

FRESHWATER BIODIVERSITY IN MAINE



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Maine Department of Inland Fisheries and Wildlife**

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EXECUTIVE SUMMARY

Freshwater ecosystems contribute substantially to Maine's landscape diversity. The Maine Aquatic Biodiversity Project (MABP) was designed to review and evaluate what is known about the floral and faunal diversity of these ecosystems. MABP was spearheaded by The Nature Conservancy, the Department of Environmental Protection and the Department of Inland Fisheries and Wildlife. Key issues addressed by MABP include:

- What plant and animal species inhabit lakes and streams in Maine, and where are they found?
- What are the geographic patterns in biodiversity across the state?
- How much do we know about the composition of assemblages of species in lakes and streams? How are these assemblages associated with landscape-level ecosystem attributes?
- How do biological communities in key lake and stream types vary across different regions of the state?
- How much is known about the extent to which freshwater communities are changing / have changed through time?
- What are the key threats confronting freshwater biodiversity in Maine? What information exists to document the impacts of these threats?
- Where are major data gaps?
- What is an effective approach for sharing with a broader audience the biodiversity data accessed by MABP?

Lakes, ponds, rivers, streams and freshwater wetlands comprise about one tenth of the state's surface area. There are more than 6,000 lakes and ponds in Maine and over 31,000 miles of rivers and streams. Although not explicitly covered by MABP, wetlands are critical to Maine's freshwater ecosystems. On average, wetlands comprise about one fifth of the riparian area around Maine lakes. Groups of lakes can be defined based on size and shape (e.g. surface area, depth, perimeter configuration) as well as by a series of landscape-level characteristics (e.g. elevation, degree of connectivity to the surface drainage network, extent of isolation from human settlements and roads, intersection with conservation lands). In the west and northwest regions of the state, about one quarter of lakes are located entirely or partially within lands that are under some form of conservation management. Elsewhere, the percentage of lakes within conservation lands is much lower. Other lake groupings include those based on water quality, especially productivity, color, transparency and acidity.

Biological diversity in Maine today is the result of re-colonization of the region by fauna and flora following deglaciation approximately 13,000 years ago. Because of the relatively recent retreat of the glaciers, species richness in many groups is lower in the Northeast than areas to the south. At the same time, however, Maine lies within a transition zone between south and north. The transitional nature of the state contributes to regional biodiversity.

The most intensively surveyed freshwater faunal groups are amphibians and reptiles, fish, freshwater mussels, odonates and mayflies. For these groups, we have a reasonably complete knowledge of regional diversity, although some parts of the state remain under-sampled. Maine has 18 amphibian species and 10 turtle species (three of which are marine). Three turtle species are currently listed as threatened or endangered. Habitat loss, particularly in southern Maine, is the major threat to amphibians and turtles. Seventy one fish species in Maine spend all or part of their life cycle in freshwater. About 70% of these species are native to the state. Non-native species are more common in the southern and central regions of the state. Diversity of native minnows is highest in northern and western Maine. Introductions over the past 150 years have played a major role in shaping the contemporary fish assemblages of Maine's lakes and streams. Today, illegal introductions continue to threaten the biological integrity of freshwater ecosystems.

A number of ponds are known to be fishless and thus represent relatively unique ecosystems. While there are likely a number of fishless ponds remaining to be discovered, it is known that many fishless ponds have been stocked over the past century or more. While most large lakes in Maine have been surveyed for fish, there are many hundreds of smaller waterbodies that have never been sampled. A network of stream sites is routinely surveyed with standardized protocols, providing a valuable information source for trend assessment. Efforts to quantitatively document the fish assemblages of large rivers have got underway in recent years, thus beginning to fill a major gap in our understanding of the state's ichthyofauna. Extensive fish monitoring occurs in the Atlantic salmon watersheds.

Freshwater mussels are one of the most threatened freshwater faunal groups worldwide. Ten mussel species are present in Maine, two of which are listed as threatened here. Mussel species richness tends to be higher in lower elevation regions of central and eastern Maine. The invasive zebra mussel (*Dreissena polymorpha*) has not yet been found in Maine, although it is known to now exist in neighboring New Hampshire. While many of Maine's waters would probably not be capable of supporting populations of zebra mussel, there are several regions in the state where this species could survive and, possibly, thrive. Maine has similar numbers of odonate and mayfly species (158 and about 170, respectively). Highest odonate diversity occurs in southern Maine, whereas highest mayfly diversity appears to occur in the western part of the state.

For other groups of macro-invertebrates, including crayfish, stoneflies, caddisflies, beetles and snails, survey effort has been much more patchy. With the exception of crayfish, it is likely that current species lists for these groups significantly underestimate actual numbers of species. Furthermore, there are some regions of the state where there are major data gaps. The recent confirmation that the extremely rare, apparently endemic, Roaring Brook mayfly (*Epeorus frisoni*) continues to exist in Baxter State Park serves to further underscore the fact that many of Maine's mayfly species appear to be rare here. Caddisfly species richness is known to be remarkably high in the Tomah Stream area of Washington County. However, little is known about caddisfly diversity in many other parts of the state. Regional patterns in the diversity of snails, aquatic beetles and several other invertebrate groups are poorly understood. There are relatively few crayfish species in Maine. Thus, while survey effort has been variable across the state, the species list is probably complete for this group. More information is needed, however, about the current status of a recently introduced crayfish species.

Assessment of trends in the composition and structure of macro-invertebrate assemblages is complicated by the paucity of consistently-collected data and by changes in taxonomy. The Department of Environmental Protection's (MDEP) stream biomonitoring program nevertheless provides a valuable source of quantitative stream invertebrate data. The fact that many taxa cannot be identified to the species level limits the extent to which these data can be used for documenting temporal variation in species-level assemblage composition.

There are about 130 species of aquatic vascular plants in Maine – the exact number depending on the definition of "aquatic". Plant assemblages have been documented for a number of Maine lakes and rivers. Additional collections of rare species have been, and continue to be, made around the state. Current "rapid bioassessment" surveys of waterbodies are expanding our knowledge of the distribution and frequency of occurrence of plant species. Four species of invasive aquatic plants have been recorded from Maine, with most records being from the southern part of the state. Extensive efforts are currently underway to document new infestations and manage existing populations.

Water quality in many of Maine's rivers has improved substantially over the past 30 years. Nevertheless, a number of factors today threaten the integrity of Maine's freshwater ecosystems. Water quality remains sub-optimal in a number of rivers. Dams and other barriers continue to block fish passage in many river systems. Dam removals have already begun to restore diadromous species to some of their ancestral areas and this process will continue as more dams are removed in the future. At the same time, however, recent dam removals underscore the fact

that these barriers also serve to restrict access of non-native species to upstream lakes and streams. Dams and water withdrawals can modify stream and lake hydrology and thus influence aquatic biodiversity. Water withdrawals are particularly significant in parts of southern, northeastern and Downeast Maine. The issue of water level management is being addressed in a series of proposed management regulations under development by MDEP. Habitat degradation and loss is a major threat for many aquatic groups. Sprawl, especially in the south, continues to destroy valuable wetland habitat. Forestry and agricultural practices, including associated road construction, can impact aquatic habitat via non-point and other source of pollution. As indicated above, species introductions continue to reduce biological integrity throughout Maine. At least for fish assemblages, these introductions are leading to an increasing homogenization of biodiversity in lake and stream systems. Mercury is being increasingly seen as a pervasive threat to aquatic (and terrestrial) systems. A number of mercury hotspots are known to be present in Maine and there is a growing body of information on the effects of mercury of aquatic biota.

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MABP's steering committee donated appreciable amounts of their time getting the project started, and reviewing progress and products. Committee members are:

Nancy Sferra, Dave Courtemanch, Peter Bourque, Cyndy Loftin, Alex Huryn, Rich Dressler, Molly Docherty and Ken Warner.

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