

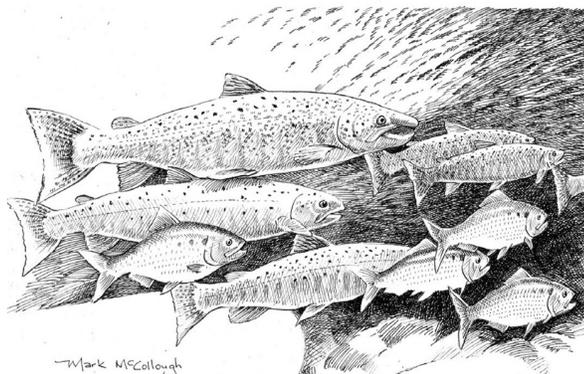


# NOAA FISHERIES

## Penobscot River Habitat Focus Area

# Atlantic Salmon (*Salmo salar*) Information Sheet

### Life History



Atlantic salmon are anadromous, spending portions of their lives in both freshwater and ocean habitats. Atlantic salmon in the Gulf of Maine generally remain in the freshwater regions where they hatched from one to four years before emigrating to the ocean and undertaking an extensive feeding migration to Labrador and Greenland. Adults instinctively return to the rivers where they hatched to spawn

beginning in April and continuing through October. Most of the Atlantic salmon that return to New England rivers do so after two years at sea. Unlike Pacific salmon that die after a single spawning event, Atlantic salmon may spawn more than once in their lifetime. To complete its life cycle, the species must have access to spawning grounds, and juveniles require rearing habitats in rivers and streams.

This dramatic change in habitats (i.e., moving from freshwater to salt water, and then back to freshwater again to spawn) require Atlantic salmon to undergo distinct phases in their life stages where they adapt to specific changes in water temperature, water chemistry, prey fields, and predator suites.

In freshwater, juveniles feed on phytoplankton early in life, and switch to feeding on insects (beetles, mayflies, stoneflies, and caddisflies) during later stages. At sea, Atlantic salmon feed on locally abundant prey including fish (Atlantic herring, sand lance, capelin, alewife, rainbow smelt, cod and haddock, among other species), squid, and invertebrates (krill, amphipods, small shrimps, polychaetes, etc). In terms of predators, young, Atlantic salmon are preyed upon by a number of opportunistic predators, including larger piscivorous fish (striped bass, cod, haddock), birds and mammals. As adults, predation comes from sharks, Bluefin tuna, toothed whales, and harbor and gray seals feeding inshore and in the lower rivers (Dymond 1963).

### Human Use

Epitomized by the annual presentation of the “Presidential Salmon” to the U.S. President from 1912 to 1992, wild Atlantic salmon were historically a fundamental element of New England cultures, economies and ecosystems.

In the Penobscot River basin, Atlantic

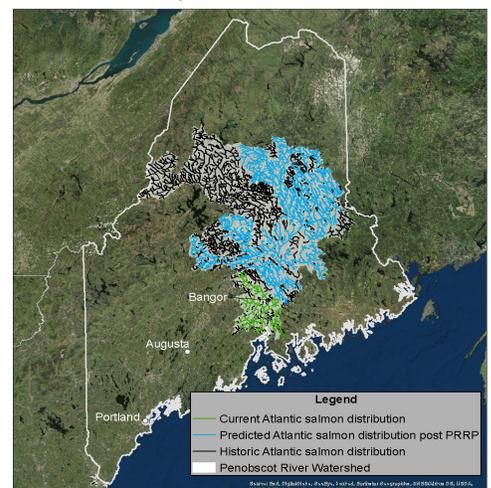


Figure 1. Atlantic salmon distribution within Penobscot watershed

salmon were an important source of food for residents for thousands of years. Early Wabanaki peoples used spears, nets, seines, weirs, and birch bark canoes to harvest Atlantic salmon. Later on, recreational fly fishing and commercial gill net and weir fisheries became primary harvest methods.

Atlantic salmon stocks of the Gulf of Maine have been most affected by human activities, with their runs (i.e., when adults migrate from the ocean to the upper reaches of a river) having been severely depleted since the early 1800s. Although the earliest impacts were from fishing activities, other activities such as water quality degradation and barriers to migration quickly became issues as well. Commercial fishing continued through the 1800s, with catch peaking in 1889 at over 17,000 salmon. Although there were a few exceptions, catches steadily declined until only 40 fish were caught in 1947 (Kocik and Friedland, 2002). The commercial fishery was closed in 1948.

The earliest restoration efforts began in the late 1800s, but were not very successful due to impassable dams and ineffective fish-culture techniques. In the 1960s, restoration efforts were renewed and modern hatchery practices became more productive at enhancing runs (Baum 1997; Colligan et al. 1999). Regardless, population numbers remain extremely low, mostly due to poor marine survival and dam-related impacts (direct and indirect mortality, delayed migrations, limited habitat connectivity, increased predation, etc.).

### Distribution in Penobscot River Watershed

Historically, U.S. Atlantic salmon ranged from the Canadian border to as far south as Long Island Sound. By 1865 Atlantic salmon had been extirpated from southern New England rivers (Colligan et al. 1999).

The Penobscot River once held Maine's largest populations of Atlantic salmon, with annual runs estimated at upwards of 100,000 adults. Prior to the construction of the first mainstem dams in the 1830s, Atlantic salmon accessed vast

amounts of habitat in the headwaters of the Penobscot River for spawning and rearing. Early reports indicated they were found throughout the West Branch of the Penobscot River as far as Penobscot Brook, a distance of over 350 km inland (Atkins 1877). Today, the Penobscot River still supports the nation's largest remaining run of Atlantic salmon, but that number is shockingly low compared to historic levels: Only about 1,000 adults return annually (Saunders et al. 2006).

Today, conservation hatcheries intervene in certain phases of the natural life history of Atlantic salmon to help slow, and hopefully reverse, the decline of wild populations. Individuals that are produced under various conservation hatchery programs are released (stocked) into their natural environment instead of being held captive through adulthood like commercially farmed individuals. Atlantic salmon populations in the Penobscot River are supported by two US Fish and Wildlife Service hatcheries, Craig Brook and Green Lake National Fish Hatcheries.

### Population Status and Regulatory Concerns

A suite of populations of Atlantic salmon were recognized as endangered under the Federal Endangered Species Act (ESA) in 2000; the initial ESA-listing was revised to include a wider geographic area (over half the state of Maine) and a greater number of populations (including the Penobscot) in 2009. These populations are referred to as the Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon. The three primary threats to endangered Atlantic salmon are dams, the inadequacy of existing regulatory mechanisms for dams, and low marine survival (USOFR 2009). A series of other threats (water quality, invasive species, etc.) were designated as secondary and are still of pressing concern throughout the range of Atlantic salmon in the United States. Dams, along with low marine survival, remain the greatest impediment to self-sustaining populations of Atlantic salmon in the United States (NRC 2004). The GOM DPS is co-managed by NMFS, USFWS, the

Maine Department of Marine Resources (ME DMR), and the Penobscot Indian Nation (PIN).

Fortunately, Atlantic salmon demonstrate a remarkable degree of resilience, a trait that fosters optimism in the face of recent declines. Opportunities for recovery lie in providing access to a diverse array of well-connected habitat types and restoring the ecological links Atlantic salmon need to persist. For example, projects that seek to restore river herring and rainbow smelt populations that benefit salmon at many important phases in the salmon's life history will lay the foundation for sustaining Atlantic salmon into the future.

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