Overview

Nearly 1,000 lakes and ponds larger than 10 acres and more than 3,000 small ponds are scattered throughout New Hampshire’s watersheds (Figure 3-1). They are an integral part of New Hampshire’s quality of life, economy and natural heritage. Lakes are a major attraction for short-term recreational visitors, those who own or rent seasonal homes, and permanent residents.

Some lakes, such as Lake Massabesic in Manchester and Penacook Lake in Concord, are used as public water supplies and have partial or total restrictions on recreational uses, but the most popular uses for most lakes are swimming and boating, followed by fishing. In fact, New Hampshire has approximately 170 public beaches on lakes and ponds. A recent study estimates that as much as $1.1 billion in annual sales result from these recreational uses in New Hampshire (Shapiro & Kroll, 2003).

Although the great majority of lakes and ponds have clear water and relatively low biological productivity, i.e., the tendency to grow algae and aquatic plants, most New Hampshire lakes have other water quality issues. The most common issues result from atmospheric deposition of pollutants, such as mercury and acid deposition, and increasing impacts from road salt. Development threatens lakes and ponds as forest land is converted to homes, businesses, roadways and parking lots. The trend is significant with approximately 13,500 acres of forest land converted to other uses every year in the state (Society for the Protection of New Hampshire Forests, 2006). As described in Chapter 10 – Stormwater, transformation from a forested to a developed landscape produces increased stormwater runoff and greater inputs of phosphorus and road salt into surface waters (streams, rivers, lakes and ponds). Increased phosphorus causes greater growth of algae and aquatic plants because phosphorus is usually the limiting nutrient in lakes. Existing land management efforts and regulations by themselves do not effectively mitigate this risk. Toxic concentrations of chloride from road salt also present a risk to aquatic life.

Carrying capacity is also a significant issue for lakes and ponds. This is the level or intensity of use beyond which impacts to the lake or the visitor experience exceed acceptable limits. Other significant issues include invasive exotic species and climate change.

Local lake advocates and state agencies must remain vigilant to arrest the trend of declining health in some lakes, to address water use impairments where they exist.

Figure 3-1. The geographic distribution of lakes and ponds in New Hampshire. Source: NHDES, 2008d.
New Hampshire Water Resources Primer

Chapter 3: Lakes and Ponds

3.1 Occurrence and Significance

Lakes typically have limited currents, little surface vegetation and depths too great for wading. Some lakes are natural, but most lakes have a dam at the outlet that increases the depth. The words “lake” and “pond” are often used interchangeably, though ponds are usually smaller (NHDES, 2003). Impoundments, which are created by a dam across a river, are also occasionally referred to as lakes. There are nearly 1,000 lakes and ponds greater than 10 acres in the state with a total surface area of almost 165,000 acres (NHDES, 2008a). With the exception of Lake Umbagog and Lake Sunapee, the largest lakes are in New Hampshire’s Lakes Region: Winnipesaukee, Squam, Winnisquam and Newfound. However, the majority of the state’s lakes and ponds are less than 100 acres in size (Figure 3-2).

3.1.1 The Lakes and Ponds of New Hampshire Are Valuable Economic and Ecological Resources

New Hampshire’s lakes and ponds provide abundant recreational opportunities; historic, cultural and economic values; and critical natural assets. A study conducted in 2002 determined that just four uses of New Hampshire’s surface waters – boating, fishing, swimming, and drinking water supply – contribute up to $1.5 billion annually in total sales to the state’s economy and surface waters boost property tax revenue by an estimated $247 million per year (Shapiro & Kroll, 2003).
More recently a survey of boaters, anglers and swimmers determined that if these user groups perceived a degradation in water clarity and purity, their use of these surface waters would decline, resulting in an economic loss of $51 million in total sales, $18 million in income, and more than 800 jobs statewide (Nordstrom, 2007).

Lakes are ecological systems made up of many complex interactions and while they may appear to be large basins with uniform conditions throughout, these surface waters are heterogeneous and their physical, biological and chemical characteristics also vary over time. The physical and chemical characteristics support a variety of biological organisms that may be specific to a lake. The abundance of clean and clear water and the diversity of plant communities not only provide habitat for fish and other aquatic wildlife, but also support terrestrial and bird species.

Each lake is also part of a larger ecosystem – its watershed – that includes all of the land that surrounds it and drains into the lake. The land use and development within a lake watershed directly affect the quality and quantity of water in a lake. When excess sediment, nutrients or pollutants are added to the lake, then the lake system is disrupted. If one characteristic of a lake is altered, then other parts of the system will also be affected.

### 3.1.2 Water Quality Is Generally Good, but Salt Is Becoming a Problem

Section 305(b) of the federal Water Pollution Control Act, commonly called the Clean Water Act (CWA), requires each state to prepare a report every two years that describes the quality of its surface waters and an analysis of the extent to which all such waters support six designated uses: aquatic life, primary contact recreation (swimming), secondary contact recreation (boating), drinking water, fish consumption, and wildlife. The latest comprehensive report, called the 305(b) and 303(d) Surface Water Quality Report, was published in April 2008 (NHDES, 2008b).

New Hampshire’s lakes and ponds greater than 10 acres comprise 165,000 surface acres of water. As indicated in Figure 3-3 and the accompanying table, not all of those acres have been assessed for all designated uses due to resource limitations. For example, 22.3 percent of the state’s surface water acres have not yet been assessed for the primary contact designated use. While a majority of assessed lakes and ponds in New Hampshire meet water quality standards for recreation and drinking water designated uses, low pH values and exotic species infestations marginally impair a high percentage of assessed waters for aquatic life; and mercury impairs all waters for fish consumption.

The majority (70 percent) of aquatic life impairments in New Hampshire’s lakes and ponds are due to pH values that fall below the minimum water quality standard of pH 6.5. In the vast majority of cases (81 percent of pH-impaired lakes) the pH readings were just below the standard of 6.5, meaning these lakes are marginally impaired and are not expected to have any significant adverse impacts to aquatic life. Low pH is primarily attributable to deposition of acids from the atmosphere, i.e., acid rain. The source of acidifying pollutants in the atmosphere is air emissions, primarily from fossil fuel burning power plants and motor vehicles (Swackhamer et al., 2004). Since 1991 New Hampshire has taken active steps to reduce emissions from within the state. While some of these emissions still originate from within New Hampshire, the majority of emissions are from sources outside of the state.
New Hampshire, like many other New England states, has a statewide freshwater fish consumption advisory due to mercury levels in fish tissue. The major pathway of mercury to lakes is also atmospheric deposition. This means that fish from remote lakes may contain mercury levels that are similar to fish from lakes in industrialized areas. Most of the mercury in New Hampshire waters probably comes from sources outside the state (NHDES, 1998).

Although useful in summarizing the current status of water quality, the data on impaired versus supporting waters do not depict water quality trends, because the assessment methods, volume of sampling and targeting of sampling have changed over time. However, data collected from New Hampshire lakes and ponds through the Volunteer Lake Assessment Program (VLAP) over the past 30 years have shown an increasing trend in conductivity, sodium and chloride. An analysis of 150 lakes in the VLAP program showed that these parameters increased at least 10 percent in 70 percent of the lakes, that no change occurred in 20 percent of the lakes, and that the parameters decreased more than 10 percent in 10 percent of the lakes. The increasing trends were greatest in urban ponds and in ponds near major roads and highways. The use of deicing salts (sodium chloride) is considered to be the major source of the increasing trend. No change occurred in ponds remote from salted roads or parking lots. While only four ponds violate the water quality criterion for chloride (three Manchester
ponds and a Seacoast pond receiving salt spray as well as deicing salts (R. Estabrook, NHDES, personal communication, September 15, 2008), the trend is troubling because chloride is toxic to aquatic life.

### 3.1.3 Trophic Status Is Stable or Improving Overall, but a Few Lakes Are in Decline

Lakes are classified into three categories according to their trophic status, which is a measure of a lake’s productivity, or tendency to grow algae and aquatic plants. Oligotrophic lakes tend to be clear and deep, with little plant and algae growth; mesotrophic lakes are intermediate in depth, clarity and productivity; and eutrophic lakes are usually shallow and support abundant algae and plant growth, with resulting green or blue-green summer algae blooms and reduced water clarity.

As shown in Table 3-1, 74 percent of surveyed lake area is oligotrophic, more than 21 percent is mesotrophic, and a small percentage is eutrophic. It is important to note that the table only includes information for lakes classified as “significant” for purposes of reporting to the EPA. In general, a “significant” lake or pond is 10 acres or more in size, is not private, and does not have a prohibition on recreational activity. Of the nearly 1,000 lakes and ponds in the state, 663 are defined as “significant,” with a total surface area of 155,601 acres.

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of Lakes</th>
<th>Percent of Lakes</th>
<th>Acres of Lakes</th>
<th>Percent of Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessed</td>
<td>663</td>
<td>100</td>
<td>155,601</td>
<td>100</td>
</tr>
<tr>
<td>Oligotrophic</td>
<td>187</td>
<td>28.2</td>
<td>115,075</td>
<td>74.0</td>
</tr>
<tr>
<td>Mesotrophic</td>
<td>329</td>
<td>49.6</td>
<td>33,454</td>
<td>21.5</td>
</tr>
<tr>
<td>Eutrophic</td>
<td>147</td>
<td>22.2</td>
<td>7,072</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Statewide, there has not been a significant positive or negative trend in trophic status during the last 30 or more years. A statistical analysis of water quality parameters related to trophic status, such as chlorophyll and phosphorus concentrations and Secchi disk transparency, found that while a majority of lakes with at least 10 consecutive years of data are either stable or fluctuating, there are more lakes with improving trends than lakes with degrading trends (NHDES, 2008b). This does not mean that action should not be taken; eight lakes showed a significant decline in transparency over the 10-year period.

### 3.2 Issues

#### 3.2.1 Landscape Change Threatens Water Quality

As noted in Chapter 10 – Stormwater, research performed throughout the country, including New Hampshire, has demonstrated that impervious cover is a good general indicator of the effects of landscape change on stream hydrology, water quality and biological health. Increasing amounts of impervious surface and shoreland development are negatively affecting many of New Hampshire’s lakes and ponds. The primary mechanisms of this process include increased transport of...
road salt, sediment, and associated phosphorus from land to water. In addition to stormwater run-off associated with development, road salt and nutrients seep into the ground from roadways and parking lots and travel via groundwater to New Hampshire’s lakes and ponds.

3.2.2 Toxic Algae (Cyanobacteria) Blooms Are Occurring with Greater Frequency, Causing Concern for Public Health

Cyanobacteria, sometimes called “blue-green algae,” are a growing concern in New Hampshire. Cyanobacteria are aquatic, photosynthetic bacteria. Many species of cyanobacteria can proliferate rapidly to form “blooms” in surface water (Figure 3-4). An increase of phosphorus in combination with increased sunlight and warmer water temperatures often accelerates cyanobacteria growth in a lake. Several cyanobacterial species produce toxins (cyanotoxins) that can cause both acute and chronic problems in humans. The possible effects of cyanobacteria on New Hampshire lakes and their natural inhabitants, such as fish and other aquatic life, are under study at this time. The Center for Freshwater Biology (CFB) at the University of New Hampshire (UNH) is currently examining the potential impacts of these toxins upon the lake food web. The potential human health hazards via exposure through drinking water or during recreational water activities are also a concern to the CFB and DES.

3.2.3 The Carrying Capacity of New Hampshire’s Lakes and Ponds Has Not Been Evaluated

New Hampshire’s Lakes Management and Protection statute (RSA 483-A:5 (e)) states: “recreational uses of lakes shall be consistent with the carrying capacity and character of each lake.” Carrying capacity refers to the level or type of use beyond which impacts to the lake or the visitor experience exceed acceptable limits. There are three components of carrying capacity:

- Biological carrying capacity: the capability of the lake to sustain certain activities before the degradation of water quality or impacts to aquatic life occur.
• Social carrying capacity: the maximum combinations and intensities of human uses without unacceptable diminishment of people’s enjoyment of the lake due to the presence and activities of other users.

• Physical carrying capacity: the maximum intensity of human use that a lake or river can accommodate.

While the Lakes Management and Protection statute mandates consistency between uses and carrying capacity, other statutes encourage greater recreational use of lakes. The New Hampshire Fish and Game Department (NHF&G) has a mandate to carry out the statewide public boat access program (RSA 233-A:4), and other state agencies, by virtue of their land holdings, also provide public access, both passive and active. The 1991 New Hampshire Office of State Planning (NHOSP) Public Access Plan recommended that for great ponds, there should be one public access point for each five miles of shoreline or for every 1,000 acres of surface water and for rivers there should be one public access point for each 10 miles of shoreline (NHOSP, 1991). In connection with this issue, the Public Water Access Advisory Board is planning to review the 1991 Public Access Plan for New Hampshire Waters, with a view to the plan’s revision. The N.H. Fish and Game Department currently lists 232 public access points (NHF&G, 2008).

To date, the state has not determined the carrying capacity of its surface waters. In the absence of this information, it is very difficult for the state, municipalities and lake organizations to ensure that lakes are being managed in such a way as to avoid undesirable impacts.

3.2.4 More Data Is Needed to Detect Trends

While the Volunteer Lake Assessment Program (VLAP) and other similar programs in the state collect a wealth of data, water quality and quantity trends for many lakes cannot yet be determined because of information gaps or because there is little or no information on some lakes and ponds. As illustrated in Figure 3-3, more data is needed. Long-term trends can help define the current status of lakes relative to their more natural state. The expansion of lake monitoring and sampling activities would improve the base of information upon which decisions can be made about the future of lake resources in New Hampshire. This would require more staff to assist volunteers in accurate and timely monitoring. Equally important, watershed management programs geared to prevention, i.e., land use planning and regulation to protect lakes and ponds, are needed for cleaner lakes, while watershed restoration programs are needed for those lakes already apparently declining. In order for such programs to be effective, they need to be quantitative and should include carrying capacity analyses, with efforts to meet water quality goals tied directly to the proposed restoration measures. This will require more data on water quality, land use and the connection between the two.

3.2.5 Exotic Aquatic Species Are a Growing Threat

Exotic aquatic species are aquatic plants or animals that are not part of New Hampshire’s native flora and fauna. Because exotic plants are introduced from outside of the state, they have no established relationships with native fauna that keep their growth in check. When these exotic plants grow without natural controls they encroach upon and replace the habitats of native plants, disrupting the food chain, stunting fish growth and degrading wildlife habitat.
Since the first exotic aquatic plant infestation in New Hampshire was discovered in 1965, exotic aquatic plant infestations have continued to increase (Figure 3-5). Variable milfoil, by far the most widespread exotic aquatic plant in New Hampshire, was first found in Moultonborough Bay in Lake Winnipesaukee. Today, it has spread to infest approximately 68 water bodies. Fanwort, water chestnut, Eurasian milfoil, purple loosestrife and *Didymosphenia geminata* ("didymo") are also problematic species in the state. There were two new infestations of exotic aquatic plants in New Hampshire in 2008. With these new infestations, there were 74 documented infestations of exotic species, including didymo, in New Hampshire’s lakes, ponds and rivers.

Exotic aquatic plant fragments can easily attach to aquatic recreational equipment, such as boats, motors and trailers, and can spread from one water body to another through transient boating activities. Infestations can have detrimental effects on the ecological, recreational, aesthetic and economic values of the state’s precious surface waters, limiting use of the water bodies and decreasing shorefront property values by as much as 10 percent to 20 percent according to a UNH study (Gibbs et al., 2002).

Zebra mussels are not yet a problem in New Hampshire, but they are just over our borders in neighboring and nearby states. Vermont has a widespread population of zebra mussels in Lake Champlain, and at least a dozen other waterbodies have had veligers (larval form of the zebra mussel) identified within them. In Connecticut, East and West Twin Lakes are infested with zebra mussels, and Lake George in New York has a small problem at the southern end of the lake. It is anticipated that zebra mussels will initially appear in New Hampshire within the Connecticut River Valley. It is a water body that New Hampshire holds in common with Vermont, where zebra mussels are present, and the water chemistry is such that it could support growths of the mussels based on calcium content and algal densities.
3.3 Current Management and Protection

This section describes management and protection efforts that are not described elsewhere in the New Hampshire Water Resources Primer and that are most directly related to the issues facing New Hampshire lakes and ponds. Additional programs that are related to lake and pond issues include the Shoreland Protection Program and Alteration of Terrain Program, both described in Chapter 10 – Stormwater.

3.3.1 Exotic Species Programs

The DES Exotic Species Program coordinates activities associated with the control and management of exotic aquatic plants; as well as activities associated with the implementation of education programs and volunteer plant monitoring programs.

Since its inception in 1981 with the passage of RSA 487:15, the Exotic Aquatic Plant Program has grown to become a cooperative effort among state agencies, lake organizations and concerned citizens. At the state level this involves a partnership among DES, the N.H. Fish and Game Department, the N.H. Department of Safety, and the N.H. Department of Agriculture, Markets and Food to prevent the spread of exotic plants to new water bodies and to monitor and treat infestations. Many lake associations and other non-profit organizations, such as the New Hampshire Lakes Association and individual lake associations, participate in monitoring, education and control efforts.

Program activities include five focus areas: 1) prevention of new infestations through education and outreach; 2) monitoring for early detection of new infestations; 3) control of new and established infestations; 4) research towards new control methods; and 5) regional or national cooperation with other exotic species programs. The Lake Host Program, long-term management plans, and physical harvesting techniques are effective mechanisms addressing the program’s five focus areas.

Lake Host Program

The Lake Host Program is a courtesy boat inspection program implemented by the New Hampshire Lakes Association in cooperation with local participating groups and partially funded by DES to prevent the introduction and spread of exotic aquatic plants, such as variable milfoil, from lake to lake. During 2008 approximately 54,000 courtesy boat inspections were conducted statewide and 515 “saves” have been documented since the program’s inception in 2002. A “save” occurs when a Lake Host removes a piece of exotic aquatic plant from a boat that either enters or leaves a water body.

Long-Term Management Plans

Starting in 2006, prior to any herbicide treatment of an exotic aquatic species, a long-term management plan must be prepared by the DES Exotic Species Program for the water body, outlining the problem, the goals of management, and what techniques will be used to achieve those goals. The purpose of these plans is to ensure that there is a strategic, well-organized process that is tailored to best manage growths of exotic aquatic vegetation on a water body-by-water body basis.
Most of these activities will employ concepts of Integrated Pest Management (IPM). By using this management plan approach it is hoped that herbicide applications to control exotic aquatic plants can and will be used only when needed, and at the same time the invasive species is successfully eradicated or controlled for a long-term period. To date, approximately 40 plans have been prepared. DES, in consultation with the Fish and Game Department and the Department of Agriculture, Markets and Food, is currently developing criteria for management plans that involve using herbicides to control native aquatic plants.

**Physical Harvesting Techniques**

Other newly implemented programs to control exotic aquatic species include the Weed Control Diver Program and the Diver-Assisted Milfoil Machine (DAMM), a watercraft outfitted to suction harvest exotic weeds from a water body. The diver program began in 2007 and 55 divers have since been certified and have worked in approximately 20 lakes over the last two years. These individuals are specially trained to safely extract exotic plants from the lakebed with minimum disruption to the lake bottom and little impact to lake quality. The DAMM, first used in 2008, has harvested exotic weeds from approximately 20 lakes. The combination of these two programs provides very effective means to physically remove exotic aquatic plants from New Hampshire’s lakes and ponds.

### 3.3.2 Lakes Management and Protection Program

The New Hampshire Lakes Management and Protection Program (LMPP) was established with the passage of RSA 483-A in 1990, which also called for the establishment of a Lakes Coordinator and Lakes Management Advisory Committee (LMAC). The LMPP involves the coordination and development of lake management and protection criteria and plans. The LMPP provides technical assistance regarding lakes management to state and federal agencies as well as the public and private sectors. The LMPP also reviews relevant existing statutes and proposed legislation pertaining to lakes.

The LMAC advises the DES Commissioner and Lakes Coordinator regarding the management and protection of lakes. The committee is made up of 18 members from state agencies; municipalities; the conservation community; marine, tourism, real estate, business and industry interests; and academia. Projects directed by LMAC include the following:

- Comprehensive Lake Inventory, a tool to assess lakes and their surrounding watersheds, completed in 2007 (NHDES, 2007).

### 3.3.3 The Sustainability Initiative

The LMAC and the Rivers Management Advisory Committee (RMAC) recently launched a “Sustainability Initiative for New Hampshire’s Surface Waters” (LMAC and RMAC, 2008). This initiative focuses primarily on issues with New Hampshire’s changing land uses and watershed ac-
tivities. One goal of the initiative is to develop recommendations for watershed management using the antidegradation language in the Water Quality Standards, described in Chapter 2 – Rivers and Streams.

The Sustainability Initiative addresses the following eight issues:

- The need to increase the stream gage and water quality monitoring networks and improve data access.
- The need for a clear, well-communicated strategy to address landscape change.
- The need to better protect shoreland and riparian buffers.
- Increasing stormwater impacts on flooding and water quality.
- Carrying capacity of and public access to lakes and ponds.
- Invasive aquatic species research and prevention/eradication.
- Instream flow protection and groundwater withdrawal protections.
- Climate change.

3.3.4 The DES Volunteer Lake Assessment Program and the UNH Lakes Lay Monitoring Program

The New Hampshire Volunteer Lake Assessment Program (VLAP) facilitates the collection of lake monitoring data through an extensive network of volunteers. Aside from providing DES with information to evaluate lake water quality, VLAP serves to empower lake residents and volunteer monitors with information about the health of their water body. VLAP annually publishes reports containing data from participating lakes that are available on the DES website. The reports show the status of each lake or pond and can provide evidence of nutrients, road salt, sediment deposition, and other sources of pollution that may be affecting the water quality.

The UNH Lakes Lay Monitoring Program (LLMP) is dedicated to the preservation and sound management of lakes through citizen-based monitoring and research. Through its integration of research, outreach and teaching, the LLMP provides valuable data on the lakes of New Hampshire, broad community service, local empowerment, and a unique opportunity for hands-on learning and employment for students. The LLMP is administered jointly through the Cooperative Extension and the Center for Freshwater Biology at UNH. Introduced in 1978 as a class project on Lake Chocorua, the LLMP has grown into an internationally recognized volunteer monitoring effort. More than 500 volunteers have been trained to monitor hundreds of lake, tributary and outlet sites each year.

DES uses data from both volunteer monitoring programs to compile water quality assessments.

3.3.5 Water Quality Surveys and Assessments

DES conducts a variety of surveys and assessments to monitor the water quality of New Hampshire’s lakes and ponds. The collected information is used to establish baseline conditions for future comparisons and to evaluate long-term trends by comparing current conditions with historical data. The trend analysis is useful for determining general trends in a large number of lakes.
However, because of the limited frequency of sampling and lack of data, only major changes can be detected in any particular lake. More frequently collected data is necessary to detect subtle changes in a given lake.

**Trophic Surveys**

This program was initiated in 1975 and is designed to measure the trophic state of a lake as required by the federal Clean Water Act. Physical, chemical and biological measurements are made at each lake, once during the winter and once during the summer. Lakes have been sampled once every 15 to 20 years and almost every New Hampshire lake and pond has been surveyed at least once in the program. The program has been suspended since 2007 due to changed EPA and state monitoring priorities.

**Acid Pond Surveys**

Two groups of lakes – remote ponds and accessible ponds – are routinely monitored for acid deposition-related parameters to evaluate long-term trends. The results for 10 lakes from each of the two groups are provided to the New England Governors-Eastern Canadian Premiers Water Quality Monitoring Network as part of a northeast North American Acid Trend Program.

Each spring the N.H. Fish and Game Department stocks brook trout into remote ponds by helicopter. At the time of the stocking, a water sample is collected from mid-lake at a 0.5 meter depth and analyzed for acid deposition parameters. The program was initiated in 1981. A total of 60 different ponds have been sampled in the program with a core of 23 ponds sampled essentially every year. Many of these ponds are at high elevation and are the most susceptible to the impacts of acid deposition because of small watersheds, shallow to no soils and elevated precipitation rates.

The outlets of 20 accessible headwater ponds are sampled twice a year, at spring and fall overturn when outlet waters are representative of in-lake conditions, and analyzed for acid deposition parameters. The program began in 1983 and is designed to complement the remote pond program by documenting acid deposition trends in low elevation, non-colored ponds.

**3.3.6 Mercury in Fish Program**

Mercury is highly toxic to wildlife. It accumulates in the tissues of fish and other organisms inhabiting mercury-contaminated waters and builds up in the tissues of organisms higher up the food chain, including humans. With assistance from the N.H. Fish and Game Department, the U.S. Fish and Wildlife Service, and volunteers, 297 fish were collected from the state’s lakes and ponds in 2007. The fish were frozen upon collection and analyzed for total mercury in the DES Limnology Center in late 2007 and early 2008. To date there have been 1,561 analyses of freshwater fish, including 1,214 from lakes and reservoirs. Total mercury levels ranged from 0.01 to 2.49 parts per million (ppm) for the 25 fish species sampled, which include 628 yellow perch, 217 largemouth bass, 178 smallmouth bass, and 149 eastern chain pickerel. As noted in section 3.1.2, New Hampshire, has a statewide freshwater fish consumption advisory due to mercury levels in fish tissue.
3.3.7 Public Beach Inspection Program

The DES Public Beach Inspection Program has monitored public beaches for over 20 years in response to the potential health threats associated with waterborne pathogens. These pathogens are responsible for diseases such as cholera, giardiasis, gastroenteritis and cryptosporidiosis. DES also recognizes the threat of toxic cyanobacteria at public beaches. As the use of New Hampshire’s inland and coastal waters grows, the continued goal of the program is to protect public health and inform the public of potential health risks at public beaches.

In 2007 DES visited a total of 168 freshwater public swimming beaches on a monthly schedule for a total of 567 inspections. Eleven freshwater beaches were issued cyanobacteria advisories for the presence of a potentially toxic cyanobacteria scum. Swimming use was impaired at 38 of New Hampshire’s lakes due to elevated algal or cyanobacterial growth.

Thirty-one freshwater public beaches were issued a total of 37 advisories for exceedances of the public beach water quality standards for E. coli. Fourteen beach advisories were issued at Ahern State Park, Laconia, as a result of a pre-emptive advisory following greater than 0.25 inch of rainfall.

3.3.8 Boat Inspection Program and Clean Vessel Act

The Boat Inspection Program conducts boat inspections on Lake Winnipesaukee and Winnisquam Lake. In 2007 the program conducted 63 inspections. Violations of sink and shower or marine sanitation device regulations were the most common violations. The major source of violations continues to be boats brought in from other states, especially those coming from the ocean. Under pressure from local marine dealers, most manufacturers modify boats destined for New Hampshire to comply with the state’s no-discharge law (RSA 487:2).

The primary goal of the federal Clean Vessel Act (CVA) is to reduce overboard sewage discharge from boats by providing pumpout and dump stations for boaters to dispose of human waste in an environmentally safe manner. The CVA provides funds to states for the construction, renovation, operation and maintenance of pumpout and dump stations for pumping out waste from recreational boat holding tanks and emptying portable toilets.

Every year DES requests funds from the U.S. Fish and Wildlife Service for the installation of new pumpout systems and dump stations throughout the state and to operate the mobile pumpout boat service in coastal waters. Dump stations accept only portable toilet wastes, while a pumpout system removes wastes from fixed toilets. Although no new pumpout facilities were funded for the state’s inland waters during 2007, an operation and maintenance grant was awarded to Lakeport Landing Marina on Paugus Bay. DES is pursuing a pumpout facility for Lake Sunapee, which is currently served by a dump station.

3.3.9 Lake Associations and Protection Groups

In addition to the efforts of federal, state, and local governments, several hundred lake and pond associations and watershed protection groups play an important role in monitoring, advocating for, and protecting lakes and ponds. These groups range from lakefront property owners associations to environmentally-oriented lake protective associations to the statewide New Hampshire Lakes
Association. Many of these organizations are active in public education, land conservation, volunteer monitoring, control of invasive species, and advocacy. Their contributions in these areas have been essential to the protection of state’s lakes and ponds.

3.4 Stakeholder Recommendations

3.4.1 Improve Coordination of Water Quality Programs

New Hampshire’s regulations regarding water quality are divided among various agencies, bureaus and programs. Communications are not always ideal, and during periods when significant development is taking place, water quality problems may develop. Recent revisions to the Alteration of Terrain regulations and the Comprehensive Shoreland Protection Act regulations (Chapter 10 – Stormwater) will help address some water quality threats, but do not go far enough to help all lakes, particularly those that are already developed. Since the water quality of lakes and ponds is significantly affected by land use in their watersheds and the associated road salt, phosphorus, and sediment loading, better coordination of state and local programs is needed to manage changing land use.

So far, efforts to reduce salt use have focused on specific areas, such as the portion of the Interstate 93 corridor targeted for expansion. A statewide approach to address the road salt issue is needed, although the issue presents difficult challenges. Salt (sodium chloride) is applied to roads and parking lots by the New Hampshire Department of Transportation, municipal agencies and private companies; therefore any successful management strategy would involve multiple stakeholders. Salt is a very cost-effective de-icing agent; approaches to minimizing its use generally focus on technology that enables more judicious application as well as on partially substituting other deicing chemicals.

3.4.2 Determine Carrying Capacity and Provide Adequate Public Access

Optimizing the use of surface waters, while minimizing the impacts to the resource and conflicts among users, is becoming an increasingly important issue in New Hampshire. While the N.H. Department of Fish and Game and other state agencies have developed and installed public access sites at lakes across the state, the recommendations of the 1991 Public Access Plan have not yet been met, nor has the mandate of the Lakes Management and Protection statute (RSA 483-A) to maintain consistency between carrying capacity and recreational lake use.

A Carrying Capacity subcommittee of the Lakes Management Advisory Committee (LMAC) and the Rivers Management Advisory Committee (RMAC) has been established in an effort to develop an approach to determine carrying capacity on New Hampshire’s lakes. The subcommittee is presently working with N.H. Lakes Association; Joshua Carroll, UNH professor of Recreation Management and Policy; and Lori Siegel, ecological risk consultant, to review two methodologies to determine carrying capacity – the Water Recreation Opportunity Spectrum and System Dynam-
ics, respectively. The subcommittee and its partners should be encouraged and supported in their efforts to test these two unique methodologies to determine whether they can be merged into a carrying capacity methodology for the state’s lakes and ponds.

3.4.3 Continue New Initiatives to Prevent and Control Invasive Aquatic Species

With climate change and more recreationists using our water bodies, the expectation is that more infestations will occur and an expanded variety of exotic species will be introduced into our lakes and ponds. The state, working with organizations and individuals, will have to maintain and probably increase the existing level of effort to successfully combat invasive aquatic species. Recently implemented initiatives to control invasive aquatic species, specifically the Lake Host Program, long-term management plans, and physical harvesting techniques, show considerable promise and should be continued.

Figure 3-6. Examples of invasive aquatic species that are commonly found in or around New Hampshire’s lakes and ponds. Clockwise from top left: Purple loosestrife, Eurasian milfoil, variable milfoil. Source: NHDES Watershed Management Bureau.
References


