Rideau Lakes Subwatershed Report 2014
WESTPORT SAND LAKE CATCHMENT

RIDEAU VALLEY CONSERVATION AUTHORITY

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 Westport Sand 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.

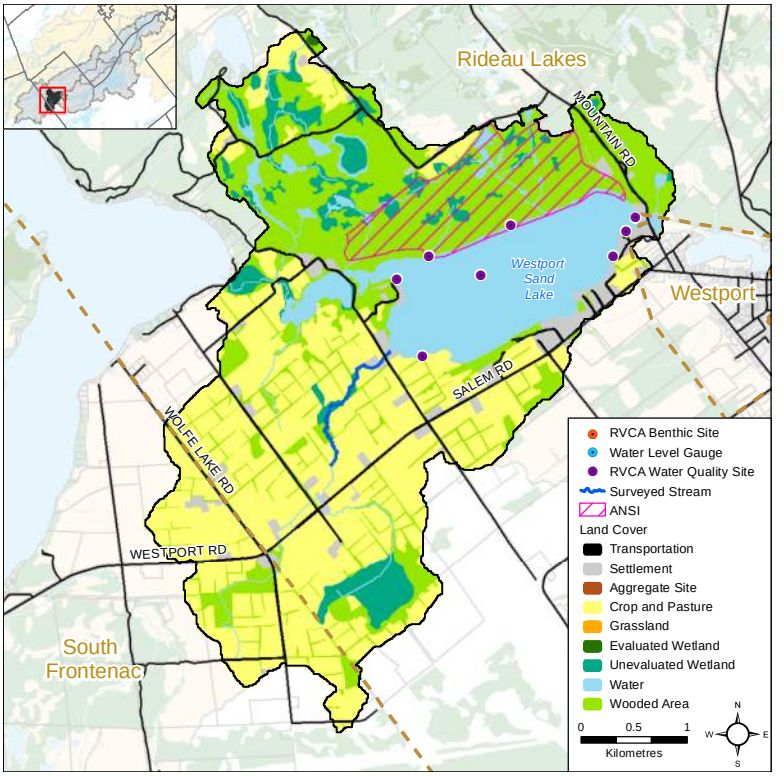
The following pages of this report are a compilation of that work. For other Rideau Lakes catchments and the Rideau Lakes Subwatershed Report, please visit the RVCA website at www.rvca.ca

What's Inside

Catchment Facts

General Geography

- Rideau Lakes is a very popular seasonal tourist and residential destination because of its diverse natural amenity, cultural history associated with the Rideau Waterway, close proximity to a number of large cities and towns and ease of access via the Rideau Canal. Residents and vacationers flock to the 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 now 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. Newboro and Westport are located on Upper Rideau Lake and are service centres for local residents. Westport is a major tourist attraction for visitors to the Rideau Lakes and is known as the "The Heart of Rideau Lakes." It offers accommodations, shopping, restaurant and watercraft docking along with other water related recreational services
- 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



- 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

Physical Geography

- The area of the Westport Sand Lake catchment that is north of the lake and the majority of the Rideau Lakes subwatershed resides within the Algonquin Highlands, which is an ancient (Precambrian) hilly area made up of thin and variable glacial deposits overlying igneous and metamorphic rock ridges and knolls. Here, these rocks are granitic and syenitic gneisses. A geologic fault, oriented roughly east-west, follows the northern shore of the lake. The sediment overlying the bedrock is thin and composed primarily of mixed glacial sediment often referred to as drift
- The southern part of the Westport Sand Lake catchment is located within a transition area between the physiographic region known as the Smith Falls Limestone Plain and the Algonquin Highlands. In this area, the underlying bedrock consists of Paleozoic quartzose sandstone and possibly conglomerate. The sediment overlying the bedrock south of the lake is primarily composed of thick sandy glacial deposits. This is one of the only areas within the subwatershed where there is a significant extent of thick and permeable soils. As a result, this area may be one of the most important groundwater recharge areas for the region
- The only area, within the subwatershed, where karstic terrain may be found is located at the eastern extent of this catchment at the boundary with the Upper Rideau Lake catchment. Karstic terrain is very susceptible to land use impacts
- Eighty eight percent of the catchment lies within the Township of Rideau Lakes and 12 percent within the Township of South Frontenac
- Westport Sand Lake catchment drainage area is 17 square kilometres and occupies about four percent of the Rideau Lakes subwatershed and less than one percent of the Rideau Valley watershed
- Dominant land cover is crop and pastureland (41 percent) followed by woodland (29 percent), water (16 percent), wetland (seven percent), settlement areas (four percent) and transportation routes (three percent)

Vulnerable Areas

- Certain lands around Westport Sand Lake are subject to a flooding hazard; surveys and studies undertaken in accordance with provincial standards have not, however, been undertaken to determine the 100 year flood elevation for the lake. A flood elevation will be determined in the near future as funds become available
- The Assessment Report developed under the Ontario *Clean Water Act,* identified the catchment area as a Significant Groundwater Recharge Area and Highly Vulnerable Aquifer

Development/Trends

- Given the proximity to the serviced communities of Westport, Perth, Portland 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 Westport Sand 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
- The Village of Westport is the largest urban area at the fringe of the catchment and is a separate municipality from the Township of Rideau Lakes. Lands in Westport are primarily zoned Residential and Commercial along with some Institutional and Rural land-uses
- Lands immediately adjacent to Westport in the Township of Rideau Lakes are predominately zoned Rural with the south shore of Westport Sand Lake zoned Waterfront Residential and the north shore predominantly zoned Environmental Protection due to the location of the Westport Sand Lake ANSI (Area of Natural and Scientific Interest) Land-use at the east end of Westport Sand Lake is restricted as the lands are zoned Open Space, which generally coincides with the location of the Westport Fish Hatchery

Conditions at a Glance

- Surface water quality rating in Westport Sand Lake is ”Poor”
- In the Westport Sand Lake catchment, the riparian buffer (30 metres wide strip along the shoreline of all lakes and streams) is comprised of woodland (51 percent), wetland (24 percent), crop and pastureland (16 percent), settlement areas (six percent) and transportation routes (three percent)
- Along the **south (off-Shield) shore of Westport Sand Lake**, the shoreline buffer is comprised of settlement areas (52 percent), woodland (26 percent), crop and pastureland (18 percent) and transportation routes (four percent); in contrast, the **north (on-Shield) shore of Westport Sand Lake** is comprised of woodland (73 percent), settlement areas (nine percent), crop and pastureland (eight percent), wetland (five percent) and transportation routes (five percent)
- Along streams, the riparian buffer is comprised of woodland (39 percent), wetland (32 percent), crop and pastureland (24 percent), settlement areas (three percent) and transportation routes (two percent)
- Woodland cover proportion has changed/decreased by less than one percent (four ha) from 2002 to 2008, due to a combination of changes in land cover/land uses and/or applied digital classification methods
- Development on Westport Sand Lake occurs on private wells (of which there are about 137 water well records in the catchment) and septic systems
- The only remaining Rideau Lakes stocking takes place on Westport Sand Lake where walleye is stocked annually by the Westport Area Outdoors Association The former provincial fish station is being used by the Association to raise walleye for the stocking of Westport Sand Lake (currently managed as a Put-Grow-Take (i.e., stocked) fishery on an annual basis)
- 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 2006, RVCA monitors Westport Sand 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 four times of the year at one deep point site and twice a year at seven sites on Westport Sand Lake. Three of the shoreline sites are monitored every year and four other sites are monitored every fifth year
- RVCA has been providing septic system re-inspection at the request of the Township of Rideau Lakes since 2007
- Township of Rideau Lakes septic system voluntary re-inspections were undertaken on eight Westport Sand Lake properties in the catchment by the Mississippi Rideau Septic System Office. Remedial/ maintenance work was advocated for six of those properties
- Seven stewardship projects have been completed through RVCA's Rural Clean Water Program (see Section 4 of this report for details)
- 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 Westport Sand Lake catchment
- The Village of Westport and Rideau Lakes Township have land use planning policies and zoning provisions (on lake capacity, water setbacks, frontage and 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 Village and Township 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 Rideau Lakes and the Village of Westport 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 *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
- Much of the shoreline of Westport Sand 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 Westport Sand Lake 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 Westport Sand Lake 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.

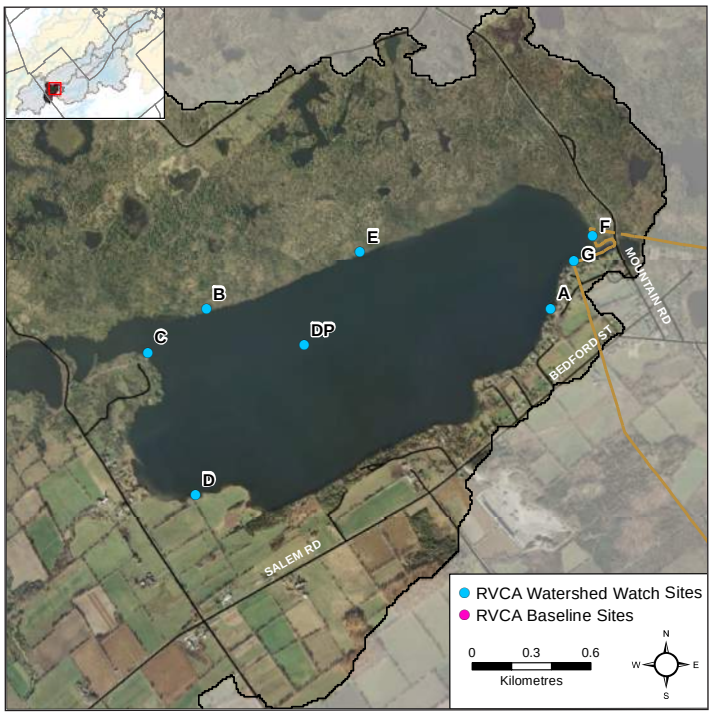


Figure 1 Water quality monitoring sites in the Westport Sand Lake catchment

The water quality rating for Westport Sand Lake is "Poor" (Table 1) as determined by the CCME Water Quality Index. Water quality 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 Westport Sand Lake prior to 2005; thus only the 2008-2013 data is considered in this report. Table 1 shows the overall rating for the monitored surface water quality sites within the Westport Sand Lake catchment and Table 2 outlines the Water Quality Index (WQI) scores and their corresponding ratings.

Table 1 WQI Ratings for Westport Sand Lake

Sampling Site	Location	2008-20013	Rating
RVL-14	Westport Sand	52	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. Westport Sand Lake Water Quality

Surface water quality conditions in Westport Sand Lake have been regularly monitored by RVCA's Watershed Watch Program since 2006. Data from one deep point site has been used to calculate the WQI rating for Westport Sand Lake, which was determined to be "Poor" (Table 1). Elevated nutrient concentrations, periods of reduced oxygen availability, 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 7 additional shoreline 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 contributes 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[1] within surface waters.

At the Deep Point

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

Table 3 Summary of nutrient results for Westport Sand Lake, 2008-2013

Total Phosphorus 2008-2013			
Site	**Average (mg/l)**	**Below Guideline**	**No. Samples**
RVL-14	0.018	68%	22
Total Kjeldahl Nitrogen 2008-2013			
Site	**Average (mg/l)**	**Below Guideline**	**No. Samples**
RVL-14	0.374	86%	22

[1] 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. Sixty-eight percent of the samples analyzed for TP were less than the TP guideline and the average concentration was 0.018 mg/l (Table 3).

TKN concentration were also generally below the guideline; 86 percent of results were below the TKN guideline and the average concentration was 0.374 mg/l (Table 3). Average year to year concentrations have varied for both TP and TKN (Figure 4 and 5). From 2009 to 2011 there appears to be a decline in the average yearly TP concentrations (Figure 4). Average TKN results do not exceed the guideline and have remained generally consistent. Despite the recent decline in average TP concentrations, overall the data presented indicates that often elevated TP concentrations are a concern in the mid-lake, deep water sites of Westport Sand Lake.

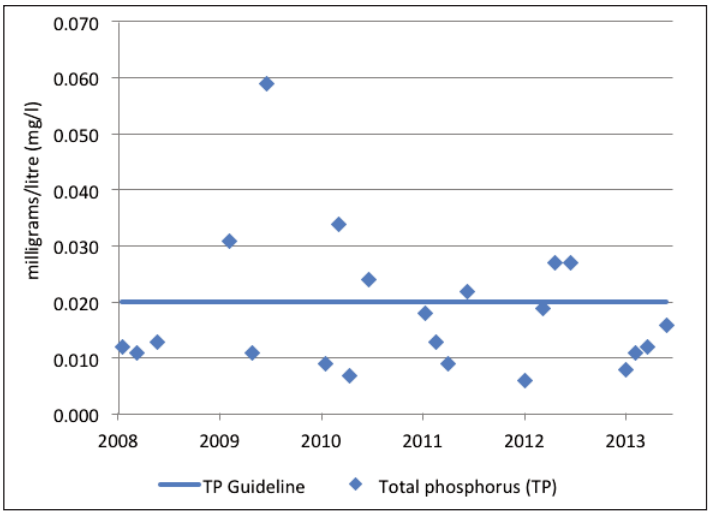


Figure 2 Total phosphorus sampling results at the deep point site in Westport Sand Lake, 2008-2013

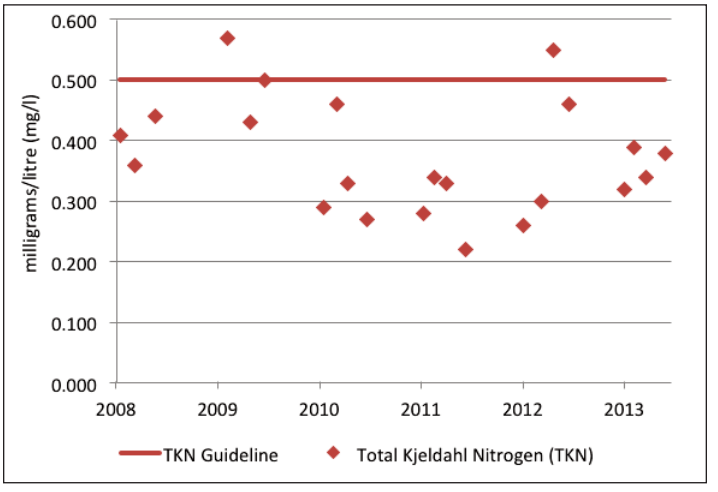


Figure 3 Total Kjeldahl nitrogen sampling results at the deep point site in Westport Sand Lake, 2008-2013

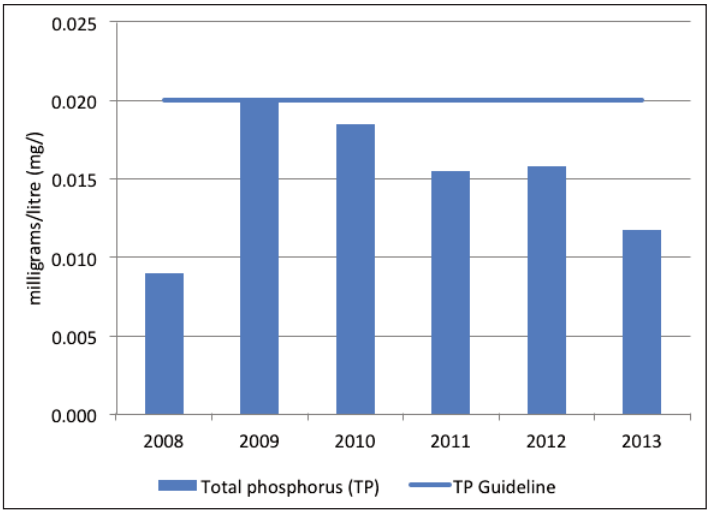


Figure 4 Average total phosphorus at the deep point site in Westport Sand Lake, 2008-2013

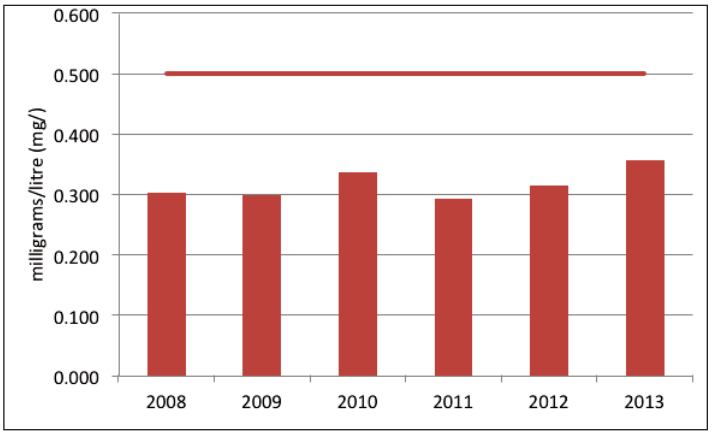


Figure 5 Average total Kjeldahl nitrogen at the deep point site in Westport Sand Lake, 2008-2013

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, D, and F are monitored each year while other sites are monitored every fifth year.

Average total phosphorous concentrations were above the TP guideline at all sites; there is evidence of an increase trend in concentrations at site D (Figure 6). This site is located near agricultural lands and it is possible that animal manure or fertilizer runoff is contributing to elevated concentrations at this site. However, given that all sites regularly exceed the TP guideline, better stewardship practices should be employed around the lake to ensure that phosphorus loading is minimized wherever possible.

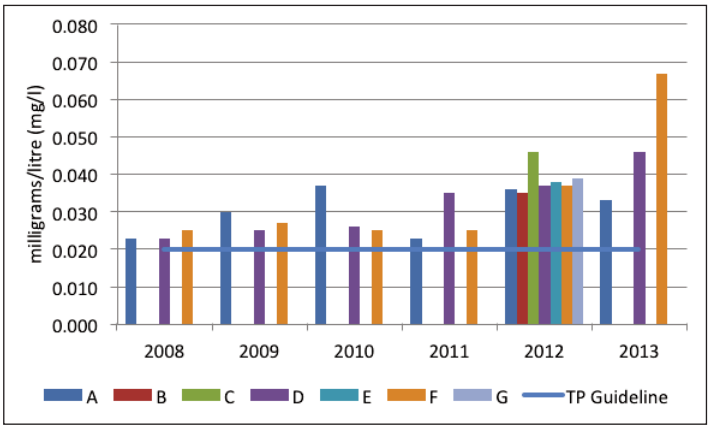


Figure 6 Average total phosphorus concentration at shoreline monitoring sites on Westport Sand Lake, 2008-2013

TKN concentrations were also consistently above the guideline at all shoreline sites (Figure 7). These results provide further evidence that nutrient loading is a concern and may result in abundant plant or algal growth and low oxygen levels which may put stress on sensitive aquatic species.

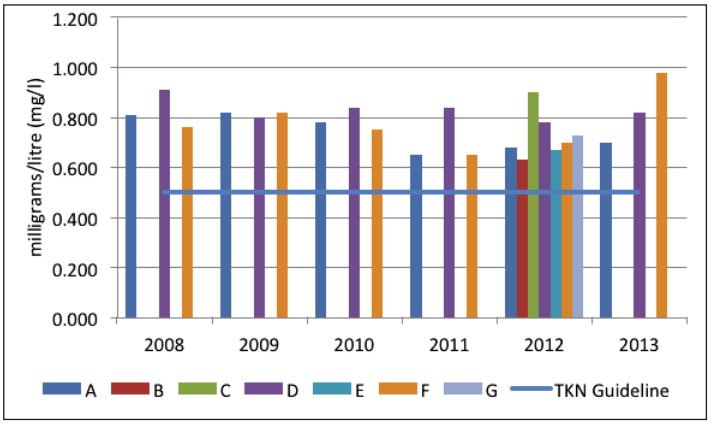


Figure 7 Average total Kjeldahl nitrogen concentration at shoreline monitoring sites on Westport Sand Lake, 2008-2013

Summary

Within Westport Sand Lake nutrient concentrations in the mid lake deep point can be considered moderate to high; in the near shore area nutrient enrichment is a concern. Shoreline sites should be examined to identify if sources of nutrient inputs can be reduced through methods such as the diversion of runoff and enhanced shoreline buffers. Areas where high concentrations of nutrients persist may observe excessive aquatic plant growth, algae blooms and depleted oxygen concentrations.

Nutrient exceedances may be partially attributed to the natural aging of a lake and its basin characteristics. Aging of the lake can be slowed with the help of all catchment 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 4 summarizes the recorded depths and shows that all readings have exceeded the minimum PWQO of 2 metres, indicating good water quality with an average Secchi depth of 5.3 metres. Figure 8 shows that no individual reading has been below the guideline and measured depths range from 2.75 metres to 9 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.

Table 4 Summary of Secchi depths recorded at the deep point in Westport Sand Lake, 2008-2013

Secchi depth 2008-2013			
Site	**Average (m)**	**Above Guideline**	**No. Samples**
RVL-14	5.3	100%	22

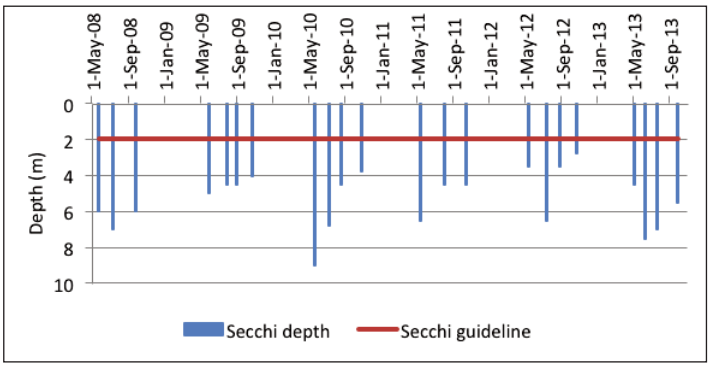


Figure 8 Recorded Secchi depths at the deep point site in Westport Sand Lake, 2008-2013

Summary

This data indicates that waters are clear and adequate sunlight is able to penetrate the water column to support aquatic life and provides 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 Westport Sand Lake from a fish habitat perspective.

Dissolved Oxygen and Temperature

The red bars in Figure 9 shows 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 over an average depth of 9 metres. Suitable habitat typically becomes limited during the summer months as the upper portion of the water column warms and bottom depths are depleted of oxygen; this is most evident in August 2011, July 2012 and July 2013 (Figure 9).

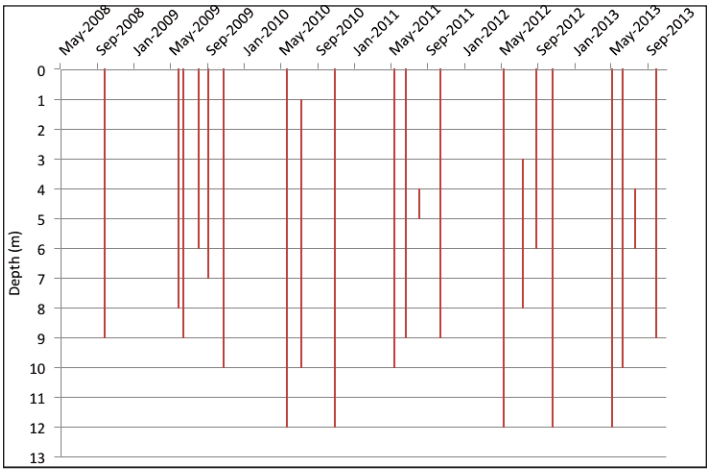


Figure 9 Depths suitable for warm water fish species at site RVL-14DP in Westport Sand Lake, 2008-2013

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 Westport Sand Lake and Figure 11 summarizes average concentrations by year.

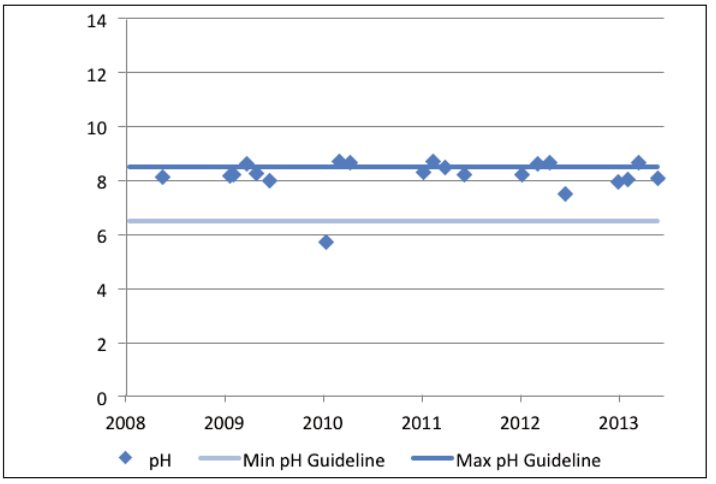


Figure 10 pH concentrations at the deep point in Westport Sand Lake, 2008-2013

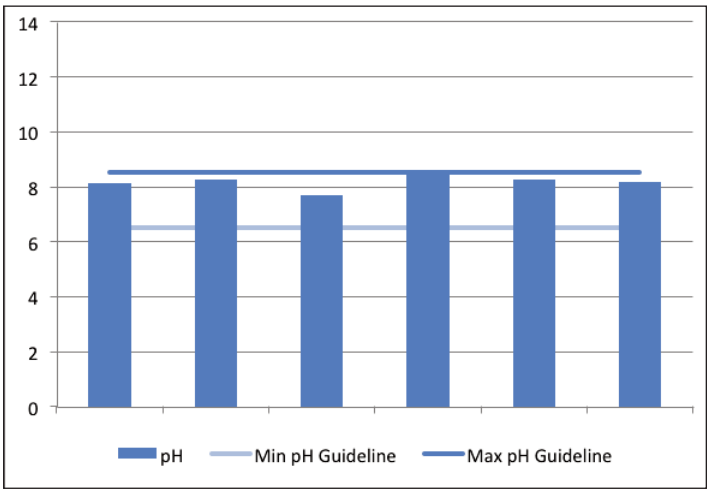


Figure 11 Average pH concentrations at the deep point in Westport Sand Lake, 2008-2013

Sixty two 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 deep point sites in Westport Sand Lake, 2008-2013

pH 2008–2013			
Site	**Average**	**% that meet guideline**	**No. Samples**
RVL-14	8.20	62%	21

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

Summary

Overall the water chemistry data at the deep point describes generally suitable habitat conditions for warm water fish species such as pickerel, bass and pike. There is some evidence that the warming of the water column and oxygen depletion in the summer months limits the amount of habitat available and may cause stress to some aquatic communities. pH conditions are typically within the upper range recommended for the protection of aquatic life.

E. coli

E. coli is sampled at monitored shoreline sites twice each sampling season. *E. coli* data was not used in the calculation 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[2] was only 4 CFU/100ml (Table 6). Figure 12 shows that samples across all sites were well below the guideline.

[2] 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

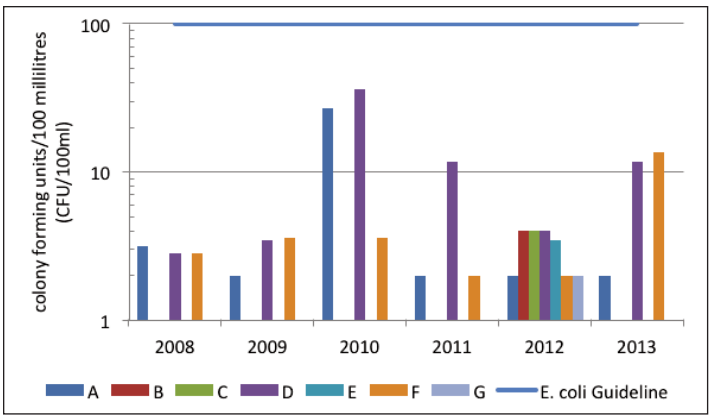


Figure 12 Geometric mean of shoreline sites monitored on Westport Sand Lake

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

***E. coli* 2008–2013**			
Site	**Geometric mean (CFU/100ml)**	**Below Guideline**	**No. Samples**
RVL-14	4	100%	42

Summary

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

Westport Sand Lake as seen from Spy Rock, Foley Mountain Conservation Area

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 metre wide vegetated buffer along at least 75 percent of the length of both sides of rivers, creeks and streams.

Figure 13 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 metres wide strip) in the catchment is comprised of woodland (51 percent), wetland (24 percent), crop and pastureland (16 percent), settlement areas (six percent), and transportation routes (three percent).

Around **Westport Sand Lake** itself, the shoreline buffer is made up of woodland (56 percent), settlement areas (25 percent), crop and pastureland (11 percent), transportation routes (four percent) and wetland (four percent). This can be further broken down as follows: the **north (on-Shield) shore** is comprised of woodland (73 percent), settlement areas (nine percent), crop and pastureland (eight percent), wetland (five percent) and transportation routes (five percent); in contrast, the **south (off-Shield) shore** is comprised of settlement areas (52 percent), woodland (26 percent), crop and pastureland (18 percent) and transportation routes (four percent).

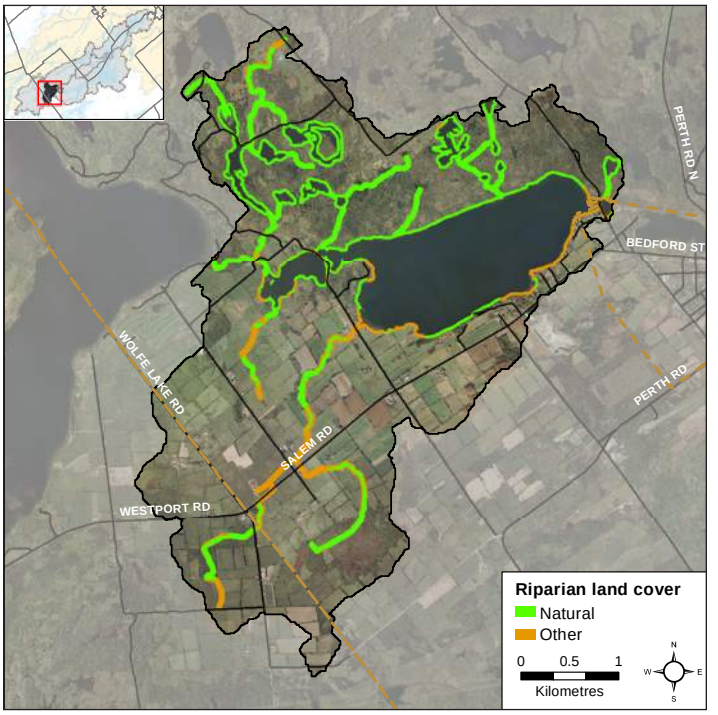


Figure 13 Natural and other riparian land cover around Westport Sand Lake

Along streams in the catchment, the riparian buffer is comprised of woodland (39 percent), wetland (32 percent), crop and pastureland (24 percent), settlement areas (three percent) and transportation routes (two percent).

Sicklers Creek Overbank Zone

Riparian Buffer Width Evaluation

Figure 14 shows buffer conditions along the left and right banks of Sicklers Creek. Using data from the 2013 Stream Characterization Program, Adrains Creek had a buffer of greater than 30 meters along 82 percent of the right bank and 83 percent along the left bank.

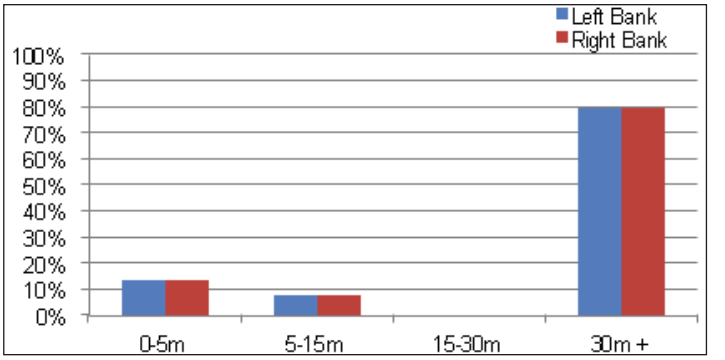


Figure 14 Riparian buffer evaluation along Sicklers Creek

Adjacent Land Use

The RVCA's Stream Characterization Program identifies seven different land uses beside Sicklers Creek (Figure 15). Surrounding land use is considered from the beginning to end of the survey section (100 m) and up to 100 metres on each side of the creek. Land use outside of this area is not considered for the surveys but is nonetheless part of the subwatershed and will influence the creek. Natural areas made up 89 percent of the stream, characterized by forest, scrubland and meadow. The remaining land use consisted of pasture, abandoned fields, infrastructure and residential.

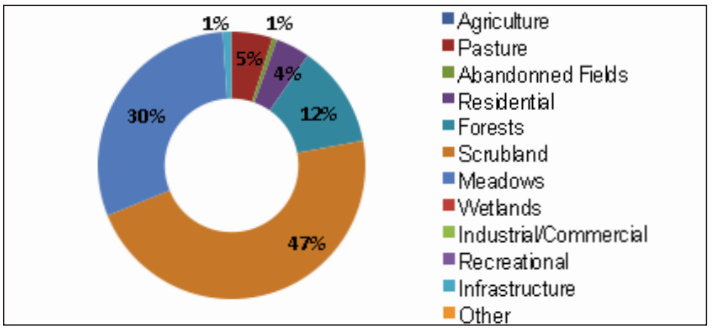


Figure 15 Land use along Sicklers Creek

Sicklers Creek Shoreline Zone

Instream Erosion

Erosion is a normal, important stream process and may not affect actual bank stability; however, excessive erosion and deposition of sediment within a stream can have a detrimental effect on important fish and wildlife habitat. Poor bank stability can greatly contribute to the amount of sediment carried in a waterbody as well as loss of bank vegetation due to bank failure, resulting in trees falling into the stream and the potential to impact instream migration. Figure 16 shows low levels of erosion along Sicklers Creek with the exception of one section which had high levels of erosion.

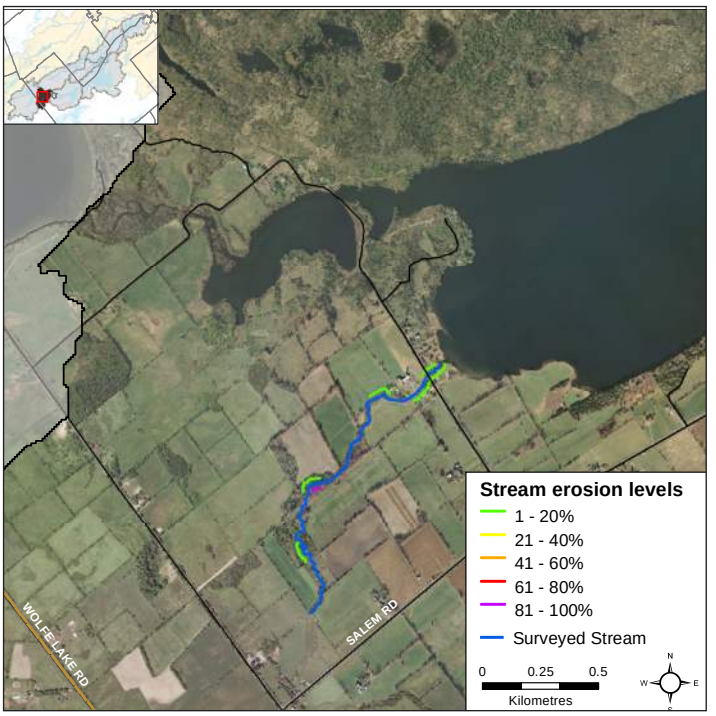


Figure 16 Erosion along Sicklers Creek

Undercut Stream Banks

Undercut banks are a normal and natural part of stream function and can provide excellent refuge areas for fish. Figure 17 shows that Sicklers Creek had low levels of undercut banks.

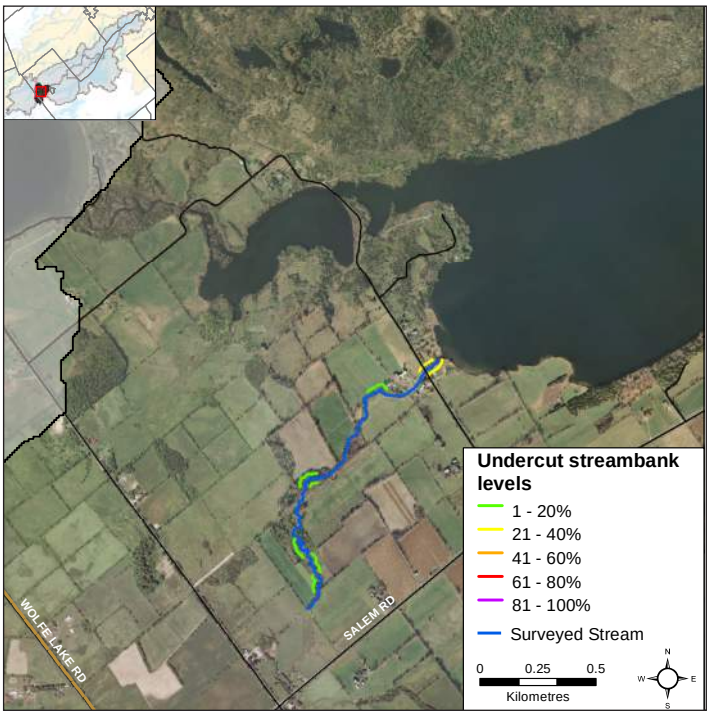


Figure 17 Undercut stream banks along Sicklers Creek

Stream Shading

Grasses, shrubs and trees all contribute towards shading a stream. Shade is important in moderating stream temperature, contributing to food supply and helping with nutrient reduction within a stream. Figure 18 shows highly variable stream shading conditions ranging from moderate to high levels along Sicklers Creek.

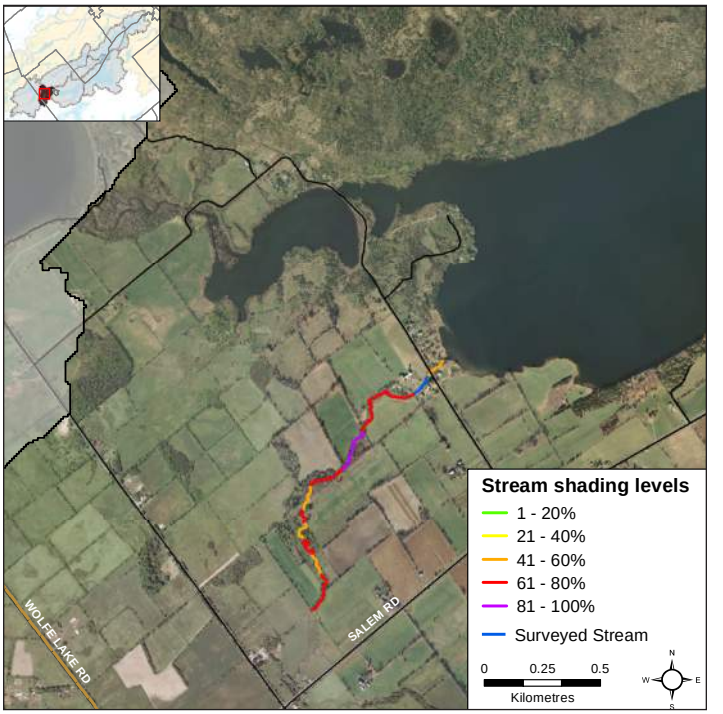


Figure 18 Stream shading along Sicklers Creek

Instream Woody Debris

Figure 19 shows that the majority of Sicklers Creek had low levels of instream woody debris in the form of branches and trees. Instream woody debris is important for fish and benthic habitat, by providing refuge and feeding areas.

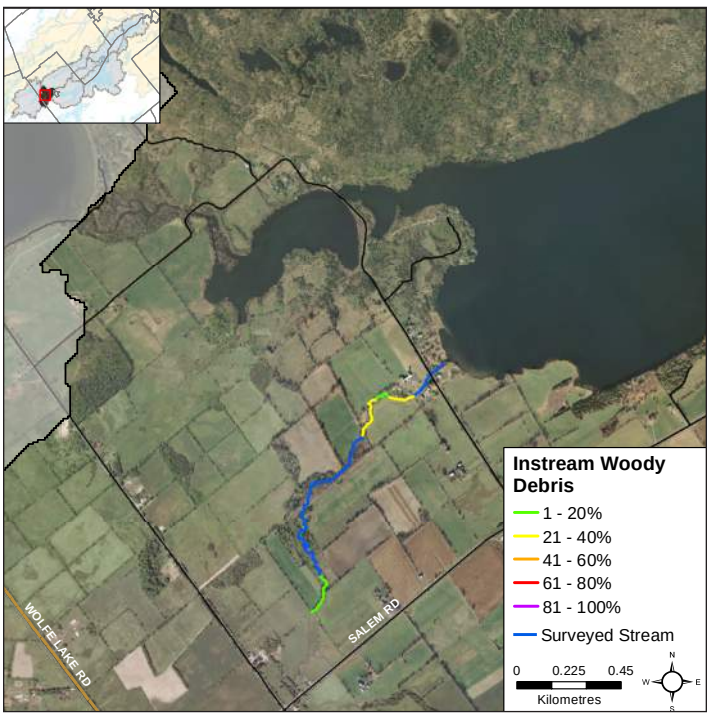


Figure 19 Instream woody debris along Sicklers Creek

Overhanging Trees and Branches

Figure 20 shows highly variable conditions along Sicklers Creek ranging from low to high levels of overhanging branches and trees. Overhanging branches and trees provide a food source, nutrients and shade which helps to moderate instream water temperatures.

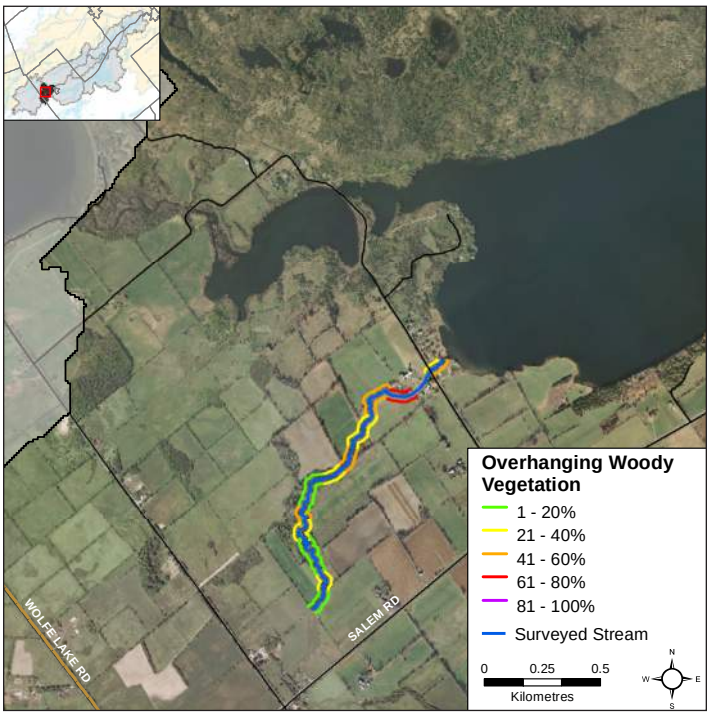
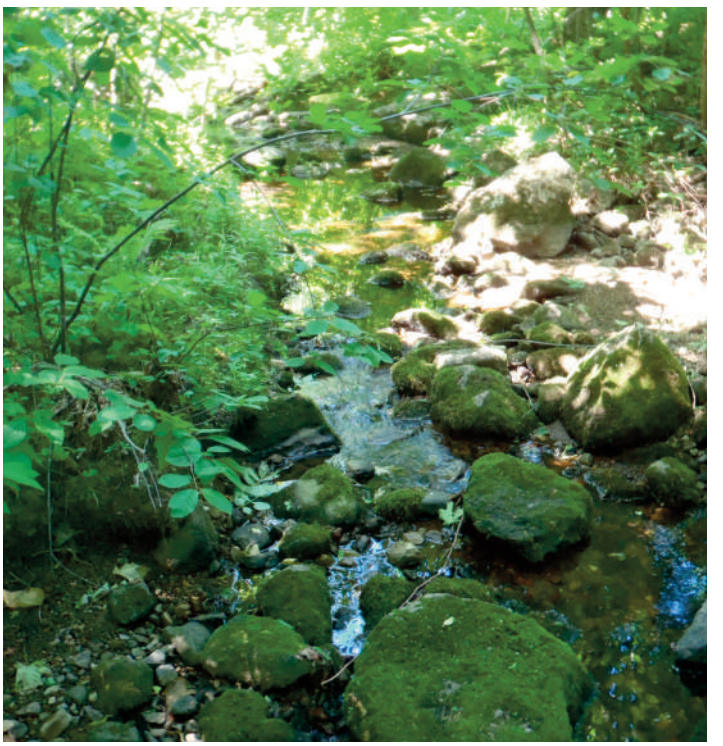


Figure 20 Overhanging trees and branches along Sicklers Creek



Anthropogenic Alterations

Figure 21 shows 76 percent of Sicklers Creek remains "unaltered" with no anthropogenic alterations. Eighteen percent of Sicklers Creek was classified as natural with minor anthropogenic changes and six percent of its length was considered altered in the form of buffers of less than 15 meters along the banks and road crossings.

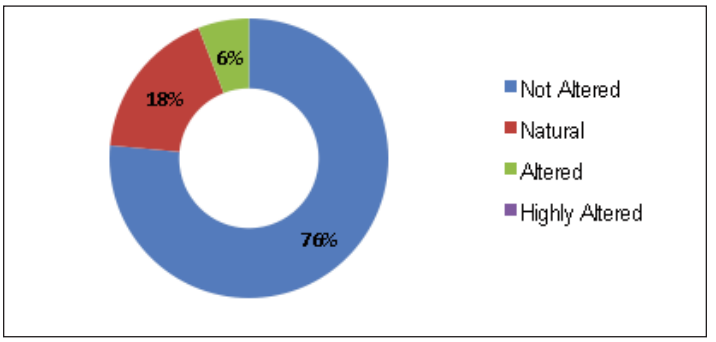


Figure 21 Anthropogenic alterations along Sicklers Creek

Habitat Complexity

Streams are naturally meandering systems and move over time; there are varying degrees of habitat complexity, depending on the creek. Examples of habitat complexity include variable habitat types such as pools and riffles as well as substrate variability and woody debris structure. A high percentage of habitat complexity (heterogeneity) typically increases the biodiversity of aquatic organisms within a system. One hundred percent of Sicklers Creek was considered heterogeneous, as shown in Figure 22.

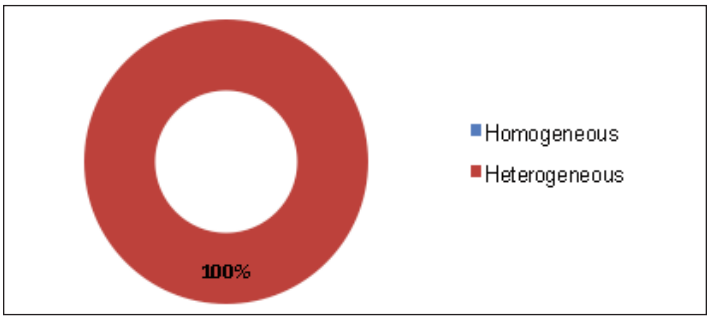


Figure 22 Habitat complexity along Sicklers Creek

Instream Substrate

Diverse substrate is important for fish and benthic invertebrate habitat because some species have specific substrate requirements and for example will only reproduce on certain types of substrate. Boulders create instream cover and back eddies for large fish to hide and/or rest out of the current. Cobble provides important spawning habitat for certain fish species like walleye and shiners who are an important food source for larger fish. Cobble can also provide habitat conditions for benthic invertebrates that are a key food source for many fish and wildlife species. Figure 23 shows where cobble and boulder substrate are found in Sicklers Creek.

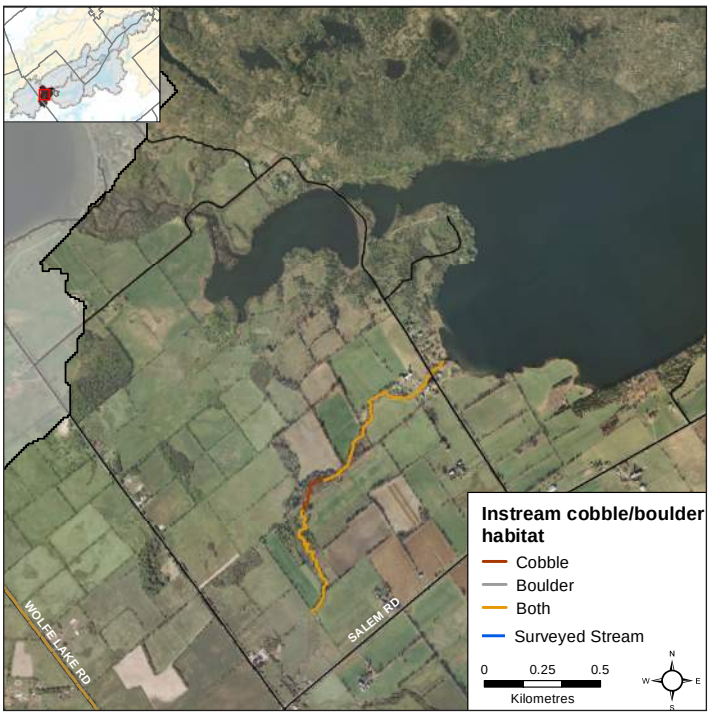


Figure 23 Instream substrate along Sicklers Creek

Instream Morphology

Pools and riffles are important habitat features for fish. Riffles are areas of agitated water and they contribute higher dissolved oxygen to the stream and act as spawning substrate for some species of fish, such as walleye. Pools provide shelter for fish and can be refuge pools in the summer if water levels drop and water temperature in the creek increases. Pools also provide important over wintering areas for fish. Runs are usually moderately shallow, with unagitated surfaces of water and areas where the thalweg (deepest part of the channel) is in the center of the channel.

Figure 24 shows that Sicklers Creek is somewhat variable; 79 percent consists of runs, 11 percent pools and 9 percent riffles.

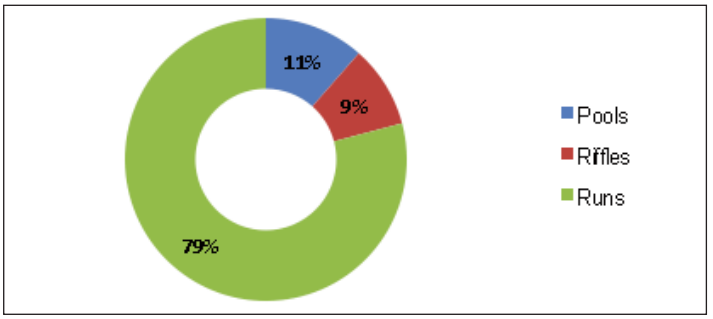


Figure 24 Instream morphology along Sicklers Creek

Vegetation Type

Instream vegetation provides a variety of functions and is a critical component of the aquatic ecosystem. For example emergent plants along the shoreline can provide shoreline protection from wave action and important rearing habitat for species of waterfowl. Submerged plants provide habitat for fish to find shelter from predator fish while they feed. Floating plants such as water lilies shade the water and can keep temperatures cool while reducing algae growth. Sicklers Creek had moderate levels of diversity of instream vegetation. The dominant vegetation type recorded at forty-nine percent consisted of narrow leafed emergents. Figure 25 depicts the plant community structure for Sicklers Creek.

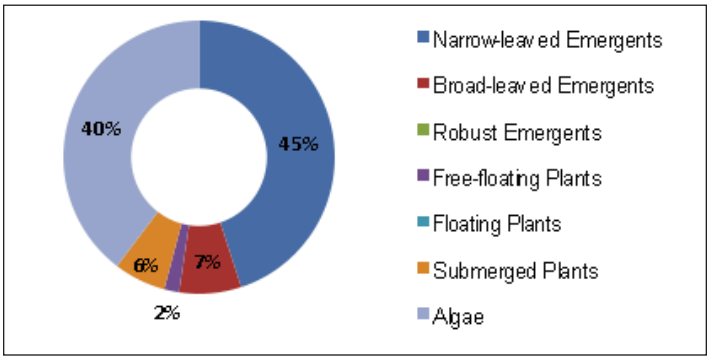


Figure 25 Vegetation type along Sicklers Creek

Instream Vegetation Abundance

Instream vegetation is an important factor for a healthy stream ecosystem. Vegetation helps to remove contaminants from the water, contributes oxygen to the stream and provides habitat for fish and wildlife. Too much vegetation can also be detrimental. Figure 26 demonstrates that Sicklers Creek had lower levels of instream vegetation for most of its length.

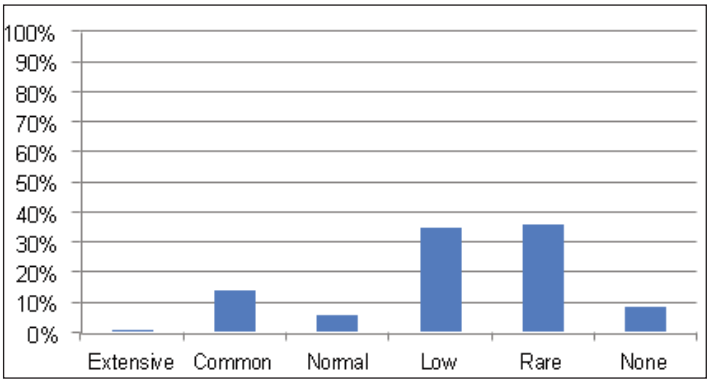


Figure 26 Instream vegetation abundance along Sicklers Creek

Invasive Species

Invasive species can have major implications on streams and species diversity. Invasive species are one of the largest threats to ecosystems throughout Ontario and can out compete native species, having negative effects on local wildlife, fish and plant populations. Sixty three percent of the sections surveyed along Sicklers Creek had invasive species (Figure 27). The invasive species observed in Sicklers Creek were common buckthorn and purple loosestrife.

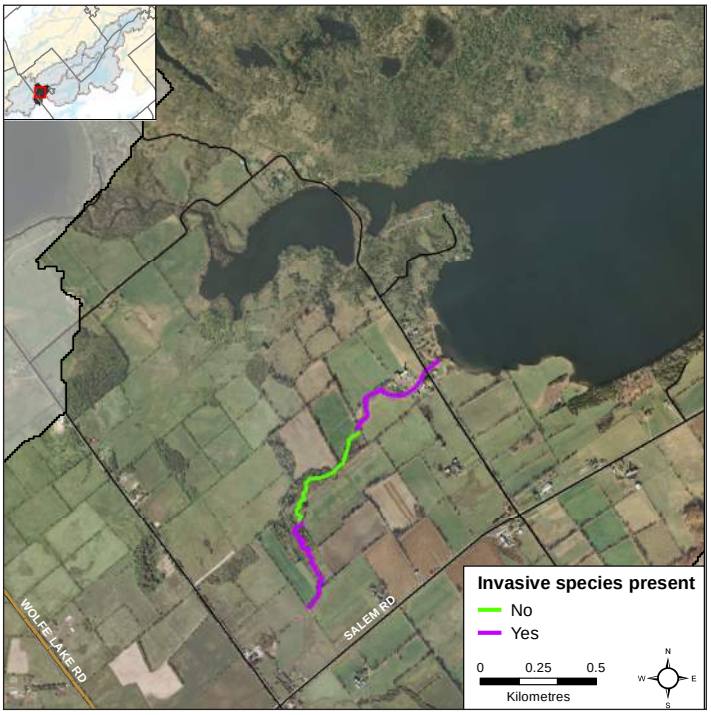


Figure 27 Invasive species along Sicklers Creek

Thermal Regime

Many factors can influence fluctuations in stream temperature, including springs, tributaries, precipitation runoff, discharge pipes and stream shading from riparian vegetation. Water temperature is used along with the maximum air temperature (using the Stoneman and Jones method) to classify a watercourse as either warm water, cool water or cold water. Figure 28 shows the location of temperature loggers at two sampling locations along Sicklers Creek. Analysis of the data collected indicates that Sicklers Creek is classified as a cool/warm water system (Figure 29).

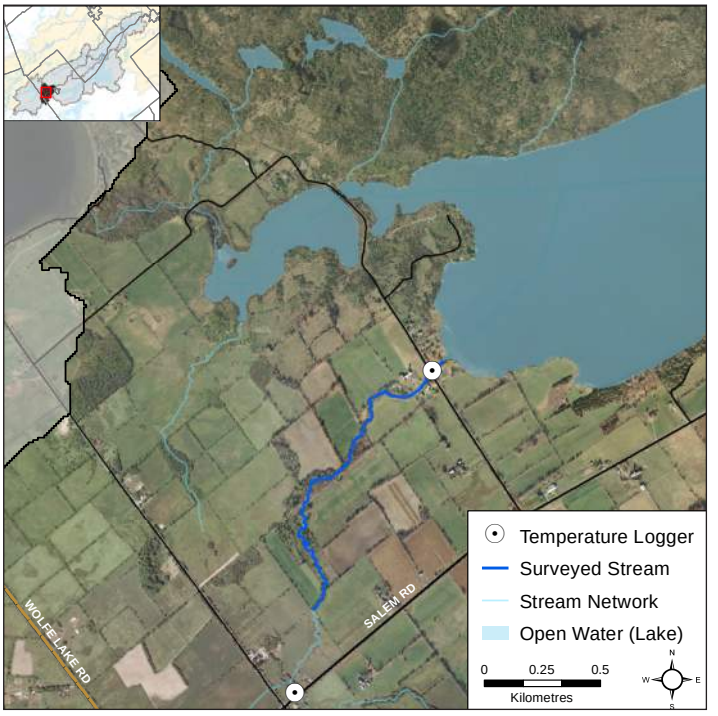


Figure 28 Temperature loggers in Sicklers Creek

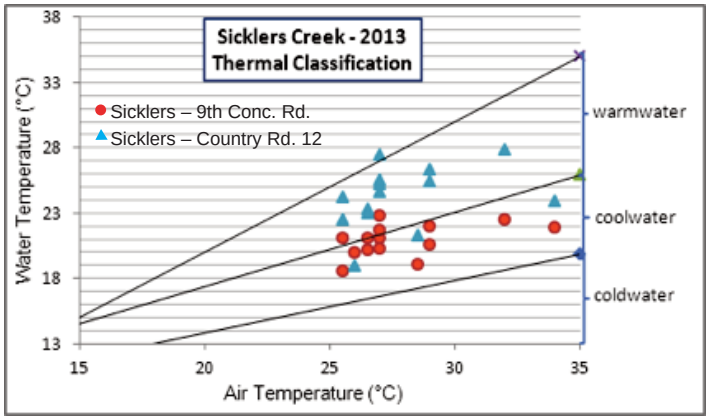


Figure 29 Temperature logger data for two sites on Sicklers Creek

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 nine sites in the Westport Sand Lake catchment area. Figure 30 shows the headwater drainage features sampling locations in the catchment.

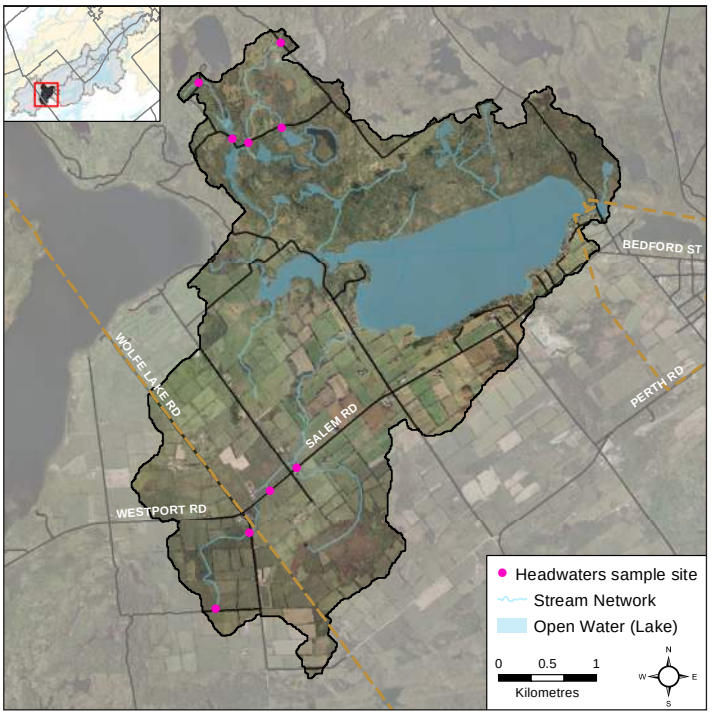


Figure 30 Headwater drainage feature sampling locations around Westport Sand Lake

Two headwater sampling sites sampled in the Westport Sand Lake catchment in 2013

Fisheries

The Westport Sand Lake catchment is classified as a mixed community of warm, cool and cold water recreational and baitfish fishery with 22 species observed. The following is a list of species observed in the watershed (Source: MNR/RVCA). Fish sampling sites are shown in Figure 31.

banded killifish
black crappie
bluegill
brook stickleback
brown bullhead
central mudminnow
common shiner
creek chub
darter spp.
fathead minnow
finescale dace
largemouth bass
northern pike
northern redbelly dace
pearl dace
pumpkinseed
rock bass
shorthead redhorse
smallmouth bass
walleye
white sucker
yellow perch

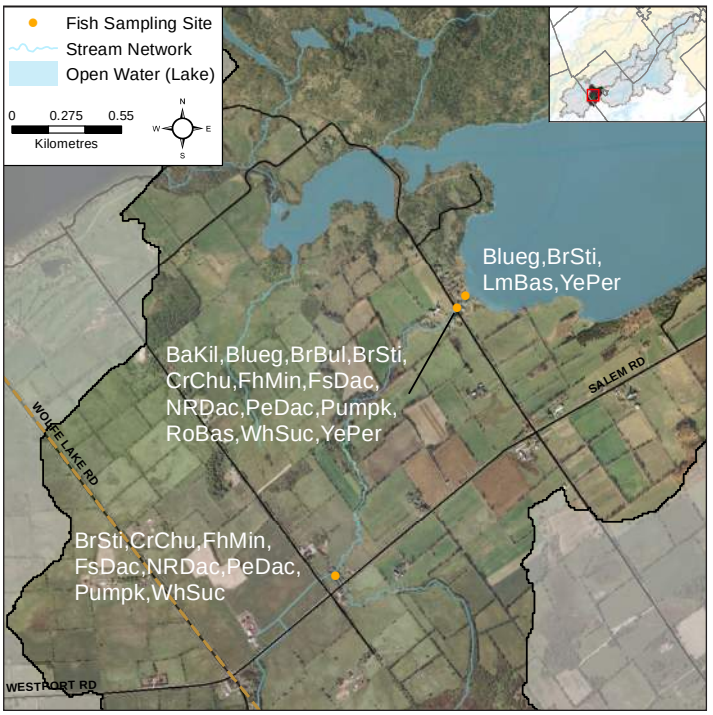
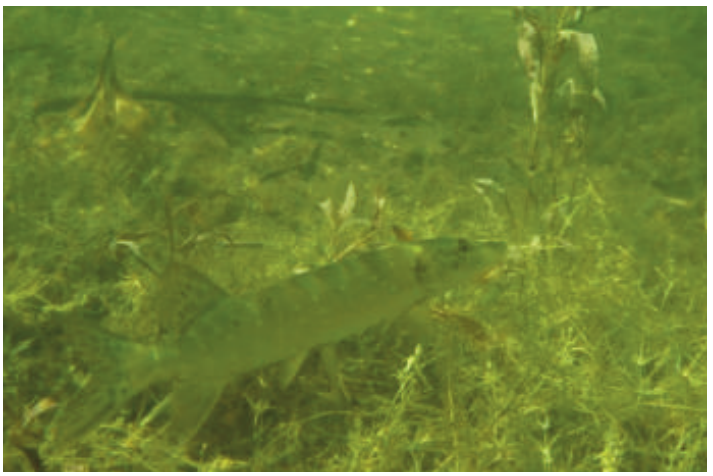


Figure 31 Fish sampling on Westport Sand Lake



Northern pike *(Esox lucius)* in its lake habitat

Riparian Restoration

Figure 32 depicts the locations where various riparian restoration activities can be implemented as a result of observations made during the stream assessment survey.

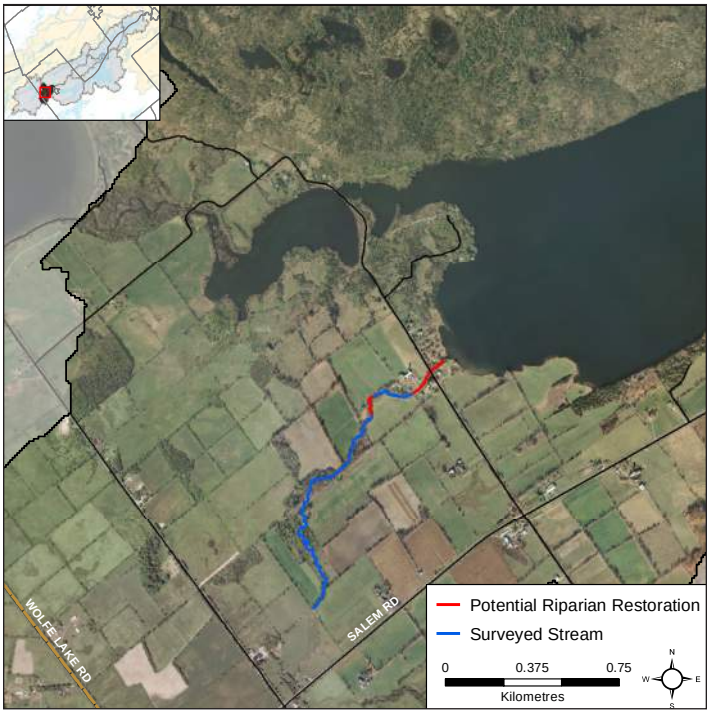


Figure 32 Riparian restoration along Sicklers Creek

Migratory Obstructions

It is important to know the locations of migratory obstructions because they can prevent fish from accessing important spawning and rearing habitat (Figure 33). Migratory obstructions can be natural or manmade, and they can be permanent or seasonal. There were a number of seasonal man-made and natural barriers within the Sicklers Creek catchment at the time of the survey.

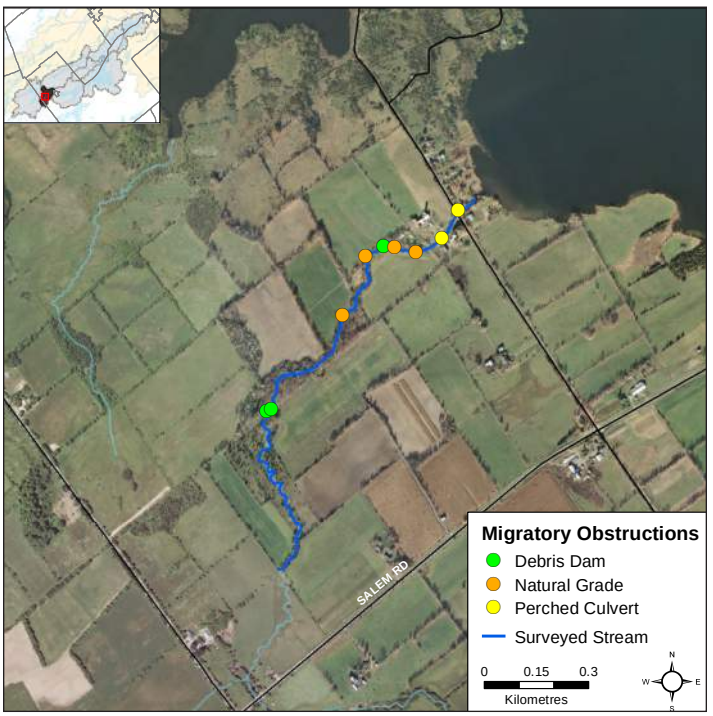


Figure 33 Migratory obstructions along Sicklers Creek

Water Chemistry

During the stream characterization survey, a YSI probe is used to collect water chemistry, as follows:

- Dissolved Oxygen is a measure of the amount of oxygen dissolved in water. The lowest acceptable concentration of dissolved oxygen is 6.0 mg/L for early stages of warm water fish and 9.5 mg/L for cold water fish (CCME, 1999). A saturation value (concentration of oxygen in water) of 90 percent or above is considered healthy. Saturation levels above one hundred percent are not uncommon in sections of stream where there are high amounts of algae and other aquatic plants
- Conductivity is the ability of a substance to transfer electricity. This measure is influenced by the presence of dissolved salts and other ions in the stream
- pH is a measure of relative acidity or alkalinity, ranging from 1 (most acidic) to 14 (most alkaline/basic), with 7 occupying a neutral point. 2011 data for these four parameters is summarized in Table 7

Table 7 Water chemistry in Sicklers Creek

Month	Range	DO (mg/L)	DO(%)	Conductivity (µs/cm)	pH
May 2013	Low	11.4	124.9	491	8.0
	High	14.0	153.4	498	8.6
June 2013	Low	7.5	74.2	463	7.5
	High	14.2	140.8	600	8.6

Students measuring water chemistry parameters on Sicklers Creek

3. Land Cover

Crop and pastureland is the dominant land cover type in the catchment along with woodland, as shown in Table 8 and displayed in the map on the front cover of the report.

Table 8 Catchment land cover type

Cover Type	Area (ha)	Area (% of Cover)
Crop & Pasture	689	41
Woodland*	500	29
Water	264	16
Wetland**	115	7
Settlement	69	4
Transportation	56	3

* Does not include treed swamps ** Includes treed swamps

Woodland Cover

The Westport Sand Lake catchment contains 500 hectares of upland forest and 21 hectares of lowland forest (treed swamps) (Figure 34) that occupies 30 percent of the drainage area (versus the 44 percent of woodland cover in the Rideau Lakes Subwatershed). This figure is the same as 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.

Twenty-six (45 percent) of the 58 woodland patches in the catchment are very small, being less than one hectare in size. Another 29 (50 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 three (five percent of) woodland patches range between 32 and 277 hectares. Two of these patches contain woodland between 20 and 50 hectares and may support a few area-sensitive species and some edge intolerant species, but will be dominated by edge tolerant species. Conversely, one (two percent) of the 58 woodland patches in the drainage area tops 200 hectares, which according to the Environment Canada Guideline, will support 80 percent of edge-intolerant forest bird species (including most forest dependent, area sensitive species) that prefer interior forest habitat conditions.

Forest Interior

The same 58 woodlands contain 19 forest interior patches (Figure 34) that occupy three percent (63 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 (18) have less than 10 hectares of interior forest, 13 of which have small areas of interior forest habitat less than on hectare in size. One other patch contains between 30 and 50 hectares of interior forest (at 45 hectares).

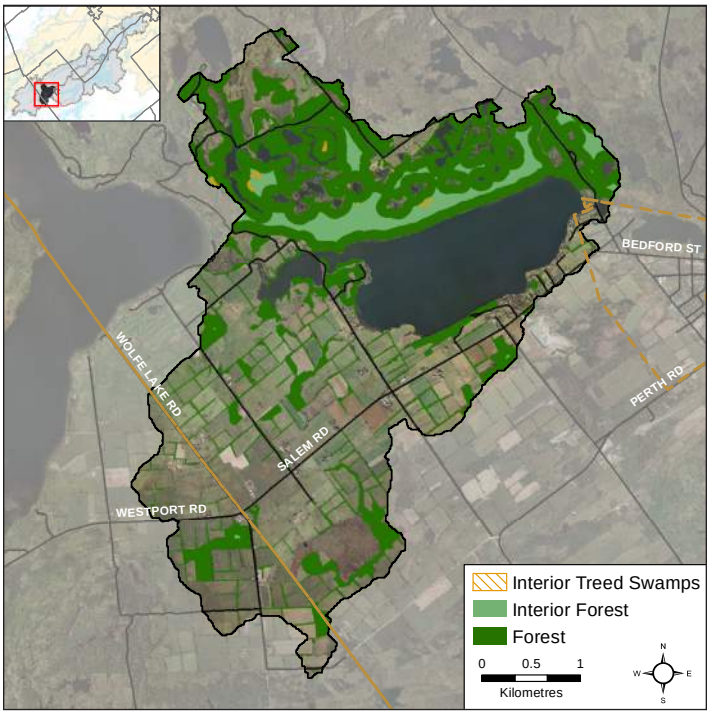
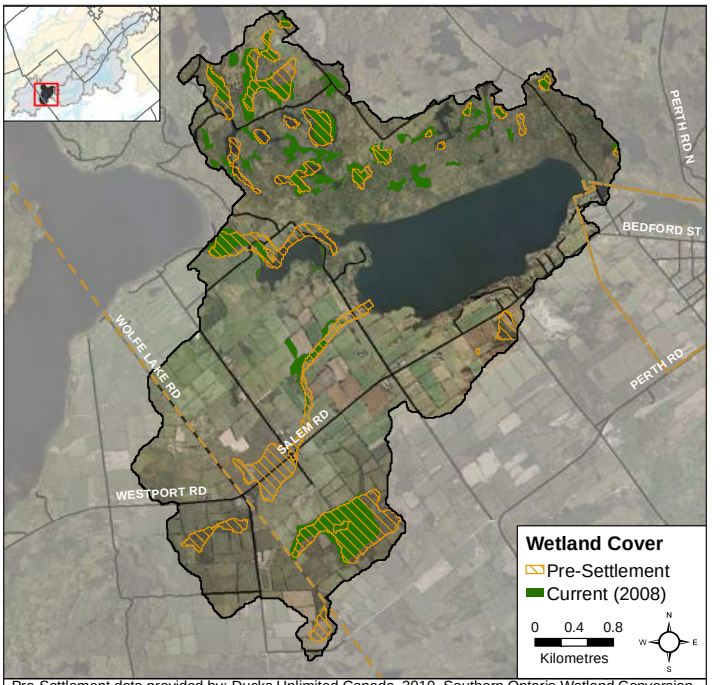


Figure 34 Catchment woodland cover and forest interior

Wetland Cover

Figure 35 shows pre-settlement wetland cover (Ducks Unlimited Canada 2010) versus current wetland cover (DRAPE 2008) 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, (March 2010)

Figure 35 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 36 shows the location of all Rural Clean Water Projects in the Westport Sand Lake drainage area. From 2008 to 2013, landowners completed four projects: one nutrient management plan, one erosion control project, one septic system repair and one milkhouse washwater disposal system. RVCA contributed $12,500 in grant dollars towards the total project cost of $40,499.

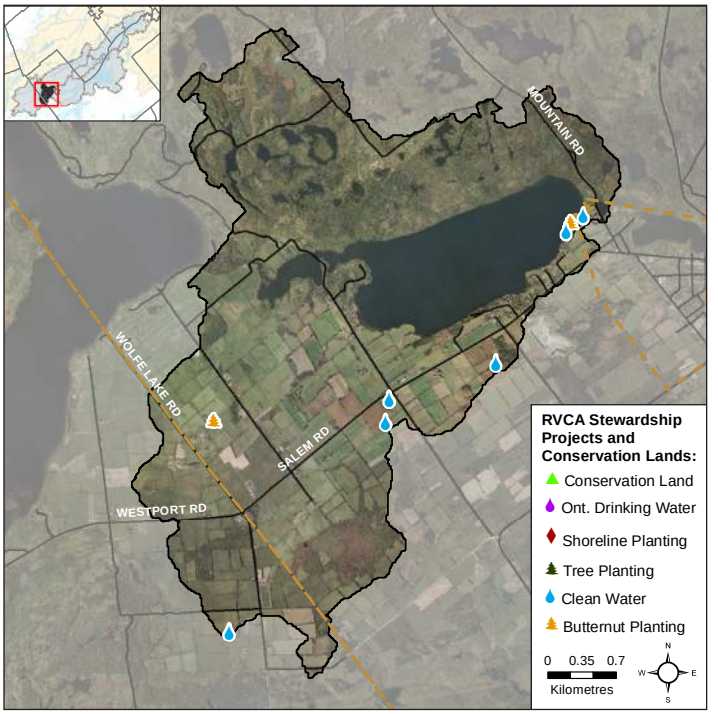


Figure 36 RVCA stewardship program project locations

Prior to 2008, the RVCA completed three projects in the area consisting of two fuel storage/handling facilities and one surface and washwater disposal/treatment system. In total, RVCA contributed $5,915 in grant dollars to projects valued at $8,343.

Septic System Re-Inspections

In 2011, the Mississippi Rideau Septic System Office performed eight septic system re-inspections (five cottages and three houses) on Westport Sand Lake in Rideau Lakes Township. Remedial/maintenance work (i.e. pump outs, baffle replacement, work that generally does not require a permit) was recommended for six (or 75 percent) of those properties that were inspected.

Valley, Stream, Wetland and Hazard Land Regulation

Less than one square kilometre or less than one percent of the catchment drainage area is within the regulation limit of Ontario Regulation 174/06 (Fig.49), leaving most wetland areas and river or stream valleys that are affected by flooding and erosion hazards without any protection. 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.

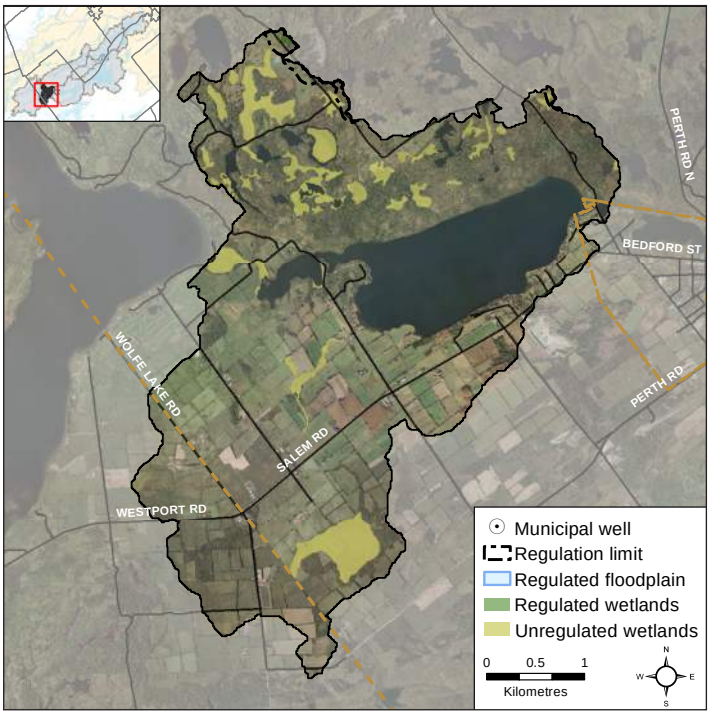


Figure 37 RVCA regulation limits

Vulnerable Drinking Water Areas

The Westport Sand 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 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 coldwater ecosystem such as a brook trout 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 Westport Sand Lake has a "Poor" surface water quality rating (for the 2008-2013 period) and is generally characterized by moderate to elevated nutrient concentrations and periods of low oxygen availability
- No surface water quality data is available for Sicklers Creek to determine if it is contributing to the nutrient loadings reported in Westport Sand Lake; nor is there any biological water quality data available to assess overall aquatic habitat conditions
- RVCA's 2013 Algae and Aquatic Plant Survey for Eastern Ontario Lakes and Rivers notes that a majority of the respondents in the Rideau Lakes subwatershed have noticed an increase in algae blooms and aquatic plants on their lake.
- Six (of eight) Rideau Lakes Township septic system voluntary re-inspections conducted in 2011 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

- Along the south shore of Westport Sand Lake (off the Canadian Shield), the majority of the 30 metre wide riparian, shoreline buffer contains (74 percent) non-natural land cover (comprised of village/waterfront settlement areas, roads and crop and pastureland) and 26 percent natural land cover (made up of woodland), which is below the recommended 75 percent naturally vegetated riparian, shoreline buffer target.
- By comparison, the shoreline cover on the north shore of Westport Sand Lake (on the Canadian Shield) is comprised of 78 percent natural land cover (made up of woodland and wetland) and 22 percent non-natural land cover (comprised of waterfront settlement areas and crop and pastureland)
- No clear picture of the physical condition of the shoreline of Westport Sand Lake is available. Consideration should be given to conducting a shoreline survey of Westport Sand Lake using the MAPLE Shoreline Classification Survey (as has been done on Adam Lake and Upper Rideau Lake) to help assess shoreline health
- Emerald ash borer poses a significant threat to the ecology of the subwatershed, given the prominence of ash trees along shorelines and in riparian and wetland 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 1960's/early 1970's 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 Westport Sand Lake catchment. However, there is limited knowledge of the overall issues and concerns about natural resource management, use and the health of the Westport Sand Lake and its watershed
- The Westport Sand 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 Westport Sand Lake to help tackle lake health concerns in partnership

6. Opportunities

Water Quality

- Reduce pollutant loadings to Westport Sand Lake 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
- Review monitoring of surface water quality in Westport Sand Lake (including the need to establish a surface water quality site on Sicklers Creek), 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)*
- Add Sicklers Creek to the RVCA Ontario Benthos Biomonitoring Network (OBBN) to sample bottom dwelling bugs (benthic invertebrates) to attain a more thorough understanding of its water quality and overall aquatic habitat conditions (using a biological method) to complement RVCA's baseline surface water quality (chemistry sampling) monitoring program

Development

- Collectively work with approval authorities (Township of Rideau Lakes, Village of Westport, Conservation Authority, Parks Canada, 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*[3] 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)

Shorelines

- RVCA and its partners (including the municipalities of Rideau Lakes and Westport and the Upper 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 Westport Sand Lake and its tributaries during the development approvals process through adherence to and enforcement of municipal land-use policies and zoning standards
- Target riparian and instream restoration at sites identified in this report (as shown in Figure 13 as "Other" riparian cover and Figure 32) and explore other restoration and enhancement opportunities along the Sicklers Creek riparian corridor
- Consider a comprehensive assessment of shoreline conditions around Westport Sand 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 Westport Sand Lake

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

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

[3] 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

Consider the need for a community-driven lake management plan for Westport Sand 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