



Bilberry Creek 2009 Summary Report

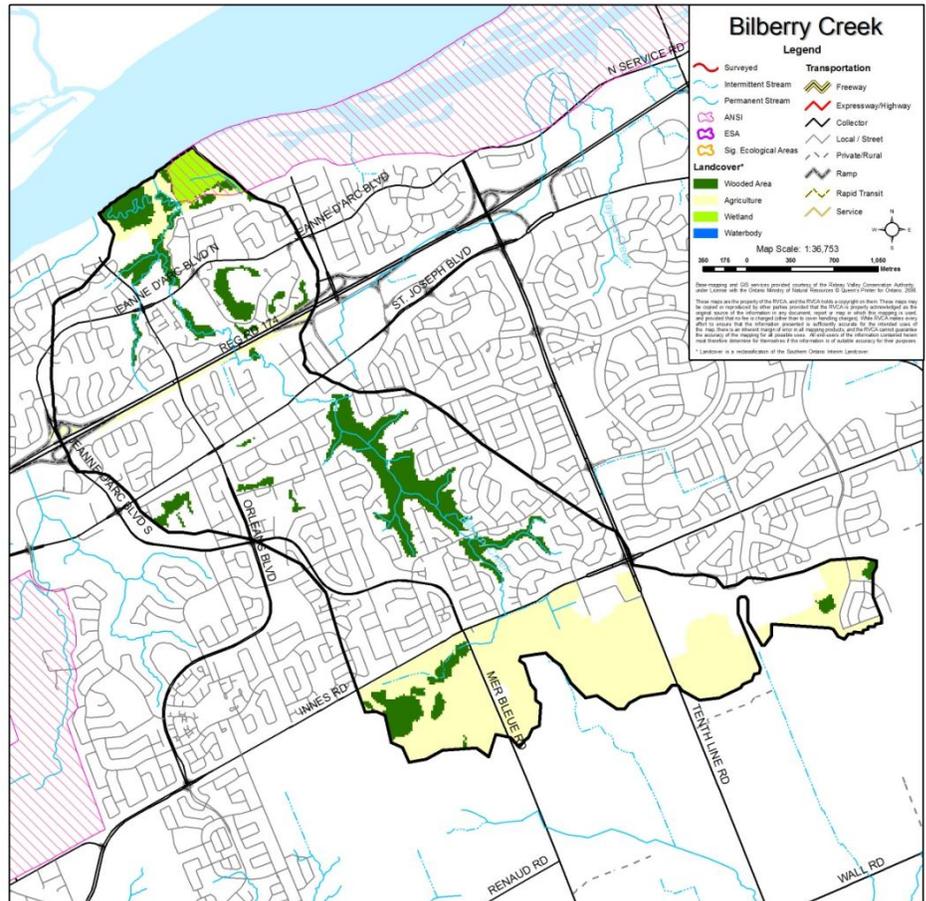
The Rideau Valley Conservation Authority, in partnership with six other agencies in Ottawa (City of Ottawa, Heron Park Community Association, Ottawa Flyfishers Society, Ottawa South Community Association, Rideau River Roundtable and National Defense HQ – Fish and Game Club) initiated the City Stream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

Watershed Features

Area	12 square kilometres, 0.3% of the Rideau River watershed
Land Use	67.6% urban, 16.1% mixed agriculture, 3.8% monoculture, 1.5% transportation, 9.5% forest, 1.1% wetlands, 0.4% unclassified
Surficial Geology	78% clay, 5% diamicton, 1% organic deposits, 6% Paleozoic bedrock, 10% sand
Watercourse Length & Type	<i>Total length:</i> 7.5 km, including the West branch <i>Watercourse type:</i> 86% natural, 14% channelized <i>Flow type:</i> 100% permanent
Dams & Barriers	There are a total of 10 seasonal fish migratory obstructions along the main branch of Bilberry Creek, mainly accumulations of woody material and sediment.
Spills	There were no spills reported by CSW staff in 2009.
Species at Risk	There were no species at risk observed during stream surveys in 2009.



Figure 1. Horntail wasp observed along Bilberry Creek



Vegetation Cover Types		
Types	Hectares	% of Cover
Wetlands	1	0.9
Wooded areas	113	99.1
Hedgerow	0	0
TOTAL COVER	114	100%

Wetland Cover
• 0.08% of the watershed is in wetland cover
• Wetlands make up 0.9% of the vegetation cover

Woodlot Size		
Size Category	Number of Woodlots	% of Woodlots
<1 ha	19	50
1-9 ha	18	47
10-30 ha	0	0
>30 ha	1	3

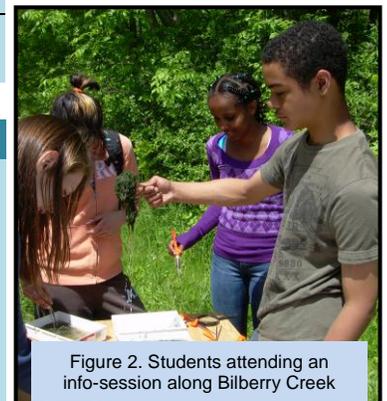


Figure 2. Students attending an info-session along Bilberry Creek

The headwaters of Bilberry Creek begin just north of Innes Road. From there, the creek runs through a forested ravine between housing subdivisions, crossing under St. Joseph, Highway 174 and Jeanne D'Arc prior to feeding into the Ottawa River. While the headwaters of Bilberry Creek run through a forested valley, the land use around the creek is intensive, putting a lot of pressure on the creek with stormwater runoff, especially during rain events. The main geology of the subwatershed is silt and clay deposits with outcrops of bedrock closer to the Ottawa River. In 1945, the main branch of Bilberry Creek only had two major road crossings, and the land use was largely agricultural. Since then, most of the subwatershed has been developed and reaches have been greatly altered with piping, storm water drains, channelization and shoreline hardening (armourstone, rip rap, gabion baskets). An estimated 5.6 km of headwater channels have been lost (a 26% loss of stream length from 1945), and this does not include the diversion of West Bilberry Creek which would increase that loss (Geomorphologic Solutions, 2008). This subwatershed development has resulted in channel widening and active erosion, and the stream is still in transition from those changes. During storm events, water is rapidly carried from the tributaries of Bilberry to the main branch, and water levels rise dramatically shortly after any precipitation. With such a rapid delivery of stormwater, contaminants from roadways and sewers are flushed directly into the creek and carried out into the Ottawa River. Bilberry Creek was surveyed in its entirety, for a total of six and a half kilometres. Ten more surveys (one kilometre) were completed on the West branch of Bilberry Creek. The following is a summary of the 75 macro-stream assessment forms completed by staff and volunteers.

Anthropogenic Alterations to Bilberry Creek

Of the 65 sections of stream sampled, volunteers identified that 38 percent had no human alterations. Twenty-three percent of the sampled sections were still considered natural, 30 percent of the sections were and nine percent of the surveyed sections were observed as highly altered. The altered and highly altered sections of the stream coincided with roadways, storm water outlets, shoreline modification and armouring. West Bilberry Creek differed in that it had no sections without anthropogenic alterations and no sections that were highly altered. Eighty percent of the sections surveyed were altered and 20 percent were considered natural.

Anthropogenic Alterations to Bilberry Creek

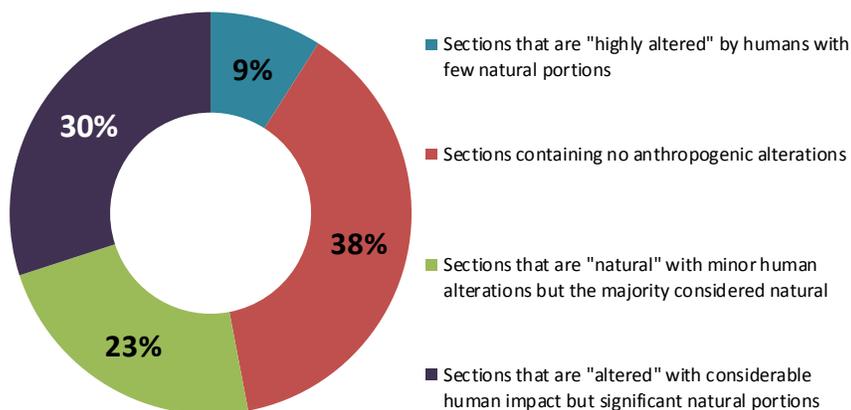


Figure 3. Shoreline alterations along Bilberry Creek

Land Use Adjacent to Bilberry Creek

Seven major land uses were observed along Bilberry Creek, consisting of 37 percent forest, 14 percent meadow, 14 percent scrubland, 17 percent residential, nine percent recreational, six percent infrastructure (roads, culverts, hydro lines, etc.) and three percent industrial/commercial. The same land uses were found along the West branch of Bilberry Creek; however, there was less forest, meadow and scrubland, and more residential, recreational and industrial/commercial.

Land Use Adjacent to Bilberry Creek

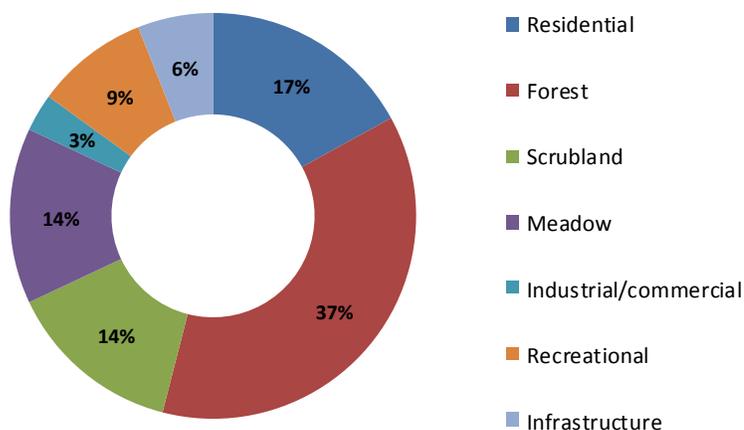
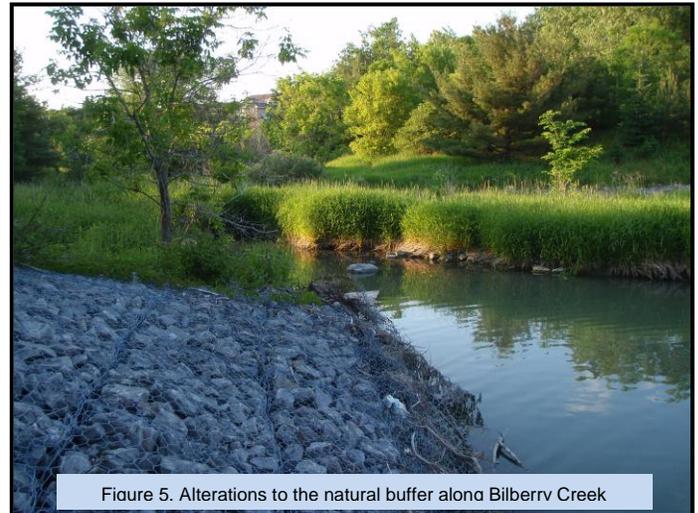
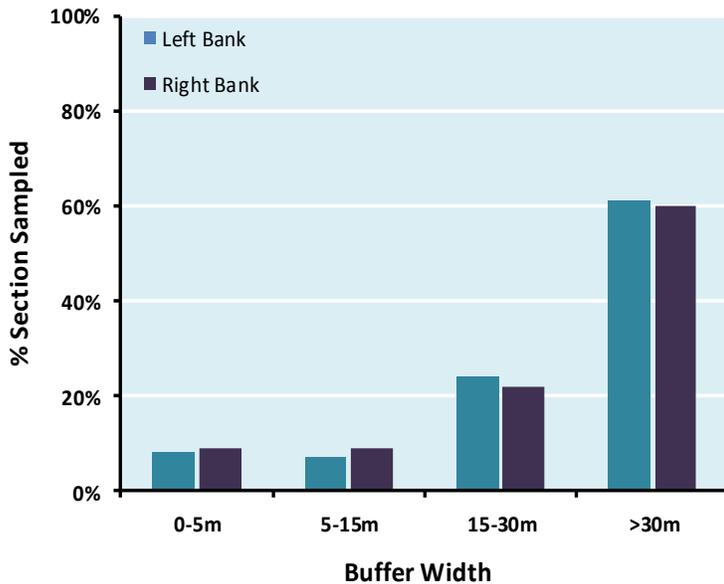


Figure 4. Meadow/forest landcover adjacent to Bilberry Creek

Buffer Evaluation of Bilberry Creek

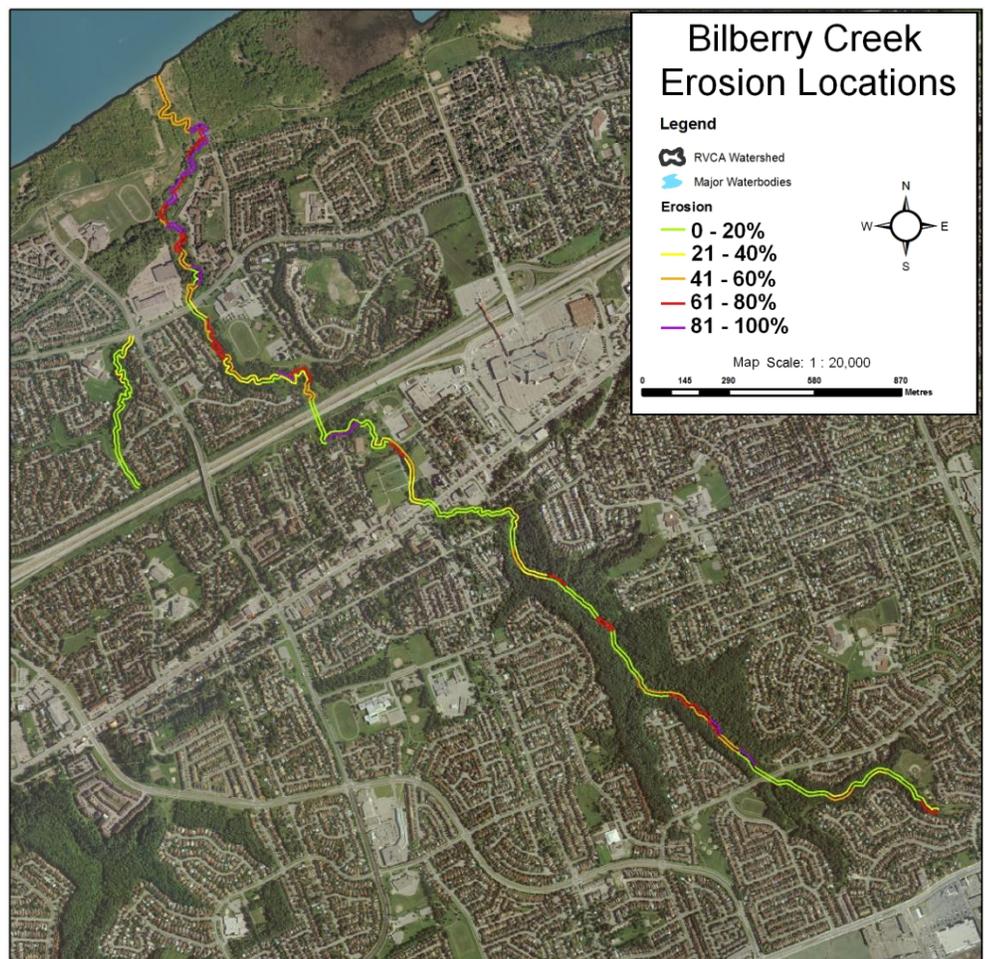
Natural buffers are extremely important for filtering excess nutrients running into the creek, infiltrating rainwater, maintaining bank stability, maintaining baseflow levels, keeping water temperatures cool and providing wildlife habitat. According to the document *How Much Habitat Is Enough*, a stream should have riparian areas of 30 metres minimum or more, depending on the site conditions. Both the left and right banks along Bilberry Creek were fairly even, with sixty percent of the stream length meeting the 30 metre buffer recommendation. Along the West branch, the left bank had a similar buffer to the main branch, but the right bank had considerably less buffer.

Buffer Evaluation of Bilberry Creek



Erosion on Bilberry 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 Bilberry Creek, erosive forces have been excavating material from the banks, making them steep and bowl-shaped. Due to past development, very few controls for stormwater runoff have been implemented for the creek, and this is the main cause of the erosion issues. Forty-five percent of the left bank was considered stable and 55 percent unstable; on the right bank, 43 percent were considered stable and 57 percent unstable. Ninety percent of the West branch was considered stable.



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. Instream morphology along Bilberry Creek is fairly heterogeneous, consisting of large runs with 24 percent pools and 10 percent riffles. The morphology of the West branch was more homogeneous; ninety percent of the sections were runs, and only three percent of the sections had pools and riffles.

Instream Morphology of Bilberry Creek

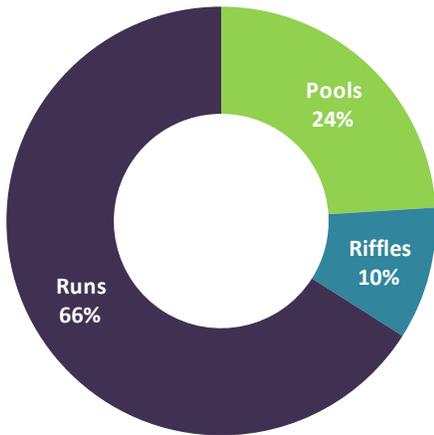


Figure 7. Pool/riffle habitat along a reach of Bilberry Creek

Types of Instream Substrate

Diverse substrate is important for fish and benthic macroinvertebrate habitat for spawning, resting, over wintering and feeding. Over half of the substrate observed in Bilberry Creek was clay and silt. A variety of other substrates were observed in smaller percentages. Many areas, especially near the mouth of Bilberry Creek, were homogeneous, with little cobble, boulder or gravel. The West branch is much shallower than the main branch and collects a large amount of woody material and leaf litter. The same types of substrate were found along the West branch but in much smaller quantities. Sixty percent of the sections were made up of muck (23), detritus (25) and clay (20).

Types of Instream Substrate Along Bilberry Creek

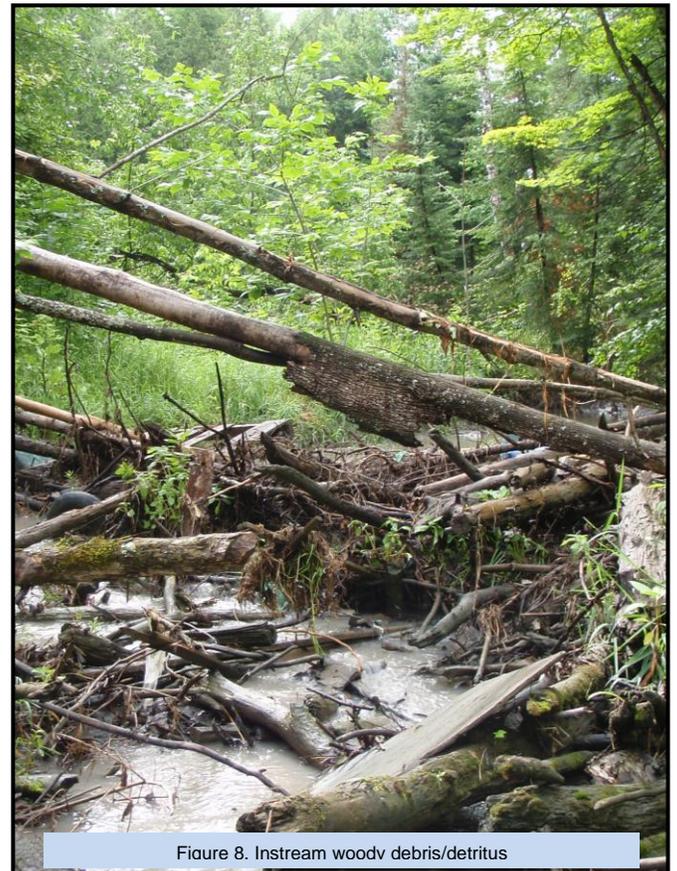
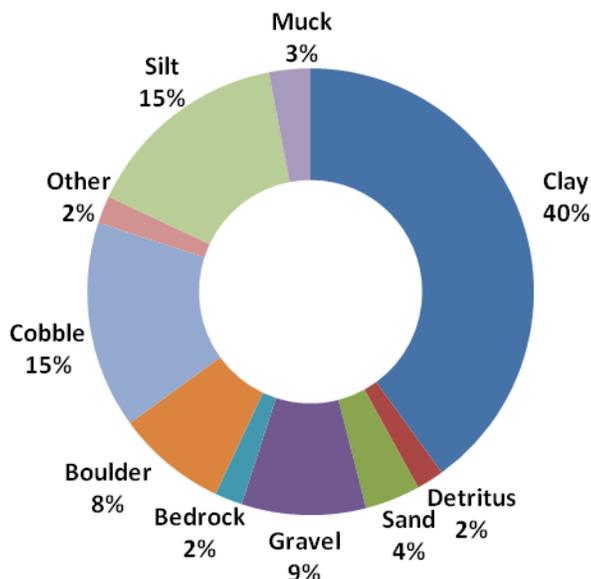


Figure 8. Instream woody debris/detritus

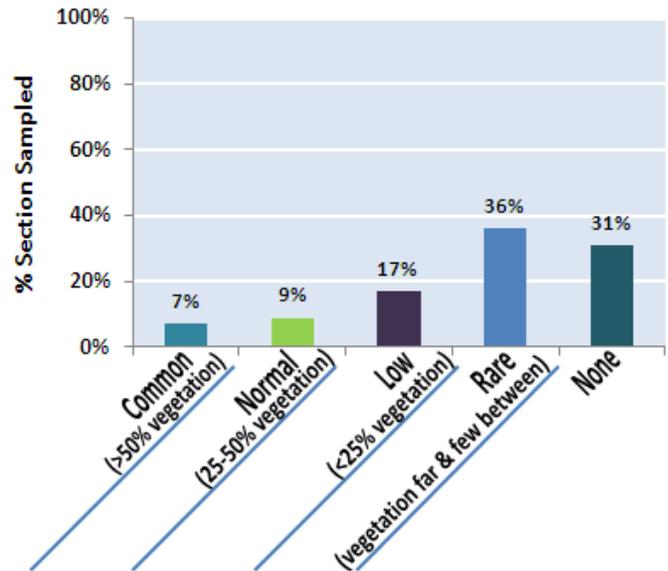
Instream Vegetation

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. Bilberry Creek does not have a healthy variety of instream vegetation and very few types were found. A healthy level of vegetation was observed in only 16 percent of Bilberry Creek, which mainly consisted of non-filamentous algae; the rest of the stream had little to no vegetation. The geology of Bilberry Creek is mainly clay and silt, which makes it difficult for light to penetrate the water and encourage aquatic plant growth. Many sections of Bilberry Creek have steep, bowl-shaped, clay slopes, and flashy water fluctuations that also make it difficult for instream vegetation to take root. In the West branch, some emergents were observed, but 88 percent of the sections had no vegetation.



Figure 9. Instream emergent vegetation observed along Bilberry Creek

Instream Vegetation of Bilberry Creek



Pollution/Garbage Along Bilberry Creek

Pollution and garbage along Bilberry Creek was assessed visually and noted for each section where it was observed. Only three percent of the stream surveyed was free of pollution or garbage. Along the rest of the stream, 88 percent had floating garbage in the water and 57 percent had garbage on the stream bottom. In three percent of the sections, unusual colouration of the channel bed was observed. Only one section along the West branch was free of garbage.

Pollution Observed in Bilberry Creek

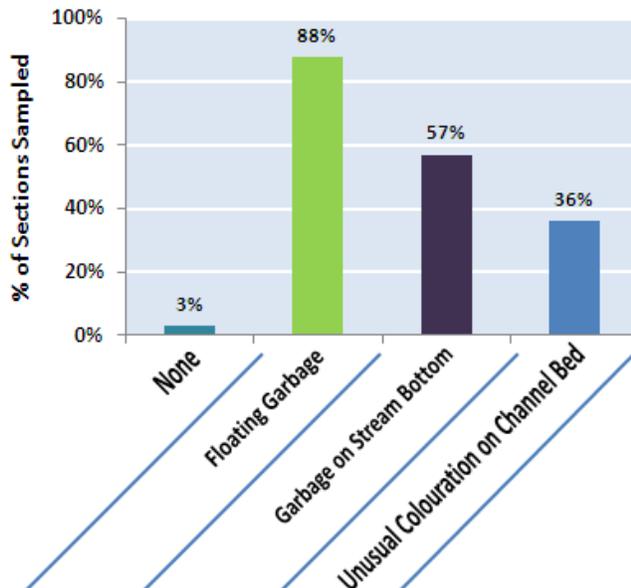


Figure 10. Pollution observed along Bilberry Creek

Wildlife Observed While Sampling Bilberry Creek

Wildlife	Observed While Sampling
Birds	cardinal, crows, robin, hummingbird, chickadees, woodpecker, ring-billed gulls, red-winged blackbird, goldfinches, grackle, sparrows, phoebe, nuthatch, bluejay, hawk, barred owl
Mammals	river otter, red squirrel, raccoon, deer, rabbit, beaver, chipmunk, muskrat, black squirrel, groundhog
Reptiles/Amphibians	garter snake, northern leopard frog, green frog, gray treefrog, tadpoles
Aquatic Insects	snails, leeches, molluscs, water strider, water spider, amphipods, aquatic earthworm
Other	dragonflies, damselflies, butterfly, moth, mosquitoes, spiders, ants, cicadas, bumblebees

Monitoring and Events History

Year	Accomplishment	Description
2004	Forty-five macro stream surveys were completed on Bilberry 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	Bilberry Creek was seined at five sites with RVCA staff and volunteers. A total of 15 species were caught.
2006	Fish sampling, City of Ottawa	City of Ottawa conducted fish sampling at various sites along Bilberry Creek.
2009	65 macro stream surveys were completed on Bilberry Creek, and 10 macro stream surveys were completed on West Bilberry Creek	Volunteers began at the mouth of the creek and worked their way upstream (skipping the SWMF), taking measurements and making observations on instream habitat, bank stability, land use, etc.
2009	Fish sampling, City Stream Watch	Bilberry Creek was sampled at five sites with RVCA staff and volunteers. A total of 18 species were caught. Sampling methods included a mix of seining, electrofishing, windemere traps and a fyke net.
2009	Temperature Profiling	RVCA staff placed four temperature probes at different locations along Bilberry Creek to give a representative sample of how temperature fluctuates and differs throughout the system. Only three of those dataloggers could be recovered.
2009	Garbage Cleanup and Outdoor Education with Cairine Wilson Secondary School	Cairine Wilson S.S. backs onto Bilberry Creek close to the mouth. Approximately 80 students participated in an outdoor activity day on Bilberry Creek. In the morning, students worked their way from St. Joseph Boulevard to the mouth, picking up garbage along the way. In the afternoon, students were split into five groups and rotated through stations on invasive species, benthic macroinvertebrates and sampling, fish sampling, stream measurements and water issues.
2009	Riparian planting	Nineteen volunteers spent 38 hours planting approximately 300 shrubs upstream of St. Joseph Boulevard to enhance the buffer in that area.

Local Actions for Improvement of Bilberry Creek

Type of Project	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 appropriate for bioengineering. However, there are two areas near the mouth where these techniques could be used. Another suitable 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. Regulatory approvals 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

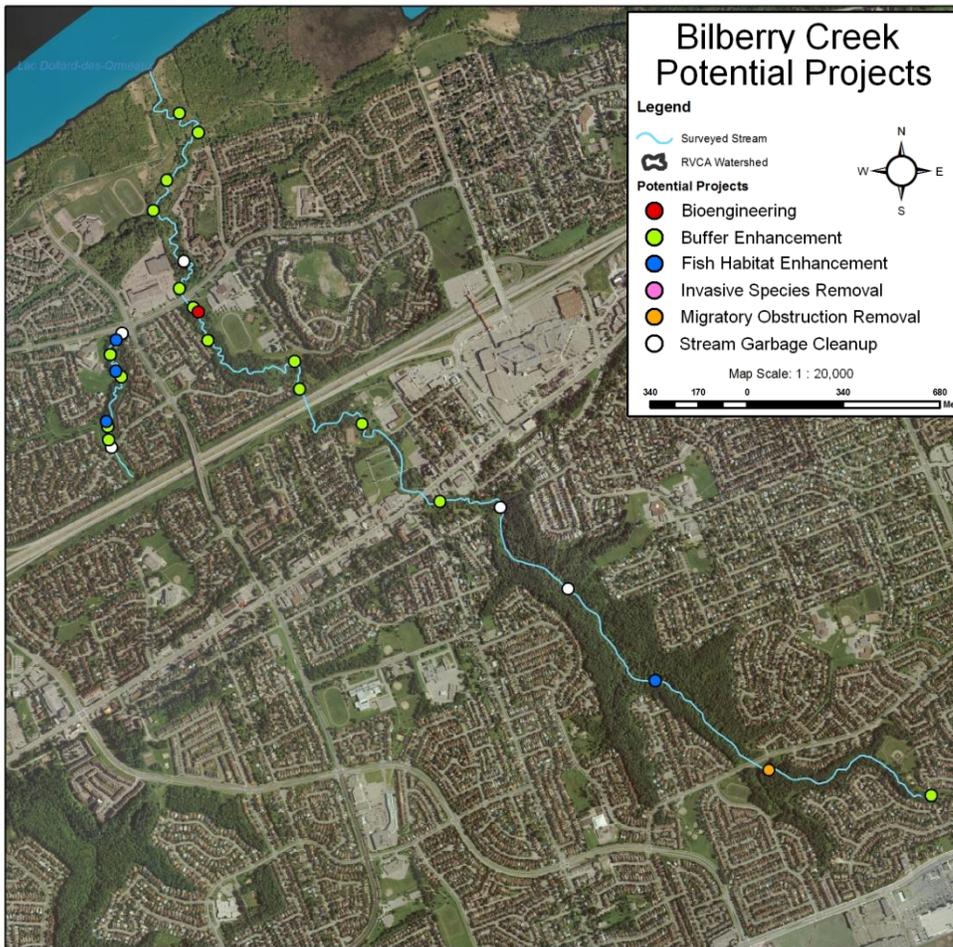


Figure 11. Various program highlights to date. (Top: Fallfish captured during sampling session; Middle: Riparian planting with volunteers; Bottom: Fish sampling session with volunteers)

Summary of Water Quality Data for Bilberry 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 representing a neutral point.

Month	Range	DO (mg/L)	Conductivity ($\mu\text{s}/\text{cm}$)	pH
May	low	12.43	142	8.03
	high	13.97	1505	8.71
June	low	9.29	487	8.24
	high	13.79	2090	8.64
July	low	9.63	763	7.83
	high	10.54	1118	7.99
August	low	6.58	61	7.55
	high	11.4	2019	8.51
September	low	N/A	N/A	N/A
	high	N/A	N/A	N/A



Figure 12. Water chemistry sampling along Bilberry 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 Bilberry Creek at Jeanne D'arc (one in the west branch and one in the main branch), St. Joseph Boulevard and Des Epinettes. The datalogger on the main branch of Jeanne D'arc was not recovered. 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, Bilberry Creek can be classified as a cool water stream with some coldwater inputs near the mouth. The fish community structure is made up of ten cool water species, two cool/warm species, five warm water species and one coldwater species (the coldwater species was only found near the mouth).

Month	Range	Datalogger 1 (°C) Jeanne D'arc, west branch	Datalogger 3 (°C) St. Joseph	Datalogger 4 (°C) Des Epinettes
May	low	10.26	11.33	9.18
	high	18.43	18.04	19.14
June	low	14.45	14.22	12.07
	high	23.88	22.94	23.14
July	low	17.47	18.04	14.98
	high	24.41	23.89	23.46
	class	no days	no days	no days
August	low	15.25	12.51	13.52
	high	22.87	25.51*	21.89
	class	21.52	24.76	21.58
September	low	12.44	11.61	12.07
	high	21.7	27.81*	21.58
	class	17.6	18.27	19.14



Blue values represent coldwater (<19°C), green values coolwater (19-25°C) and red values (>25°C) warm water temperatures none-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

Fish sampling was carried out at six sites along Bilberry Creek, and when possible, sampled multiple times between April and July. Capture methods included seine netting, electrofishing, fyke net and windemere traps. A total of 18 fish species were collected: black crappie, bluntnose minnow, brook stickleback, brown bullhead, burbot, central mudminnow, creek chub, emerald shiner, fallfish, fathead minnow, longnose dace, pumpkinseed, rock bass, smallmouth bass, spottin shiner, spottail shiner, white sucker and yellow perch. The majority of the species within Bilberry Creek are significant to the recreational or baitfish fisheries; there are mainly insectivores and some piscivores. Most of the species found are somewhat tolerant to sediment and turbidity for reproduction and feeding with the exception of some of the game fish species. Species diversity was highest downstream of St. Joseph, closer to the Ottawa River.



Figure 13. Burbot (*Lota lota*) captured along Bilberry Creek

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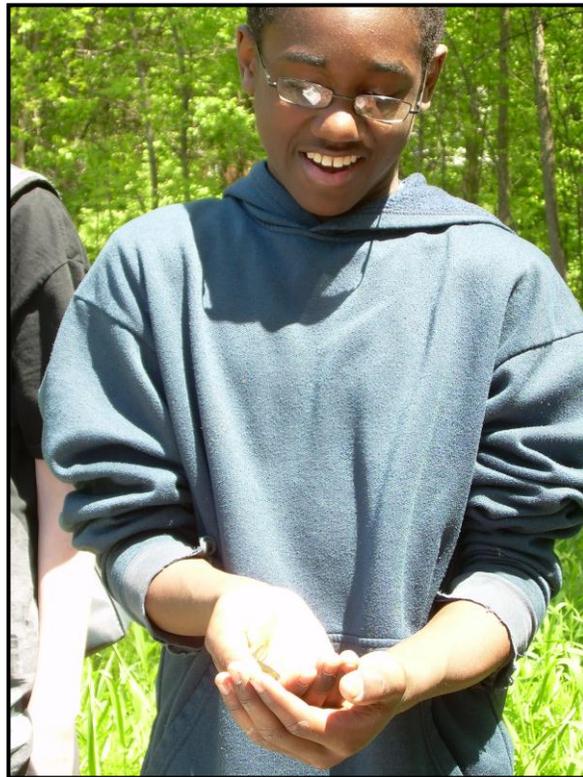
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2009 City Stream Watch Sponsors

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- 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