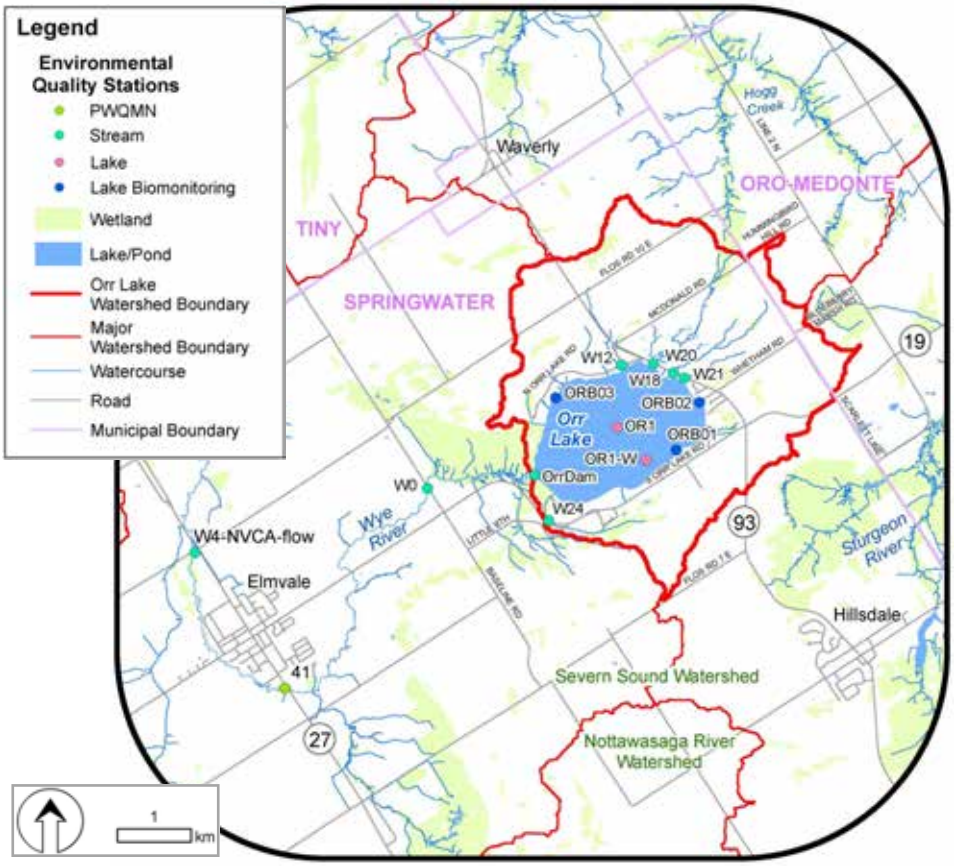
Orr Lake Subwatershed 2017 Conditions Report



The Orr Lake Subwatershed conditions report identifies the status, trends, and baseline conditions of Orr Lake using the most recent data sets available. The main focus of this report is to inform people who live on the lake or in the surrounding area of the general health of Orr Lake and the contributing watershed. This report is supported through the partnership with the Township of Springwater.

Orr Lake is a shallow, warm-water lake with a relatively flat lakebed. Orr Lake is located approximately three km northeast of Elmvale, Ontario and flows into Wye River, which outlets to Severn Sound near Midland. The underlying geology in the watershed is limestone-based, resulting in well buffered waters with high pH. The lake is mainly fed by surface water, with incoming streamflow that can be continuous or intermittent, and some groundwater inputs along the north shore.

Trends
↑ = Increasing
↓ = Decreasing
⇆ = No Change
I.D. = Insufficient data

Summary: How does Orr Lake Measure Up?

Indicator	Value (most recent year available)	Quality Status*	Trend	Indicator Description
Lake Water Quality Index	100 (2015)	Good	↑	The Canadian Council of Ministers of the Environment (CCME) Water Quality Index (WQI) summarizes water quality as a score based on the number of parameters that do not meet guidelines, and the number of times and amount by which they are not met.
Stream Water Quality Index	78 (2017)	Good	⇆	
Lake Benthic Invertebrates	6.3% (2016)	I.D.	**I.D.**	% *Ephemeroptera*, *Odonata*, and *Trichoptera* (%EOT) percent of the sample that contains Mayflies, Dragonflies and Caddisflies
Stream Benthic Invertebrates	4.1 (2017)	Fair	↑	The Hilsenhoff Biotic Index (HBI) estimates the overall pollution tolerance of the invertebrate community.
Forest Cover	45% (2016)	Fair	↑	Proportion of watershed that is forested
Forest Interior	14% (2016)	Fair	↓	Proportion of watershed that is interior forest (>100m from an outside edge)
Riparian Cover	26% (2016)	Poor	⇆	Amount of stream length with >30m adjacent forest cover on both sides of watercourse
Wetland Cover	18% (2016)	Good	**I.D.**	Proportion of watershed that is wetland; includes wooded wetlands (swamps)
Wetland Buffer	63% (2016)	I.D.	**I.D.**	Proportion of land within 100m of wetlands that is in a relatively natural state

*For more information on how indicator status was arrived at, please refer to the technical report

The **Severn Sound Environmental Association (SSEA)** provides continuing support to local municipalities, to sustain environmental quality and to ensure continued protection through wise stewardship of Severn Sound and its tributaries. Orr Lake subwatershed is part of one such tributary, Wye River. The SSEA samples Orr Lake water quality every five years. The SSEA is a Joint Service Board under the Municipal Act (Section 202) with membership consisting of the municipalities of Midland, Penetanguishene, Tiny, Tay, Springwater, Oro-Medonte, Georgian Bay, and Severn. The SSEA also works with many other partners including the provincial and federal governments to develop cost effective environmental projects in the Severn Sound area to the benefit of the entire community.

Status Scoring
Good
Fair
Poor
I.D.

Lake Water Quality

Lake WQI	Good

The CCME WQI for the protection of aquatic life is a summary index based on water quality guidelines. Using this index, water quality in Orr Lake is considered good and improving. Note that only parameters that have guidelines associated with them were used to calculate the water quality index; see technical report for more detail. Trends in individual water quality parameters are indicated in the adjacent table, and described below.

Orr Lake is considered moderately productive, or mesotrophic, based on nutrient concentrations and water clarity. Given its small size and shallow depth, Orr Lake has likely always been mesotrophic. This moderate level of productivity shapes the types of plant and animal communities to be expected in the lake.

Characteristic	Value
Average depth:	1.2 m
Maximum depth:	3.0 m
Shoreline perimeter:	7.2 km
Fetch (longest distance across):	2.5 km
Surface area:	309 ha
Watershed area (excluding lake):	1552 ha
Number of shoreline properties (2017):	Approx. 286 (59% seasonal & 32% full time)

Quality Indicator	Trend
Total phosphorus	No change
Total nitrogen	No change
Water clarity	No change
Total algae abundance	No change
Sodium, chloride, conductivity	Deteriorating

Shoreline Conditions

The lake shoreline is a mix of natural and manicured conditions. There is a large wetland on the west end of the lake, while the remaining shoreline is privately developed, with the exception of public access points. Developed sections of shoreline vary from being natural and well vegetated to being artificial and hardened.

Nutrients

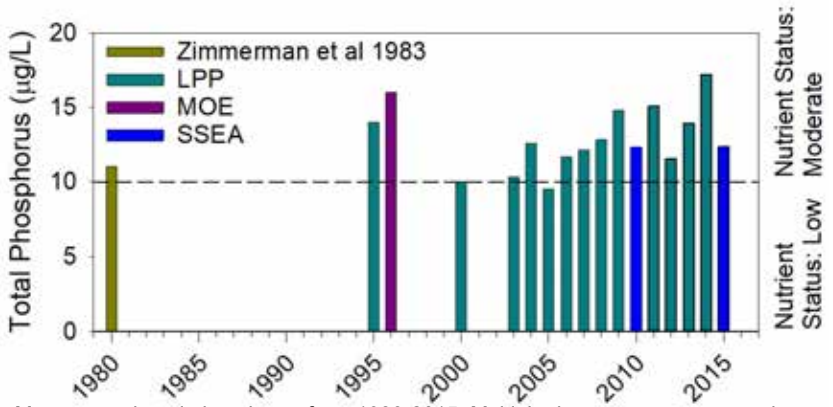
Phosphorus concentrations in Orr Lake are moderate. Nitrate values are low, likely due to rapid uptake by aquatic plants. Total nitrogen values are moderate.

Temperature

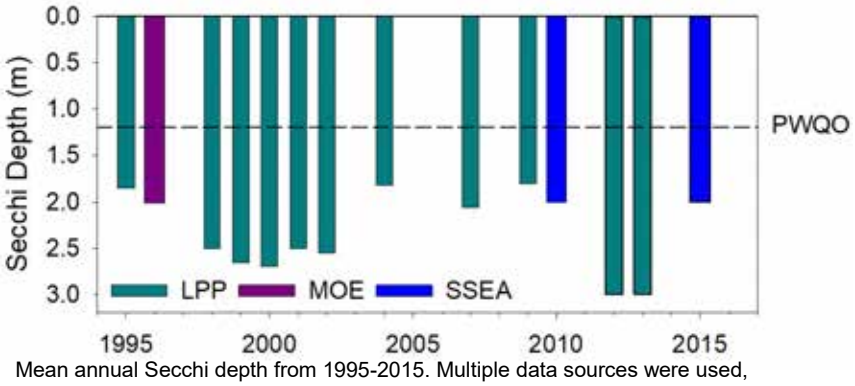
Due to its shallow depth, the temperature of Orr Lake is relatively uniform from top to bottom. It warms quickly in the spring and cools quickly in the fall, with peak temperatures above 25°C in August. Orr Lake is considered to be a warm-water lake.

Water Clarity

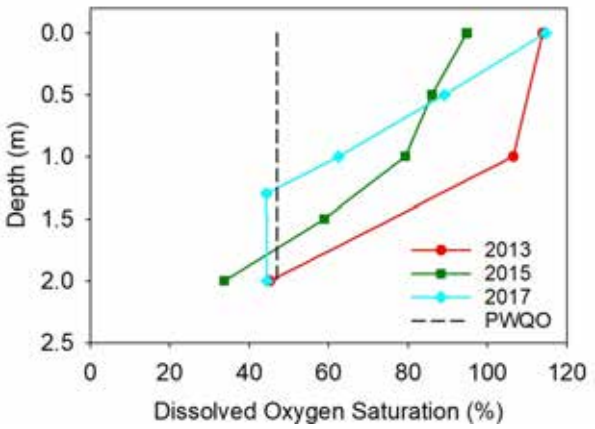
Water clarity in Orr Lake is considered fair to good. Clarity in lakes is described based on the visibility of a Secchi disk. The disk is often near or on bottom for most of the season except for periods during mid-late summer, meaning the lake is relatively clear. Long term Secchi depth data shows variability, part of which could be due to water level fluctuations.



Mean annual total phosphorus from 1980-2015. Multiple data sources were used, including volunteer Lake Partner Program (LPP) data. The Ministry of the Environment, Conservation and Parks (MECP) guideline for providing a high level of protection against aesthetic deterioration due to nuisance blooms is also shown (10 µg/L; dashed line).



Mean annual Secchi depth from 1995-2015. Multiple data sources were used, including volunteer LPP data. The Provincial Water Quality Objective (PWQO) for swimming safety is also shown (1.2 m; dashed line).



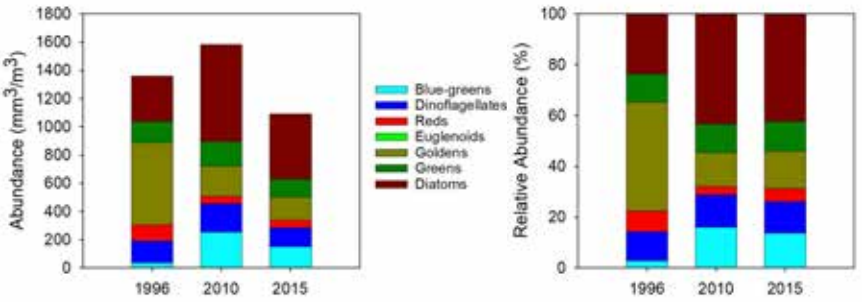
Under-ice dissolved oxygen saturation in Orr Lake. Data from 2013 and 2015 courtesy of Nottawasaga Valley Conservation Authority (NVCA). All data collected in early March.

Dissolved Oxygen

While Orr Lake experiences a mid-summer drop in dissolved oxygen concentrations, levels remain above the temperature-dependent PWQO for warm and cold water fauna. Under-ice oxygen conditions in late winter show depletions below 1 m depth that are lower than the PWQO, and may be limiting for some cool water fish.

Winter Sampling on Orr Lake

Algae and Zooplankton

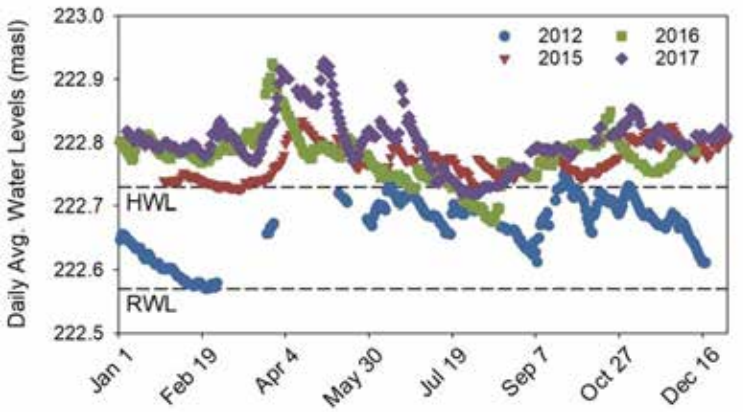


Algae and zooplankton (tiny floating or weakly swimming invertebrates that drift with water currents) form the basis of the lake food web, and both are necessary to sustain healthy fish populations. Past studies have shown moderate algae abundance with communities typical of a moderately enriched shallow lake. Nuisance species such as the blue-green algae *Microcystis* have been kept in check by the widespread coverage of aquatic plants. Without aquatic plants to use up the nutrients in the lake, nuisance algae blooms would likely occur. Zooplankton community diversity is relatively low, but includes a substantial proportion of large-bodied species, which are essential food for prey fish and young-of-the-year sport fish.

Water Levels

Orr Lake water levels are regulated by a dam at the west end of the lake, which is managed by the Township of Springwater. Water level limits are set by the Ministry of Natural Resources and Forestry (MNRF). Based on water level data from a gauge operated by NVCA, levels have been mostly above the MNRF High Water Level since 2015. MNRF definitions:

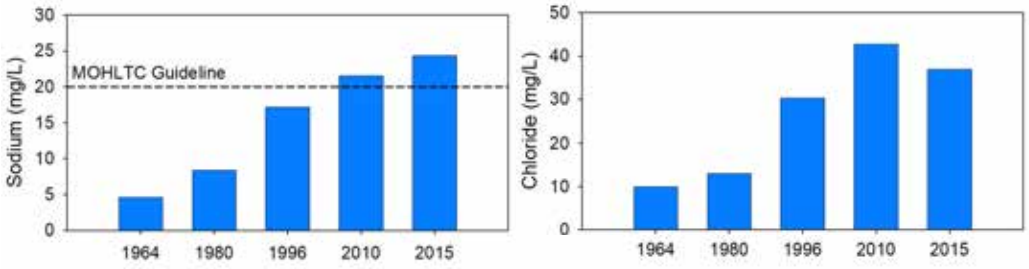
- High Water Level – highest level that can be held on the lake (222.73 m above sea level)
- Regulated Water Level – normal functioning level of the lake (222.57 m above sea level)



Orr Lake water levels for 2012-2017 (courtesy of NVCA). The Regulated Water Level (RWL) and High Water Level (HWL) are also shown for reference.

Sodium and Chloride

The most common source of sodium and chloride in lakes is from winter application of de-icing salts. Chlorides can also enter waterways from septic effluent. Concentrations of chloride have been steadily increasing in Orr Lake and the Wye River, and sodium in Orr Lake has exceeded the Ontario Ministry of Health and Long-Term Care (MOHLTC) guideline since at least 2010. Residents who are on low sodium diets should be aware that drinking treated lake water is a source of sodium. Chloride levels are well below the CCME guideline for the protection of aquatic life (120 mg/L).



Fishery

The warm temperature of the lake supports a cool/warm water fishery. Species documented by MNRF include: brown bullhead, largemouth bass, pumpkinseed and rock bass. Additional species reported by the public include northern pike. MNRF's Fish ON-Line website provides information on the Orr Lake fishery and also invites anglers to contribute information on their fishing efforts in order to better understand sportfish populations.

MECP Consumption Advisories are available for: brown bullhead, largemouth bass, pumpkinseed, rock bass, northern pike and yellow perch, and can be found at the MECP's Fish Consumption Advisory page. Generally, the further up the food chain and the larger the fish, the lower the recommended number of servings per month, particularly for more sensitive populations such as children and pregnant women.

Rock Bass

Public Beaches

While the Simcoe Muskoka District Health Unit does not currently monitor *E. coli* at Orr Lake beaches, general information on beach water quality is available on their website. In particular, they recommend that beach users avoid swimming two days after a heavy rainstorm.

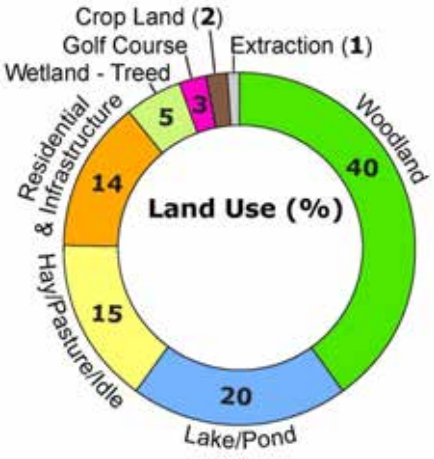
Recreational Use of Orr Lake

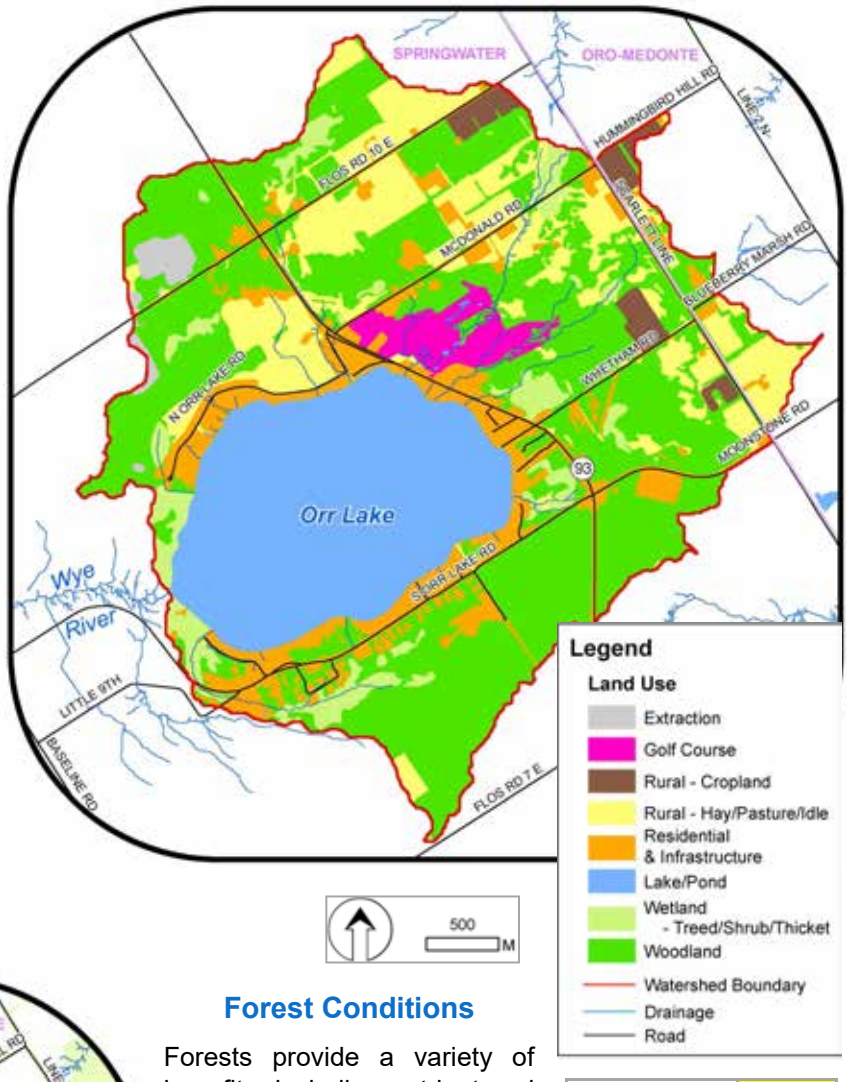
Habitat and Land Use

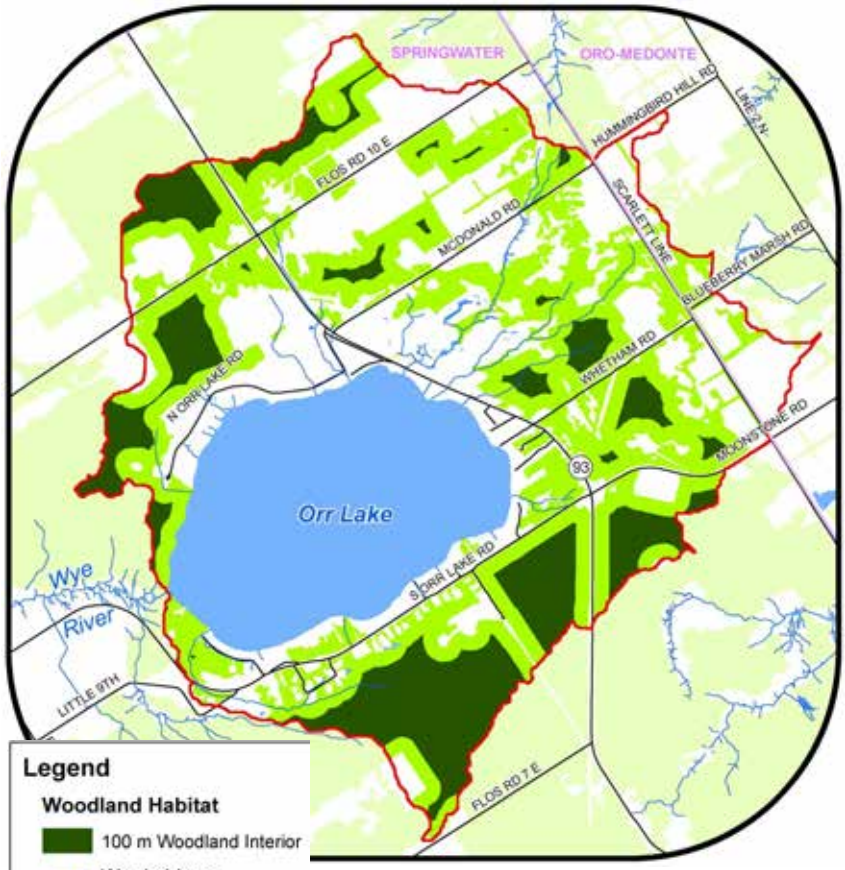
Land Use

Land Use	I.D.

The lake has 7.2 km of shoreline, which consists of approximately 286 shoreline properties. In addition to these seasonal and permanent dwellings, there are three trailer parks, one of which is on the waterfront. Combined, the trailer parks have approximately 136 full service sites. The lake makes up approximately 20% of the watershed area. Land cover within the watershed is highly permeable, allowing for much of the precipitation to soak into the ground before making its way to the lake. Land cover (excluding the lake) is comprised of 80% highly permeable lands (including farmlands and non-urban natural spaces) and 20% lower permeability lands (including roads and residential properties). Land use is a combination of agriculture, woodland, residential, commercial/recreational, and wetland.



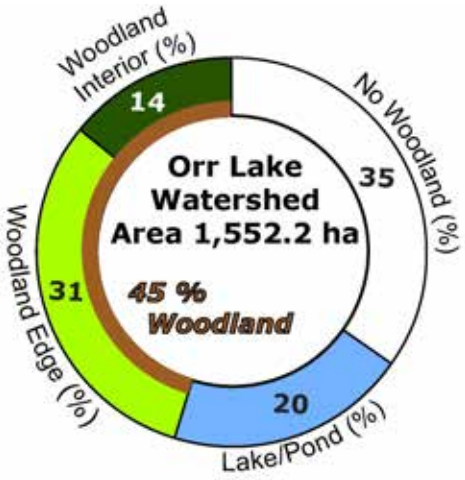




Forest Conditions

Forest Cover	Fair
Forest Interior	Fair

Forests provide a variety of benefits, including nutrient and water cycling, preventing erosion, and providing wildlife habitat, clean air, recreational opportunities and wood products. Some woodland plants and animals require large tracts of undisturbed woodland with wide buffers from the forest edge because they are vulnerable to noise, light, temperature, wind, predation and other conditions found in edge habitat. The amount of *forest interior habitat* in a woodland is the portion of the forest that is situated 100 metres or more from an outside edge.



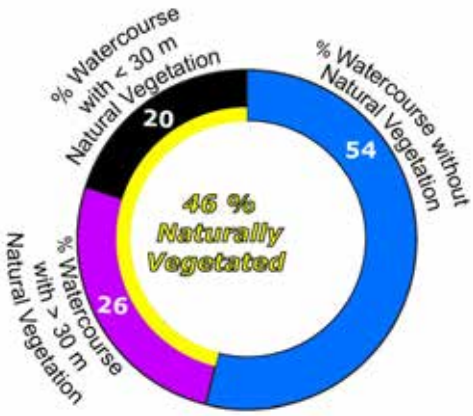
Orr Lake Watershed

- 702.8 ha or 45% of watershed is woodland
- 217.2 ha or 14% of watershed is forest interior habitat

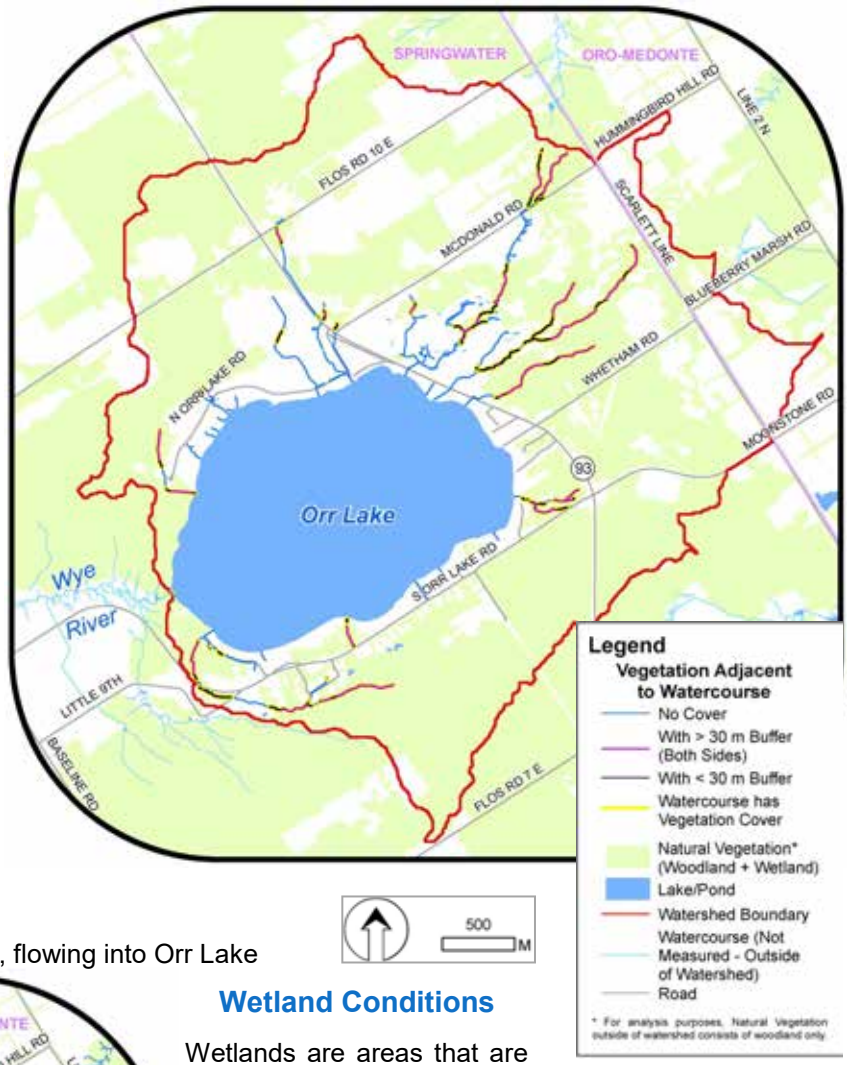
Riparian Zone

Riparian Cover	Poor

The riparian zone is the area beside a river, stream or lake where the aquatic and upland habitats influence each other. A wide, vegetated riparian zone provides habitat, mitigates water temperature fluctuations, helps reduce bank erosion, and protects aquatic health and water quality.

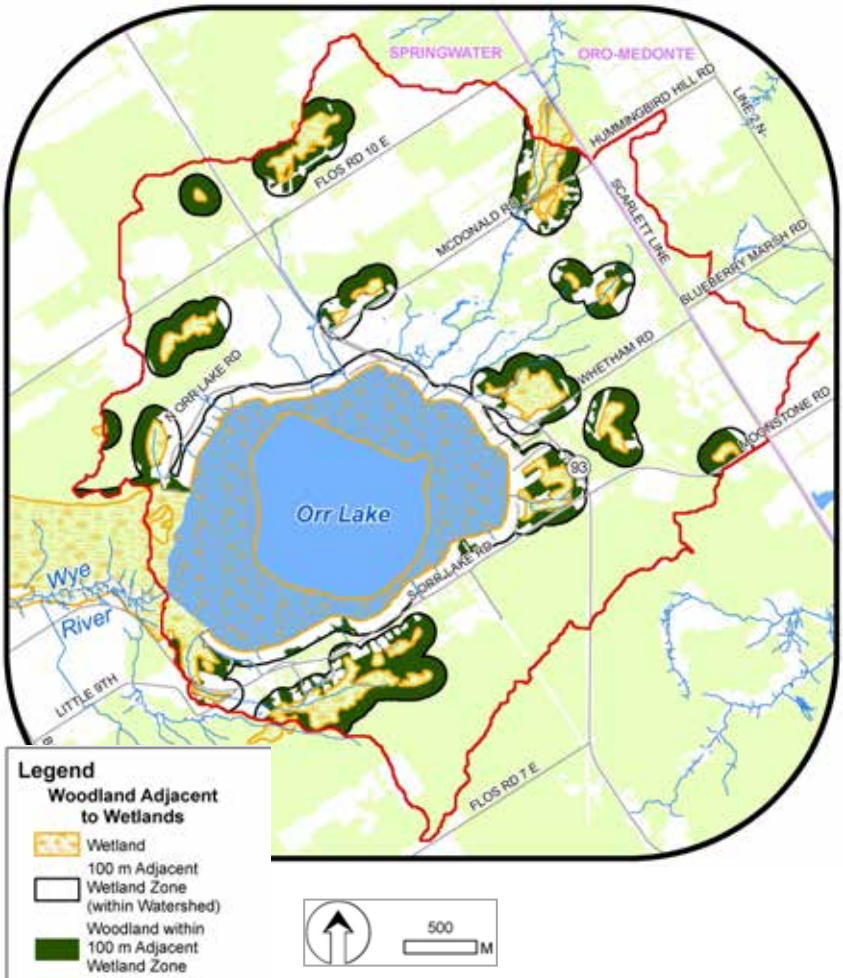


Watercourses include streams as well as overland flow, ditches or culverts that originate in or flow out of a natural drainage feature (wetland, lake, or stream).



Orr Lake Watershed

- 46% of stream length is bordered by natural vegetation, but only 26% of watercourses have at least 30 m of natural vegetation on both stream banks
- There are 17.6 km of watercourses draining the land, flowing into Orr Lake



Wetland Conditions

Wetland Cover	Good
Wetland Buffer	I.D.

Wetlands are areas that are periodically or permanently flooded with shallow water, or where the water table is close to the surface, resulting in saturated soils and the establishment of water-loving or water-tolerant plants. Common types of wetlands are swamps (treed wetlands) and marshes.

Wetlands are home to a wide variety of native plants and wildlife, and provide important ecological and hydrological services such as flood retention, water quality improvement and shoreline erosion control.

Natural areas adjacent to wetlands are important for protecting and maintaining wetland functions and features, and for providing additional breeding, foraging, dispersal and overwintering habitat for wetland species.

Orr Lake Watershed

- 273.7 ha or 18% of watershed is wetland (includes wooded wetlands/swamps and parts of Orr Lake nearshore/open water)
- Within 100 m of wetlands, 37% of the land has been developed or altered, and 63% is in a relatively natural state

Stream Water Quality

Stream WQI	Good

Based on the CCME WQI, the overall water quality in the Wye River (crossing at Hwy 27 south of Elmvale) is good and relatively stable. Trends in individual water quality parameters are indicated in the adjacent table. Data for the Wye River are available through the Provincial Water Quality Monitoring Network (PWQMN) Program from 2002- 2017.

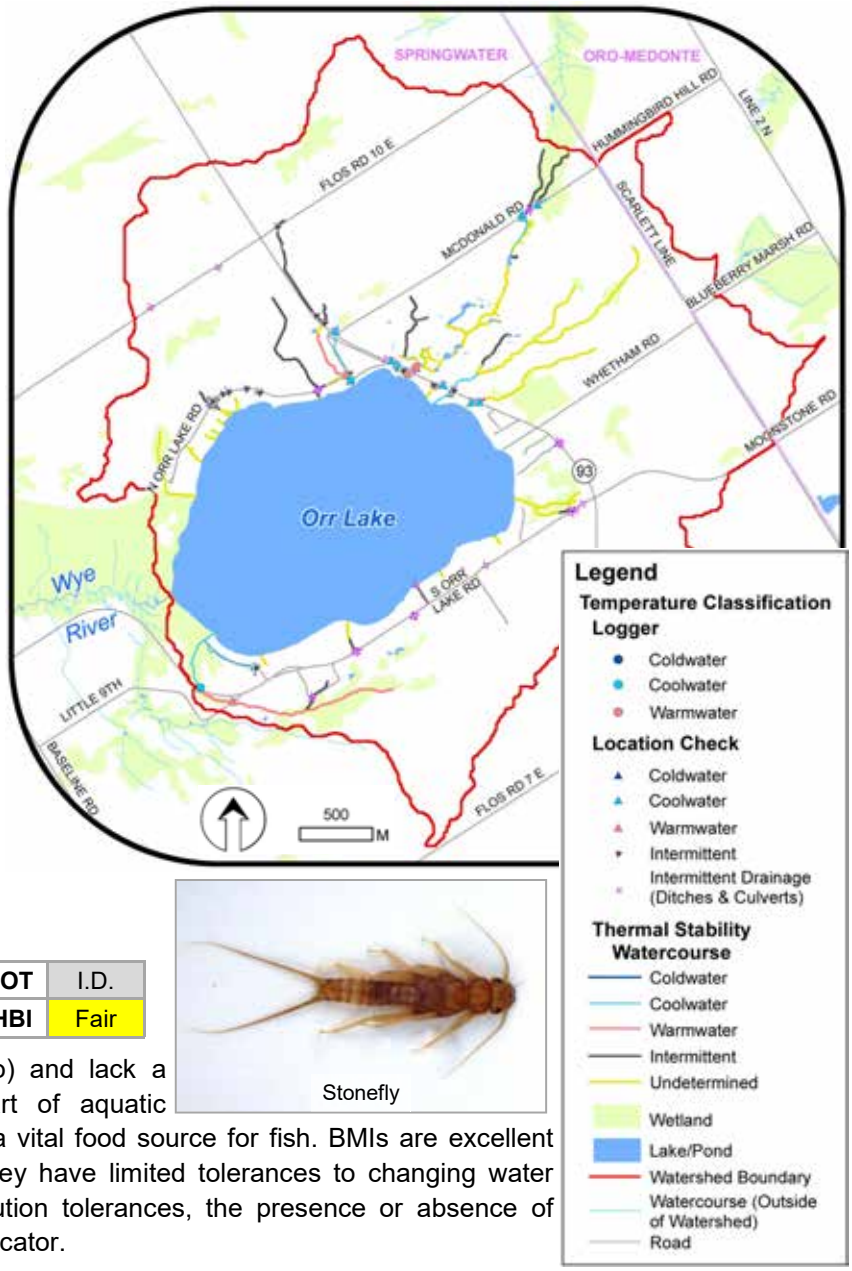
Quality Indicator	Trend
Total phosphorus	Improving
Total nitrogen	Deteriorating
Sediment load	No change
Sodium, chloride, conductivity	Deteriorating

Some of the inflowing tributaries to Orr Lake have high nitrate and phosphorus concentrations and represent a source of nutrients to the lake. Downstream water quality in the Wye River shows moderate levels of phosphorus and sediment, which peak during high flow events. Nitrate and total nitrogen values are high.

Thermal Stability

Thermal stability is the ability of a stream to buffer changes in water temperature as air temperature increases. This is primarily a function of the influence of groundwater discharge and, to some extent, the amount of shading provided by riparian vegetation. Thermal stability is best measured during the warm summer period when air temperatures are higher and low streamflow conditions predominate.

Streams that stay cool even on very hot days are thermally stable, while those that warm up with increasing air temperatures are thermally unstable and potentially unsuitable habitat for cool or cold water fish species such as rainbow or brook trout. The SSEA uses the thermal stability model that was developed by Stoneman & Jones (1996) "A Simple Method to Determine the Thermal Stability of Southern Ontario Trout Streams". This standardized approach is directly comparable with protocols that are widely used by the MNRF and Ontario Conservation Authorities.



Benthic Macroinvertebrates

Lake %EOT	I.D.
Stream HBI	Fair

Stonefly

Benthic macroinvertebrates (BMI) are organisms that live in the bottom sediments of streams and lakes (benthic), are large enough to see with the naked eye (macro) and lack a backbone (invertebrate). They are an essential part of aquatic ecosystems, processing organic matter and providing a vital food source for fish. BMIs are excellent indicators of local water quality conditions because they have limited tolerances to changing water quality and are relatively immobile. With varying pollution tolerances, the presence or absence of certain types of BMIs serve as a useful water quality indicator.

Baseline condition values were collected for three Orr Lake locations (ORB01, ORB02 and ORB03, Map on Page 1). These sites had different habitats but the BMI communities were similar in terms of indices such as diversity (total taxa) and pollution tolerance (Hilsenhoff Biotic Index, HBI, 2016 data, New York State tolerance values). Future quality and trend information will be determined based on additional monitoring. BMI indices from 1998-2017 at the Wye River site showed that conditions are improving or holding steady, with indices in 2017 showing average or above average conditions.

Quality Indicator	Indicator Description	Trend	2017 Stream Assessment
Total # of Bugs	Total number of bugs collected	No change	Typical
Total Taxa	The number of different taxa present	Improving	Extremely Atypical*
Ephemeroptera, *Plecoptera*, and *Trichoptera* (%EPT)	Percent of the sample that is Mayflies, Stoneflies and Caddisflies	Improving	Typical
Hilsenhoff	Based on known tolerances values of BMI to organic pollution	Improving	Typical

*The Wye River was classed as Extremely Atypical based on Total Taxa because it had a high number of families present when compared to the past sample results. Higher diversity indicates a healthier stream.

Invasive Species

Non-native, invasive fish, plants, and insects can negatively impact native ecosystems, affect water quality, devalue property, and pose a human health risk. At least nine invasive species have been confirmed within the Orr Lake watershed, with a high probability that more aquatic and terrestrial invasive species may be found in the future. Boat launches, roadsides, shorelines, beaches, parks, and trails are some of the most common areas where invasive species are found. Invasive species can be spread through movement of firewood, improper disposal of yard and garden waste, and as hitchhikers on recreational vehicles, pets, and footwear.

Phragmites

Invasive species confirmed within the Orr Lake Watershed:

- Phragmites (*Phragmites australis spp. australis*)
- Spotted knapweed (*Centaurea maculosa*)
- Periwinkle (*Vinca minor*)
- Glossy buckthorn (*Frangula alnus*)
- Purple loosestrife (*Lythrum salicaria*)
- Canada thistle (*Cirsium arvense*)
- Manitoba maple (*Acer negundo*)
- White sweet clover (*Melilotus albus*)
- Reed canary grass (*Phalaris arundinacea*)

Spotted Knapweed

How you can help fight invasive species:

- Use native species for landscaping and gardens
- Learn how to identify common invasive species and report your sightings
- Don't dump aquariums or release live baitfish into a waterbody
- Dispose of yard waste in certified compost facilities

Well Water Testing Information

Regular testing is needed to stay informed about the safety of your well water and the condition of your well. Private wells should be tested though the Simcoe Muskoka District Health Unit for bacteria (*E. coli* and total coliform) three times per year, after a heavy rainfall or snowmelt. Well water should also be tested occasionally for other parameters such as nitrate, minerals and metals. The Ontario Ground Water Association offers water testing packages for well owners.

Well Testing Bottle

Maintaining your Septic

A septic system, when working properly, safely treats sewage and wastewater. The users can increase the septic system's effectiveness by conservative use of water and careful consideration of what is put down toilets and drains.

If your property has a septic system:

- Conserve water
- Avoid using harsh chemicals and cleaners that kill the bacteria that are needed to keep the system functioning properly
- Keep solids (e.g., grease, food waste) and anything else that takes a long time to break down out of the system
- Maintain the system: clean the effluent filter every 6 months, have the tank pumped regularly (generally every 3-5 years)
- Keep heavy items (e.g., vehicles, swimming pools, skating rinks) off the leaching bed to prevent compaction
- Pursue necessary repairs or replacement as needed

Rusted Septic Tank

Protecting Orr Lake Water Quality

Citizen Science

There are several ways that citizens can become lake stewards and help gather valuable information about the lake. SSEA runs an **Ice Spotters program** where observers submit photos and ice descriptions along with the date that ice forms in the winter and breaks up in the spring. SSEA's **Shorewatch program** encourages shoreline owners and lake users to contact the SSEA office with observations of nuisance algae growth.

Individuals interested in hands-on sampling can also join the MECP's Lake Partner Program (LPP) and collect spring total phosphorus and seasonal water clarity measurements. SSEA is grateful to Ted Woodcock for his years of dedication in collecting samples for the LPP and for assisting with SSEA's lake sampling efforts.

Contact the SSEA office if you are interested in becoming a citizen scientist!

SSEA Tree Program

Trees and forests provide a wide variety of benefits to people, wildlife and the environment. The SSEA and local volunteers plant thousands of tree seedlings each year through the SSEA Habitat Restoration Tree Planting Program. This program's goals are to restore habitat, improve stream water quality and increase woodland cover. For larger tree plant projects that qualify, the SSEA provides assistance with project planning, supplies native tree and shrub seedlings, and coordinates volunteers to plant the trees, at no cost. A limited number of seedlings are available each year - landowners should contact SSEA by early fall if they are interested.

Property owners that are planning to plant a smaller number of trees on their own may be interested in the SSEA's Tree Seedling Distribution Program, which offers reasonably-priced native tree and shrub seedlings. For this initiative, seedlings must be pre-ordered by mid-January.

Maintaining Healthy Shorelines

Natural vegetation along the shoreline and in the shallow nearshore plays a crucial role in providing habitat for a diversity of fish and wildlife, as well as maintaining lake health and improving water quality. Waterfront property owners and lake users can help limit impacts from damaging practices and shoreline development. SSEA's Natural Shorelines Project offers more information and tips on maintaining a natural shoreline. The population of Wild Rice (*Zizania palustris*) that grows in Orr Lake is noteworthy. Wild rice has cultural, spiritual and historical importance, and provides food and habitat for waterfowl and other wildlife. Wild rice is protected and can only be harvested or removed with a permit from the MNRF through the Wild Rice Harvesting Act.

Resources

SSEA Resources Page

More Water Quality Information

Simcoe Muskoka District Health Unit Beach Water Quality

Fish Consumption Advisory

Swim Guide

Fish ON-Line

Working Around Water

Nottawasaga Valley Conservation Authority (NVCA)

Interactive Property Map (shows NVCA Regulated Area)

Department of Fisheries and Oceans (DFO)

Ministry of Natural Resources and Forestry (MNRF)

Municipal permits - Township of Springwater

DFO Projects Near Water

Crown Land Work Permits

Stay Connected!

Orr Lake Ratepayers Association (OLRA)

Additional information on this conditions report will be available in the SSEA Orr Lake Technical Report (Winter 2018/19). Maps produced by the Severn Sound Environmental Association with Data supplied in part from the County of Simcoe, the Ontario Ministry of Natural Resources and Forestry (© Queen's Printer 2018) and under License with Members of the Ontario Geospatial Data Exchange, 2018. While every effort has been made to accurately depict the feature data, errors may exist. Any party relying on this information does so at their own risk. This document is supported by the partnership with the Township of Springwater. It contains data from the SSEA, the Nottawasaga Valley Conservation Authority (NVCA) and the Lake Partner Program (LPP).