Lake Fact Sheet

Lake Ivanhoe

LAKE FACTS

Watershed: Wakefield, NH

Counties: Carroll

Midas Number: N/A

Mean Depth: 12 feet (3.7 m)

Max Depth: 20 feet (6.1 m)

Surface Area: 68 acres (0.12 mi^2)

Volume: 992,000 m^3

Perimeter: 8,858 feet

Flushing Rate: 0.90 flushes/year

Avg. Transparency: 5.1 meters (19 ft)

Watershed Area: 455 acres (0.71 mi^2)

Drains to: Great East Lake

Major Drainage Basin: Salmon Falls River

Lake Ivanhoe, originally known as Round Pond, sits between Acton Ridge Road and Round Pond Road near Wakefield, New Hampshire's eastern border with Maine. The lakeshore is developed with numerous homes and camps, as well as a campground on Acton Ridge Road. Historically, a small stream drained the lake at its western end, crossing Wansor Road, and then south through a small area of forest and into Great East Lake. Local residents report that the stream outlet was filled in years ago during a construction project, and that water flowing out of Lake Ivanhoe is currently flowing over land toward Great East Lake causing serious flooding problems including flooding of septic systems. Great East Lake, to the south, forms the headwaters of the Salmon Falls River, the natural borderline between the two states which empties into the tidal waters of the Piscataqua River in Portsmouth, New Hampshire.

The water quality of Lake Ivanhoe is classified as "Potentially Impaired" based on recent analysis of measured water quality parameters. Lake Ivanhoe is potentially impaired because its in-lake phosphorus concentration exceeds the water quality standard for oligotrophic lakes in NH (< 8 ppb) as well as for chlorophyll-a (< 3.3 ppb). NH DES will determine whether Lake Ivanhoe should be listed as a federally impaired waterbody. Reducing in-lake phosphorus by 0.8 ppb will enable Lake Ivanhoe to once again be considered a high quality waterbody.

The Lake Ivanhoe direct watershed covers 0.71 square miles (455 acres). The lake is threatened by polluted runoff from development in the surrounding watershed and along its well developed shoreline. Soil erosion, in particular, is the single greatest source of pollution to Lake Ivanhoe. Soil contains the nutrient phosphorus, which has the potential to promote algae blooms when it enters a lake in large quantities. As the algae die off, the water becomes depleted of oxygen, affecting fish and animals who depend on the lake water.

In the spring of 2009, in an effort to address this concern, a team of local volunteers and technical staff from the Great East Lake Improvement Association, Acton Wakefield Watersheds Alliance, York County SWCD, NHDES, and Maine DEP conducted a survey of the watershed and identified sites that are contributing polluted runoff to Lake Ivanhoe. Teams documented polluted runoff sources from roads, properties, driveways, and shorelines using cameras and standardized field data sheets. Survey results and remediation recommendations were compiled in the *Lake Ivanhoe Watershed Survey Report (*Appendix C).

Current Water Quality Trends - LAKE IVANHOE

Water Quality Information

Water quality monitoring data for Lake Ivanhoe has been collected since 1981. This includes 16 years of secchi disk transparencies, 17 years of total phosphorus (TP) data (including 2 years of epicore samples), 16 years of chlorophyll_a (Chl-a) and color data, and 14 years of dissolved oxygen (DO) profiles. The UNH Lay Lakes Monitoring Program (LLMP) and Center for Freshwater Biology (CFB), and NH Department of Environmental Services (NHDES) have collaborated in the collection of lake data to collect water quality data for Lake Ivanhoe in order to evaluate present water quality, track algae blooms, and determine water quality trends.

According to NH Lake Nutrient Criteria, Lake Ivanhoe is considered "Potentially Impaired". This is because the median phosphorus concentration is at the tipping point (8 ppb) between a high quality lake (<8 ppb) and the lower classification (>8 and <12ppb), and the Chl-a value exceeds the state standard (<3.3 ppb).

Lake Ivanhoe has a relatively low flushing rate (0.9 flushes/ year) which can make it sensitive to pollution. The average Maine and NH lake flushes 1 to 1.5 times per year. Phosphorus loading reductions have been recommended for Lake Ivanhoe to halt future water quality declines.

Sampling Locations

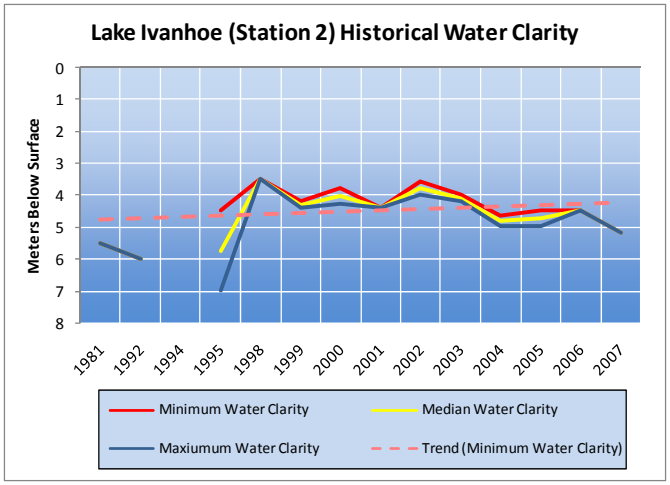
Lake Ivanhoe has two sampling locations. Station 2 (deep hole) is located in the large, western basin of the lake, and Station 1 is located within the smaller eastern basin.

Water Clarity

Secchi Disk Transparency (SDT) is a quick, simple, inexpensive, and accurate method for determining the clarity of a lake. Factors that limit the depth of clarity include algae, zooplankton, water color, and silt. Generally, as algal populations increase, SDT readings decrease. SDT readings have been conducted in Lake Ivanhoe for over 16 years at Station 2, with a mean annual SDT of 4.8 m (15.7 ft) at Station 2, and 5.1 m (16.7 ft) at Station 1.

Sampling Results for Station 2 (1981-2008)

Sampling Parameter	Station 2
Mean Color (SPU)	15.2
Median EpiCore P (ppb)	8.0
Mean Secchi (m)	4.7
Mean Chl-a (ppb)	3.4



Dissolved Oxygen

Dissolved oxygen (DO) in the lake is critical to the survival of all plants and animals, and is therefore an indicator of water quality and the level of life a lake can support. DO levels below 5 parts per million stress certain cold water fish, and a persistent loss of oxygen may eliminate or reduce habitat for sensitive cold water species. Low DO at the bottom of the lake is of particular concern because it can result in the release of phosphorus from bottom sediments- leading to increased algal production. Historic and more recent profiles confirm that Lake Ivanhoe is not stratified. Therefore, the potential for TP to be released from bottom sediments and become available to algae in the water column (internal loading) is low.

Total Phosphorus

Phosphorus is an essential element for plant growth, yet is found in limited amounts in lake systems. Therefore, small increases in phosphorus in Lake Ivanhoe can lead to substantial increases in algal growth Lake Ivanhoe over the period from 1981 to 2007 for Station 1 is 2 – 24 parts per billion (ppb) with a median of 8 ppb. A reduction of 0.8 ppb of total phosphorus is recommended for this lake.

Lake Fact Sheet

Great East Lake

LAKE FACTS

Watershed: Acton, ME & Wakefield, NH

Counties: York (ME) & Carroll (NH)

Midas Number: 3922

Mean Depth: 35 feet (11 m)

Max Depth: 102 feet (31 m)

Surface Area: 1,707 acres (2.7 mi^2)

Volume: 75,589,500 m^3

Perimeter: 95,144 feet

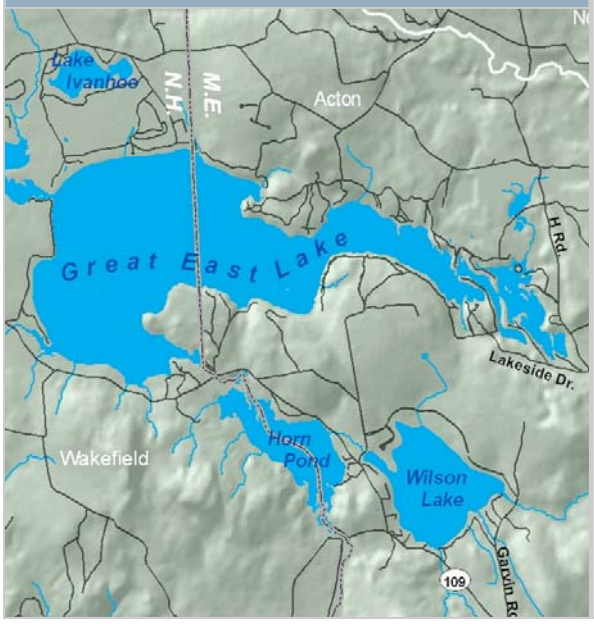
Flushing Rate: 0.3 flushes/year

Avg. Transparency: 9.2 meters (30.2 ft)

Watershed Area: 9,939 acres (15.53 mi^2)

Drains to: Horn Pond

Major Drainage Basin: Salmon Falls River



Great East Lake lies on the Maine and New Hampshire border with 763 acres (45%) of its 1,707 acre surface area in Acton, Maine and 944 acres (55%) in Wakefield, New Hampshire. The outlet of Great East Lake flows over a dam and through an 800 foot canal where it enters Horn Pond near Canal Road. Great East Lake forms the headwaters of the Salmon Falls River, the natural borderline between the two states which empties into the tidal waters of the Piscataqua River in Portsmouth, New Hampshire. Copp Brook and Scribner Brook feed into Great East Lake from the north-west as well as some smaller tributaries including JoDo Brook.

With nearly 18 miles of shoreline, Great East Lake is the largest of the Salmon Falls Headwater Lakes. The lake is regarded as a high quality waterbody, known for its natural beauty and abundance of wildlife. Great East Lake is managed for both coldwater and warmwater fisheries. The extensive rocky, gravelly shoreline serves as an excellent spawning and nursery habitat for smallmouth bass. The lake is home to 21 species of fish, two species of crayfish, and one species of freshwater mussel.

Numerous camps and residences dot the perimeter of Great East Lake. A town-owned boat launch is located on the north side of the lake, and a state-owned boat launch, located adjacent to the outlet off Canal Road, provides boat access. Great East Lake dam, operated by the NH Department of Environmental Services (NH DES), is located at the southeast end of the lake near the Maine-New Hampshire border in Wakefield. Water levels are maintained at full capacity during the summer, with seasonal fall drawdown to three feet below full lake level beginning in October.

The Great East Lake direct watershed covers 15.53 square miles (9,939 acres). The direct watershed area for Great East Lake is the largest of all of the five target AWWA subwatersheds, and therefore has a strong influence on downstream water quality. A watershed survey was conducted in the Great East Watershed in the Spring of 2009. Results of this survey are summarized in Appendix C.

Water Quality Information

The Maine Department of Environmental Protection (Maine DEP), the Maine Volunteer Lake Monitoring Program (VLMP), the UNH Lay Lakes Monitoring Program (LLMP) and Center for Freshwater Biology (CFB), and the NH Department of Environmental Services (NHDES) have collaborated in the collection of lake data to collect water quality

Current Water Quality Trends - GREAT EAST LAKE

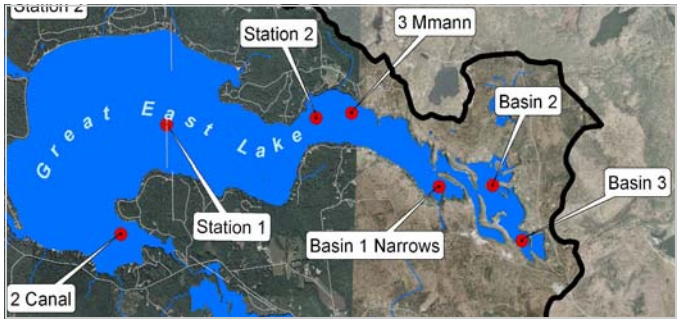
data for Great East Lake in order to evaluate present water quality, track algae blooms, and determine water quality trends.

Water quality monitoring data for Great East Lake has been collected since 1974. This includes 29 years of secchi disk transparencies, 23 years of total phosphorus (TP) data (including 21 years of epicore samples), 20 years of chlorophyll-a, (Chl-a) data 20 years of color data, and 7 years of dissolved oxygen profiles.

Great East Lake is on the cusp of an "outstanding" and "good" classification in Maine, and qualifies as a high quality waterbody in New Hampshire. Outstanding lakes exhibit average secchi disk transparency (SDT) greater than 9.1 meters (30 feet), have very low algae levels (Chl-a of <2 ppb) and have very low phosphorus concentrations (2 to 5 ppb). These lakes are rare and unique resources, which are particularly sensitive to small increases in phosphorus concentrations. As such, management actions are needed to limit future phosphorus increases in Great East Lake.

The ultimate goal for Great East Lake is maintain or improve existing water quality by limiting future inputs of phosphorus from the watershed. This can be accomplished by controlling non-point source pollution (e.g. soil erosion) from existing development and restricting phosphorus loading from new development through watershed-wide planning efforts.

Sampling Locations



Great East Lake has four regular sampling locations: Station 1 (Center Hole) located in the deepest area of the lake; Station 2 (Canal); Station 3 (Maine Mann); and Basin 2. Two additional sites, Basin 3 and Basin 1 (Narrows) are sampled occasionally.

Water Clarity

Secchi Disk Transparency (SDT) is a quick, simple, inexpensive, and accurate method for determining the clarity of a lake. Factors that limit the depth of clarity include algae, zooplankton, water color, and silt. Generally, as algal populations increase, SDT readings decrease. SDT readings have been conducted over 29 years at Station 1, with an average SDT reading of 9.2 m (30.2 ft). There is some evidence to suggest this lake may be changing over time toward reduced minimum transparency and higher TP.

Sampling Results for Station 1 (1974-2008)

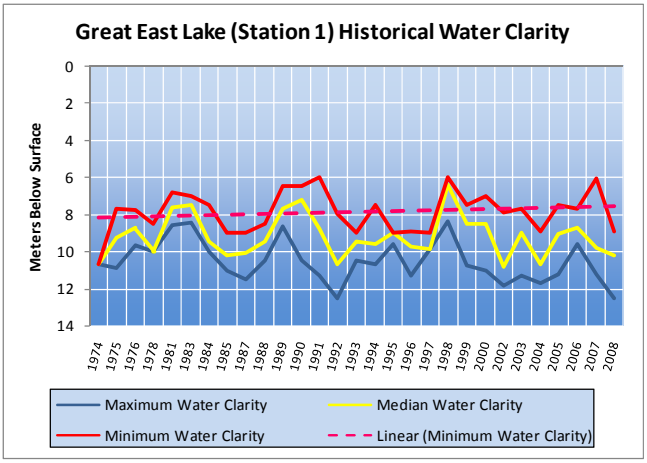
Sampling Parameter	Station 1
Mean Color (SPU)	13.8
Median EpiCore P (ppb)	6.4
Mean Secchi (m)	9.2
Mean Chl-a (ppb)	1.2

Dissolved Oxygen (DO)

Dissolved oxygen (DO) in the lake is critical to the survival of all plants and animals, and is therefore an indicator of water quality and the level of life a lake can support. DO levels below 5 parts per million stress certain cold water fish, and a persistent loss of oxygen may eliminate or reduce habitat for sensitive cold water species. Historic profiles show little DO depletion in deep areas of Great East Lake.

Total Phosphorus (TP)

The range of water column TP for Great East Lake from 1976 to 2008 for Station 1 is 0.9 – 17.8 parts per billion (ppb) with a median of 6.4 ppb. High quality lakes with low flushing rates, such as Great East, may be particularly sensitive to small increases in phosphorus, making management measures to limit phosphorus inputs from the watershed particularly important. The existing in-lake TP concentration should be maintained or improved.



Lake Fact Sheet

Horn Pond

LAKE FACTS

Watershed: Acton, ME & Wakefield, NH

Counties: York (ME) & Carroll (NH)

Midas Number: 3924

Mean Depth: 13 feet (3.9 m)

Max Depth: 31 feet (9.4 m)

Surface Area: 227 acres (0.35 mi^2)

Volume: 3,155,000 m^3

Perimeter: 25,544 feet

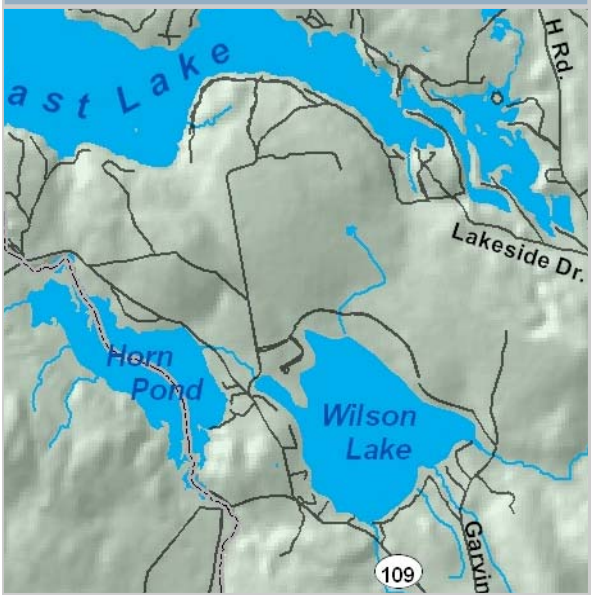
Flushing Rate: 8.2 flushes/year

Avg. Transparency: 6.6 meters (21.7 ft)

Watershed Area: 1,139 acres (1.78 mi^2)

Upstream Waterbodies: Great East Lake, Wilson Lake

Major Drainage Basin: Salmon Falls River



Horn Pond lies on the Maine and New Hampshire border with 119 acres (52%) of its 227 acre surface area in Acton, Maine and 108 acres (48%) in Wakefield, New Hampshire. The lake is both spring-fed and fed by outflow from Great East Lake to the north, and Wilson Lake to the east. Wilson Lake flows into Horn Pond via a wide rushing stream that flows through a large culvert under New Bridge Road on the eastern shore. The outlet for Great East Lake enters south of Canal Road. Horn Pond is natural pond raised by a dam on the Salmon Falls River. The Salmon Falls River forms a natural borderline between Maine and New Hampshire and eventually empties into the tidal waters of the Piscataqua River in Portsmouth, New Hampshire.

Horn Pond is currently considered "Potentially Non-supporting" according to the State of NH revised water quality standards for oligotrophic lakes. Oligotrophic lakes are characterized as being nutrient-poor, having rocky substrates and shorelines, deeper water, limited algae and aquatic plant growth, and an abundance of dissolved oxygen, even in deep water. This profusion of dissolved oxygen is crucial for productive fish habitat and is exemplified by the abundance of fish in the lake. Horn Pond is managed for both coldwater and warmwater fisheries.

The Horn Pond direct watershed covers 1.78 square miles (1,139 acres). Although Horn Pond's water quality is above average, the pond is threatened by polluted runoff from development in the surrounding watershed and along it's well developed shoreline. Soil erosion, in particular, is the single greatest source of pollution to Horn Pond. Soil contains the nutrient phosphorus, which has the potential to promote algae blooms when it enters a lake in large quantities. As the algae die off, the water becomes depleted of oxygen, affecting fish and animals who depend on the lake water.

In June 2008, in an effort to address this concern, a team of 20 local volunteers and technical staff from Acton Wakefield Watersheds Alliance, York County SWCD, NHDES, and Maine DEP conducted a survey of the watershed and identified 55 sites that are contributing polluted runoff to Horn Pond. Teams documented polluted runoff sources from roads, properties, driveways, and shorelines using cameras and standardized field data sheets. Survey results and remediation recommendations were compiled in the *Horn Pond Watershed Survey Report,* and summarized in Appendix C).

Current Water Quality Trends - HORN POND

Water Quality Information

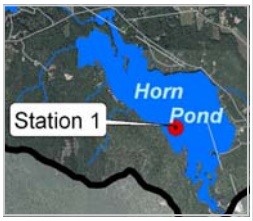
Water quality monitoring data for Horn Pond has been collected since 1982. This includes 11 years of secchi disk transparencies (SDT), 7 years of total phosphorus data (including 2 years of epicore samples), 2 years of chlorophyll-a, (Chl-a) data 7 years of color data, and 5 years of dissolved oxygen profiles. The Maine Department of Environmental Protection (Maine DEP), the Maine Volunteer Lake Monitoring Program (VLMP), the UNH Lay Lakes Monitoring Program (LLMP) and Center for Freshwater Biology (CFB), and NH Department of Environmental Services (NHDES) have collaborated in the collection of lake data to collect water quality data for Horn Pond in order to evaluate present water quality, track algae blooms, and determine water quality trends.

The water quality of Horn Pond is considered to be good by Maine standards, based on measures of SDT, TP, and Chl-a, and potentially non-supporting by NH standards based on the median TP concentration. The potential for nuisance algal blooms on Horn Pond is low. Water flushes through the Horn Pond 8.2 times/year, much more frequently than the average Maine or New Hampshire lake which flushes 1 to 1.5 times per year.

The ultimate goal for Horn Pond is to reduce the current in-lake TP concentration by 0.8 ppb to 7.2 ppb to achieve high quality standards, and prevent future water quality declines in Horn Pond. This can be accomplished by preventing soil erosion and stormwater runoff from existing development, and restricting phosphorus loading from new development.

Sampling Locations

Horn Pond has one regular sampling location, Station 1, located in the deepest area of the lake near the western shore. Station 1 is located on the Wakefield, NH side of Horn Pond.

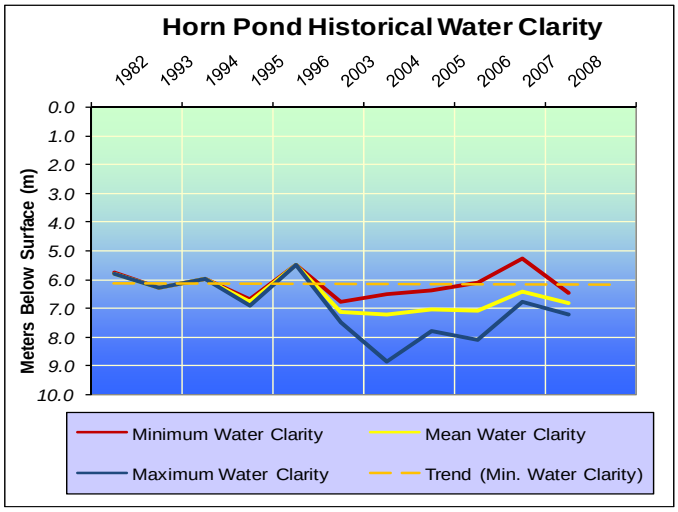


Water Clarity

Secchi Disk Transparency (SDT) is a quick, simple, inexpensive, and accurate method for determining the clarity of a lake. Factors that limit the depth of clarity include algae, zooplankton, water color, and silt. Generally, as algal populations increase, SDT readings decrease. SDT readings have been conducted in Horn Pond for over 29 years at Station 1, with an average annual SDT of 6.6 m (21.7 ft).

Sampling Results for Station 1 (1982-2008)

Sampling Parameter	Station 1
Mean Color (SPU)	16
Median EpiCore P (ppb)	8.0
Mean Secchi (m)	6.6
Mean Chl a (ppb)	2.8



Dissolved Oxygen (DO)

Dissolved oxygen (DO) in the lake is critical to the survival of all plants and animal. DO levels below 5 parts per million stress certain cold water fish, and a persistent loss of oxygen may eliminate or reduce habitat for sensitive cold water species. Low DO at the bottom of the lake is of particular concern because it can result in the release of phosphorus from bottom sediments- leading to increased algal production. Recent profiles show low to moderate DO depletion in deep areas of Horn Pond. Therefore, the potential for TP to leave the bottom sediments and become available to algae in the water column (internal loading) is low.

Total Phosphorus (TP)

Phosphorus is an essential element for plant growth, yet is found in limited amounts in lake systems. Therefore, small increases in phosphorus in Horn Pond can lead to substantial increases in algal growth. The range of water column total phosphorus for Horn Pond over the period from 1982 to 2008 for Station 1 is 4 – 11 parts per billion (ppb) with a median of 8.0 ppb. A TP reduction of 0.8 ppb is recommended for Horn Pond.

Lake Fact Sheet

Wilson Lake

LAKE FACTS

Watershed: Acton, ME

Counties: York

Midas Number: 3920

Mean Depth: 17 feet (5.2 m)

Max Depth: 44 feet (13.4 m)

Surface Area: 308 acres (0.48 mi^2)

Volume: 6,756,766 m^3

Perimeter: 19,419 feet

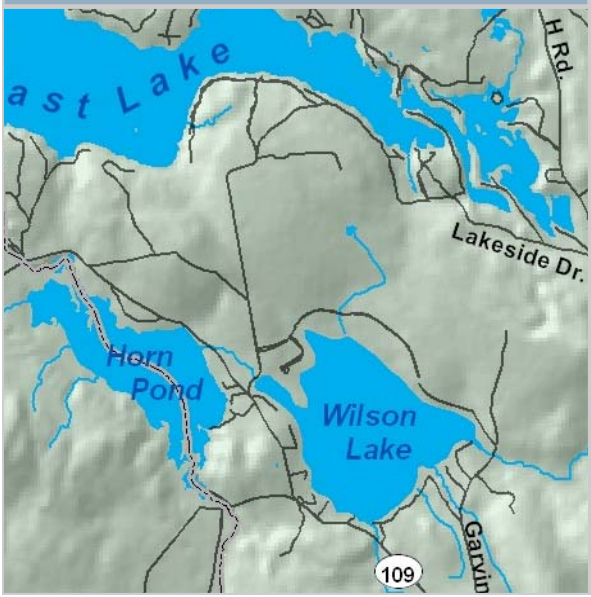
Flushing Rate: 0.85 flushes/year

Avg. Transparency: 5.8 meters (19 ft)

Watershed Area: 2,479 acres (3.9 mi^2)

Drains to: Horn Pond

Major Drainage Basin: Salmon Falls River



Wilson Lake is located on Route 109 in Acton, Maine - north of Gerrish Mountain and approximately 2 miles from the New Hampshire Border. The 308-acre waterbody drains to Horn Pond to the northwest, which flows into the Salmon Falls River and eventually empties into the tidal waters of the Piscataqua River in Portsmouth, New Hampshire. Boat access for Wilson Lake is located on the northwest side of the lake, off Young's Ridge Road.

The water quality of Wilson Lake is classified as "good", based on measured water quality parameters. Water quality classifications are assigned by Maine DEP based on measures of Secchi disk transparency (SDT), chlorophyll-a (Chl-a), and total phosphorus (TP). Lakes in this category are clear with an average SDT of 6.1 to 9.1 meters (20 to 30 feet) with relatively low algae levels (chlorophyll-a of 2 to 4 ppb) and phosphorus concentrations ranging from 5 to 10 ppb. This water quality type is common, and lakes in this category are considered to have average water quality.

The Wilson Lake direct watershed covers 3.9 square miles (2,479 acres) and is surrounded by houses on all shores. Although Wilson Lake's water quality is above average, the lake is threatened by polluted runoff from development in the surrounding watershed and along it's well developed shoreline. Additionally, low dissolved oxygen levels in deep areas of the lake indicate that it is threatened by polluted runoff. Soil erosion, in particular, is the single greatest source of pollution to Wilson Lake. Soil contains the nutrient phosphorus, which has the potential to promote algae blooms when it enters a lake in large quantities. As the algae die off, the water becomes depleted of oxygen, affecting fish and animals who depend on the lake water.

In the spring of 2009, in an effort to address this concern, a team of 32 local volunteers and technical staff from the Wilson Lake Association, Acton Wakefield Watersheds Alliance, York County SWCD, NHDES, and Maine DEP conducted a survey of the watershed and identified 71 sites that are contributing polluted runoff to Wilson Lake. Teams documented polluted runoff sources from roads, properties, driveways, and shorelines using cameras and standardized field data sheets. Survey results and remediation recommendations were compiled in the *Wilson Lake Watershed Survey Report* (summarized in Appendix C).

Current Water Quality Trends - WILSON LAKE

Water Quality Information

Water quality monitoring data for Wilson Lake has been collected since 1977. This includes 29 years of secchi disk transparencies, 9 years of phosphorus data (including 7 epicore samples), 5 years of chlorophyll-a, data 7 years of color data, and 17 years of dissolved oxygen profiles. The Maine Department of Environmental Protection (Maine DEP) and the Volunteer Lake Monitoring Program (VLMP) have collaborated in the collection of lake data to evaluate present water quality, track algae blooms, and determine water quality trends.

The water quality of Wilson Lake is considered to be good, based on measures of SDT, total phosphorus (TP), and Chlorophyll-a (Chl-a), and the potential for nuisance algal blooms on Wilson Lake is low to moderate. As such, stringent protection loading recommendations have been recommended for Wilson Lake.

The ultimate goal for Wilson Lake is to protect existing water quality by limiting future phosphorus increases to less than 1.0 ppb from current levels. This can be accomplished by limiting non-point source pollution (e.g. soil erosion, stormwater runoff) from existing development and restricting phosphorus loading from new development through watershed-wide planning efforts.

Sampling Location

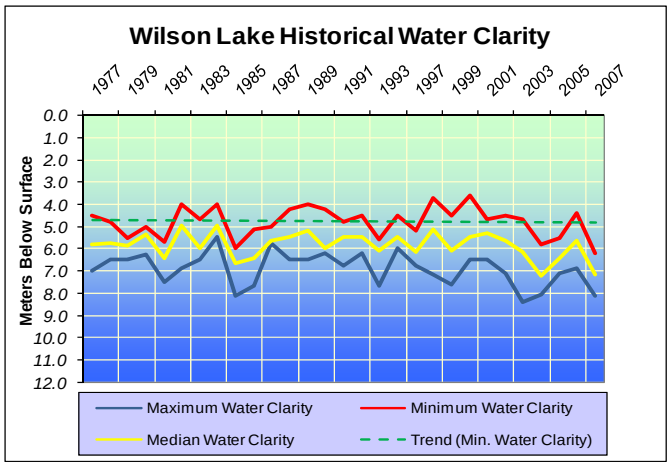
Wilson Lake has one regular sampling location, Station 1, located in the deepest area (44 ft.) in the lake's center.

Water Clarity

Secchi Disk Transparency (SDT) is a quick, simple, inexpensive, and accurate method for determining the clarity of a lake. Factors that limit the depth of clarity include algae, zooplankton, water color, and silt. Generally, as algal populations increase, SDT readings decrease. SDT readings have been conducted in Wilson for over 29 years at Station 1. Historical transparency readings range from 3.6 to 8.4 meters, with an average annual SDT of 5.9 m (19.4 ft). According to standards in Maine, Horn Pond has above average water clarity.

Sampling Results for Station 1 (1977-2007)

Sampling Parameter	Station 1
Mean Color (SPU)	16
Median EpiCore P (ppb)	6.5
Mean Secchi (m)	5.9
Mean Chl-a (ppb)	3.5



Dissolved Oxygen (DO)

Dissolved oxygen (DO) in the lake is critical to the survival of all plants and animals. DO levels below 5 parts per million stress certain cold water fish, and a persistent loss of oxygen may eliminate or reduce habitat for sensitive cold water species. Low DO at the bottom of the lake is of particular concern because it can result in the release of phosphorus from bottom sediments- leading to increased algal production. Recent profiles show high DO depletion in deep areas of Wilson Lake Therefore, the potential for TP to leave the bottom sediments and become available to algae in the water column (internal loading) is high.

Total Phosphorus (TP)

Phosphorus is an essential element for plant growth, yet is found in limited amounts in lake systems. Therefore, small increases in phosphorus in Wilson Lake can lead to substantial increases in algal growth. The range of water column total phosphorus for Wilson Lake over the period from 1979 to 2004 for Station 1 is 4 – 13 parts per billion (ppb) with a median of 6.5 ppb. Wilson Lake may be particularly sensitive to small increases in phosphorus, making management measures to limit phosphorus inputs from the watershed particularly important.

Lake Fact Sheet

Lovell Lake

LAKE FACTS

Watershed: Wakefield, NH

Counties: Carroll

Midas Number: N/A

Mean Depth: 13 feet (3.9 m)

Max Depth: 41 feet (12.5 m)

Surface Area: 538 acres (0.84 mi^2)

Volume: 8,623,000 m^3

Perimeter: 34,777 feet

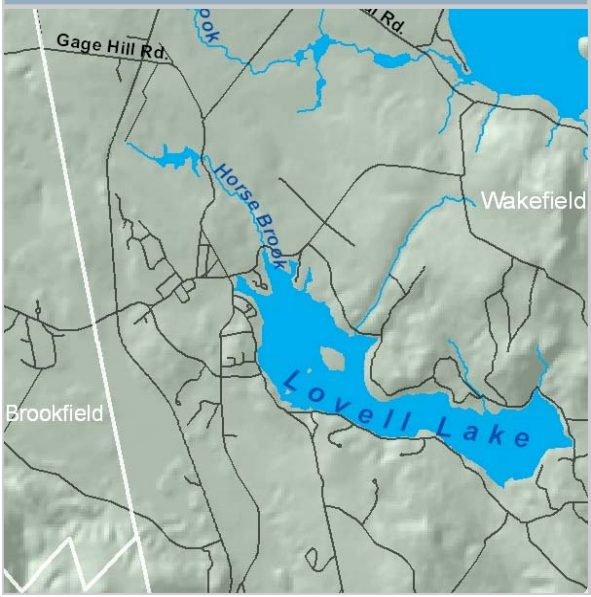
Flushing Rate: 0.70 flushes/year

Avg. Transparency: 5.9 meters (19 ft)

Watershed Area: 3,076 acres (4.81 mi^2)

Drains to: Branch River

Major Drainage Basin: Salmon Falls River



Lovell Lake is located in Wakefield, New Hampshire just north of Route 109. The 538-acre lake is both spring-fed and fed by small streams, including Horse Brook to the northwest. Lovell Lake outlets into the Branch River in the village of Sanbornville to the west. From here, the Branch River flows in a southeasterly direction to Milton, NH where it joins the Salmon Falls River on the Maine-New Hampshire border. The Salmon Falls River eventually empties into the tidal waters of the Piscataqua River in Portsmouth, New Hampshire.

Lovell Lake is a "Tier 1" waterbody and is "Fully Supporting" its designated uses according to NH water quality standards. Water quality classifications are assigned by New Hampshire DES based on measures of total phosphorus (TP) and chlorophyll-a (Chl-a). Lakes in this category are generally clear with relatively low algae levels of phosphorus (< 8 ppb) and Chl-a (< 3.3 ppb).

Lovell Lake is an oligotrophic lake, which means that it is generally nutrient-poor, with a rocky substrate and shoreline, limited algae and aquatic plant growth, and an abundance of dissolved oxygen, except in the deepest waters. This profusion of dissolved oxygen is crucial for productive warm water fish habitat, while low dissolved oxygen near the lake bottom prevents the establishment of a cold water fishery.

The Lovell Lake direct watershed covers 4.8 square miles (3,076 acres) in the Village of Sanbornville in the Town of Wakefield. Although Lovell Lake's water quality is average, the lake is threatened by polluted runoff from development in the surrounding watershed. Soil erosion, in particular, is the single greatest source of pollution to Lovell Lake. Soil contains the nutrient phosphorus, which has the potential to promote algae blooms when it enters a lake in large quantities. As the algae die off, the water becomes depleted of oxygen, affecting fish and animals who depend on the lake water.

In September 2008, in an effort to address this concern, a team of 32 local volunteers and technical staff from the Lovell Lake Association, Acton Wakefield Watersheds Alliance, York County SWCD, NH DES, and Maine DEP conducted a survey of the watershed and identified 161 sites that are contributing polluted runoff to Lovell Lake. Teams documented polluted runoff sources from roads, properties, driveways, and shorelines using cameras and standardized field data sheets. Survey results and remediation recommendations were compiled in the *Lovell Lake Watershed Survey Report* (summarized in Appendix C).

Current Water Quality Trends - LOVELL LAKE

Water Quality Information

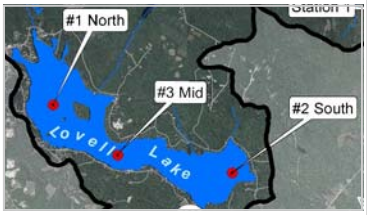
Water quality monitoring data for Lovell Lake has been collected at Station 1 since 1979, and Station 2 since 1989. This includes 19 years of secchi disk transparencies, 19 years of phosphorus data, 16 years of chlorophyll-a (Chl-a) and color data, and 3 years of dissolved oxygen profiles. The UNH Lay Lakes Monitoring Program (LLMP) and Center for Freshwater Biology (CFB), and NH Department of Environmental Services (NHDES) have collaborated in the collection of lake data for Lovell Lake in order to evaluate present water quality, track algae blooms, and determine water quality trends.

Based on measures total phosphorus (TP), and Chl-a, Lovell Lake does not meet standards for High Quality Waters in New Hampshire. Lovell Lake has a relatively low flushing rate which can make it sensitive to pollution. It takes 1.4 years for water to flush through the Lovell Lake system. The average Maine and NH lake flushes 1– 1.5 times/year.

Based on a slight decrease in water clarity, and a median phosphorus concentration of 7.5 ppb (which indicates that Lovell Lake has limited capacity to treat additional phosphorus from the land), phosphorus reduction strategies are needed for Lovell Lake. Lowering current in-lake phosphorus levels by 0.3 ppb will help establish Lovell Lake as a high quality waterbody in NH. This can be accomplished by limiting non-point source pollution (e.g. erosion and stormwater runoff) from existing development and restricting phosphorus loading from new development through watershed-wide planning efforts.

Sampling Locations

Lovell Lake has three sampling locations: Station 1 (north), Station 2 (south), and Station 3 (middle). Station 2 is located in the deepest part of the lake (41 ft.).

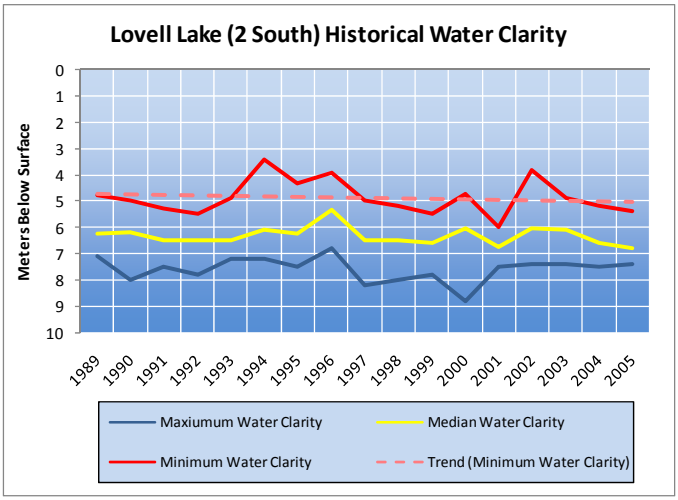


Water Clarity

Secchi Disk Transparency (SDT) is a quick, simple, inexpensive, and accurate method for determining the clarity of a lake. Factors that limit the depth of clarity include algae, zooplankton, water color, and silt. Generally, as algal populations increase, SDT readings decrease. SDT readings have been conducted in Lovell Lake for over 19 years at Station 2, with an average a mean annual SDT of 6.3 m (20.7 ft).

Sampling Results for Station 2 (1989-2007)

Sampling Parameter	Station 2
Mean Color (SPU)	11.7
Median EpiCore P (ppb)	7.5
Mean Secchi (m)	6.3
Mean Chl-a (ppb)	2.7



Dissolved Oxygen (DO)

Dissolved oxygen (DO) in the lake is critical to the survival of all plants and animals. DO levels below 5 parts per million stress certain cold water fish, and a persistent loss of oxygen may eliminate or reduce habitat for sensitive cold water species. Low DO at the bottom of the lake is of particular concern because it can result in the release of phosphorus from bottom sediments- leading to increased algal production. Recent DO profiles have not been collected in Lovell Lake, though profiles from previous decades indicate high DO depletion in deep areas of the lake. Therefore, the potential for TP to be released from bottom sediments and become available to algae in the water column (internal loading) is high.

Total Phosphorus (TP)

Phosphorus is an essential element for plant growth, yet is found in limited amounts in lake systems. Therefore, small increases in phosphorus in Lovell Lake can lead to substantial increases in algal growth. The range of water column total phosphorus for Lovell Lake over the period from 1989 to 2007 for Station 2 is 1.3 – 16.4 parts per billion (ppb) with a median of 7.5 ppb.