

The RVCA produces individual reports for 16 catchments in the Lower Rideau 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 the Rideau River 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 Lower Rideau catchments and Lower Rideau Subwatershed Report, please visit the RVCA website at www.rvca.ca.

Inside

1. Surface Water Quality Conditions	2
Rideau River	2
2. Riparian Conditions	7
Overbank Zone	7
Fish Community	7
3. Land Cover	8
4. Stewardship & Protection	9
5. Issues	10
6. Opportunities for Action	10

Catchment Facts

- A predominantly rural/agricultural reach with urbanized areas in Manotick, Osgoode Village and Rideau Forest
- Much of the shoreline between Manotick and Kars has been developed (i.e., hardened or otherwise altered by urban development)
- Rideau Canal (Parks Canada) operates Long Island and Manotick Dams to maintain water levels for navigation from mid-May to mid-October
- This reach is under shoreline development pressure and is intensively used for boating. Parks Canada - Rideau Canal Office is working on education and awareness around the boat speed/wake problem, in cooperation with police
- Drains 67 sq. km of land or 8.7% of the Lower Rideau Subwatershed and 1.6% of the Rideau Valley Watershed
- Dominant land cover is crop and pastureland (44%), followed by woodland (22%), settlement (19%), transportation (5%), wetland (5%), water (3%), and grassland (2%)
- Riparian buffer (30 m. wide along both sides of the Rideau River and its tributaries) is comprised of crop and pastureland (45%), settlement (24%), woodland (16%), wetland (9%), transportation (5%) and grassland (1%)
- Contains a warm/cool water recreational and baitfish fishery with 40 fish species
- Contains 22 municipal drains
- Water quality rating along the Rideau River is fair at Barnsdale Road and fair at the Long Island Dam, with no change in the water quality rating observed over a 12 year reporting period (2000-2005 vs. 2006-2011)
- Woodland cover has decreased by 2.2 percent (147 ha.) from 2002 to 2008
- Between 2002/2003 and 2009/2010, 12.1 percent of the natural/regenerative vegetation cover along the Rideau River shoreline was converted to ornamental/degraded shoreline; over the same period, 7.1 percent of the ornamental/degraded shoreline converted to natural/regenerative vegetation cover
- One hundred and ninety-one stewardship (landowner tree planting/ clean water/shoreline naturalization) projects have been completed
- Flood plain mapping has been available since 1976 for the entire reach and was last updated in 1989. Flood forecasting and warning services aim to give residents and municipalities 48 hours notice prior to onset of flooding ("flood stage" based on elevation of access roads), enabling mobilization of emergency response measures and evasive action to minimize damages and losses
- Major studies completed include: Manotick Master Drainage Plan. 1996 (Robinson Consultants for Rideau Township); A Multidisciplinary, Community-Based Study of the Environmental Health of the Rideau River: Final Report. 2001(Canadian Museum of Nature); Lower Rideau Watershed Strategy, Final Report. 2005 ((Robinson Consultants for RVCA); Village of Manotick Environmental Management Plan. 2005(MMM/WESA for City of Ottawa)
- Rideau River designated a UNESCO World Heritage Site

1) Surface Water Quality

Assessment of streams in the Lower Rideau is based on 24 parameters including nutrients (total phosphorus, total Kjeldahl nitrogen, nitrates), E. coli, metals (like aluminum and copper) and additional chemical/physical parameters (such as alkalinity, chlorides pH and total suspended solids). Each parameter is evaluated against established guidelines to determine water quality conditions. Those parameters that frequently exceed guidelines are presented below.

The assessment of water quality throughout the Lower Rideau Subwatershed also looks at water quality targets that are presented in the 2005 Lower Rideau Watershed Strategy (LRWS), to see if they are being met. The LRWS identifies improving water quality as a priority concern; specifically reducing the levels of nutrients, bacteria and contaminants in the Lower Rideau.

1) a. Rideau River-Long Island

Surface water quality conditions in Rideau River-Long Island are monitored through the City of Ottawa's Baseline Water Quality Program (Site RRS-119C upstream side of Barnsdale Road bridge and 119-B North end of Long Island Locks dam, at Cecil Rowat Lane, see Fig. 1 for their location).

The water quality rating for Rideau River-Long Island is "Fair" as determined by the CCME Water Quality Index (CCME WQI); analysis of the data has been broken into two periods 2000-2005 and 2006-2011, to examine if conditions have changed in this timeframe. Table 1 outlines the WQI scores and their corresponding ratings

For more information on the CCME WQI please see the Lower Rideau Subwatershed Report.

Table 1. 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

Rideau River-Long Island 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 Objectives (PWQO) of 0.030mg/l is used as the TP Guideline. Concentrations greater than 0.030 mg/l indicate an excessive amount of TP. Rideau River-Long Island TP results are shown in Figures 2a and 2b. In addition to the TP guideline, the Lower Rideau Watershed Strategy set a target for TP concentration of 0.030 mg/l at the 85th percentile for the main channel of the Rideau River. Percentile plots of TP data are shown for two time periods 2000-2005 (Fig. 3a) and 2006-2011 (Fig. 3b). Any point to the left of the 85th percentile line (vertical) and above the guideline (horizontal line) have failed to reach the LRWS target.

Total Kjeldahl nitrogen (TKN) is used as a secondary indicator of nutrient loading; RVCA uses a guideline of 0.500 mg/l (TKN Guideline) to assess TKN concentrations. Rideau River-Long Island TKN results are shown in Figures 4a and 4b.

Tables 2 and 3 summarize average nutrient concentrations at the monitored site on the Rideau River-Kars and shows the proportion of samples that meet guidelines. Highlighted values indicates that that average exceeds the guideline.

Table 2. Summary of total phosphorous results for Rideau River-Long Island from 2000-2005 and 2006-2011

Total Phosphorus 2000-2005			
Site	Average (mg/l)	% Below Guideline	No. Samples
RRS-119C	0.033	53	73
RRS-119B	0.036	47	60
Total Phosphorus 2006-2011			
Site	Average (mg/l)	% Below Guideline	No. Samples
RRS-119C	0.032	59	71
RRS-119B	0.033	46	52

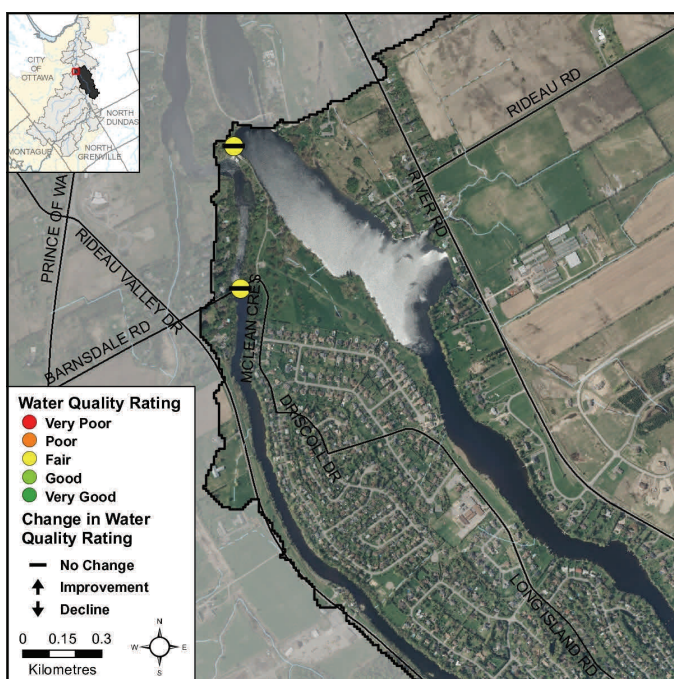


Figure 1. Sampling site on Rideau River-Kars

Table 3. Summary of total Kjeldahl nitrogen results for Rideau River-Long Island from 2000-2005 and 2006-2011

Total Kjeldahl Nitrogen 2000-2005			
Site	Average (mg/l)	% Below Guideline	No. Samples
RRS-119C	0.643	4	72
RRS-119B	0.650	3	60
Total Kjeldahl Nitrogen 2006-2011			
Site	Average (mg/l)	% Below Guideline	No. Samples
RRS-119C	0.584	17	71
RRS-119B	0.603	8	52

Rideau River-Long Island Nutrients: Site RRS-119C

The majority of samples at site RRS-119C were below the TP guideline of 0.030mg/l for both time periods (Fig. 2a, 2000-2005 and 2b, 2006-2011), fifty-three percent of samples were below the guideline in the 2000-2005 period and improved to fifty-nine percent of samples in the 2006-2011 period. There was also a slight decrease in average TP concentration from 0.033 mg/l (2000-2005) to 0.032 mg/l (2006-2011). The Lower Rideau Watershed Strategy set a target for TP concentration of 0.030 mg/l at the 85th percentile for the main channel of the Rideau River. Percentile plots of TP data are shown for two time periods 2000-2005 (Fig. 3a) and 2006-2011 (Fig. 3b). The target of a TP concentration of 0.030mg/l at the 85th percentile has not been achieved at this site, though the concentration at the 85th percentile did decline from 0.046 mg/l (2000-2005, Fig 3a) to 0.044 mg/l (2006-2011, Fig 3b).

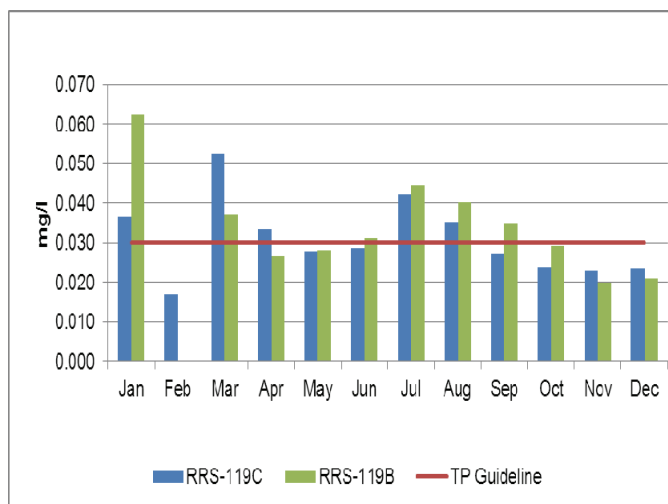


Figure 2b. Total phosphorous concentrations in Rideau River-Long Island from 2006-2011

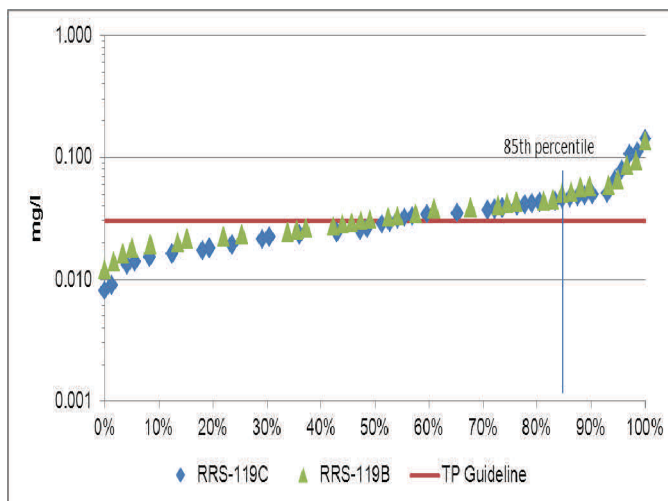


Figure 3a. Percentile plots of total phosphorous in the Rideau River-Long Island from 2000-2005

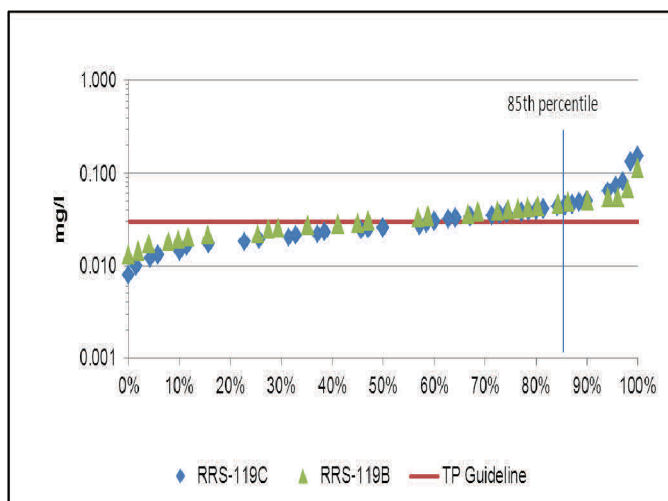


Figure 3b. Percentile plots of total phosphorous in the Rideau River-Long Island from 2006-2011

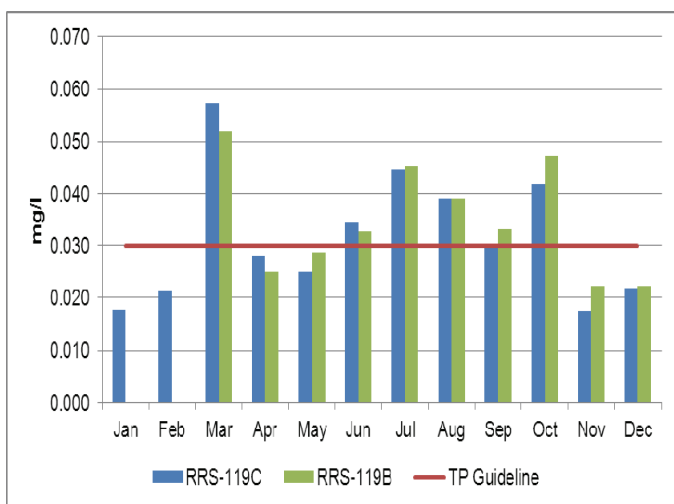


Figure 2a. Total phosphorous concentrations in Rideau River-Long Island from 2000-2005

TKN is used as a secondary indicator of nutrient enrichment. Figures 4a and 4b show that the majority of results exceeded the TKN guideline of 0.500 mg/l, only four percent of samples were below the guideline in 2000-2005; this improved to seventeen percent of samples in the 2006-2011 period. The average concentration decreased from 0.643 mg/l to 0.584 mg/l.

Rideau River-Long Island Nutrients Site: RRS-119B

The majority of samples at site RRS-119B were above the TP guideline of 0.030mg/l for both time periods (Fig. 2a, 2000-2005 and 2b, 2006-2011). Forty-seven percent of samples were below the guideline in the 2000-2005 period and remained fairly consistent at forty-six percent of samples in the 2006-2011 period. Average TP concentration decreased from 0.036 mg/l (2000-2005) to 0.032 mg/l (2006-2011). Percentile plots of TP data are shown for two time periods 2000-2005 (Fig. 3a) and

2006-2011 (Fig. 3b) and show that the target set by the LRWS has not been achieved. The concentration at the 85th percentile decreased from 0.051 mg/l (2000-2005, Fig. 3a) to 0.046mg/l (2006-2011, Fig. 3b).

TKN results show that the majority of results exceeded the TKN guideline of 0.500 mg/l (Fig. 4a and 4b); three percent of samples were below the guideline in the 2000-2005 period and improved to eight percent in the 2006-2011 period. The average concentration decreased from 0.650 mg/l to 0.603 mg/l.

Rideau River-Long Island Nutrients Summary

Overall the data suggests that nutrient loading is a significant problem at site RRS-119C; efforts should be made to reduce nutrient inputs to the river.

Overall the data suggests that nutrient loading continues to be a problem at site RRS-199B; efforts should be made to reduce nutrient inputs to the creek wherever possible.

Rideau River-Long Island E. coli

E. coli is used as an indicator of bacterial pollution from human or animal waste; in elevated concentrations it can pose a risk to human health. The PWQO Objectives of 100 colony forming units/100 millilitres is used. E. coli counts greater than this guideline indicate that bacterial contamination may be a problem within a waterbody. The LRWS set the target of achieving the guideline for all samples and having no results exceed 500 CFU/100ml.

Table 4 summarizes the geometric mean at monitored sites in Rideau River and shows the proportion of samples that meet the E. coli guideline of 100 CFU/100ml.

Table 4. Summary of E. coli results in Rideau River-Kars.

E. coli 2000-2005			
Site	Geometric Mean	% Below Guideline	No. Samples
RRS-119C	21	85	73
RRS-119B	11	93	60
E. coli 2006-2011			
Site	Geometric Mean	% Below Guideline	No. Samples
RRS-119C	21	89	71
RRS-119B	18	90	52

Figure 5 shows the results of the geometric mean with respect to the guideline for the two periods 2000-2005 (Fig. 5a) and 2006-2011 (Fig 5b). Figures 6a and 6b show percentile plots of the data for the two time periods of interest 2000-2005 (Fig. 6a) and 2006-2011 (Fig. 6b).

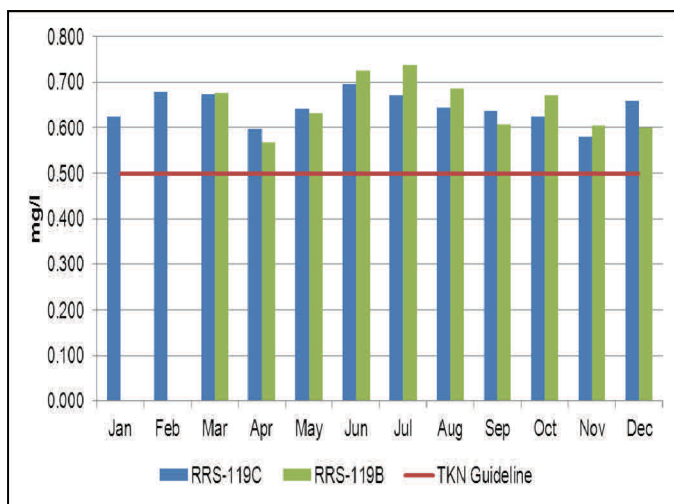


Figure 4a. Total Kjeldahl nitrogen concentrations in Rideau River-Long Island from 2000-2005

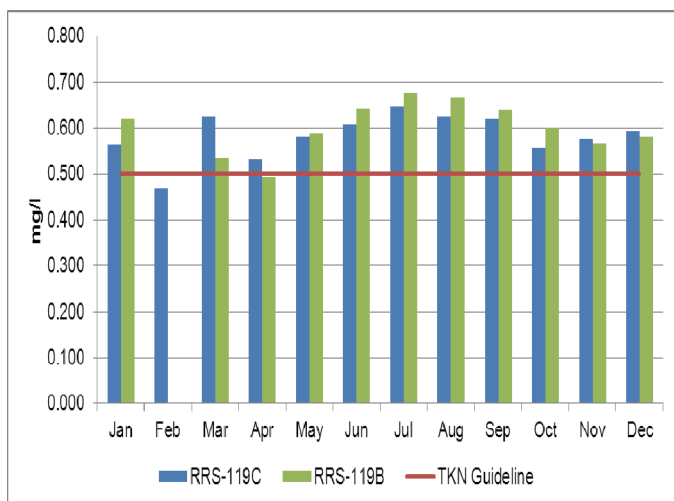


Figure 4b. Total Kjeldahl nitrogen concentrations in Rideau River-Long Island from 2006-2011

Any point to the left of the 80th percentile line (vertical) and above the guideline (horizontal line) have failed to reach the LRWS target.

Rideau River-Long Island E. coli: Site RRS-119C

E. coli counts above the guideline of 100 colony forming units per 100 mL (CFU/100mL) were infrequent at the following water quality monitoring sites on the Rideau River. In comparing the two time periods at site RRS-119C the proportion of samples below the guideline improved from eighty-five percent (Fig. 5a) to eighty-nine (Fig. 5b), indicating higher counts occur less often. The count at the geometric mean remained constant at 21 CFU/100ml. Percentile plots of E.coli data at site RRS-119 C are show the distribution of results for both time periods. Figures 6a and 6b show the E. coli that most results are below the guideline and only one sample in the 2006-20011 period exceeded the maximum target of 500 CFU/100ml (Fig. 6b) set by the LRWS.

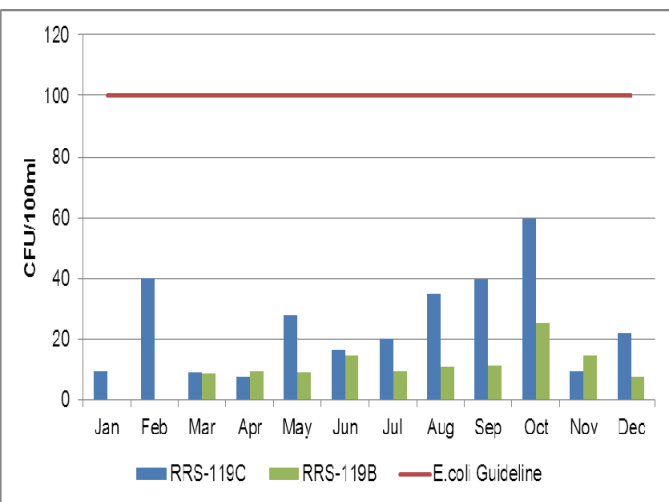


Figure 5a. E. coli counts in the Rideau River-Long Island from 2000-2005

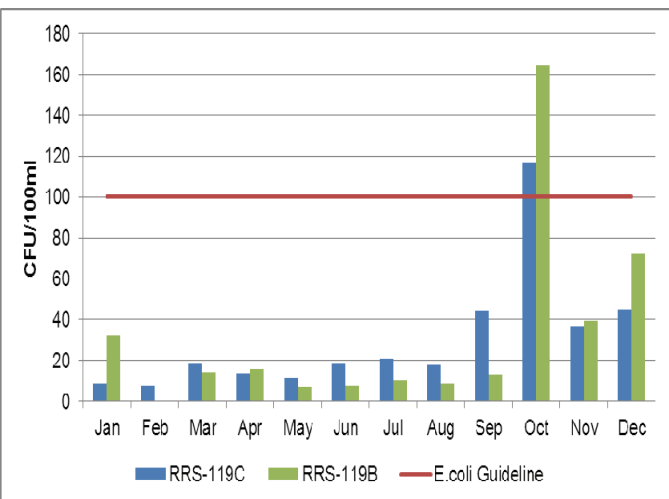


Figure 5b. E. coli counts in the Rideau River-Long Island from 2006-2011

Rideau River-Long Island E. coli: Site RRS-119B

Site RRS-119B is located downstream of RRS-119C. The majority of samples were below the guideline at RRS-119B and only decreased slightly from ninety-three percent (Fig. 5a) to ninety percent (Fig. 5b). The count at the geometric mean was also very low and increased from 11 CFU/100 ml to 18 CFU/100 ml. In comparing the distribution of sample results in the percentile plots (Fig. 6a and 6b) it can be observed that only one sample exceed the maximum target of 500 CFU/100 ml in the 2006-2011 period.

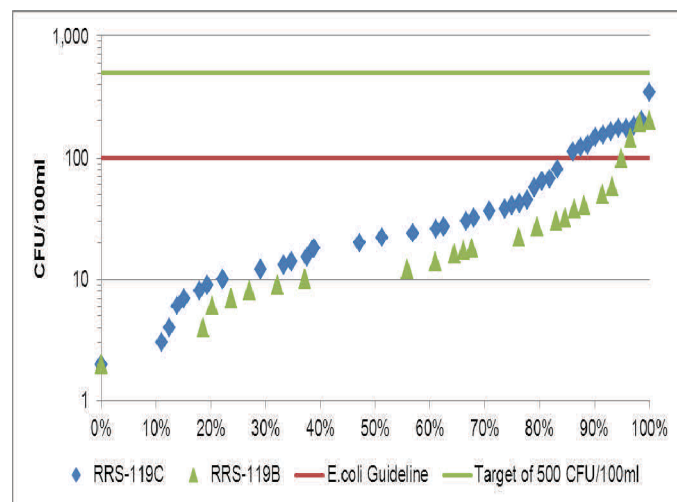


Figure 6a. Percentile plots of E. coli in the Rideau River-Kars from 2000-2005

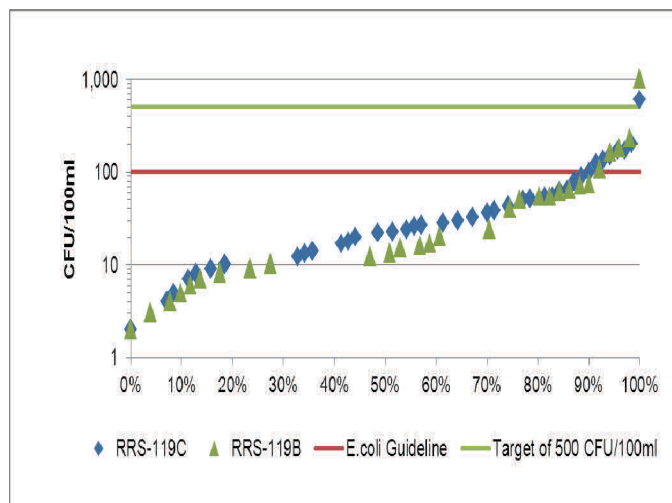


Figure 6b. Percentile plots of E. coli in the Rideau River-Long Island from 2006-2011

Rideau River-Long Island E. Coli Summary

These statistics indicated that bacterial counts have remained low at site RRS-119C; however efforts should be made to reduce any possible sources of contamination to the river to protect overall water quality and aquatic life in the future.

Overall these statistics indicate that bacterial counts have increased at site RRS-119B though the majority of results are below the target of 100 CFU/100ml. Efforts should be continued to reduce any additional sources of contamination to the creek to protect overall water quality and aquatic life.

Rideau River-Long Island Metals

The majority of metals monitored at sites in the Rideau River were below guidelines however results for aluminum (Al) were occasionally elevated in the reach between sites RRS-119C to RRS-119B.

Table 5 summarizes average Aluminum concentrations at monitored sites on Rideau River-Long Island and shows the proportion of samples that meet guidelines. Highlighted values indicate average values that have exceeded the guidelines

Figure 7 shows the results for each site with respect to guidelines for the two periods 2000-2005 (Fig. 7a) and 2006-2011 (Fig. 7b). The guidelines for Aluminum as stated by the PWQO are Al 0.075 mg/l

Table 5. Summary of metal concentrations in the Rideau River-Long Island

Aluminum 2000-2005			
Site	Average (mg/l)	% Below Guideline	No. Samples
RRS-119C	0.092	77	70
RRS-119B	0.081	71	58
Aluminum 2006-2011			
Site	Average (mg/l)	% Below Guideline	No. Samples
RRS-119C	0.119	72	71
RRS-119B	0.086	62	52

Rideau River-Long Island Metals: Site RRS-119C

Results for Al at site RRS-119C were typically below the guideline of 0.075 mg/l in both time periods (Fig. 7a, 2000-2005 and 7b, 2006-2011), seventy-seven percent of samples were less than the guideline in the 2000-2005 period this remained fairly consistent at seventy-two percent in the 2006-2011 period. There was an increase in the average Al concentration from 0.092 mg/l (2000-2005) to 0.119 mg/l (2006-2011).

Rideau River-Long Island Metals: Site RRS-119B

Results for Al were generally below the guideline at RRS-119B and comparable to site RRS-119C, sixteen percent of samples were below the guideline in the 2000-2005 period (Fig. 7a) and declined to sixty-two percent in the 2006-2011 period (Fig. 7b). There was a slight increase in the average Al concentration from 0.081 mg/l (2000-2005) to 0.086 mg/l (2006-2011).

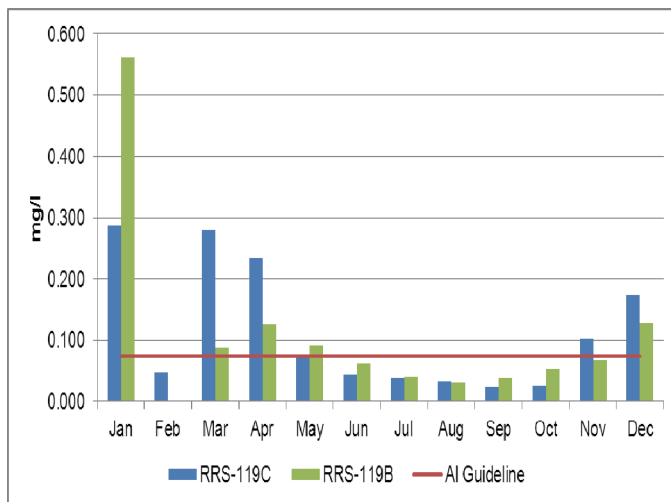


Figure 7a. Aluminum concentrations in Rideau River-Kars from 2000-2005

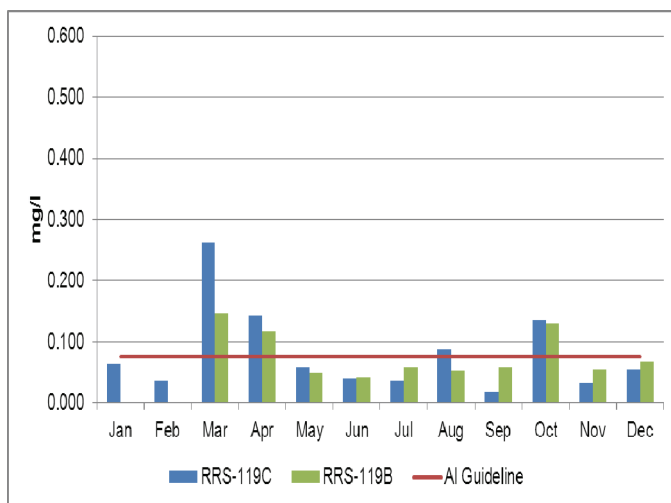


Figure 7b. Aluminum concentrations in Rideau River-Kars from 2006-2011

Rideau River-Long Island Metals Summary

Overall this data indicates that metal inputs at this have remained fairly consistent over the monitoring period; efforts should be made to reduce pollution sources wherever possible and improve overall water quality.

2) a. Overbank Zone

Riparian Buffer along the Long Island Reach of the Rideau River and Tributaries

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 8 shows the extent of the naturally vegetated riparian zone in the catchment, 30 metres on either side of all waterbodies and watercourses. Results from the RVCA's Land Cover Classification Program show that 26 percent of streams and creeks are buffered with woodland, wetland and grassland; the remaining 74 percent of the riparian buffer is occupied by settlement, crop and pastureland and transportation.

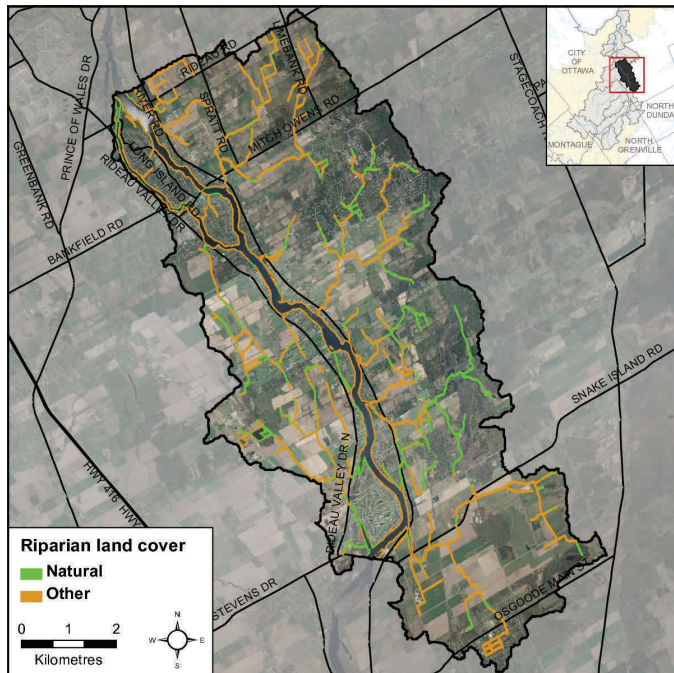


Figure 8. Catchment land cover in the riparian zone

Fish Sampling

Fish sampling sites located along Long Island reach are shown in Figure 9. The provincial fish codes shown on the following map are listed (in Table 6) beside the common name of those fish species identified in the Long Island reach of the Rideau River.

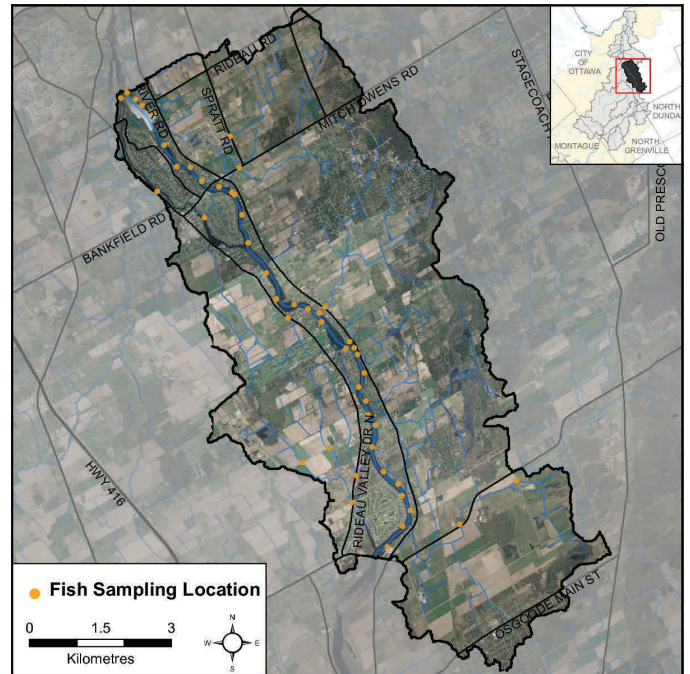


Figure 9. Fish sampling locations along Long Island reach

Table 6. Fish species observed in the Long Island reach

Wall walleye	NoPik northern pike	Muske muskel-lunge	Hy502 tiger muskel-lunge	ceMud central mud minnow	CoCar common carp
ESMin eastern silvery minnow	CoShi common shiner	GoShi golden shiner	EmShi emerald shiner	BcShi blackchin shiner	BnShi blacknose shiner
SpShi spottail shiner	MiShi mimic shiner	BnMin bluntnose minnow	Fallf fallfish	WhSuc white sucker	SiRed silver redhorse sucker
ShRed shorthead redhorse sucker	GrRed greater redhorse sucker	Redsp redhorse sucker species	BrBul brown bullhead	YeBul yellow bullhead	ChCat channel catfish
TaMad tadpole madtom	BaKil banded killifish	BrSil brook silverside	BrSti brook stickleback	MoScu mottled sculpin	RoBas rock bass
Pump pump-inseed	Blue bluegill	SmBas smallmouth bass	LmBas largemouth bass	BlCra black crappie	JoDar johnny darter
YePer yellow perch	LoPer log perch	TeDar tessellated darter			

3) Land Cover

Crop and pastureland is the dominant land cover type in the catchment as shown in Table 7 and displayed in the land cover map on the front cover of the report.

Table 7. Catchment land cover type

Cover Type	Area (ha)	Area (% of Cover)
Crop & Pasture	2915	44
Woodland	1446	22
Settlement	1291	19
Transportation	345	5
Wetland	339	5
Water	217	3
Grassland	114	2

Woodland Cover

The Rideau River-Long Island catchment contains 1446 hectares of woodland (Fig.10) that occupies 22 percent of the drainage area. 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.

Eighty-eight (39%) of the 226 woodland patches in the catchment are very small, being less than one hectare in size. Another 123 (54%) 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 15 (7 percent of) woodland patches range between 21 and 264 hectares. Twelve 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, three (1%) of the 226 woodland patches in the drainage area exceed the 100 plus hectare size needed to support most forest dependent, area sensitive birds and are large enough to support approximately 60 percent of edge-intolerant species. One of these patches 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 226 woodlands contain 40 forest interior patches (Fig.10) that occupy two percent (111 ha.) of the catchment land area. 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.

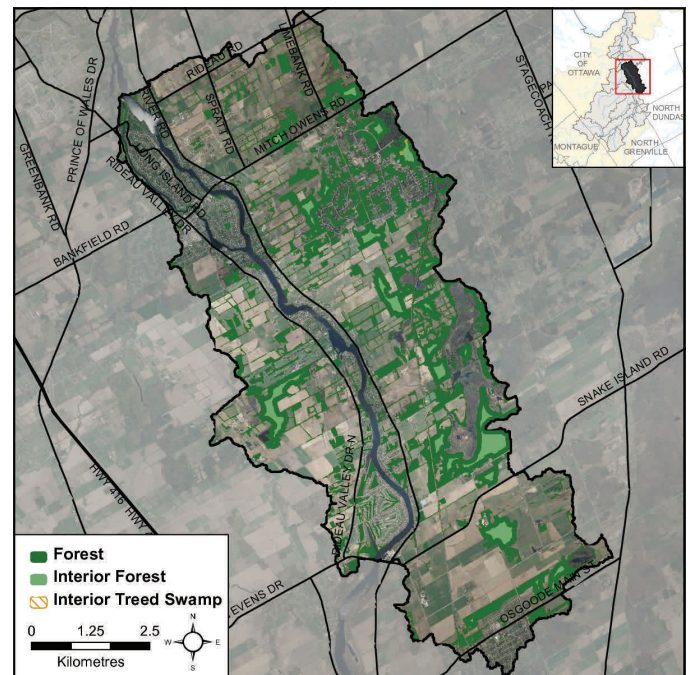


Figure 10. Catchment woodland cover and forest interior

Most patches (37) have less than 10 hectares of interior forest, 23 of which have small areas of interior forest habitat less than one hectare in size. Conversely, three patches have greater than 10 hectares of interior forest, containing 14, 17 and 22 hectares of interior forest habitat respectively.

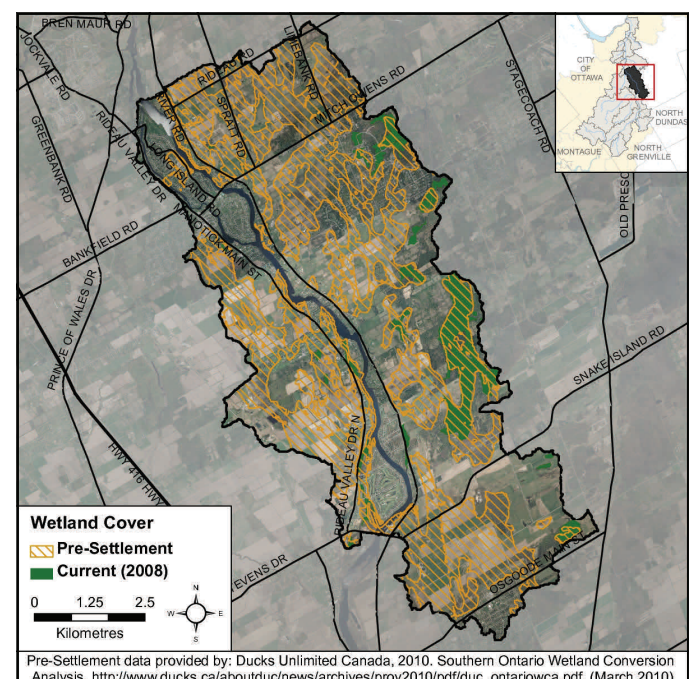


Figure 11. Pre-settlement and present day wetland cover

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)

4) Stewardship and Protection

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

Rural Clean Water Projects

Figure 12 shows the location of all Rural Clean Water Projects in the Long Island drainage area. From 2006 to 2011, landowners completed 99 projects including 29 septic system repair/replacements, 44 well upgrades, 9 well decommissionings, 4 well replacements, 1 wastewater disposal, 1 chemical/fuel storage and handling, 9 erosion control, 1 buffer/windbreaks and 1 manure storage. In total, RVCA contributed \$151,647 in grant dollars to projects valued at \$949,455.

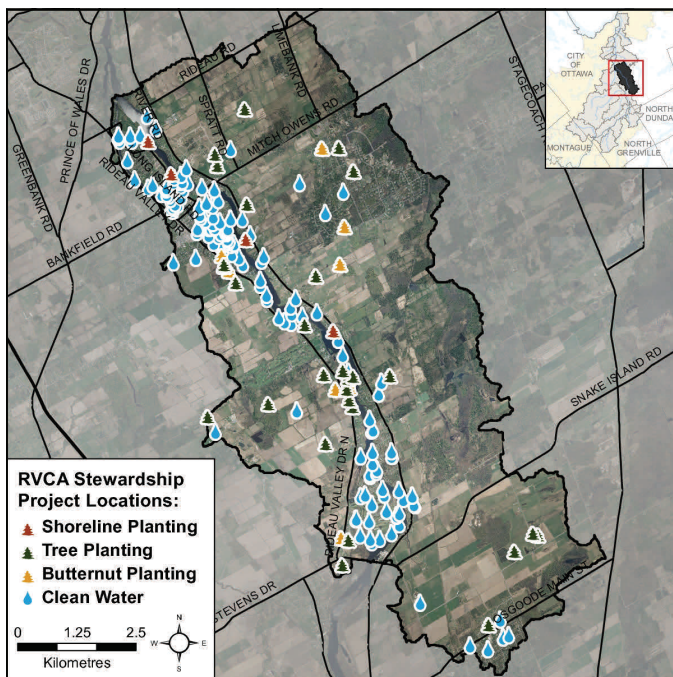


Figure 12. RVCA stewardship program project locations

Prior to 2006, the RVCA completed 60 projects in the area consisting of 35 septic repairs/replacements, 12 well upgrades, 4 well decommissionings, 3 well replacements, 5 erosion control and 1 fencing. In total, RVCA contributed \$99,889 grant dollars to projects valued at \$370,612.

Tree Planting Projects

The location of all tree planting and shoreline projects is also shown in Figure 82. From 2006 to 2011, 25,990 trees, valued at \$49,497, were planted on 8 sites through the RVCA Tree Planting Program. Before that, from 1984 to 2006, landowners helped plant 40,130 trees, valued at \$63,110, on 20 project sites, using the RVCA Tree Planting Program, on 20 hectares of private land; fundraising dollars account for \$32,754 of that amount.

Shoreline Naturalization Projects

In 2007, 30 shrubs and trees were planted on Nicolls Island through the City Stream Watch Program. Through the Shoreline Naturalization Program, 4 shoreline planting projects saw 390 tree and shrub seedlings planted along 169 m of the Rideau River in partnership with private landowners, with a total project value of \$3,864.

Valley, Stream, Wetland and Hazard Land Regulation

Eight square kilometres or 12 percent of the catchment drainage area is within the regulation limit of Ontario Regulation 174/06 (Fig.13), giving protection to wetland areas and river or stream valleys that are affected by flooding and erosion hazards.

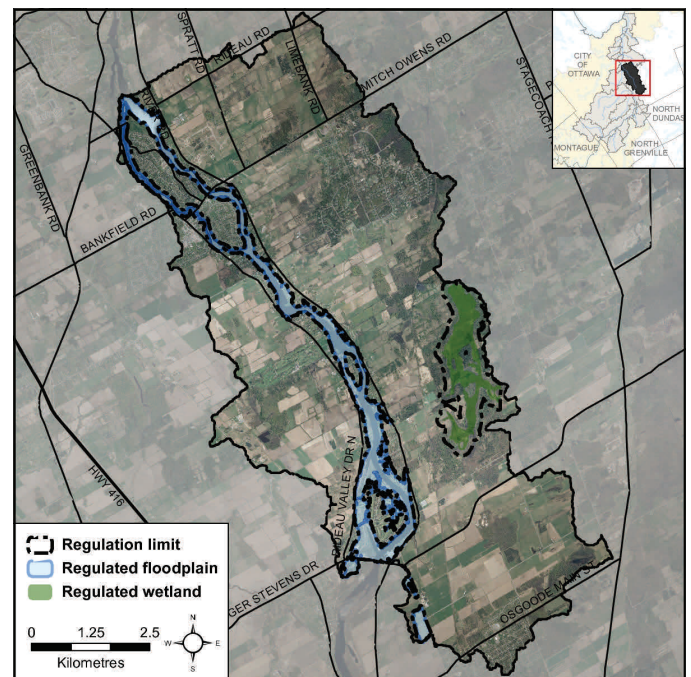


Figure 13. RVCA regulation limits

Natural features within the regulation limit include 1.4 sq. km. of wetland (representing 42 percent of all wetlands in the catchment) and 32.3 kilometres of watercourse (representing 25 percent of all watercourses in the catchment). Many of these regulated watercourses (4.6 km or four percent of streams) flow through regulated wetlands.

Regulation limit mapping has been plotted along 27.7 km (or 21 percent) of the streams that are outside of wetlands. Plotting of the regulation limit on the remaining 97.2 km (or 75 percent) of streams requires identification of flood and erosion hazards and valley systems. Within the regulation limit, “development” and “site alteration” require RVCA permission, as do any proposed works to alter a watercourse, which are subject to the “alteration to waterways” provision of Ontario Regulation 174/06.

5) *Issues*

- Loss and channelization of headwater tributaries due to urban and rural drainage practices
- Removal of natural riparian vegetation along the shoreline of the Rideau River and its tributaries
- Altered hydrology causing erosion and impacts to aquatic habitat
- Reduced biodiversity
- Loss of wetland and forest habitat
- Increasing presence of invasive species
- Nutrient and occasional metal exceedances observed in water samples taken
- This reach receives significant boat traffic and is under shoreline development pressure
- Shoreline is susceptible to erosion due to boat wake and wave action, if not protected by shoreline stabilization methods (riparian plantings, bioengineering or healthy stands of emergent wetland vegetation in the littoral zone)
- Boat speed and wake rules are in place but are only as effective as the level of effort applied to enforcement
- Many (but not all) riverfront property owners have installed erosion protection (e.g., riprap/retaining wall) works that have detrimental effects on shoreline vegetation and aquatic habitat
- Above Manotick, the river valley becomes less-well defined and relatively large expanses of land between Manotick and Highway 416 are flood prone at 1:100 year flood level. Along the Long Reach from Manotick to Burritts Rapids, 639 buildings are located within the 1:100 year flood plain (source: RVCA flood forecasting and warning manual) on riverside properties or communities that were created prior to flood plain zoning and regulation. Regulatory policies allow for continuing use of existing structures, but new lot creation or building additions are restricted

6) *Opportunities for Action*

- Engage landowners in invasive species removal, tree and riparian planting. The RVCA and its partners continue to promote shoreline naturalization efforts along this reach. Shoreline landowners are eligible for assistance under the Clean Water and Shoreline Naturalization Programs, if they use shoreline naturalization and/or bio-engineering methods to remedy erosions problems
- Continue with efforts made by the Parks Canada - Rideau Canal Office and its partners to work on education and awareness around the boat wake and speed problems