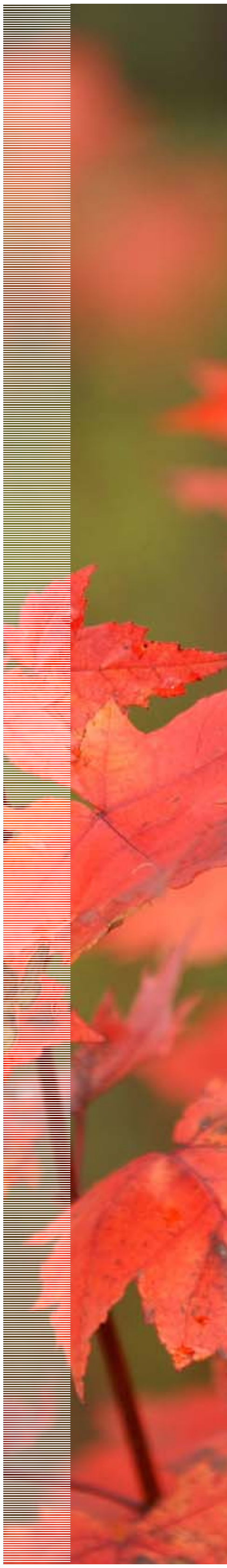

City Stream Watch

2006 Annual Report

City Stream Watch
2006 Annual Report

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December 18, 2006

Executive Summary

This document summarizes the activities of the City Stream Watch program for the 2006 season. The program was established in April of 2003 through a partnership of six groups in the Ottawa area:

- *The Heron Park Community Association*
- *The Rideau Valley Conservation Authority*
- *The Environmental Committee of Ottawa South*
- *The City of Ottawa*
- *The Ottawa Flyfishers Society*
- *The Rideau River Roundtable*

The partnership grew to seven in 2005 with the addition of the *National Defence Headquarters Fish and Game Club*. Working together, these organizations outlined a program that fulfills many of the community's needs for environmental information and promotion of local streams within the municipality.

The goal of the program is to obtain, record, and manage valuable information on the physical and biological characteristics of streams in the City of Ottawa, while ensuring that they are respected and valued natural features of the communities through which they flow. To this end, the program relies on and encourages the interest and commitment of volunteers from the community, guided by an experienced coordinator, to learn and conduct macro stream assessments on local waterways over a five-year cycle. Volunteers also participate in sampling fish communities through seining and electrofishing, assisting in stream clean-ups and habitat rehabilitation projects.

The City Stream Watch program uses a macro stream assessment protocol originally developed by the Ontario Ministry of Natural Resources. Officials at the Rideau Valley Conservation Authority, to facilitate its use by community volunteers, have since altered the protocol to make it less complicated. Alteration of the protocol was essential as volunteer groups consist of people with a variety of backgrounds and experiences.

Three streams (Becketts, Brassils and Pinecrest Creeks) were chosen for sampling in the 2006 season based on community interest as well as the level and need for current information. A total of 96 volunteers from the community participated in the program, contributing a total of 567 hours in five months. Approximately twenty-one kilometres of stream were surveyed in 2006. All information is housed in the Rideau Valley Conservation Authority's Watershed Information System and is available interactively on the Authority's website at *www.rideauvalley.on.ca*.

Volunteers assisted in fish and aquatic invertebrate sampling in 2006. Program volunteers attended sessions taught by local professionals to learn the various methods of fish and invertebrate sampling. Sites on Greens Creek and Brassils Creek were sampled through seining and electrofishing.

Stream clean-up initiatives were organized on Pinecrest and Sawmill Creek resulting in three outings. The Pinecrest Creek cleanup was part of World Oceans Day and the Sawmill Creek cleanup was part of the Great Canadian Shoreline Cleanup. In total, over 200 volunteer hours were given to help remove garbage of human origin from both stream systems.

The program should further build on the successes achieved throughout the past four years. The data will complement work conducted certain municipal and regional programs, most of which do not sample the smaller urban streams which are the focus of City Stream Watch. In addition, the intrinsic values of community based environmental monitoring, such as community involvement and social capital, will be further developed.

Acknowledgements

Thank you to all the volunteers who helped out throughout the field season. The dedication and enthusiasm you conveyed to this project was incredible and very much appreciated.

Thank you to **Evergreen** for their financial contribution to the program to enhance riparian areas on Sawmill Creek.

Thank you to Andrea Vinette and Doris Kwok of the **Monterey Inn Resort and Conference Centre** at 2259 Prince of Wales Drive for donating sandwiches and drinks for hungry volunteers during our community clean-up initiatives on Sawmill and Pinecrest Creek.

Thank you to Brian Smith, Area Manager with the **City of Ottawa Parks Department,** for arranging dumpsters to be delivered and removed during the Great Canadian Shoreline Cleanup on Pinecrest Creek.

Thank you to **Fisheries and Oceans Canada** for their financial contribution to the program in 2006.

Thank you to Peter Stewart-Burton of the **National Defense Headquarters Fish and Game Club** for organizing a cleanup initiative on Sawmill Creek.

Thank you to Dave Bennett, Store Manager of **Farm Boy** at 2950 Bank Street for helping discard of the waste collected by NDHQ on Sawmill Creek.

Thank you to Sarah Kennedy of **Environment Canada** for help organizing the World Oceans Day Cleanup on Pinecrest Creek.

Thank you to Brian Coad, Ichthyologist from the **Canadian Museum of Nature,** for his assistance at the Fisheries Sampling and Identification session.

Thank you to **A-Channel News** for press on the Great Canadian Shoreline Cleanup on Sawmill Creek.

Thank you to the **City of Ottawa** for providing office space for the coordinator.

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1.0 Introduction

1.1 City Stream Watch – An Evolving Program

The health of Ontario's water resources is of paramount importance to its citizens. A dependable supply of clean freshwater is critical to a strong economy and high quality of life, and can only be achieved through proper management of all water supplies. Water resources are threatened by a myriad of stresses, including urbanization and development, pollution, and public apathy. The City Stream Watch program obtains, records and manages valuable information on the physical and biological characteristics of streams in the City of Ottawa. From this data, areas of concern are identified and remediation projects initiated, with the goal of ensuring that city streams remain respected and valued natural features of the communities through which they flow.

1.2 Partners of the City Stream Watch Program

The City Stream Watch program was initiated in 2003 through a partnership of six groups and has grown to seven in 2005. Without the help and dedication of these organizations the Stream Watch program would not have become the success it is today.

The Heron Park Community Association

The Heron Park Community Association, created in the mid 1980's, functions as a representative body in protecting community interests, supports programs that provide safety and information for community residents, and encourages social and recreational community activities. The Association is the lead organization of the City Stream Watch program and aids in training and recruiting volunteers and organizing conservation efforts on Sawmill Creek.

The Rideau Valley Conservation Authority

Conservation Authorities in Ontario ensure the protection and restoration of Ontario's water, land and natural habitats through responsible management by providing programs that balance human, environmental, and economic needs. In 1966, in response to the above needs as they relate to the Rideau River watershed, the Rideau Valley Conservation Authority (RVCA) was established. The RVCA delivers a wide range of watershed management services to the community, including:

- Flood plain management
- Aquatic environment monitoring and reporting
- Land use and development review
- Regulations administration and enforcement
- Watershed management planning
- Stewardship advice and incentives programs
- Conservation information

The RVCA provides technical management and supervision to the City Stream Watch program to ensure the environmental data is collected, managed, and stored to meet appropriate standards.

The Environmental Committee of Ottawa South

As a working committee of the Ottawa South Community Association, the Environment Committee of Ottawa South (ECOS) encourages members of its community to take an active role in improving the health of their natural environment.

The City of Ottawa

The City of Ottawa is dedicated to monitoring and improving the natural environment, including water resources, of the municipality. The City's evolving environmental strategy works to ensure that environmental management is an integral part of its practices and policies. The City of Ottawa helps to coordinate, provide technical assistance and recruit volunteers for the City Stream Watch program.

The Ottawa Flyfishers Society

The Ottawa Flyfishers Society, created in 1983, is dedicated to promoting flyfishing as well as fish habitat conservation. The Society helps to recruit volunteers for the City Stream Watch program and concentrates its efforts on monitoring, maintaining and improving the natural beauty and health of Greens Creek.

The Rideau River Roundtable

The Rideau River Roundtable consists of representatives from community groups, municipalities, government agencies and private businesses. The Roundtable is dedicated to conducting research and coordinating projects to protect and improve the Rideau River watershed.

National Defence Headquarters Fish and Game Club (NDHQ)

The NDHQ Fish and Game Club is dedicated to observe and practice sound conservation of all wildlife and its habitat; to respect the property rights of others; to assist the authorities with implementing conservation measures for the benefit of the community; and to oppose activities such as poaching or pollution that are prejudicial to sound conservation of wildlife and its natural habitat, so as to provide a continuing source of enjoyment for all its present and future members. The NDHQ works closely with the City Stream Watch program to help maintain the health of Sawmill Creek, South of Walkley Road.

La table ronde sur la Rivière Rideau River Roundtable

RIDEAU VALLEY CONSERVATION AUTHORITY

OTTAWA FLYFISHERS PECHEURS A LA MOUCHE D'OTTAWA

Between the Bridges OldOTTAWASouth

Heron Park Community Association

Ottawa

National Defence Défense nationale

Canada

1.3 Stream Selection in 2006

Three additional streams were selected for sampling in the 2006 season. These streams were chosen based on community interest as well as the level of and need for current information. Figure 1 shows the locations of the three streams in the City of Ottawa as well as those sampled in 2003, 2004 and 2005.

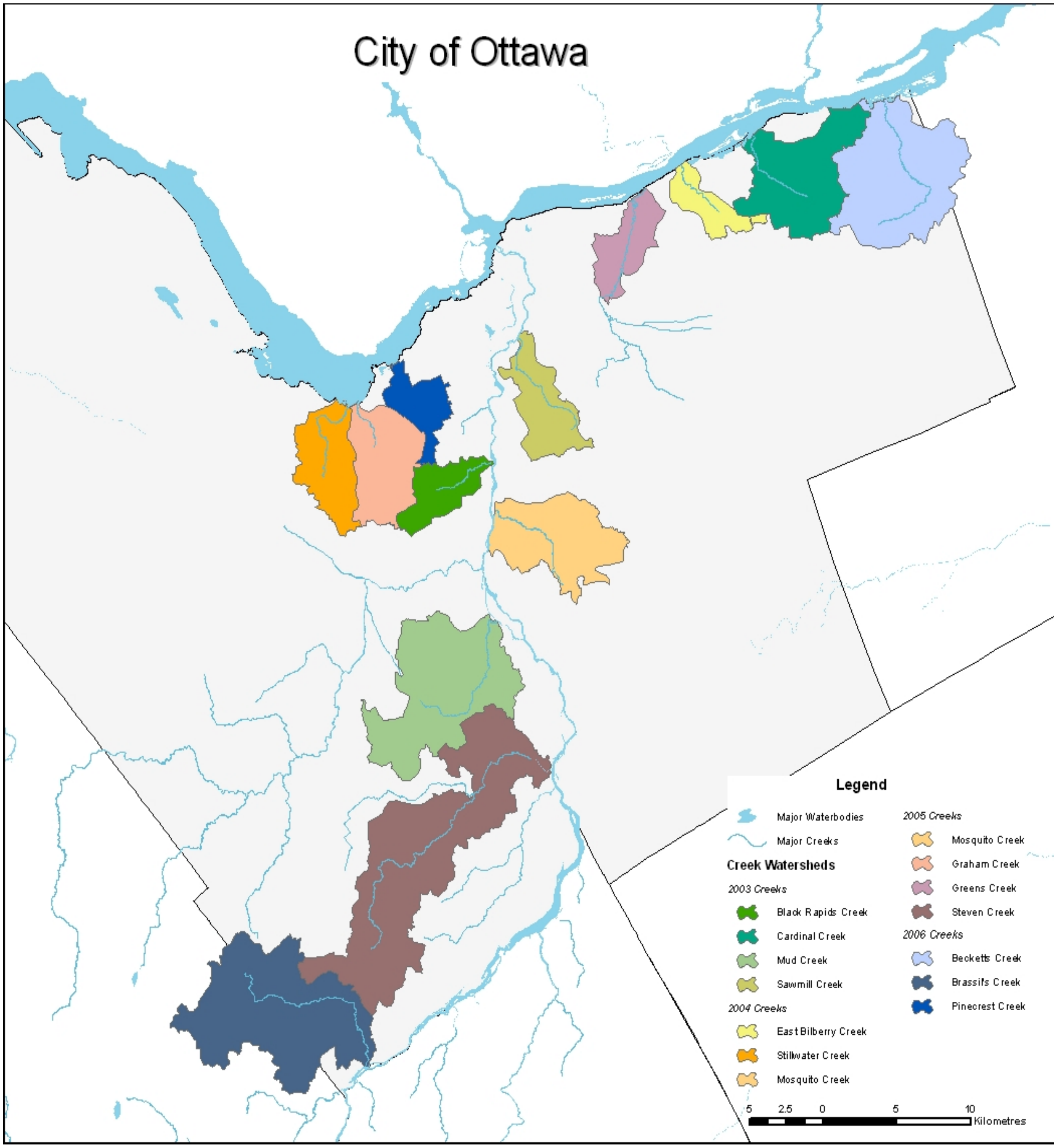

Figure 1. Locations of Streams and Their Watersheds Sampled from 2003 to 2006.

2.0 Methodology

2.1 The Stream Watchers – The Heart of City Stream Watch

The City Stream Watch program relies on and encourages the interest and commitment of volunteers from the community in order to fulfill its goal. Two formal training sessions for interested volunteers were advertised and conducted in the spring of 2006. As well, informal training sessions for individuals or small groups were conducted throughout the field season to ensure that everyone had an opportunity to participate in the program. Volunteers were introduced to representatives from the various partners and the coordinator of the program. Volunteers were given an interest form to fill out (see appendix A) and were then guided through the protocol used for monitoring the streams (see appendix B). Volunteers were given a summary and definitions handout for future reference (see appendix C), shown the equipment used in sampling (see appendix D) and given a brief demonstration on how to use some of the more technical instruments. Representatives from RVCA then demonstrated the entire process for sampling one section of stream.

2.2 The Macro Stream Assessment Protocol

The City Stream Watch program utilizes a macro stream assessment protocol. The protocol was originally used by the Ontario Ministry of Natural Resources, but has been modified by officials at RVCA so that community volunteers can easily apply it. Changes to the original protocol were essential as volunteers have a variety of educational backgrounds and experiences.

Streams are sampled in 100-meter sections. At the start of each section, the date, time and section number are recorded. GPS coordinates are taken using a handheld GPS, pre-programmed for the NAD 83 Datum and displaying Universal Transverse Mercator (UTM) coordinates. These parameters were chosen to facilitate analysis and display of City Stream Watch data with other spatial information already digitally captured in the RVCA's existing spatial database. Overhead cloud cover is estimated and recorded as a percent, air temperature in ºC is recorded and a photo upstream is taken. Water temperature is recorded to the nearest ºC. Stream width is measured to the nearest tenth of a metre using the 60-meter tape spread at right angles to the banks originating at water level. Stream depth is measured using the metre stick, at the deepest point along the width of the stream. Where stream depth is greater than one metre and can be accessed safely by the volunteers, stream depth is estimated to the nearest tenth of a metre.

After all necessary measurements are recorded for the start of the section, one volunteer remains at the start of the section and holds on to one end of the tape while the others begin walking upstream holding the other end. Volunteers walking upstream are asked to remember observations on land use, anthropogenic alterations of the stream, substrate characteristics and instream vegetation, bank characteristics and vegetation on the banks, tributaries, agricultural impacts, presence of wildlife and habitat, pollution and other characteristics as outlined in the macro stream assessment form. When the tape hits 50 metre, the volunteer left behind joins the others at the 50-metre mark of the section, observing the stream characteristics while walking up.

Water temperature, stream width, and stream depth are again recorded at the mid-way point of the section. The procedure used for observing the first 50 metres of the section is repeated for the second 50 metres, thereby completing a 100 metre section. Water temperature, stream width, and stream depth are recorded at the end of the section. The UTM coordinates are recorded for the end of the section and a photo is taken downstream. The volunteers now discuss what they observed, and the macro stream assessment form is filled out for the section. The entire procedure is repeated for each section of stream.

2.3 Fish Sampling through Seine Netting

The City Stream Watch program once again conducted seine netting and introduced volunteers to electrofishing in 2006. Appropriate sampling sites were chosen and volunteers assisted in pulling the net through the water column and processing and identifying the catch. The different species of fish were sorted and counted. Minnow species were counted and a bulk weight (weight of all the individuals of a particular species) was measured. Game species were counted, a round weight was taken, and individuals were measured for total length (from tip of the nose to the end of the caudal fin). Only certain stream habitats can be effectively seined and so it is important to remember that the results may not represent the entire fish community of each creek. However, volunteers gained valuable insight into fish sampling methodology as well as experience in identifying different fish species.

2.4 Stream Clean-Ups

In 2006, two major stream cleanups were held on Pinecrest and Sawmill Creek. As part of World Oceans Day, the City Stream Watch program joined an Eastern Ontario-wide cleanup to help bring our stream and river systems back to their original state. In the fall of 2006 the program took part in the nationwide cleanup put on by the Vancouver Aquarium and TD Canada Trust. The Great Canadian Shoreline Cleanup was held on Sawmill Creek. Volunteers were guided in the safe and appropriate removal of garbage from the creek bed and riparian areas. Only human-made materials were removed and protocols were followed for the safe removal of hazardous objects (broken glass, hypodermic needles, etc.).

2.5 Riparian Planting/Bioengineering Initiatives/Fish and Wildlife Habitat Rehab

Funding was obtained to coordinate and implement fish and wildlife habitat restoration through riparian planting on city streams. In 2006 three riparian planting initiatives were successfully carried out on streams in the city of Ottawa. Sawmill, Mosquito and Graham Creek were planted in the spring of 2006 to help reduce erosion and siltation as well as promote growth of natural plant species along the banks. For 2007 more planting opportunities have been identified and will commence in the spring. Such projects include Phase II planting on Mosquito and Graham Creek.

2.6 Data Management

All data collected, as well as photos taken during the City Stream Watch program, have been entered and are maintained in a digital spatial database by the RVCA. Data on human alterations, instream vegetation, fish habitat, instream pollution or garbage, bank characteristics and invasive species present will be available for each section of the stream that was surveyed. Information on each stream is made available to the public through the Watershed Information System on the RVCA website *www.rideauvalley.on.ca* to facilitate data sharing while maintaining data integrity.

3.0 Results

3.1 The Community Response

A total of 96 volunteers from the community participated in the 2006 City Stream Watch program, consisting of people from a variety of backgrounds and experiences. Each volunteer approached the work in a slightly different way, contributing their own unique qualities to enhance the program as well as the experiences of their fellow volunteers. The most significant quality they all brought with them was their concern for the welfare of the environment in which they live. As a result, over 567 volunteer hours were given to learning about, sampling and rehabilitating streams in the Ottawa area. Table 1 summarizes volunteer activities for the 2006 season.

	Pinecrest Creek	Brassils Creek	Becketts Creek	Greens Creek	Sawmill Creek	Mosquito Creek	Graham Creek	TOTAL
# of Sections Surveyed	26	68	116	0	0	0	0	210
# of Seining/ Electrofishing Events	1	3	0	3	0	0	0	7
# of Species Caught	0	7	0	9	0	0	0	14*
# of Cleanup Outings	1	0	0	0	2	0	0	3
# of kilometres (km) Cleaned	2.2	0	0	0	7	0	0	9.2
# of Riparian Plantings	0	0	0	0	2	1	1	4
# of Temperature Probe Readings	3	2	2	0	0	0	0	7
# of Volunteers	NA	NA	NA	12	37	2	2	96
# of Volunteer Hours	115	105	101	42	147	4	2	567**

Table 1. City Stream Watch Accomplishments of 2006

* This number represents the total number of species caught in all systems. Many species were found in more than one stream. For more detailed results on fish communities refer to fish community sampling page.

** An aquatic invertebrate Sampling/ID session was held at the Jock River landing in which seventeen volunteers attended contributing 51hours to the volunteer total.

3.2 Environmental Monitoring

3.2.1 Pinecrest Creek

Pinecrest Creek is approximately 2.6 kilometres long and flows from Baseline Road, just east of Woodroffe Ave and empties into the Ottawa River at the Ottawa River Parkway, north of Lincoln Fields Shopping Centre. The stream flows through the NCC Greenbelt and follows the Pinecrest Creek recreational trail for its duration. Much of Pinecrest Creek is entombed (flows underground) due to development in the area and therefore, these sections could not be surveyed. Figure 2 shows air photos taken of the Pinecrest Creek area in 2002.

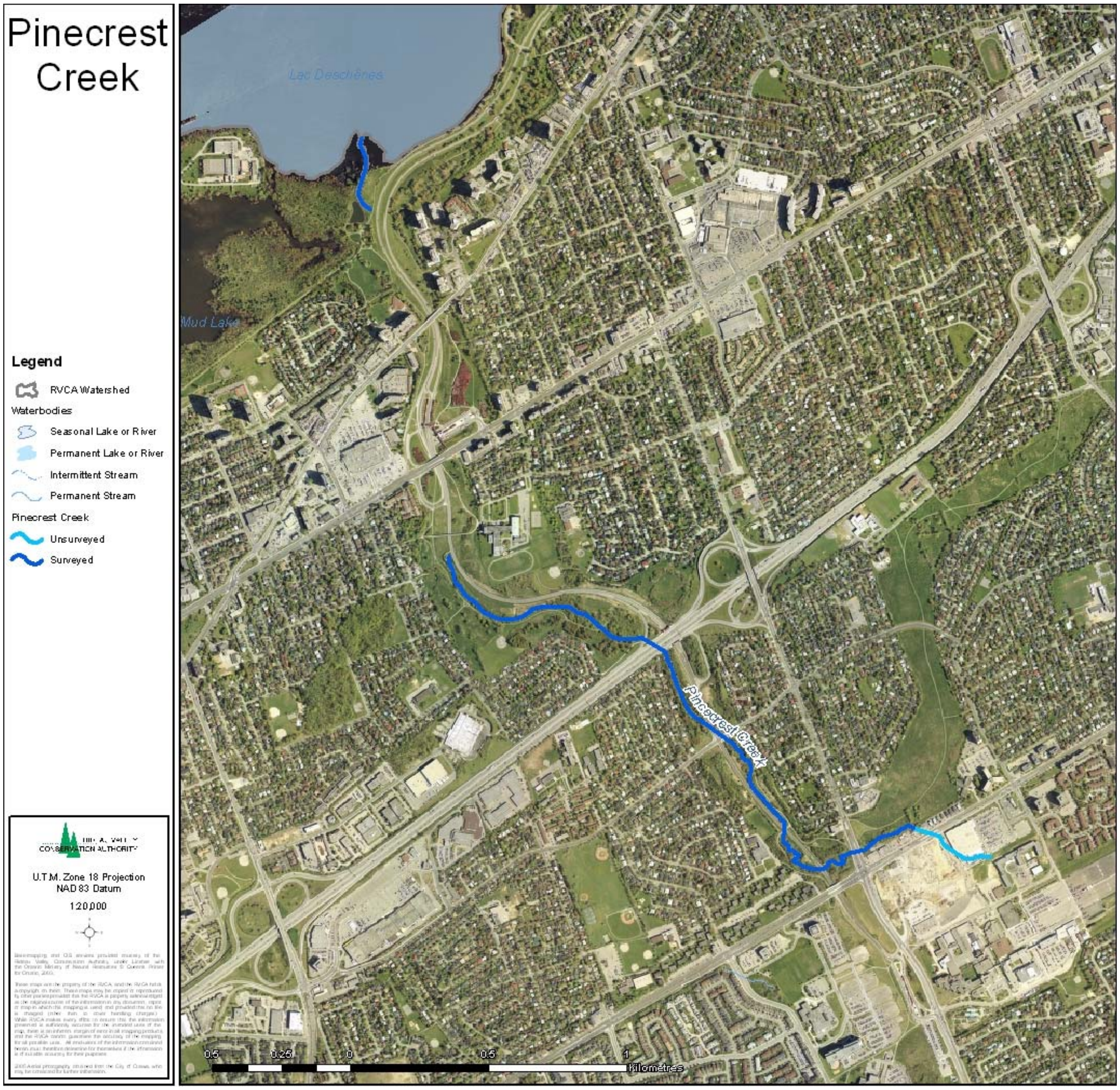

Figure 2. Air Photo of Pinecrest Creek and Surrounding Area.

A total of 2.6 kilometres of Pinecrest Creek was sampled during the 2006 season. The following is a summary of the 26 macro-stream assessment forms filled out by volunteers. Observations concerning anthropogenic alterations, land use, instream vegetation, bank stability, wildlife and pollution are discussed.

1. Observations of Anthropogenic Alterations and Land Use

Figure 3 illustrates the classes of anthropogenic alterations that volunteers observed on Pinecrest Creek. Of the 26 sections of stream sampled, volunteers identified no sections of stream that were without human alterations of some kind. Much of the stream was disturbed from its natural state from the transitway and recreational pathway which run along the banks of the stream. These disturbances along with walk bridges made the 46% (12 sites) of altered sections. Sections that were considered highly altered were a result of entombed sections of stream, major road/bridge crossings and gabion cage re-enforced banks.

Altered sections still in a natural condition did exist and made up approximately 19% of the sampled stream.

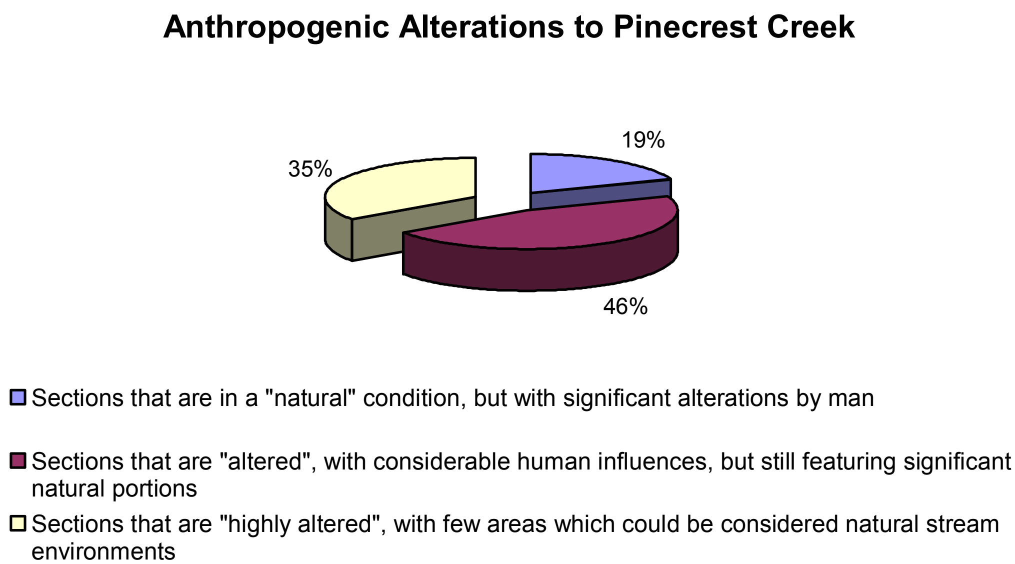

Figure 3. Classes of Anthropogenic Alterations Occurring on Pinecrest Creek.

Figure 4 demonstrates the four different land uses identified by volunteers occurring along the banks adjacent to Pinecrest Creek. Recreational parks and pathways make up the primary land use for Pinecrest Creek. The stream flows through the National Capital Commission (NCC) Greenbelt and the Pinecrest Creek recreational trail follows alongside the stream. Roadway bridges and industrial/commercial development such as the transitway make up a combined 34% of the stream's land use. Although the area surrounding the stream is developed, natural areas still exist making up 22% of the stream. These areas remain natural, as buffers have been left between developed areas and the stream.

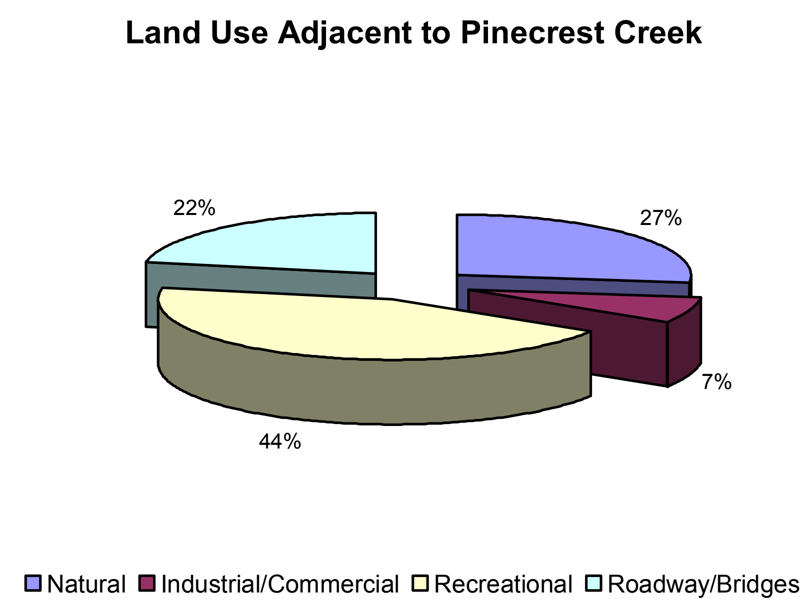

Figure 4. Land Use Volunteers Identified Along Pinecrest Creek.

2. Observations of Instream Vegetation

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 important habitat for fish and wildlife. Figure 5 demonstrates the frequency of instream vegetation in Pinecrest Creek.

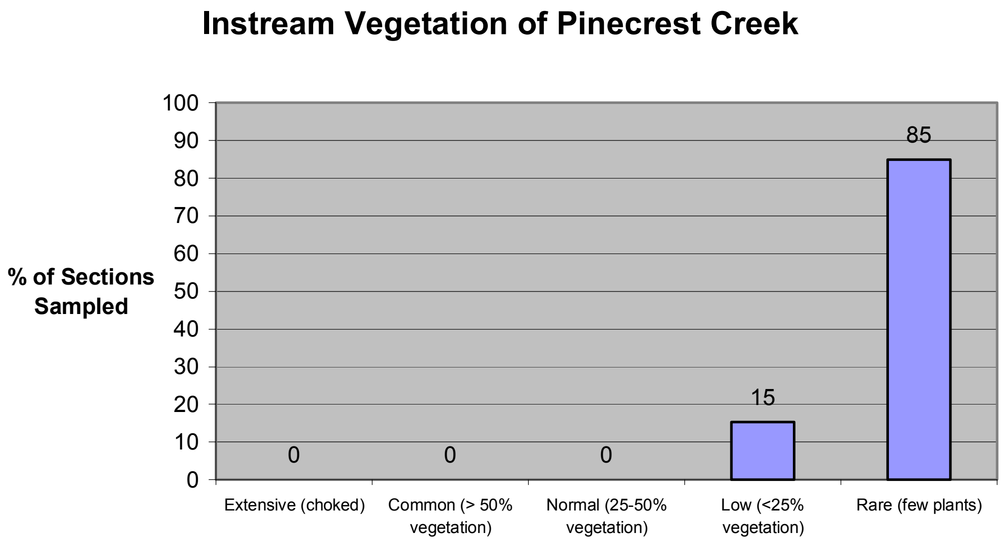

Figure 5. Frequency of Instream Vegetation Abundance in Pinecrest Creek.

Volunteers found Pinecrest Creek contained very little instream vegetation. In the sections surveyed, vegetation was found to be low (<25%) or rare throughout the stream. The only instream vegetation observed was algae on the substrate. A lack of instream vegetation can greatly increase bank erosion and sediment pollution which was problem observed throughout the stream.

3. Temperature Profiling

Temperature is an important parameter in streams as it influences many aspects of physical, chemical and biological health. The temperature of a stream can vary considerably between the seasons as well as fluctuate between night and day. Many factors can influence fluctuations in stream temperature such as groundwater, tributaries, rain runoff and discharge pipes. The greatest factor of fluctuating temperature is solar radiation and runoff from developed areas. Streams with large amounts of riparian canopy cover will yield lower temperatures where areas with no trees will be warmer.

Fisheries and Oceans Canada (DFO) has a standard temperature range to classify water as being cool, cold or warm. Table 2. illustrates this classification and identifies fish species which occupy each temperature range.

Water System	Temperature Range	Common Fish Species
warm water	> 25˚C	carp, bluegill, pumpkinseed, catfish, largemouth bass
cool water	19-25˚C	muskellunge, white sucker, sauger, yellow perch, northern pike, smallmouth bass, black crappie
cold water	<19˚C	trout, salmon, whitefish

Table 2. DFO Water Temperature Classifications

Three temperature dataloggers were set in Pinecrest Creek for a 90-day period beginning on June 12 and removed on September 9, 2006. Figure 6 shows the locations of dataloggers in Pinecrest Creek.

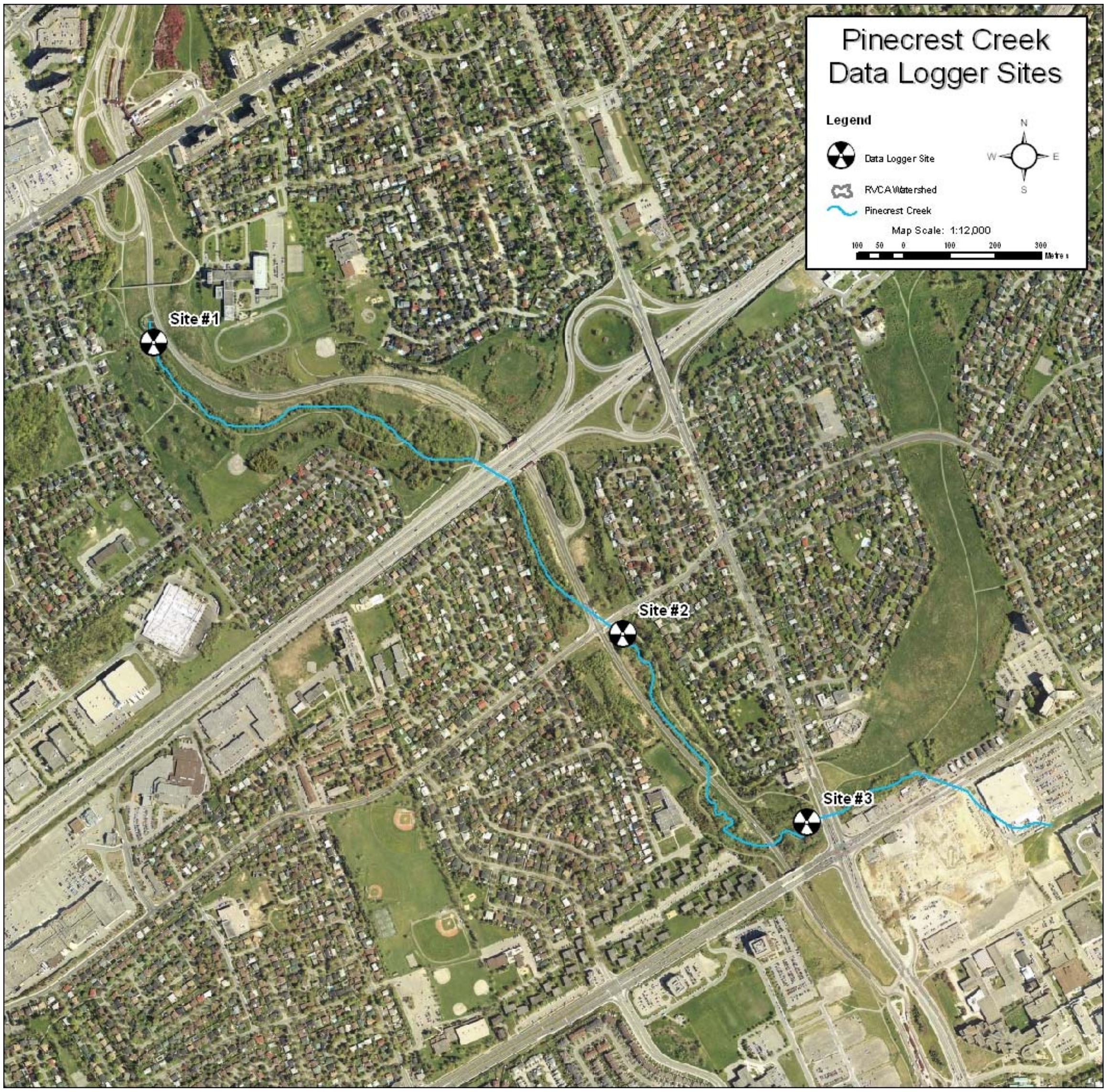

Figure 6. Datalogger Locations Along Pinecrest Creek

Dataloggers were set in three different locations along the stream to give a representative sample of how temperature fluctuates and differs throughout the course of the stream. Sites begin at the furthest downstream site and were placed by walking upstream.

Figure 7 shows the results from the three dataloggers relative to one another.

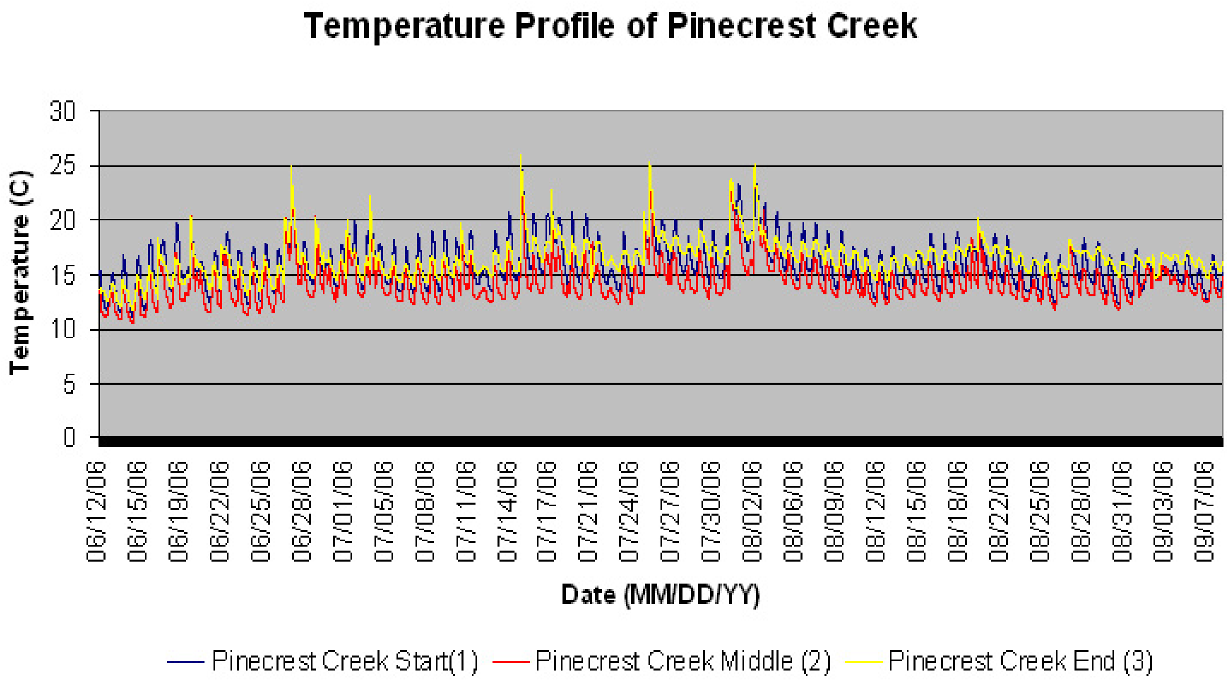

Figure 7. Temperature Profile for Pinecrest Creek

Figure 7 has a consistent trend of fluctuating temperatures throughout the stream. Over the three-month period this stream reached a maximum temperature of 25.93°C and a minimum of 10.51°C. The average temperature for all three dataloggers over the 90 day period is 15.74°C.

When comparing the three dataloggers there is little variation and the same pattern is seen. Temperature highs and lows differ and this can be attributed to the depth of water where the datalogger was placed in and the amount of solar radiation allowed to penetrate the water. For example, when comparing Pinecrest 2 (red) with Pinecrest 3 (yellow), set approximately 1 km apart, there is a noticeable difference in temperature minimums and maximums. This is due to water depth and canopy cover. Pinecrest 2 was placed below a riffle area with shallow water, moderate flow and moderate canopy cover whereas Pinecrest 3 was set in a deep, wide reach with no canopy cover at all. Given this information it can be concluded that canopy cover contributes greatly to keeping stream temperatures cooler.

Another irregular pattern, though consistent in the stream, is seen from July 31 to August 2, 2006. When historical weather data was researched, it was found that the temperature of the stream climbed when air temperatures reached 33°C and heavy rain and thunderstorms moved through the area. This is common in urban streams as impervious surfaces such as pavement, parking lots and other unnatural features absorb and store more of the sun's energy. Features such as the transitway, parking lots at College Square and the NCC pathway are solar heated throughout the day and during afternoon thunderstorms, these surfaces transfer energy to the water that gathers on them. This heated water then ends up in the stream by drainage ways and runoff. Dramatic fluctuations of water temperature such as these can have detrimental effects on aquatic fauna. After thunderstorms subsided water temperatures dropped and then rose again when it began raining in the evening of August 2.

4. Observations of Bank Stability

Bank stability indicates how much soil has eroded from the bank and into the stream. Poor bank stability can greatly contribute to the amount of sediment carried in a waterbody as well as the loss of bank vegetation in the form of bank failure, resulting in trees falling into the stream. Excessive erosion and deposition of sediment within a stream can have detrimental effects on fish and wildlife habitat.

Figure 8 shows the overall bank stability of Pinecrest Creek. In 81% of sections sampled by volunteers, the stream banks along Pinecrest Creek were identified as being unstable or undercut. Many sections identified as being stable were due to artificial features. These included concrete bridge structures and entombed sections which offer no habitat or refuge for wildlife. A percentage of the stable banks along Pinecrest Creek can also be attributed to gabion cage reinforcement. Though gabion cage secures the bank structure they have a tendency to fail and require repair. Gabion structures also create a steep vertical interface between the terrestrial and aquatic ecosystems along a stream, which can negatively impact fish and wildlife. Natural shoreline bioengineering projects such as brush bundles, fascines, live cribwalls and live cuttings are now the preferred options as they require little maintenance and promote the regeneration of vegetation to further stabilize the bank. In addition they also help to dissipate energy from flow to reduce negative affects downstream. These bioengineering projects should be promoted along many of the eroded banks observed on Pinecrest Creek.

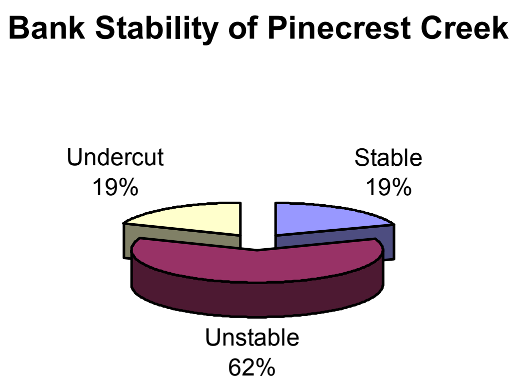

Figure 8. Bank Stability of Pinecrest Creek.

Areas of erosion have been identified on an aerial photo of Pinecrest Creek and can be found in Appendix G. This information includes a percentage of the 100-metre site that is eroded.

5. Observations of Wildlife

The presence or absence of diverse fish and wildlife populations can be an indicator of water quality and overall stream health. Table 3 is a summary of all wildlife observed.

Wildlife	Observed
Birds	Crow, mallard ducks, red-wing blackbird, robin, sparrows, mourning dove, blue jay
Mammals	Chipmunk, grey squirrel, groundhog
Reptiles/Amphibians	None observed
Fish	Minnow species, fry, common white suckers
Aquatic Insects	Aquatic sowbugs, leeches, snails, amphipods
Other	Butterflies, spiders, various arthropods

Table 3. Wildlife Observed on Pinecrest Creek.

6. Observations of Pollution

Figure 9 demonstrates the incidence of pollution in Pinecrest Creek. Pollution in the stream is assessed visually and noted for each section where it is observed. Of the 26 sections sampled, at least one piece of garbage (floating or on the stream bottom) was found in 24 sites making up 92% of the stream. Garbage did not occur in large quantities or accumulate in large amounts, but there was scattered debris in the majority of sections. The two sites that were recorded as not having pollution were under bridges where the incidence of pollution could not be recorded although it is assumed to be present.

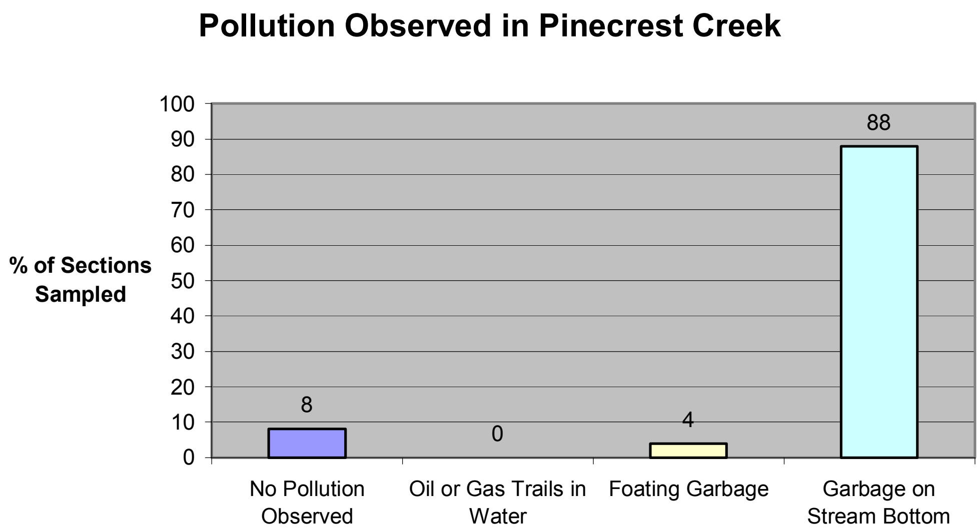

Figure 9. Frequency of Pollution Occurring in Pinecrest Creek.

Much of the garbage found in the stream likely results from high pedestrian traffic on the Pinecrest Creek Trail, littering at transitway stops and on roadways and blowing garbage from College Square Shopping Center. Floating garbage found in the stream consisted of plastic bags and styrofoam. Garbage found on the stream bottom include scrap metal, plastic, glass bottles, cans, barbeque grill, shopping carts and bicycle parts. A stream cleanup was held on Pinecrest Creek as part of World Oceans Day to help rid the stream of human debris. For more information on the cleanup see page 40. Pinecrest Creek would benefit from annual cleanups where members from the community walk the stream and remove all human debris from its stream channel.

3.2.2 Becketts Creek

Becketts Creek is approximately 18 kilometres long, flowing from north of Sarsfield and emptying into the Ottawa River just east of Cumberland. Figure 10 shows a more detailed look at the stream and its location.

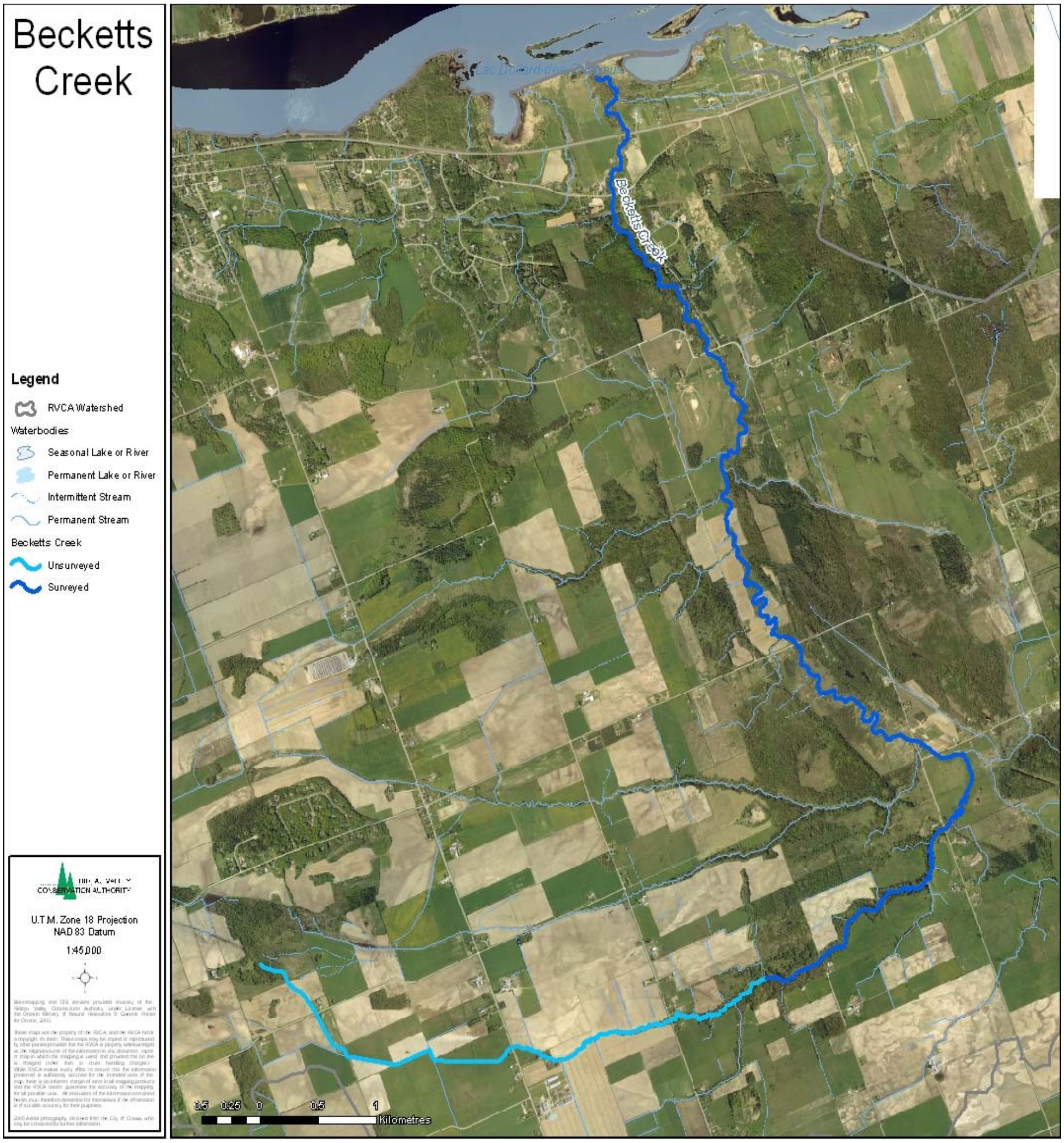

Figure 10. Map of Becketts Creek and Surrounding Area.

A total of 11.6 kilometres of Becketts Creek was sampled throughout the 2006 season. Approximately 6 km of stream was not surveyed as these sections were straight drainage areas and therefore will not be included in the analysis. The following is a summary of the 116 macro-stream assessment forms filled out by volunteers. Observations for anthropogenic alterations, land use, instream vegetation, bank stability, wildlife and pollution are discussed.

1. Observations of Anthropogenic Alterations and Land Use

Figure 11 illustrates the classes of anthropogenic alterations observed by volunteers on Becketts Creek. Of the 116 sections sampled, volunteers identified ninety sections that displayed no human alterations. Of the remaining sections, two were considered highly altered due to the construction of a bridge at French Hill Road. This construction is temporary and will be returned to its natural state when complete. Only 18% of sections were observed as being altered by volunteers. These alterations include shoreline modification and armouring, bridges for roadways and clearing of riparian vegetation due to development.

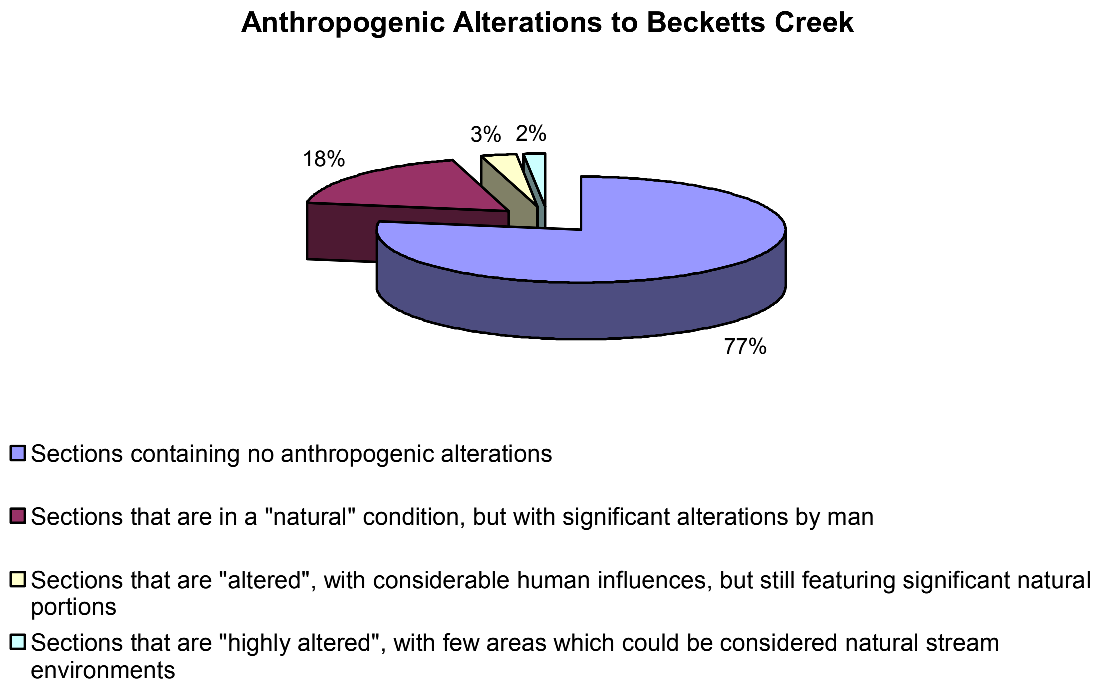

Figure 11. Classes of Anthropogenic Alterations Occurring on Becketts Creek.

Volunteers observed many different land use patterns occurring along the banks of Becketts Creek. Figure 12 demonstrates the different land uses identified adjacent to Becketts Creek. Natural areas made up 79% of the sampled stream while abandoned agricultural fields, which have a low impact on the stream, made up 10%. Land uses such as residential property, pastures, active agriculture, roadways and bridges made up the remaining 11%. Many large natural buffers are left between development and Becketts Creek making it a natural, healthy system.

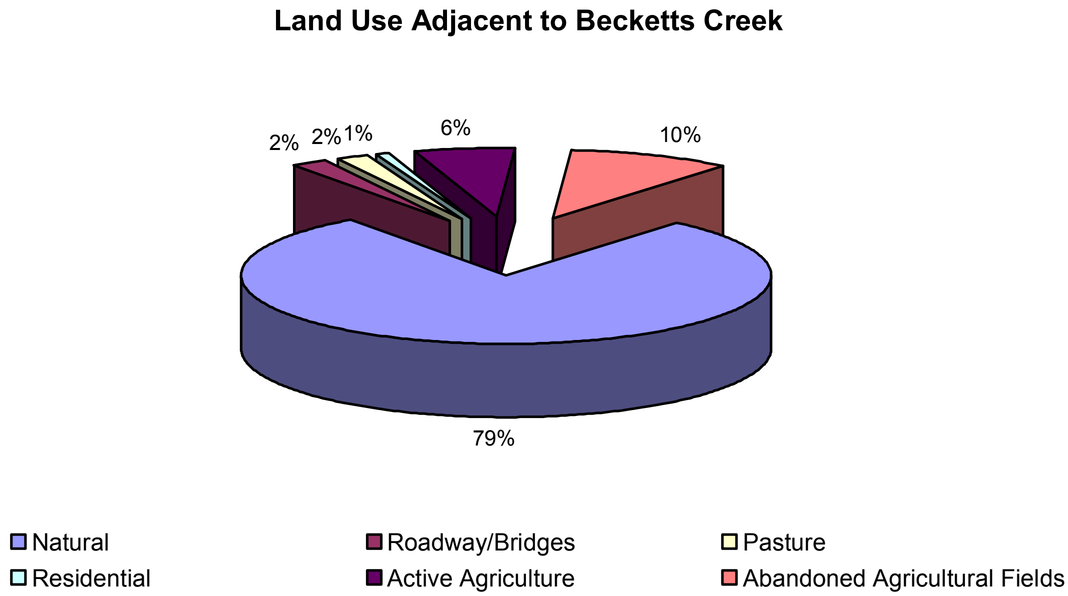

Figure 12. Various Land Uses Volunteers Identified Occurring on Becketts Creek.

2. Observations of Instream Vegetation

Figure 13 shows the abundance of instream vegetation in Becketts Creek. Instream vegetation was categorized as being normal in 34% of sections sampled. In 56% of sections sampled, instream vegetation was considered low or rare. This was due in part by slick clay substrate and murky water that reduces the ability of sunlight to penetrate to stream bottom. Rare and low vegetation growth negatively affects aquatic systems by limiting instream cover and food sources. Two sections were sampled that had extensive growth of emergent instream vegetation. This extensive growth does not prove harmful to the stream as extensive algae would, since it still allows sunlight to penetrate the substrate and offers essential nursery habitat to fish and nesting habitat for wildlife.

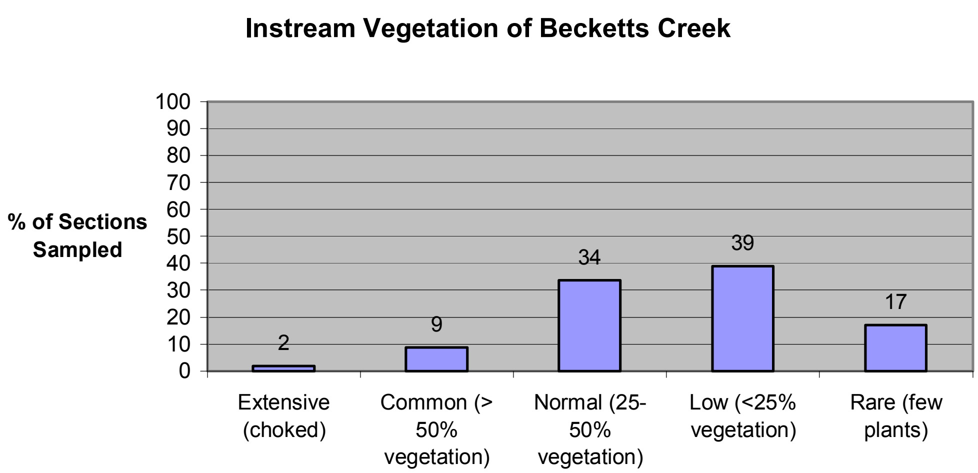

Figure 13. Frequency of Instream Vegetation Abundance in Becketts Creek.

Exotic plants are species that are not native to an area and cause specific harm to an ecosystem. Species such as purple loosestrife, European frogbit, Eurasian milfoil and flowering rush are examples of invasive plant species. The presence of these exotics degrade ecosystems as they out-compete native species, especially the rare or endangered species which in turn eliminate fish and wildlife habitat.

Purple loosestrife was found in thirteen sections along Becketts Creek. Areas where invasive species exist have been identified on aerial photographs in Appendix H for Becketts and Brassils Creeks. These maps will help mangers determine whether or not invasive species are growing in population.

3. Temperature Profiling

Three temperature dataloggers were set in Brassils creek for a 90-day period beginning on June 12 and removed on September 9, 2006. When analyzed, temperatures from Datalogger 2 show that it may have been malfunctioning and therefore, it will not be analyzed in this report. Data will be continued to be studied and sampled at Site 2 to see if data is consistent in 2007. Figure 14 shows the locations of dataloggers in Brassils Creek.

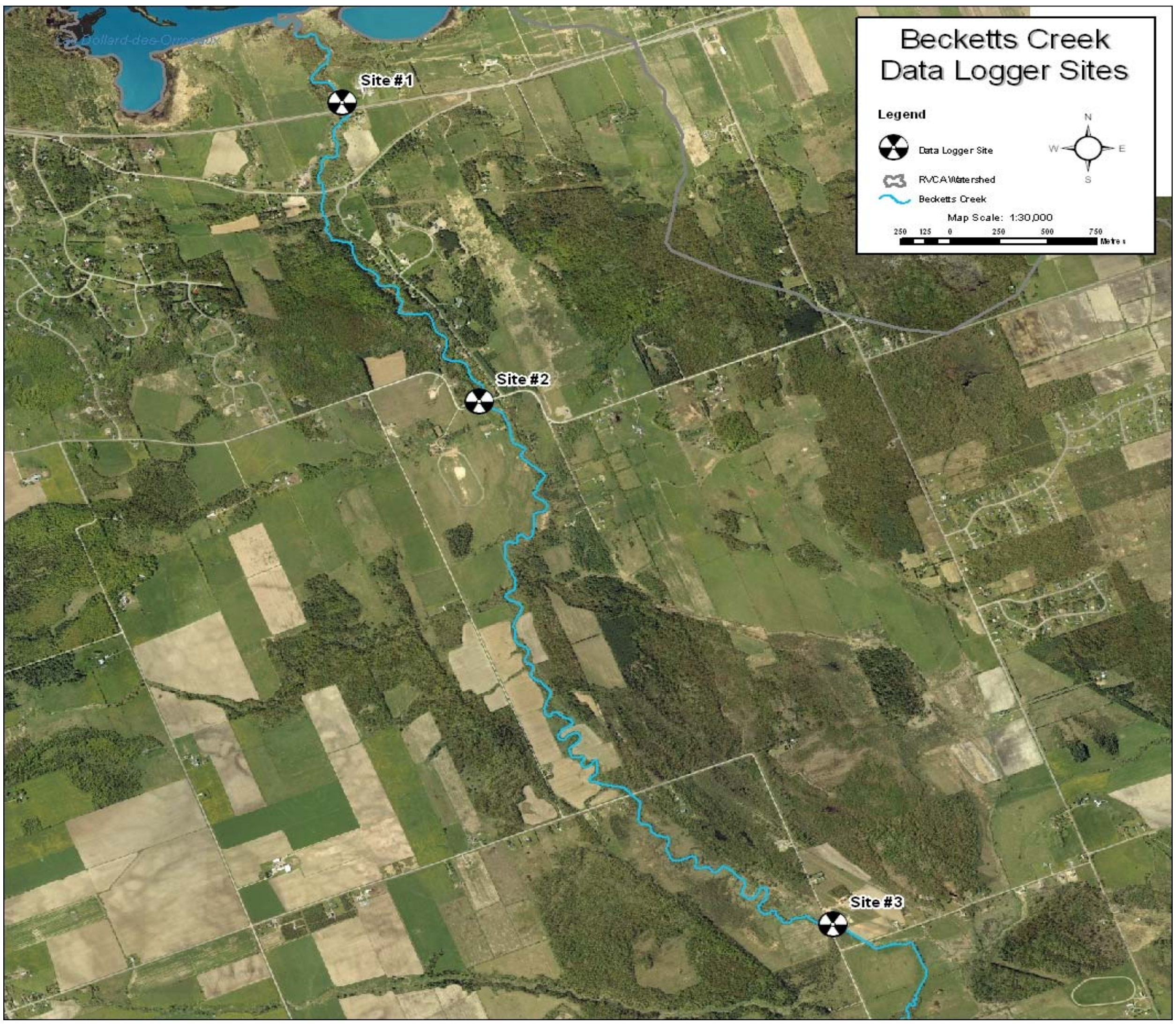

Figure 14. Datalogger Locations Along Becketts Creek

Dataloggers were set in three different locations along the stream to give a representative sample of how temperature fluctuates and differs throughout the course of the stream. Sites begin at the furthest downstream site and were placed by walking upstream.

Figure 15 shows the results from the dataloggers relative to one another.

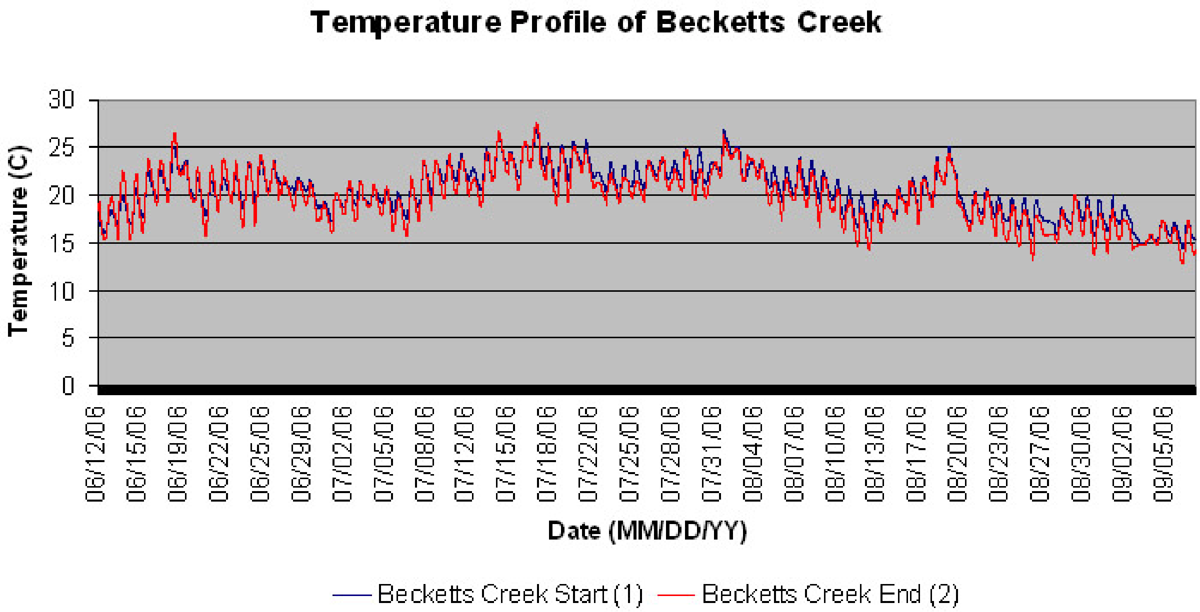

Figure 15. Temperature Profile for Becketts Creek

Figure 15 shows a consistent temperature trend at both start and end dataloggers. Becketts Creek reached a maximum temperature of 27.53 °C and a minimum of 12.68 °C during the three-month period. Declines in water temperature can be seen throughout the graph. When historical weather data was obtained, these drops in temperature correspond with rain events of 10mm of rain or more moving through the area.

When rain events from this rural stream are compared to rain events on Pinecrest Creek, an urban stream, is can be seen how development can affect water temperature. Temperatures usually drop during rain events on rural streams due to less runoff of rainwater whereas a stream such as Pinecrest Creek has a high runoff rate from developed areas where water is warmed before entering the stream, resulting in elevated stream temperature during rain events.

4. Observations of Bank Stability

Figure 16 demonstrates the overall bank stability of Becketts Creek. Evidence of erosion from the stream bank was observed along 57% of the shoreline, coinciding with areas of little or no vegetation. Many failed banks, where trees have fallen into the stream, were observed. Becketts Creek is a natural flowing stream, with little urban/commercial disturbance, so it is likley that most of this erosion is natural and possibly a result of a large drainage area and varying soil conditions.

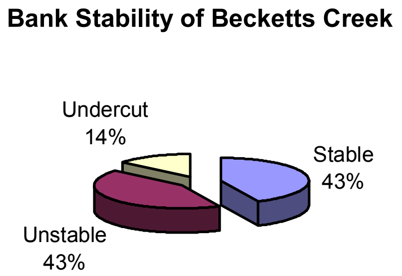

Figure 16. Bank Stability of BeckettsCreek.

Areas of erosion have been identified on an aerial photo of Becketts Creek and can be found in Appendix G. This map includes a percentage of the 100 m sites, which are eroded and will prove useful for rehabilitation opportunities.

5. Observations of Wildlife

Volunteers recorded the presence of many types of wildlife in and around Becketts Creek. Table 4 is a summary of wildlife observed.

Wildlife	Observed
Birds	Cedar waxwing, mallard ducks, chickadee, crow, American goldfinch, mourning doves, great blue heron, green heron, bluejay, hawk, killdeer, oriole, kingfisher, red-wing blackbird, grackles, sandpiper, woodpecker
Mammals	Chipmunk, squirrel, white-tailed deer, raccoon
Reptiles/Amphibians	American toad, green frog, bullfrog, painted turtles, leopard frog
Fish	Carp, minnows, fry,
Aquatic Insects	Caddisfly, damselfly, dragonfly, waterstriders, whirligig beetle, mayfly, leech, waterpenny, aquatic sowbugs, stonefly, predacious diving beetle, water scorpion, snails, gastropods
Other	Various arthropods

Table 4. Wildlife Observed on Becketts Creek.

6. Observations of Pollution

Figure 17 demonstrates the incidence of pollution in Becketts Creek. Floating debris and garbage on the stream bottom was observed in 33% of sampled sections. Though the majority of stream is natural and isolated from development, pollution can still make its way into the stream from littering by passing motorists. The majority of pollution observed was downstream of road crossings. The garbage found consisted of styrofoam, glass and plastic bottles, automobile tires, scrap metal and plastic bags.

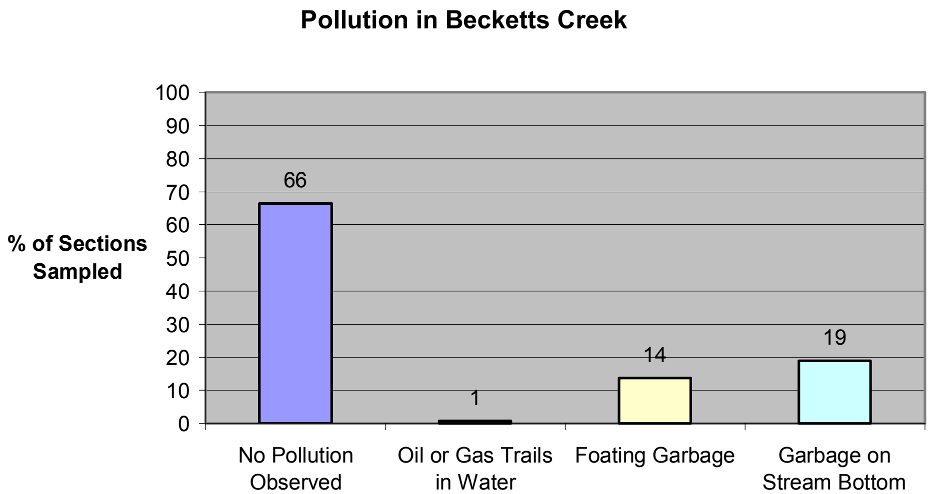

Figure 17. Frequency of Pollution Occurring in Becketts Creek

Oil or gas trails were observed in three sections, which can be attributed to runoff from busy roadways. Although there is a high percentage of garbage on the stream bottom recorded, pollution is not a major problem in Becketts Creek. The frequency of human debris in each section was low but many sections had the odd piece of garbage such as a plastic bag, bottle or wrapper, therefore making the numbers seem as if there was a high density of pollution. Becketts Creek would benefit from a walk along cleanup where community volunteers walk a reach of stream ridding it of the pollution problems identified. This would also provide an opportunity to learn about the ecosystem and to observe a natural stream system within the City of Ottawa.

3.2.3 Brassils Creek

Brassils Creek is approximately 10.6 kilometres long, flowing through mainly natural land. The streams watershed includes a class 3 wetland, known as Brassils Creek Wetland and is home to a significant waterfowl population. The stream begins just north of Roger Stevens Road and empties into the Rideau River at Burritts Rapids. Figure 18 shows air photos taken of the Brassils Creek area in 2002.

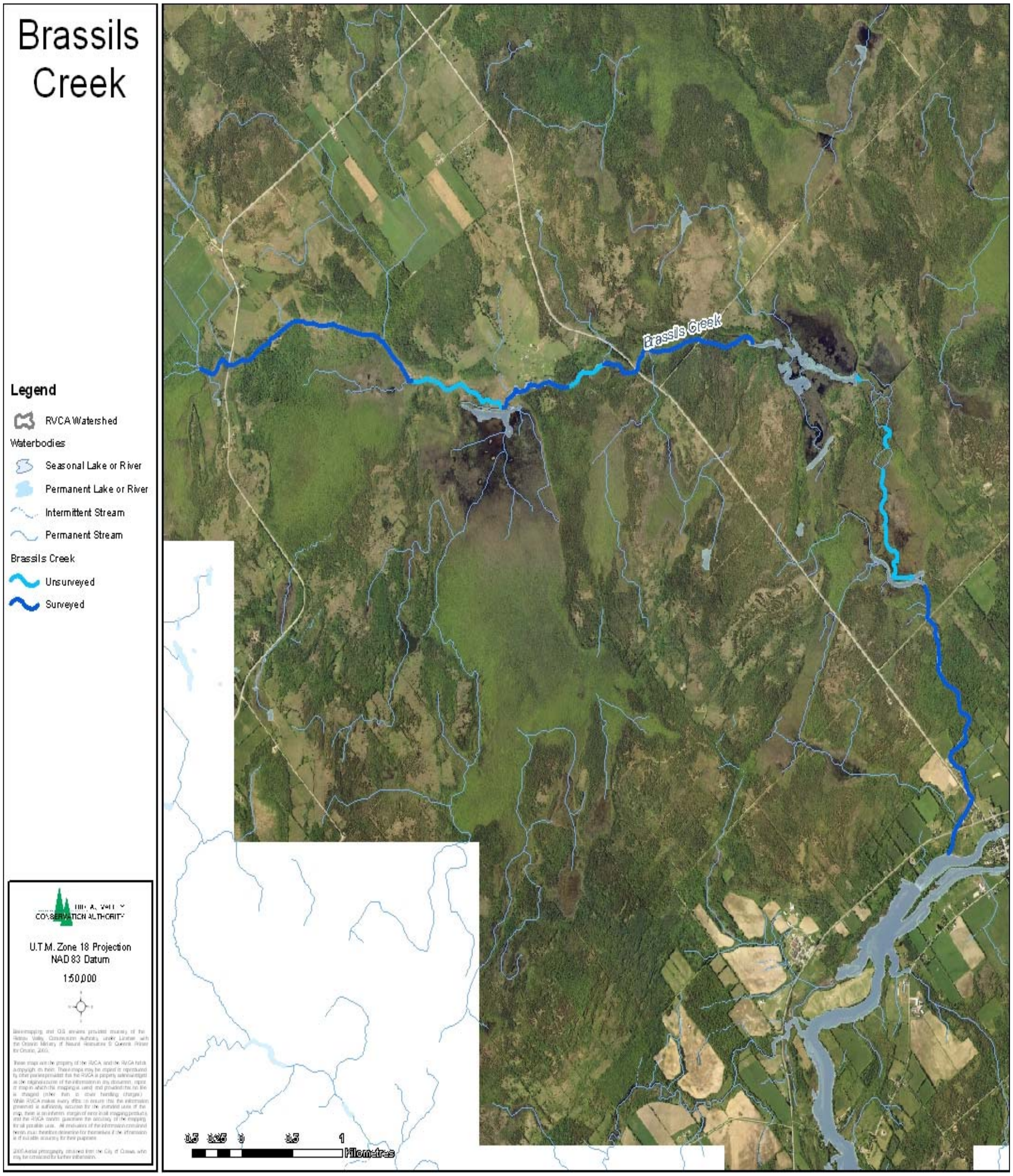

Figure 18. Air Photo of Brassils Creek and Surrounding Area.

A total of 6.8 kilometres of Brassils Creek was sampled during the 2006 season. The headwaters of Brassils Creek were not sampled due to a change in habitat type from a stream to wetland. There were also many instances where the stream turned into a wetland as it flowed toward the Rideau River, therefore these areas were skipped and not surveyed. Wetland areas do not fall under the macro stream survey since there is no defined channel; however, future wetland studies of these areas would provide valuable data on the system.

The following is a summary of the 68 macro stream assessment forms filled out by volunteers. Observations concerning anthropogenic alterations, land use, instream vegetation, bank stability, wildlife and pollution are discussed.

1. Observations of Anthropogenic Alterations and Land Use

Figure 19 illustrates the classes of anthropogenic alterations that volunteers observed on Brassils Creek. Of the 68 sections of stream sampled, volunteers identified 54 sections that displayed no human alterations or disturbances. Of the remaining sections, three were considered altered and these alterations include culverts and bridges for roadways as well as some shoreline stabilization work by landowners. There were no sections considered highly altered observed along this system.

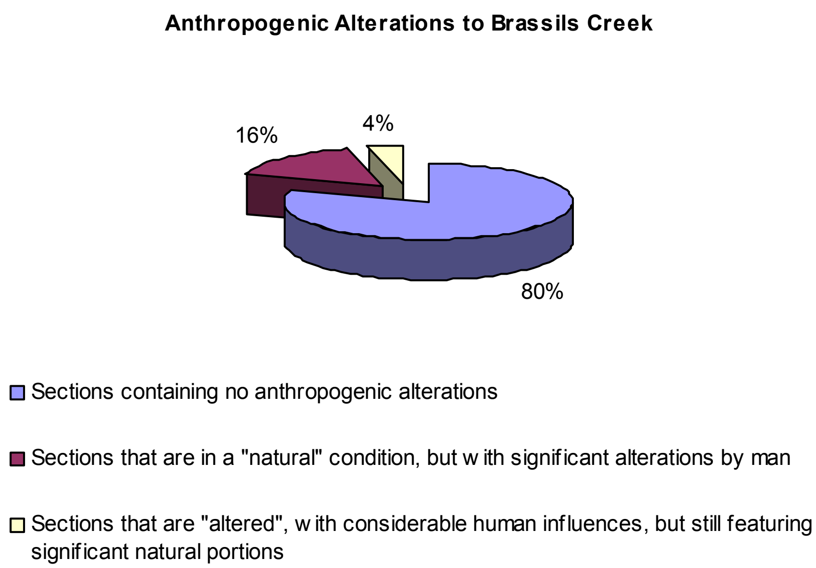

Figure 19. Classes of Anthropogenic Alterations Occurring on Brassils Creek.

Figure 20 demonstrates the four different land uses observed by volunteers occurring adjacent to Brassils Creek. Natural areas exist along 82% of the creek, while residential areas made up a small 2%. Agricultural impacts were minimal for most of the stream as grazing pasture made up 9% of sampled sections. Near the upper reaches of the stream, cattle access was an issue resulting in extensive bank trampling and increased erosion and siltation. These impacts can drastically degrade fish and wildlife habitat. Roadways and bridges where the stream passes under major road crossings such as Dwyer Hill Road and Roger Stevens Road made up 2% of land use along Brassils Creek.

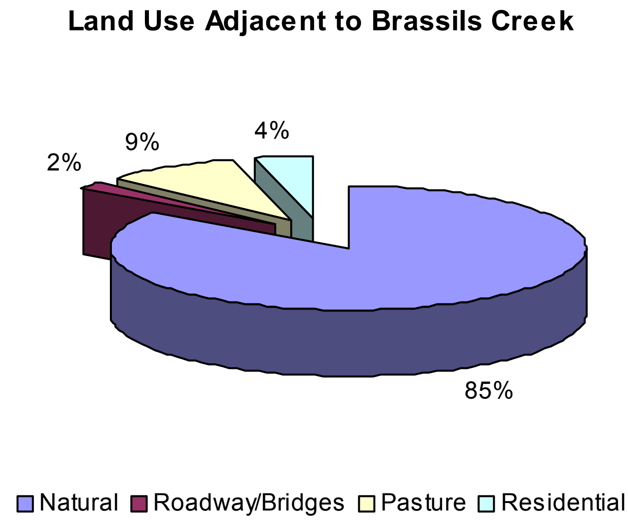

Figure 20. Various Land Use Volunteers Identified Occurring on Brassils Creek.

2. Observations of Instream Vegetation

Figure 21 demonstrates the incidence of instream vegetation abundance in Brassils Creek. Instream vegetation was categorized as being common to normal for 79% of the stream. There were three sections, making up 5% of the stream, which represented extensive vegetation. These sections were in isolated wetland areas where it is common to find thick growth of macrophytes. Low vegetation made up 16% of sampled sections and was due to a change of substrate from soft muck/organic to hard rubble, boulder and bedrock. Overall, instream vegetation was considered to be in a healthy abundance for aquatic organisms.

The frequency of invasive species was high in Brassils Creek. Purple loosestrife, European frogbit and rusty crayfish were identified. See Appendix I for a map of distribution and frequency.

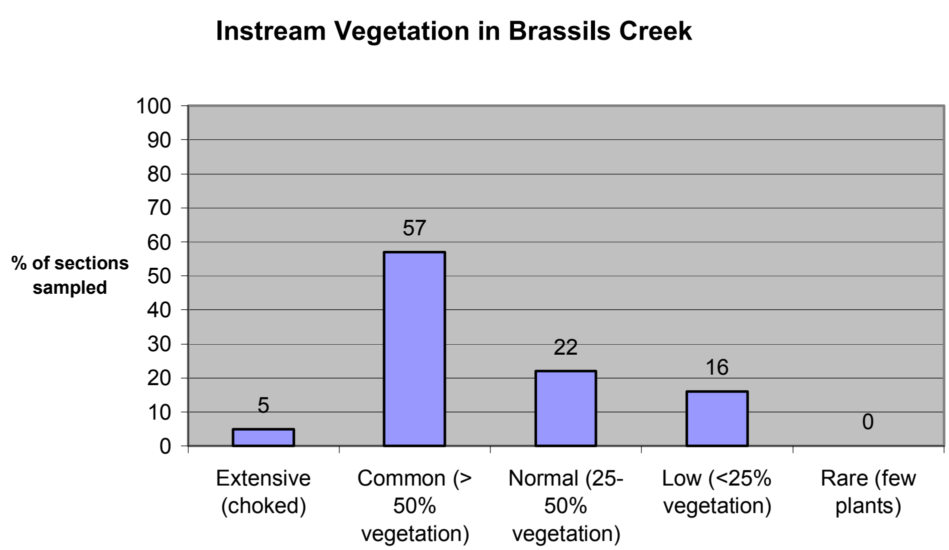

Figure 21. Frequency of Instream Vegetation Abundance in Brassils Creek.

3. Temperature Profiles

Three temperature dataloggers were set in Brassils Creek for a 90-day period beginning on June 12 and removed on September 9, 2006. Datalogger 3 was not recovered therefore only two sites were analyzed. Figure 22 shows the locations of dataloggers in Brassils Creek.

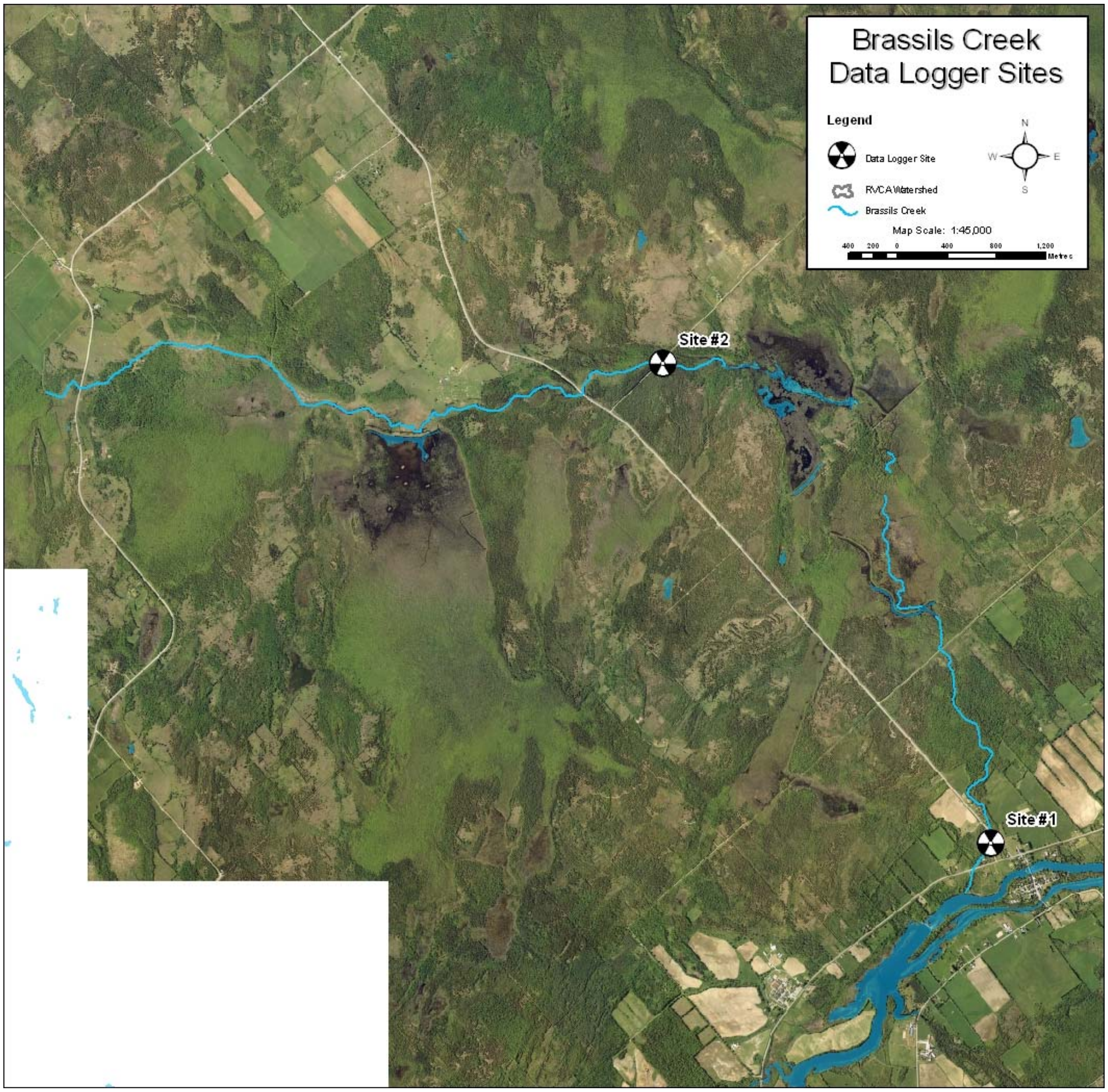

Figure 22. Datalogger Locations Along Brassils Creek

Sites begin at the furthest downstream site and were placed walking upstream. Figure 22 shows the results from the two dataloggers.

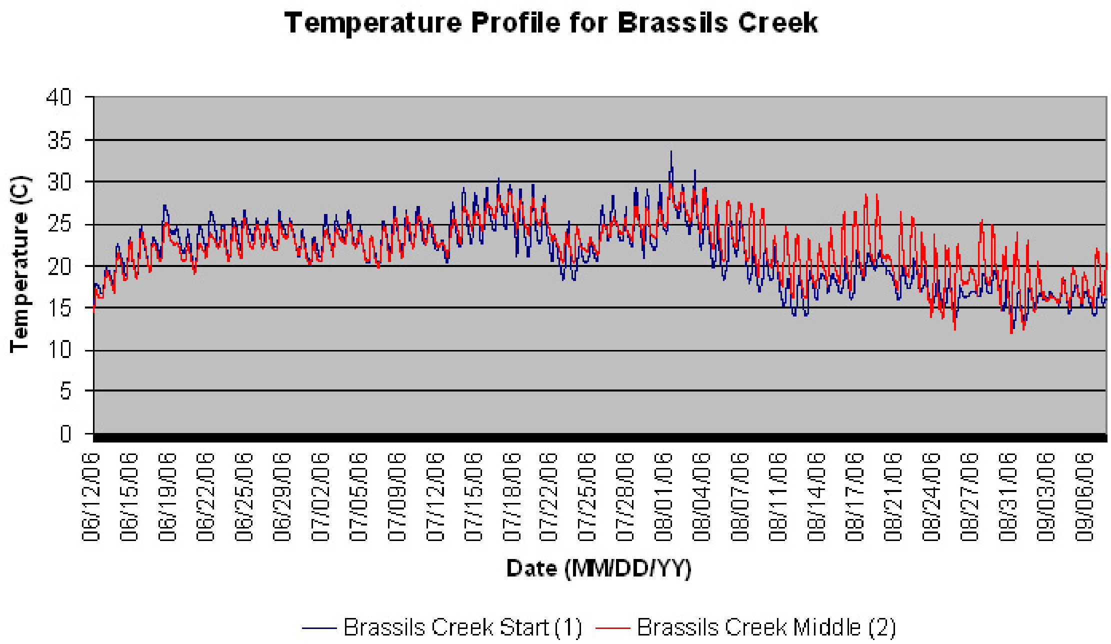

Figure 23. Temperature Profile for Brassils Creek

The two temperature patterns mirror each other almost perfectly for the first month. In mid July a temperature variance is seen, and in August water temperatures at Datalogger 2 begin to heat up and stay warmer than Datalogger 1. For example on August 18 Datalogger 1 only reaches a max temperature of 21.52°C and Datalogger 2 hits a maximum of 28.53°C, a difference of 7°C. After comparing the temperatures from Datalogger 2 to historical weather data it can be said that the stream flow got so low that the datalogger was out of water and exposed to air, recording air temperature instead of water temperature. Temperatures from Datalogger 2 match air temperatures from the same dates and times as the historical weather data. From August 2 to Sept 2 there was only 18mm of rain and air temperatures up to 30+°C, therefore it can be concluded that Datalogger 2 was exposed out of water from August 2 to September 2 resulting in the temperature change seen in Figure 30.

Temperature data from Datalogger 2 is void as it was out of water. Data from Datalogger 1 reveals that the stream (at Dwyer Hill Rd.) reached a maximum temperature of 33.58°C and a minimum of 12.63°C. This maximum water temperature seems high but historical weather data shows that the day's maximum temperature was 36°C. This section has a lot of exposed bedrock, which would absorb energy and warm the stream. The average temperature for Datalogger 1 over the 90 day period is 21.22°C. It can be said that Brassils Creek is a coolwater stream with warm water reaches.

4. Observations of Bank Stability

Figure 24 demonstrates the overall bank stability of Brassils Creek. Evidence of erosion from the stream bank was observed along 8% of the shoreline, coinciding with areas of little or no vegetation. Being a rural stream, Brassils Creek has had little human disturbance from development which is reflected in the stability of the banks. The banks of the stream are densely vegetated and stable resulting from a natural healthy buffer.

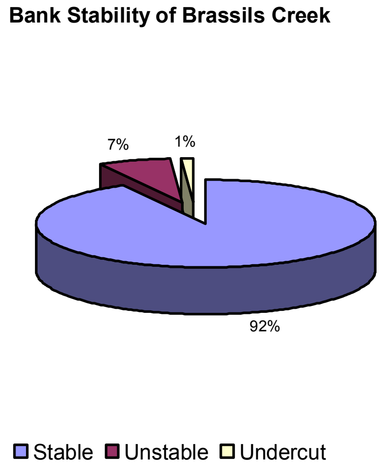

Figure 24. Bank Stability of Brassils Creek.

South of Roger Stevens Road, trampling of the stream banks by cattle has a significant impact on the stream and accounts for the majority of erosion along this system. Allowing cattle to access the stream for water can cause a number of problems. Riparian zones are critical habitat for fish and wildlife and hooves trampling the soft stream bank increase erosion and release sediment into the water degrading the streams habitat. It is important to fence along streams to keep livestock away from the water as they damage banks, increasing erosion of the property and lowering the streams water quality. It is recommended that fences be set a minimum of 30 meters from the top of the bank to improve stream health and reduce the likelihood of contaminated runoff reaching the stream.

Areas of erosion have been identified on an aerial photo of Brassils Creek and can be found in Appendix G. This information includes a percentage of the 100 meter sites, which are eroded and/or undercut.

5. Observations of Wildlife

Volunteers recorded the presence of many types of wildlife in and around Brassils Creek. Table 5 is a summary of wildlife observed.

Wildlife	Observed
Birds	Canada geese, mallard ducks, great blue heron, kingfisher, red-wing blackbird, sandpiper, crow, robin
Mammals	Muskrat, squirrel, chipmunk
Reptiles/Amphibians	Green frogs, bullfrogs, leopard frog
Fish	Logperch, minnows, fry,
Aquatic Insects	Water strider, whirligig beetle, dragonfly, caddisfly, crayfish, stonefly, giant water bug, leeches, water scorpion, mayfly, aquatic sowbugs, damselfly,
Other	Rusty crayfish (invasive species), arthropods

Table 5. Wildlife Observed on Brassils Creek.

6. Observations of Pollution

Figure 25 demonstrates the incidence of pollution in Brassils Creek. Pollution was observed in only 19% of sampled sections. Of the 68 sections sampled, no pollution was found in 55 sections making up 81% of the stream.

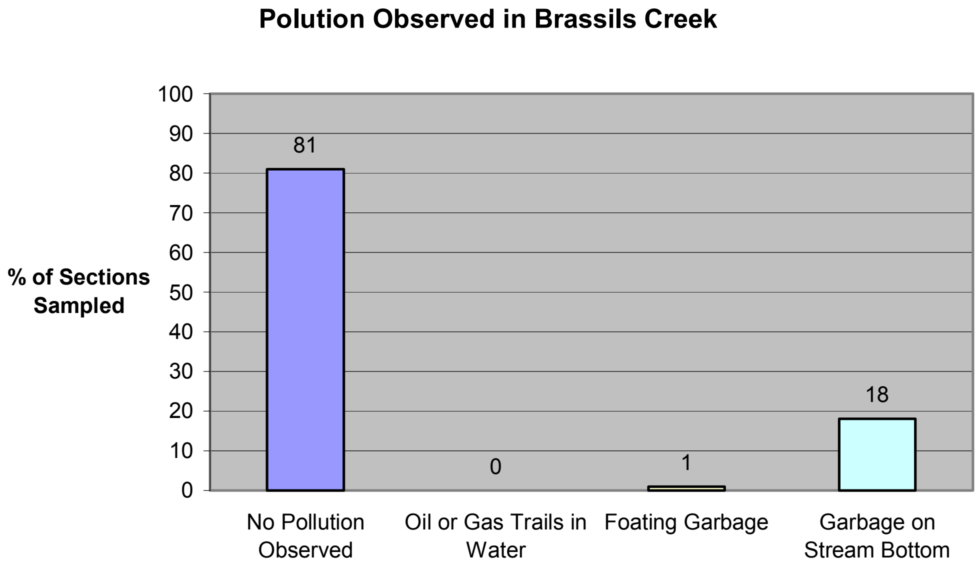

Figure 25. Frequency of Pollution Occurring in Brassils Creek.

Brassils Creek is a rural stream therefore pollution is low. Streams that flow though rural land generally lack human disturbance, which are a result of urban/commercial pressures. Pollution was observed in the reaches in and around the town of Burrits Rapids and downstream of major road crossings such as Dwyer Hill Road. Pollution included cans, plastic, tires, scrap metal, styrofoam, old lumber and car parts.

3.3 Fish & Aquatic Invertebrate Sampling

3.3.1 Greens Creek

In 2006, a different approach was taken to fish community sampling. Instead of volunteers coming out and assisting in sampling fish, a “Fish Community Sampling and Identification” session was held. Interested volunteers from the community were invited to Greens Creek where they would learn hands-on the various methods of fish capture, including seine netting and electrofishing. This session was instructed by RVCA staff along with Brian Coad, Ichthyologist from the Canadian Museum of Nature. In total, twelve volunteers attended and contributed 42 hours to learning fisheries sampling and identification skills. This training session was part of a pilot project in preparation for the 2007 Biothon. Figure 26 shows the locations of the sampling sites and Table 7 is a summary of the fish caught in Greens Creek.

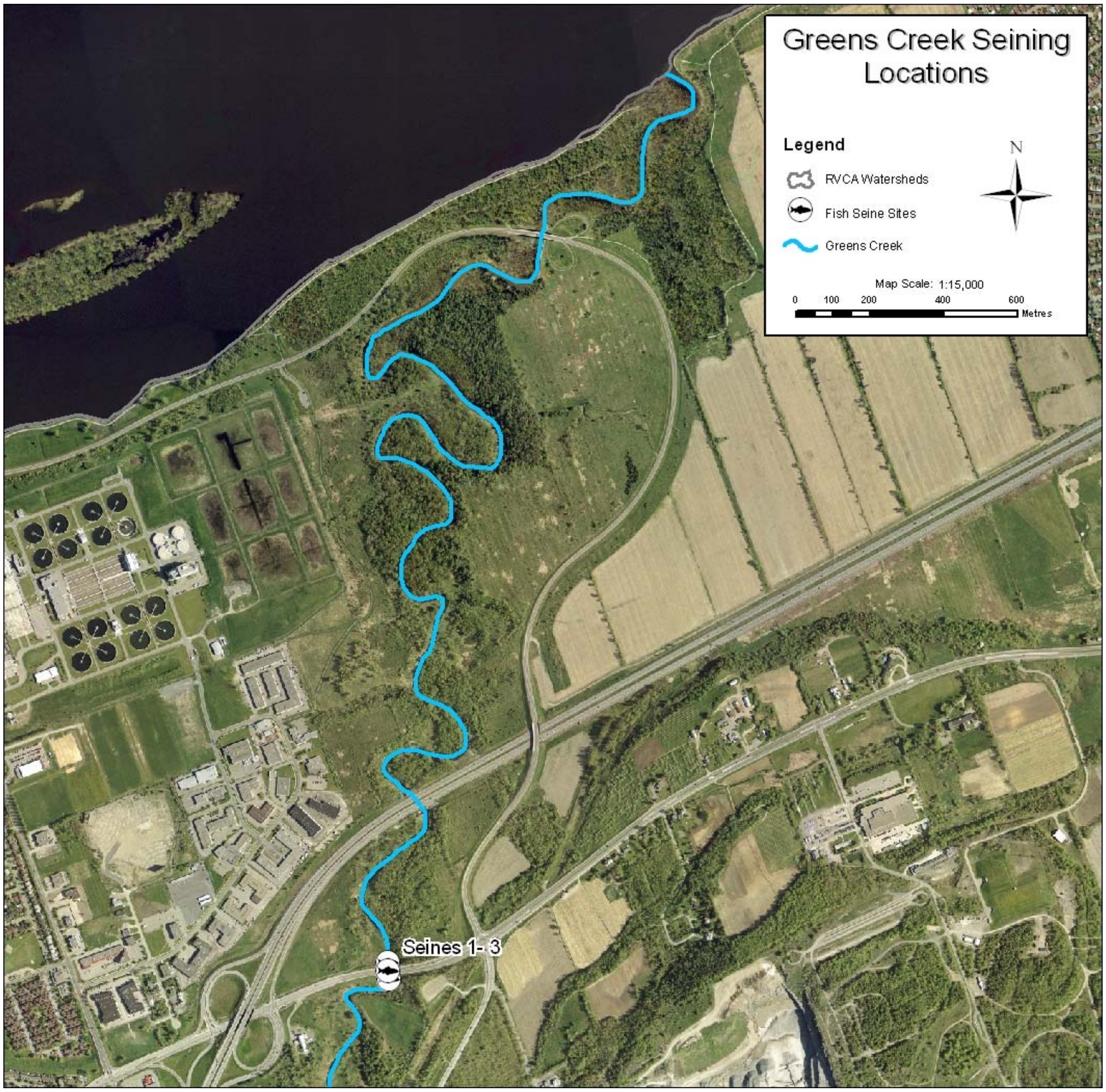

Figure 26. Air Photo of Greens Creek Showing Seining Site Locations.

Water chemistry data was taken prior to netting using an instrument called a YSI probe. This information aids in determining the quality of water in relation to fish abundance and diversity. When looking at fish communities it is important to look at many aspects of the stream to determine why or why not certain fish species are present.

Water and air temperature are important because these parameters influence many aspects of physical, chemical and biological health. Connected closely to water temperature is dissolved oxygen (DO). Dissolved oxygen is what stream-dwelling species such as fish and invertebrates use to breathe. Fast flowing, cold water will have higher dissolved oxygen content than slow moving warm water. This is because cold water has the ability to hold more oxygen as does water that is constantly churning, thereby incorporating air from the atmosphere into the water. Conductivity is a measure of the water's ability to pass an electrical current. It is primarily affected by the geology of the area in which the stream flows. Streams with clay soils tend to have a higher conductivity because of ionized materials in the water. The pH of water is a scale used to evaluate the alkalinity or acidity of water and is ranked on a scale of 1 to 14. Acidity increases as pH gets lower (7 being neutral). The pH determines the solubility and availability of nutrients and heavy metals to stream dwelling organisms. Table 6 summarizes water chemistry data for each seining site.

Location	Seine #	Date (mm/dd/yy)	Air Temp (°C)	Water Temp (°C)	DO (mg/L)	pH	Conductivity (uS/cm)	Substrate	Instream Vegetation
Greens Creek	1	30/07/2006	28	22.7	11.1	7.9	1716*	clay with boulders and rubble	algae, pondweed
Greens Creek	2	31/07/2006	28	22.5	11.27	7.9	1716*	clay with boulders and rubble	algae, pondweed
Greens Creek	3	30/07/2006	28	23.1	11.56	8	1714*	clay with boulders and rubble	algae, pondweed

Table 6. Water Chemistry Results at Seining Sites for Greens Creek

* Conductivity of Greens Creek is very high therefore electrofishing was not successful at this site. As mentioned, conductivity is a measure of the water's ability to pass an electrical current. Greens Creek has a clay substrate which elevates the streams conductivity making it hard to shock fish. Although electrofishing yielded no fish, volunteers were still able to observe and learn how this fish sampling equipment works.

Table 7 summarizes the biological data obtained from each seine-netting event on Greens Creek. A total of nine different fish species were collected.

Seine #	Species	Number	Total Length (mm)	Weight (g)	Comments
1	Common shiner	2	308	117.5	NA
	Creek chub	1	NA	9.5	NA
	Logperch	2	NA	16.5	NA
	Spottail shiner	2	NA	3.9	NA
	Johnny darter	9	NA	3	NA
	Emerald shiner	2	NA	3.6	NA
	Longnose dace	7	NA	4.7	NA
2	Johnny darter	12	NA	3.9	NA
	Common white sucker	2	245, 227	122, 111	NA
	Common shiner	2	NA	120.2	NA
3	Common white sucker	1	230	113.8	red bloches on body, lesion on gill plate
	Common shiner	3	140	NA	NA
	Logperch	2	NA	NA	NA
	Longnose dace	3	NA	NA	NA
	Johnny darter	25	NA	NA	NA
	Trout-perch	6	NA	41.1	NA

Table 7. Results of Seine Net Catches on Greens Creek

3.3.2 Brassils Creek

Brassils Creek was sampled twice throughout the season. A total of seven species were caught in Brassils Creek, most notably being young of year and juvenile largemouth bass. Figure 27 shows the locations of the electrofishing sites.

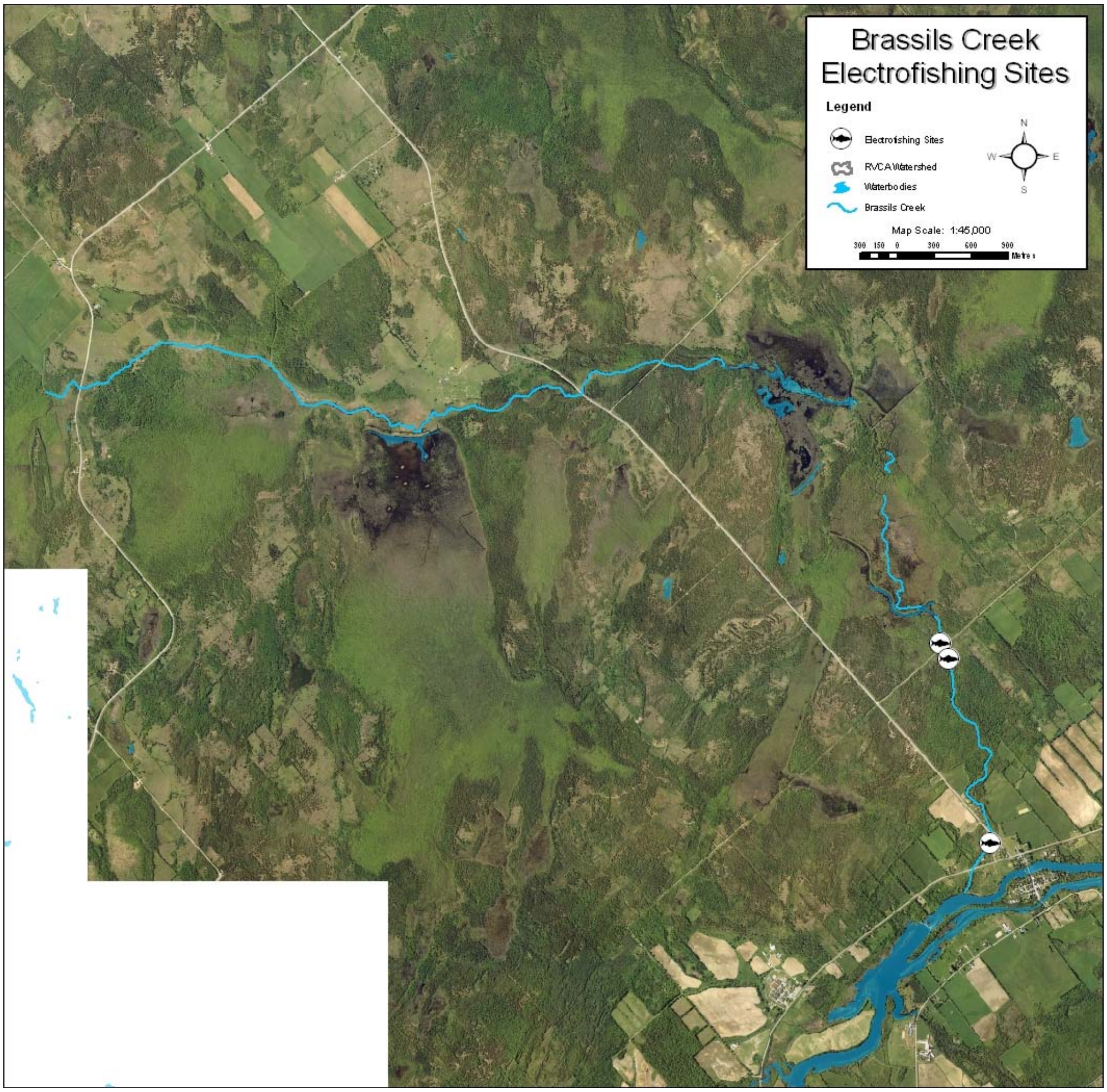

Figure 27. Electrofishing Sites on Brassils Creek

Table 8 illustrates the water chemistry values obtained at the time of electrofishing. No water chemistry data was recorded for Site 1, as the YSI probe was not available. The other two sites were sampled in late fall in pool areas.

E-fish #	Date (mm/dd/yy)	Air Temp (°C)	Water Temp (°C)	DO (mg/L)	pH	Conductivity (uS/cm)	Substrate	Vegetation
1	08/02/06	24	23	NA	NA	NA	cobble/rubble With some boulder	algae, grasses
2	11/29/06	9	3.4	14.16	7.5	344	rubble, boulder, bedrock	grasses, algae, pondweed
3	11/29/06	9	3.6	14.11	7.5	342	muck, silt	pondweed, grasses

Table 8. Water Chemistry Results at Electrofishing sites on Brassils Creek

Table 9 summarizes the biological data obtained from each electrofishing event on Brassils Creek.

E-fish #	Species	Number	Total Length (mm)	Weight (g)	Comments
1	**Largemouth bass**	**1**	**63**	**4.1**	NA
	Largemouth bass	**1**	**63**	**2.9**	NA
	Largemouth bass	**1**	**57**	**1.4**	NA
	Largemouth bass	**1**	**63**	**1.9**	NA
	Largemouth bass	**1**	**56**	**2.2**	NA
	Largemouth bass	**1**	**60**	**2.4**	NA
	Largemouth bass	**1**	**57**	**1.5**	NA
	Largemouth bass	**1**	**63**	**2.1**	NA
	Largemouth bass	**1**	**65**	**3**	NA
	Largemouth bass	**1**	**55**	**2.1**	NA
	Largemouth bass	**1**	**70**	**3.5**	NA
	Largemouth bass	**1**	**50**	**2**	NA
	Largemouth bass	**1**	**60**	**2.1**	NA
	Largemouth bass	**1**	**50**	**1.4**	NA
	Logperch	1	80	4.5	NA
	Central mudminnow	4	NA	13.3	NA
	Unknown	10	NA	14.3	could not identify
2	Central mudminnow	7	NA	34.9	NA
	Northern redbelly dace	1	NA	1.4	NA
	Brook stickleback	9	NA	2.6	NA
	Young of Year (YOY)	4	NA	0.5	young of year; could not identify
3	Common white sucker	1	76	4.6	NA
	Central mudminnow	5	NA	3	NA
	Brook stickleback	8	NA	2.1	NA
	YOY	14	NA	NA	young of year; could not identify
	Cyprinid spp.	5	NA	NA	could not identify

Table 9. Results of Electrofishing Catches on Brassils Creek

3.3.3 Invertebrate Sampling

Freshwater benthic macroinvertebrates, or more simply "benthos", are animals without backbones. These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life. Benthos include crustaceans such as crayfish, mollusks such as clams and snails, aquatic worms and the immature forms of aquatic insects such as stonefly and mayfly nymphs. Benthos represent an extremely diverse group of aquatic animals that exhibit wide ranges of responses to stressors such as organic pollutants, sediments and toxicants, which allow scientists to use them as bioindicators.

New to the program in 2006, a “Benthic Invertebrate Sampling/ID Session” was held for interested volunteers on August 12 at the Jock River Landing. This session taught the importance of aquatic invertebrates as part of the food chain and their role as bioindicators of aquatic heath. Volunteers learned the basics of the OBBN protocol (Ontario Benthos Biomonitoring Network), the various scientific methods of capture and how to process and identify many different species. In total seventeen eager volunteers attended and contributed 51 hours toward the program. This training session was also a pilot project in preparation for the 2007 Biothon.

3.4 Community Stream Clean-Ups

3.4.1 Pinecrest Creek

The City Stream Watch program held a day long cleanup on Pinecrest Creek as part of World Oceans Day on June 10, 2006. The 2006 Oceans Day theme of “watersheds” celebrates watersheds in Canada, from upstream rivers through to the ocean environment into which they flow. This watershed wide cleanup marks the wrap up of a week of Oceans Day festivities (June 4 - June 10) as well as a day of festivities for National Rivers Day (June 11). City Stream Watch volunteers worked together cleaning 2.2km of Pinecrest Creek from south of Carling Rd to Woodroffe Ave. Figure 28 shows the stretches of creek that were cleaned by the volunteers

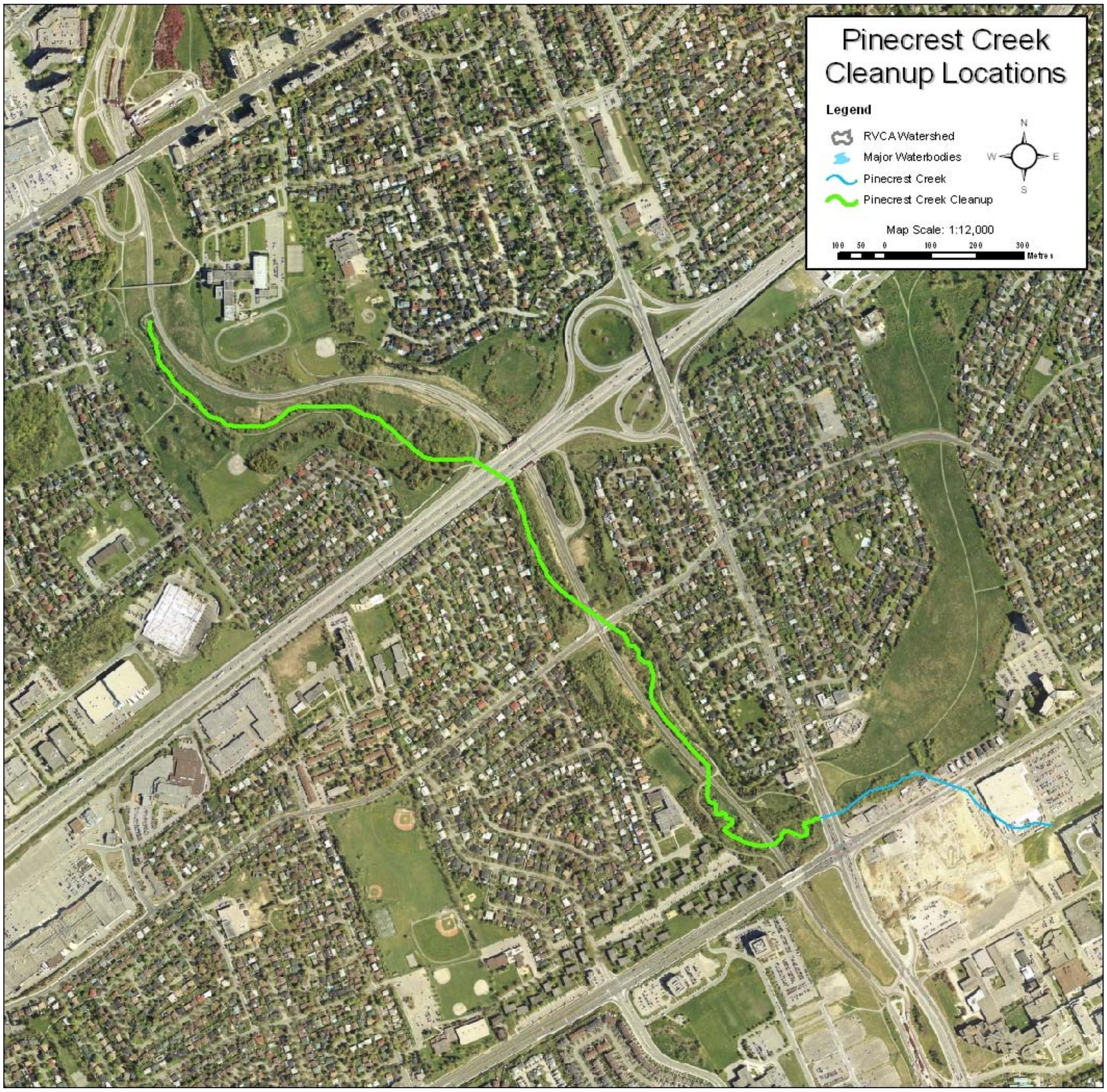

Figure 28. Pinecrest Creek Cleanup Site

Pinecrest Creek flows from Baseline Road, just east of Woodroofe Ave, and empties into the Ottawa River at the Ottawa River Parkway, north of Lincoln Fields Shopping Centre. The stream flows through the NCC Greenbelt and follows the Pinecrest Creek recreational trail for its duration. Twenty-one volunteers participated despite the weather and cleaned up approximately 2 km of stream removing garbage and leaving it looking natural once again.

The Monterey Inn Resort and Conference Centre provided sandwiches, vegetable platters and beverages for hungry volunteers at the end of the day.

Many items were pulled out of the stream including tires, shopping carts, bicycles, plastic bottles and bags, glass bottles, styrofoam, wood and scrap metal. Much of the garbage found in the stream can be attributed to littering along the recreational pathway and transit stops as well as blowing debris from heavily developed College Square, which ends up in the stream. Garbage and littering is a continued concern on Pinecrest Creek and this stream will require continued attention and frequent cleanups.

3.4.2 Sawmill Creek

On September 16 City Stream Watch volunteers joined forces with members of OFS and Heron Park Community Association to cleanup Sawmill Creek as part of TD Canada Trust – Great Canadian Shoreline Cleanup. The Vancouver Aquarium started the TD Canada Trust Great Canadian Shoreline Cleanup over 12 years ago and with support from the TD Canada Trust, the program has grown from a local beach cleanup to a national program with participants in every province and territory. Each September, hundreds of thousands of participants from around the world join Canadians to clean up their shorelines. Figure 29 shows the stretches of creek that were successfully cleaned by the volunteers at the Great Canadian Shoreline Cleanup (GCSC) and by members of National Defence Headquarter Fish & Game Club (NDHQ) in a fall cleanup.

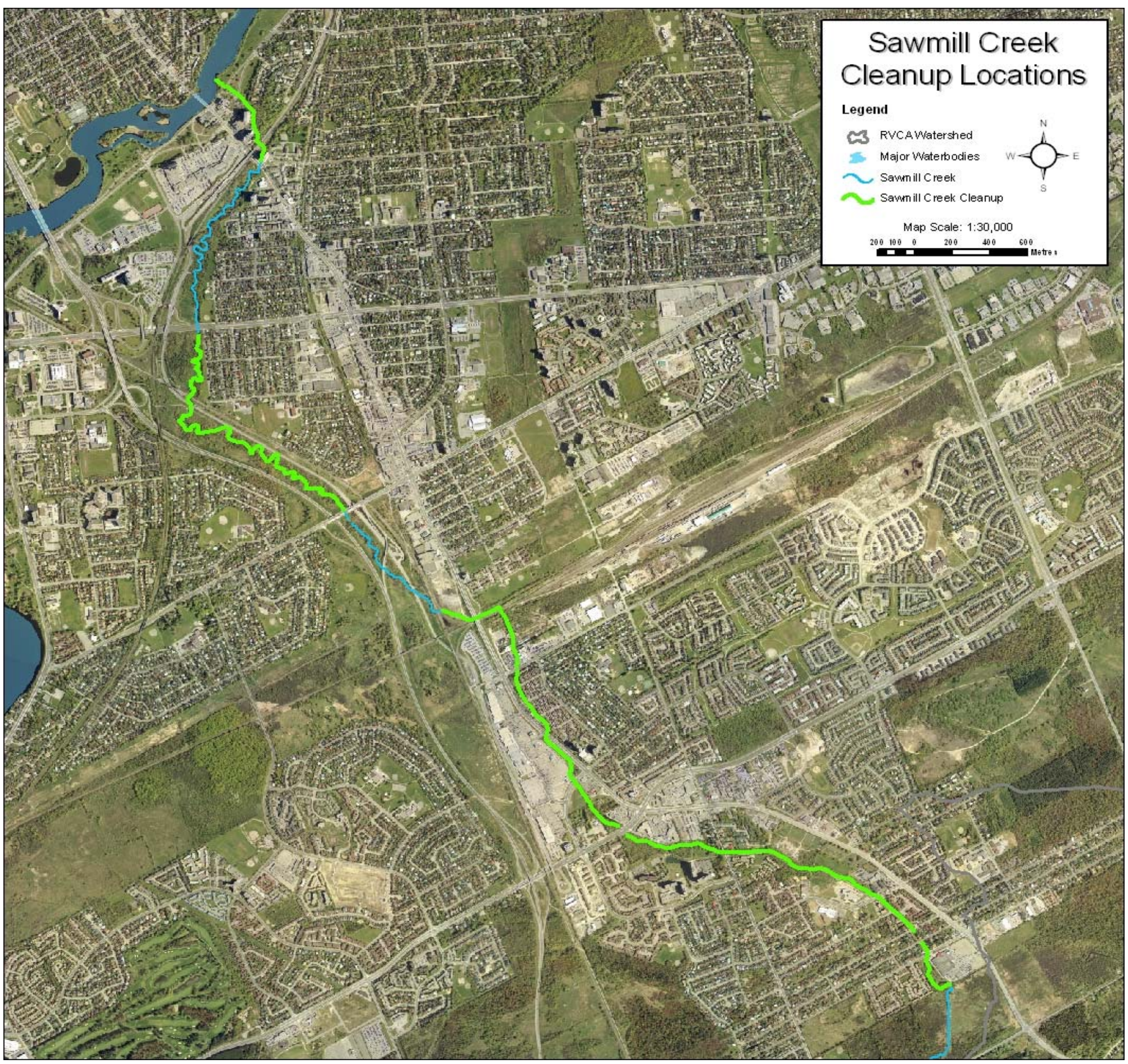

Figure 29. Map of Sawmill Creek Cleanup Locations in 2006

Twenty-three volunteers helped clean all of the man-made litter from the stream between Walkley Road and Heron Road as well as the stretch from Bank Street. to where Sawmill Creek empties into the Rideau River. Thanks to community interest, a section of Lester Road, between the Airport Parkway and Albion Road was also cleaned. This was necessary due to litter, which collected along the road and eventually ended up in the wetland surrounding this roadway.

After a morning of cleaning up the stream, volunteers were treated to a delicious lunch provided by the Monterey Inn Resort and Conference Centre who is a long time supporter of the program as well as the first "Carbon Neutral Company" in Canada. Stream Watch volunteers joined over 40,000 other Canadians as part of the nation-wide "Great Canadian Shoreline Cleanup Day" cleaning up streams, lakes, oceans and beaches across the country.

Members of the National Defence Headquarters Fish and Game Club participated in a fall cleanup on Sawmill Creek. The club focused its attention this year on its adopted stretch of Sawmill Creek from Bank Street at South Keys Shopping Centre to Albion Road. Approximately 4 km of shoreline and creek bottom was cleaned. Shopping carts, plastic bags, bottles, lumber, food wrappers, street signs, tires and styrofoam were all removed from the creek and discarded in a dumpster.

3.5 Riparian Planting Projects

Riparian zones are the vegetated transition areas between aquatic and terrestrial habitat. They make up one of the most important aspects of stream health because they protect surface water from polluted runoff, siltation and most importantly erosion. Riparian zones also offer very important habitat for many fish and wildlife species. Riparian zones are densely populated, and thus have an intricate root system that helps to stabilize the bank and prevent erosion. In a stream surrounded by a healthy riparian zone, sediment pollution is controlled. Waterbodies that have lost this essential vegetation require rehabilitation projects such as these to help restore stream health.

3.5.1 Sawmill Creek

The City Stream Watch program in cooperation with Heron Park Community Association held a shoreline rehabilitation project on Sawmill Creek on May 6. This was Phase II of the Sawmill Creek Rehabilitation Project which started in 2005. The goal of this project is to restore a failed bank on the east side of the stream just north of Heron Road. In Phase I of this project the lower sections of bank, close to the stream, did well throughout the growing season although many trees were lost on the upper portion of the bank due to trampling and dry conditions. In Phase II, planting was to focus on the upper bank failure as well as filling in necessary sections that may have been washed away by spring flows. Figure 30 shows where the riparian rehab projects took place.

Figure 30. Sawmill Creek Planting Site in Heron Park

The riparian tree plant on Sawmill Creek at Heron Park was a successful event. Twelve volunteers successfully planted 600 trees in total (250 red osier, 200 nannyberry, 50 white spruce and 100 white cedar). Another site upstream, which had some bank erosion, was planted as well to help generate growth and prevent further erosion.

Sawmill Creek bank Before

Sawmill Creek After

3.5.2 Graham Creek

Based on recommendations of the 2005 City Stream Watch Annual Report, a riparian planting project was carried out in the spring of 2006 on an eroded bank on Graham Creek. Figure 31 shows where Phase I of this planting project was carried out.

Figure 31. Graham Creek Planting Site in Andrew Haydon Park

The riparian tree plant on Graham Creek took place in early June to help rehabilitate an eroded section along the stream in Andrew Haydon Park. Two volunteers from the program successfully planted 50 Red Osier along the bank on the east side of the stream.

Graham Creek Before

Graham Creek After

The goal of this planting project is to enhance conditions for natural colonization of plant species, help prevent further erosion, reduce siltation of fish habitat and produce streamside wildlife habitat. As this section is in plain view of a walk bridge in Andrew Haydon Park, the planting project also hopes to enhance the creeks aesthetic quality. Phase II of this planting site will take place in the spring of 2007 to further rehabilitate the bank.

3.5.3 Mosquito Creek

Mosquito Creek bank rehabilitation project was based on community interest and concern for the health of the stream. The planting project was carried out in early June on an eroded section just north of Spratt Road in the Riverside South community. Figure 32 shows the area that was planted.

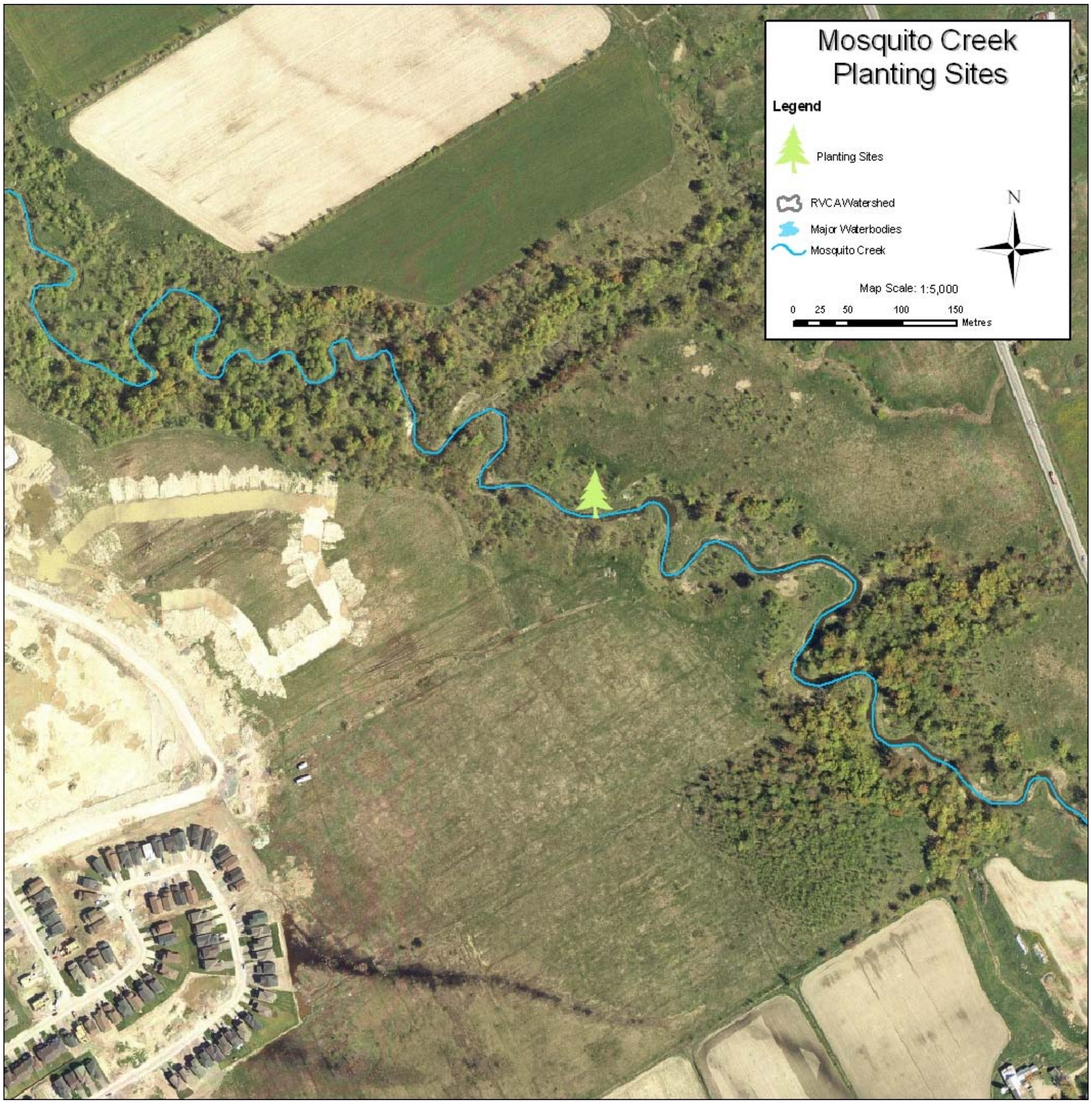

Figure 32. Mosquito Creek Planting Site in Riverside South Community

Two volunteers assisted in the planting of 150 trees along the eroded banks of Mosquito Creek. Volunteers planted 100 nannyberry and 50 bur oak in hopes to stabilize the eroded sections and promote growth on the banks. This site will be planted again in the spring of 2007 to further rehabilitate the banks.

Mosquito Creek Erosion

3.5.4 Tree Donation

In the spring of 2006, a donation of 200 red osier dogwood was made from the City Stream Watch program to the residents of Nicolls Island. Eight of the twenty homes on the island planted the shrubs on their waterfront properties in hopes to stabilize their shorelines and reduce erosion of their properties.

It is crucial for landowners who live around water to leave a natural buffer of vegetation between their property and the water edge. Removing this vegetation eliminates root systems, which are required to stabilize banks, and increases runoff, which allows pollutants and silt to degrade habitat for aquatic life. For more information on how to naturalize your property and eliminate erosion of your property visit "Living By The Water Project" at *www.livingbywater.ca*.

3.6 Community Outreach Projects

3.6.1 Envirothon

In June 2006 the City Stream Watch coordinator was invited to give three, thirty-minute presentations on aquatic environments at one of the regional envirothon competitions. Ontario Envirothon (The "Environmental Olympics") is an interactive environmental education program in English and French for youth from grades 9 to 12. This program is delivered through field trips, resource materials and competitions at the regional, provincial and international level. Regional competitions take place throughout the school year, with the Provincial Envirothon Competition taking place in spring.

Students were given insight into just how complex these systems are by discussing the different types of lakes, rivers and wetlands. In addition, other topics ranged from what keeps aquatic environments healthy, using bioindicators to access aquatic health and how climate change will impact our freshwater resources.

3.6.2 Bell Highschool – Environmental Monitoring Day

On June 3 the City Stream Watch Program hosted a field trip for students from the grade ten science class at Bell High School to learn the basics of environmental monitoring. Students, led by professionals from the Rideau Valley Conservation Authority (RVCA), learned the hands-on techniques of sampling fish and aquatic invertebrate communities, performing stream assessments, and analyzing riparian forest communities.

3.6.3 Carleton Field Course – Electrofishing

City Stream Watch Coordinator, along with RVCA technicians, were invited to teach a day-long electrofishing session to Carleton University students who were taking part in the week-long Environmental Studies Field Course. Students learned the basic operation of an electrofishing pack along with how to use it to sample fish communities, net fish and process and record their catch. This course is held by the Centre for Sustainable Watersheds and provides both theoretical and hands on experience to help participants understand watershed management.

3.6.4 Turtle Habitat Protection

Turtle Sign on Lester Road

Throughout the summer there was concern from community residents about turtle road-kills along Lester Road, between the Airport Parkway and Albion Road. Lester Road passes through (fragments) a large wetland, which is home to many turtle species, one of which being the Blanding's Turtle, a threatened species protected under federal law (Species At Risk Act). Many turtle kills were reported throughout the summer and include some turtles over 30 years of age and a Blanding's. Turtles must cross Lester Road to access the southern wetland, taking on the risk of being killed. After some investigation, the City was contacted and asked to install signs to warn motorist to keep a watchful eye for turtles crossing the road. Signs were installed and the site will be continually monitored. If turtle road kills continue, further action will be required.

4.0 A Look Ahead to 2007

The City Stream Watch program is currently planning projects for the 2007 season. Streams have been chosen and will include Nepean Creek, Cranberry Creek and Greens Creek tributaries, which include Mud and Borthwick Creek, to close out the five-year stream cycle study. Figure 33 below illustrates the stream watersheds in relation to the City of Ottawa. Maps of 2007 streams in relation to other years can be found in Appendix F.

The program is always looking to extend its efforts to new initiatives and goals. In the 2007 season various projects have been identified and plan to be implemented beginning in the spring. Some projects include:

- Start of year kick-off party for volunteers (May)
- Stream Surveys on Cranberry Creek, Nepean Creek and Greens Creek tributaries (including Borthwick and Mud Creek)
- Biothon – Biodiversity Day on various streams within the Rideau Valley Watershed
- Fish, aquatic invertebrate and riparian vegetation identification training sessions in preparation for the Biothon
- Boy Scout Troop taking part in stewardship work on Graham Creek
- High school field trips to local streams and classroom visits to educate youth on environmental matters
- Monitoring success of Sawmill Creek rehabilitation project

- Intensive fish community sampling by seine netting and electrofishing on various stream systems, in particular Greens Creek
- Temperature profiling of 2007 streams
- Graham Creek riparian planting – Phase II
- Mosquito Creek riparian planting – Phase II
- Sawmill Creek Cleanup (Spring/Fall)
- Pinecrest Creek Cleanup
- Sawmill Creek remediation efforts to enhance habitat and stream health
- Cleanup city streams as part of Canadian Rivers Day – June 10, 2007
- Cleanup for Great Canadian Shoreline Cleanup – Sept 15 – 23, 2007

Many of these projects are explained further in the special projects section. New projects continue to be identified and included in the 2007 program in hopes of continuing the success of City Stream Watch as well as keeping volunteers interested in the program. For more information refer to the RVCA website (*www.rideauvalley.on.ca*) in the spring for updates and information on the program and how to sign up.

Figure 33. Map of 2007 Sample Streams

4.1 Recommendations

It is important that City Stream Watch continues in order to inform, involve and educate community residents on the state of urban creeks and streams as well as to encourage restoration projects and sound stewardship practices. To this end, the City Stream Watch program should further build on the successes achieved during its first four years. Through its ongoing implementation, temporal and spatial environmental trends of creeks in the Ottawa area may be observed and recorded. The data will complement work conducted by municipal and watershed-based programs, most of which do not sample the smaller urban streams that are the focus of this program. As well, the intrinsic values of community-based environmental monitoring, such as community involvement and social capital, will be further developed.

4.2 Program Improvement

The following are recommendations to improve the program:

- Continue to develop creative means in order to contact, as well as ensure, the involvement and ongoing interest of all concerned members of the community.
- Employ a summer student to help with fieldwork and allow more flexibility to match volunteer schedules
- Recruit assistance from universities to help with the program
- Continue contacting community early in the year to maximize both the involvement and the diversity of participants.
- Foster relationships with environmentally oriented groups (i.e. Sierra Youth Coalition, Scouts Canada) to facilitate student involvement.
- Continue to run stream cleanups on city streams to enhance fish and wildlife habitat and maintain the natural beauty of our city's streams.
- Develop a more aggressive approach to youth recruitment to entice educators and high school students to participate in the program. Hours of participation can be counted toward the student's volunteer hours to graduate.
- Develop new, creative projects to keep volunteer interest high
- Continue to ensure that the needs of the participating community are satisfied as they relate to their continued involvement in the program.
- Attract funding opportunities from outside funders for the program and rehabilitation projects
- Develop relationships with universities and colleges to attract students to participate to gain experience
- Enhance participation for existing and new potential collaborative partners

4.3 Special Projects

The following are projects that have been developed from information obtained through monitoring and could be implemented through City Stream Watch or other community based environmental initiatives.

Table 10 Special projects developed through monitoring activities over the past few years.

Table 10. City Stream Watch – Project Proposals

Location	Issue	Picture	Remediation Strategy	Expected Results
Graham Creek - shoreline in between Acres Road and Carling Ave.	High water is eroding banks causing them to fail resulting in trees falling into stream. Landowners are worried that stream erosion may encroach on their land. Bioengeneering work may take place in 2007. This could be a possible planting initiative after construction work is completed. Work would be best completed in spring of 2008.		Utilize existing volunteer base of the City Stream Watch program to participate in this rehabilitation effort. Plant shrubs and tress to stabilize banks and help stop erosion.	• Community involvement • Enhancement of fish and wildlife habitat • Reduce erosion of banks • Eliminate possibility of bank failure causing tree collapse into stream

Location	Issue	Picture	Remediation Strategy	Expected Results
Sawmill Creek - just North of Heron Park Community Centre (Heron Road.)	A bank failure just upstream of the Phase II planting site on Sawmill Creek is an area of concern. The bank failure has caused many trees to fall into the stream causing blockages as well as a considerable amount of siltation.		Utilize existing volunteer base of the City Stream Watch program and residents from the Heron Park area to participate in this rehabilitation effort. Interested members can monitor progress of areas planted and report back to the coordinator with updates.	• Promote community involvement in rehabilitation projects • Enhancement of fish and wildlife habitat • Enhancement of the creek's aesthetic qualities • Erosion control

Location	Issue	Picture	Remediation Strategy	Expected Results
Sawmill Creek - just north of Hunt Club Road.	Woody debris has accumulated at an abandoned culvert on Sawmill Creek. The wood has dammed up the stream pooling water above the abandoned culvert resulting in a channel restriction impacting flow. This has caused the stream to alter its course, creating an erosion and siltation problem. Secondly a cement wall has failed (as seen in the picture) creating a flow deflector, which is severely eroding the east bank.		Examine ways and obtain partners to remove the abandoned culvert. Utilize existing volunteer base of the City Stream Watch program to participate in this rehabilitation effort. Plant shrubs and tress to stabilize banks to help stop erosion.	• Community involvement • Enhancement of fish and wildlife habitat • Reduce erosion of banks • Eliminate possibility of bank failure causing tree collapse into stream • Improve natural flow conditions • Remove potential fish barrier

Location	Issue	Picture	Remediation Strategy	Expected Results
Many sections of Sawmill Creek (South Keys Shopping Area of primary concern)	The accumulation of garbage and refuse along various stretches of Sawmill Creek is a ongoing problem. Not only does man made pollution take away from the aesthetic quality of the stream but it limits and degrades fish and wildlife habitat.		Utilize existing volunteer base of the City Stream Watch program to participate in this cleanup effort. Sawmill Creek cleanup days should be carried out in the summer and fall to properly remove garbage and rid the stream and riparian areas of pollution of human origin.	• Community involvement • Enhancement of fish and wildlife habitat • Enhancement of the creek's aesthetic qualities

Location	Issue	Picture	Remediation Strategy	Expected Results
Graham Creek at Andrew Haydon Park. On east bank just downstream from bridge.	**PHASE II** The phase II planting site on Graham Creek in Andrew Haydon Park hopes to further rehabilitate a highly eroded bank on the east side of the stream just north of Carling Rd. Phase I was carried out in early June of 2006 in hopes to stabilize the bank and prevent further erosion.		Utilize existing volunteer base of the City Stream Watch program and recruit volunteers from neighbouring communities to participate in this rehabilitation effort.	• Community involvement • Effective stream bank protection • Reduce siltation of fish spawning habitat • The enhancement of conditions for natural colonization of existing plant community • Produce streamside wildlife habitat • Enhancement of the creek's aesthetic qualities

Location	Issue	Picture	Remediation Strategy	Expected Results
Mosquito Creek downstream of Spratt Road within the Riverside South community	**PHASE II** Erosion of stream banks along Mosquito Creek is an issue. Development along with creation of roads, bridges and residential properties has increased runoff and caused significant erosion along the stream.		Utilize existing volunteer base of the City Stream Watch program and recruit volunteers from neighbouring communities to participate in this rehabilitation effort.	• Enhancement of fish and wildlife habitat • Enhancement of the creek's aesthetic qualities • Effective stream bank protection • Erosion control

Location	Issue	Picture	Remediation Strategy	Expected Results
Pinecrest Creek	Frequency of litter on this system is high. Walk along cleanups involve members of the community walking certain stretches of stream with garbage bags and removing items such as bags, styroforam, lumber, bottles etc. to rid the stream of human oriented debris.		Utilize existing volunteer base of the City Stream Watch program and recruit volunteers from the communities around the streams to participate in this cleanup effort. The goal would be to facilitate the proper removal of garbage and to rid the stream and riparian areas of (man made) pollution.	• Community involvement • Enhancement of fish and wildlife habitat • Enhancement of the creek's aesthetic qualities

Location	Issue	Picture	Remediation Strategy	Expected Results
Pinecrest Creek	Erosion of stream banks along Pinecrest Creek is of major concern. The National Capital Commission (NCC) is leading an initiative to implement a to create a remediation strategy to eliminate erosion and help rehabilitate the stream.		NCC Remediation Strategy	• Enhancement of fish and wildlife habitat • Enhancement of the creek's aesthetic qualities • Effective stream bank protection • Erosion control

Location	Issue	Picture	Remediation Strategy	Expected Results
Sawmill Creek just North of Heron Park Community Centre (Heron Rd.).	Phase I and Phase II planting took place on in 2005 and 2006 to help rehabilitate a failed bank on Sawmill Creek. Planting work has been successful although monitoring needs to be done often to ensure planting communities are successful. If trampling and further erosion are noticed, more planting may be needed.		Utilize existing volunteer base of the City Stream Watch program and residents from the Heron Park community to monitor success of planning site and report back to the coordinator with updates.	• Promote community involvement in rehabilation projects • Enhancement of fish and wildlife habitat • Enhancement of the creek's aesthetic qualities • Erosion control

Appendix A

Volunteer Interest Form
Rideau Valley Conservation Authority
City Stream Watch Program

Date (Contacted): ____

Volunteer: Name: ____

Phone #: ____

E-mail: ____

Have you ever helped with the Stream Watch program before?

- ❑ **No**
- ❑ **Yes** **When/Where:** ____ ____

Do you have a preference as to what project you would work on?

- ❑ **No**
- ❑ **Yes** **Circle Interests:** **Tree Planting** **Stream Rehab Work** **Stream Cleanups** **Stream Assessment**

Do you have a particular area that you would prefer to work?

- ❑ **Yes** **Circle: Becketts Creek (East End, Orleans)** **Brassils Creek (South, Kemptville)** **Pinecrest Creek (Nepean)** **Others:** ___________________________________
- ❑ **No Preference**

Are there specific days you would prefer to sample?

- ❑ **Weekends**
- ❑ **Weekdays**
- ❑ **No Preference**

Are there specific times you would prefer to sample?

- ❑ **Mornings**
- ❑ **Afternoons**
- ❑ **Evenings**
- ❑ **No Preference**

Will you be/did you attend a training session?

- ❑ **May 13th, 2006**
- ❑ **May 27th, 2006**
- ❑ **Won't be attending/did not attend**

Appendix B

MACRO STREAM ASSESSMENT

Date:____________
Time: Start________ Photo Upstream_____
Section:__________ Photo Downstream_____
Start: UTM Easting _________ Northing _________
End: UTM Easting__________Northing_________

Stream Survey Overview (100m)

Name of Stream/River/Drain:____

Water Temp (ºC): S_____ M______ E______ Overhead Cloud Cover (%): dense(75-100)____

Stream Width (m): S_____ M_____ E______ part open(25-75)___

Stream Depth (m): S_____ M_____ E______ open (0-25) ____

Air Temp (ºC): _______

Overall

1. Has this section of water been altered? Yes No
   If yes, would you generally characterize this altered section as being:

   In a “**natural**” condition, but with significant alterations by man? ________

   An “**altered**” waterway, with considerable human influences, but still featuring significant “natural” portions? ________

   A “**highly altered**” stream section, with few areas which could be considered natural stream environments? ________

2. What would you say is the general land use pattern along this 100m section? %

   Active agriculture _______
   Pasture _______
   Abandoned agricultural fields _______
   Residential _______
   Natural (i.e forests, meadows, wetlands, etc.) _______
   Industrial/Commercial _______
   Recreational _______
   Other (please specify) _________________________ _______

INSTREAM SUBSTRATE

3. Having surveyed the substrate, how would you characterize overall the type of substrate in the stream? %

	%
Bedrock-exposed rock	______
Boulders-rock over 25cm (10in)	______
Rubble-8-25cm (3-10in)	______
Gravel-0.2-8cm (1/8-2in)	______
Sand- >0.05-0.10 will feel some grit	______
Silt- 0.05 feels soft like a powder	______
Clay- 0.01greasy between fingers	______
Muck-combo of sand, silt, clay, marl, organic	______
Detritus-organic material	______
Other (i.e. marl)	______

4. Is the substrate type fairly: Homogenous/Heterogeneous?

INSTREAM STRUCTURE

5. How would you characterize the type of major structures in this 100m stretch? (Relative to each other)

	%
Woody debris	______
Downed trees	______
Boulders	______

B) How would you characterize the stream morphology in this 100m segment?

	%
Pools	______
Riffles	______
Reaches	______

6. A) Active beaver dams #______
   Abandoned beaver dams #______

B) Tree cropping: (Check one)

Extensive	________
Common	________
Low	________
None	________

C) Beaver Lodges #_______

INSTREAM VEGETATION

7. How would you characterize the abundance of aquatic vegetation? (Check one)

Extensive (choked with weeds)	______
Common (more than 50% vegetation)	______
Normal (25-50% vegetation)	______
Low (less than 25 % vegetation)	______

Rare (instream plants "few and far between") ______

8. Are there dominant types of instream vegetation? Yes No

	%
Algae	________
Leafed submergents	________
Narrow submergents	________
Lily-type plants	________
Narrow emergents	________
Leafed emergents	________
Other (please Specify) _____________________________	________

TRIBUTARIES

9. Are there any major tributaries? Yes No

10. If yes: How many does this 100m section have? #_______

11. Do any of these tributaries obviously alter the character of the stream after they enter it? Yes No

12. If yes: In what way (i.e. pollution) _____________________________________

13. What are the types of tributaries? (Check one)

Small intermittent natural streams	________
Large permanent natural streams	________

Other: (eg. Ditch/ravine) _____________________________________

14. Are any of the tributaries worthy of being surveyed further? Yes No
If Yes, Which one(s): _____________________________________

15. Is this tributary flowing at present? Yes No

BANK CHARACTERISTICS

16. In terms of erosion of banks, how would you generally characterize this section? %

Stable (little or no erosion)	_______
Unstable (eroding, little or no vegetation)	_______
Undercut banks	_______

17. In general, what is the composition of banks along this section? %

	Left Bank	Right Bank
Bedrock- exposed rock	______	______
Boulders- rock over 25 cm (10in)	______	______
Rubble- 8-25cm (3-10in)	______	______
Gravel- 0.2-8cm (1/8-2in)	______	______
Sand- >0.05-0.10 will feel some grit	______	______
Silt- 0.05 feels soft like a powder	______	______
Clay- 0.01greasy between fingers	______	______
Organic	______	______
Gabion Cage	______	______
Rip Rap Stone	______	______
Logs and Trees	______	______
Bridge Structures	______	______

Other: (please specify) ____________________ ______ ______

18. How would you characterize the general steepness of banks along this section? %

	Left Bank	Right Bank
Very Steep (>25%)	_____	_____
Steep (16%-25%)	_____	_____
Moderate (9%-15%)	_____	_____
Low (4%-8%), gently sloping banks	_____	_____
Broad flat banks, (0-3%) little slope	_____	_____

19. What are the dominant vegetation type along the banks? %

	Left Bank	Right Bank
Coniferous trees	_____	_____
Hardwood trees	_____	_____
Dead trees	_____	_____
Woody Shrubs	_____	_____
Tall grasses	_____	_____
Short grasses	_____	_____
Agricultural crops	_____	_____
Wetland vegetation	_____	_____
Ferns	_____	_____
Mosses	_____	_____
Other (please specify) ______________	_____	_____

20. Are their any agricultural impacts? Yes No

If yes, what kinds:

a) **Cattle access**	Yes	No	extreme (>20m) moderate (10-20m) low (<10m)
b) **Field erosion**	Yes	No	observed / potential
c) **Agricultural drain**	Yes	No	
d) **Barnyard runoff**	Yes	No	
e) **Tile Drain**	Yes	No	How Many?______
f) **Distance to field from stream**	_________m		

21. Did you notice any wildlife? Yes No

If yes, what kinds? (Check one or more)

Waterfowl	_______
Birds	_______
Mammals	_______
Reptiles/amphibians	_______
Fish	_______
Aquatic Insects	_______
Other	_______

Observed: ____

____

____

22. Is this 100m section fish habitat? Yes No
If yes, what class? (Check one or more)

1. **Critical** (nursery) _______
2. **Normal** _______
3. **Degraded** (drainage) _______

23. Did you observe any springs in this 100m stretch? Yes No

If yes, how many? #________

24. Did you notice any pollution in the stream or entering the stream? Yes No
If yes, which kinds:

a) Oil or gas trails in the water Yes No
b) Floating Garbage Yes No
c) Garbage on the stream bottom Yes No

Observed____
____

25. Are there any invasive species in the stream? Yes No
If yes, list them____
____
____

26. Dominant types of instream vegetation, if present, are__________________________
____
____

27. Are there any observed invertebrate species present in the stream? Yes No
If yes, identify____
____

28. Is there any visible angling pressure present within this section? Yes No
If yes, identify____
____

COMMENTS

____
____
____
____

NAME OF SURVEYORS:_______________________________
____
____
____

DATE INPUTTED INTO DATABASE ______________

Appendix C

Protocol Summary and Definitions

Descriptive Information at Top

Date is the date sampling occurred.

Time is the time sampling started.

Section is the section # of the current 100m of stream being sampled.

Starting and Ending UTM coordinates: UTM coordinates are needed for both the starting and ending points of the 100m sections. These are taken using the GPS receivers. The GPS supplies both an easting and northing. The UTM grid number is 18 for all of Eastern Ontario.

Upstream and Downstream Photos: Photos are taken at the starting and ending points of each 100m section. Please record the camera name and exposure number for each photo.
(ie. Sawmill 1, exposure 25).

Stream Survey Overview (100m)

Water temperature in °C at the starting point, middle, and end of the 100m section.

Stream width in meters at the starting point, middle, and end of the 100m section.

Stream depth in meters at the starting point, middle, and end of the 100m section.

Air temperature in °C

Overhead cloud cover in percent.

Overall

1. An **unaltered natural section of stream** is one characterized as having a series of meanders, pools, and riffles, with a significant amount of riparian (transitional zone between aquatic and terrestrial habitats that contains moist soils and lush plant growth) area.

   A **natural stream** can be altered in a number of ways:
   - shoreline can be armored to varying extents (retaining walls, rip-rap);
   - can be diverted;
   - riparian vegetation replaced by lawn, beaches, etc;
   - docks or other structures extending into the stream.

2. **Active agricultural:** refers to land that is currently being farmed.

   Pasture: refers to land being used by grazing livestock.

   Abandoned agricultural fields: refers to land previously, but not currently, farmed.

   Residential: refers to land occupied by homes.

   Natural: refers to unaltered land free from human development.

Industrial/Commercial: refers to land occupied by industry/businesses.

Instream Substrate

3. **Instream substrate** is the material that constitutes the stream bed.

4. It can be **homogenous** (all of one type), or **heterogenous** (diverse types).

Instream Structure

5. **Stream morphology** refers to the physical structure and shape of the stream.

6. **Active beaver dams** are those which are still functioning, while abandoned beaver dams are visible but are not holding back water.

   Tree cropping is the cutting down of trees by beavers.

   Beaver lodges are homes built by beavers out of sticks and muck.

Instream Vegetation

7. **Aquatic vegetation** refers to vegetation occurring within the stream.

   Extensive: weeds within entire stream

   Common: >50%

   Normal: 25-50%

   Low: <25%

   Rare: weeds very sparse

8. **Dominant types of instream vegetation** are dominant plant types that occur in the waterway.

   Algae: simple photosynthetic organisms, often covering substrate; feels slimy.

   Leafed submergents: completely underwater, these plants have leaves branching from the main stem.

   Narrow submergents: completely submerged sedges/grasses

   Lily-type plants: characterized by having a leaf floating on the surface attached to a main stem

   Narrow emergents: sedges/grasses with submerged roots and stems emerging from the water

   Leafed emergents: plants with submerged roots, stems emerging from the water with leaves attached to main stem.

Tributaries

9. **Tributaries** are waterways that flow into/enter the stream.

10. Total number of tributaries flowing into current 100m section.

11. Tributaries drain water into the stream, as well as anything suspended or dissolved in the water. Tributaries can alter the character of the stream in a number of ways, including **sediment deposition**, **nutrient loading**, **and other pollutants**.

12. How is the tributary altering the character of the stream.

13. **Intermittent natural streams** are natural streams that flow periodically throughout the year, usually in the spring and in times of high amounts of precipitation.

    Permanent natural streams are natural streams that flow year round.

14. Is the tributary significant enough to justify further surveying?

15. Is water entering the stream from the tributary?

Bank Characteristics

16. **Stable** means no sign of erosion.

    Unstable means signs of erosion.

    Undercut banks refers to the excavation of material under the vegetation on the bank by the stream.

17. **Bedrock** – exposed rock.

    Boulders – rock over 25 cm (10 in) in diameter.

    Rubble – rock between 8 cm and 25 cm (3 – 10 in) in diameter.

    Gravel – rock between 0.2 cm and 8 cm (1/8 – 2 in) in diameter.

    Sand – rock between 0.05cm and 0.2cm in diameter (feels gritty between fingers)

    Silt – approximately 0.05 cm in diameter (feels powdery/velvety between fingers)

    Clay – approximately 0.01cm in diameter (feels greasy between fingers)

    Organic – not of mineral origin.

    Gabion Cage – a square or rectangular cage filled with rocks used to armor a shoreline.

    Rip Rap Stone – chunks of broken concrete/brick used to armor a shoreline.

18. **Steepness** of the shoreline is represented by the general slope, calculated by the rise divided by the run multiplied by 100%.

19. **Coniferous trees**: evergreens

    Hardwood trees: deciduous

    Woody shrubs: shrubs with stems that are brown, hard and woody (not green and herbacious).

    Tall grasses: >1m

Short grasses: <1m

Agricultural crops: wheat, corn, soybeans, etc.

20. **Cattle access:** evidence of cattle using the stream, such as tracks or manure.

    Field erosion: evidence of excavation/deposition of material from fields in or around the stream

    Agricultural drain: a drainage ditch from agricultural fields entering the stream.

    Barnyard runoff: evidence of runoff from agricultural outbuildings entering the stream.

    Tile Drain: a tile is a perforated pipe buried under ground that drains an area. It usually drains water into the stream by a protruding pipe from the bank.

    What is the approximate distance from the stream to the field (if present).

21. **Waterfowl:** Ducks, geese, etc.

    Birds: Osprey, king fisher, etc.

    Mammals: Beaver, muskrat, weasels, mink, etc.

    Reptiles/amphibians: snakes, turtles, frogs, toads, salamanders, etc.

    Fish: minnows, bass, pike, perch, sunfish, etc.

    Aquatic Insects: water striders, whirligig beetles, dragonflies/nymphs, etc.

22. **Critical fish habitat** are areas that are directly responsible for the level of recruitment of individuals into a population. **Spawning habitat** are areas fish utilize for laying eggs.
    Pike spawning habitat includes submerged vegetation ie. grasses/sedges
    Nursery habitat are areas where young of the year individuals live. These are usually backwater areas out of current with vegetation/cover for protection against predators.

23. Springs are areas where groundwater flows out of the ground.

24. Is there any pollution in the stream, entering the stream, or near the stream?

25. **Invasive species** are non-native plant and animal species. See attached notes for invasive species in our area.

26. Are there any dominant types of instream vegetation species that you can identify?

27. Are there any invertebrate animals that you can identify ie. Crayfish, insects, etc?

Visible angling pressure includes presence of anglers, used/old fishing line, bait containers, lures, etc.

Appendix D

Equipment List / Stream Watch Crew (2 person minimum)

1 handheld GPS unit
1 60m Tape / 50-meter length of rope
1 meter stick
1 thermometer
1 clipboard with several stream assessment forms
2 Pencils
Insect repellent
Sunscreen
1 waders/person
1 camera
2 extra batteries for GPS unit
Bottled water
1 garbage bag

Appendix E

Landowner Permission Form

Dear Landowner:

The Rideau Valley Conservation Authority, in partnership with a collaborative of six other agencies

- City of Ottawa
- Heron Park Community Association
- National Defense HQ – Fish and Game Club
- Ottawa Flyfishers Society
- Ottawa South Community Association
- Rideau River Roundtable

is conducting surveys that are designed to document basic stream characteristics, including instream as well as bank characteristics of three city streams. This year's focus will be on Pinecrest Creek, Brassils Creek, and Becketts Creek. The survey examines and collects information regarding fish community/habitat, aquatic invertebrates, aquatic and riparian vegetation, bank stability, stream temperatures, etc.

The program is designed to increase public participation and awareness concerning the state of streams within the city. These efforts will provide officials with valuable information needed to better manage stream resources.

We seek your permission to carry out these surveys on the creeks adjacent to your land. The work will involve a crew of 2-5 people working for approximately 1 hour on the site. We will respect all private property and leave the site clean and with minimal disturbance.

If you would like more information on the project or have any concerns, feel free to contact me. To learn more about the program and view 2003, 2004 and 2005 reports, visit us on the web at:

www.rideauvalley.on.ca/programs/streamwatch/index.html

Thank you for your cooperation.

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Rideau Valley Conservation Authority
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Mark Scott
Acting Aquatic and Fish Habitat Biologist
Rideau Valley Conservation Authority
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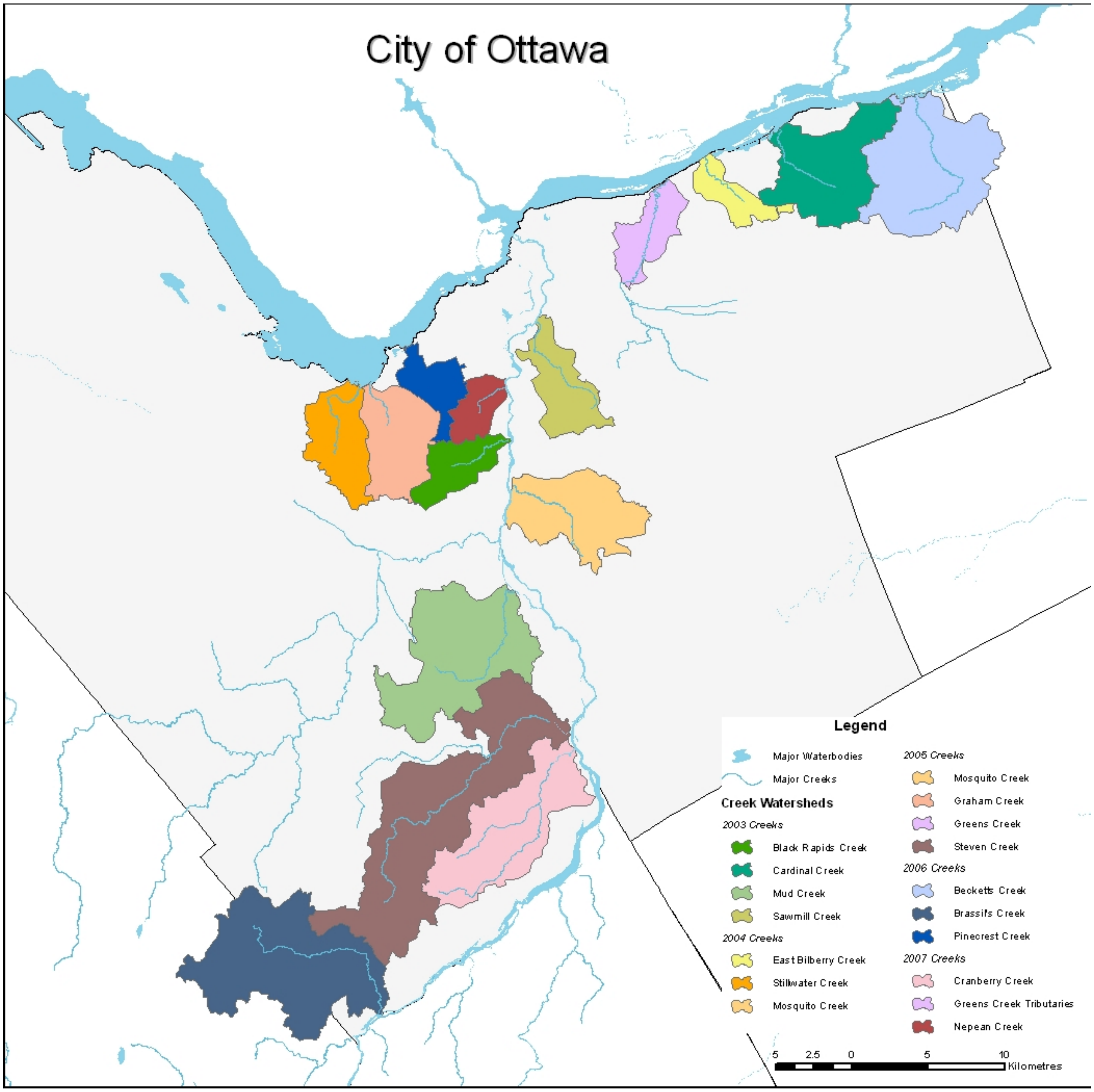
Appendix F

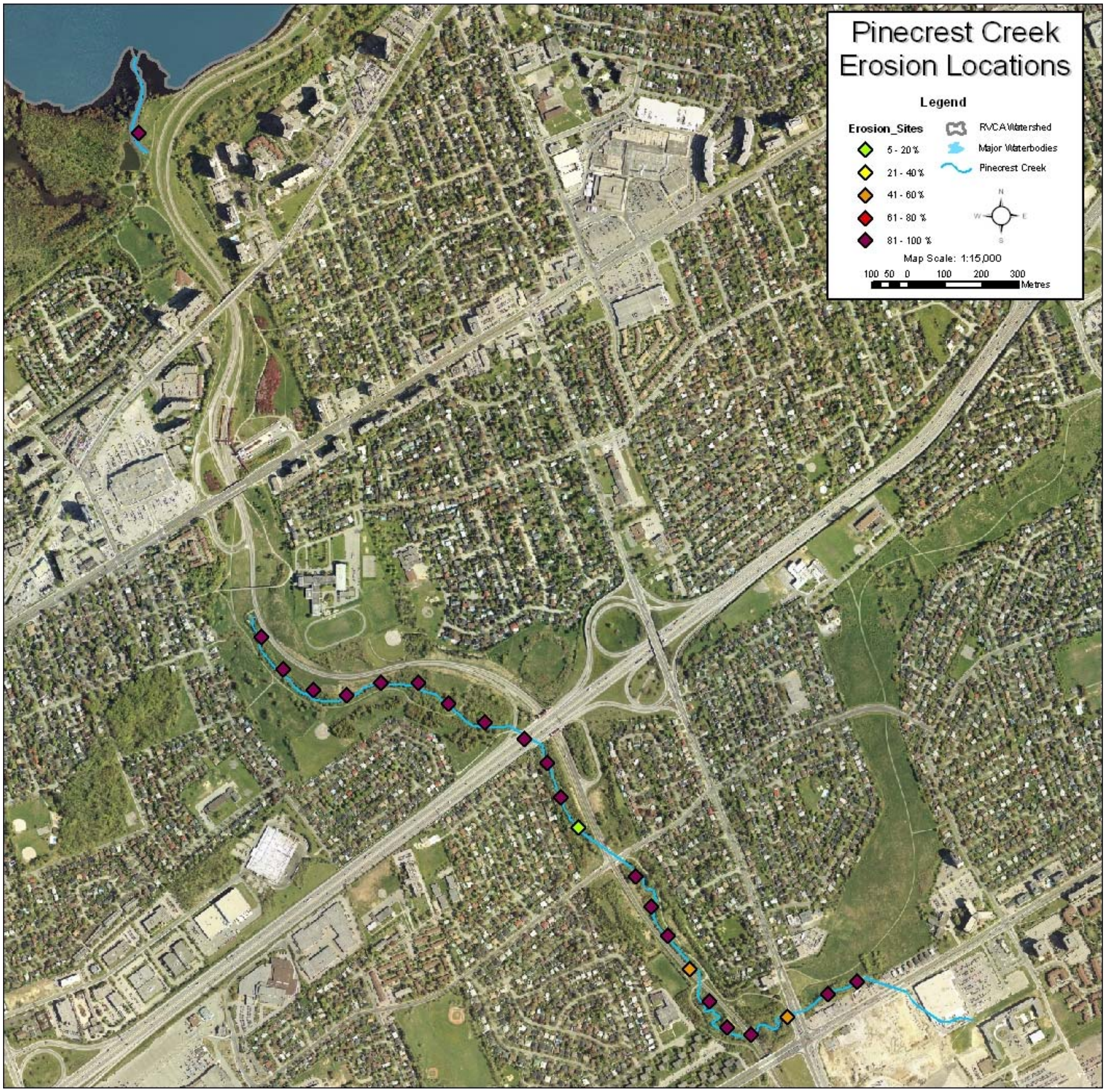
2003 to 2007 Stream Survey Creeks (Five year cycle stream selection)



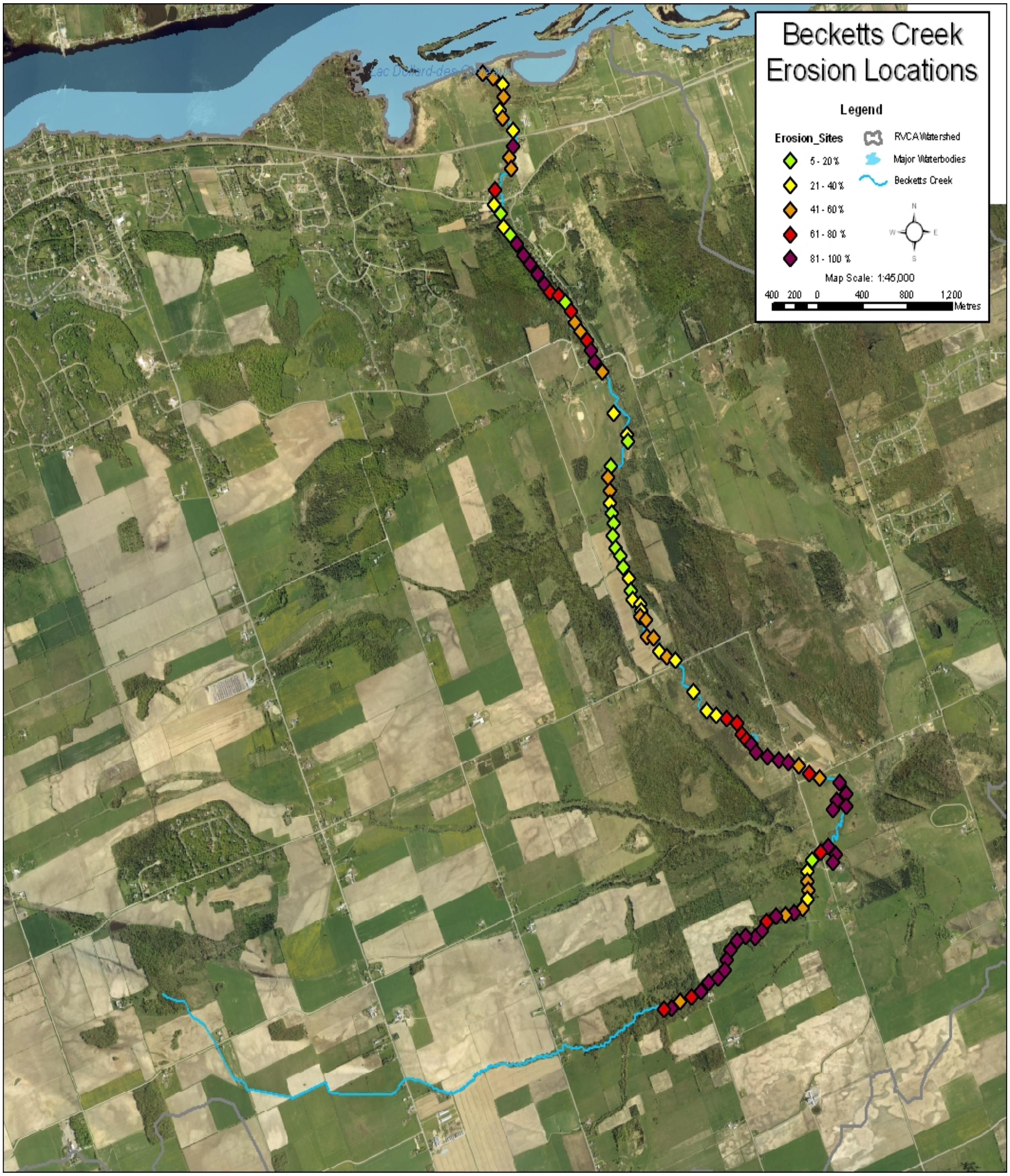
Appendix G

Map of Erosion Sites

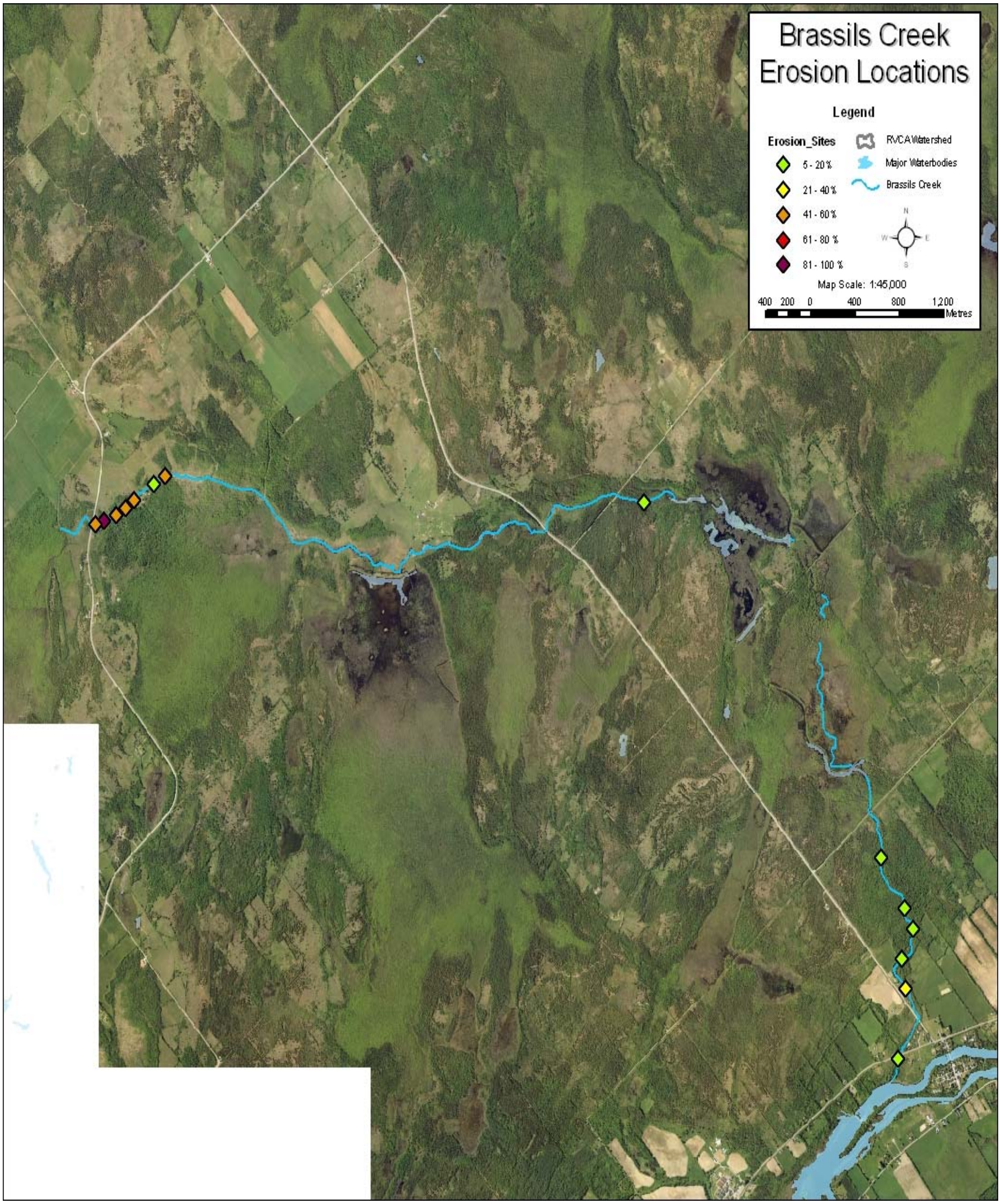
i) Pinecrest Creek Erosion



ii) Becketts Creek Erosion



iii) Brassils Creek Erosion



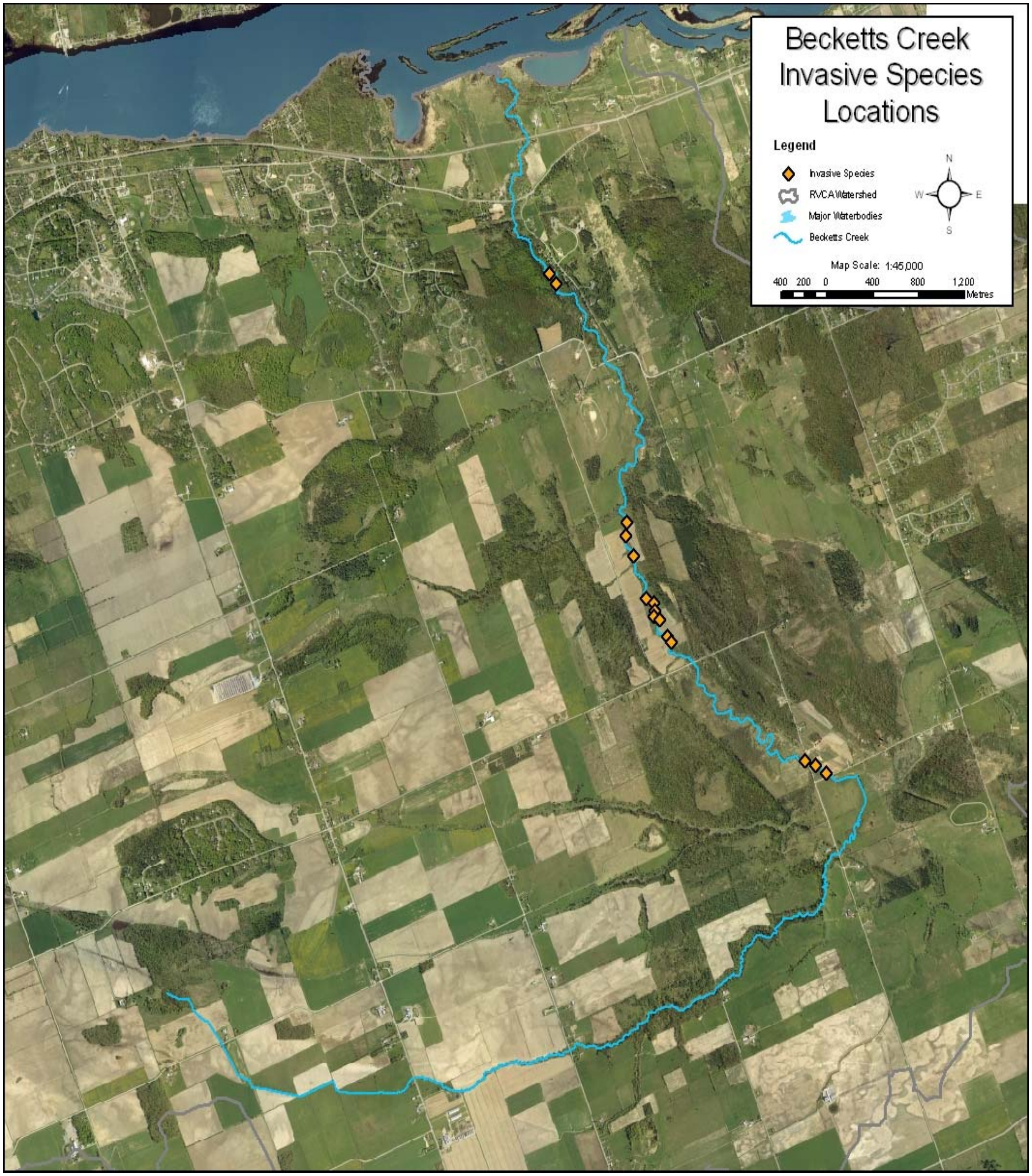
Appendix H

Maps of Invasive Species Areas

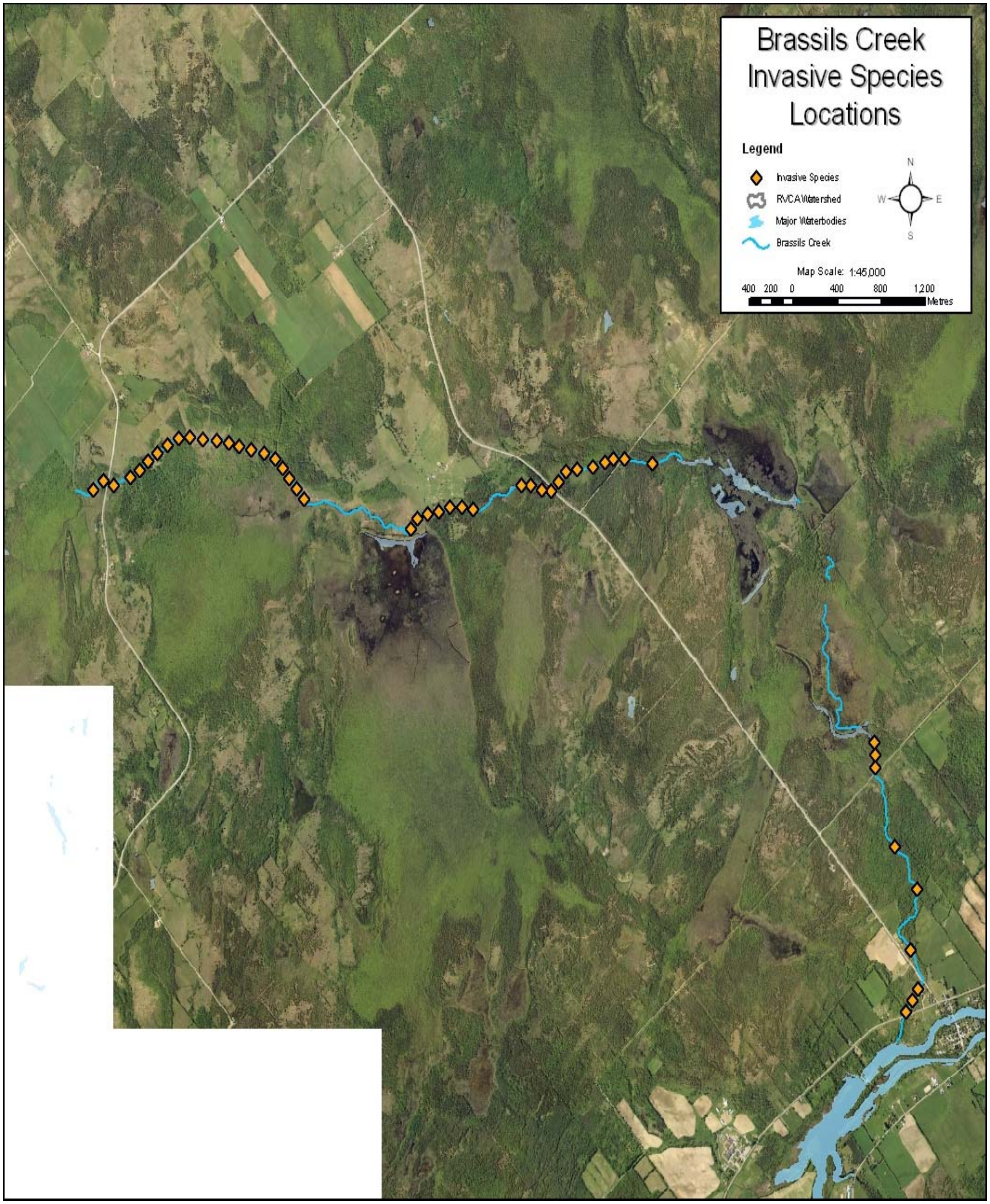
i) Pinecrest Creek Invasive Species Sites

As reported by volunteers in the 67 sites surveyed no invasive species were observed. This stream was surveyed early in the season therefore invasive species may not have been easily identifiable.

ii) Becketts Creek Invasive Species Sites



iii) Brassils Creek Invasive Species Sites



Appendix I

City Stream Watch 2006 Organizational Chart