



# Rideau Lakes Subwatershed Report 2014

## LOWER RIDEAU LAKE CATCHMENT



The RVCA produces individual reports for eight catchments in the Rideau Lakes subwatershed. Using data collected and analysed by the RVCA through its watershed monitoring and land cover classification programs, surface water quality conditions are reported for Upper Rideau Lake along with a summary of environmental conditions for the surrounding countryside every six years.

This information is used to help better understand the effects of human activity on our water resources, allows us to better track environmental change over time and helps focus watershed management actions where they are needed the most.

The following pages of this report are a compilation of that work. For other Rideau Lakes catchments and the *Rideau Lakes Subwatershed Report*, please visit the RVCA website at [www.rvca.ca](http://www.rvca.ca)

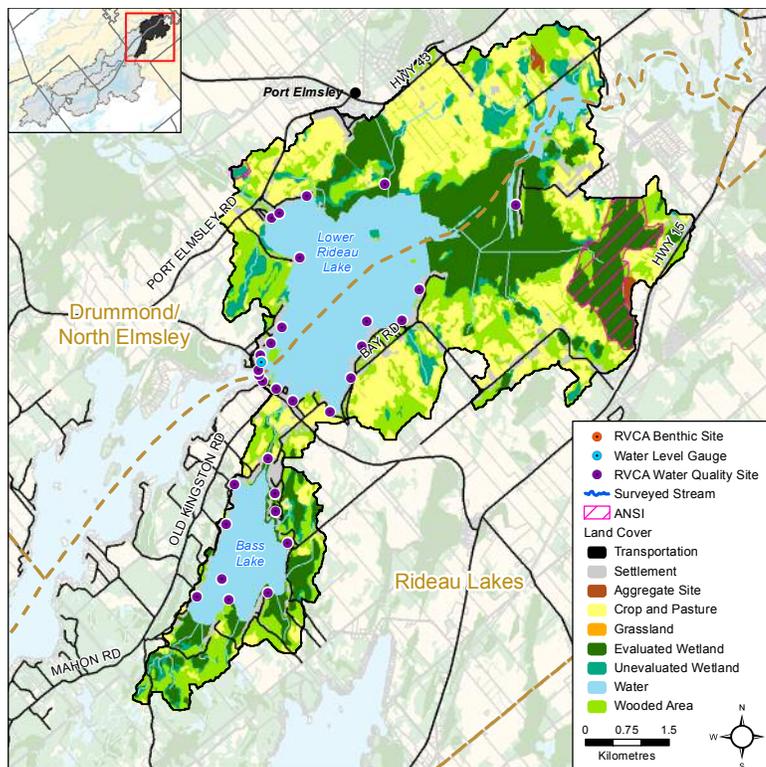
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## Catchment Facts

### General Geography

- The Rideau Lakes are a very popular seasonal tourist and residential destination because of its diverse natural amenity, cultural history associated with the UNESCO World Heritage Site designated Rideau Canal, close proximity to a number of large cities and towns and ease of access via the Rideau Canal. Residents and vacationers flock to Rideau Lakes in the



summer to take advantage of its natural heritage and recreational opportunities such as boating, fishing and swimming. Cottages, houses, campgrounds, B&Bs and marinas stretch extensively along the shoreline that was once largely untouched, putting pressure on the natural resources that support the Rideau Lakes many uses and users

- Newboro, Portland, Rideau Ferry and Westport are the main settlement areas in the Rideau Lakes subwatershed. Of these, only Rideau Ferry is located in the Lower Rideau catchment, which supports a substantial tourist trade and is a service centre for local residents. It is also a major boating centre in the Rideau Lakes offering marina and other services and is one of the main gateways for visitors to access the Rideau Lakes
- Parks Canada manages water levels for recreational purposes along the Rideau Canal/Waterway (also designated a National Historic Site and a Canadian Heritage River) that runs through the catchment, ensuring 1.5 metres of draft during the navigation season. In this managed system, water levels on the Rideau Canal are manipulated by operation of numerous dams. In the Rideau Lakes subwatershed, Parks Canada staff operate dams at Wolfe Lake, the Narrows on Upper Rideau and Poonamalie at the outlet of Lower Rideau Lake. The dams on Westport Sand Lake and Westport Pond are operated by the Ministry of Natural Resources and Forests in cooperation with Parks Canada. Water levels are lowered in October throughout the Canal system to the winter operating level that is maintained until early March when snow, ice and precipitation data are used to estimate spring snow melt conditions. At the onset of the spring freshet, water levels are targeted using a rule curve (i.e. a pre-determined estimate of water levels to ensure a "best fit" to prevent as much as possible high and low levels). In late May, levels are at the maximum for the beginning of the navigation season. Levels decline gradually throughout the summer until the winter level is reached once again. The annual range of operational water levels on the lakes is in the order of one metre

- The Rideau Lakes form part of the Frontenac Arch Biosphere Reserve (Frontenac Axis), an important intra-regional landscape feature which supports a wide variety of species and their movements between Algonquin Park in Central Ontario and Adirondack Park in Upper New York State
- Lower Rideau Lake has embayments including Beveridge, Millers, Pettys and Sawlog Bay

#### Physical Geography

- The Lower Rideau Lake catchment is located within the physiographic region known as the Smith Falls Limestone Plain. In this area, the underlying bedrock consists of Paleozoic quartz sandstone, some dolostone and possibly conglomerate. The sediment overlying the bedrock is primarily mixed glacial sediment often referred to as drift
- Organic deposits are also found within the catchment where swamps and marshes are situated. Geologic faults, oriented in an east to west and north easterly direction transect all or part of the lake and drumlin features are located between Poonamalie Side Road and Highway 43
- Fifty-eight percent of the catchment lies within the Township of Rideau Lakes and 42 percent is in Drummond/North Elmsley Township
- The Lower Rideau Lake catchment drainage area is 48 square kilometres and occupies about 10 percent of the Rideau Lakes subwatershed and one percent of the Rideau Valley watershed
- Land cover is comprised of wetland (26 percent), crop and pastureland (23 percent), water (23 percent) and woodland (20 percent) followed by settlement areas (six percent) and transportation routes (two percent)

#### Vulnerable Areas

- Certain lands around Big Rideau Lake are subject to flooding hazard during the regional storm flood (the 100 year flood) conditions in the area. Surveys and studies undertaken in accordance with provincial standards have determined that the 100 year flood elevation for the lake is 124.51 metres above mean sea level
- The Assessment Report developed under the Ontario *Clean Water Act*, identified the catchment area as Highly Vulnerable Aquifer and a portion of the area is considered to be a Significant Groundwater Recharge Area

#### Development/Trends

- Given the proximity to the serviced communities of Perth, Portland, Rideau Ferry and Smiths Falls, (which have a mix of residential, commercial and institutional uses), there is added pressure for other residential development beyond existing settlement areas in the Rural zoned areas around Lower Rideau Lake
- Much of this development will continue to occur along waterfronts, as it has in the past. While many lakes have been developed to the extent that the physiography of the region will allow, others still have some development potential. In some cases, new lot development can occur only on marginal lands (steep slopes, shallow soils, narrow waterfronts, low lying poorly-drained lands) as the remaining lands have been fully developed
- Most development activity is focused around redevelopment, where cottages are being replaced with large permanent residences on small lots. This can put additional stress on the lake environment because large development envelopes on smaller lots leave less space for natural processes (e.g., runoff, infiltration and retention, nutrient uptake, erosion control and shading) and natural features (e.g., trees, shrubs and plants) that support a healthy lake environment. Minor variances are frequently triggered because the lots do not have sufficient area to provide for a minimum 30 metre development setback from the lake

- In the Drummond/North Elmsley Township area of the catchment, the shoreline is less densely developed than other waterfront areas in the Township and has a relatively natural setting. Clusters of development include the Beveridge Locks community, a mobile home park adjacent to the canal locks and Rideau Ferry Village at the western end of the catchment. The Easter Seals Camp Merrywood overlooking Beveridge Bay is also one of the largest and most established uses on Lower Rideau Lake. There is also scattered residential and agricultural development along Poonamalie Sideroad. Development pressure in this part of the Township over the last few years has been relatively light and mostly limited to cottage expansions and the redevelopment of existing lots. Recreational infrastructure is fairly well developed with the Beveridge Lock station and boat launch along with boat launches at the Rideau Ferry Conservation Area and Township docks. The Beveridge Locks facility is part of Parks Canada's Rideau Canal infrastructure and includes a historic lock station, museum and two sets of locks, which is a popular venue for boaters doing day trips up the Tay River to Perth. Current land-use zoning in the catchment consists mainly of Limited Service Residential along the waterfront of Lower Rideau Lake and Rural elsewhere with some smaller Rural and Residential zones in Rideau Ferry and in adjacent subdivisions. There is also commercial and recreational development in the catchment oriented towards the Rideau Ferry Road in the vicinity of the Village
- In the Township of Rideau Lakes area of the catchment, land use is predominately Rural with the southern shoreline of Lower Rideau Lake zoned Waterfront Residential. Rideau Ferry itself has both residential and commercial uses. Access to the lake is provided via a combination of public and privately maintained roads with the majority of waterfront residential properties being serviced by private roads. Bass Lake is the other major waterbody in the catchment within Rideau Lakes Township and is surrounded by Waterfront Residential lands and Rural lands elsewhere

#### Conditions at a Glance

- Surface water quality rating in Lower Rideau Lake is "Very Poor" and "Poor" in Bass Lake
- Woodland cover proportion has changed/decreased by less than one percent (36 hectares) from 2002 to 2008, due to a combination of changes in land cover/land uses and/or applied digital air photo classification methods
- In the Lower Rideau Lake catchment, the riparian buffer (30 metre wide strip along the shoreline of all lakes and streams) is comprised of wetland (52 percent), settlement areas (22 percent), woodland (16 percent), crop and pastureland (eight percent) and transportation routes (two percent)
- Around Lower Rideau Lake, the shoreline buffer is made up of wetland (54 percent), settlement areas (29 percent), woodland (14 percent), transportation routes (two percent) and crop and pastureland (one percent)
- Around Bass Lake, the shoreline buffer is made up of settlement areas (65 percent), woodland (16 percent), wetland (15 percent), transportation routes (three percent) and crop and pastureland (one percent)
- Along streams, the riparian buffer is comprised of wetland (65 percent), woodland (16 percent), crop and pastureland (14 percent), settlement areas (three percent) and transportation routes (two percent) throughout the catchment
- Development on Bass lake and Lower Rideau Lake and in Rideau Ferry occurs on private wells (of which there are about 499 water well records in the catchment) and septic systems

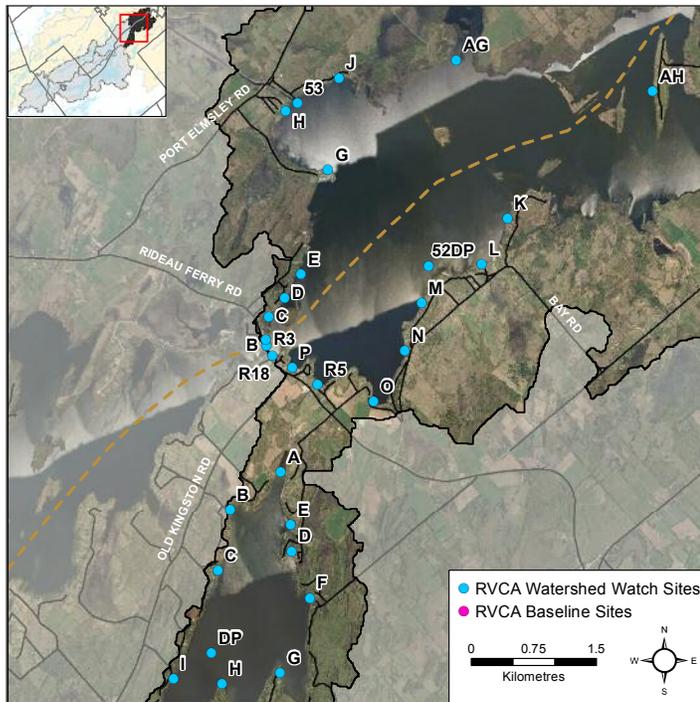
- One groundwater monitoring well is located at the Rideau Ferry Yacht Club Conservation Area (part of the Provincial Groundwater Monitoring Network). Groundwater levels and some water quality data can be obtained for this well at <http://www.ontario.ca/environment-and-energy/provincial-groundwater-monitoring-network>
- Commercial fishery quotas and conditions for the last several years on Upper, Big and Lower Rideau Lakes have remained the same with one exception on Upper Rideau where MNR has increased the yellow perch quota based on the 2013 assessment. MNR fisheries research specialists confirm that inland commercial fishery quotas on the Rideau Lakes system are sustainable

#### Catchment Care

- Since 2005, RVCA monitors Lower Rideau Lake surface water quality through its Watershed Watch Program. In 2006, the program was altered to gain consistent, year to year data for the set of lakes being monitored. In response to the *2009 Rideau Lakes Watershed Plan* action to “Develop a more intensive and coordinated water quality monitoring program for the Rideau Lakes,” RVCA monitors surface water quality: On Lower Rideau Lake four times of the year at one deep point site (four samples annually) and twice a year at eight shoreline sites (16 samples annually) and twice at an additional 10 shoreline sites every fifth year (20 samples in total); On Bass Lake four times of the year at one deep point site (four samples annually), twice a year at four shoreline site (eight samples annually) and twice at an additional five shoreline sites every fifth year (ten samples in total)
- RVCA provides septic system re-inspection at the request of the Township of Rideau Lakes (since 2007); currently, there is no re-inspection program offered in the catchment within Drummond/North Elmsley Township
- Township of Rideau Lakes septic system voluntary re-inspections were undertaken on 17 Big Rideau Lake properties in the catchment by the Mississippi Rideau Septic System Office. Remedial/maintenance work was advocated for six of those properties and one septic system replacement at another property; nine properties were identified as having no concerns with more information provided to one other landowner with identified septic system concerns
- Twenty-six stewardship projects have been completed through RVCA's Private Land Forestry, Rural Clean Water and Shoreline Naturalization Programs (see Section 4 of this report for details)
- RVCA completed littoral zone mapping around Bass Lake and Lower Rideau Lake in 2013, identifying substrate type, vegetation and habitat features along with opportunities for shoreline enhancements
- Big Rideau Lake Association provides lake community representation for Lower Rideau Lake landowners and has worked for many decades to enhance the social community and natural environment of the Rideau Lake system by providing ongoing activities and programs for residents living along its shores from the Narrows Lock to Poonamalie (visit Big Rideau Lake Association for more information at <http://www.bigrideaulakeassociation.com/>)
- One surface water Permit to Take Water (PTTW) has been issued for field and crop agricultural activities
- A watershed model developed by the RVCA in 2009 was used to study the hydrologic function of wetlands in the Rideau Valley watershed, including those found in the Lower Rideau Lake catchment
- RVCA provides flood forecasting and warning services throughout the Rideau Valley watershed. In the Lower Rideau subwatershed, only general flooding information has been made available historically for the lakes. In 2014, lake levels were higher than most years and more attention was required from RVCA and municipal staff, resulting in the decision to review what the flood forecasting and warning program provides to the Upper Rideau Valley
- The Townships of Drummond/North Elmsley and Rideau Lakes have land use planning policies and zoning provisions on lake capacity, water setbacks, frontage, naturalized shorelines and wetland protection and use site plan control to implement these policies and provisions. Together with RVCA and Parks Canada, they work with landowners on a case by case basis to achieve net environmental gains (particularly with respect to shoreline vegetation protection and rehabilitation) through the use of shoreline best management practices. Collectively, the Townships and the agencies request conditions on planning approvals to ensure that development and redevelopment is appropriate for the property, impacts on neighbours are minimized (particularly on very small lots) and development setbacks for the shoreline are maximized
- Development in and adjacent to Provincially Significant Wetlands and some locally significant wetlands is subject to Ontario Regulation 174-06 (entitled “Development, Interference with Wetlands and Alterations to Shorelines and Watercourses”) that protects the hydrologic function of the wetland and also protects landowners and their property from natural hazards (flooding, fluctuating water table, unstable soils) associated with them
- *Rideau Lakes Basin Carrying Capacity Study* (1992) evaluated the capacity of the Rideau Lakes to support development with respect to lake trophic state (level of phosphorus and chlorophyll a) and shoreline development. Results have been used to provide land-use planning policy direction and guidance (in the form of a site evaluation guideline) to the municipalities of Drummond/North Elmsley and Rideau Lakes and the Conservation Authority. Using phosphorus as the determinant for lake capacity, the study attempted to identify how much development was permissible to retain the “no net loss” in water quality principle (i.e., no net increase in phosphorus loading). Recommendations from it included the need to set water quality targets for each lake of concern, requiring buildings to be set no closer than 30 metres from water (with greater widths being recommended in areas with poor phosphorus retention based on soil type, slope and geological conditions), minimizing disturbance to shoreline vegetation and no alteration to the soil mantle within the protective setback area. An update to the abovementioned site evaluation guide is currently underway and is to be made available in 2015
- Parks Canada attempts to incorporate the breeding and habitat needs of fish and wildlife when determining water levels, flows and timing of drawdowns in the Rideau Lakes. For more information, please refer to the “Operating Rule Curve” for Big Rideau Lake available (at [www.rvca.ca](http://www.rvca.ca)) in the 2014 *Rideau Lakes Subwatershed Report* section on “Water Levels”
- *Rideau Canal National Historic Site of Canada Management Plan* (2005) update establishes the long term strategic direction for the management of the Rideau Canal
- *Rideau Canal World Heritage Site Management Plan* (2005) specifies how its world heritage values will be protected for present and future generations
- *2002 Rideau Lake State of the Lake Report* (Centre for Sustainable Watersheds) seeks to give a backdrop of understanding of the lake and the natural forces and past human activities that have shaped it
- Most of the shoreline of Big Rideau Lake is held in private ownership, so that the best opportunity for shoreline restoration/enhancement rests with private landowners. RVCA offers its Shoreline Naturalization Program to Rideau Lakes landowners to assist with shoreline re-vegetation (an enhanced delivery program has been put into place in response to the *2009 Rideau Lakes Watershed Plan* action to “Increase funding for the RVCA Shoreline Naturalization Program”)

# 1. Surface Water Quality Conditions

Surface water quality conditions in the Lower Rideau catchment are monitored by the Rideau Valley Conservation Authority's (RVCA) Watershed Watch Program. Watershed Watch monitors watershed lakes to assess nutrient concentrations, water clarity, dissolved oxygen availability and pH. The locations of monitoring sites are shown in Figure 1 and Table 1.



**Figure 1** Water quality monitoring sites on Bass Lake and Lower Rideau Lake

The water quality ratings for the Lower Rideau catchment ranges from “Very Poor” to “Poor” (Table 1) as determined by the CCME Water Quality Index. Monitored parameters are evaluated against established guidelines to determine water quality conditions. Those parameters that frequently exceed guidelines are presented below. There is limited data available for Bass and Lower Rideau Lakes prior to 2005; thus only the 2008 to 2013 data is considered in this report. Table 1 shows the overall rating for the monitored surface water quality sites within the Lower Rideau catchment and Table 2 outlines the Water Quality Index (WQI) scores and their corresponding ratings.

**Table 1** Water Quality Index Ratings for the Lower Rideau Lake catchment, 2008-2013

Sampling Site	Location	2008-2013	Rating
RVL-35	Bass Lake	53	Poor
RVL-38	Lower Rideau Lake	41	Very Poor

**Table 2** WQI Ratings and corresponding index scores (RVCA terminology, original WQI category names in brackets)

Rating	Index Score
Very good (Excellent)	95-100
Good	80-94
Fair	65-79
Poor (Marginal)	45-64
Very poor (Poor)	0-44

## 1) a. Bass Lake Water Quality

Surface water quality conditions in Bass Lake have been monitored by RVCA's Watershed Watch Program since 2005. Data from one deep point site has been used to calculate the WQI rating for Bass Lake, which was determined to be “Poor” (Table 1). Nutrient exceedances, periods of limited fish habitat conditions, generally clear water and occasionally elevated pH levels contributed to the rating. The following discussion explains how each of the monitored water quality parameters contributes to the lake's water quality.

This report also considers data from nine additional sites that are regularly monitored around the lake. These sites have not been included in the calculation of the CCME WQI rating as they are not monitored with the same frequency as deep point sites. However, they do provide important information on water quality conditions in the near shore areas. For locations of shoreline sites please see Figure 1.

## Nutrients

Total phosphorus (TP) is used as a primary indicator of excessive nutrient loading and may contribute to abundant aquatic vegetation growth and depleted dissolved oxygen levels. The Provincial Water Quality Objective (PWQO) is used as the TP Guideline and states that in lakes, concentrations greater than 0.020 mg/l indicate an excessive amount of TP within the water column.

Total Kjeldahl nitrogen (TKN) is used as a secondary indicator of nutrient loading. RVCA uses a guideline of 0.500 mg/l to assess TKN within surface waters.

## At the Deep Points

One deep point site is monitored within this lake. Average nutrient concentrations at this site are summarized in Table 3 as well as the proportion of results that meet the guideline.

**Table 3** Summary of nutrient results for Bass Lake, 2008-2013

Total Phosphorus 2008-2013			
Site	Average (mg/l)	Below Guideline	No. Samples
RVL-35	0.016	70%	23
Total Kjeldahl Nitrogen 2008-2013			
Site	Average (mg/l)	Below Guideline	No. Samples
RVL-35	0.397	96%	23

<sup>1</sup> No Ontario guideline for TKN is presently available however waters not influenced by excessive organic inputs typically range from 0.100 to 0.500 mg/l, Environment Canada (1979) *Water Quality Sourcebook, A Guide to Water Quality Parameters*, Inland Waters Directorate, Water Quality Branch, Ottawa, Canada

TP and TKN sampling results are presented in Figures 2 and 3. Of the samples analyzed for TP, 70 percent were less than the TP guideline with an average concentration of 0.016 mg/l (Table 3). TKN concentrations were less likely to be elevated; 96 percent of results were below the TKN guideline and the average concentration was 0.397 mg/l (Table 3). Average year to year concentrations have varied for both TP and TKN (Figure 4 and 5) but do not indicate a general trend; all results are below the guideline with the exception of results for 2008, which exceeded the guideline for both parameters. Overall, the data presented indicates that phosphorus concentrations are moderate in the mid lake deep waters of Bass Lake which may lead to impairment such as algal blooms and excessive aquatic plant growth.

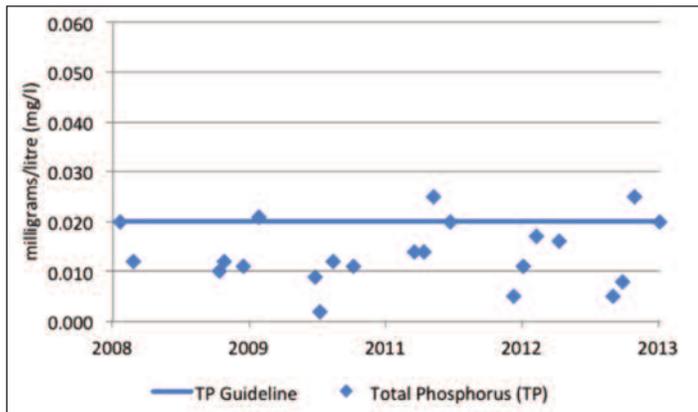


Figure 2 Total phosphorus sampling results at the deep point site in Bass Lake, 2008-2013

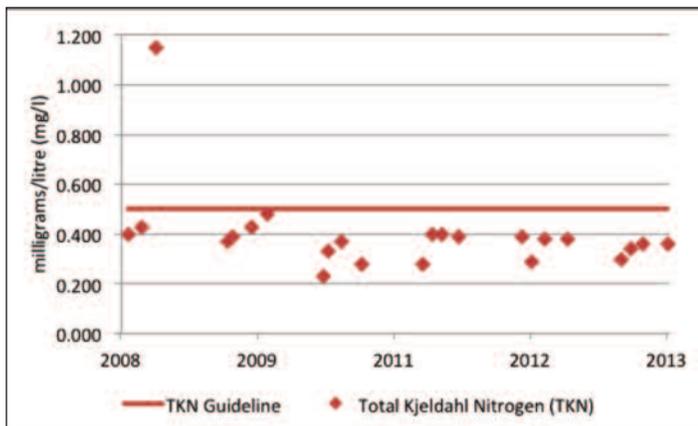


Figure 3 Total Kjeldahl nitrogen sampling results at the deep point site in Bass Lake, 2008-2013

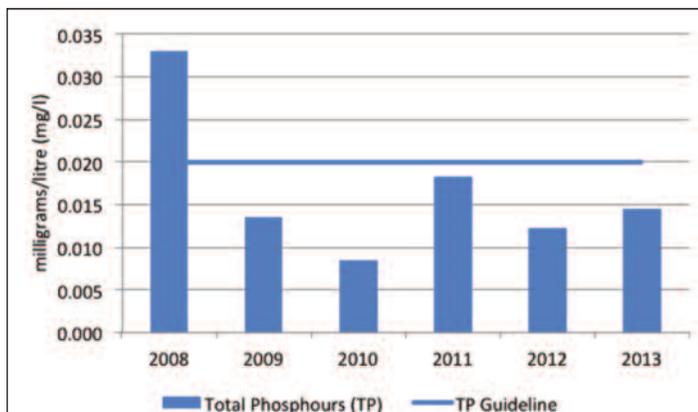


Figure 4 Average total phosphorus at the deep point site in Bass Lake, 2008-2013

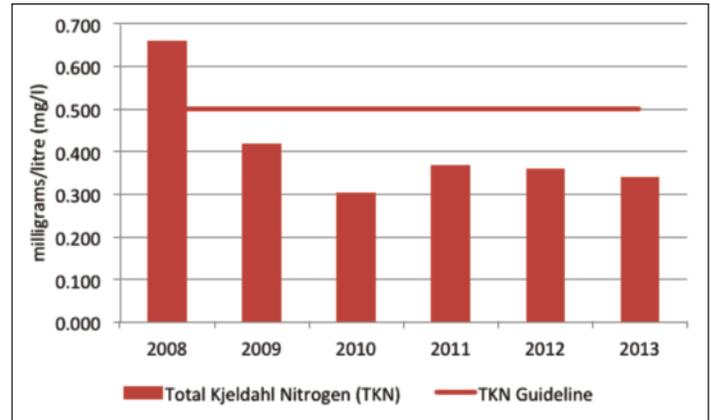


Figure 5 Average total Kjeldahl nitrogen at the deep point site in Bass Lake, 2008-2013

### Around the Lake

The average nutrient concentrations at monitored sites around the lake vary from year to year (Figures 6 and 7). Please note that sites A, B, F and E are monitored each year while other sites are monitored every fifth year.

Average total phosphorous concentrations are below the TP guideline at all shoreline sites and concentrations can generally be considered as moderate across all sites (Figure 6) and that occasionally some problems associated with nutrient enrichment may be observed.

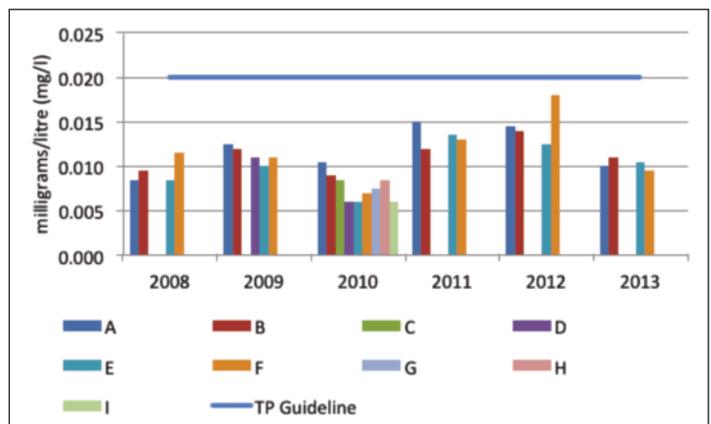
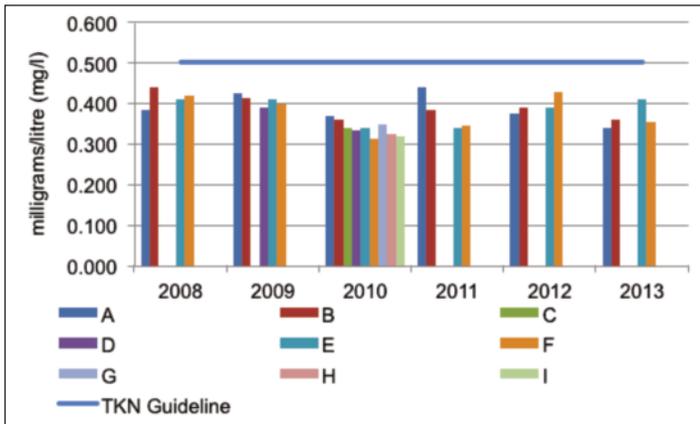


Figure 6 Average total phosphorus concentration at additional monitoring sites on Bass Lake, 2008-2013

TKN concentrations were also not elevated above the guideline at any of the sites. These results provide further evidence that nutrient enrichment may not be a problem in some near shore areas. However, if concentrations were to increase it could result in abundant plant or algal growth, particularly in areas where both TP and TKN are persistently elevated.



**Figure 7** Average total Kjeldahl nitrogen concentration at additional monitoring sites on Bass Lake, 2008-2013

**Summary**

Within Bass Lake nutrient concentrations generally meet guidelines, though TP concentrations are occasionally elevated at the deep point.

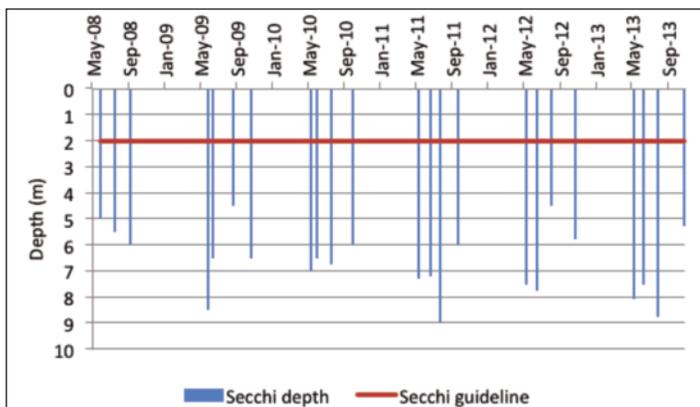
Nutrient exceedances may be partially attributed to the natural aging of a lake and can be slowed with the help of all lake residents by reducing nutrient inputs through practices such as proper maintenance of septic systems, keeping shorelines natural, minimizing the amount of runoff to the lake and using phosphate free soaps and detergents.

**Water Clarity**

Water clarity is measured using a Secchi disk during each deep point sample. Table 4 summarizes the recorded depths and shows that all readings have exceeded the minimum PWQO of 2 metres indicating good water clarity with an average Secchi depth of 6.9 metres. Figure 8 shows that no reading has been below the guideline; measured depths range from 4.5 metres to 9.0 metres. It should also be noted that Secchi depths in many waterbodies have been influenced by the colonization of zebra mussels resulting in clearer waters than may have been seen prior to the introduction of this species in Bass Lake.

**Table 4** Summary of Secchi depths recorded at the deep point site in Bass Lake, 2008-2013

Secchi depth 2008-2013			
Site	Average (m)	Above Guideline	No. Samples
RVL-35	6.9	100%	17



**Figure 8** Recorded Secchi depths at the deep point site in Bass Lake, 2008-2013

**Summary**

This data indicates that waters are generally clear and sufficient sunlight is able to penetrate the water column to support aquatic life and provide sufficient visibility for safe recreational use (i.e. boating, swimming).

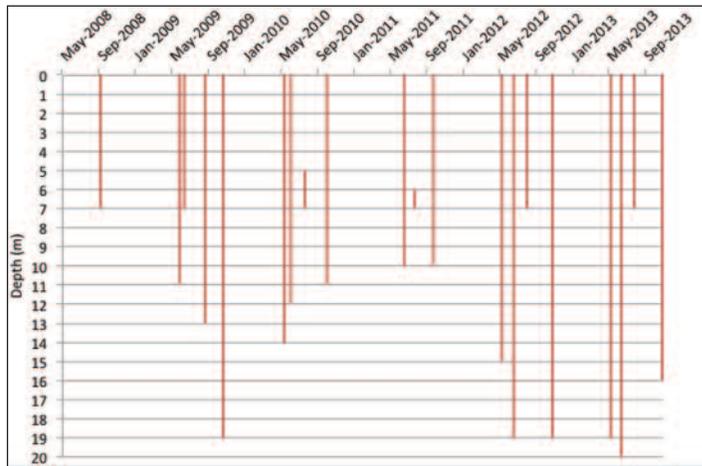
**Fish Habitat**

Two other factors, dissolved oxygen/temperature and pH were also assessed to provide an overall sense of the health of Bass Lake from a fish habitat perspective.

**Dissolved Oxygen and Temperature**

The red bars in Figure 9 show the depths where suitable conditions exist for warm water fish species (temperature less than 25°C and dissolved oxygen greater than 4 mg/l) at the monitored deep point. The vertical axis represents the total lake depth at each site where the profile is taken. Suitable oxygen temperatures exist to an average depth of 12 metres.

Spring and early summer typically have good conditions for fish habitat but as temperatures warm and oxygen becomes limited in the deeper water through the summer, available habitat becomes more limited; this is particularly evident in July 2010 and July 2011.



**Figure 9** Depths suitable for warm water fish (red bars) at site RVL-35DP in Bass Lake, 2008-2013



## pH

pH is a basic water quality parameter used to assess the acidity of water, an important factor for aquatic life. Figure 10 shows pH concentrations in Bass Lake and Figure 11 summarizes average concentrations by year.

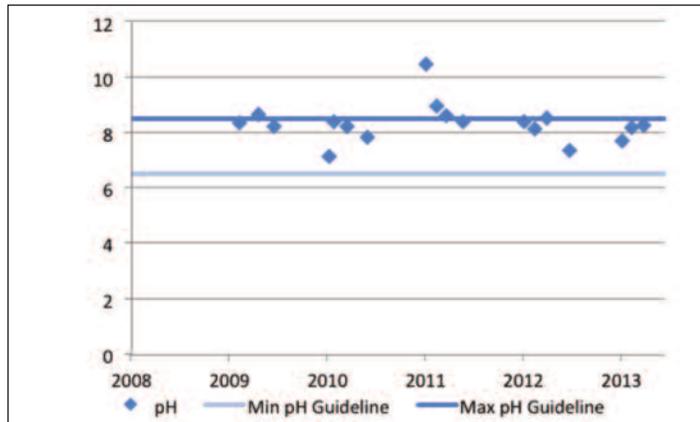


Figure 10 pH concentrations at the deep point site in Bass Lake, 2008-2013

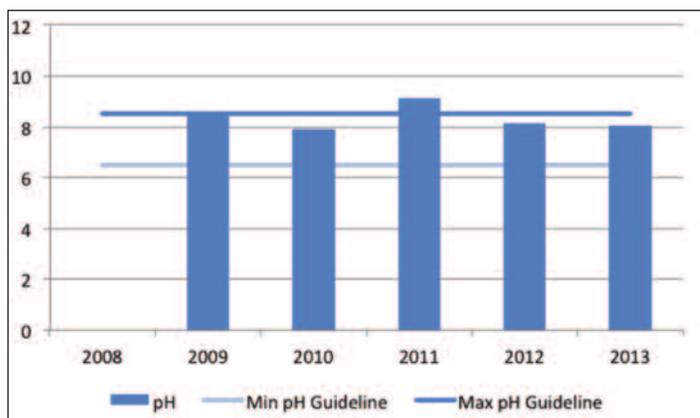


Figure 11 Average pH concentrations at the deep point site in Bass Lake, 2008-2013

Seventy-four percent of samples (Table 5) were within guidelines established by the PWQO which state that pH should be between 6.5 and 8.5 to protect aquatic life and prevent irritation for anyone using the waters for recreational purposes.

Table 5 Summary of pH results for the deep point site in Bass Lake, 2008-2013

pH 2008-2013			
Site	Average	Within Guideline	No. Samples
RVL-35	8.3	74%	19

In some areas of the Rideau Lakes subwatershed, surface waters tend to be more alkaline (higher pH) which can generally be attributed to geology rather than anthropogenic activities; biological activities such as photosynthesis may also affect pH.

## Summary

Overall, the water chemistry data at the deep point describes generally good habitat conditions for warm water fish species. There is some evidence that the warming of the water column and oxygen depletion in the summer may limit the amount of habitat for sensitive species. pH conditions are usually within the range recommended for the protection of aquatic life, indicating a healthy environment for aquatic species.

## E. coli

*E. coli* is sampled at monitored shoreline sites twice each sampling season. *E. coli* data was not used in the calculations of the WQI rating for the lake due to differences in sampling frequency and site locations. All samples were below the *E. coli* guideline of 100 colony forming units (CFU) per 100 ml set by the PWQO; across the lake the count at the geometric mean<sup>2</sup> was only 6 CFU/100ml (Table 6). Figure 12 shows that samples across all sites were well below the guideline.

Table 6 Summary of *E. coli* results for Bass Lake, 2008-2013

<i>E. coli</i> 2008-2013			
Site	Geometric mean (CFU/100ml)	Below Guideline	No. Samples
RVL-35	6	100%	50

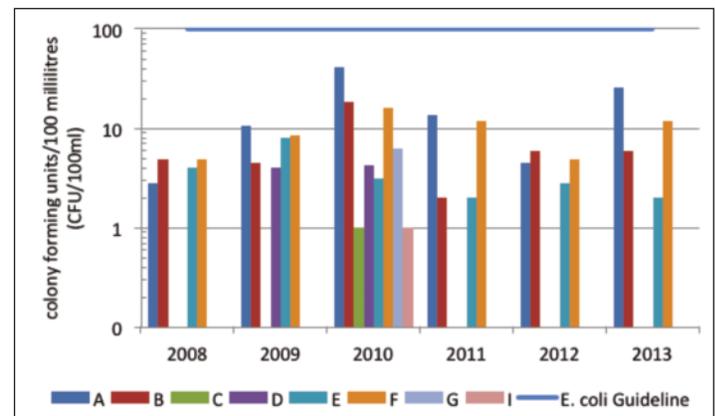


Figure 12 Geometric mean of shoreline sites monitored on Bass Lake, 2008-2013

## Summary

The results presented above provide evidence that bacterial contamination is not a significant concern in Bass Lake and the water should be safe for recreational activities such as swimming and boating.

<sup>2</sup> A type of mean or average, which indicates the central tendency or typical value of a set of numbers by using the product of their values (as opposed to the arithmetic mean which uses their sum). It is often used to summarize a variable that varies over several orders of magnitude, such as *E. coli* counts

### 1) b. Lower Rideau Lake Water Quality

Surface water quality conditions in Lower Rideau Lake have been monitored by RVCA’s Watershed Watch Program since 2005. Data from one deep point site has been used to calculate the WQI rating for Lower Rideau Lake, which was determined to be “Very Poor” (Table 1). Nutrient exceedances, periods of limited fish habitat conditions, generally clear water and occasionally elevated pH levels contributed to the rating. The following discussion explains how each of the monitored water quality parameters contributes to the lake’s water quality.

This report also considers data from 18 additional sites that are regularly monitored around the lake. These sites have not been included in the calculation of the CCME WQI rating as they are not monitored with the same frequency as deep point sites. However, they do provide important information on water quality conditions in the near shore areas. For locations of shoreline sites please see Figure 1.

The *Rideau Lake State of the Lake Report 2002* (Centre for Sustainable Watersheds, 2003) determined that Lower Rideau Lake has a high nutrient status verging on eutrophic. The data presented in this report indicates that nutrient enrichment continues to be an issue and that a proactive program of best management practices is important to ensure the protection of the lake environment and improvements to water quality wherever possible.

### Nutrients

Total phosphorus (TP) is used as a primary indicator of excessive nutrient loading and may contribute to abundant aquatic vegetation growth and depleted dissolved oxygen levels. The Provincial Water Quality Objective (PWQO) is used as the TP Guideline and states that in lakes, concentrations greater than 0.020 mg/l indicate an excessive amount of TP within the water column.

Total Kjeldahl nitrogen (TKN) is used as a secondary indicator of nutrient loading. RVCA uses a guideline of 0.500 mg/l to assess TKN<sup>3</sup> within surface waters.

### At the Deep Points

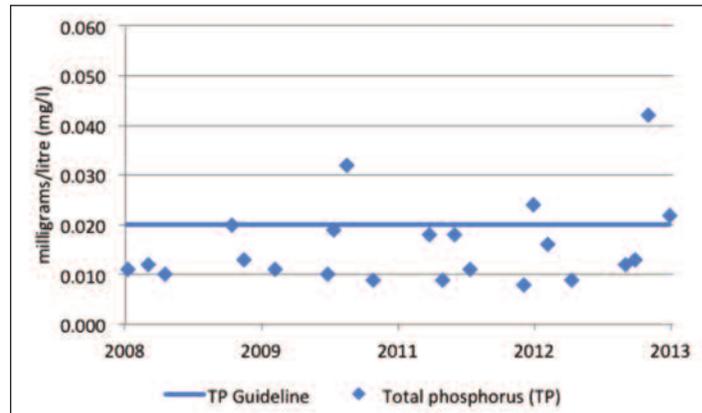
One deep point site is monitored within this catchment. Average nutrient concentrations at this site are summarized in Table 7 as well as the proportion of results that meet the guideline.

**Table 7** Summary of nutrient results for Lower Rideau Lake, 2008-2013. Highlighted values indicate average concentrations exceed the guideline

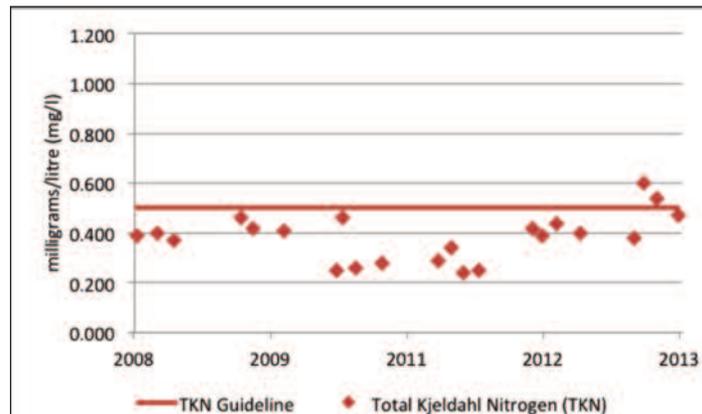
Total Phosphorus 2008-2013			
Site	Average (mg/l)	Below Guideline	No. Samples
RVL-38	0.025	74%	23
Total Kjeldahl Nitrogen 2008-2013			
Site	Average (mg/l)	Below Guideline	No. Samples
RVL-38	0.520	87%	23

TP and TKN sampling results are presented in Figures 13 and 14. The majority (74 percent) of samples analyzed for TP were less than the TP guideline and the average concentration exceeded the guideline at 0.025 mg/l (Table 7). TKN concentrations were also elevated; 87 percent of reported results were below the TKN guideline and the average

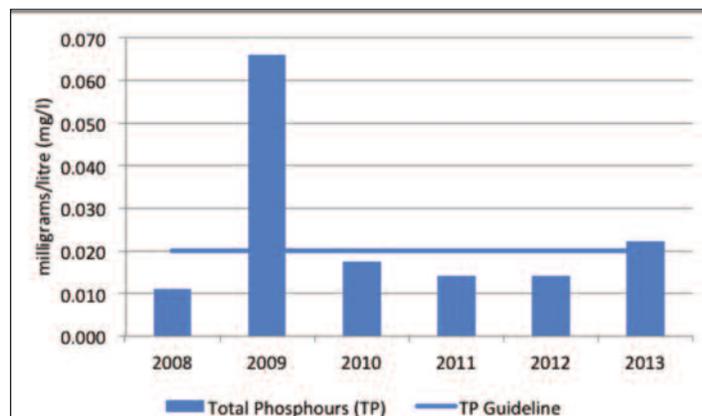
concentration was 0.520 mg/l (Table 7). Average year to year concentrations have varied for both TP and TKN (Figure 15 and 16) but do not indicate a general trend; all average results exceed the guidelines in both 2009 and 2013. Overall, the data presented indicates that nutrient enrichment is a concern in the mid-lake, deep water site of Lower Rideau Lake.



**Figure 13** Total phosphorus sampling results at the deep point site in Lower Rideau Lake, 2008-2013

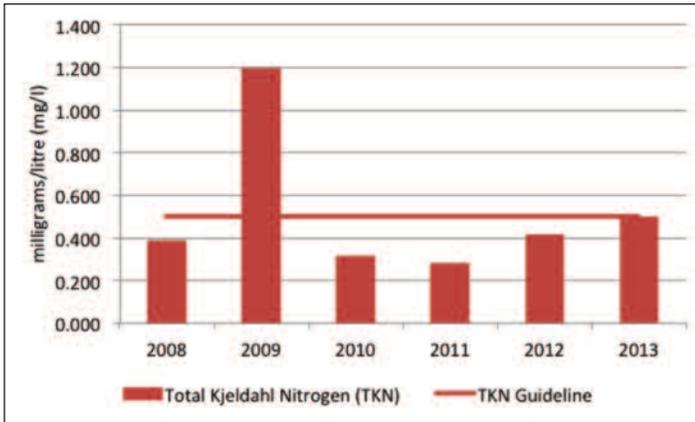


**Figure 14** Total Kjeldahl nitrogen sampling results at the deep point site in Lower Rideau Lake, 2008-2013



**Figure 15** Average total phosphorus at the deep point site in Lower Rideau Lake, 2008-2013

<sup>3</sup> No Ontario guideline for TKN is presently available; however, waters not influenced by excessive organic inputs typically range from 0.100 to 0.500 mg/l, Environment Canada (1979) *Water Quality Sourcebook, A Guide to Water Quality Parameters*, Inland Waters Directorate, Water Quality Branch, Ottawa, Canada

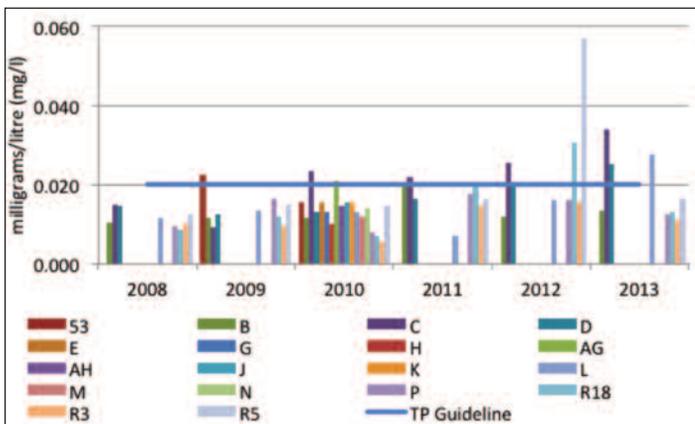


**Figure 16** Average total Kjeldahl nitrogen at the deep point site in Lower Rideau Lake, 2008-2013

### Around the Lake

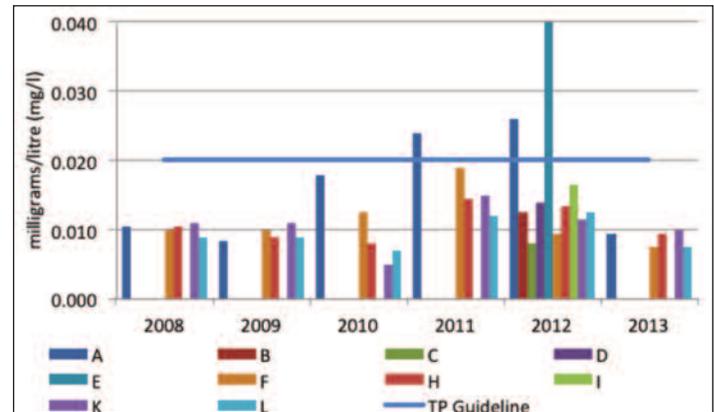
The average nutrient concentrations at monitored sites around the lake vary from year to year (Figures 17 and 18). Please note that sites B, C, D, L, P, R3, R5, and R18 are monitored each year while other sites are monitored every fifth year.

Total phosphorous concentrations are below the TP guideline at the majority of sites with the exception of site C which exceeded the guideline in more than one year; exceedances were also noted at sites 53, AG, R18, D, and L (Figure 17). Site C is in a very shallow bay behind Hog Island dominated by wetland features. In shallow waters active boating may stir the water column and cause re-suspension of nutrient rich sediment. Site D is close to site C though further downstream and likely impacted by similar circumstances. Sites 53 is located at the outflow of the Tay Canal and site AG at the outflow of the Tay River; the Tay River has been identified as a source of nutrient loading. R18 is near a stormwater outfall to a small shallow bay near the Rideau Ferry Bridge. Site L is in a developed area along the south shore and increased runoff from this area may have contributed to higher results in 2013. Overall the impacts of increased shoreline development, boat traffic and high levels of recreational use in these shallow water areas may contribute to increased loading and re-suspension of sediment resulting in higher TP concentrations.



**Figure 17** Average total phosphorus concentration at additional monitoring sites on Lower Rideau Lake, 2008-2013

TKN concentrations were not elevated above the guideline at the majority of sites. Site R5 is the only site with repeated exceedances in 2012 and 2013; this site is located at the outflow from a small tributary. As with TP, TKN exceedances are also noted at site 53, R5, R18 and L. These results provide further evidence that nutrient enrichment may be a problem in some near shore areas and could result in abundant plant or algal growth, particularly in areas where both TP and TKN are persistently elevated.



**Figure 18** Average total Kjeldahl nitrogen concentration at additional monitoring sites on Lower Rideau Lake, 2008-2013

### Summary

Within Lower Rideau Lake nutrient concentrations usually meet guidelines though average concentrations exceed guidelines. As previously discussed, TP concentrations exceed the normal values reported in the *2002 State of Rideau Lake Report* (Centre for Sustainable Watersheds, 2003), which noted that TP typically fell between 0.01 mg/l to 0.02 mg/l and TKN was above 0.500 mg/l.

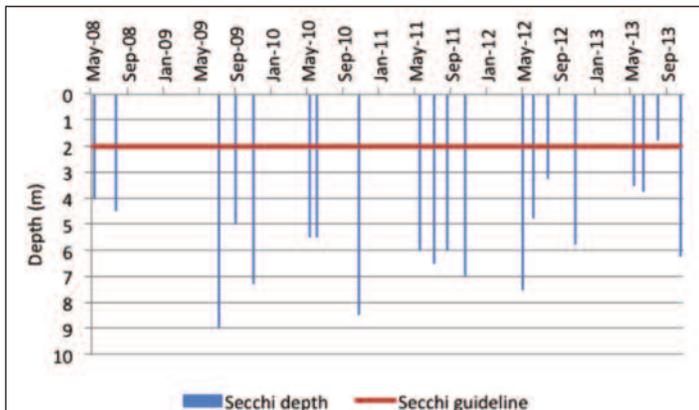
Sites with particularly high results should be further investigated to determine if sources of nutrient inputs can be reduced such as the diversion of runoff and enhanced shoreline buffers. Areas where high concentrations of nutrients are persistent may observe excessive aquatic plant growth, algae blooms and depleted oxygen concentrations. Consideration should also be given to upstream sources within the subwatershed to reduce overall loading. Nutrient exceedances may be partially attributed to the natural aging of a lake, but can be slowed with the help of all lake residents by reducing nutrient inputs through practices such as proper maintenance of septic systems, keeping shorelines natural and using phosphate free soaps and detergents.

### Water Clarity

Water clarity is measured using a Secchi disk during each deep point sample. Table 8 summarizes the recorded depths and shows that all readings have exceeded the minimum PWQO of 2 metres indicating good water clarity and the average Secchi depth is 5.6 metres. Figure 19 shows that only one reading has been below the guideline; measured depths range from 1.75 metres to 9.0 metres. It should also be noted that Secchi depths in many waterbodies have been influenced by the colonization of zebra mussels resulting in clearer waters than may have been seen prior to the introduction of this species in Lower Rideau Lake.

**Table 8** Summary of Secchi depths recorded at the deep point site in Lower Rideau Lake, 2008-2013

Secchi depth 2008-2013			
Site	Average (m)	Above Guideline	No. Samples
RVL-38-52	5.6	95%	20



**Figure 19** Recorded Secchi depths at the deep point site in Lower Rideau Lake, 2008-2013

**Summary**

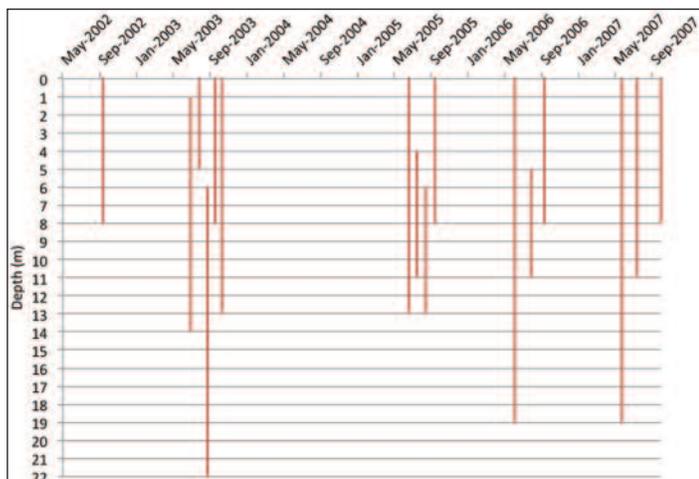
This data indicates that waters are generally clear and sufficient sunlight is able to penetrate the water column to support aquatic life and provide sufficient visibility for safe recreational use (i.e. boating, swimming).

**Fish Habitat**

Two other factors, dissolved oxygen/temperature and pH were also assessed to provide an overall sense of the health of Lower Rideau Lake from a fish habitat perspective.

**Dissolved Oxygen and Temperature**

The red bars in Figure 20 show the depths where suitable conditions exist for warm water fish species (temperature less than 25°C and dissolved oxygen greater than 4 mg/l) at the monitored deep point. The vertical axis represents the total lake depth at each site where the profile is taken. Suitable oxygen temperatures exist to an average depth of 16 metres.

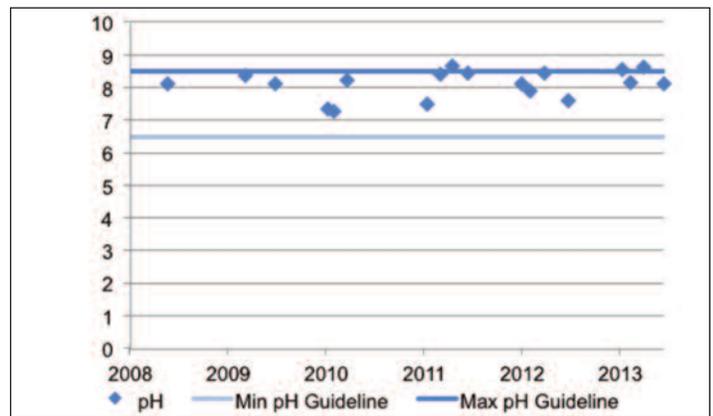


**Figure 20** Depths suitable for warm water fish (red bars) at site RVL-38-52 in Lower Rideau Lake, 2008-2013

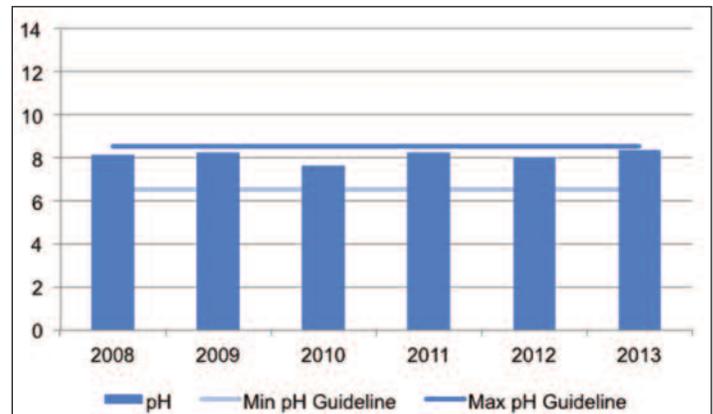
Spring and early summer typically have good conditions for fish habitat but as temperatures warm and oxygen becomes limited in the deeper waters through the summer, available habitat becomes more limited; this was particularly evident in July 2010.

**pH**

pH is a basic water quality parameter used to assess the acidity of water, an important factor for aquatic life. Figure 21 shows pH concentrations in Lower Rideau Lake and Figure 22 summarizes average concentrations by year.



**Figure 21** pH concentrations at the deep point site in Lower Rideau Lake, 2008-2013



**Figure 22** Average pH concentrations at the deep point site in Lower Rideau Lake, 2008-2013

Eighty-three percent of samples (Table 9) were within guidelines established by the PWQO which state that pH should be between 6.5 and 8.5 to protect aquatic life and prevent irritation for anyone using the waters for recreational purposes.

**Table 9** Summary of pH results for the deep point site in Lower Rideau Lake, 2008-2013

pH 2008-2013			
Site	Average	Within Guideline	No. Samples
RVL-38	8.1	83%	18

In some areas of the Rideau Lakes subwatershed, surface waters tend to be more alkaline (higher pH), which can generally be attributed to geology rather than anthropogenic activities; biological activities such as photosynthesis may also affect pH.

**Summary**

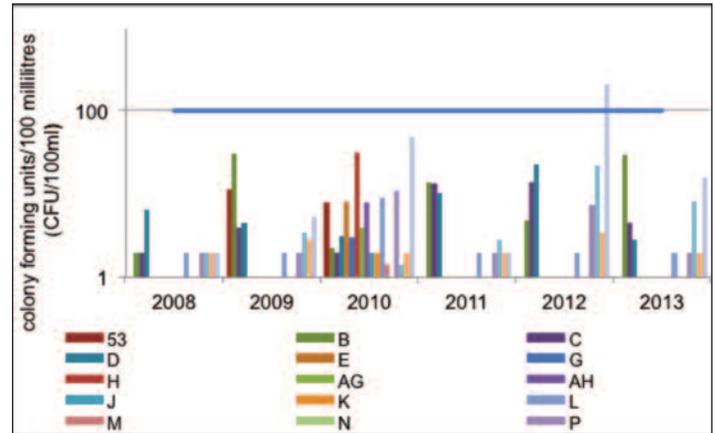
Overall, the water chemistry data at the deep points describes generally good habitat conditions for warm and cold water fish species. There is some evidence that the warming of the water column and oxygen depletion in the late summer may limit the amount of habitat for more sensitive species. pH conditions are typically within the range recommended for the protection of aquatic life, indicating a healthy environment for aquatic species.

***E. coli***

*E. coli* is sampled at monitored shoreline sites at twice each sampling season. *E. coli* data was not used in the calculations of the WQI rating for the lake due to differences in sampling frequency and site locations. Ninety-four percent of samples were below the *E. coli* guideline of 100 colony forming units (CFU) per 100 ml set by the PWQO; across the lake the count at the geometric mean<sup>4</sup> was only 5 CFU/100ml (Table 10). Figure 23 shows that samples across all sites were well below the guideline.

**Table 10** Summary of *E. coli* results for Lower Rideau Lake, 2008-2013

<i>E. coli</i> 2008-2013			
Site	Geometric mean (CFU/100ml)	Below Guideline	No. Samples
RVL-38	5	94%	108



**Figure 23** Geometric mean of shoreline sites monitored on Lower Rideau Lake, 2008-2013

**Summary**

The results presented above provide evidence that bacterial contamination is not a significant concern in Big Rideau Lake and the water should be safe for recreational activities such as swimming and boating.



<sup>4</sup> A type of mean or average, which indicates the central tendency or typical value of a set of numbers by using the product of their values (as opposed to the arithmetic mean which uses their sum). It is often used to summarize a variable that varies over several orders of magnitude, such as *E. coli* counts

## 2. Riparian Conditions

### Shoreline Buffer Land Cover Evaluation

The riparian or shoreline zone is that special area where the land meets the water. Well-vegetated shorelines are critically important in protecting water quality and creating healthy aquatic habitats, lakes and rivers. Natural shorelines intercept sediments and contaminants that could impact water quality conditions and harm fish habitat in streams. Well established buffers protect the banks against erosion, improve habitat for fish by shading and cooling the water and provide protection for birds and other wildlife that feed and rear young near water. A recommended target (from Environment Canada's Guideline: *How Much Habitat is Enough?*) is to maintain a minimum 30 meter wide vegetated buffer along at least 75 percent of the length of both sides of rivers, creeks and streams.

Figure 24 shows the extent of the naturally vegetated riparian zone in the catchment, 30 meters along the shoreline of waterbodies and watercourses. This analysis from the RVCA's Land Cover Classification Program (derived from 2008 DRAPE imagery) shows that the riparian buffer (30 metre wide strip) in the catchment is comprised of wetland (52 percent), settlement areas (22 percent), woodland (16 percent), crop and pastureland (eight percent), and transportation routes (two percent).

Around **Lower Rideau Lake** itself, the shoreline buffer is made up of wetland (54 percent), settlement areas (29 percent), woodland (14 percent), transportation routes (two percent) and crop and pastureland (one percent).

Around **Bass Lake**, the shoreline buffer is made up of settlement areas (65 percent), woodland (16 percent), wetland (15 percent), transportation routes (three percent) and crop and pastureland (one percent).

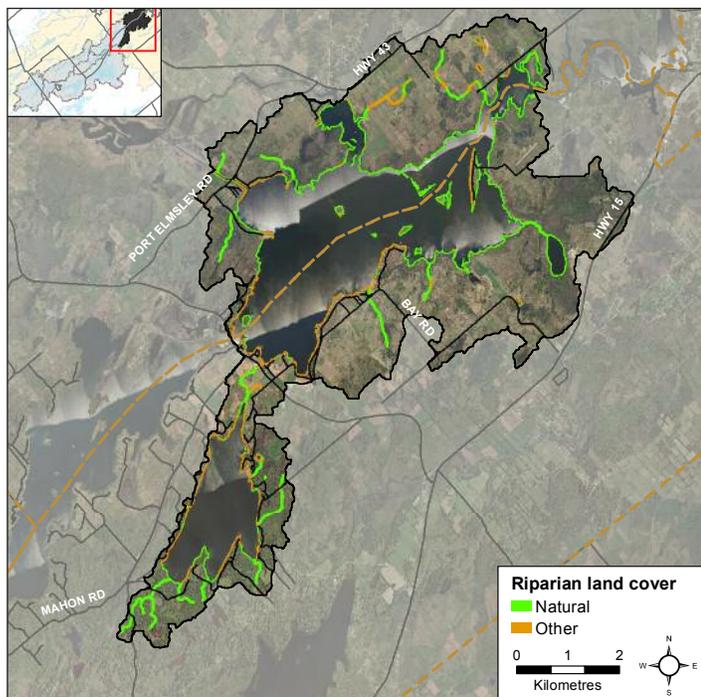


Figure 24 Natural and other riparian land cover around Bass Lake and Lower Rideau Lake

Along streams, the riparian buffer is comprised of wetland (65 percent), woodland (16 percent), crop and pastureland (14 percent), settlement areas (three percent) and transportation routes (two percent) throughout the whole catchment.

Along streams, the riparian buffer is comprised of wetland (65 percent), woodland (16 percent), crop and pastureland (14 percent), settlement areas (3 percent) and transportation routes (2 percent) throughout the catchment.

### Headwaters Drainage Features Assessment

The RVCA Stream Characterization program assessed Headwater Drainage Features for the Rideau Lakes subwatershed in 2013. This protocol measures zero, first and second order headwater drainage features (HDF). It is a rapid assessment method characterizing the amount of water, sediment transport, and storage capacity within headwater drainage features (HDF). RVCA is working with TRCA and the MNR to implement the protocol with the goal of providing standard datasets to support science development and monitoring on both the interim guideline for headwater drainage features and existing mitigation strategies. An HDF is a depression in the land that conveys surface flow. Additionally, this module provides a means of characterizing the connectivity, form and unique features associated with each HDF (OSAP Protocol, 2013). An initiative is underway to evaluate how these data can help understand the cumulative contributions of individual headwater drainage features on the downstream watershed state (see Stanfield *et al.*, 2013). In 2013 the program sampled five sites in the Lower Rideau Lake catchment area. Figure 25 shows the headwater drainage features sampling locations in the catchment.

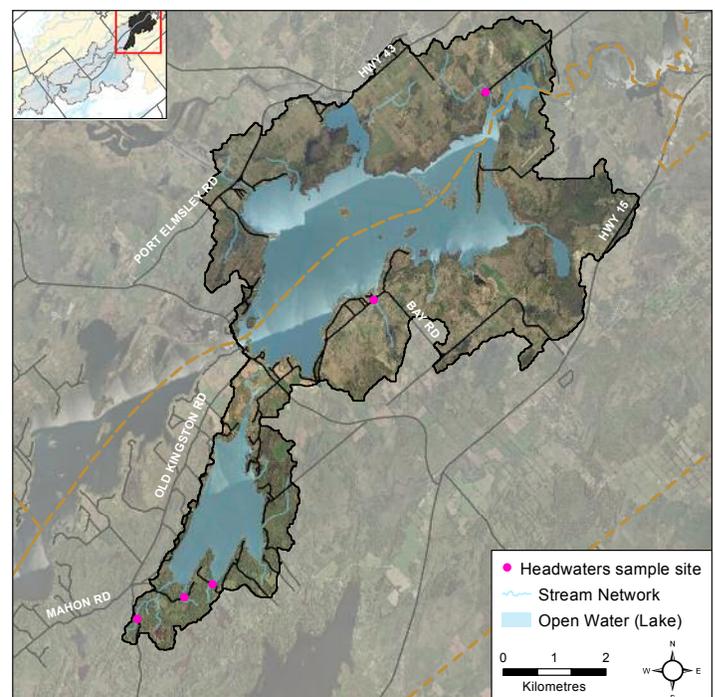


Figure 25 Headwater drainage feature sampling locations around Bass Lake and Lower Rideau Lake



Headwater Drainage Features sampling sites in the Lower Rideau Lake catchment area sampled in 2013

## Fisheries

The Lower Rideau Lake catchment is classified as a mixed community of warm, cool and cold water recreational and baitfish fishery with 26 species observed. The following is a list of species in the catchment (Source: MNR/RVCA). Fish sampling sites are shown in Figure 26.

- |                 |                  |
|-----------------|------------------|
| lake trout      | lake herring     |
| northern pike   | fallfish         |
| smallmouth bass | blackchin shiner |
| largemouth bass | burbot           |
| yellow perch    | rainbow smelt    |
| rock bass       | brook silverside |
| black crappie   | alewife          |
| pumpkinseed     | bluntnose minnow |
| bluegill        | banded killifish |
| brown bullhead  | golden shiner    |
| yellow bullhead | blacknose shiner |
| white sucker    | fathead minnow   |
| lake whitefish  | iowa darter      |

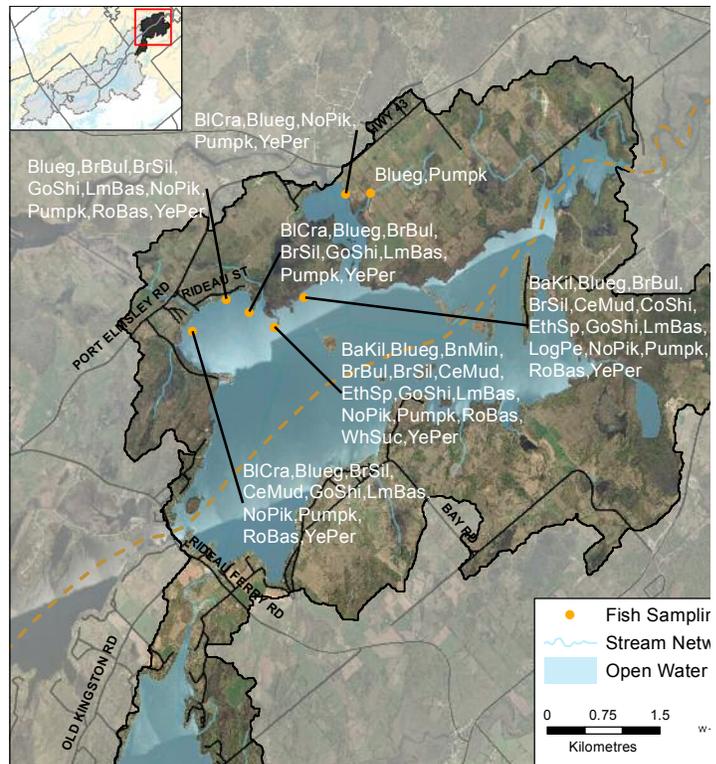


Figure 26 Fish sampling on Lower Rideau Lake

### 3. Land Cover

Woodland is the dominant land cover type in the catchment along with water, as shown in Table 11 and displayed in the map on the front cover of the report.

**Table 11** Catchment land cover type

Cover Type	Area (ha)	Area (% of Cover)
Wetland*	1233	26
Water	1102	23
Crop & Pasture	1099	23
Woodland**	973	20
Settlement	281	6
Transportation	105	2

\* Does not include treed swamps \*\* Includes treed swamps

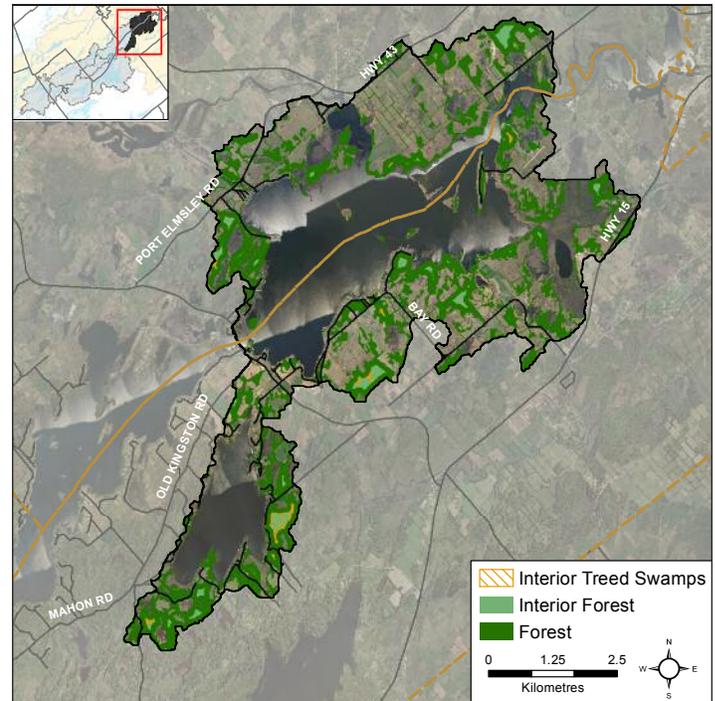
#### Woodland Cover

The Lower Rideau Lake catchment contains 973 hectares of upland forest and 196 hectares of lowland forest (treed swamps) (Figure 27) that occupies 24 percent of the drainage area (versus the 44 percent of woodland cover in the Rideau Lakes subwatershed). This figure is less than the 30 percent of woodland area required to sustain forest birds, according to Environment Canada’s Guideline: *How Much Habitat is Enough?* When forest cover declines below 30 percent, forest birds tend to disappear as breeders across the landscape.

One hundred and seven (53 percent) of the 202 woodland patches in the catchment are very small, being less than one hectare in size. Another 79 (39 percent) of the wooded patches ranging from one to less than 20 hectares in size tend to be dominated by edge-tolerant bird species. The remaining 16 (eight percent of) woodland patches range between 20 and 102 hectares. Fifteen of these patches contain woodland between 20 and 100 hectares and may support a few area-sensitive species and some edge intolerant species, but will be dominated by edge tolerant species. Conversely, one (less than one percent) of the 202 woodland patches in the drainage area exceeds the 100 plus hectare size needed to support most forest dependent, area sensitive birds and is large enough to support approximately 60 percent of edge-intolerant species. No patch tops 200 hectares, which according to the Environment Canada Guideline will support 80 percent of edge-intolerant forest bird species (including most area sensitive species) that prefer interior forest habitat conditions.

#### Forest Interior

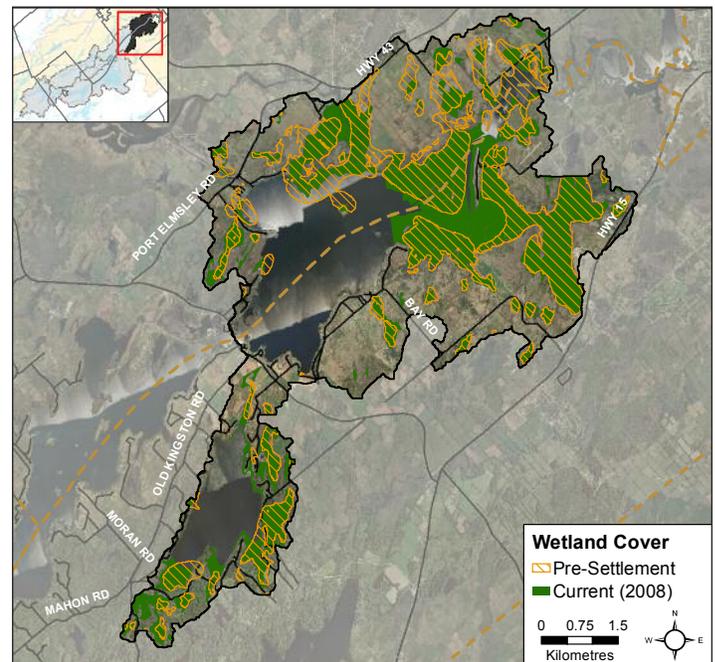
The same 202 woodlands contain 40 forest interior patches (Figure 27) that occupy one percent (61 hectares) of the catchment land area (versus the five percent of interior forest in the Rideau Lakes subwatershed). This is below the ten percent figure referred to in the Environment Canada Guideline that is considered to be the minimum threshold for supporting edge intolerant bird species and other forest dwelling species in the landscape. Most patches (38) have less than 10 hectares of interior forest, 28 of which have small areas of interior forest habitat less than one hectare in size. The remaining two patches have greater than 10 hectares of interior forest (at 11 and 12 hectares).



**Figure 27** Catchment woodland cover and forest interior

#### Wetland Cover

Figure 28 shows pre-settlement versus current (2008) wetland cover in the catchment.



Pre-Settlement data provided by: Ducks Unlimited Canada, 2010. Southern Ontario Wetland Conversion Analysis, [http://www.ducks.ca/aboutduc/news/archives/prov2010/pdf/duc\\_ontariowca.pdf](http://www.ducks.ca/aboutduc/news/archives/prov2010/pdf/duc_ontariowca.pdf), (March 2010)

**Figure 28** Catchment wetland cover

## 4. Stewardship and Protection

The RVCA and its partners are working to protect and enhance environmental conditions in the Rideau Lakes subwatershed.

### Rural Clean Water Projects

Figure 29 shows the location of all Rural Clean Water Projects in the Lower Rideau drainage area. From 2008 to 2013, landowners completed 15 projects: nine septic system repairs/replacements, two well decommissionings, two well upgrades, one buffer/windbreak planting and one well replacement. RVCA contributed \$17,529 in grant dollars towards the total project cost of \$ 120,765.

Prior to 2008, the RVCA completed seven projects in the area consisting of three erosion control projects, two septic system repairs/replacements and two well upgrades. In total, RVCA contributed \$9,750 in grant dollars to projects valued at \$51,827.

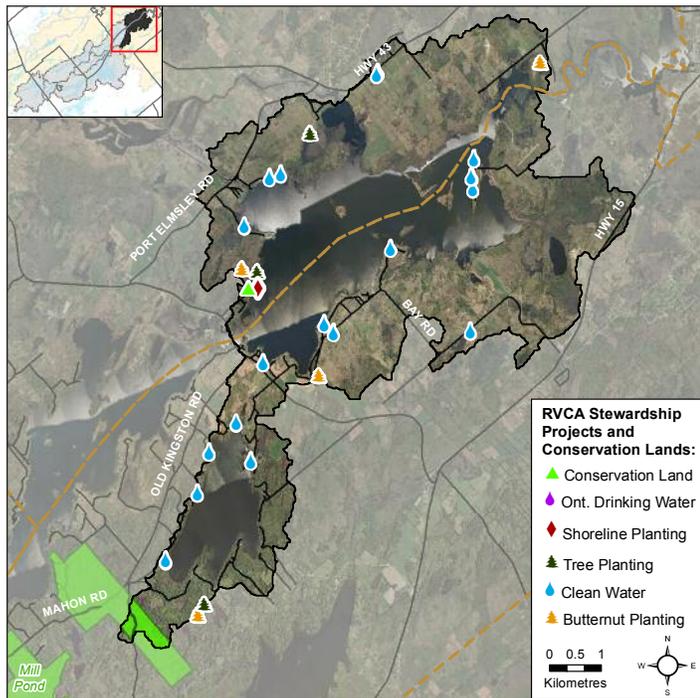


Figure 29 RVCA stewardship program project locations

### Tree Planting Projects

The location of all tree planting projects is also shown in Figure 29. From 2008 to 2013, 4,010 trees were planted at two sites through the RVCA Tree Planting Program. Project value is \$10,199 with \$7,190 of that amount coming from other fundraising sources. Prior to 2008, 1,000 trees were provided to landowners under the program.

### Shoreline Naturalization Projects

With the assistance of the RVCA's Shoreline Naturalization Program, 223 trees and shrubs were planted at two project locations from 2008 to 2013 to create 88 metres of shoreline buffer at a total project value of \$647.

### Septic System Re-Inspections

From 2008 to 2009, the Mississippi Rideau Septic System Office performed 17 septic system re-inspections (12 cottages and five houses) in Rideau Lakes Township within the Lower Rideau Lake catchment. Remedial/maintenance work (i.e. pump outs, baffle replacement, work that generally does not require a permit) was recommended for six (or 35 percent) of those properties that were inspected, a septic system replacement at one other property with more information provided to another landowner with identified septic system concerns.

### Valley, Stream, Wetland and Hazard Land Regulation

Eighteen square kilometres or 38 percent of the catchment drainage area is within the regulation limit of Ontario Regulation 174/06 (Figure 30), giving protection to wetland areas and river or stream valleys that are affected by flooding and erosion hazards.

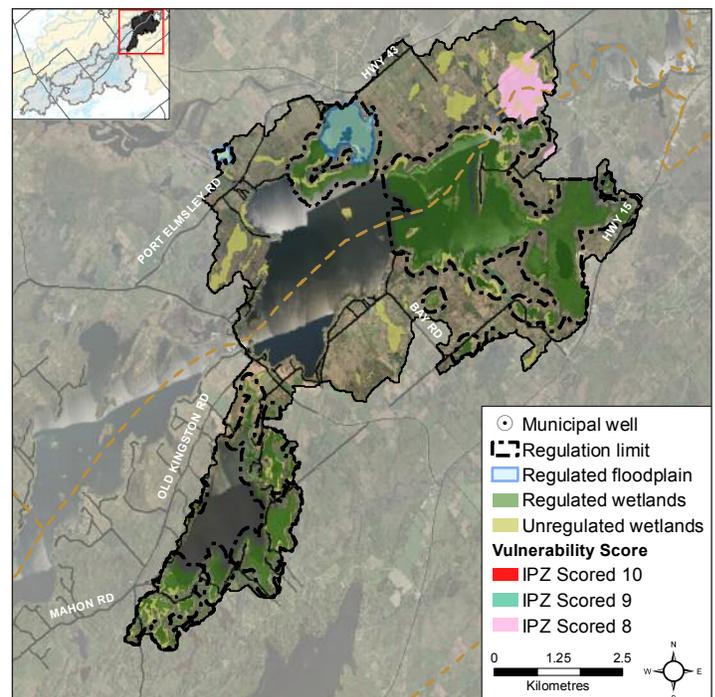


Figure 30 RVCA regulation limits and Smiths Falls Intake Protection Zone

Natural features within the regulation limit include 9.5 sq. kilometres of wetlands (representing 77 percent of all wetlands in the catchment) and 22.3 kilometers of streams (representing 45 percent of all streams in the catchment). Some of these regulated watercourses (16.1 kilometres or 33 percent of all streams) flow through regulated wetlands.

Regulation limit mapping has been plotted along 6.2 kilometres (or 28 percent) of the streams that are outside of wetlands. Plotting of the regulation limit on the remaining 87.4 kilometres (or 82 percent) of streams requires identification of flood and erosion hazards and valley systems.

Within the regulation limit, "development" and "site alteration" require RVCA permission. The "alteration to waterways" provision of Ontario Regulation 174/06 applies to all watercourses.

## Vulnerable Drinking Water Areas

The Intake Protection Zone (IPZ) around the Town of Smiths Falls municipal drinking water source is located within the catchment drainage area (Figure 30). The Intake Protection Zone is subject to mandatory policies in the Mississippi-Rideau Source Protection Plan developed under the *Clean Water Act*. These policies specifically regulate land uses and activities that are considered drinking water threats, thereby reducing the risk of contamination of the surface water that feeds the municipal water treatment plant intake.

The catchment area is considered to have a Highly Vulnerable Aquifer. This means that the nature of the overburden (thin soils, fractured bedrock) does not provide a high level of protection for the underlying

groundwater making the aquifer more vulnerable to contaminants released on the surface. The Mississippi-Rideau Source Protection Plan includes policies that focus on the protection of groundwater region-wide due to the fact that most of the region, which encompasses the Mississippi and Rideau watersheds, is considered Highly Vulnerable Aquifer.

The small portion of the southeast portion of the catchment area is also considered a Significant Groundwater Recharge Area. This means that there is a volume of water moving from the surface into the ground and groundwater serves either as a municipal drinking water source or supplies a cool/cold water stream. The Plan was not required to include policies to specifically address Significant Groundwater Recharge Areas.



## 5. Issues

### Water Quality

- Recent findings from the RVCA's surface water quality monitoring program show that Bass Lake has a "Poor" surface water quality rating (for the 2008-2013 period) and is generally characterized by moderate nutrient concentrations and noted algal bloom occurrences
- Recent findings from the RVCA's surface water quality monitoring program show that Lower Rideau Lake has a "Very Poor" surface water quality rating (for the 2008-2013 period) and is generally characterized by elevated nutrient concentrations and periods of limited oxygen availability, which likely result from the decomposition of aquatic plants and algae. The shallow nature of the lake basin and the nutrient rich organic sediment within it also make Lower Rideau Lake vulnerable to additional nutrient loadings
- RVCA's 2013 Algae and Aquatic Plant Survey for Eastern Ontario Lakes and Rivers found that a majority of the survey respondents in the Rideau Lakes subwatershed have noticed an increase in algae and aquatic plants on their waterbody
- Seven (of 17) Rideau Lakes Township septic system re-inspections conducted from 2008 to 2009 revealed the need for additional maintenance/remedial/replacement works to be performed. Those properties with concerns are identified in the yearly report submitted by the Mississippi Rideau Septic System Office to the Township

### Development

- Traditional cottage character of the Rideau Lakes is being slowly altered by the scale of development and the trend toward larger year-round dwellings. This transition is taking place either through re-development of an existing cottage lot or incremental alterations (additions, sleeping cabins, gazebos, decks, sheds, boat houses, garages, lawns, docks)
- Many waterfront properties contain existing non-complying dwellings with respect to minimum water frontage and lot area and are often located within 30 metres of the water that require minor variances for expansion and/or reconstruction of dwellings where standard development setbacks from water are difficult to achieve. In these cases, of which there are many, municipal staff and the Conservation Authority often meet with resistance and push back when attempts are made to implement standards for development setbacks, vegetated shorelines and septic systems
- Monitoring implementation of conditions of planning and regulatory approvals is challenging due to a lack of resources
- Access to waterfront properties along private roads/rights-of-way is becoming more of a municipal liability for emergency vehicle access (ambulance, fire and police)

### Shorelines

- Around Bass Lake, the 30 metre wide riparian, shoreline buffer contains 69 percent non-natural land cover (comprised of waterfront cottages and homes, recreational properties and roads) and 31 percent natural land cover (made up of woodland and wetland), which is below the recommended 75 percent naturally vegetated riparian, shoreline buffer target
- Around Lower Rideau Lake, the 30 metre wide riparian, shoreline buffer contains 32 percent non-natural land cover (comprised of waterfront cottages and homes, recreational and commercial properties and roads) and 68 percent natural land cover (made up of wetland and woodland), which is below the recommended 75 percent naturally vegetated riparian, shoreline buffer target

- No clear picture of the physical condition of the shoreline of Bass Lake and Lower Rideau Lake is available. Consideration should be given to conducting a shoreline survey of Lower Rideau Lake and Bass Lake using the MAPLE Shoreline Classification Survey to help assess shoreline health
- Emerald ash borer poses a significant threat to the ecology of the area, given the prominence of ash trees along shorelines and in riparian and wetland natural areas. Many tree stands are predominantly ash and with their anticipated loss, it is unclear what will replace them and the overall effect of their collective demise on the physical and natural functions/values they provide for erosion, water quality and fish and wildlife habitat protection

### Water Levels

- Fluctuations above/below the expected/typical range in water levels due to cool and wet or hot and dry conditions cause concern amongst property owners around the Rideau Lakes. Information about water level management is available on various websites; however, timely communication about the manipulation of water level control structures and specific conditions is not always forthcoming during high water events

### Fisheries

- There is limited information available about the state of the fisheries resource in this catchment. Fisheries studies were completed on most Rideau Lakes in the late 1960s/early 1970s revealing a diverse fishery resource with cold, cool and warm aquatic habitats present. Since then, no other studies have been completed on the local lakes with the exception of Big Rideau Lake where landscape level, broad-scale, creel surveys are conducted by MNR on a five year cycle

### Lake Planning

- This report outlines some issues and concerns regarding the health of the Lower Rideau Lake catchment. However, there is limited knowledge of the overall issues and concerns about natural resource management, use and the health of Bass Lake, Lower Rideau Lake and the catchment
- The Bass Lake and Lower Rideau Lake community might consider working together to undergo the lake planning process. The lake planning process allows for valuable information about the current health of the lake and its watershed, as well as an overview of all the issues and concerns facing the lake to be collected together. The lake planning process requires involvement and input from the whole lake community which includes lake residents, users, businesses, municipalities, non-governmental organizations, agency partners and other stakeholders. The process ensures that the lake community's issues and concerns are gathered into one action-oriented document, which can guide the many stakeholders that care about Bass Lake and Lower Rideau Lake to help tackle lake health concerns in partnership

## 6. Opportunities

### Water Quality

- Address reported high nutrient levels in Bass Lake and in Lower Rideau Lake to determine if sources of nutrient inputs can be reduced to improve water quality
- Reduce pollutant loadings to Bass Lake, Lower Rideau Lake and the Tay River through application of shoreline, stormwater and agricultural best management practices; also consider using low impact development (LID) methods to improve the quality and reduce the amount of stormwater runoff reaching the lake ecosystem. This may be particularly beneficial in areas of high density development with extensive impervious surfaces (i.e., asphalt, concrete, buildings and severely compacted soils) or on sensitive waterfront properties (with steep slopes/banks, shallow/impermeable soils)
- Continue to promote the protection of the Rideau Lakes water resources through implementation of municipal and agency land use and development policies and practices
- Continue to promote septic system re-inspections by the Mississippi Rideau Septic System Office to ensure that sewage disposal systems are functioning properly and advocate for the replacement of faulty septic systems in accordance with current *Ontario Building Code* standards
- Continue to offer septic repair/replacement project funding provided by the Rideau Valley Rural Clean Water Program to waterfront landowners
- Continue efforts to educate boaters about the need to properly dispose of on-board grey and black water and the availability of environmentally conscious marinas with sewage pump-out facilities that have been certified by the Clean Marinas Program
- Review RVCA monitoring of surface water quality in the Lower Rideau Lake, along with other Rideau Lakes before the next round of the Watershed Watch monitoring cycle begins in 2016 to determine if there is a need to “develop a more intensive and coordinated water quality monitoring program for all Rideau Lakes” (an identified action in the *2009 Rideau Lakes Watershed Plan*)

### Development

- Collectively work with approval authorities (Drummond/North Elmsley Township, Township of Rideau Lakes, Conservation Authority, the Health Unit, and Mississippi-Rideau Septic System Office) to consistently implement current land use planning and development policies for water quality and shoreline protection adjacent to lakes and streams (e.g., a minimum 30 metre development setback from water)
- Explore ways and means to more effectively enforce and implement conditions of land-use planning and development approval to achieve net environmental gains (particularly with respect to rehabilitating or protecting naturally vegetated shorelines and water quality)
- Encourage Committees of Adjustment to take advantage of technical and environmental information and recommendations forthcoming from planning and environmental professionals
- Municipal and agency planners together with development proponents are to continue using the *Rideau Lakes Basin Carrying Capacity Study* (1992) and associated 2014 Site Evaluation Guidelines<sup>5</sup> to inform decision-making about the application of development setbacks on lots with shallow soils/bedrock, steep slopes and sparse vegetation cover along with the use of the appropriate, development related, best management practices

- Utilize RVCA subwatershed and catchment reports to help develop/revise official plan policies to protect surface water resources and the natural environment (including woodlands, wetlands and shoreline cover)
- New development around Lower Rideau Lake should take into account a first floor elevation of 124.81 metres (using the 124.51 metre 100 year flood elevation plus 0.3 metre freeboard) above sea level so as to ensure the safety and integrity of building contents and their contents; this figure should also be taken into account in the design and placement of septic systems and well heads so that they are not adversely impacted during flood events

### Shorelines

- RVCA and its partners (including the municipalities of Drummond/North Elmsley and Rideau Lakes and the Big Rideau Lake Association) are to continue educating landowners about waterfront property best management practices with respect to shoreline use and development, septic system installation/maintenance and shoreline vegetation retention and enhancement
- Protect the riparian buffer along the shoreline of Lower Rideau Lake and its tributaries during the development approvals process through adherence to and enforcement of municipal land-use policies and zoning standards
- Consider a comprehensive assessment of shoreline conditions around Lower Rideau Lake (using the MAPLE protocol) to monitor the effect of future changes to the lake ecosystem
- RVCA and partners are to continue promoting the RVCA’s Shoreline Naturalization Program and other similar initiatives to enhance vegetation cover around Lower Rideau Lake
- Target shoreline restoration at sites identified in this report (as shown in Figure 24 as “Other” riparian cover)
- Continue to educate boaters about the effect of excessive speeding and ensuing boat wake on the shoreline and wildlife of Lower Rideau Lake; also consider enforcement of speeding watercraft in close proximity to the shoreline

### Water Levels

- Forge connections amongst water resources management agencies, businesses, municipalities and lake residents to continually improve water level management activities. This will include the pooling of resources where possible and regular communications about how, when and why water levels are manipulated and what the impacts will be on navigation, fisheries, recreation and flood attenuation
- In 2014, lake levels were higher than most years and more attention was required from RVCA and municipal staff. Only general flood information was available for municipalities to address landowner concerns. In response, a review of the RVCA Flood Forecasting and Warning Program in the Upper Rideau Valley is underway to address this need

<sup>5</sup>Hutchinson Environmental Sciences Ltd. 2014. *Assessment of Municipal Site Evaluation Guidelines in Eastern Ontario’s Lake Country*. Prepared for: Mississippi Valley Conservation Authority, Rideau Valley Conservation Authority and Cataraqui Region Conservation Authority

## Lake Planning

### A Lake Plan:

- Is an action plan developed by a lake community (which includes lake residents, users, businesses, municipalities, non-governmental organizations, agency partners and other stakeholders) that identifies and preserves the natural and social characteristics that are valued by the lake community for future generations
- Helps to promote community discussion, education and action
- Sets goals and objectives for the protection and enhancement of the lake
- Recommends land use policies/practices that influence development on the lake
- Promotes stewardship actions to improve the environmental conditions of a lake so it can be enjoyed by future generations

Consider the need for a community-driven lake management plan for Bass Lake and Lower Rideau Lake that can:

- Bring the lake community together
- Engage the community beyond the lake residents and lake association members and develop partnerships
- Identify and bring together common values and concerns
- Provide a baseline of data on water quality, land-use activities, shoreline development, fisheries management, etc., that can help to inform water resources management, land use planning and stewardship actions
- Range in complexity from a comprehensive living document to a simplified list of priorities that can be carried out by the lake community to protect the lake environment