

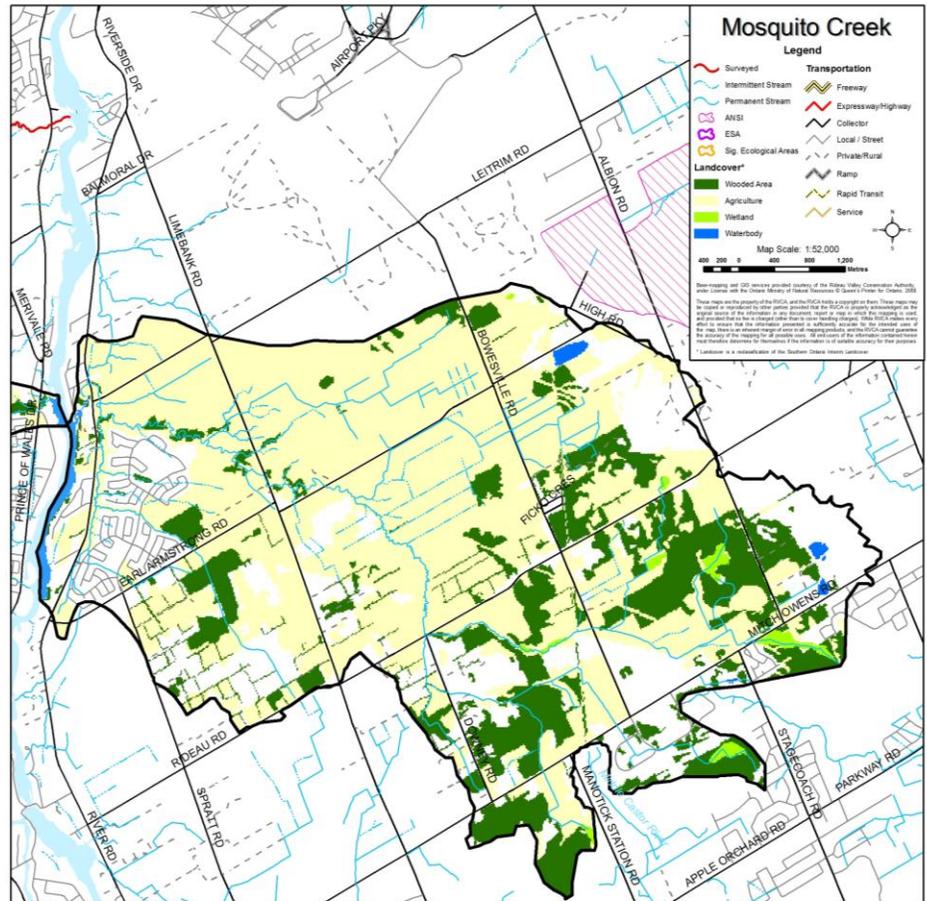


Mosquito Creek 2009 Summary Report

The Rideau Valley Conservation Authority, in partnership with six other agencies in Ottawa (City of Ottawa, Heron Park Community Association, Ottawa Flyfishers Society, Ottawa South Community Association, Rideau River Roundtable and National Defense HQ – Fish and Game Club) initiated the City Stream Watch program in 2003.

Watershed Features

| | |
|--------------------------------------|---|
| Area | 38 square kilometres, 10% of the Rideau River watershed |
| Land Use | 8.5% urban, 1.1% hedgerow, 4% licensed pits and quarries, 45.3% mixed agriculture, 7.7% monoculture, 0.7% plantation, 12.5% rural land use, 1.8% transportation, 0.3% unclassified, 0.8% waterbody, 0.8% wetland, 16.6% wooded area |
| Surficial Geology | 44% clay, 14% diamicton, 9% gravel, 4% organic deposits, 3% bedrock, 26% sand |
| Watercourse Length & Type | <i>Total length:</i> 8 km <i>Watercourse type:</i> 98% natural, 2% channelized <i>Flow type:</i> 76% permanent, 24% permanent |
| Dams & Barriers | There are a total of 3 seasonal fish migratory obstructions along Mosquito Creek ranging from bedrock ledges to accumulations of woody material and sediment. |
| Spills | There were no spills reported by CSW staff in 2009, but illegal sediment dumping was reported. |
| Species at Risk | There were no species at risk observed during stream surveys in 2009. |



| Vegetation Cover Types | | |
|------------------------|-----------|-------------|
| Types | Hectares | % of Cover |
| Wetlands | 3 | 4 |
| Wooded areas | 62 | 90 |
| Hedgerow | 4 | 6 |
| TOTAL COVER | 69 | 100% |

| Wetland Cover |
|---|
| • 0.8% of the watershed is in wetland cover |
| • Wetlands make up 3% of the vegetation cover |

| Woodlot Size | | |
|---------------|--------------------|---------------|
| Size Category | Number of Woodlots | % of Woodlots |
| <1 ha | 89 | 59 |
| 1-9 ha | 48 | 32 |
| 10-30 ha | 10 | 7 |
| >30 ha | 4 | 3 |



Figure 1. Green heron observed along Mosquito Creek

The headwaters of Mosquito Creek begin at Rideau Road, at the confluence of the Spratt and Nolan municipal drains. Dancy and Downey municipal drains flow into Spratt and Nolan upstream of that confluence. Mosquito Creek then winds its way through agricultural fields north of Earl Armstrong Road, where land use changes from agricultural to residential. Halfway between Spratt Road and Leitrim Road, Mosquito Creek becomes deeper and requires a canoe or kayak to survey. Mosquito Creek winds around River Road, and becomes quite wide where it flows into the Rideau River. There are eight significant woodlots in the Mosquito Creek subwatershed, each with different habitat features, such as amphibian breeding pools or channels, area sensitive breeding bird species (species that require a minimum area of cover to maintain a viable population), regionally rare plant species and locally rare plant species. A variety of reptiles and amphibians can also be found (Stantec, 2009). Mosquito Creek provides significant spawning and rearing habitat for both baitfish and gamefish, which in turn, enhances the productivity of the Rideau River. Between the mouth of Mosquito Creek and the crossing at Leitrim Road, grassy banks provide important habitat for pike and muskellunge spawning during the spring freshet. Much of the land surrounding Mosquito Creek in the headwaters has been bought by developers and is currently being rented out for agricultural purposes. Presently, the City limit boundary does not allow for urban expansion into these areas, but there is strong pressure to expand the urban boundary and develop that land into subdivisions. Mosquito Creek was surveyed in its entirety, for a total of eight and a half kilometers. The following is a summary of the 85 macro-stream assessment forms completed by staff and volunteers.

Anthropogenic Alterations to Mosquito Creek

Of the 85 sections sampled on Mosquito Creek, 47 percent had no anthropogenic alterations, 40 percent were considered natural, 12 percent were considered altered and only one section was considered highly altered, and this was a section of which half was in a culvert. Areas that were listed as "altered" were associated with road crossings, culverts, stormwater inputs, channelized sections or areas that had little or no buffer or little aquatic or wildlife habitat.

Anthropogenic Alterations to Mosquito Creek

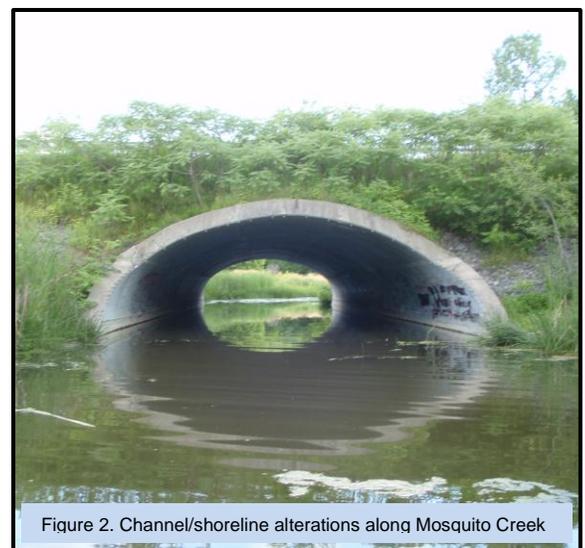
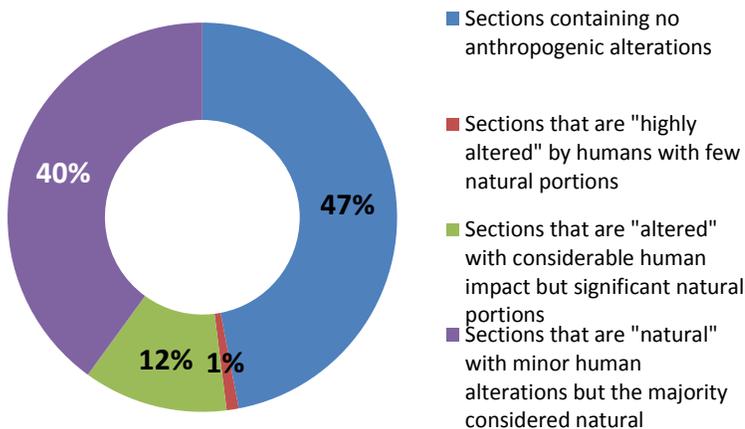


Figure 2. Channel/shoreline alterations along Mosquito Creek

Land Use Adjacent to Mosquito Creek

Sixty-three percent of the land use adjacent to Mosquito Creek was considered natural, characterized by 22 percent meadow, 25 percent forest, 12 percent scrubland and four percent wetland. The other land use was made up of 23 percent agricultural, eight percent residential, one percent abandoned agriculture, one percent recreational and four percent infrastructure.

Land Use Adjacent to Mosquito Creek

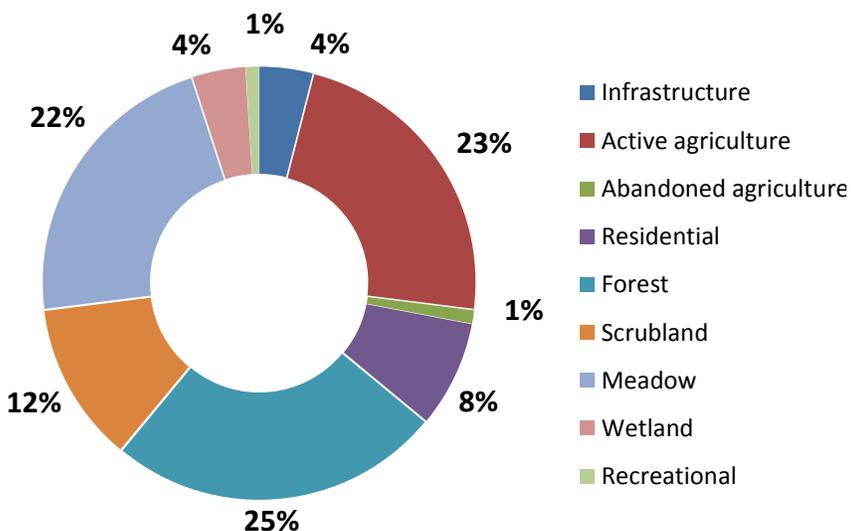


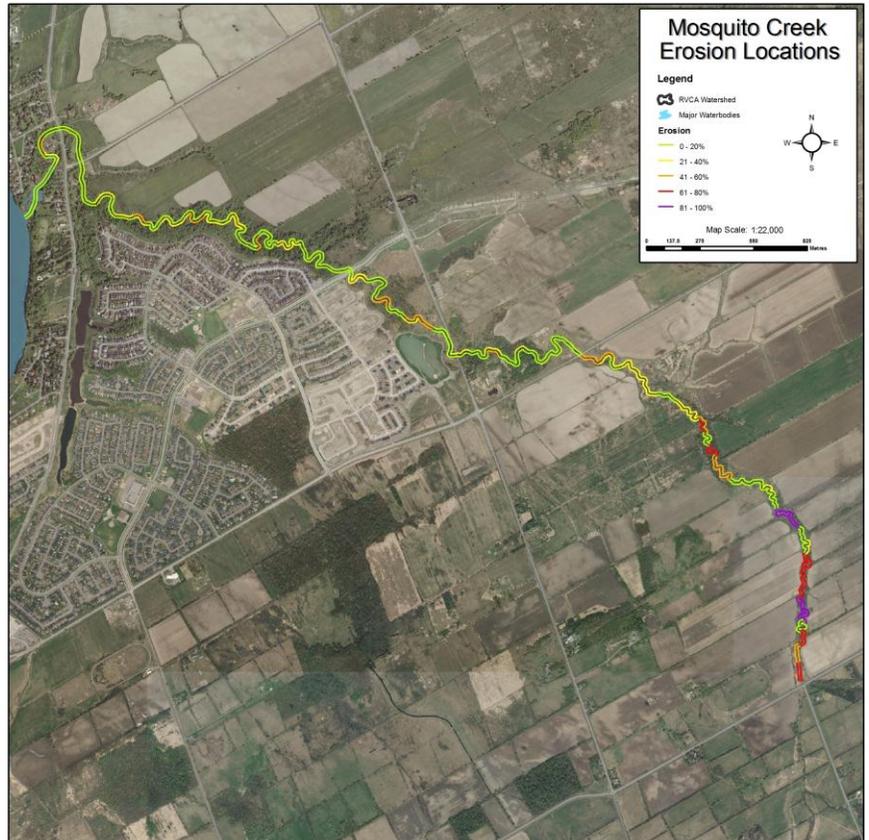
Figure 3. Meadow/forest landuse adjacent to Mosquito Creek

Erosion on Mosquito Creek

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 detrimental effects to important fish and wildlife habitat. Along Mosquito Creek, the left bank was found to be stable for 72 percent of the sections sampled and 28 percent unstable, compared to the right bank which was considered 71 percent stable. Many of the unstable areas coincided with areas that had smaller buffers or steep banks.



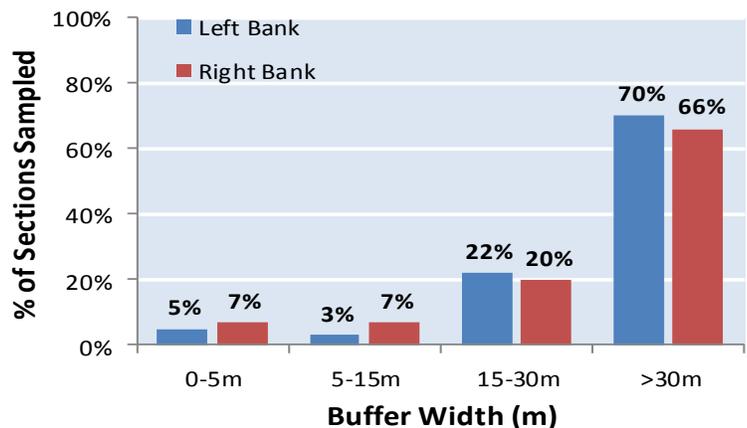
Figure 4. Eroded shoreline along Mosquito Creek



Buffer Evaluation of Mosquito Creek

Buffer Evaluation of Mosquito Creek

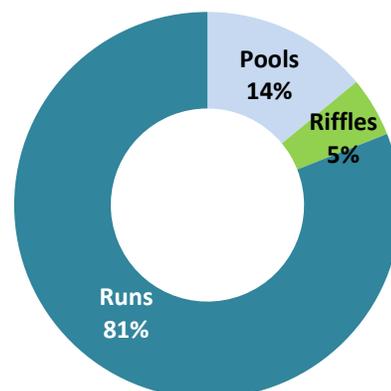
Natural buffers are extremely important for filtering excess nutrients running into the creek, infiltrating rainwater, maintaining bank stability, maintaining baseflow levels, keeping water temperatures cool and providing wildlife habitat. According to the document *How Much Habitat Is Enough*, a stream is recommended to have riparian areas of 30 metres minimum or more, depending on the site conditions. Along Mosquito Creek, over 60 percent on both the left and right banks met these recommendations.



Instream Morphology Features

Pools and riffles are important features for fish habitat. Riffles contribute higher dissolved oxygen to the stream and act as spawning substrate for some species of fish and pools provide shelter for fish and can be refuge areas. 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. Mosquito Creek consists of large runs with 14 percent pools and only five percent riffles. More riffles could be introduced to the stream with cobble or woody material to enhance fish habitat.

Instream Morphology of Mosquito Creek



Types of Instream Substrate

Diverse substrate is important for fish and benthic macroinvertebrate habitat for spawning, resting, over wintering and feeding. Sixty-seven percent of the substrate observed in Mosquito Creek was clay, silt and sand. A variety of other substrates were observed in much smaller quantities.

Types of Instream Substrate Along Mosquito Creek

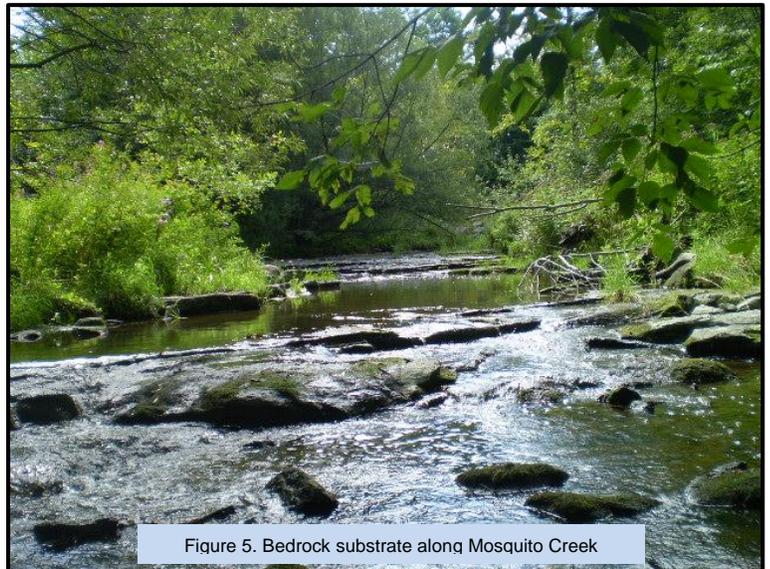
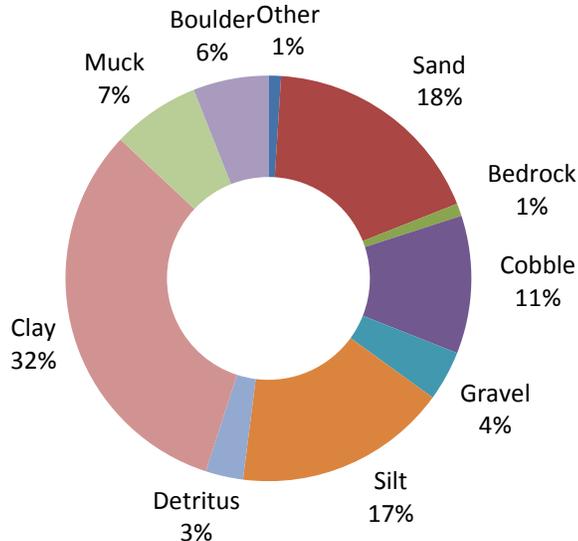


Figure 5. Bedrock substrate along Mosquito Creek

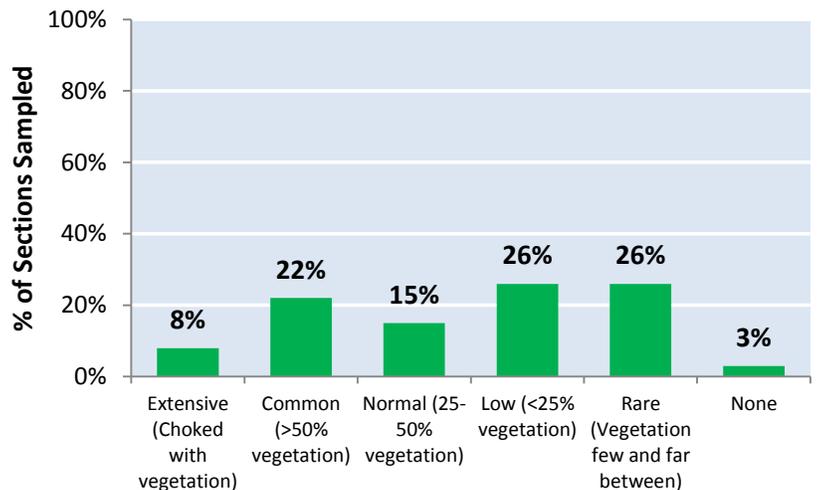
Instream Vegetation of Mosquito Creek

Instream vegetation is an important factor for a healthy stream ecosystem; it helps to remove contaminants, contributes oxygen and provides habitat for fish and wildlife, although extensive vegetation can have negative impacts. A healthy level of vegetation was observed in only 37 percent of Mosquito Creek; the majority of the stream had little to no vegetation, and some areas were considered extensive which was during an algae bloom in June.



Figure 6. Extensive algal growth along Mosquito Creek

Instream Vegetation of Mosquito Creek



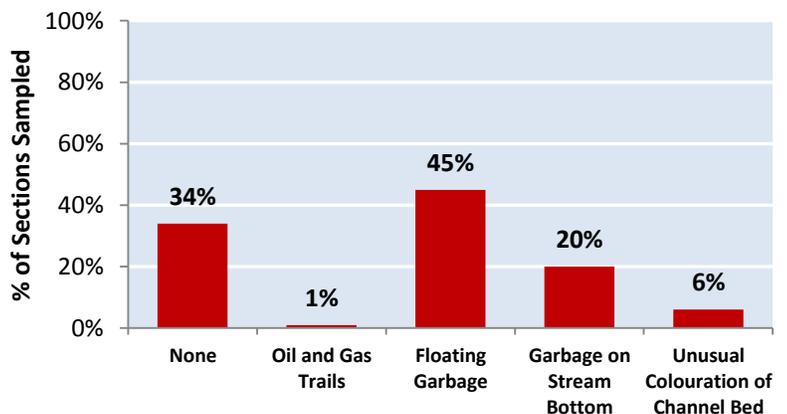
Pollution Observed in Mosquito Creek

Pollution and garbage along Mosquito Creek was assessed visually and noted for each section where it was observed. Garbage was not as much of an issue in Mosquito Creek compared to the other creeks surveyed in 2009. Most did not occur in large quantities. One percent of the sections had visible oil or gas trails in the water and six percent exhibited unusual colouration of the channel bed. It is important to note that the incidence of garbage has greatly increased between 2004 when Mosquito Creek was last surveyed by City Stream Watch and 2009.



Figure 7. Sediment dumping discovered on Mosquito Creek

Pollution Observed in Mosquito Creek



Wildlife Observed While Sampling Mosquito Creek

| Wildlife | Observed While Sampling |
|---------------------|--|
| Birds | red-winged blackbird, morning dove, sparrow, blackbird, robin, flicker, swallow, phoebe, chickadee, cedar waxwing, crow, kingfisher, goldfinch, killdeer, hawk, oriole, Canada warbler, song sparrow, kingbird |
| Mammals | deer, beaver, raccoon, chipmunk, dead mouse, skunk, muskrat, otter |
| Reptiles/Amphibians | green frog, bullfrog, american toad, tadpoles, frog eggs, turtle |
| Aquatic Insects | water striders, snails, fishing spider, whirligig beetle, crayfish, amphipods, water penny, molluscs, caddisflies, chironomids, leeches |
| Other | damselflies (bluet spp., darner spp.), jewelwing, widow skimmer, monarch, viceroy, tiger swallowtail |

Highlights of Progress

| Year | Accomplishment | Description |
|------|---|--|
| 2002 | Fish sampling, City of Ottawa | Fisheries assessment was carried out at the mouth by City of Ottawa as part of the Rideau River Fisheries Report. |
| 2003 | OBBN sampling, RVCA | OBBN site established just downstream of the Spratt Road crossing and has been sampled every spring and fall for benthic macroinvertebrates since 2003. |
| 2004 | 28 macro stream surveys were completed along Mosquito Creek | Volunteers began at the mouth of the creek and worked their way upstream, taking measurements and making observations on instream habitat, bank stability, land use, etc. |
| 2004 | Fish sampling, City Stream Watch | Mosquito Creek was sampled at one site with RVCA staff and volunteers. A total of 10 species were caught. |
| 2005 | 50 macro stream surveys were completed along Mosquito Creek | Volunteers carried on from where the 2004 surveys had stopped and worked their way upstream, taking measurements and making observations on instream habitat, bank stability, land use, etc. |
| 2006 | Fish sampling, Muncaster | Fish Habitat Assessment for Limebank Road widening was completed. |
| 2006 | Fish sampling, City of Ottawa | City of Ottawa completed their Baseline Study: Fish Community and Aquatic Habitat Assessment on Mosquito Creek |
| 2006 | Riparian planting | Two City Stream Watch volunteers planted 150 trees at the Spratt Road crossing to stabilize the bank in that area and enhance the buffer. |

Local Actions for Improvement of Mosquito Creek

| | Description |
|--|---|
| Stream Garbage Cleanups | Garbage is a major issue on Bilberry Creek and the West branch, especially between St. Joseph Boulevard and the mouth. Annual garbage cleanups should be held on Bilberry Creek to ensure that garbage does not negatively affect fish and wildlife habitat and stream aesthetics. |
| Riparian Planting/Buffer Enhancements | Riparian Plantings and buffer improvements could be implemented in several locations. There are many areas along Bilberry Creek that would benefit from small buffer enhancements. |
| Bioengineering | Over 50 percent of the shoreline along Bilberry Creek was considered unstable. Not all areas are suitable for bioengineering. However, there are two areas near the mouth where these techniques could be used. Another good site for a bioengineering project is just upstream of Jeanne D'Arc Boulevard. |
| Migratory Obstruction Removal | The seasonal and permanent migratory obstructions in Bilberry Creek that are blocking fish passage mainly consist of woody material and sediment. There is a migratory obstruction upstream of Des Epinettes of woody material that could be partially removed. Permits may be required for this removal. |
| Invasive Species Control | The most common invasive species observed along Bilberry Creek is purple loosestrife (<i>Lythrum salicaria</i>); however, in most sections it does not appear to be outcompeting the native vegetation and is serving as a source of nectar to pollinator species. The other invasive species observed are wild parsnip (<i>Pastinaca sativa</i>), European buckthorn (<i>Rhamnus cathartica</i>) and garlic mustard (<i>Alliaria petiolata</i>). No invasive species removal is planned for Bilberry Creek. If you see an invasive species, you can report it to the Ontario Federation of Anglers and Hunters invading species hotline: 1-800-563-7711 |

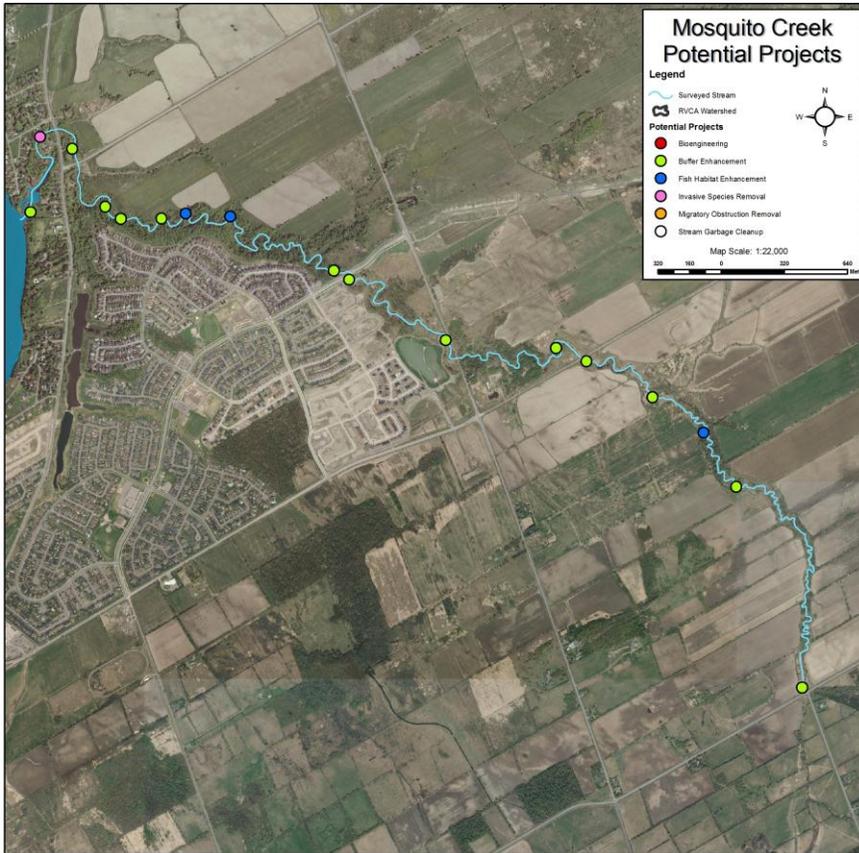


Figure 8. City Stream Watch volunteers hard at work

Summary of Water Quality Data for Mosquito Creek

During the surveys, a YSI probe was used to collect values on dissolved oxygen, conductivity and pH. The data from the 2009 season is summarized in the following chart.

Dissolved Oxygen: A measure of the amount of oxygen dissolved into a medium, such as water

Conductivity: 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: A measure of relative acidity or alkalinity, ranging from 1 (most acidic) to 14 (most alkaline/basic), with 7 occupying a neutral point.

| Month | Range | DO (mg/L) | Conductivity (µs/cm) | pH |
|-------------|-------|-----------|----------------------|------|
| April | low | 9.05 | 432 | 7.73 |
| | high | 11.26 | 497 | 8.06 |
| May | low | 9.82 | 549 | 8.11 |
| | high | 11.39 | 604 | 8.25 |
| June | low | 6.8 | 339 | 8.03 |
| | high | 14.9 | 874 | 8.68 |
| July | low | 7.36 | 315 | 7.41 |
| | high | 15.52 | 873 | 8.44 |
| August | low | 8.7 | 653 | 7.73 |
| | high | 9.68 | 734 | 7.81 |
| September** | low | NA | NA | NA |
| | high | NA | NA | NA |

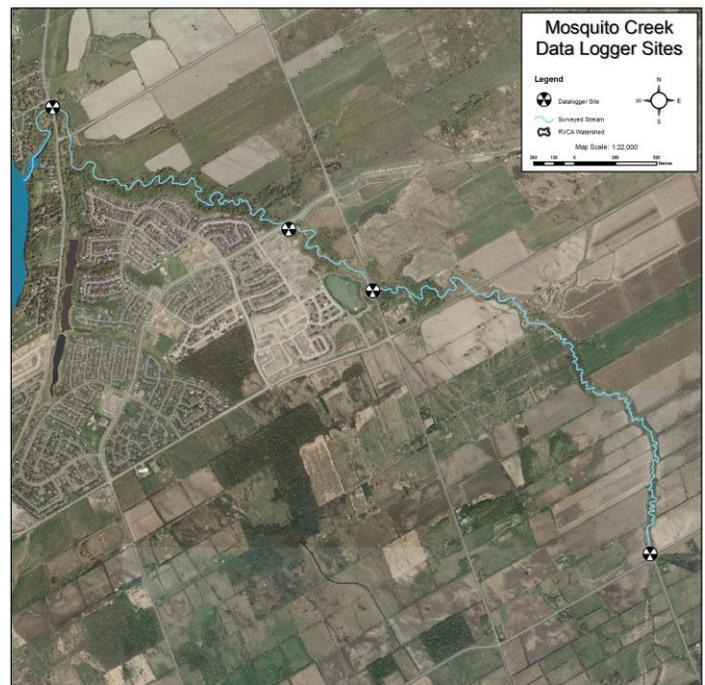


Figure 9. Water chemistry sampling along Mosquito Creek

Temperature Profiling

Temperature is an important parameter in streams as it influences many aspects of physical, chemical and biological health. Four temperature dataloggers were placed in Mosquito Creek at River Road, Spratt Road, Earl Armstrong Road and Rideau Road. Water temperature values from July, August and September are colour coded for cold, cool and warm water classification and are listed in the chart under "class". Classification is based on the Ontario Stream Assessment Protocol. Based on the stream temperature classification and fish community structure, Mosquito Creek appears to be a cool water stream with warm and cold water reaches. The fish community is mainly made up of cool water species, with some cool/warm and warm water species. Mottled sculpin were found in Mosquito Creek which are a coldwater species.

| Month | Range | Datalogger 1 (°C) River Road | Datalogger 2 (°C) Spratt | Datalogger 3 (°C) Earl Armstrong | Datalogger 4 (°C) Rideau Road |
|-------------|-------|------------------------------|--------------------------|----------------------------------|-------------------------------|
| April | low | 1.16 | 0.86 | 1.02 | -0.95 |
| | high | 28.18 | 18.04 | 19.07 | 28.61 |
| May | low | 8.3 | 6.99 | 7 | 2.58 |
| | high | 20.11 | 21.38 | 21.68 | 33.56 |
| June | low | 12.48 | 10.46 | 10.1 | 4.63 |
| | high | 25.34 | 29.17 | 28.09 | 28.79 |
| July | low | 17.68 | 16.26 | 15.23 | 8.67 |
| | high | 23.61 | 24.86 | 24.05 | 25.75 |
| | class | no days | no days | no days | no days |
| August | low | 15.45 | 14.22 | 13.82 | 5.72 |
| | high | 27.82 | 26.48 | 25.61 | 27.34 |
| | class | 26.57 | 25.83 | 24.22 | 24.53 |
| September** | low | 14.82 | 11.61 | 10.57 | 2.42 |
| | high | 21.59 | 21.07 | 20.05 | 20.99 |
| | class | no days | no days | no days | no days |



Blue values represent coldwater (<19°C), green values coolwater (19-25°C) and red values (>25°C) warm water temperatures

N/A-Stream not sampled during that month

*Likely that water levels dropped below the temperature datalogger, and air temperature was being recorded

no days-there were no days meeting the OSAP temperature classification criteria during this month

September**-Temperature loggers were removed September 22, therefore temperatures recorded do not include the entire month

Fish Sampling

Six sites along Mosquito Creek were sampled, using windemere traps, a fyke net, a seine net and boat seining. A total of 22 species were captured: blackchin shiner, blacknose shiner, bluegill, bluntnose minnow, brassy minnow, brook stickleback, brown bullhead, central mudminnow, common shiner, creek chub, fathead minnow, finescale dace, golden shiner, logperch, mottled sculpin, northern pike, northern redbelly dace, pumpkinseed, rock bass, spottail shiner, white sucker and yellow perch. Mosquito Creek has a high diversity of fish species, and that diversity was actually higher from sites four to six. There is a good mix of fish from the recreational and bait fishery in Mosquito Creek, most of which are insectivores, with some omnivores, herbivores and piscivores. The species captured all have a fairly high tolerance to sediment and turbidity, for reproduction, feeding and respiration. Although we did not capture any during the fish sampling, a landowner mentioned that muskellunge migrate up Mosquito to spawn in the grassy banks and that there are many bass in the system.



Figure 10 Northern pike captured on Mosquito Creek

Ontario Benthic Biomonitoring Network (OBBN) Data Summary for Mosquito Creek

Freshwater benthic macroinvertebrates are animals without backbones that live on the stream bottom and include crustaceans such as crayfish, molluscs and immature forms of aquatic insects such as stonefly and mayfly nymphs. Benthos represents an extremely diverse group of aquatic animals and exhibit wide ranges of responses to stressors such as organic pollutants, sediments and toxicants, which allows scientists to use them as bioindicators. Mosquito Creek was sampled at Spratt Road from 2003 to 2009 in the spring and fall, using the Ontario Biomonitoring Benthic Network (OBBN) method. The following table is a summary of those results until 2008. The mean value of the three replicates at each site has been used to calculate the value for each index. Mosquito Creek has a fairly poor to fair index, indicating that there is very substantial pollution to fairly substantial pollution likely in that system. It is important to note that overall water quality conditions for Mosquito Creek seem to be declining. Poor results were observed in both the spring and fall for the first time in 2008.



Spratt Road, R3, on Mosquito Creek

| Family Biotic Index (Hilsenhoff): | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | |
|-----------------------------------|--------|---------------|--------------|---------------|---------------|-------------|------------------|---------------|-----------------|---------------|-----------------------|---------------|------------------|------------------|
| | Spring | Fall | Spring | Fall | Spring | Fall | Spring | Fall | Spring | Fall | Spring | Fall | Spring | Fall |
| Mosquito Creek @ Spratt Road | NA | 5.104 Fair | 5.73 Fair | 5.348 Fair | 5.611 Fair | 5.6 Fair | 5.949 F. Poor | 5.746 Fair | 6.12 F. Poor | 5.507 Fair | *2/3 6.575 Poor | 6.687 Poor | 5.838 F. Poor | 6.075 F. Poor |

Family Biotic Index (Hilsenhoff)

| Family Biotic Index | Water Quality | Degree of Organic Pollution |
|---------------------|---------------|-------------------------------------|
| 0.00 - 3.75 | Excellent | Organic pollution unlikely |
| 3.76 - 4.25 | Very Good | Possible slight organic pollution |
| 4.26 - 5.00 | Good | Some organic pollution probable |
| 5.01 - 5.75 | Fair | Fairly substantial pollution likely |
| 5.76 - 6.50 | Fairly Poor | Substantial pollution likely |
| 6.51 - 7.25 | Poor | Very substantial pollution likely |
| 7.26 - 10.00 | Very Poor | Severe organic pollution likely |

Please refer to the 2009 City Stream Watch Annual Report for more detailed information. The report is listed at: <http://www.rvca.ca/programs/streamwatch/index.html>

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2009 City Stream Watch Sponsors

A very large and sincere thank you to our program sponsors in 2009:

- Monterey Inn Resort and Conference Centre for donating sandwiches and drinks for hungry volunteers
- Fisheries and Oceans Canada for their financial contribution
- RBC Blue Water Project for their financial contribution
- TD Friends of the Environment for their financial contribution