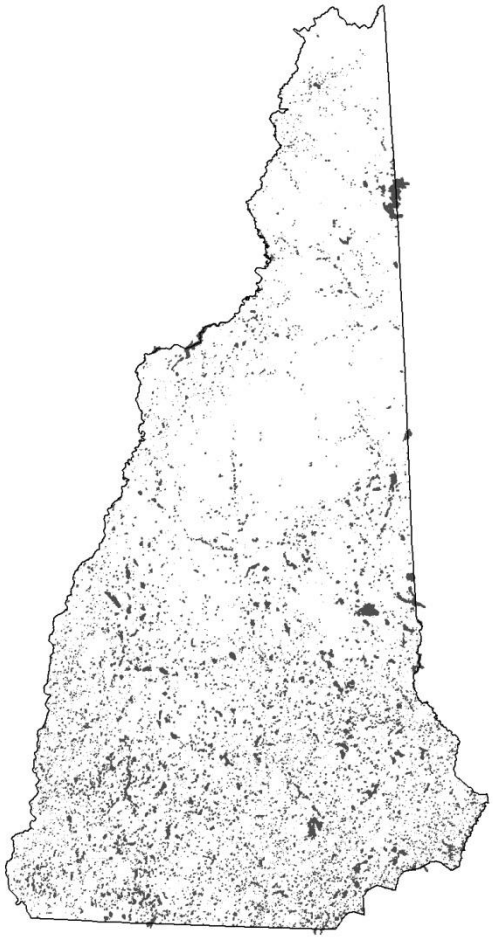
Warmwater Lakes and Ponds

Photo by NHFG



Habitat Distribution Map

Acres in NH: 99,702 ac
Percent of NH Area: 1.68%
Acres of Shoreline within a 100m Buffer Protected: 64,368 ac
Percent Buffer Protected: 37% of warmwater lakes
23% of warmwater ponds

Habitat Description

Warmwater lakes and ponds are defined by their inability to support naturally reproducing populations of coldwater fish species due to a lack of cold, well oxygenated water in the summer. Coldwater fish species are frequently supplemented in these waters but long term survival and reproduction is thought to be minimal. Warmwater lakes and ponds are widespread in New Hampshire and they vary in size, shape, and depth. Bottom substrates also vary from boulder, to sand or mud. One important component of most warmwater lakes and ponds is submerged aquatic vegetation. Usually along the shoreline or in shallow areas of the lake, submerged aquatic vegetation provides critical spawning and nursery habitat for a number of fish species. Predators use aquatic vegetation as cover for ambushing prey. Turtles, amphibians, and fish feed on the abundant invertebrate species that are found on aquatic plants. In warmwater lakes and ponds with undeveloped shorelines, waterfowl and many terrestrial species will use the lake or pond as nesting or foraging habitat.

Justification (Reason for Concern in NH)

Warmwater lakes and ponds are important habitat for a great diversity of aquatic and upland species. Shoreline development and other threats have impacted water quality and degraded habitat

in many warmwater lakes and ponds in New Hampshire.

Protection and Regulatory Status

Regulatory Protections:
Comprehensive Shoreland Protection Act – NHDES
Clean Water Act-Section 404

Regulatory Comments: Although the Shoreland Water Quality Protection Act provides some level of protection for maintaining the water quality of a lake or pond, protected areas of undeveloped shoreline are critical for maintaining healthy aquatic communities. Municipal regulations related to aquatic habitats vary widely throughout the state.

Management Guidelines

- Where water levels are maintained by a dam, avoid unnatural water level fluctuations or deep drawdowns of the lake or pond.
- Protect areas of shoreline from development.
- Manage development and stormwater in the watershed of the lake or pond to reduce the influx of nutrients and other pollutants.
- Avoid broad scale herbicide treatments when managing invasive plant species. These treatments can temporarily reduce oxygen levels and their long term impacts on native plant and animal species are not well understood.

Distribution and Research

The distribution of warmwater lake and pond habitat in New Hampshire is well known. Lake assessment surveys are conducted periodically by NHDES at waterbodies throughout the state.

Relative Health of Populations

The habitat quality of warmwater lakes and ponds varies greatly in New Hampshire. At one end of the spectrum are lakes and ponds with completely developed shorelines and chronic issues with nutrient loading and cyanobacteria blooms. At the other end of the spectrum are remote ponds with undeveloped shorelines and unpolluted water. Ponds with largely undeveloped shorelines are relatively rare in New Hampshire due to the popularity of shorefront real estate. Relatively undeveloped lakes and ponds should be the focus of land protection efforts due to the value of the upland and aquatic interface to so many different species. Many studies have documented the impairment of aquatic communities that results from high densities of shoreline development (Bryan and Scarnecchia 1992; Hicks and Frost 2011). Some lakes and ponds in New Hampshire are also impacted by excessive water level drawdowns which degrade submerged aquatic plant communities and may expose reptiles, amphibians, and aquatic invertebrates to desiccation and freezing temperatures during hibernation. Invasive species are altering both aquatic plant and animal communities in a growing number of water bodies. Once established, invasive species are nearly impossible to eradicate and some removal efforts may cause further damage to native species.

Habitat Condition

A set of GIS data was used to assess ecological condition of each habitat type. Chapter 3 describes the methodology. The data used for this habitat is described below.

Local Condition (200m shoreline buffer) Categories

1	buffer >=90% natural/ no dams/ nearest road or trail is >1 mi
2	buffer >=90% natural/ no dams/ nearest road or trail is .5 – 1 mile
3	buffer >=90% natural/ no dams/ nearest road 500m -.5 mile
4	buffer >= 90% natural/no dams/ nearest road < 500m
5	buffer < 90% natural/no dams/ any remoteness
6	Dams

Watershed (HUC12) Condition Categories

1	HUC12 Watershed Very Intact: >= 90% Natural Cover
2	HUC12 Watershed Lightly Impacted: 80-90% Natural Cover and <10% developed
3	HUC12 Watershed Impacted: All Others

Threats to this Habitat in NH

Threat rankings were calculated by groups of taxonomic or habitat experts using a multistep process (details in Chapter 4). Each threat was ranked for these factors: Spatial Extent, Severity, Immediacy, Certainty, and Reversibility (ability to address the threat). These combined scores produced one overall threat score. Only threats that received a "medium" or "high" score have accompanying text in this profile. Threats that have a low spatial extent, are unlikely to occur in the next ten years, or there is uncertainty in the data will be ranked lower due to these factors.

Habitat degradation from altered flow regimes due to water level management (Threat Rank: High)

Unnatural water level fluctuations alter upstream lake and pond habitat. Lake drawdowns, usually during winter, reduce shoreline plant communities and expose aquatic organisms to desiccation. Poor recruitment may be an issue for species that spawn on shallow reefs or along the shoreline, depending on the timing and extent of the drawdown. River and stream habitat below lakes and ponds may also be impacted as flows are reduced in an attempt to refill lakes or increased rapidly during lake drawdowns.

Aquatic habitat in the littoral zone becomes degraded during excessive water level drawdown, including declines in aquatic macrophytes, invertebrate density, and species diversity. These impacts are linked to overall lake function, including potential influences on nutrient cycling (Zohary and Ostrovsky 2011).

Habitat degradation from point source pollution (Threat Rank: Medium)

Industrial pollutants and pollution from untreated wastewater have been greatly reduced since the passage of the Clean Water Act. However, there are still isolated areas such as superfund sites or combined sewer overflows (CSO's) where pollutants continue to enter aquatic habitats at known locations.

There are 23 Superfund sites and 33 CSO's in New Hampshire (NHDES 2008; NHDES 2012). These sites are carefully monitored with long term plans for reducing their environmental impact.

Habitat degradation from agricultural run-off (Threat Rank: Medium)

Nutrients from agricultural sources, sedimentation, lawn fertilizers, and poorly functioning septic systems contribute to increased algal growth in lakes and ponds. This excess productivity causes reductions in water quality and eventually lowers dissolved oxygen levels as microorganisms consume the dead algal cells, using up oxygen in the process.

Many lakes and ponds in New England show signs of degraded water quality due to cultural eutrophication (USEPA 2010).

Habitat degradation from stormwater run-off from impervious surfaces (Threat Rank: Medium)

Oil based pollutants, sediment, and road salt are washed from roads and parking lots into surrounding waterbodies which can lead to chronic declines in water quality.

Oil based pollutants, sediment, and road salt are washed from roads and parking lots into surrounding waterbodies which can lead to chronic declines in water quality. Warmwater lakes fed by tributaries that flow through urban or suburban areas are more susceptible to pollutants from impervious surface runoff.

Habitat degradation from nutrient loading from lawn fertilizers and contaminated run-off (Threat Rank: Medium)

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Many lakes and ponds in New England show signs of degraded water quality due to cultural eutrophication (USEPA 2010). Increasing development pressure in southern New Hampshire has led to eutrophication issues with many of the water bodies that support aquatic species of concern, including banded sunfish, bridle shiner, redfin pickerel, swamp darter, and eastern pondmussel.

Habitat degradation from nutrient loading due to septic systems (Threat Rank: Medium)

Failed or poorly designed septic systems contribute excess nutrients to aquatic habitats. These nutrients contribute to increased algal growth which may cause reductions in water quality and eventually lower dissolved oxygen levels as microorganisms consume the dead algal cells, using up oxygen in the process. Although septic systems are gradually being improved as older homes are resold and upgraded to meet stricter standards, even well designed septic systems can leach excess nutrients (NHDES 2008).

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Habitat degradation and impacts from introduced or invasive plants (Threat Rank: Medium)

Invasive plant species alter the composition of aquatic plant communities, which may influence the aquatic species that depend on this habitat type.

The density, composition, and structure of aquatic plant communities have a strong influence on the types of species that inhabit nearshore areas. Dense monocultures of nonnative plant species generally support a less diverse community of aquatic species than native communities of aquatic plant species or patchworks of both native and nonnative species (Valley et al. 2004).

Habitat degradation from water withdrawal for irrigation, public water supply, or commercial use (Threat Rank: Medium)

Water withdrawals for irrigation and drinking water can alter seasonal water level fluctuations in lakes and ponds. When these fluctuations are excessive, they can alter shoreline plant communities in lakes and ponds (Zohary and Ostrovsky 2011).

There are a number of waterbodies used as drinking water supplies in New Hampshire. These waterbodies are usually managed to protect water quality, which generally benefits the resident aquatic species. Issues are most likely to occur during periods of drought, when water levels may be drawn down to unusually low levels.

Habitat impacts from fragmentation due to impassable dams (Threat Rank: Medium)

Dams restrict the movement of aquatic species. Most aquatic species make daily and seasonal movements to access spawning habitat and foraging areas. Movement is also required in response to changes in water level, temperature, or water chemistry. Dispersal and colonization of new habitat is critical for long term population viability.

The effect of dams on diadromous fish species have been well documented (Limburg and Waldman 2009). Resident freshwater species are also impacted by dams, but the effects have been less studied. Dams have clearly restricted the dispersal of freshwater mussel species (Watters et al. 1996).

Habitat conversion or degradation due to shoreline development **(Threat Rank: Medium)**

Development along the shoreline of lakes, ponds, and larger rivers degrades critical habitat for aquatic species.

Aquatic plant removal, clearing of trees and branches that fall into the water, shoreline armoring, dock construction, tree and shrub thinning, and lawn maintenance are common practices associated with shoreline development. The cumulative effects of shoreline development combine to reduce habitat quality throughout a waterbody (Bryan and Scarnecchia 1992; Hicks and Frost 2010).

List of Lower Ranking Threats:

Habitat impacts from wastewater treatment sites and associated unmonitored contaminants

Habitat impacts from mercury toxicity

Habitat degradation from run-off pollution (pesticides)

Habitat degradation and impacts from aquatic herbicide application

Habitat degradation from acid deposition Habitat

degradation from stormwater run-off Habitat

impacts from introduced or invasive animals Habitat

impacts from various diseases and parasites

Habitat impacts from fragmentation due to impassable stream crossings

Habitat impacts from increased flood damage

Habitat impacts from unsuitable water temperatures that disturb species life cycles

Actions to benefit this Habitat in NH

Prevent invasive species introductions

Primary Threat Addressed: Habitat degradation and impacts from introduced or invasive plants

Specific Threat (IUCN Threat Levels): Invasive & other problematic species, genes & diseases

Objective:
Prevent the introduction of invasive species, which alter the composition of native ecological communities.

General Strategy:
Whether they are accidental or intentional, invasive aquatic species introductions are notoriously hard to prevent and even more difficult to control. NHDES, NH Lakes Association, and other individual lake and pond groups have had some success preventing invasive aquatic species introductions with public outreach and by staffing boat ramps with trained inspectors, called Lake Hosts. Prevention and early detection is the most effective strategy for limiting the spread of invasive species. Once an introduced species has become established it is nearly impossible to eradicate it. Management efforts to control the species can be costly and requires long term planning. An angler determined to create a new fishing opportunity by stocking a new fish species into a waterbody is hard to deter. Education on the ecological damage that can be caused by introducing nonnative species into a waterbody will help prevent some, but not all deliberate species introductions. In some cases, anglers invested in the existing fishery may make the best advocates against new species introductions. However, outreach will not persuade everyone, so laws, penalties, and adequate funding for enforcement are the last line of defense against species introductions. It is important that penalties are severe enough and the presence of law enforcement is noticeable enough to act as a deterrent. New species introductions are inevitable, but the rate and overall extent of introductions may be contained.

Political Location: **Watershed Location:**

Land Protection

Primary Threat Addressed: Habitat degradation from stormwater run-off

Specific Threat (IUCN Threat Levels): Pollution / Domestic & urban waste water / Run-off

Objective:
Preserve the natural ecological functions of an area by protecting land from development.

General Strategy:
Land protection is a strategy that can be used to ensure a level of habitat quality that is necessary to support certain species and habitats of conservation concern. Many warmwater lakes and ponds have been impacted by shoreline development. Land protection is one strategy for preserving the natural shoreline characteristics that are important to aquatic species. Land protection in the surrounding watershed can also reduce the impacts of nonpoint source pollution on the water quality of a lake or pond. It is rarely practical to protect the entire shoreline or watershed of a waterbody, but land protection can play an important role in a greater conservation strategy. Land protection projects in New Hampshire usually require the coordination of a variety of funding

sources, with involvement from town conservation commissions, local land trusts and watershed associations, government agencies, and state or national NGO's. Since 2005, the NH Wildlife Action Plan has helped direct land protection efforts toward conserving habitat for species and habitats of concern. The effectiveness of land conservation could be improved by identifying and addressing barriers to land conservation in New Hampshire and increasing outreach to help prioritize projects that benefit species and habitats of concern.

Political Location: **Watershed Location:**

Water level management

Primary Threat Addressed: Habitat degradation from altered flow regimes due to water level management

Specific Threat (IUCN Threat Levels): Natural system modifications

Objective:
Reduce the aquatic habitat impacts associated with artificial water level fluctuation at dams.

General Strategy:
Work with dam managers to achieve water level fluctuations that mimic natural flow regimes. Practices such as rapid changes in water level, excessive winter drawdown, and reductions in downstream flow to refill a waterbody should be avoided. Engaging stakeholders, including shorefront property owners, boaters, anglers, and hydropower project owners is critical to changing long established water level management traditions. The NHDES Dam Bureau is the lead on dam management issues in New Hampshire. The best strategy for improving water level management practices for fish and wildlife is to work with the Dam Bureau to identify opportunities to create more natural water level fluctuations at a certain dams and then make slow incremental changes. This allows stakeholders to adjust to the changes and make comments when conflicts arise.

Political Location: **Watershed Location:**

Shoreline Buffer Protection

Primary Threat Addressed: Habitat conversion or degradation due to shoreline development

Specific Threat (IUCN Threat Levels): Residential & commercial development

Objective:
Protect important habitat features along the shorelines of lakes, ponds, and larger rivers.

General Strategy:
The NH Shoreland Water Quality Protection Act provides a minimum level of protection for shoreline habitat along New Hampshire's lakes, ponds, and rivers (third order and larger). While the Shoreland Water Quality Protection Act does a good job of protecting natural vegetation along the shoreline, it falls short of protecting other important habitat features such as submerged aquatic vegetation and trees that fall into the water. Landowners often remove plants and trees from the water to improve access for swimming and boating. These trees and submerged aquatic plants offer important

structure for spawning, foraging, and evading predators. Increasing the percentage of natural or undeveloped shoreline will improve the overall habitat quality in a lake or pond. Conservation easements, changes in zoning, legislative acts, or landowner outreach programs may be used to restore natural shoreline features to New Hampshire lakes and ponds, many of which have little

remaining undeveloped shoreline.

Political Location: **Watershed Location:**

Reduce nutrient loading

Primary Threat Addressed: Habitat degradation from nutrient loading from lawn fertilizers and contaminated run-off

Specific Threat (IUCN Threat Levels): Pollution / Domestic & urban waste water / Run-off

Objective:
Reduce the impacts of eutrophication by removing excess sources of nutrients.

General Strategy:
The primary sources of excess nutrients are lawn fertilizers in residential and commercial developments, agricultural fertilizers, and poorly functioning septic systems. Reducing nutrient loads can be achieved on two fronts. One is through outreach, which includes creating awareness about the effects of fertilizers on water quality and offering alternatives to fertilization practices that lead to the greatest amount of nutrient loading in nearby waterbodies. Best management practices can be developed for property owners with a focus on reducing runoff, minimizing or eliminating fertilizer use, and landscaping in a way that reduces the need for fertilization. In the case of septic failure, shoreline property owners with older septic systems can be targeted with incentives for upgrading. The second front is legislative. Laws that set limits on fertilizer use and require upgrades to septic systems will have long term benefits on water quality throughout the developed watersheds of southern New Hampshire. Requirements for new septic systems have greatly improved in recent years. The challenge is identifying and upgrading older systems that were constructed before septic systems were required to meet modern standards.

Political Location: **Watershed Location:**

Stormwater Management

Primary Threat Addressed: Habitat degradation from stormwater run-off from impervious surfaces

Specific Threat (IUCN Threat Levels): Pollution / Domestic & urban waste water / Run-off

Objective:
To reduce the impacts of runoff from impervious surfaces by using Low Impact Development Technology.

General Strategy:
Stormwater runoff from impervious surfaces has been shown to damage aquatic habitats (Wang et al. 2001; Cuffney et al. 2010). Much of this damage can be prevented by stormwater management practices that filter runoff through the ground before it enters surface water. This practice not only removes much of the sediment and toxins that are typically washed into streams, but it also reduces the rapid fluctuation in temperature, as well as the excess erosion and sediment deposition that have become a chronic issue for rivers and streams in developed areas. Pollution from stormwater runoff is cumulative. As more headwater streams become degraded by stormwater runoff from impervious surfaces, declines in water quality and habitat may be observed in lakes, larger rivers, and estuaries. The University of New Hampshire Stormwater Center is an excellent resource for Low

Impact Development (LID) practices for stormwater management. The long term goal is to make rivers and
streams in developed watersheds mimic the hydrology of similar habitats in undeveloped watersheds.

Political Location: **Watershed Location:**

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