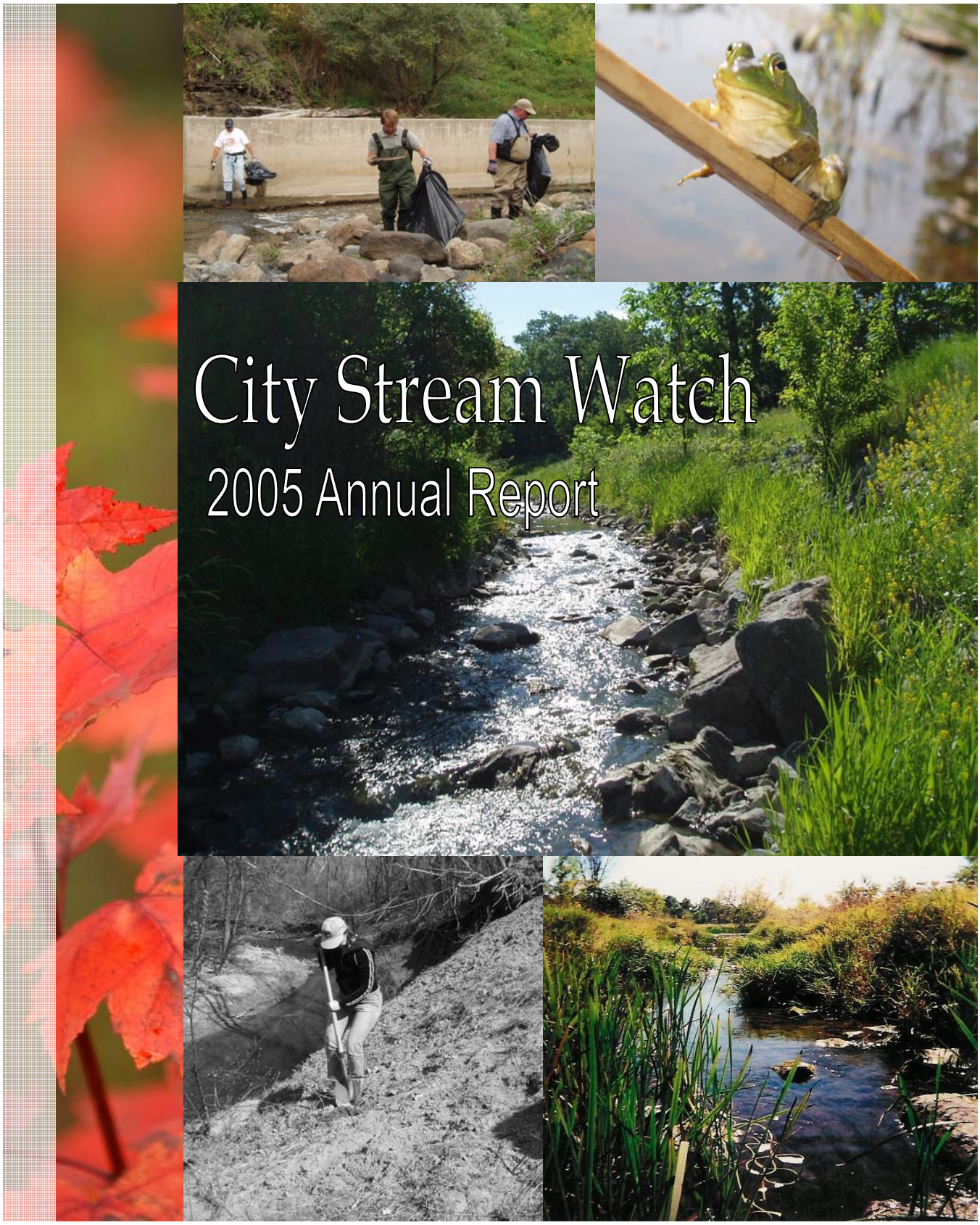

City Stream Watch

2005 Annual Report

City Stream Watch
2005 Annual Report

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December 15, 2005

Executive Summary

This document summarizes the activities of the City Stream Watch program for the 2005 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 Roundtable*;

The partnership has grown to seven in 2005 with the addition of the *National Defence Headquarters Fish and Game Club*. Representatives from these organizations met, and together outlined a program that fulfills many of the needs of the community 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 creeks and 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, participate in sampling fish communities through seining, and assist in stream clean-ups and stream 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 educational backgrounds and experiences.

Four streams (Greens, Graham, Stevens and Mosquito Creeks) were chosen for sampling in the 2005 season, based on community interest as well as the level and need for current information. A total of 105 volunteers from the community participated in the program, contributing a total of 458 hours. Approximately 38.5 kilometres of stream were surveyed in total. All information is housed in the Rideau Valley Conservation Authority's Watershed Information Management System and is available interactively on the authority's website at www.rideauvalley.on.ca.

Volunteers assisted in sampling the fish communities in three of the four creeks, identifying different fish species. A total of 25 seining events occurred on Greens, Stevens and Graham Creek. In total, 18 different species were observed.

Two stream clean-up initiatives were organized on Greens Creek and Sawmill Creek resulting in five outings. Over 165 hours were given to help remove garbage of human origin from the creek.

The program should further build on the successes achieved throughout the past three 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 a few 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 **T.D. Friends of the Environment Foundation** for their financial contribution to the program.

Thank you to Jason Kelly and Doris Kwok of the **Monterey Inn Resort and Conference Centre** at 2259 Prince of Wales Drive, for donating fruit, sandwiches and drinks for hungry and thirsty volunteers during our community clean-up initiatives on Sawmill and Greens 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 Sawmill and Greens Creek clean-ups.

Thank you to Lorne Pennycook and Peter Stewart-Burton of the **National Defense Headquarters Fish and Game Club** for their assistance in organizing a clean-up initiative on Sawmill Creek.

Thank you to Bruce Clarke of the **Ottawa Flyfishers Society** for all his hard work and dedication to the program in 2005.

Thank you to Tony Provenzano of **1414875 Ontario Ltd.** for allowing access to Sawmill Creek through the company's property on Hunt Club Road during our clean-up.

Thank you to Cody Barbeau, General Manger of the **Pinecrest Golf Course** for the use of golf carts to get to Greens Creek from their land.

Thank you to Mark Lamoureux, Store Manager of **Rona (Innes Rd.)** for donating work gloves and garbage bags for the three-day cleanup on Greens Creek.

Thank you to Brian Kennedy, Store Manger of **Home Depot South Keys** for donating work gloves and garbage bags for the cleanup on Sawmill Creek

Thank you to Doug Gowenlock for allowing us access to Graham Creek through property of the **Canadian Food Inspection Agency**.

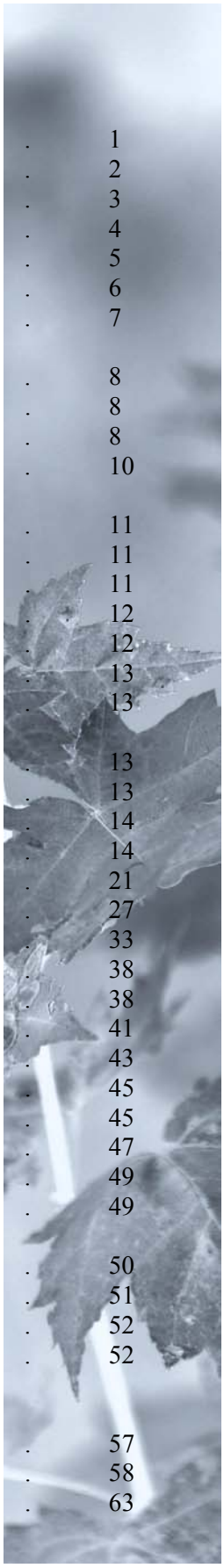
Thank you to Brian Gravelle of the **National Capital Commission** for allowing access to gated NCC property.

Thank you to **A-Channel News** for airing a morning show on the City Stream Watch program in hopes of raising awareness about the program and recruiting volunteers.

Thank you to **Councillor Alex Cullin** for participating in accessing Stillwater creek for cleanup and planting opportunities.

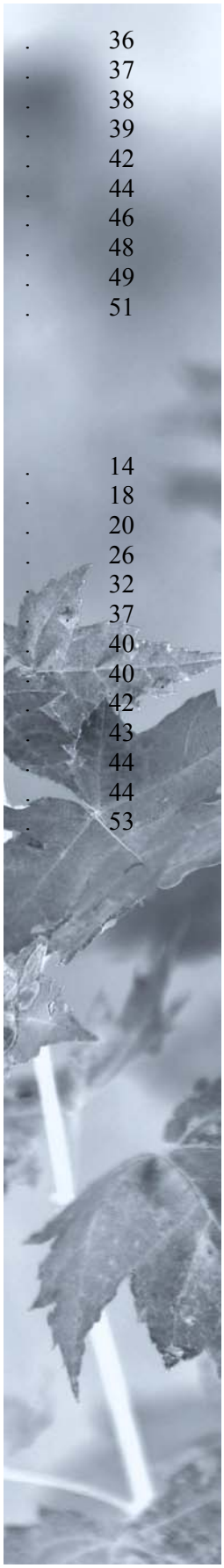
Thank you to the **City of Ottawa** for providing office space for the coordinator.

Table of Contents



Index of Figures

Index of Tables



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 creeks and 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 provides 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.

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 Committee aids in training and recruiting volunteers of the City Stream Watch program.

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 aids in coordinating, recruiting, and training volunteers of 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 aids in recruiting volunteers for the City Stream Watch program and concentrates its efforts on monitoring, maintaining and improving the natural beauty and health of Greens Creek.

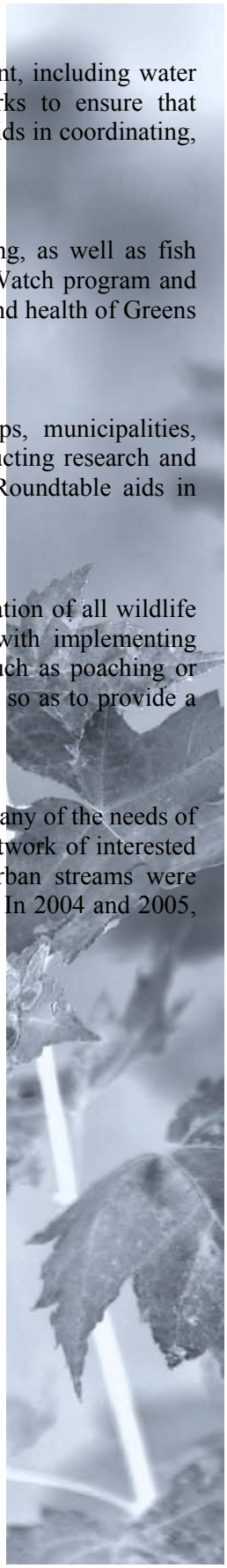
The Rideau River Roundtable

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. The Roundtable aids in training and recruiting volunteers of the City Stream Watch program.

National Defence Headquarters Fish and Game Club

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.

Representatives from these groups met and together outlined a program that fulfilled many of the needs of the community for information and promotion of local urban streams. Through a network of interested volunteers from the community, guided by an experienced project coordinator, urban streams were surveyed and valuable information was recorded between May and October of 2003. In 2004 and 2005, the City Stream Watch program built on the successes it achieved during its first year.



1.3 Stream Selection in 2005

Three additional streams were selected for sampling in the 2005 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 and 2004.

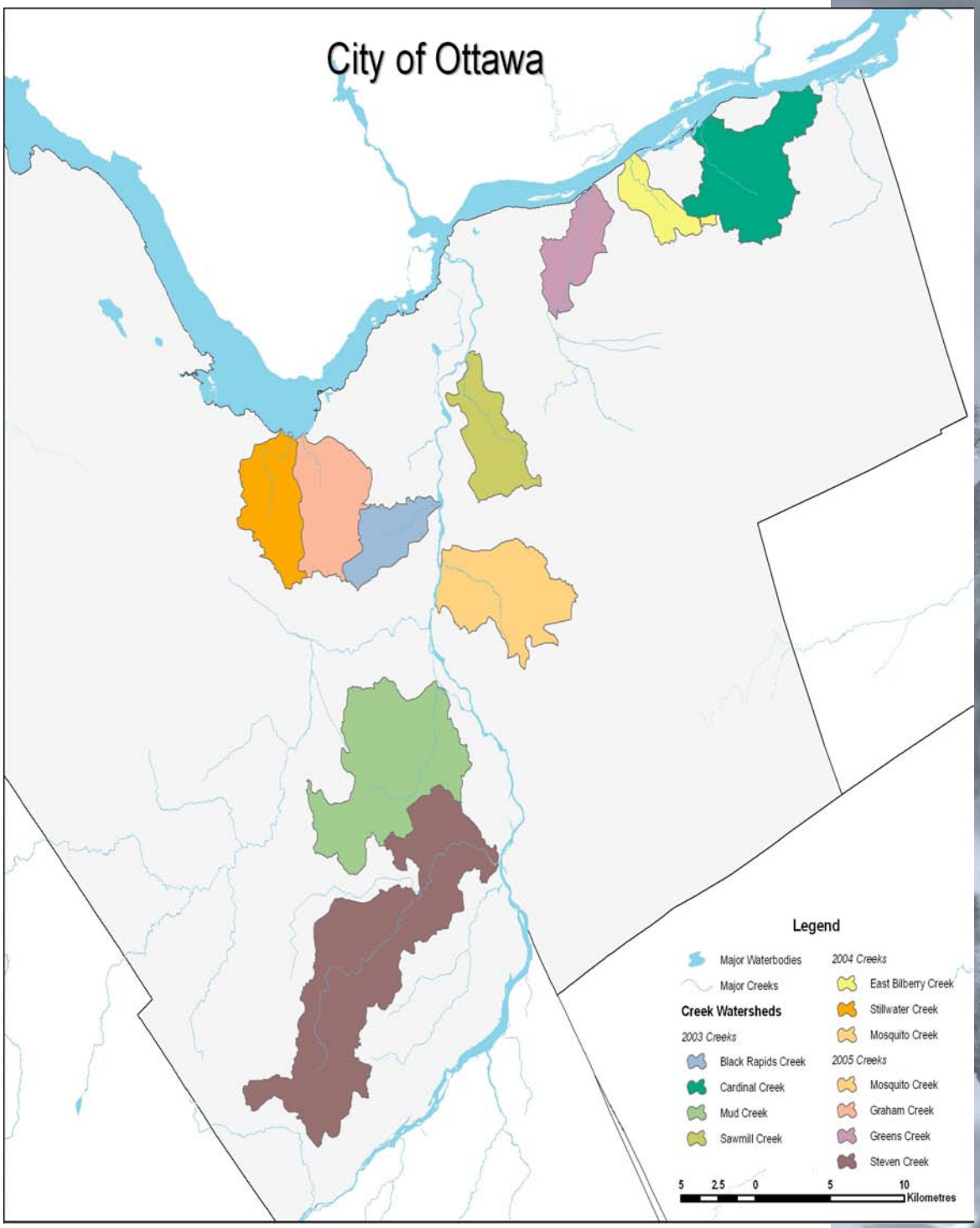


Figure 1. Locations of streams and their watersheds sampled during the 2003, 2004 and 2005 seasons.

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 2005. 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 it is used by volunteers having 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 Magellan SporTrak 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 is taken upstream. 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 50m, the volunteer left behind joins the others at the 50-meter 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 meters of the section is repeated for the second 50 meters, therefore completing a 100m 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 in 2005. The coordinator chose appropriate sampling sites, and volunteers assisted in pulling the net through the water column and processing the catch. The different species of fish were sorted and counted. Minnow species were counted and a round weight (the 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 the 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 response to the recommendations from the 2004 City Stream Watch Annual Report, a number of stream clean-up activities were undertaken on Sawmill Creek in the spring and fall of 2005 with help from the National Defence Fish and Game Club. A polluted stretch of Greens Creek was found while sampling this year and a cleanup was initiated to remedy the problem. The program and its volunteers received a letter of thanks from the National Capital Commission (NCC) recognizing their efforts to rid Greens Creek of pollution (see appendix F). Volunteers were guided in the safe and appropriate removal of garbage from the creek bed and riparian areas. Only human made material was 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 riparian/fish and wildlife habitat restoration on city streams. In 2005 one riparian planting project was successfully completed on a failed bank of Sawmill Creek. For 2006 more planting opportunities have been identified and will commence in the spring. Such projects include Phase II of Sawmill Creek riparian work and a planting project on Graham Creek.

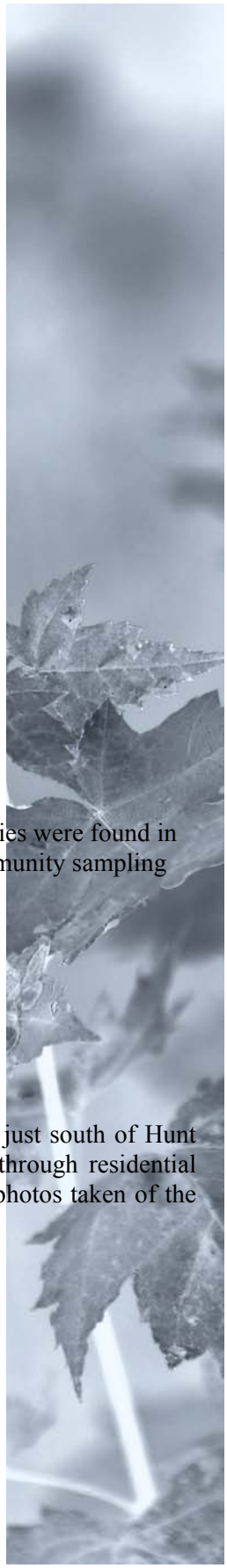
2.6 Data Management

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. In 2006 changes will be made to the Watershed Information System (WIS) system which allows data layers to be viewed and turned off. 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 Management 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 105 volunteers from the community participated in the 2005 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 in enhancing 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 458 volunteer hours were given to learning about, sampling and rehabilitating streams in the Ottawa area. Table 1 summarizes volunteer activities for the 2005 season.



	Graham Creek	Greens Creek	Stevens Creek	Mosquito Creek	Sawmill Creek	TOTAL
# of Sections Surveyed	67	124	144	50	0	385
# of Seining Events	16	7	2	0	0	25
# of Species Caught Seining	12	7	8	0	0	20*
# of Cleanup Outings	0	3	0	0	2	5
# of Kilometres (KM) Cleaned	0	2	0	0	6	8
# of Riparian Plantings	0	0	0	0	1	1
# of Temperature Probe Readings	2	2	2	2	2	12
# of Volunteers	_	_	_	_	_	110
# of Volunteer Hours	_	_	_	_	_	458

Table 1. City Stream Watch Accomplishments of 2005

* 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.

3.2 Environmental Monitoring

3.2.1 Graham Creek

Graham Creek is approximately nine kilometres long, and flows from Highway 416, just south of Hunt Club Road through the Canadian Food Inspection Agency farm and works it way through residential areas before entering the Ottawa River at Andrew Haydon Park. Figure 2 shows air photos taken of the Graham Creek area in 2002.

Figure 2. Air photo of Graham Creek and surrounding area.

A total of 6.7 kilometres of Graham Creek was sampled during the 2005 season. The following is a summary of the 67 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 Graham Creek. Of the 67 sections of stream sampled, volunteers identified ten sections (1km) of stream that displayed no human alterations. Of the remaining sections, 22 were considered highly altered due to channel hardening from gabion cage and stone armoring lining the banks for floodwater protection. The 28% of altered sections represent the many bridges and entombed sections which Graham Creek encounters.

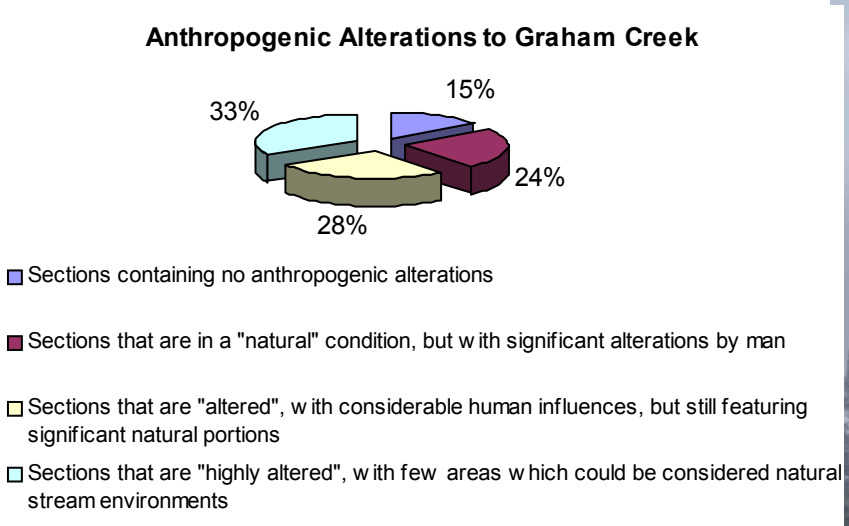


Figure 3. Classes of anthropogenic alterations occurring on Graham Creek.

Figure 4 demonstrates the different land uses recognized adjacent to Graham Creek. Volunteers identified seven different land uses occurring on the banks adjacent to Graham Creek. Residential neighbourhoods and parks make up the majority of land use for Graham Creek as it flows through many developed areas. Though this is a highly developed area, natural areas still exist, making up 33% of the stream. Active agriculture exists only because Graham Creek flows through a portion of the Canadian Food Inspection Agency experimental farm in its headwater reaches.

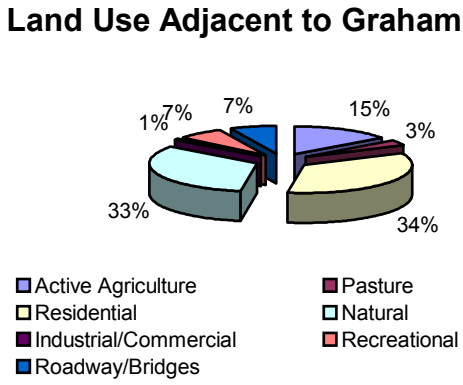


Figure 4. Land use volunteers identified along Graham Creek.

2. Observations of Instream Vegetation

Instream vegetation is an important factor for a healthy stream ecosystem. Vegetation aids in removing contaminants from the water, contributes oxygen to the stream and provides important habitat for fish and wildlife. Figure 5 demonstrates the incidence of instream vegetation abundance in Graham Creek. Instream vegetation was categorized as being low or rare in abundance in 58% of sections sampled. This is due in part to the gabion cage structure which stabilizes the bank, although does not allow for considerable plant growth along the banks of the channel. Low and rare vegetation can negatively impact fish habitat by reducing instream cover and affecting the food sources for the aquatic ecosystem. Sections classified as having common or normal growth represent areas which remain natural and provide important habitat to stream dwelling species. Extensive growth is generally found in agricultural areas and can negatively impact an ecosystem as it deprives the water of oxygen and sunlight. In this case the vegetation was not extensive to the point of degraded conditions as minnows and macro invertebrates were still observed. Volunteers did not identify any invasive plant species on this system. Graham Creek was sampled early in the spring, therefore plants may have not been easily identifiable. (See Appendix I)

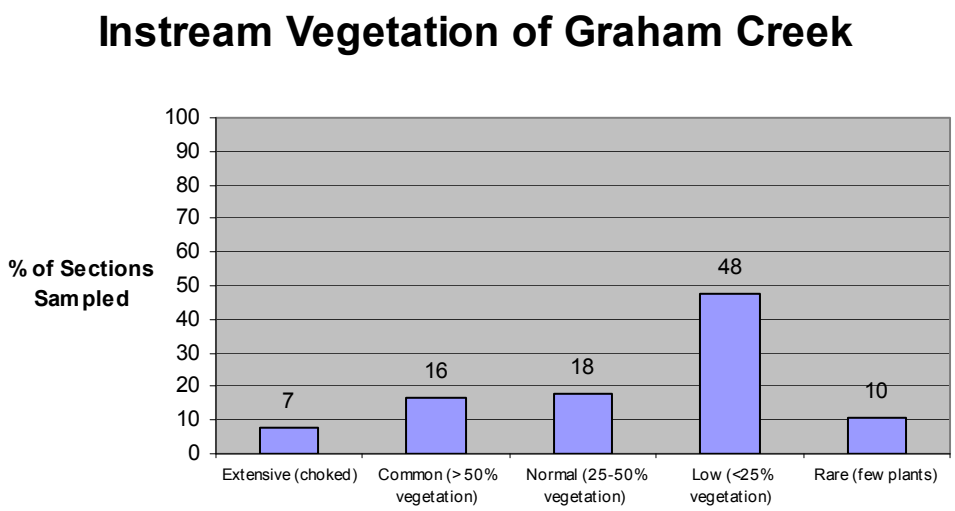


Figure 5. Frequency of instream vegetation abundance in Graham Creek.

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 and discharge pipes. The greatest factor of fluctuating temperature is solar radiation. Streams with large amounts of riparian canopy cover will yield lower temperatures where areas with no trees will be warmer.

Department of Fisheries and Oceans (DFO) has a standard temperature range to classify water as being cool, cold or warm. Table 2 illustrates this classification and identifies 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

Two temperature dataloggers were set approximately 5km apart in Graham Creek on June 13 and picked up September 11. One was set close to where the stream crosses Carling Ave at the Ottawa River in a shaded reach. The other was set in the early reaches, downstream of Hunt Club Road in a reach with little canopy cover. The graphs below show the temperature trends between the three-month period.

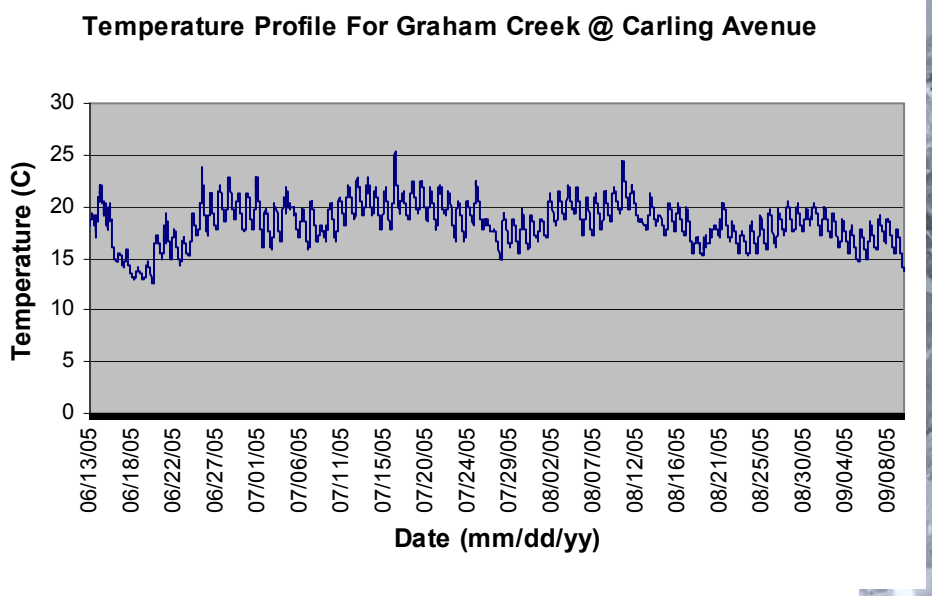


Figure 6. Temperature Profile (1) for Graham Creek

Figure 6 shows a normal, fluctuating temperature trend. Temperatures are characteristic of a warm water system which may have some cool water reaches. In the three-month period this stream section reached a maximum temperature of 25.32 °C and a minimum of 12.63 °C. There is a large drop in temperature the week of June 13 to June 20th. This trend is observed in all four of the streams surveyed. When historical weather data was obtained from Environment Canada, temperature records show rain accumulation of 90mm and air temperatures dropping to lows of 10°C throughout the week. Thus, we see a dramatic drop in water temperature due to cold weather patterns.

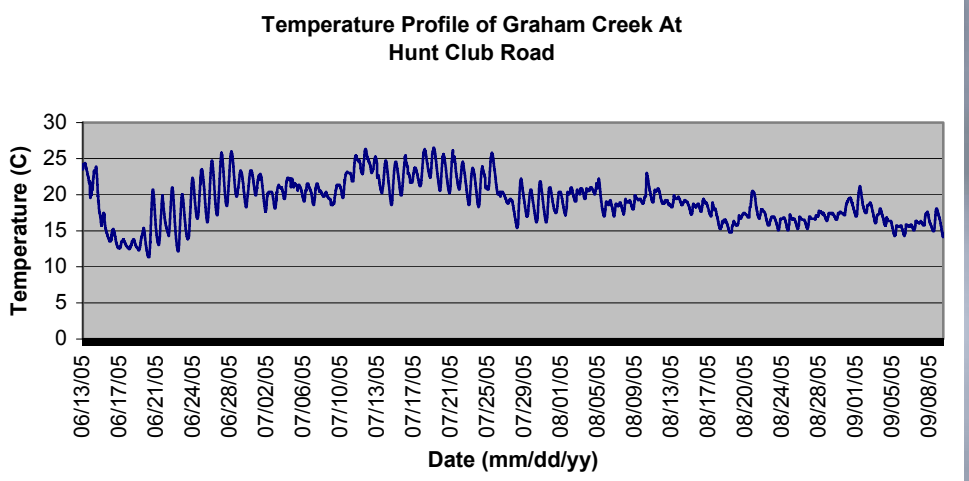


Figure 7. Temperature Profile (2) for Graham Creek

Figure 7 illustrates the same temperature drop as mentioned above for the week of June 13 to June 20th. This stretch can also be characterized as a warm-water system. In the three-month period this stream section reached a maximum of temperature of 26.48 °C and a minimum of 11.34 °C. This graph appears to have more fluctuations between minimum and maximum temperatures from June to early August. This can be attributed to the fact that there is little canopy cover over the stream, therefore the water heats up from solar radiation during the day and then drops during the night when it is cooler.

4. Observations of Bank Stability

The level of bank stability indicates the occurrence of the removal of soil from the bank into the stream. High levels of bank instability 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 affects on fish and wildlife habitat. Figure 8 shows the overall bank stability of Graham Creek. Evidence of erosion on the stream bank was observed along 29% of the shoreline, coinciding with areas of little or no vegetation. The high percentage of stable banks can be attributed to the floodwater prevention system of gabion cage lining the banks of the stream in most residential areas. 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 option as they require little maintenance and promote the regeneration of vegetation to further stabilize the bank.

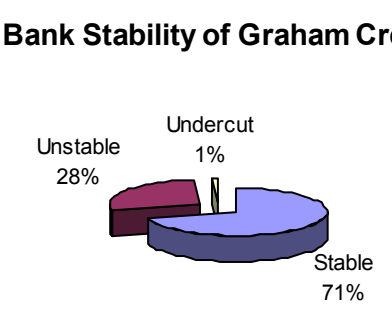


Figure 8. Bank stability of Graham Creek.

Areas of erosion have been identified on an aerial photo of Graham Creek and can be found in Appendix H. This information includes a percentage of the 100m site which 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. Volunteers recorded the presence of many types of wildlife in and around Graham Creek. Table 3 is a summary of all wildlife observed.

	Observed
Birds	*Red-wing blackbird, flicker, robin, sparrows, ring-billed gull, crow, goldfinch, chickadee, blue jay, swallow, mallard duck, Canada geese, grackle, cedar waxwing, great blue heron, morning dove, killdeer, wood duck, cardinal, kingfisher, nuthatch, starling*
Mammals	*Chipmunk, raccoon, groundhog, muskrat, mouse, deer, beaver, black squirrel*
Reptiles/Amphibians	*Green frog, Pickerel frog, tadpoles, garter snake*
Fish	*Minnow species, gamefish species, fry, white suckers*
Aquatic Insects	*Waterstriders, damselfly, dragonfly, mosquitoes, sowbugs, black flies, amphipods, backswimmer, caddisfly, isopod, bloodworms*
Other	*Crayfish, clams, snails, leeches, butterflies*

Table 3. Wildlife observed on Graham Creek.

6. Observations of Pollution

Figure 9 demonstrates the incidence of pollution in Graham Creek. Pollution was observed in 73% of sampled sections which is quite high. Of the 67 sections, garbage on the stream bottom was observed in 69% of sections sampled, while floating garbage was observed in 1% of sampled sections. Garbage

did not occur in large quantities or accumulate in large amounts but there was scattered debris in the majority of sections. This high percentage could yield a stream cleanup for a group of community

volunteers that would like to walk large reaches of the stream, removing all human debris from its identified problem sections. Floating garbage included plastic bags and bottles as well as styrofoam. Garbage on the stream bottom included cans, scrap metal, grocery carts and tires. Oil and Gas trails often run off of roadways and enter the stream. This is the likely source in this case as the creek runs under heavily traveled roadways such as Carling Ave, Hwy 417 and Hunt Club Road.

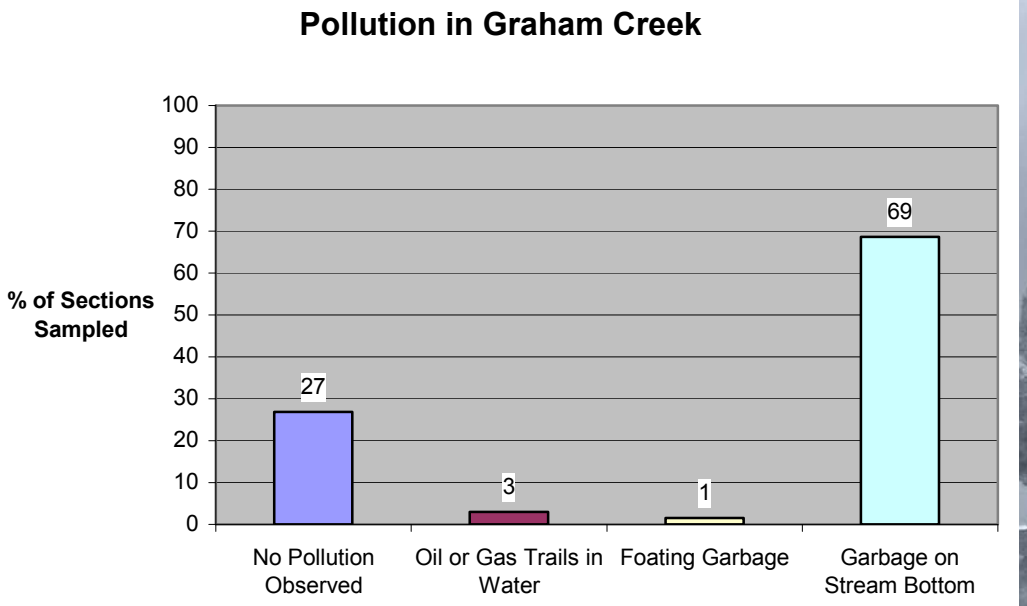


Figure 9. Frequency of pollution occurring in Graham Creek.

3.2.2 Greens Creek

Greens Creek is approximately fourteen kilometres long, flowing from Walkley Rd north through NCC land before entering the Ottawa River just east of Lower Duck Island. Greens Creek begins where Borthwick and Ramsay Creek join, just north of Walkley Rd. Greens Creek has many tributaries which, in the 2006 season, may be sampled to gain more insight on its fish communities. Figure 10 shows a more detailed look at the creek.

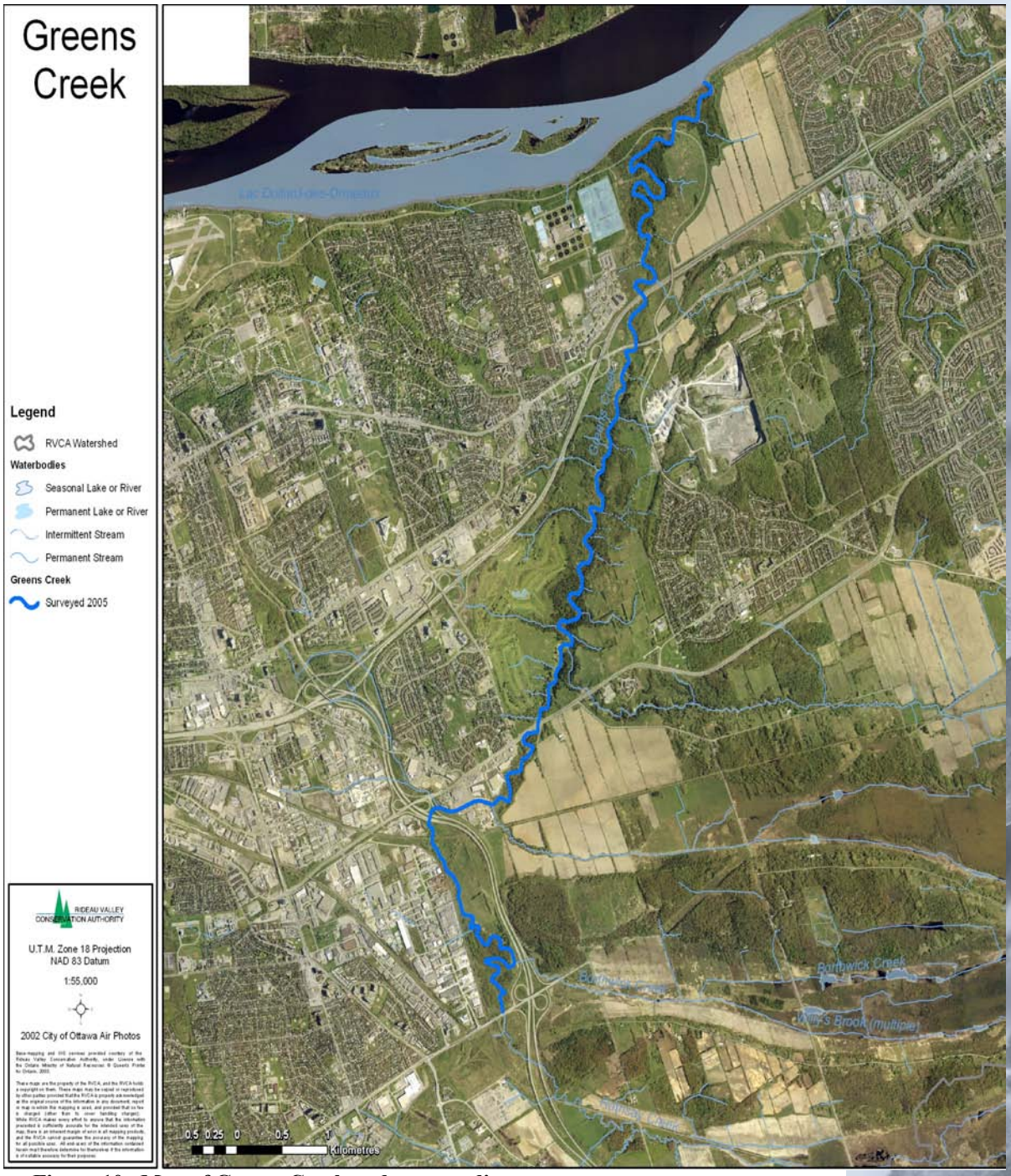


Figure 10. Map of Greens Creek and surrounding area.

A total of 12.4 kilometres of Greens Creek was sampled throughout the 2005 season. The following is a summary of the 124 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 11 illustrates the classes of anthropogenic alterations that volunteers observed on Greens Creek. Of the 124 sections of stream sampled, volunteers identified eighty-two sections that displayed no human alterations. Of the remaining sections, one section was considered highly altered by the construction of two large parking lots on each side of stream. Only 12% of sections were considered altered by volunteers. These alterations include shoreline modification and armoring, bridges for roadways, and lack of riparian vegetation due to development.

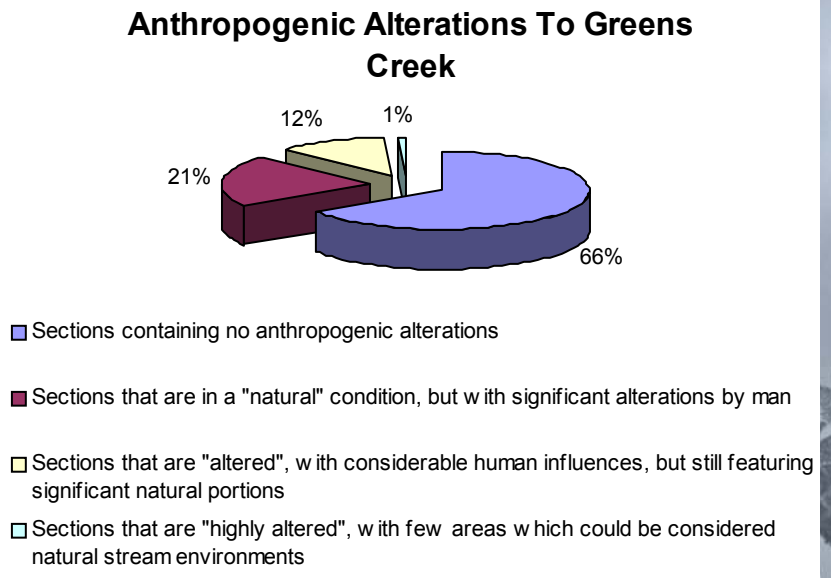


Figure 11. Classes of anthropogenic alterations occurring on Greens Creek.

Volunteers observed three different land uses occurring adjacent to Greens Creek. Natural areas exist along 89% of sampled creek, while industrial/commercial and residential areas comprise the remaining 11%. NCC ownership and protection along with difficult access account for the large percentage of natural areas. Figure 12 demonstrates the different land uses identified adjacent to Greens Creek.

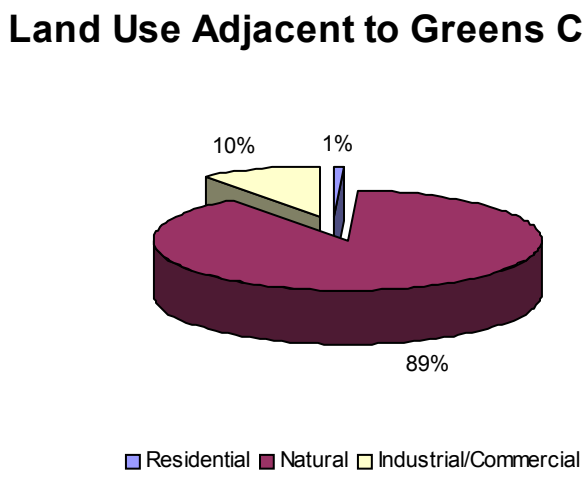


Figure 12. Various land uses volunteers identified occurring on Greens Creek.

2. Observations of Instream Vegetation

Figure 13 demonstrates the incidence of instream vegetation abundance in Greens Creek. Instream vegetation was categorized as being rare in abundance in 21% of sections sampled, and either low or rare in abundance in 73% of sections sampled. This was due in part by slick clay substrate and murky water that does not allow 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 algae would, as it still allows sunlight to penetrate the substrate and offers essential nursery habitat to fish and nesting habitat for wildlife.

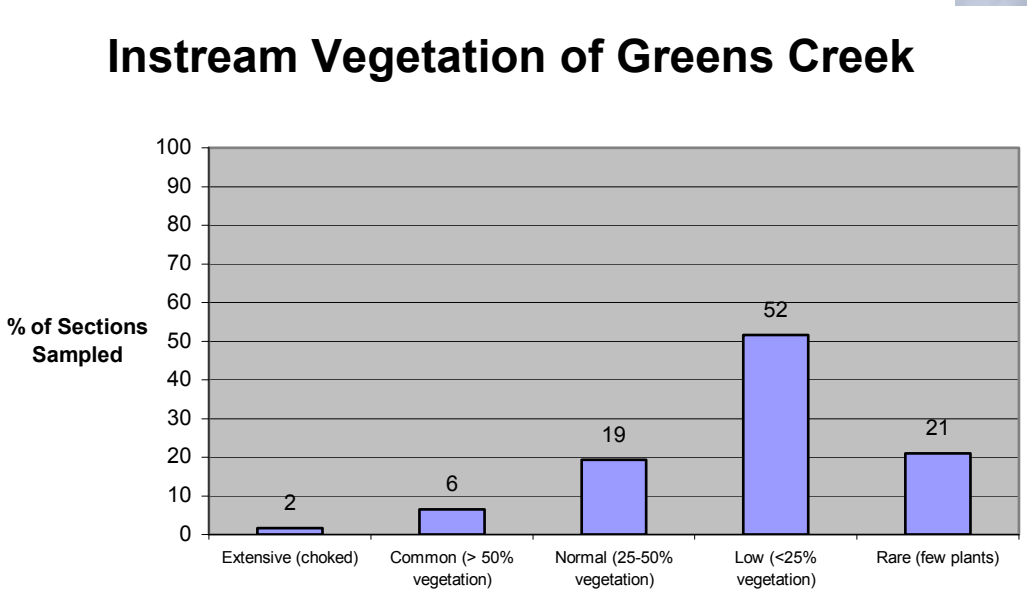


Figure 13. Frequency of instream vegetation abundance in Greens Creek.

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, eurasion milfoil, and flowering rush are examples of invasive plant species. These exotics degrade ecosystems which they occupy as they out-compete native species, especially the rare or endangered and eliminate fish and wildlife habitat.

Purple loosestrife and flowering rush were found in many sections of Greens Creek. Maps of invasive species have been identified on aerial photographs in Appendix I for Greens, Stevens and Mosquito Creeks. These maps will help mangers determine whether or not invasive species are growing in population.

3. Temperature Profiling

Two temperature dataloggers were set in Greens Creek approximately 3km apart. The first was set approximately half a kilometre upstream from the mouth at the Ottawa River, near shore in a wide section of stream. The second was set in a reach after a riffle area below the bridge at St. Joseph Blvd where seine netting occurred. The graphs below show the temperature trends between the three-month period of June 13 to September 11.

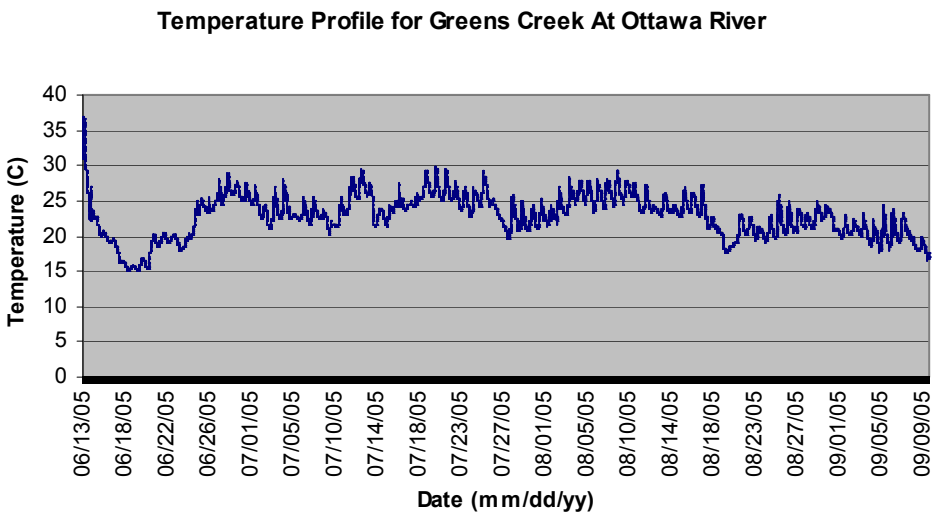


Figure 14. Temperature Profile (1) for Greens Creek

Figure 14 shows little fluctuation in temperature. This section of stream reached a maximum temperature of 36.89 °C and a minimum of 15.09 °C. Looking at the temperature trend we can conclude that this stretch of Greens creek is a warm water system. As explained in the Graham creek section, there is a dramatic drop in temperature from June 13 to June 20th from cold weather and rain events that occurred throughout that week. Temperatures appear warmer in this section and fluctuations are not great due to stream morphology. It is a deeper, wider, low flowing stretch, which allows the water to be heated and remain warm from not mixing.

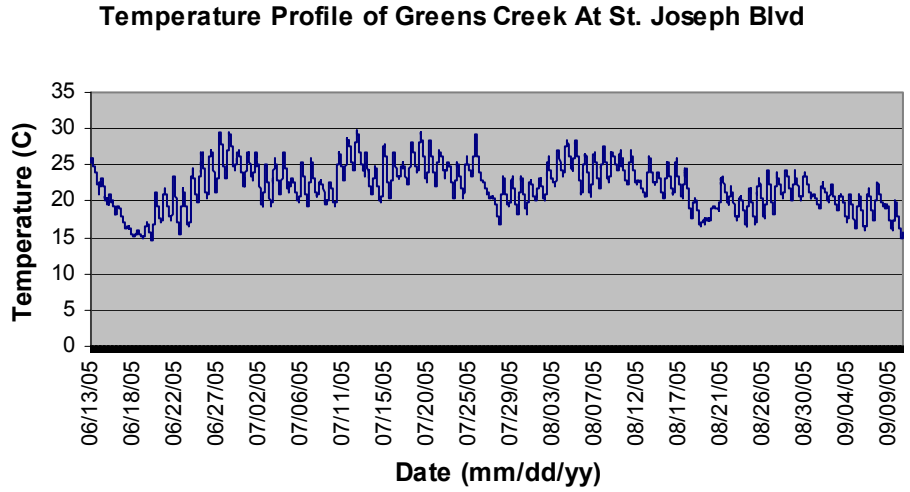


Figure 15. Temperature Profile (2) for Greens Creek

Throughout the three month period this section of stream reached a maximum temperature of 29.82 °C and a minimum of 13.89°C, charateristic of a warmwater system. Figure 15 has two evident water temperature fluctuations. The first occurring from June 13 to June 20th as previously mentioned in the Graham Creek section and the second occurring from July 26 to 29th. This temperature fluctuation is attributed to rain and colder temperatures, which occurred a few days prior.

4. Observations of Bank Stability

Figure 16 demonstrates the overall bank stability of Greens Creek. Evidence of erosion from the stream bank was observed along 51% of the shoreline, coinciding with areas of little or no vegetation. Many failed banks where trees have fallen into the stream were observed. Greens Creek is a natural flowing stream, with little urban/commercial disturbance, so it can be said that most of this erosion is natural. Spring high flows and extended rain events can account for this natural erosion.

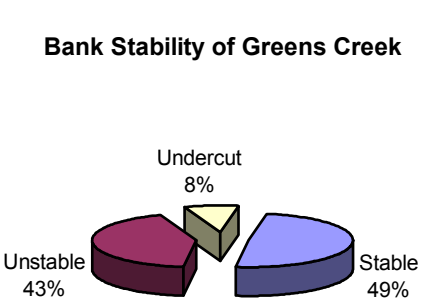


Figure 16. Bank stability of Greens Creek.

Areas of erosion have been identified on an aerial photo of Greens Creek and can be found in Appendix H. This information includes a percentage of the 100m 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 Greens Creek. Table 4 is a summary of wildlife observed.

	Observed
Birds	*Black duck, mallard ducks with ducklings, woodpecker, sparrows, starlings, kingfisher, herring gull, swallows, red-wing blackbird, robin, crow, goldfinch, chickadee, blue jay, great blue heron, morning dove, cardinal, sandpiper*
Mammals	*Chipmunk, raccoon, otters, groundhog, muskrat, deer, black squirrel, red squirrel*
Reptiles/Amphibians	*Leopard frog, painted turtle, american toad, green frog*
Fish	***Northern pike, largemouth bass**,minnow species, white suckers, fry*
Aquatic Insects	*Water strider, whirligig beetle, damselfly, dragonfly, mosquitoes, water boatman, aquatic sowbugs, caddisfly, mayfly*
Other	*Crayfish, snails, leeches, butterflies, spiders, freshwater clams*

Table 4. Wildlife observed on Greens Creek.

6. Observations of Pollution

Figure 17 demonstrates the incidence of pollution in Greens Creek. Pollution was observed in 82% of sampled sections. This high abundance of pollution can be attributed to debris being blown and washed into the stream by littering from the many busy roadways, and flowing downstream. Of the 124 sections sampled, garbage on the stream bottom was observed in 73%, while floating garbage was observed in 7%. 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 Greens 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. Greens Creek would benefit from a walk along cleanup where community volunteers walk a reach of stream ridding it of the pollution problems identified, while also having the opportunity to learn about the ecosystem and observe the habitat of this natural system within the city of Ottawa.

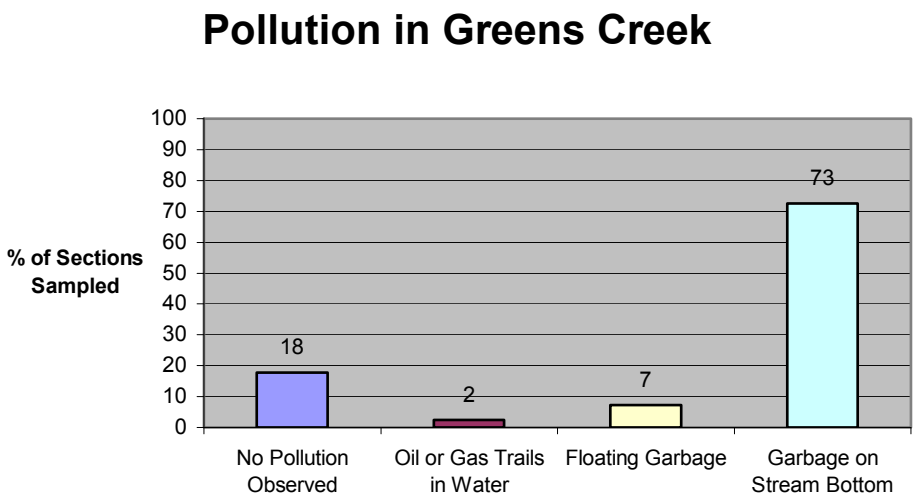


Figure 17. Frequency of pollution occurring in Greens Creek

3.2.3 Mosquito Creek

Mosquito Creek is approximately 10.5 kilometres long, flowing Northwest through rural agricultural areas before entering the Rideau River just north of Manotick. Figure 18 shows air photos taken of the Mosquito Creek area in 2002, before the development of the Riverside South subdivision and extension of Spratt Rd.

Figure 18. Air photo of Mosquito Creek and surrounding area.

In 2004 the City Stream Watch program surveyed 22 sites of Mosquito creek (highlighted in green). To gain more data on the stream, a total of 5 kilometres of Mosquito Creek were sampled during the 2005 season to nearly complete the system. The following is a summary of the 72 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 Mosquito Creek. Of the 72 sections of stream sampled, volunteers identified 41 sections that displayed no human alterations. Of the remaining sections, there were no sections considered highly altered. Only 3% of sections were considered altered and these alterations include culverts and bridges for roadways.

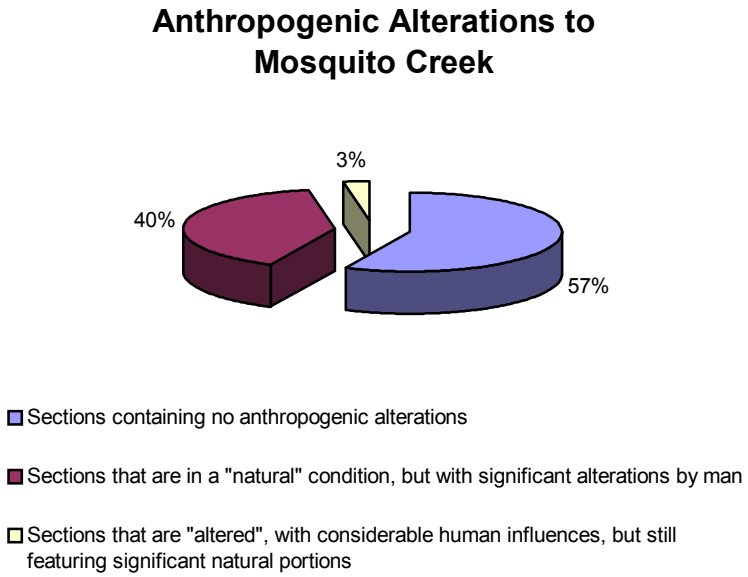


Figure 19. Classes of anthropogenic alterations occurring on Mosquito Creek.

Figure 20 demonstrates the different land uses recognized adjacent to Mosquito Creek. Volunteers identified five different land uses occurring adjacent to Mosquito Creek. Natural areas exist along 72% of the creek, while residential, pasture and roadway made up 16% and active agricultural areas comprise the remaining 12%.

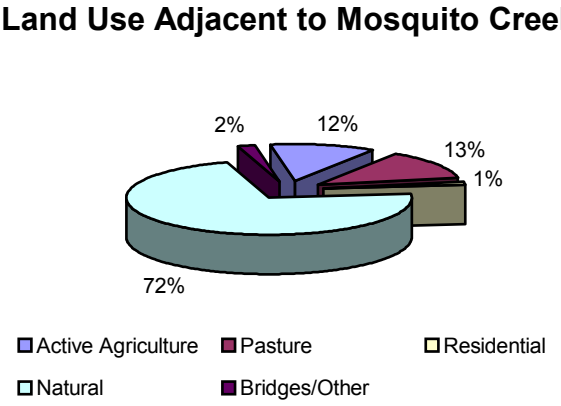


Figure 20. Various land use volunteers identified occurring on Mosquito Creek.

2. Observations of Instream Vegetation

Figure 21 demonstrates the incidence of instream vegetation abundance in Mosquito Creek. Instream vegetation was categorized as being normal for over 50% of the stream. There were no sections,

which represented vegetation being rare or extensive which shows a healthy stream system. Areas of low vegetation growth coincided with hard clay substrate. The pattern which is seen in Figure 21 is typical of a healthy stream ecosystem. Invasive plant species were identified in Mosquito Creek, which included purple loosestrife and flowering rush. A map of the frequency of these plants can be found in Appendix I.

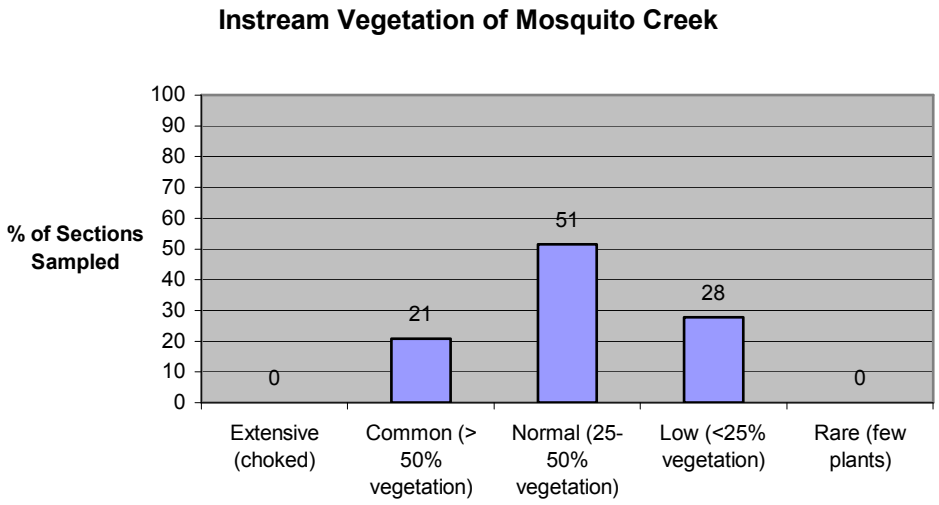


Figure 21. Frequency of instream vegetation abundance in Mosquito Creek.

3. Temperature Profiles

Two temperature dataloggers were set in Mosquito Creek approximately 5 km apart. The first was set at the end of a slow flowing reach, just upstream of Spratt Rd. The second was set in the early reaches of the stream in a shallow, slow flowing section, just downstream of Rideau Rd. The graphs below show the temperature trends between the three-month period of June 13 to September 11.

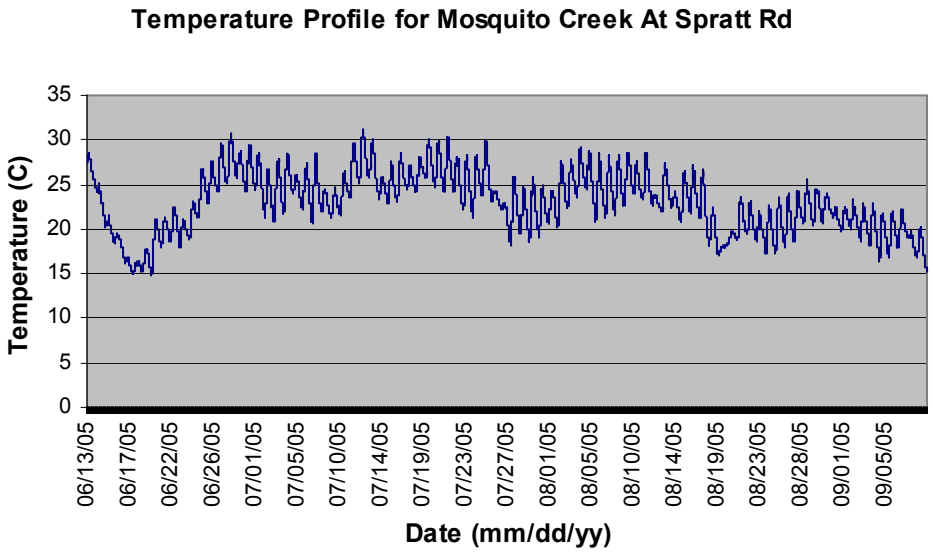


Figure 22. Temperature Profile (1) for Mosquito Creek

Figure 22 shows only one major temperature fluctuation that was explained above. This section of stream reached a maximum temperature of 31.18 °C and a minimum of 14.84°C. This graph shows fluctuating water temperatures from minimum to maximums but is still consistent with a warmwater stream. The stream section where the datalogger was placed has little canopy cover resulting in higher temperatures throughout the daylight hours from solar radiation and cooling trends after sundown.

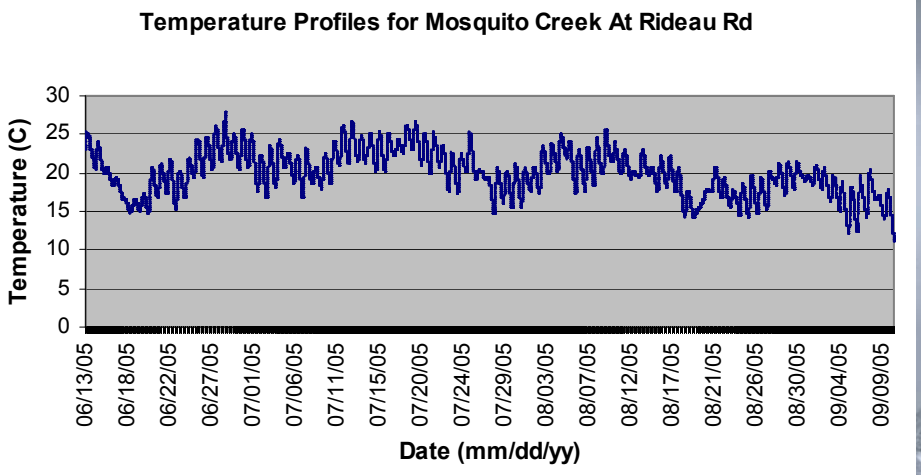


Figure 23. Temperature Profile (2) for Mosquito Creek

The section of stream seen in figure 23 reached a maximum temperature of 27.83°C and a minimum of 10.97°C. Temperatures are lower in this section compared to its downstream sample site. These lower temperatures may be from a tributary, which enters Mosquito Creek just upstream of sample site. This site represents a warm water stream with cool water reaches and tributaries.

4. Observations of Bank Stability

Figure 24 demonstrates the overall bank stability of Mosquito Creek. Evidence of erosion from the stream bank was observed along 39% of the shoreline, coinciding with areas of little or no vegetation. Sections which displayed signs of erosion were seen in the streams late reaches, just before it enters the Rideau River. This section of stream has residential development in the forms of houses and roadways which can greatly affect the streams banks from runoff.

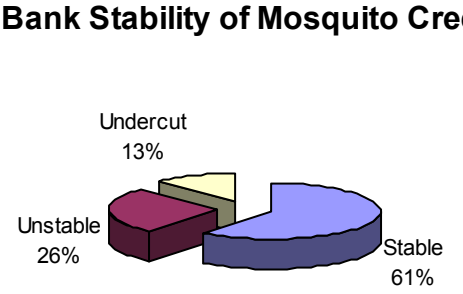


Figure 24. Bank stability of Mosquito Creek.

Areas of erosion have been identified on an aerial photo of Mosquito Creek and can be found in Appendix H. This map includes the percentage of the 100m site which is eroded.

5. Observations of Wildlife

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

	Observed
Birds	*Red-wing blackbird, flicker, robin, chipping sparrow, crow, american goldfinch, eastern kingbird, chickadee, blue jay, mallard duck, grackle, great blue heron, cardinal, sandpiper, kingfisher, house swallow, song sparrow, red-eyed vireo, baltimore oriole, hairy woodpecker, canada geese*
Mammals	*Raccoon, deer, muskrat, mouse*
Reptiles/Amphibians	*Green frog, snapping turtle, toad*
Fish	*Minnow species, suckers, fry, sunfish*
Aquatic Insects	*Water strider, whirligig beetle, damselfly, dragonfly, mosquitoes, black flies, sowbugs, water scorpion, mayfly, amphipods*
Other	*Crayfish, snails, butterflies, deer flies, freshwater clams*

Table 5. Wildlife observed on Mosquito Creek.

6. Observations of Pollution

Figure 25 demonstrates the incidence of pollution in Mosquito Creek. Pollution was observed in only 30% of sampled sections. Of the 72 sections sampled, no pollution was found in 51 sections making up 71% of the stream. This low frequency of pollution is a sign of a healthy stream with little human disturbance. Rural streams often have less human related impacts than systems with urban/commercial pressures.

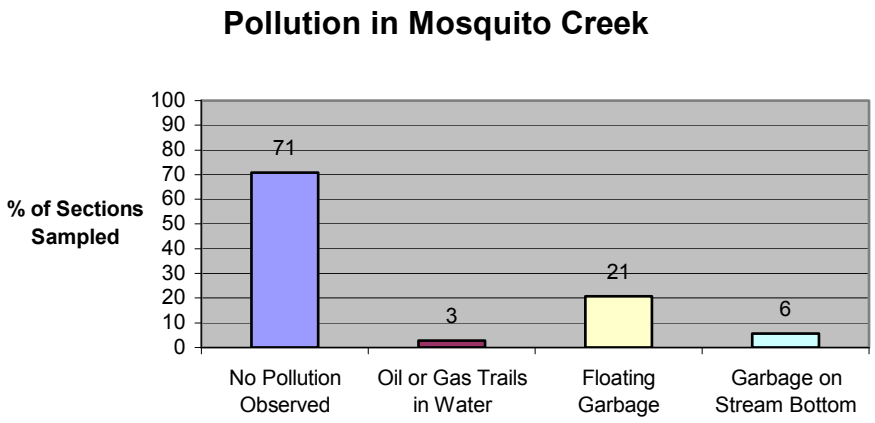


Figure 25. Frequency of pollution occurring in Mosquito Creek.

3.2.4 Stevens Creek

Stevens Creek is approximately 25 kilometres long, flowing through mainly agricultural land and the town of North Gower before entering the Rideau River in Kars. Figure 26 shows air photos taken of the Stevens Creek area in 2002.

Figure 26. Air photo of Stevens Creek and surrounding area.

A total of 14.4 kilometres of Stevens Creek were sampled during the 2005 season. The headwaters of Stevens creek was not sampled due to a change in habitat type from a stream to wetland. Wetland areas do not fall under the macro stream survey; however future wetland studies of these areas would provide valuable data on the system. The following is a summary of the 144 macro stream assessment forms filled out by volunteers. Observations concerning anthropogenic alterations, land use, instream vegetation, bank stability, wildlife, and pollution are discussed.

7. Observations of Anthropogenic Alterations and Land Use

Figure 27 illustrates the classes of anthropogenic alterations that volunteers observed on Stevens Creek. Of the 144 sections of stream sampled, volunteers identified 109 sections that displayed no human alterations. Of the remaining sections, there was one section considered highly altered. This alteration is from a business in North Gower coming directly to the stream bank with no buffer zone. Only 4% of sections were considered altered and these alterations include culverts and bridges for roadways.

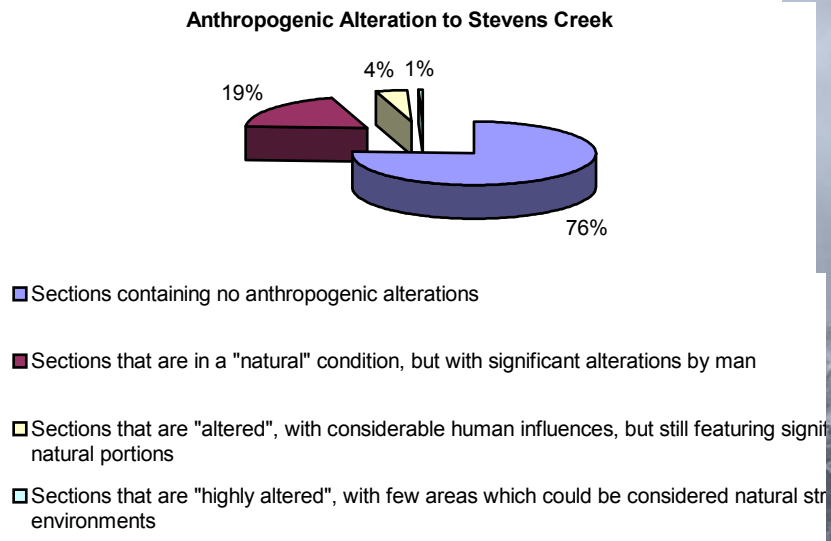


Figure 27. Classes of anthropogenic alterations occurring on Stevens Creek.

Figure 28 demonstrates the different land uses recognized adjacent to Stevens Creek. Volunteers identified eight different land uses occurring adjacent to Stevens Creek. Natural areas exist along 52% of the creek, while residential, recreational, industrial/commercial and bridges made up 9%. Agricultural areas, pasture and abandoned agricultural fields comprise the remaining 39%. Stevens creek has little residential/commercial disturbance leaving it a natural flowing stream.

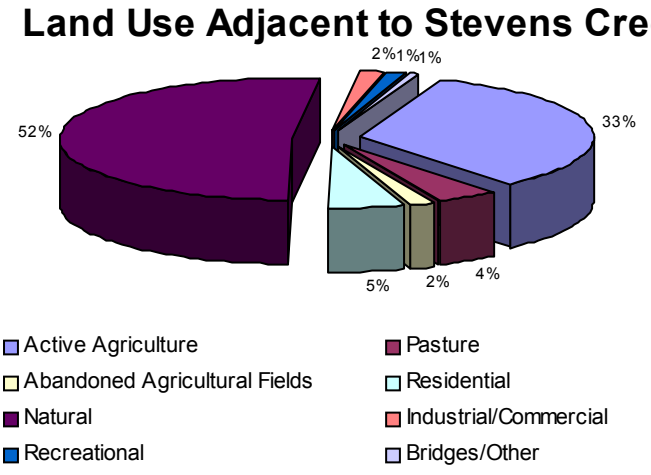


Figure 28. Various land use volunteers identified occurring on Mosquito Creek.

8. Observations of Instream Vegetation

Figure 29 demonstrates the incidence of instream vegetation abundance in Stevens Creek. Instream vegetation was categorized as being common to normal for 55% of the stream. There were nine sections, which represented vegetation being extensive, and these were generally found around active agriculture. The 21 sections that represented rare vegetation growth were typical of hard substrates made of rubble/boulders. Additionally the abundance of vegetation may be lower than normal as the majority of the stream was surveyed from mid to late fall, which is when vegetation dies off. The frequency of invasive species was low in Stevens Creek. Purple loosestrife, European frogbit and flowering rush were identified. See Appendix I for map of frequency.

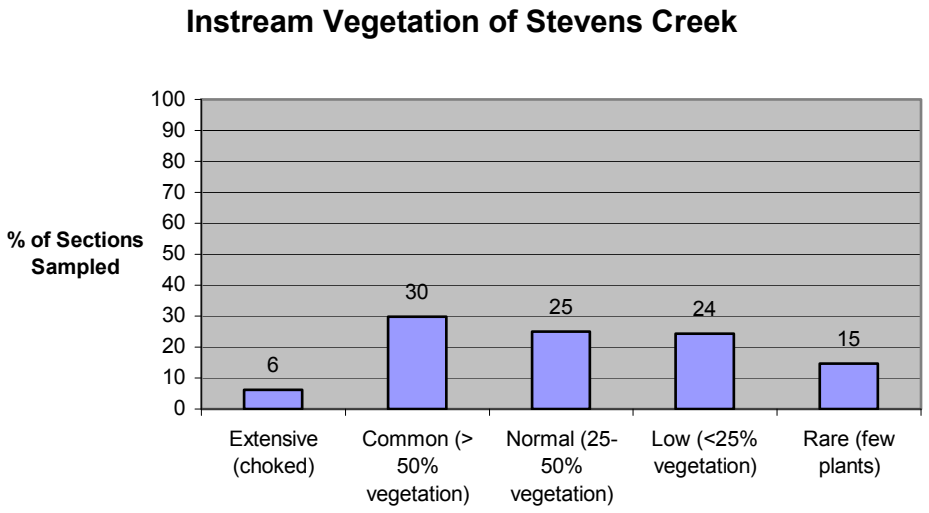


Figure 29. Frequency of instream vegetation abundance in Stevens Creek.

9. Temperature Profiles

Two temperature dataloggers were set in Stevens Creek approximately 10 km apart. The first was set in a wetland section of Stevens Creek, downstream of Second Line Rd. bridge. The second was set in a swift flowing reach, just downstream of Malakoff Rd bridge. The graphs below show the temperature trends between the three-month period of June 13 to September 11.

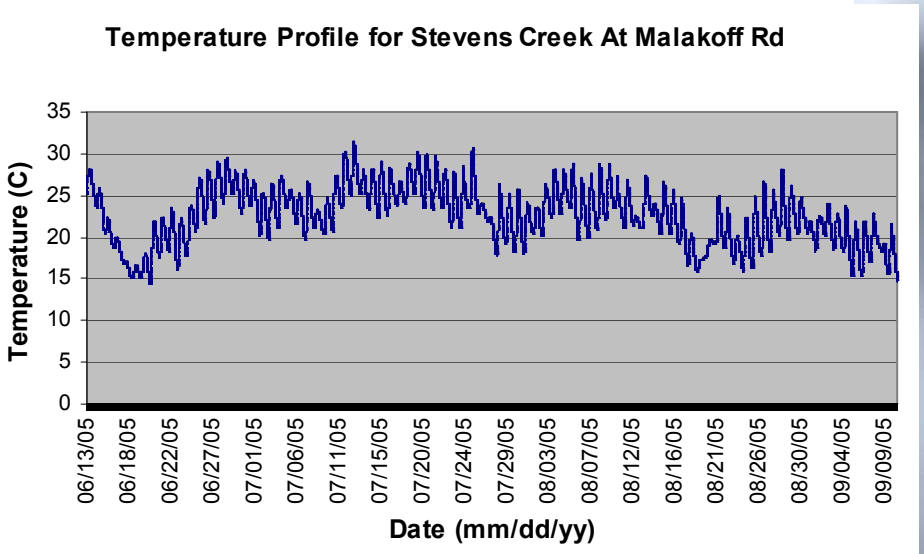


Figure 30- Temperature Profile (1) for Stevens Creek

Figure 30 shows fluctuations in temperature from minimum to maximum. This section of stream reached a maximum temperature of 31.31 °C and a minimum of 14.46 °C which is characteristic of a warm water stream with cool water reaches. As explained in the Graham creek section, there is a dramatic drop in temperature from June 13 to June 20th from cold weather and rain events that occurred throughout that week.

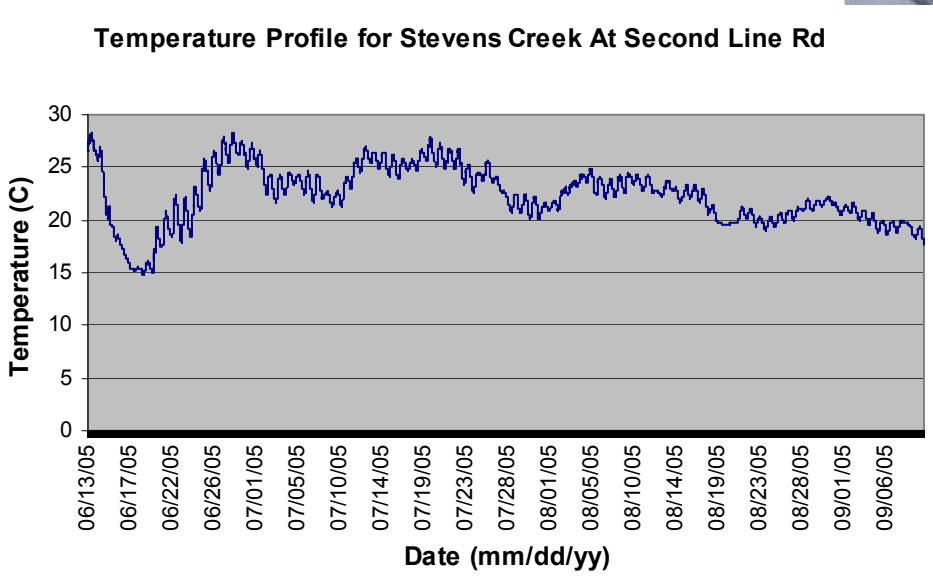


Figure 31 – Temperature Profile (2) for Stevens Creek

This section of stream seen in figure 31 reached a maximum temperature of 28.29 °C and a minimum of 14.84 °C. Temperatures appear not to fluctuate as much in this section from minimum to maximum. This section's morphology resembles that of the first site on Greens Creek. It is more pond-like than stream-like, therefore resulting in smaller changes in temperature as a result of greater depth and lower flow rates. This section is classified as a warm water system.

10. Observations of Bank Stability

Figure 32 demonstrates the overall bank stability of Stevens Creek. Evidence of erosion from the stream bank was observed along 5% of the shoreline, coinciding with areas of little or no vegetation. Being a rural stream, Stevens Creek has had little human disturbance from development. The banks of Stevens Creek are vegetated and stable resulting from a natural healthy buffer.

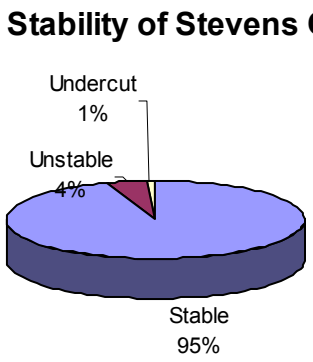


Figure 32. Bank stability of Stevens Creek.

Areas of erosion have been identified on an aerial photo of Graham Creek and can be found in Appendix H. This information includes a percentage of the 100m site which is eroded.

11. Observations of Wildlife

Volunteers recorded the presence of many types of wildlife in and around Stevens Creek. Table 6 is a summary of wildlife observed.

	Observed
Birds	*Mallard ducks with ducklings, red-wing blackbird, Canada geese, hairy woodpecker, swans, chipping sparrow, chickadees, robin, crows, owl, morning doves, great blue heron, pigeons, blue jay, cedar waxwing, hawk, herring gull, cardinal*
Mammals	*deer, muskrat*
Reptiles/Amphibians	*Green frog, snapping turtle*
Fish	***Northern pike, largemouth bass****, sunfish, minnow species, suckers, fry*
Aquatic Insects	*Water strider, whirligig beetle, backswimmers, dragonfly, water mite, water boatman, predacious diving beetle, aquatic sowbugs*
Other	*Crayfish, snails, freshwater clams, spiders, leech*

Table 6. Wildlife observed on Stevens Creek.

12. Observations of Pollution

Figure 33 demonstrates the incidence of pollution in Stevens Creek. Pollution was observed in only 17% of sampled sections. Of the 144 sections sampled, no pollution was found in 119 sections making up 83% of the stream. Much like Mosquito Creek, Stevens is a rural creek therefore pollution is low. Streams which flow though rural land generally lack human disturbance which are a result of urban/commercial pressures. Pollution that was observed was found in the reaches in and around the town of North Gower. Pollution included cans, plastic, tires, scrap metal, styrofoam, old lumber and plastic buckets. A cleanup is to be initiated in North Gower to rid Stevens Creek of pollution in the 2006 program.

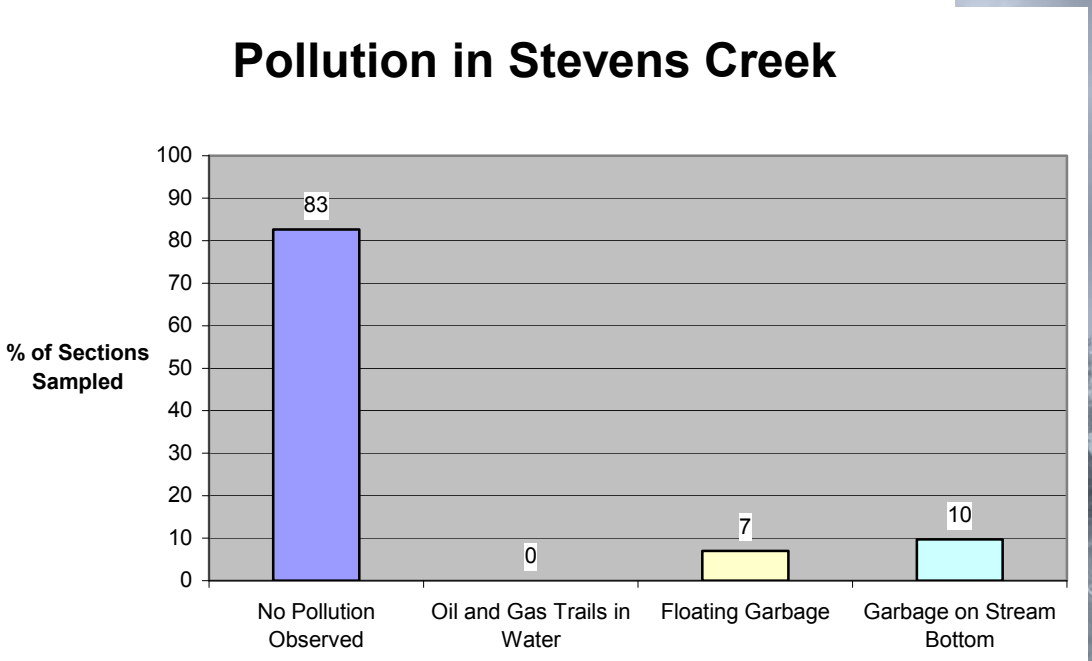


Figure 33. Frequency of pollution occurring in Stevens Creek.

3.3 Fish Communities

3.3.1 Graham Creek

There were 10 seining events held at the mouth of Graham creek at the Ottawa River occurring over a span of 2 days, once in June and once in July. Two additional sites upstream were also sampled. Figure 34 shows the locations of the sampling sites, and table 8 is a summary of the fish caught in Graham Creek.

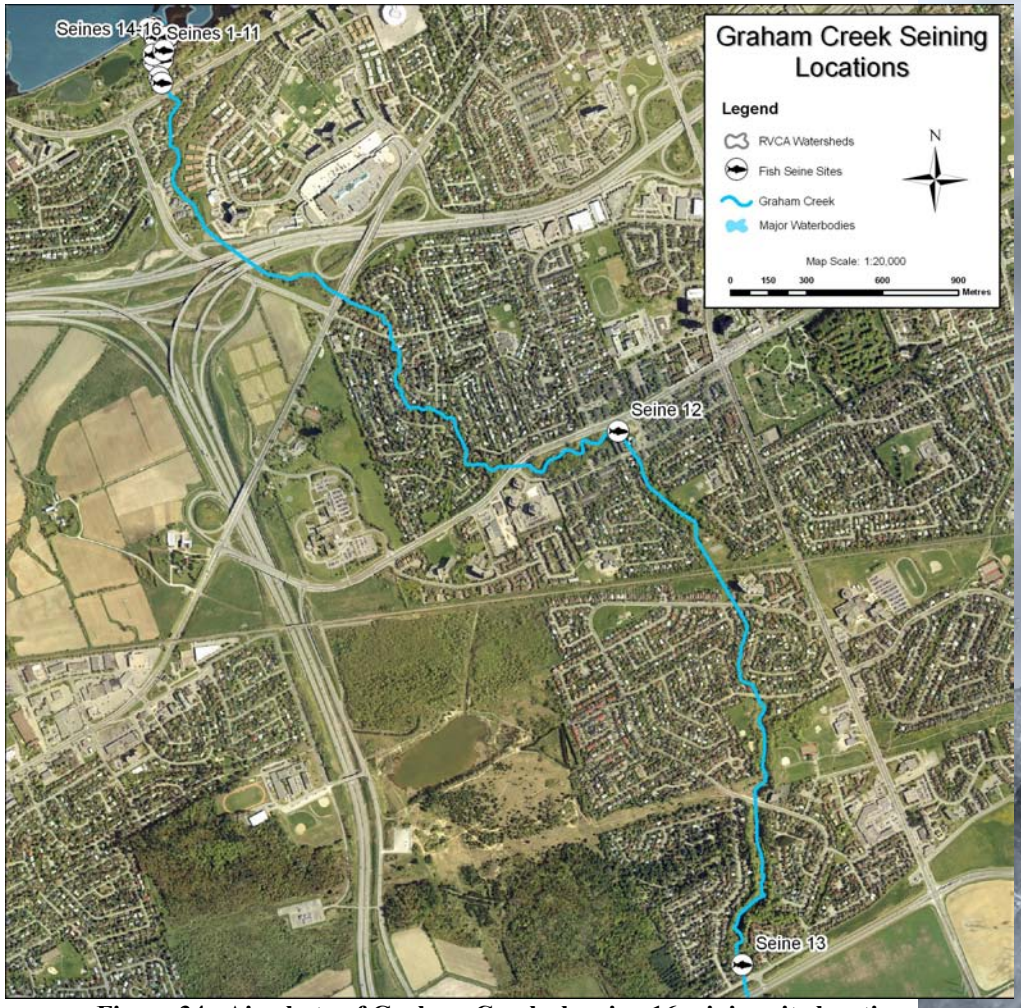


Figure 34. Air photo of Graham Creek showing 16 seining site locations.

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 a higher dissolved oxygen content than slow moving warm water. This is so because cold water has the ability to hold oxygen better as water is constantly churning at a rapid rate, incorporating air from the atmosphere into the water. Conductivity is a measure of the waters 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 in 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 7 summarizes water chemistry data for each seining site.

Table 7 Water Chemistry Results at Seining Sites for Graham Creek

Location	Seine #	Date (mm/dd/yy)	Air Temp (C)	Water Temp (C)	DO (mg/L)	pH	Conductivity (uS/cm)	Substrate	Vegetation
Graham Creek	1, 2, 3, 4	18/06/2005	14	13.43	10.86	7.83	1061	sand, gravel	no instream vegetation
Graham Creek	5, 6	18/06/2005	14	13.3	10.68	7.94	1062	sand, gravel	algae, narrow submergets
Graham Creek	7, 8, 9	18/06/2005	14	13.6	12.28	7.95	1072	clay, muck, silt	few narrow submergets
Graham Creek	10, 11	18/06/2005	14	13.6	11.07	7.95	1077	rock, muck, stable substate	few narrow submergets
Graham Creek	12	03/07/2005	25	16.67	NA	7.83	1095	sand, boulder, rubble	leaved submergents, thick veg around banks
Graham Creek	13	03/07/2005	26	20.2	10.96	7.8	1015	sand, silt, rubble	no vegetation in stream
Graham Creek	14, 15, 16	08/07/2005	20	13	NA	NA	NA	sand, muck	few narrow submergets

Table 8 summarizes the biological data obtained from each seine netting event on Graham Creek. A total of twelve different fish species were collected. Top predators within the stream ecosystem are highlighted by italics and bold.

Table 8 Results of Seine Net Catches on Graham Creek

Seine #	Species	Number	Total Length (mm)	Weight (g)	Comments
1	Bluntnose Minnow	1	NA	NA	not processed, scale malfunction
	YOY	1	NA	NA	could not ID; not processed, scale malfunction
	Spottail Shiner	3	NA	NA	not processed, scale malfunction
2	Yellow Perch	1	83	NA	weight not processed, scale malfunction
	Spottail Shiner	4	NA	NA	not processed, scale malfunction
	Brook Stickleback	1	NA	NA	not processed, scale malfunction
	YOY	1	NA	NA	could not ID; not processed, scale malfunction
3	Spottail Shiner	7	NA	25	bulk weight
	Log Perch	1	61	NA	weight not processed, scale malfunction
	YOY	2	NA	NA	could not ID; not processed, scale malfunction
4	YOY	4	NA	NA	could not ID; not processed, scale malfunction
	Spottail Shiners	1	NA	NA	not processed, scale malfunction
5	YOY	8	NA	NA	not processed, scale malfunction
	Common White Sucker	1	30	NA	weight not processed, scale malfunction
6	Spottail Shiner	1	NA	NA	not processed, scale malfunction
	Yellow Perch	2	(1) 116, (2) 115	40	bulk weight
	Brook Stickleback	1	NA	NA	not processed, scale malfunction
	YOY	5	NA	NA	could not I.D.
7	YOY	5	NA	NA	could not I.D.
	Common White Sucker	4	NA	NA	not processed, scale malfunction
	Brook Stickleback	4	NA	NA	not processed, scale malfunction
	Johnny Darter	1	NA	NA	not processed, scale malfunction

8	Yellow Perch	1	150	50	
	Johnny Darter	2	NA	NA	not processed, scale malfunction
	Brook Stickleback	2	NA	NA	not processed, scale malfunction
9	Brook Stickleback	1	NA	NA	not processed, scale malfunction
	YOY	1	NA	NA	could not I.D.
10	Brook Stickleback	2	NA	NA	not processed, scale malfunction
	YOY	12	NA	NA	could not I.D.
11	Brook Stickleback	>20	NA	NA	not processed, scale malfunction
	Mottled Sculpin	1	NA	NA	not processed, scale malfunction
	YOY	>100	NA	NA	could not I.D.
12	Northern Redbelly Dace	19	NA	32	bulk weight
	Common Shiner	2	NA	8	bulk weight
	Common White Sucker	15	128 (Ave)	191	bulk weight; average length calculated
	Unknown YOY	50	NA	NA	could not ID
13	Common White Sucker	7	165, 140, 130, 245, 150, 160, 165	140	bulk weight taken
	Common White Sucker	54	NA	NA	YOY
	Northern Redbelly Dace	3	NA	NA	not processed, scale malfunction
	Cyprinids	2	NA	NA	had red spots all over body
	Brook Stickleback	13	NA	20	Bulk weight
	Fathead Minnow	3	NA	NA	not processed, scale malfunction
	Longnose Dace	3	NA	NA	not processed, scale malfunction
	Mottled Sculpin	55	NA	170	Bulk weight
14	Spottail Shiner	369	NA	NA	not processed, scale malfunction
	Brook Stickleback	9	NA	NA	not processed, scale malfunction
	Yellow Perch	41	NA	NA	not processed, scale malfunction
	Mottled Sculpin	1	NA	NA	not processed, scale malfunction
	Johnny Darter	2	NA	NA	not processed, scale malfunction
15	Spottail Shiners	21	NA	NA	not processed, scale malfunction
	Brook Stickleback	38	NA	NA	not processed, scale malfunction
	Johnny Darter	1	NA	NA	not processed, scale malfunction
	Common White Sucker	4	NA	NA	not processed, scale malfunction
16	Yellow Perch	29	144, 116, 130	NA	not processed, scale malfunction
	Spottail Shiner	92	NA	NA	not processed, scale malfunction
	Brook Stickleback	21	NA	NA	not processed, scale malfunction
	Mottled Sculpin	1	NA	NA	not processed, scale malfunction
	Common White Sucker	1	NA	NA	not processed, scale malfunction

3.3.2 Greens Creek

Greens Creek was sampled seven times over three days in June and July. A total of 7 species were caught in Greens Creek, most notably being young largemouth bass and northern pike. According to City of Ottawa records, these species have not been identified this far up Greens Creek in the past. Figure 35 shows the locations of the sampling sites.

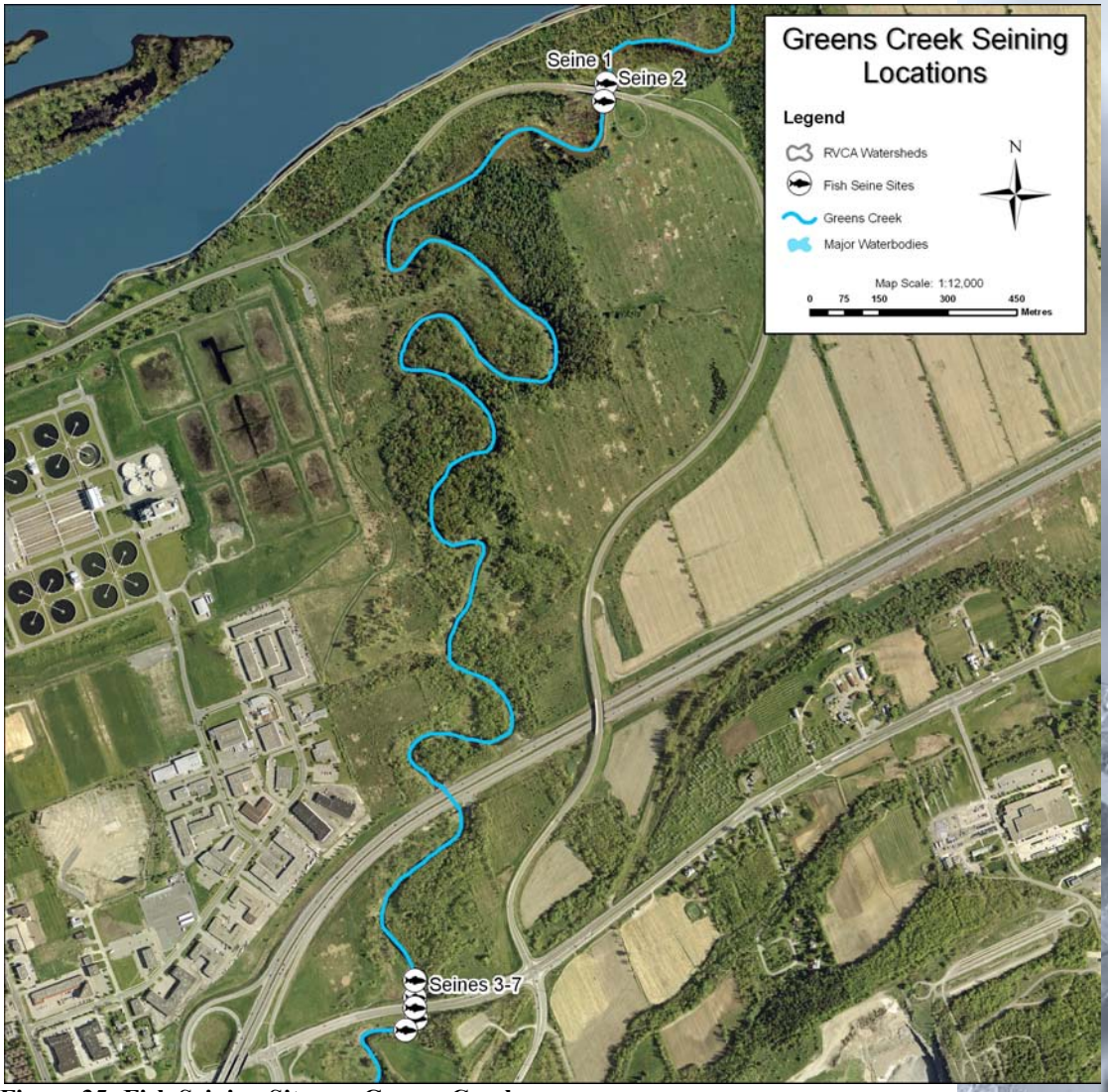


Figure 35- Fish Seining Sites on Greens Creek

Table 9 illustrates the water chemistry values obtained at the time seine netting. When compared, seine 1-2 differs from 3-4-5 by one degree in water temperature, although the dissolved oxygen readings are higher in seine 3, 4 and 5 due to a difference in stream morphology. In the first site, the stream is a wide slow-moving reach, whereas in the second site it is below a narrow, fast flowing riffle. As mentioned above, faster moving water will have a higher dissolved oxygen content. No water chemistry data was obtained for the third site as the YSI was not available.

Table 9. Water Chemistry Results at Seining Sites on Greens Creek

Seine #	Date (mm/dd/yy)	Air Temp (C)	Water Temp (C)	DO (mg/L)	pH	Conductivity (uS/cm)	Substrate	Vegetation
1, 2	25/06/2005	30	23	7.43	7.86	1448	clay with boulders; steep dropoff	Pondweed, water lilly; arrowhead on shore
3, 4, 5	25/06/2005	34	22.1	8.57	7.92	1484	clay with boulders and rubble	few leaved submergents
6, 7	11/07/2005	26	19	NA	NA	NA	boulder, clay, rubble	very litte veg, algae on substrate

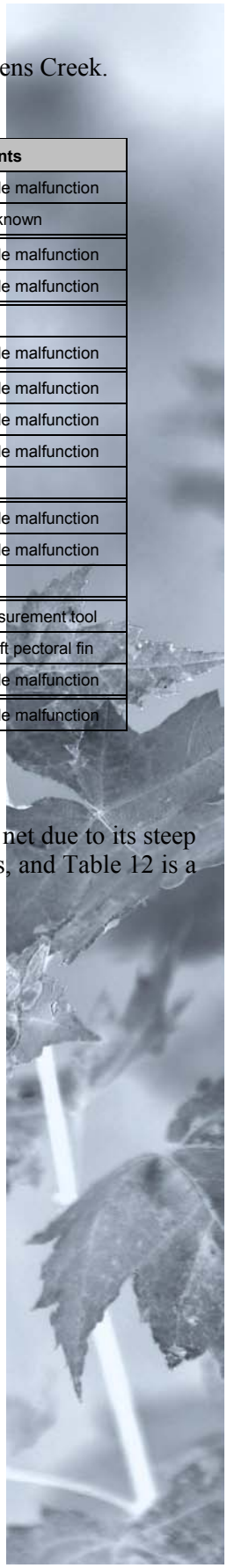
Table 10 summarizes the biological data obtained from each seine netting event on Greens Creek.

Table 10. Results of Seine Net Catches on Greens Creek

Seine #	Species	Number	Total Length (mm)	Weight (g)	Comments
1	***Largemouth Bass (YOY)***	1	NA	NA	not processed, scale malfunction
	YOY	5	NA	NA	species unknown
2	***Largemouth Bass (YOY)***	16	NA	NA	not processed, scale malfunction
	Shiner	2	NA	NA	not processed, scale malfunction
3	Common White Sucker	2	(1) 265, (2) 223	(1) 110, (2) 100	
	Blacknose Dace	1	NA	NA	not processed, scale malfunction
4	Johnny Darter	6	NA	NA	not processed, scale malfunction
	YOY unknown	5	NA	NA	not processed, scale malfunction
	Spottail Shiner	4	NA	NA	not processed, scale malfunction
	Common White Sucker	2	(1) 230, (2) 193	(1) 75, (2) 15	
5	Spottail Shiner	6	NA	NA	not processed, scale malfunction
	YOY unknown	16	NA	NA	not processed, scale malfunction
	Common White Sucker	1	250	95	
6	***Northern Pike***	1	NA	110	had no length measurement tool
	Common White Sucker	2	NA	(1) 110, (2) 75	Bloold legion on left pectoral fin
	Johnny Darter	1	NA	NA	not processed, scale malfunction
7	Spottail Shiner	3	NA	NA	not processed, scale malfunction

3.3.3 Stevens Creek

Two seining events were held on Stevens Creek in July. This creek proved difficult to net due to its steep banks and dense aquatic vegetation. Figure 36 shows the location of the sampling sites, and Table 12 is a summary of the fish caught in Stevens Creek.



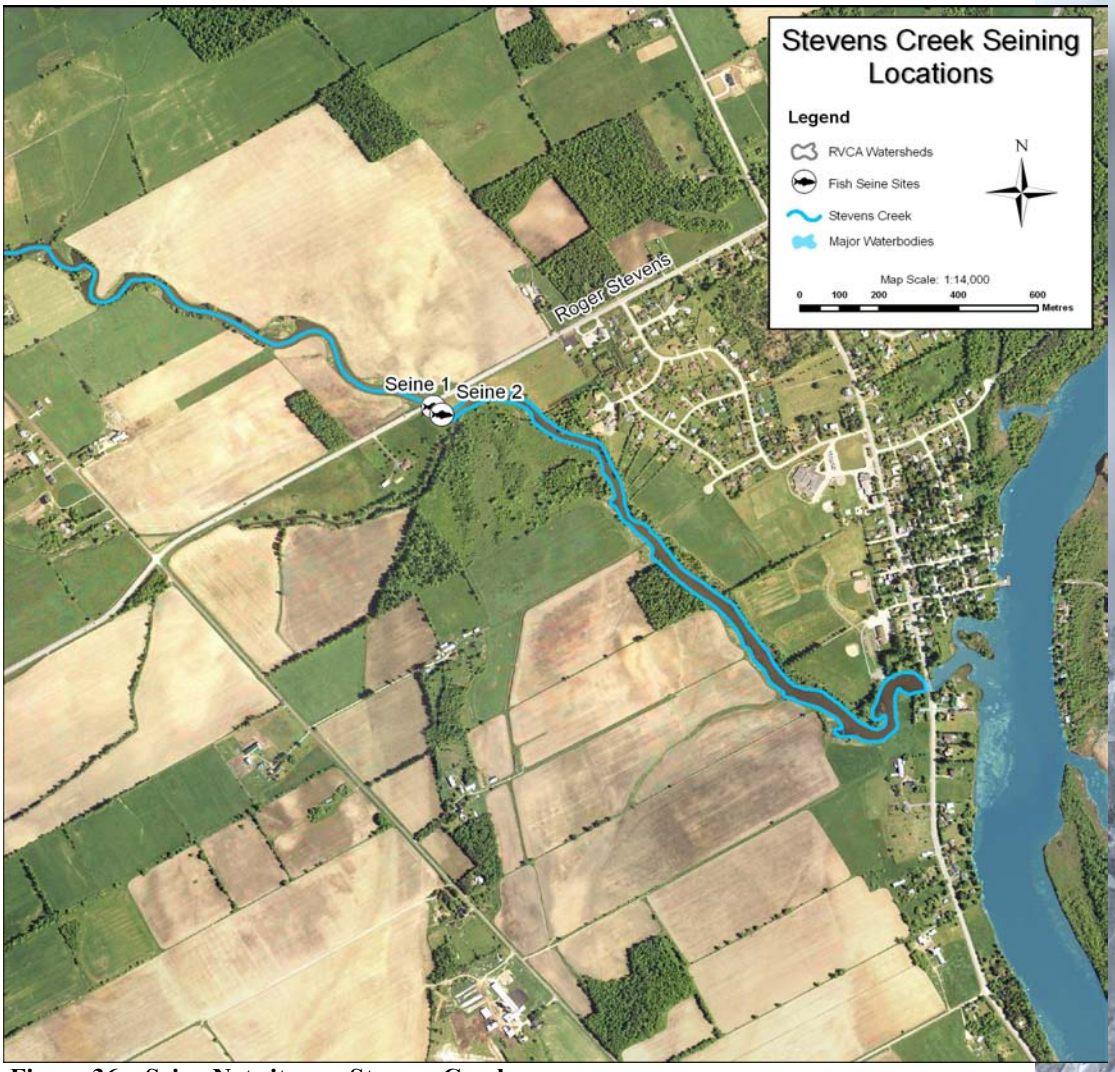


Figure 36 – Seine Net sites on Stevens Creek

Table 11. Water Chemistry Results at Seining Sites on Stevens Creek

Location	Seine #	Date (mm/dd/yy)	Air Temp(C)	Water Temp(C)	DO (mg/L)	pH	Conductivity (uS/cm)	Substrate	Vegetation
Stevens Creek	1, 2	10/07/2005	22	23	8.92	8.31	542	muck bottom with rock and rubble	Extensive growth of narrow and leaved submergents

Table 12 summarizes the biological data obtained from each seine netting event on Stevens Creek.

Table 12. Results of Seine Net Catches on Stevens Creek

Seine #	Species	Number	Total Length (mm)	Weight (g)	Comments
1	***Northern Pike***	2	125, 130	NA	no weights taken, scale malfunction
	Spottail Shiner	1	NA	NA	not processed
	Yellow Perch	4	NA	NA	too small to register on scale; YOY
	Largemouth Bass	18	40 (average)	30	bulk weight taken of total; YOY
	Sunfish	6	110	15	too small to I.D.; bulk weight; YOY
	YOY	50	NA	NA	bass/sunfish YOY

2	Rockbass	1	180	175	
	Pumpkinseed	1	140	50	
	Brown Bullhead	2	95, 60	15	bulk weight taken
	Yellow Perch	3	NA	NA	not processed
	Largemouth Bass	7	NA	NA	YOY; scale malfunction
	Cyprinids (unknown)	6	NA	NA	scale malfunction
	Sunfish/Bass YOY	40	NA	NA	scale malfunction

A total of 8 different fish species were collected in Stevens Creek. Many young-of-year largemouth bass and two young pike were collected, which shows fish are using Stevens creek as nursery habitat from the Rideau River.

3.4 Community Stream Clean-Ups

3.4.1 Sawmill Creek

The City Stream Watch program held a weekend long cleanup on Sawmill Creek on September 24th and 25th of 2005. Working with the Heron Park Community Association, National Defence Headquarters Fish and Game Club and City Stream Watch volunteers, the stream was split into two sections to be cleaned. Heron Park volunteers focused on the northern section of stream flowing from east of Bank St. to the Rideau River. NDHQ volunteers cleaned from Bank St at South Keys to Albion Rd. Figure 37 shows the stretches of creek that were successfully cleaned by the volunteers.

Figure 37. Map of Sawmill Creek showing sections cleaned in the fall of 2005.

Members of the National Defence Headquarters Fish and Game Club participated in 2 cleanup initiatives on Sawmill Creek in 2005. They held their member cleanup for a week in May and also participated in the fall cleanup in late September. The club focused its attention this year on the stretch from Bank St. at South Keys Shopping Centre to Albion Rd. Approximately 5km 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.

Heron Park Community members, along with City Stream Watch volunteers, cleaned a 1km section of stream and shoreline which flows behind Billings Bridge Shopping Plaza and enters the Rideau River. Many bags, food wrappers, scrap metal, styrofoam and tires were removed from the stream.

In total 22 volunteers came out and spent 93hrs of volunteer service cleaning up Sawmill Creek. Volunteers were rewarded at lunch time on both days with sandwiches, fruit and beverages courtesy of Monterey Inn Resort. Special thanks also to Home Depot South Keys for supplying volunteers with garbage bags and work gloves.

3.4.2 Greens Creek

The City Stream Watch program held a three day cleanup on Greens creek from August 18th to 20th of 2005. City Stream Watch volunteers worked along side Ottawa Flyfisher members cleaning 2km of stream which runs from Innes Rd upstream to Highway 417. Figure 38 shows the stretches of creek that were successfully cleaned by the volunteers

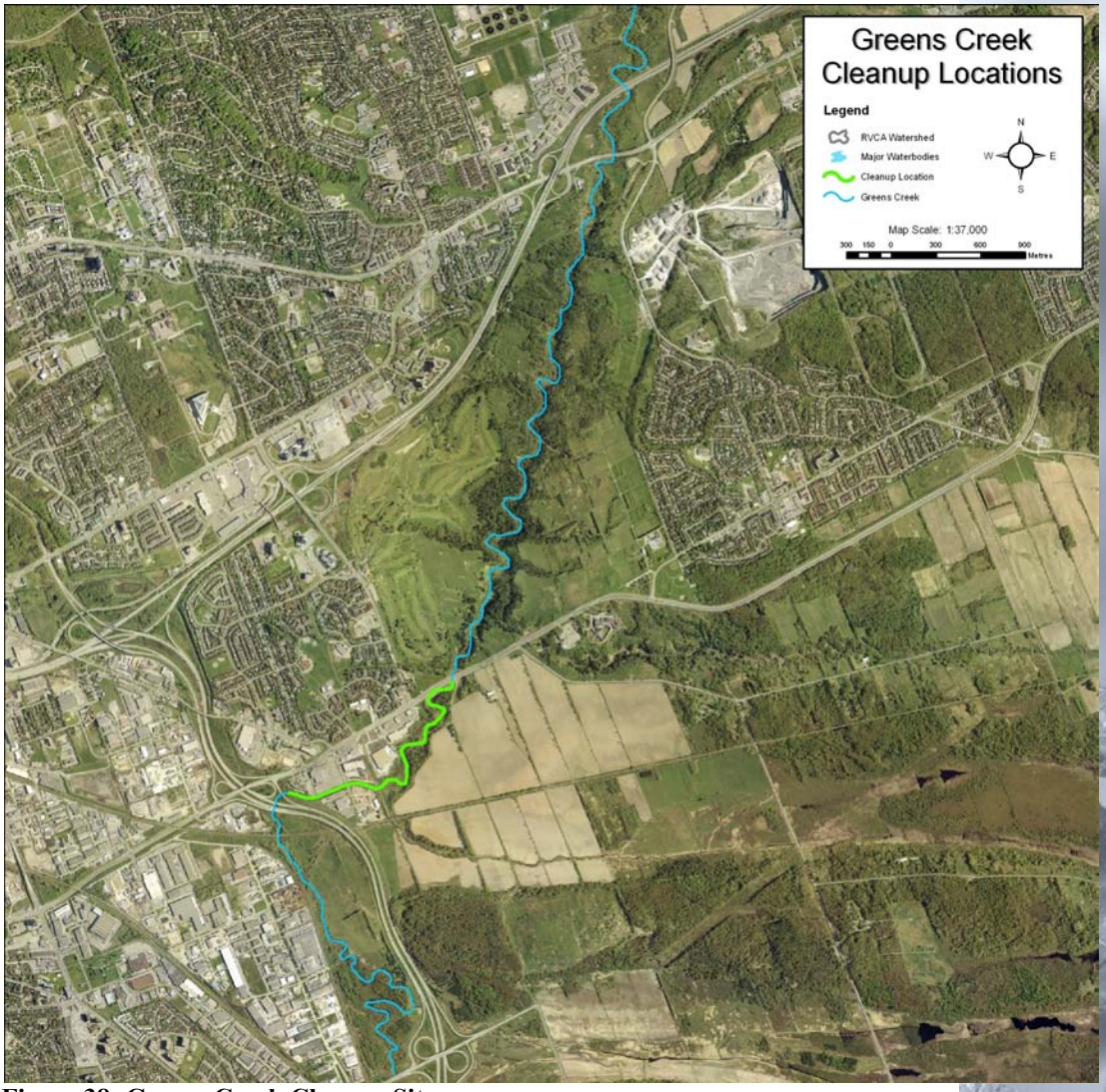
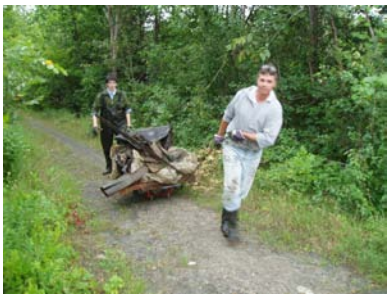


Figure 38- Greens Creek Cleanup Site

Greens Creek runs mainly through natural land although the stretch cleaned is the only section that is threatened by development. OFS members and stream watch volunteers cleaned the creek over the course of three days. Many items were pulled out of this section including a car engine, construction signs, bicycles, mattress, ladder, scrap metal, over 15 tires, plastic cups and bottles, styrofoam, old lumber, car hood and seat. In total, volunteers spent 72hrs removing garbage from Greens Creek leaving it looking natural once again. The NCC recognized the efforts of the hard working volunteers who helped to restore the natural beauty of Greens Creek with a letter of appreciation (Appendix F).



The Monterey Inn Resort provided sandwiches, vegetable platters and beverages for hungry volunteers on two of the days. Equipment for this cleanup was provided by Rona which backs onto the stream from Innes Rd. They provided volunteers with work gloves and garbage bags.

3.5 Riparian Planting Projects

Based on recommendations of the 2004 annual report, a spring tree plant was carried out on a failed bank in the Heron park area. Figure 39 shows the area which was planted, just north of Heron Rd.

Figure 39- Sawmill Creek Planting Site in Heron Park

The riparian tree plant on Sawmill Creek at Heron Park was a successful event. Two collaborative members, City Councillor Clive Doucette and 4 volunteers from the Heron Park area, successfully planted 200 Red Osier, 100 White Spruce and 50 Red Elderberry along the failed bank on the east side of Sawmill Creek. A mulch trail was also re-routed past the site to help steer foot traffic around the bank to help the top of the bank colonize with vegetation once again.

The section was revaluated in the summer to observe how well the trees took to the soil. The planted trees did well although few trees were planted on the top ridgeline of the bank. Therefore, proposed for the spring of 2006, is Phase II of the Sawmill Creek plant which will focus on the upper portion of the bank. Two other failed banks have been identified just downstream and will be planted in the spring of 2006.

4.0 A Look Ahead to 2006

The City Stream Watch program is currently planning projects for the 2006 season. Streams have been chosen and include Becketts, Brassils and Pinecrest Creek. Figure 40 below illustrates the stream watersheds in relation to the City of Ottawa. Maps of 2006 streams in relation to other years can be found in Appendix G.

The program is always looking to extend its efforts to new initiatives and goals. In the 2006 season various projects have been identified and plan to be implemented beginning in the spring. Some projects include:

- Stream Surveys on Becketts, Brassils and Pinecrest
- Biothon – Biodiversity Day on various streams withing the Rideau valley watershed
- Sawmill Creek Phase II - Riparian planting initiative
- Fish Community Sampling by seine netting
- Temperature profiling of 2006 streams
- Graham Creek riparian planting
- Sawmill Creek Cleanup (Spring/Fall)
- Graham Creek/Greens Creek – Walk along cleanup
- Cleanup on numerous city streams as part of Canadian Rivers Day
- Stevens Creek Cleanup (North Gower Community)

Many of these projects are explained further in the special projects section. New projects continue to be identified and included in the 2006 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 (http://www.rideauvalley.on.ca) in the spring for updates and information on the program and how to sign up.

Figure 40 – Map of 2006 Sample Streams

4.1 Recommendations

It is important that City Stream Watch be sustained 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 three 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 a few 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.
- 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. The Sierra Club, 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 highschool 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 to attract students to participate to gain experience

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 13 Special projects developed through monitoring

City Stream Watch – Project Proposals

Location	Issue	Picture	Remediation Strategy	Expected Results
The mouth of Sawmill Creek where it empties into the Rideau River near Billings Estate just east of the corner of Bank Street and Riverside Drive. Approximately 150m section of creek not including infrastructure.	The rock rubble that was used to armour the banks has failed at this site. The banks have failed, and much of the geotextile has been left exposed. The resulting erosion and deposition of the silty clay material from the banks is causing the deterioration of walleye spawning habitat at the mouth of the creek.		Utilize existing volunteer base of the City Stream Watch program to participate in this rehabilitation effort. A combination of several bio-engineering systems (live staking, live fascines, and bare root shrubs) should be applied along the slope. The toe of the slope requires protection against undermining and resultant slumping with appropriate sized rock rubble due to flashy flows.	• Effective stream bank protection; • Community involvement • Reduce siltation of existing walleye spawning habitat; • The enhancement of conditions for natural colonization of existing plant community; • Produce streamside fish and wildlife habitat.

Location	Issue	Picture	Remediation Strategy	Expected Results
Sawmill Creek just North of Heron Park Community Centre (Heron Rd.). One failed bank as well as three bank slumps upstream.	PHASE II The planting site on Sawmill creek hopes to further rehabilitate a failed bank on the east side of the stream just north of Heron Rd. Phase I was carried out in May of 2005 in hopes to stabilize bank. The lower sections of bank, close to the stream did well throughout the growing season although the higher portions did not due dry conditions. In May of 2006 we will plant more vegetation on the top section of the bank failure as well as fill in necessary sections in the lower section that may have been wiped out due to spring flows. Three additional bank slumps have been identified upstream and will be planted in the Phase II rehabilitation project.		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 rehabilation projects • Enhancement of fish and wildlife habitat; • Enhancement of the creek's aesthetic qualities. • Erosion control

Location	Issue	Picture	Remediation Strategy	Expected Results
Graham Creek shoreline in between Acres Rd 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.		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

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 facilitate the proper removal of garbage and to 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 right bank just downstream from bridge.	High water is eroding banks causing banks to fail and trees to fall into stream. Siltation can be affecting fish spawning and nursery habitat.		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.

Location	Issue	Picture	Remediation Strategy	Expected Results
Greens and Graham Creek	Frequency of litter on these two systems is high. Though not a lot of pollution is present, many sections have plastic bags and other small items in them. 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
Stevens Creek at North Gower	Stevens creek is a natural flowing creek although some sections would benefit from a weekend cleanup. The stretches which contain pollution are in and downstream of North Gower. Items observed were tires, plastic bags and bottles, styrofoam and buckets.		Recruit volunteers from the communities around North Gower to participate in this cleanup effort. Stevens Creek cleanup could be completed on a weekend in the fall when water levels are low. 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.

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: Graham Creek (Nepean)
  Stevens Creek (North Gower, Kars)
  Greens Creek (Gloucester, Cumberland)
  Mosquito Creek (Gloucester, Cumberland)
  Others: _____
- ❑ No

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 14th, 2005
- ❑ May 28th, 2005
- ❑ 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? If yes, would you generally characterize this altered section as being:	Yes	No
	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?

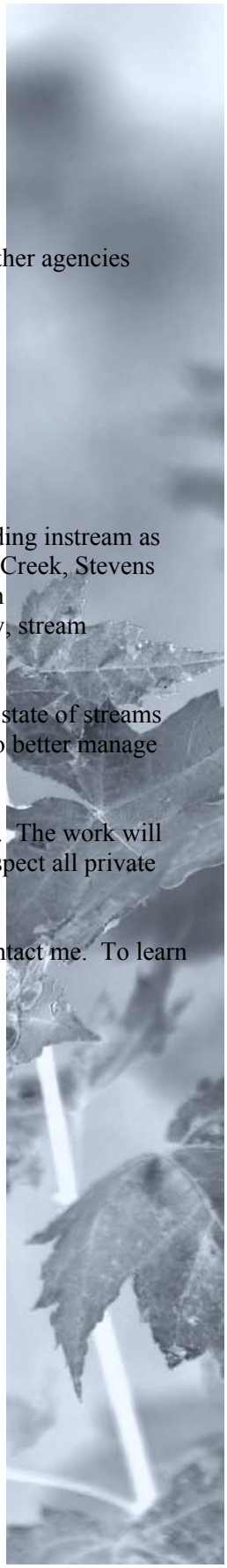
Visible angling pressure includes presence of anglers, used/old fishing line, bait containers, lures, etc.

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 Graham Creek, Stevens Creek, and Greens 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 and 2004 reports, visit us on the web at:

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

Thank you for your cooperation.

Grant Nichol
City Stream Watch Coordinator
Rideau Valley Conservation Authority
(613) 580-2424 Ext. 22886
Grant.Nichol@ottawa.ca

Jennifer Lamoureux
Aquatic and Fish Habitat Biologist
Rideau Valley Conservation Authority
(613) 692-3571 Ext. 1108
jennifer.lamoureux@rideauvalley.on.ca

Appendix F

Greens Creek Cleanup Appreciation Letter from National Capital Commission

NCC CCN

Canada

Office of the Chairman Cabinet du président

September 23, 2005

Mr. Grant Nichol
City Stream Watch Coordinator
Rideau Valley Conservation Authority
Box 599, 1128 Mill Street
Manotick, Ontario
K4M 1A5

Dear Mr. Nichol:

On behalf of the National Capital Commission (NCC), I would like to sincerely thank you and the Stream Watch volunteers for the tremendous job you did in cleaning up a portion of the Green's Creek that runs through NCC lands. Your group involvement has been brought to my attention, and I wish to let you know that the NCC really appreciates your time and effort.

The NCC values its natural areas and streams and makes every effort to keep these areas clean. Garbage is picked up on our lands and in our streams throughout the year, and every spring we have an organized river clean up along the banks of the Ottawa River. We had not managed to get this section of the Green's Creek done, so we are most grateful to the Stream Watch for their initiative in this project.

Again, many thanks for a job well done and a very positive contribution to environmental stewardship in the nation's capital.

Yours sincerely,

Marcel Beaudry
Chairman

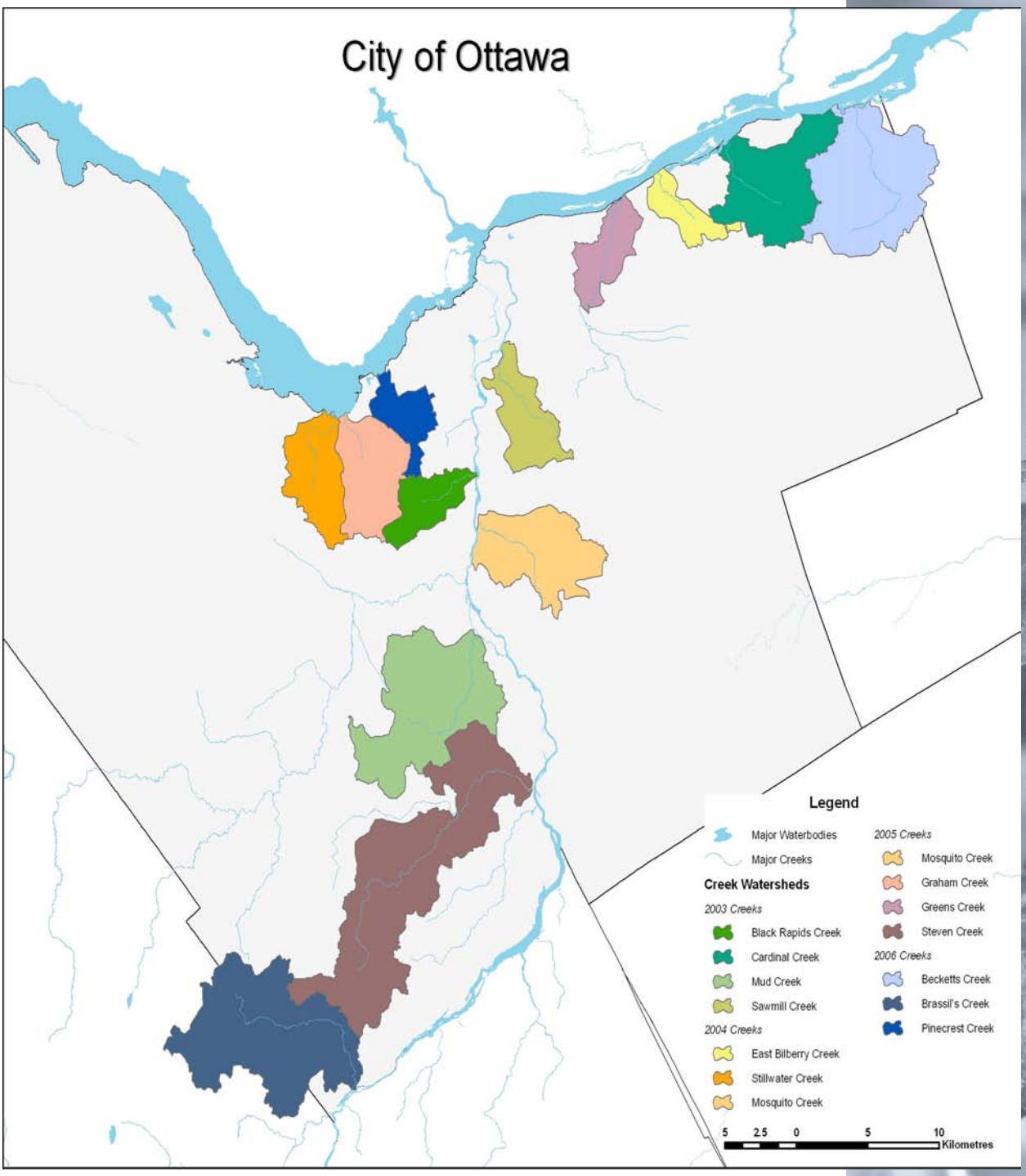
R.V.C.A.
Refer To :
SEP 29 2005
Reply | Date | Initials
File #
c.c.

National Capital Commission
202–40 Elgin Street, Ottawa, Canada K1P 1C7
www.canadascapital.gc.ca

Commission de la capitale nationale
40, rue Elgin, pièce 202, Ottawa, Canada K1P 1C7
www.capitaleducanada.gc.ca

Appendix G

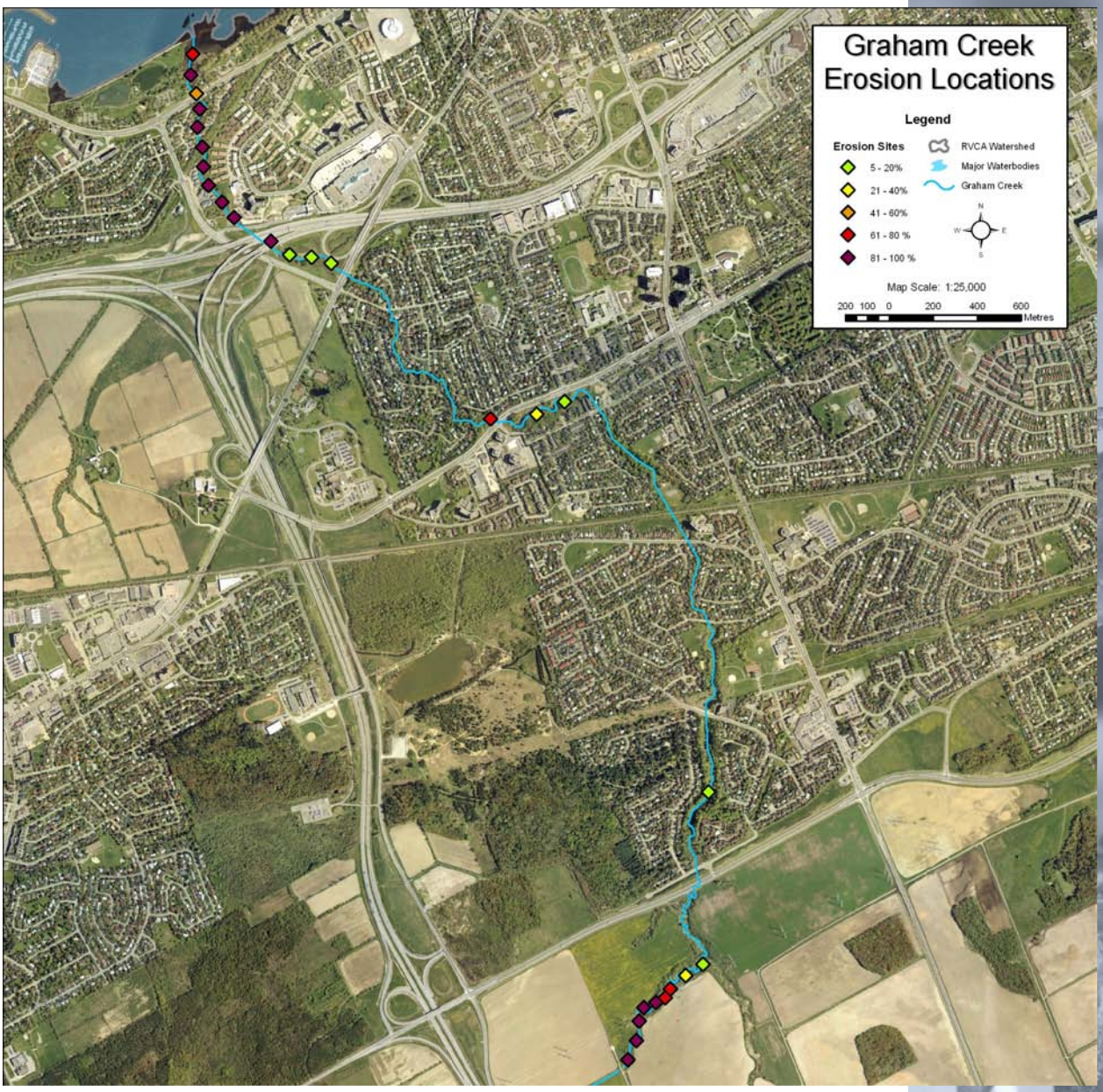
2003, 2004, 2005 and 2006 Stream Survey Creeks



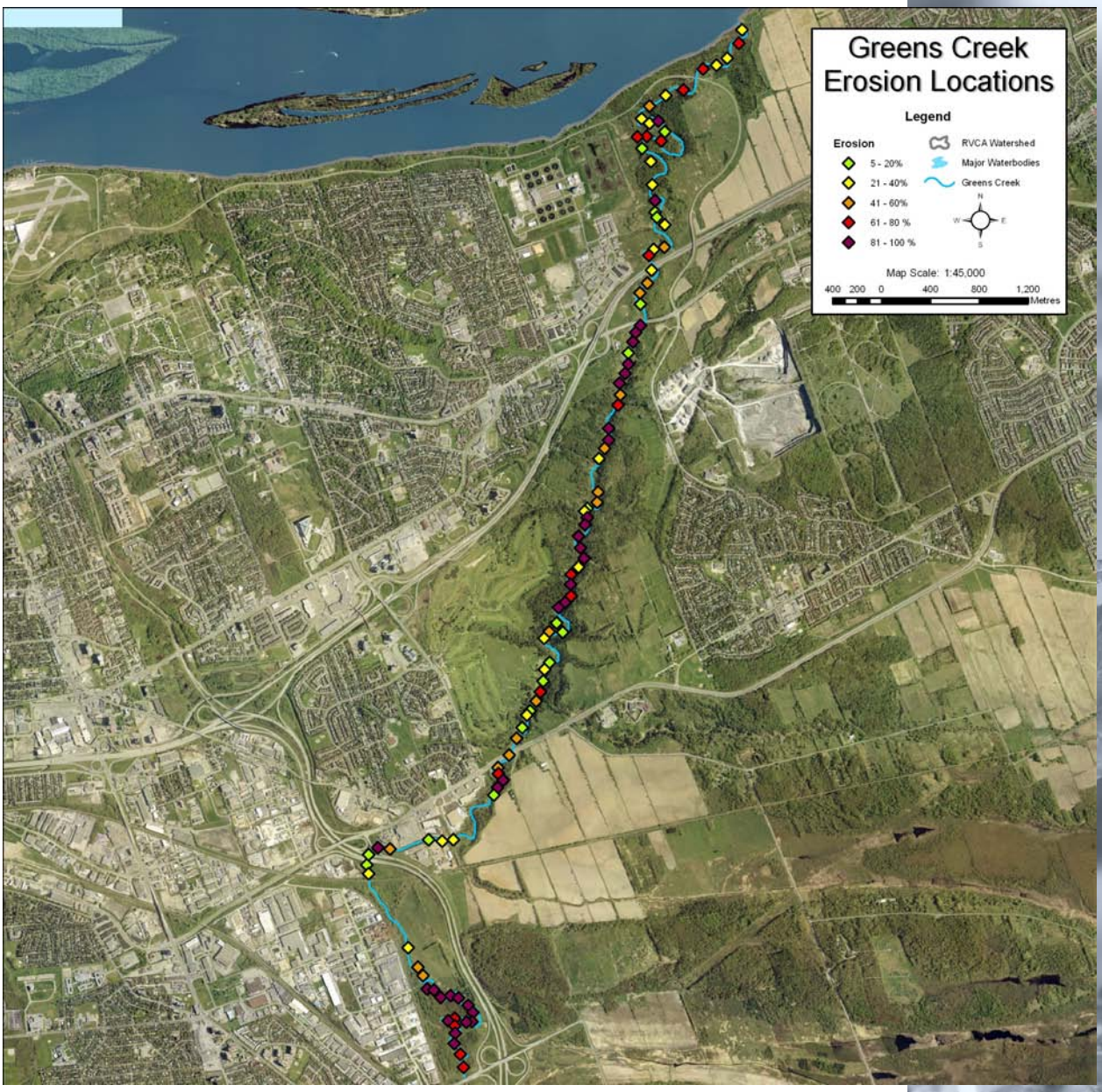
Appendix H

Map of Erosion Sites

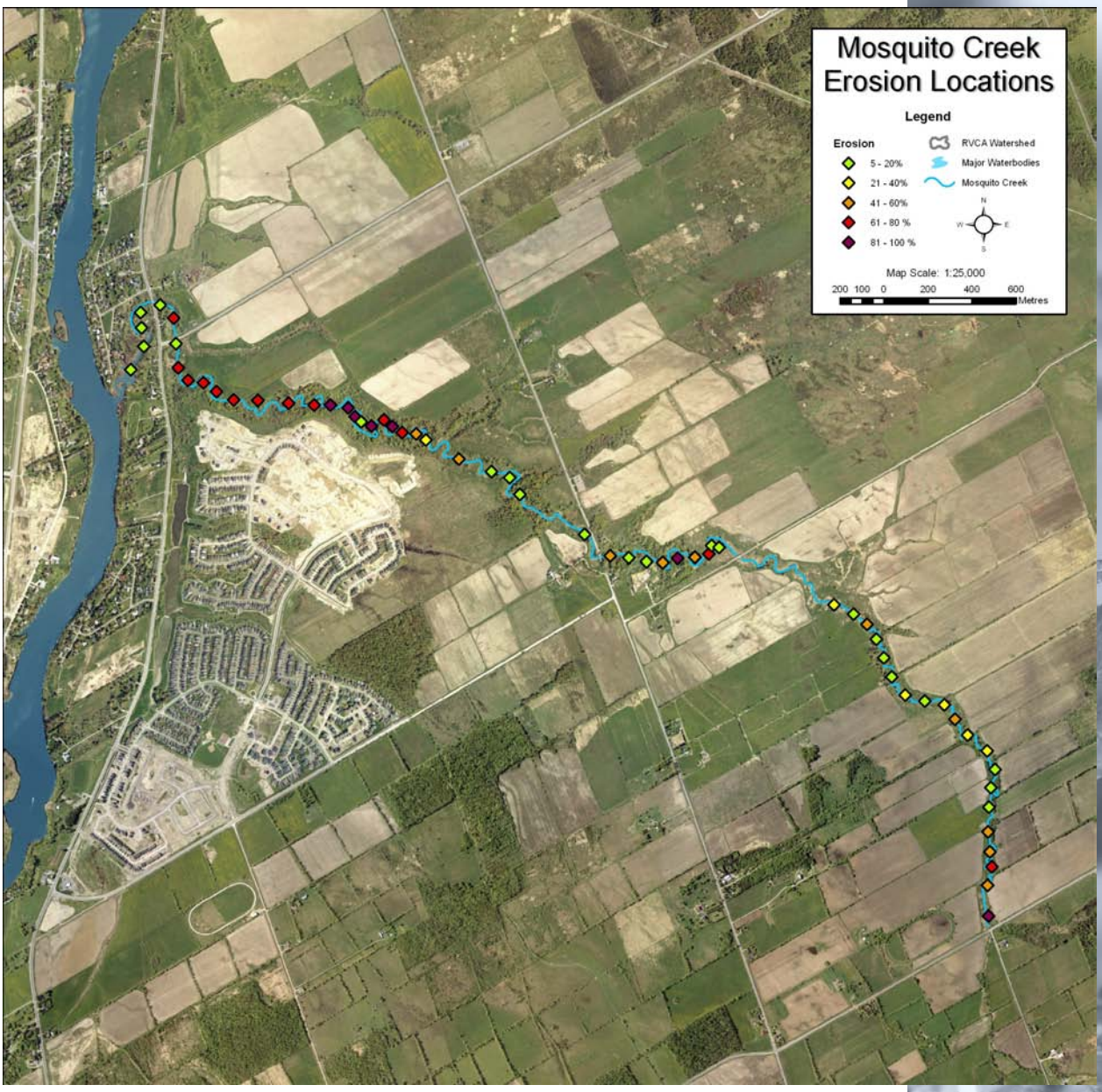
i) Graham Creek Erosion



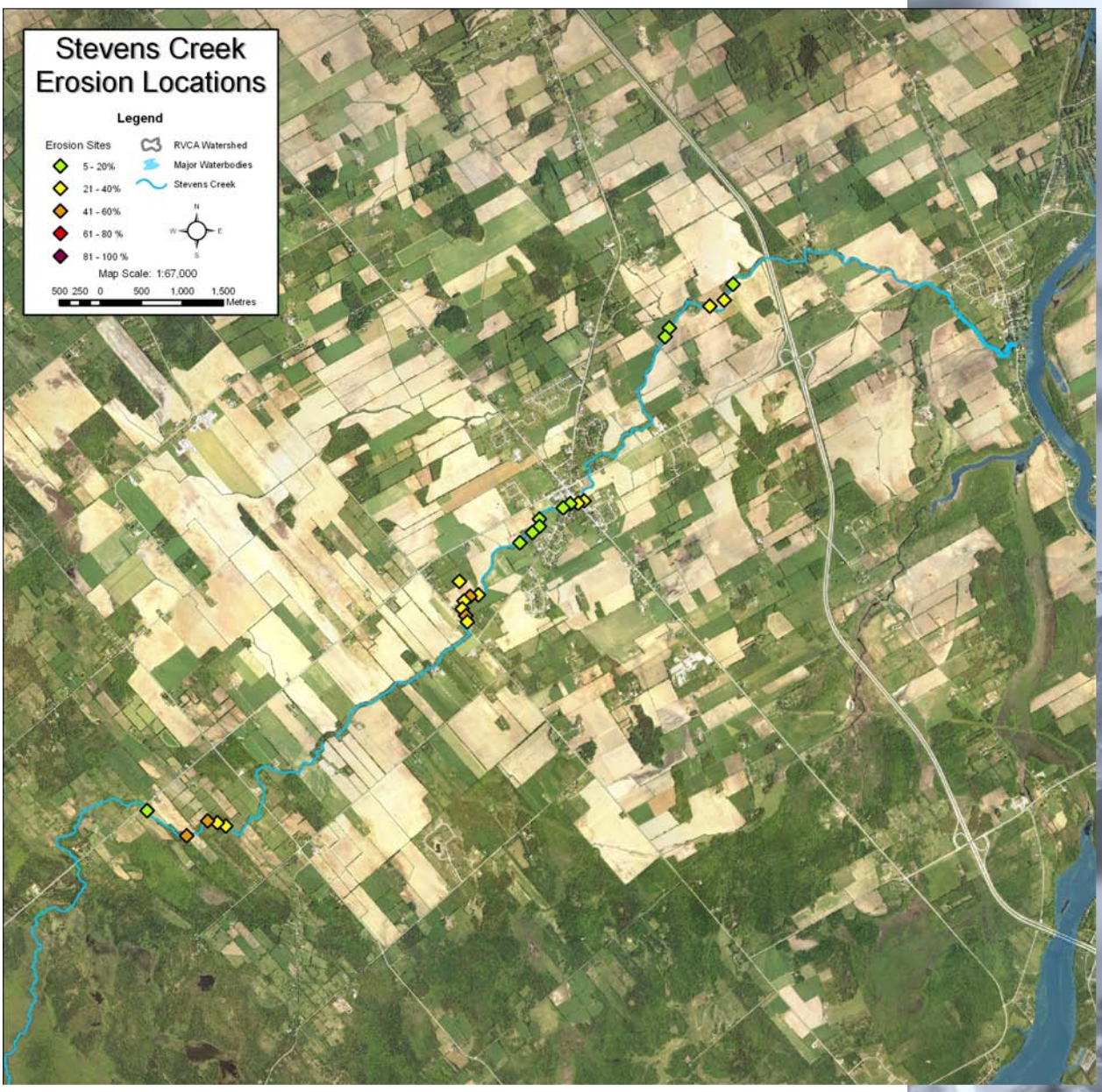
ii) Greens Creek Erosion



iii) Mosquito Creek Erosion



iv) Stevens Creek Erosion



Appendix I

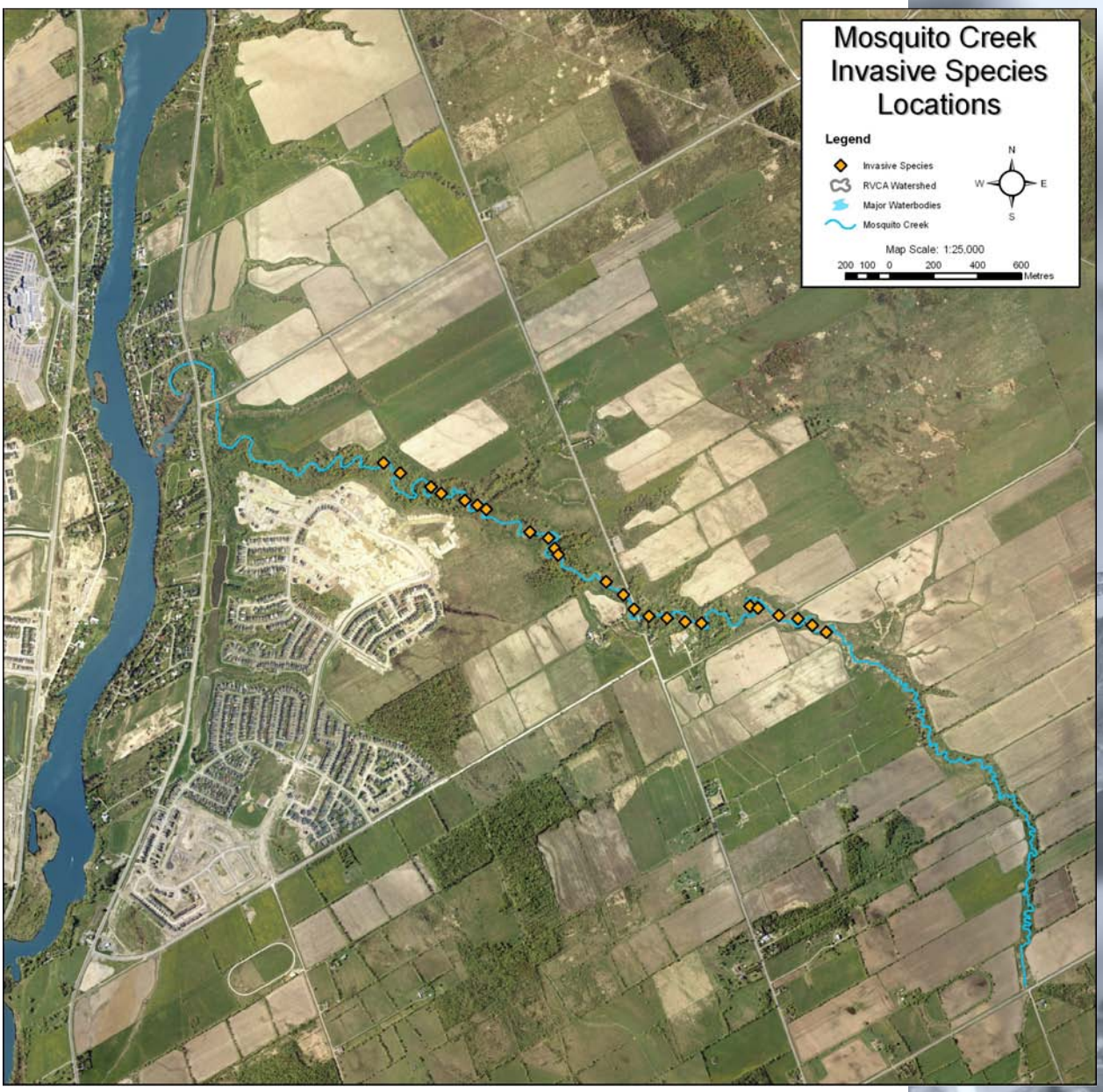
Maps of Invasive Species Areas

i) Graham Creek Invasive Species Sites

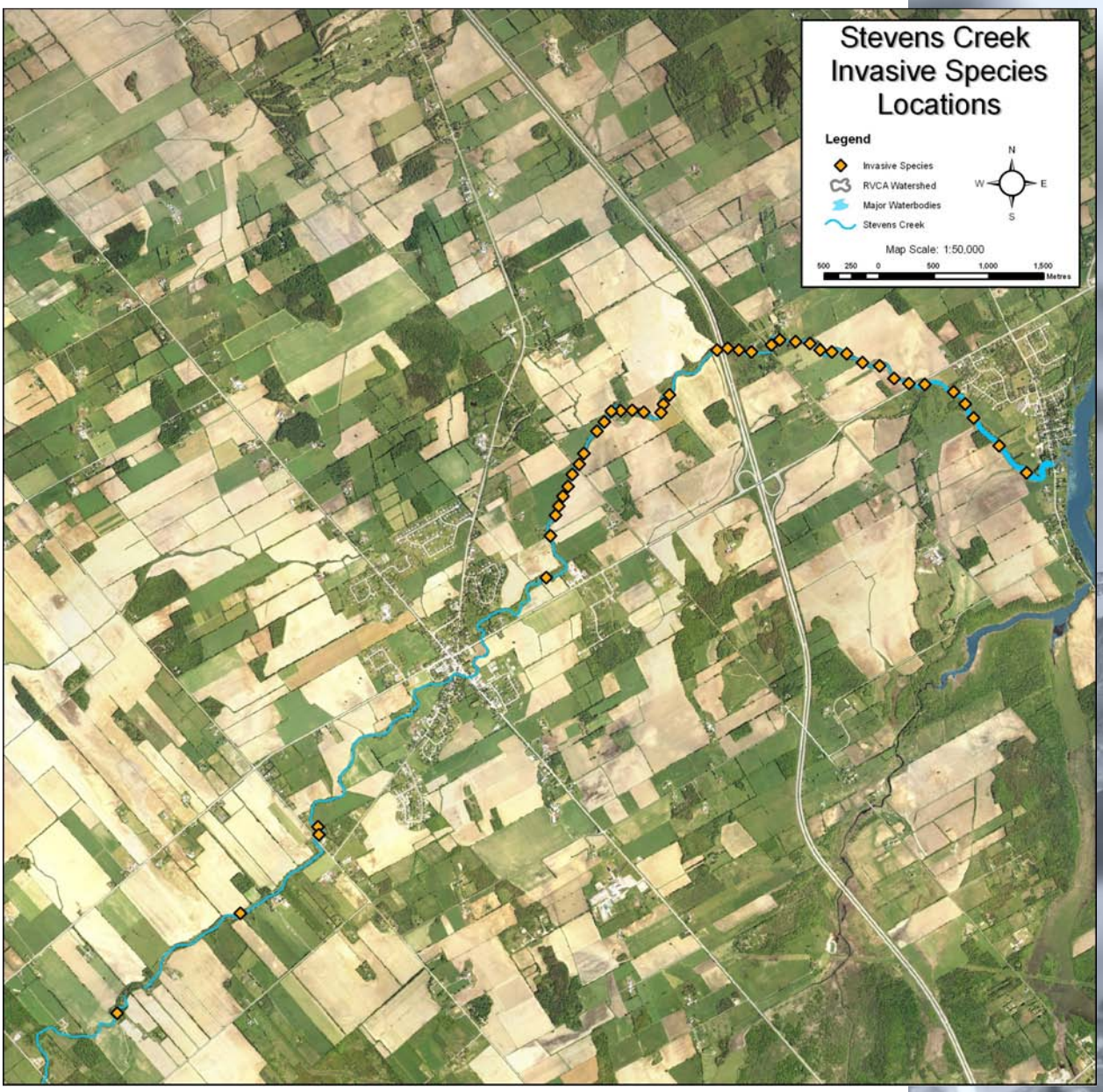
As reported by volunteers in the 67 sites surveyed no invasive species were observed. This stream was surveyed early in the season therefore invasive species may not have been easily identifiable.

ii) Greens Creek Invasive Species Sites

iii) Mosquito Creek Invasive Species Sites



iv) Stevens Creek Invasive Species Sites



Appendix J

City Stream Watch 2005 Organizational Chart