Rainbow Trout create season-long recreational angling opportunities in the Little Androscoggin River.

Past stocking of Brook Trout, brown trout, and even landlocked salmon in the mainstem of the lower Androscoggin in the 1980's and 1990's failed to develop a successful cold-water fishery, and consequently was largely suspended with one exception. Legal size Brook Trout continue to be stocked annually at one location (below Worumbo Dam) on the Androscoggin River to provide a put-and-take spring fishery in this well populated area.

Legal size fall yearling Brook Trout (12–14 inches) are also planted in some of the ponds and lakes currently stocked with Brown Trout and Rainbow Trout, including Middle Range and Upper Range Ponds, Worthley Pond, and Little Pennesseewassee Lake. This relatively new expanded program focuses on providing expanded opportunities to catch native Brook Trout. Another similar program relies on stocking smaller advanced fingerling Brook Trout (8–10 inches) to provide winter fisheries on smaller waters including Worthley Pond, and Little Pennesseewassee Lake. These catchable trout fisheries are typically short lived, providing good early winter angling. Consequently this type of program enhances or compliments other existing stocking initiatives designed to create year-round, multi-age class fisheries and improved size. However, in some situations where conditions do not favor the development of year-round coldwater fisheries, stocking may be limited to only that provided under the catchable trout program.

Tributaries of the lower Androscoggin River that are currently stocked each spring with Brook Trout include Newell Brook, Little River, Greeley Brook, and Meadow Brook. This stocking program utilizes legal-size fish to maintain a spring through early summer fishery, where angler use exceeds wild recruitment.

Habitat Use

Androscoggin River Estuary

- Historical and current migratory corridor and growth habitat for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, Atlantic Sturgeon, Shortnose Sturgeon, Rainbow Smelt, Striped Bass, and Sea Lamprey; and

- Historical and current spawning and nursery habitat for American Shad, Blueback Herring, Atlantic Sturgeon, Shortnose Sturgeon, Rainbow Smelt, and perhaps Striped Bass and Sea Lamprey.

Lower Androscoggin from Brunswick Dam to Lewiston Falls

- Historical migratory corridor for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, Striped Bass, and Sea Lamprey;
- Current migratory corridor for Alewife, American Shad, Atlantic Salmon, American Eel, and Sea Lamprey;
- Historical spawning and nursery habitat for American Shad, Blueback Herring, and Atlantic Salmon;
- Current spawning and/or nursery habitat for Alewife (suboptimal) and American Shad;
- Historical and current growth habitat for Alewife, American Shad, Blueback Herring, and American Eel;
- Current spawning, nursery, and growth habitat for numerous freshwater fish, including Smallmouth Bass; and
- Current put-and-take Brook Trout stocking program below Worumbo Dam.

Little Androscoggin River

- Historical migratory corridor for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, Sea Lamprey, and Striped Bass;
- Current migratory corridor for emigrating Alewife (stocked adults and their offspring);
- Historical spawning and nursery habitat for American Shad and Blueback Herring;
- Historical and current growth habitat for Alewife and American Eel;
- Historical holding, spawning and nursery habitat for Atlantic Salmon;
- Historical and current seasonal migratory corridor and seasonal habitat for wild native Brook Trout;
- Current season-long, cold-water fishery for stocked Brown Trout and Rainbow Trout;
- Current seasonal habitat for wild Brook Trout populations within the drainage; and
- Current spawning, nursery, and growth habitat for numerous freshwater fish, including Smallmouth Bass.

Taylor Pond, Marshall Pond, Lower Range Pond, and Worthley Pond

- Historical spawning and nursery habitat for Alewife;
- Current spawning and nursery habitat for stocked Alewife;
- Current habitat for self-sustaining populations of numerous freshwater fish; and
- Current put-grow-and-take fishery for stocked Brown Trout and a seasonal fishery for stocked Brook Trout in Lower Range and Worthley Ponds.

Upper Range Pond, Middle Range Pond, Hogan Pond, Whitney Pond, Tripp Pond, Thompson Lake, Pennesseewassee Lake, and Little Pennesseewassee Lake

- Historical Alewife spawning and nursery habitat (excluding last two lakes);
- Current habitat for self-sustaining population of numerous freshwater fish;
- Tripp Pond currently supports a put-grow-and take fishery for stocked Brown Trout and a put-and-take winter fishery for brood landlocked salmon.
- Upper Range Pond currently supports a put-grow-and-take fishery for stocked Brown Trout and Rainbow Trout and a seasonal fishery for stocked Brook Trout.
- Middle Range Pond currently supports a self-sustaining lake trout population, a put-grow-and-take fishery for stocked Brown Trout and Rainbow Trout, and a seasonal fishery for stocked Brook Trout.
- Thompson Lake currently supports a self-sustaining Lake Trout population and a put-grow-and-take stocked landlocked salmon fishery with some limited natural reproduction.

Sabattus River

- Historical migratory corridor for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, Striped Bass and Sea Lamprey;
- Current migratory corridor for emigrating Alewife (stocked adults and juveniles);
- Historical spawning and nursery habitat for American Shad and Blueback Herring;
- Historical and current growth habitat for Alewife and American Eel; and
- Current spawning, nursery, and growth habitat for numerous freshwater fish, including Smallmouth Bass.

Sabattus Pond, Little Sabattus Pond, No Name Pond, Loon Pond, and Sutherland Pond

- Historical Alewife spawning and nursery habitat;
- Current spawning and nursery habitat for stocked Alewife; and
- Current spawning, nursery, and growth habitat for populations of warm-water resident fish.

Little River

- Historical migratory corridor for Atlantic Salmon, American Eel, and perhaps Striped Bass and Sea Lamprey;
- Historical and current spawning and nursery habitat for Atlantic Salmon;
- Historical and current self-sustaining population of wild Brook Trout; and
- Current fishery for stocked Brook Trout and Brown Trout.

Public Access

Some level of recreational water access currently exists along the mainstem of the Androscoggin, Little Androscoggin, and Sabattus Rivers.

Main Stem Androscoggin

A town boat launch in Brunswick provides access to the lower section of the mainstem Androscoggin River, including Merrymeeting Bay. A number of water access sites for launching boats exists between the Brunswick Dam and Lewiston Falls. A Town owned car top launch exists in Brunswick above the Brunswick Dam. Boat launches are associated with Pejepscot and Worumbo hydropower stations. Pejepscot has recently developed a canoe portage trail between the Pejepscot and Worumbo Projects. The portage trail continues downstream, providing passage around the Brunswick Hydropower Station. In addition, a state-owned trailered boat launch is located near House Brook in Durham. A Town owned boat launch near the mouth of the Sabattus River also provides access to the Worumbo headpond.

Little Androscoggin

Most of the water access sites used by anglers and other recreational user groups are informal and are either located on private or town owned property traditionally used by the public. Some access is also informally provided at state bridge crossings, including a site off the Hotel Road, where a parking area was constructed for car top access at the request of MDIFW. Informal, unmarked water access reflects the level of access that exists at most of the dams and hydroelectric projects. The only known boat launch designed and constructed by a hydroelectric owner is located off Route 11 in Mechanic Falls.

Traditional and public boat ramps provide access to many lakes and ponds within the drainage.

Sabattus River

A trailered boat launch in Lisbon provides access to the Sabattus and Androscoggin rivers. Sabattus Lake has a public boat launch located in the Town of Sabattus that provides access for trailered boats to the lake. A privately owned traditional access site exists at Little Sabattus Pond (Hooper Pond). No public access for trailered boats exists at No Name Pond, precluding MDIFW from stocking Salmonids.

Recreational Fisheries

Recreational fisheries for diadromous fish occur predominantly in tidewater below the Brunswick Dam, where anglers target American Shad, anadromous Rainbow Smelt, and Striped Bass. On occasion large Brown Trout are caught in the spring and fall. A recent fishery for Northern Pike has developed in the Androscoggin River estuary, and is characterized by large fish. Pike are considered an invasive species, and are not managed by MDIFW.

Recreational fisheries for resident warmwater and coldwater species exist predominantly above the Brunswick Project, throughout the Androscoggin River, Little Androscoggin River, Sabattus River, and Little River. The remainder of this section provides a broad overview of freshwater fisheries in the lower Androscoggin River. More detailed water-specific management details may be obtained in the section entitled "Occurrence, Abundance, and Management".

Improved water quality has certainly increased public interest in fishing on the lower Androscoggin River. Unfortunately, efforts to manage for coldwater fisheries in the lower Androscoggin River have proved challenging even with improvements in water quality. The MDIFW suspended all experimental Salmonid stocking programs in the lower Androscoggin River in the late 1990's, except for a small annual spring put-and-take trout stocking program maintained immediately below Worumbo Dam. The focus of MDIFW management on the lower Androscoggin River is warm water fisheries. Smallmouth Bass, and to a lesser extent Largemouth Bass, provide a popular fishery in the river. In the last five to 10 years, Northern Pike, a nonnative invasive, has become well established and is targeted by a growing number of anglers. Pike are not protected or enhanced for angling

Fisheries for stocked and wild salmonids are provided in some tributaries to the lower Androscoggin River, including the Little Androscoggin River which provides suitable habitat below dams in tailwater and bypass areas, some free flowing sections of river, and tributaries. Many of the headwater lakes and ponds also support wild and stocked salmonids as discussed in Section "Occurrence, Abundance, and Management". Freshwater fish assemblages in virtually all headwater lakes and ponds have become more complex and diverse as compared to historical populations. Along with these landscape changes public expectations and use of these resources has also shifted.

All the ponds in the drainage are managed for self-sustaining warmwater fisheries (Table 8). Six (Upper Range, Middle Range, Lower Range, Tripp, Worthley, and Thompson) of the 10 lakes that were historical Alewife habitat are currently managed for stocked and wild coldwater fisheries.

Management Problems

- Lack of timely and effective upstream and downstream passage at Brunswick Dam for anadromous fish.
- Lack of upstream and downstream passage at dams on the Sabattus River for anadromous and possibly freshwater fish.
- Lack of upstream and downstream passage at dams on the Little Androscoggin River for anadromous and freshwater fish.
- Lack of dedicated upstream and downstream passage for the catadromous American Eel at dams in the Androscoggin River, Little Androscoggin River and Sabattus River.
- Lack of access to all historical lake and pond spawning habitat for Alewife.
- Unregulated, non-hydroelectric dams that impede passage for all fish.
- Loss of stream connectivity and upstream fish passage at some stream-road crossings.
- Impaired water quality.
- Lack of funding for restoration of diadromous fish.

- Lack of suitable minimum flows below some of the hydroelectric projects on the Little Androscoggin River.
- Reduced habitat suitability for freshwater fish and all Salmonids resulting from anthropogenic activities.
- Loss of high-gradient, free-flowing habitat for all Salmonids.
- Conflicting management goals between MDMR and MDIFW.
- Illegal introductions of nonnative species.
- Potential hazardous materials at dam sites in the Sabattus River.

Management Goal

The overarching goal of the Management Plan is to restore and guide management of diadromous fish populations, considering historical and existing natural limitations and the potential for success, while striving to balance the interests of migratory and resident fisheries. The MDMR and MDIFW recognize that the public benefits from the intrinsic, ecological, economic, recreational, scientific, and educational values associated with both resident and migratory fisheries.

Restoration of diadromous fish throughout the lower Androscoggin River drainage is detailed below. Restoration of alewives into the Little Androscogggin River will occur in phases. Phased development offers a methodical strategy to rebuild populations and provides fisheries agencies the ability to assess potential interactions between resident and anadromous species that exist in in some areas.

Reach 1: Androscoggin River Estuary (Merrymeeting Bay to Brunswick Project Dam)

1. Manage Reach 1 as a migratory pathway for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, Striped Bass, and Sea Lamprey and as spawning habitat for Atlantic Sturgeon, Shortnose Sturgeon, American Shad, Blueback Herring, Rainbow Smelt, Striped Bass, and Sea Lamprey.
    a. The MDMR will recommend in-water work windows for any projects that could impact spawning fish.
    b. The MDMR will continue ongoing biweekly beach seine survey conducted in the Androscoggin River estuary to assess juvenile production and growth.

Reach 2: Androscoggin River from Brunswick Project Dam to Lewiston Falls

1. Manage Reach 2 as a migratory pathway for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, Striped Bass, and Sea Lamprey and for sustained production of these species consistent with habitat capacities (if known). The annual production of adult anadromous species in Reach 2 is estimated to be 387,870 Alewife; 84,178 American Shad; 730,664 Blueback Herring; and 182 Atlantic Salmon.

a. The Licensee of the Brunswick Project will:
    i. Improve upstream and downstream passage for anadromous species and test effectiveness no later than 2025[4].
    ii. Provide upstream and downstream passage for American Eel no later than 2031[5].
    iii. Develop fish passage designs, effectiveness testing studies, and operations and maintenance plans for passage facilities in consultation with the state and federal resource agencies.
b. The Licensee of the Pejepscot Project will:
    i. Conduct effectiveness testing of upstream and downstream passage facilities for anadromous species under normal flows and improve upstream and downstream passage as needed for anadromous species no later than 2021[6].
    ii. Provide upstream and downstream passage for American Eel no later than 2025[5].
    iii. Develop fish passage designs, effectiveness testing studies, and operations and maintenance plans for passage facilities in consultation with the state and federal resource agencies.
c. The Licensee of the Worumbo Project will:
    i. Conduct effectiveness testing of upstream and downstream passage facilities for anadromous species under normal flows and improve upstream and downstream passage as needed for anadromous species no later than 2021[6].
    ii. Provide downstream passage for American eel no later than 2027[5].
    iii. Develop fish passage designs, effectiveness testing studies, and operations and maintenance plans for passage facilities in consultation with the state and federal resource agencies.
d. The MDMR will continue the current practice of passing 57,995 Alewife into the Brunswick headpond annually, which represents minimum escapement for currently accessible habitat.
e. The MDMR will continue the annual, interim stocking of Blueback Herring above the Brunswick Project.
f. The MDMR will begin passing additional Alewife and Blueback Herring into the Brunswick headpond as upstream habitat in the Sabattus River and Little Androscoggin River become accessible.
g. The MDMR will continue to pass any adult American Shad that utilize Brunswick fishway into the headpond.
h. The MDMR will continue current practice of passing upstream all Atlantic Salmon that utilize the fishway at the Brunswick Project.
i. The MDMR will pass Striped Bass at the Brunswick, Pejepscot, and Worumbo projects beginning in 2026[7].

[4] Design, construction, and testing to occur before upstream passage into Little Androscoggin is operational.
[5]Two years after License expiration.
[6] Design, construction, and testing to occur under existing license.
[7] The year after downstream fish passage is improved at the Brunswick Project..

j. As resources allow, the MDMR and partners will provide or improve fish passage at priority road crossings and other man-made structures located on tributaries that impede diadromous and freshwater species.

2. Manage species in accordance with the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Plan for American Shad and river Herring, ASMFC's Interstate Fisheries Management Plan for American Eel, and Species Protection Plans for Atlantic Salmon.
    a. The Licensees will comply with conditions of Species Protection Plans for Atlantic Salmon.
    b. The MDMR will monitor the species composition, abundance and demographics of restored diadromous fish populations.
    c. The MDMR will continue to identify and enumerate annual adult returns at the Brunswick Project.
    d. The MDMR will continue to collect biological data (e.g., length, weight, sex, scale for ageing, fin clips for genetics) from weekly samples of adult Alewife, American Shad, Blueback Herring and all Atlantic Salmon to assess restoration success.
    e. The MDMR will assess growth, number, and timing of juvenile alewives leaving lake and pond nursery habitats.

3. Provide recreational angling opportunities for anadromous and freshwater sport fisheries.
    a. The MDMR and MDIFW will enhance opportunities to fish for Striped Bass and American Shad when sufficient numbers of these species are able to access habitat in this reach.
    b. The MDIFW will maintain and where practical enhance sportfish angling opportunities for freshwater Salmonids through its stocking and management programs.
    c. The MDIFW will maintain and where possible enhance the quality of the popular bass fisheries in the Androscoggin River.
    d. The MDMR and MDIFW will maintain or improve existing habitat quality and connectivity to support life stage history requirements of wild and stocked fisheries through agency consultation with state and federal natural resource agencies and all types of environmental review and permitting.
    e. The MDIFW will work to limit the distribution and spread of existing northern pike and other invasive fish.
    f. The MDIFW and Maine Department of Agriculture, Conservation, and Forestry will maintain and where not present establish suitable water access for public use on lakes, ponds, impoundments, and navigable river reaches, including trailered motor boat access, consistent with state agency stocking-access policies.

Reach 3: Sabattus River Drainage and Little River Drainage

1. Manage Reach 3 as a migratory pathway for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, and wild Brook Trout and for sustained production of these species consistent with habitat capacities (if known). The annual production of

adult anadromous species in Reach 3 is estimated to be 509,480 Alewife; 5,577 American Shad; 48,408 Blueback Herring; and 29 Atlantic Salmon.

a. The MDMR and partners will provide fish passage at five dams on the Sabattus River as soon as possible.
b. The MDMR will continue the interim, annual stocking of Alewife at 6 fish/acre in Sabattus Pond, Little Sabattus Pond, Loon Pond, Sutherland Pond, and No Name Pond until upstream and downstream passage make this spawning habitat accessible to migrating fish.
c. As resources allow, the MDMR, MDIFW and partners will provide upstream fish passage at road crossings and other man-made structures located on tributaries that impede diadromous and freshwater species.

4.

2. Monitor the species composition, abundance and demographics of restored diadromous fish populations.
    a. The MDMR will assess growth, number, and timing of juvenile alewives leaving lake and pond nursery habitats.
    b. The MDMR will assess spawning, growth and density of Atlantic Salmon.

3. Provide recreational angling opportunities for freshwater sport fisheries, and protect wild Brook Trout populations.
    a. The MDIFW will maintain and where practical enhance sportfish angling opportunities for freshwater salmonids through MDIFW stocking and management programs.
    b. The MDIFW will reinitiate an annual salmonid stocking program on No Name Pond to enhance recreational fishing opportunities when public access is restored.
    c. The MDIFW will maintain and where possible enhance the quality of freshwater bass fisheries in headwater ponds.
    d. The MDIFW will maintain and where possible enhance smelt populations where they provide recreational or commercial fisheries, and where they provide important forage on which other recreational fisheries depend.
    e. The MDIFW will maintain or improve existing habitat quality and connectivity to support life stage history requirements of wild and stocked fisheries through agency consultation with state and federal natural resource agencies and all types of environmental review and permitting.
    f. The MDIFW will work to limit the distribution and spread of existing Northern Pike and other invasive fish.
    g. The MDIFW will maintain and where not present establish suitable water access for public use on lakes, ponds, impoundments, and navigable river reaches, including trailered motor boat access consistent with state agency stocking-access policies.

Reach 4: Little Androscoggin River Drainage

1. Manage Reach 4 as a migratory pathway for Alewife, American Shad, Blueback Herring, Atlantic Salmon, American Eel, Striped Bass, Sea Lamprey, and wild Brook Trout, and for sustained production of these species consistent with habitat capacities (if known).

The total annual production of adult anadromous species in Reach 4 is estimated to be 1,728,895 Alewife; 37,694 American Shad; 327,188 Blueback Herring; and 368 Atlantic Salmon.

2. Restoration of anadromous Alewife will occur in three phases. During Phase I, the species will have restored access to Taylor Pond, Marshall Pond, and Lower Range Pond. During Phase II, Alewife will have restored access to Upper Range Pond, Middle Range Ponds, Hogan Pond, Whitney Pond, and Tripp Pond. During Phase III, reintroduction of Alewife into Thompson Lake will be reevaluated.

Phase I (Present – 2027)

a. The MDMR will continue interim annual stocking of Alewife (6 fish/acre) in Taylor Pond, Marshall Pond, and Lower Range Pond until upstream and downstream passage makes this spawning habitat accessible to migrating fish.
b. The MDMR and partners will provide upstream and downstream passage at three dams on Taylor Brook no later than 2025, and conduct effectiveness testing.
c. The MDMR and partners will provide upstream and downstream passage at one dam on Range Brook no later than 2027, and conduct effectiveness testing.
d. The Licensee of the Lower Barker's Mill Project will:
    i. Improve downstream passage for diadromous species no later than 2021[8];
    ii. Provide upstream passage for American Eel no later than 2021;
    iii. Provide upstream passage with a sorting facility for anadromous fish no later than 2025[9];
    iv. Develop fish passage designs, effectiveness testing studies, and operations and maintenance plans for passage facilities in consultation with the state and federal resource agencies;
    v. Establish suitable minimum flows to improve habitat by 2025; and
    vi. Provide public access to enhance fishing opportunities.
e. The Licensee of the Upper Barker's Mill Project will:
    i. Provide or improve downstream passage for diadromous species no later than 2025[9];
    ii. Provide upstream passage for American Eel no later than 2025;
    iii. Provide upstream passage for anadromous fish no later than 2025;
    iv. Develop fish passage designs, effectiveness testing studies, and operations and maintenance plans for passage facilities in consultation with the state and federal resource agencies;
    v. Establish suitable minimum flows to improve habitat by 2025; and
    vi. Provide public access to enhance fishing opportunities.
f. The Licensee of the Hackett's Mill Project will:
    i. Provide or improve downstream passage for diadromous species no later than 2026[9];
    ii. Provide upstream passage for American Eel no later than 2026;
    iii. Provide upstream passage for anadromous fish no later than 2026;

[8] Two years after issuance of new license.
[9] Coincides with timing of upstream passage at Upper Barker's Mill.

iv. Develop fish passage designs, effectiveness testing studies, and operations and maintenance plans for passage facilities in consultation with the state and federal resource agencies;
v. Establish suitable minimum flows to improve habitat by 2026; and
vi. Provide public access to enhance fishing opportunities.

g. The Licensee of the Marcal Project will:
i. Provide upstream passage for anadromous fish no later than 2027[10];
ii. Provide upstream passage for anadromous fish no later than 2027;
iii. Provide upstream and downstream passage for American Eel no later than 2039[11];
iv. Develop fish passage designs, effectiveness testing studies, and operations and maintenance plans for passage facilities in consultation with the state and federal resource agencies;
v. Establish suitable minimum flows to improve habitat by 2039; and
vi. Provide public access to enhance fishing opportunities.

h. The owner of the Welchville Dam will provide upstream and downstream passage for diadromous species no later than 2027.

i. The MDMR will begin restoration of Atlantic Salmon into the Little Androscoggin River via egg-planting or transporting adults from the Brunswick Project in 2025.

j. As resources allow, the MDMR, MDIFW and partners will provide upstream fish passage at road crossings and other manmade structures located on tributaries that impede diadromous and freshwater species.

Phase II (Initiated after passage provided at the Welchville Dam)

k. The MDMR will work with the MDIFW, legislature, and lake associations to develop support for restoring anadromous alewives into Middle Range Pond, Upper Range Pond, Hogan Pond, Whitney Pond, and Tripp Pond.

l. The MDMR and MDIFW will evaluate and monitor to assess potential interactions between anadromous alewives and lake sport fisheries, as well as the forage fish they depend upon.

Phase III (Initiated after Alewife restoration has been completed at Middle Range Pond, Upper Range Pond, Hogan Pond, Whitney Pond, and Tripp Pond.

m. The MDIFW, in cooperation with MDMR, will reevaluate concerns regarding interactions between migratory and resident sport/forage fish as they pertain to resident fish management objectives, and explore the viability of extending restoration of alewives to Thompson Lake.

3. Monitor the species composition, abundance and demographics of restored diadromous fish populations.
a. The MDMR will assess growth, number, and timing of juvenile alewives leaving lake and pond nursery habitats.

[10] Per License Article 408, fish passage triggered by a MDMR fishery plan for the Little Androscoggin River.
[11] Two years after issuance of a new license.

b. The MDMR will begin assessment of juvenile Atlantic Salmon populations by electrofishing index sites when adults begin to occupy a particular reach.

4. Provide recreational angling opportunities for freshwater sport fisheries, and protect wild Brook Trout populations.
    a. Maintain and where practical enhance sportfish angling opportunities for freshwater Salmonids through MDIFW stocking and management programs.
    b. Continue successful annual trout stocking programs on the Little Androscoggin River for brown and Rainbow trout.
    c. Maintain quality recreational fisheries for trout and bass in Lower, Middle and Upper Range Ponds.
    d. Maintain quality recreational fisheries for landlocked Atlantic Salmon, lake trout, and Smallmouth Bass in Thompson Lake.
    e. Continue annual Salmon stocking at Thompson Lake and as necessary modify stocking rates to maintain good growth and condition based on annual monitoring of prespawning adults.
    f. Maintain and where possible enhance the quality of freshwater bass fisheries in headwater ponds.
    g. Maximize Smelt production in Thompson Lake in support of southern Maine's second most important landlocked Atlantic Salmon fishery. To that end, preclude the introduction/reintroduction of species that may compete directly or indirectly with Rainbow Smelt, and landlocked Atlantic Salmon.
    h. Maintain and where possible enhance Smelt populations where they provide recreational/commercial fisheries, and where they provide important forage on which other recreational fisheries depend.
    i. Maintain or improve existing habitat quality and connectivity to support life stage history requirements of wild and stocked fisheries through agency consultation with state and federal natural resource agencies and all types of environmental review/permitting.
    j. Limit the distribution and spread of northern pike and other invasive fish.
    k. Maintain and where not present establish suitable water access for public use on lakes, ponds, impoundments, and navigable river reaches, including trailered motor boat access consistent with state agency stocking-access policies.
    l. Develop equitable and long term provisions for public boat access at Thompson Lake that provides safe launching and parking for trailered boats.

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Table 1. Details of barriers located in the lower Androscoggin River. A barrier is either a licensed hydropower project (L), an exempt hydropower project (E), a nonjurisdictional hydropower project (NJ), or a nonhydropower dam (N). A star (*) indicates downstream passage is interim and seasonal.

Drainage/Barrier	Status	License expiration	Height (ft.)	Passage up	Passage down
Androscoggin River					
Brunswick Dam	L	2/28/2029	40	Yes	Yes
Pejepscot Dam	L	8/31/2022	22	Yes	Yes
Worumbo Dam	L	11/30/2025	19	Yes	Yes
Little Androscoggin River					
Lower Barker's Mill Dam	L	1/31/2019	50	No	Yes*
Upper Barker's Mill Dam	L	7/31/2023	30	No	Yes*
Littlefield Dam (breached)	N				
Hackett's Mill Dam	L	8/31/2024	8	No	Yes*
Marcal (Mechanic Falls) Dam	L	6/30/2037	10	No	Yes*
Welchville Dam	N		6	No	No
South Paris Dam	N		15	No	No
Biscoe Falls Dam	E		6	No	No
Taylor Brook Dam-Auburn	N			No	No
Taylor Brook Dam-Steven's Mill	N			No	No
Taylor Brook Dam 3	N			No	No
Lower Range Pond Outlet Dam	N			No	No
Thompson Lake Dam	N			No	No
Pennesseewassee Lake Outlet Dam 1	NJ				
Pennesseewassee Lake Outlet Dam 2	N				
Pennesseewassee Lake Outlet Dam 3	N				
Sabattus River					
Juliet Dam (1-lowermost)	N		8	No	No
Farwell Dam (2)	N		21	No	No
Mill Street Dam - breached (3)	N		6	No	No
R.J. Fortier Dam (4)	N		12	No	No
Mill Dam (5)	N			No	No
Sabattus Dam (6 uppermost)	N		6	No	No

Table 2. List of diadromous and freshwater species included in this management plan. Asterisk indicates fish found during a survey of the river from Errol, NH to Brunswick, ME (Yoder 2006).

Common name	Scientific name	Habit	Status
Alewife	Alosa pseudoharengus	D	native
American Eel	Anguilla rostrata	D	native
American Shad	Alosa sapidissima	D	native
Atlantic Salmon	Salmo salar	D, F	native
Atlantic Sturgeon	Acipenser oxyrinchus	D	native
Atlantic Tomcod	Microgadus tomcod	D	native
Blueback Herring	Alosa aestivalis	D	native
Rainbow Smelt	Osmerus mordax	D, F	native
Sea Lamprey	Petromyzon marinus	D	native
Shortnose Sturgeon	Acipenser brevirostrum	D	native
Striped Bass	Morone saxatilis	D	native
Black Crappie	Pomoxis nigromaculatus	F	introduced
Blacknose Dace*	Rhinichthys atratulus	F	native
Brook Trout*	Salvelinus fontinalis	F	native
Brown Bullhead	Ameiurus nebulosus	F	native
Brown Trout*	Salmo trutta	F	exotic
Burbot	Lota lota	F	native
Chain Pickerel*	Esox niger	F	introduced
Common Shiner*	Notropis cornutus	F	native
Creek Chub*	Semotilus atromaculatus	F	native
Banded Killifish	Fundulus diaphanus	F	native
Fallfish*	Semotilus corporalis	F	native
Golden Shiner*	Notemigonus crysoleucas	F	native
Lake Chub*	Couesius plumbeus	F	native
Lake Trout	Salvelinus namaycush	F	native
Largemouth Bass	Micropterus salmoides	F	introduced
Longnose Dace	Rhinichthys cataractae		
Longnose Sucker*	Catostomus	F	native
Northern Pike*	Esox lucius	F	introduced
Pumpkinseed Sunfish	Lepromas gibbosus	F	native
Rainbow Trout*	Oncorhynchus mykiss	F	introduced
Redbreast Sunfish	Lepomis auritus	F	native
Rock Bass	Ambloplites rupestris	F	introduced
Slimy Sculpin	Cottus cognatus	F	native
Smallmouth Bass	Micropterus dolomieui	F	introduced
Spottail Shiner*	Notropis hudsonius	F	introduced
White Perch	Morone americana	F	native
White Sucker*	Catostomus commersonii	F	native
Yellow Perch	Perca flavescens	F	native

Table 3. Alewife production potential for historically accessible spawning habitat within the Androscoggin River watershed.

Reach	Surface acres	Alewife production at 235/acre
Sabattus Pond	1,787	419,945
Little Sabattus Pond	25	5,875
Sabattus River	110	25,850
Loon Pond	70	16,450
Sutherland Pond	53	12,455
No Name Pond	123	28,905
Sabattus subtotal	2,168	509,480
Taylor Pond	625	146,875
Marshall Pond	102	23,970
Lower Range Pond	290	68,150
Worthley Pond	42	9,870
Middle Range Pond	366	86,010
Upper Range Pond	391	91,885
Hogan Pond	177	41,595
Whitney Pond	170	39,950
Tripp Pond	768	180,480
Thompson Lake	4,426	1,040,110
Little Androscoggin subtotal	7,357	1,728,895
Brunswick impoundment	313	73,626
Pejepscot impoundment	213	50,035
Worumbo impoundment	1,124	264,209
Lower Barker impoundment	11	2,672
Upper Barker impoundment	142	33,270
Hackett's Mill impoundment	93	21,955
Marcal impoundment	95	22,303
Impoundment subtotal	1,992	468,070
Lake/pond total	9,525	2,238,375
Watershed total	11,517	2,706,445

Table 4. American Shad and Blueback Herring production potential for historically accessible spawning habitat within the Androscoggin River watershed.

Site	Area (acres)	American Shad @50/acre	Blueback Herring @434/acre
Brunswick impoundment	313.3	15,665	135,973
Pejepscot impoundment	212.9	10,646	92,405
Little River	33.0	1,652	14,343
Worumbo impoundment	1124.3	56,215	487,943
Lower Androscoggin subtotal	1683.6	84,178	730,664
Sabattus subtotal	111.5	5,577	48,408
Lower Barker impoundment	11.4	569	4,935
Upper Barker impoundment	141.6	7,079	61,443
Hackett's Mill impoundment	93.4	4,671	40,547
Bog Brook	45.4	2,270	19,707
Mechanic falls impoundment	94.9	4,745	41,189
Welchville impoundment	261.3	13,064	113,392
South Paris impoundment	105.9	5,297	45,976
Little Androscoggin subtotal	753.9	37,694	327,188
Total	2549.0	127,449	1,106,260

Table 5. Number of American Shad from external sources stocked in the lower Kennebec River and number of adult returns at the Brunswick fishway.

Year	Number adult Shad stocked	Number Shad fry stocked	Number adult Shad passed at fishway
1985	115		
1986	224		
1987	92		
1988	513		
1989	414		
1990	354		1
1991	357		
1992	566		
1993	580		1
1994	707		1
1995	1,090		3
1996	312		2
1997	221		2
1998	5		5
1999	357	280,000	87
2000	88	529,000	88
2001	26	308,600	
2002	278	295,725	
2003	425	2,076,369	7
2004	929	538,613	12
2005		96,551	
2006	3		3
2007	207	721,819	6
2008	19	712,286	1
2009			
2010			22
2011			
2012			11
2012			
2013			
2014			
2015			
2016			1,096
2017			1

Table 6. Atlantic Salmon estimated habitat and production based on DeRoche 1967. Smolt estimates are based on 2.5 smolts per unit (1 unit = 100m2). Adult escapement is estimated on a 1:1 sex ratio, 7,200 eggs/female and 240 eggs/unit for saturation.

Reach	Spawning Units	Rearing Units	Smolts	Adults Escapement
Lewiston to Brunswick	84	2,726	6,814	182
Little Androscoggin	10,495	5,518	13,796	368
Little River	883	441	1,104	29
Total	11,462	8,686	21,714	579

Table 7. Annual Atlantic Salmon returns to the Brunswick Fishway.

Year	Total number of Atlantic Salmon passed	Number of hatchery origin	Number of wild origin
1983	21	17	4
1984	91	84	7
1985	21	19	2
1986	81	73	8
1987	26	25	1
1988	14	13	1
1989	19	18	1
1990	185	175	10
1991	21	9	12
1992	15	11	4
1993	44	34	10
1994	25	19	6
1995	16	14	2
1996	39	22	17
1997	1	0	1
1998	4	4	0
1999	5	2	3
2000	4	4	0
2001	5	5	0
2002	2	2	0
2003	3	3	0
2004	12	11	1
2005	10	10	0
2006	6	6	0
2007	21	18	3
2008	18	15	3
2009	24	21	3
2010	9	7	2
2011	44	27	17
2012	0	0	0
2013	2	1	1
2014	3	2	1
2015	1	1	0
2016	7	0	7
2017	0	0	0

Table 8. Current distribution of the 8 freshwater species that are of greatest management interest to MDIFW and two invasive species of concern (*) occurring within lakes/ponds targeted for diadromous restoration. LL indicates land-locked life history.

Lake/pond	LL Rainbow Smelt	Brook Trout	LL Atlantic Salmon	Lake Trout	Rainbow Trout	Brown Trout	Smallmouth Bass	Largemouth Bass	*LL Alewife	*Northern Pike
Sabattus							X	X		X
L Sabattus								X		X
No Name	X						X	X		X
Loon							X			
Sutherland										
Taylor	X						X	X		X
Marshall							X	X		
U Range	X	X			X	X	X	X	X	
M Range	X	X		X	X	X	X	X	X	
L Range	X	X				X	X	X	X	
Worthley		X				X		X		
Tripp	X		X			X	X	X	X	
Hogan	X						X	X		
Whitney	X						X	X		
Thompson	X		X	X			X	X		
Norway	X		X		X	X	X	X	X	
L Norway	X	X				X	X	X		

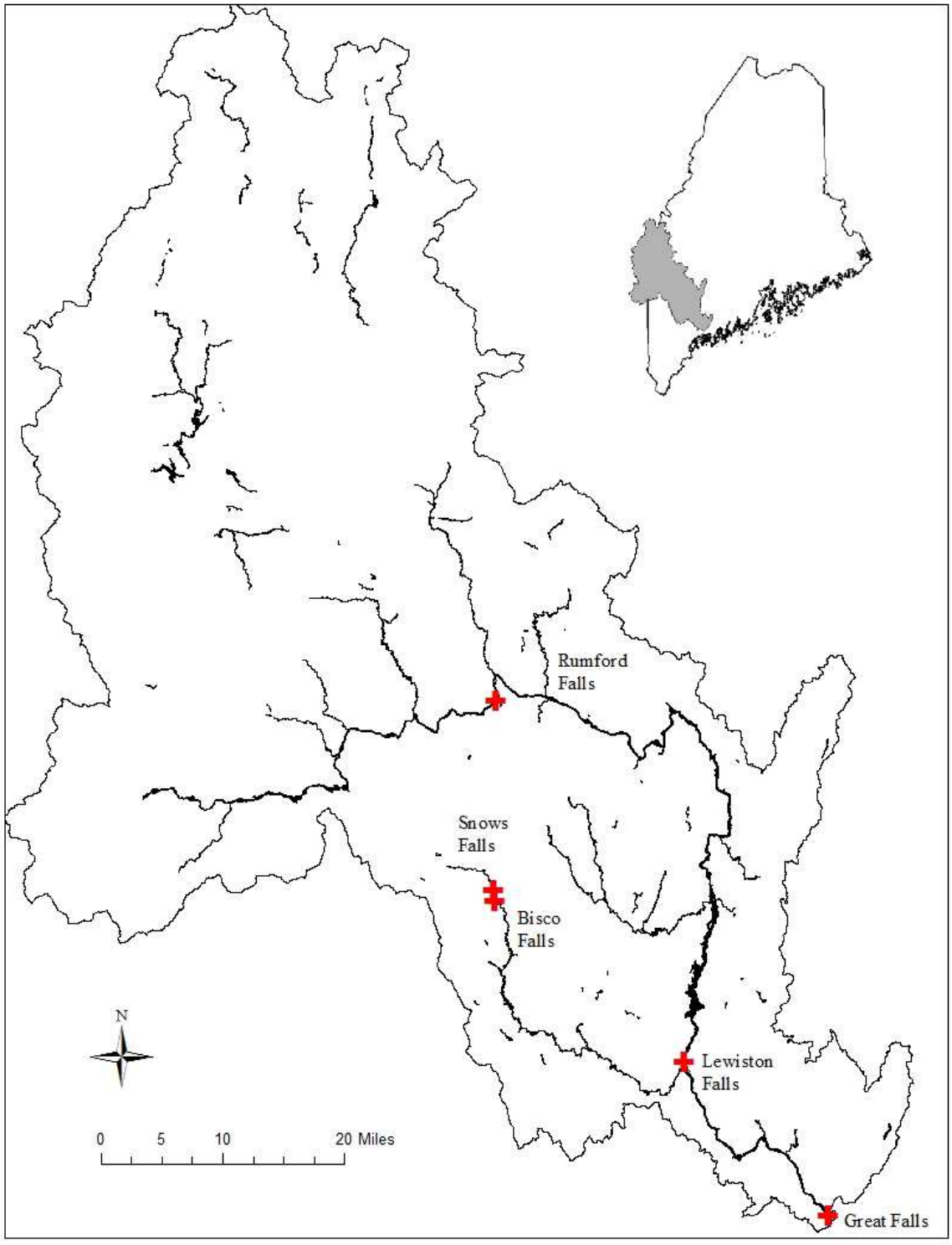

Figure 1. Map of the Androscoggin River drainage showing the location of natural barriers to the upstream migration of diadromous fishes (red crosses) and location of the drainage in Maine (insert).

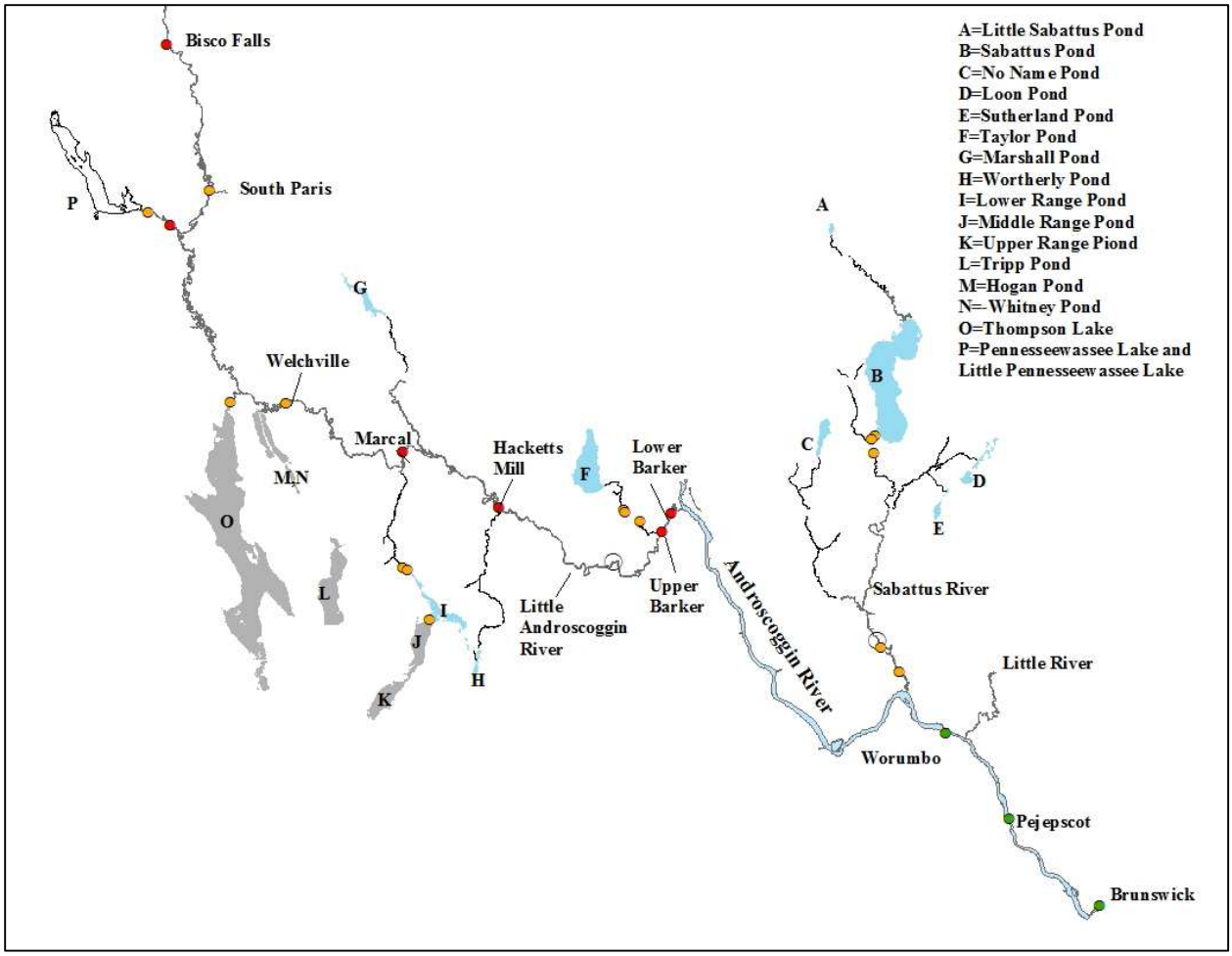

Figure 2. Map of the lower Androscoggin River, Little Androscoggin River, Sabattus River, and Little River showing locations of barriers. Barriers include hydropower dams with upstream and downstream passage (green circles), hydropower dams with downstream passage but no upstream passage (red circles), nonhydropower dams without upstream or downstream passage (orange circles), and two breached dams (unfilled circles). Three dams exist on the outlet of Penneseewassee Lake, but only one of the two nonhydropower dams is visible at this scale. Some lakes and ponds that were historically accessible to Alewife are currently being stocked (blue) while others are not (gray). Based on a recent site visit, Penneseewassee Lake and Little Pennesseewassee Lake were assumed to be not accessible to alewives due to existing natural barriers.

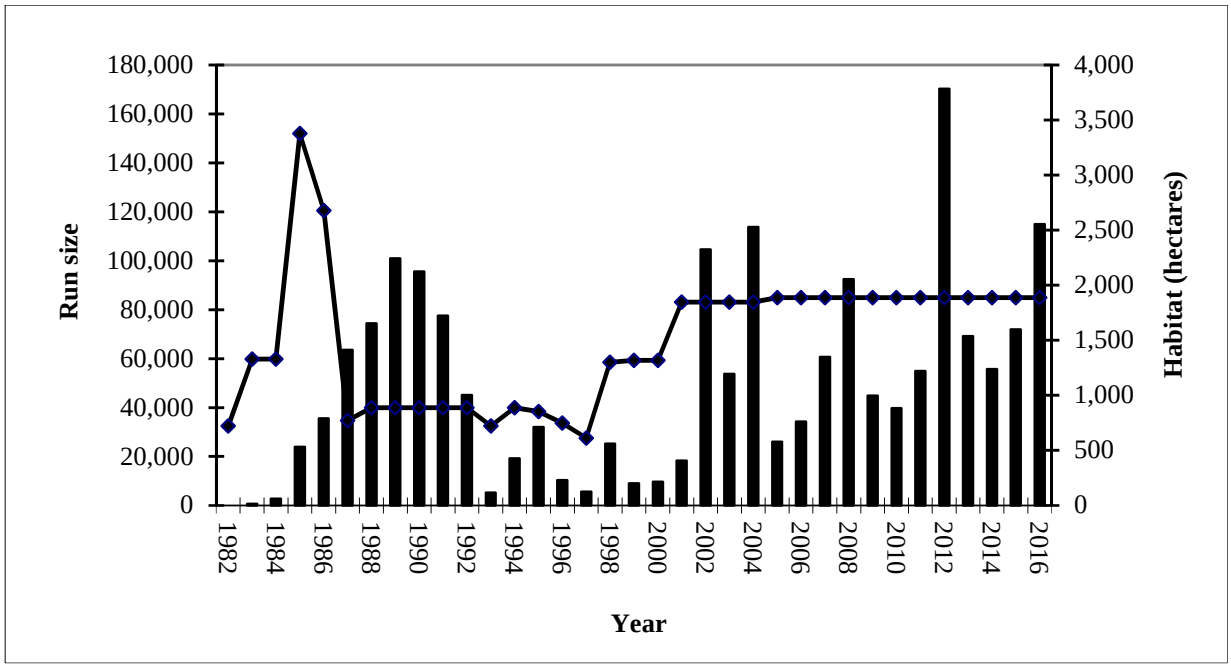

Figure 3. Adult river Herring captured at the Brunswick fishway versus habitat availability in the lower Androscoggin River, 1985-2016.

Appendix A

State of Maine Recovery Plan for American Shad and River Herring, July 1999.
(Amendment 1 to the Atlantic States Marine Fishery Commission Interstate Fishery Management Plan for Shad and River Herring - May 1999.)

State of Maine Anadromous Alewife Restoration Program – 1998.
(A Report to the Joint Standing Committee on Inland Fisheries and Wildlife.)

American Eel (Anguilla rostrata) Species Management Plan, November 1996.
Prepared by the Joint Department of Marine Resources and the Department of Inland Fisheries and Wildlife Committee on American Eel Management for Maine.)

Androscoggin River Anadromous Fish Restoration – 1986.
(Present Status of Obstructions to Alewife and American Shad Passage in the Androscoggin and Little Androscoggin Rivers.)

Androscoggin River Anadromous Fish Restoration -1983. Informational Leaflet # 2-84.

American Shad Management Plan. Completion Report, Project # AFSC-13/FWAC-2.

Anadromous Fish Restoration in the Androscoggin River – 1982.

State of Maine Statewide River Fisheries Management Plan, June 1982.

Potential Impacts of Hydroelectric Development on Anadromous Fish Restoration Plans.