City Stream Watch 2003
Annual Report

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Executive Summary

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

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

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.

Four streams were chosen for sampling in the 2003 season, based on community interest as well as the level and need for current information. These streams were:

- Sawmill Creek;
- Black Rapids Creek;
- Mud Creek;
- Cardinal Creek.

The City Stream Watch program utilizes 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. Development of the protocol was essential, as volunteer groups consist of people with a variety of educational backgrounds and experiences.

A total of 26 volunteers from the community participated in the program, contributing a total of 180 hours. Approximately 20 kilometers of stream was surveyed, and all information is housed in the Rideau Valley Conservation Authority's Watershed Information Management System that will be available interactively as of January 2004 on the authority's website at www.rideauvalley.on.ca.

The program should further build on the successes achieved during its first year. 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 that is 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

The achievements of this program could not be realized without the assistance of many organizations and individuals. Special appreciation is extended to the Ontario Trillium Foundation, to whom we are deeply thankful for the financial support they have provided.

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 the Ottawa RiverKeeper, Lara Van Loon, for her support in advertising the program and helping to recruit volunteers.

Thanks also to Scott Smithers of the Ontario Ministry of Natural Resources in Kemptville for supplying the program with a seine net for fish sampling.

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Introduction

1.1 City Stream Watch – Its inception as a 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 myriad 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, with the goal of ensuring that they remain respected and valued natural features of the communities through which they flow.

1.2 Partners of the City Stream Watch Program

In April of 2003, the City Stream Watch program was initiated through a partnership of six groups in the Ottawa area:

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 and fish habitat conservation. The Society aids in recruiting volunteers of the City Stream Watch program.

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.

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 coordinator for the project, urban streams were surveyed and valuable information was recorded between May and October of 2003.

1.3 Selection of the Streams

Four streams were selected for sampling in the 2003 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 four streams in the City of Ottawa.

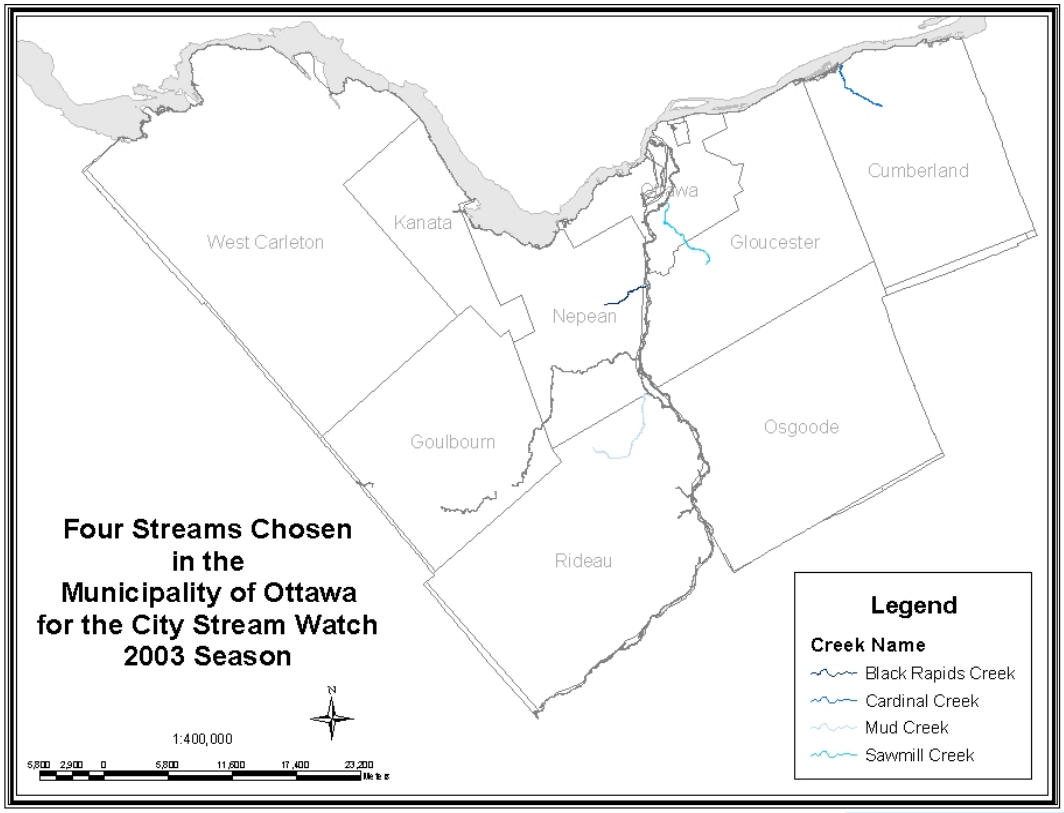

Figure 1. Four streams (Black Rapids Creek, Cardinal Creek, Mud Creek, Sawmill Creek) sampled during the 2003 season of the City Stream Watch program.

A fifth stream, Stillwater Creek, was surveyed through collaboration with another group in the Ottawa area, the Ottawa RiverKeeper.

2.0 Methodology

2.1 The Stream Watchers

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 training sessions for interested volunteers were advertised and conducted in the spring of 2003, one in late May and the other in early June. Volunteers were introduced to representatives from the various partners, as well as the coordinator, and were given a waiver form to fill out (see appendix A). Volunteers were then guided through the protocol for surveying the streams (see appendix B) and given a summary and definitions handout for future reference (see appendix C). The volunteers were shown the equipment used in sampling (see appendix D), and a brief demonstration of some of the equipment was given. Representatives from both the RVCA and the City of Ottawa then demonstrated the entire process for sampling one section of stream.

2.2 The 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 developed by officials at RVCA so that community volunteers can easily apply it. Development of the original protocol for use by volunteer groups was essential, as they consist of people with 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 NAD 83 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 meter using the 50-meter polypropylene rope spread at right angles to the banks originating at water level. Stream depth is measured, using the meter stick, at the deepest point along the width of the stream. Where stream depth is greater then one meter, and can be accessed safely by the volunteers, stream depth is estimated using the meter stick.

After all necessary measurements are recorded for the start of the section, one volunteer stays at the start of the section and holds on to one end of the rope 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 all of the rope is played out,

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 same procedure for observing the first 50 meters of the section is repeated for the second 50 meters. 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 above procedure is repeated for each section of stream.

2.3 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. Information on each section of stream is made available through the Watershed Information Management System on the RVCA website www.rideauvalley.on.ca to facilitate data sharing while maintaining data integrity.

2.4 Seine Netting

Through a partnership with the Ontario Ministry of Natural Resources, the RVCA and the City Stream Watch program were given a seine net for use throughout the summer. The coordinator chose appropriate sampling sites, and volunteers assisted in sampling the fish community and identifying some of the fish species of Black Rapids Creek, Mud Creek, and Cardinal Creek. Over ten volunteer hours were spent seining at four different sites. The volunteers gained insight into fish sampling methodology, as well as experience in identifying different fish species.

3.0 Results

3.1 The Community Response

A total of 26 volunteers from the community participated in the 2003 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 160 hours were given to learning about creeks in the Ottawa area. Table 1 summarizes volunteer activities for the 2003 season.

	Sawmill Creek	Black Rapids Creek	Mud Creek	Cardinal Creek	Total
# of Volunteers	*N/A*	*N/A*	*N/A*	*N/A*	***26***
# of Stream Sections Completed	*54*	*57*	*37*	*51*	***199***
# of Volunteer Hours	*47.5*	*35.0*	*31.5*	*53.0*	***167***
Avg. # of Hours/Section of Stream	*0.88*	*0.61*	*0.85*	*1.04*	***0.84***
# of Volunteer Hours Seining	*0*	*3*	*3*	*7*	***13***

Table 1. Summary of volunteer activities for the City Stream Watch 2003 season.

3.2 Environmental Monitoring

In total, 19.9 kilometers of stream were observed and documented. Detailed results for each section of stream can be accessed through the RVCA website. The following are brief summaries of some of the information obtained for each creek.

3.2.1 Sawmill Creek

Sawmill Creek flows through the urban landscape of Ottawa South. Figure 2 shows a more detailed look at the creek. The creek is approximately ten kilometers long, and flows North through South Keys and

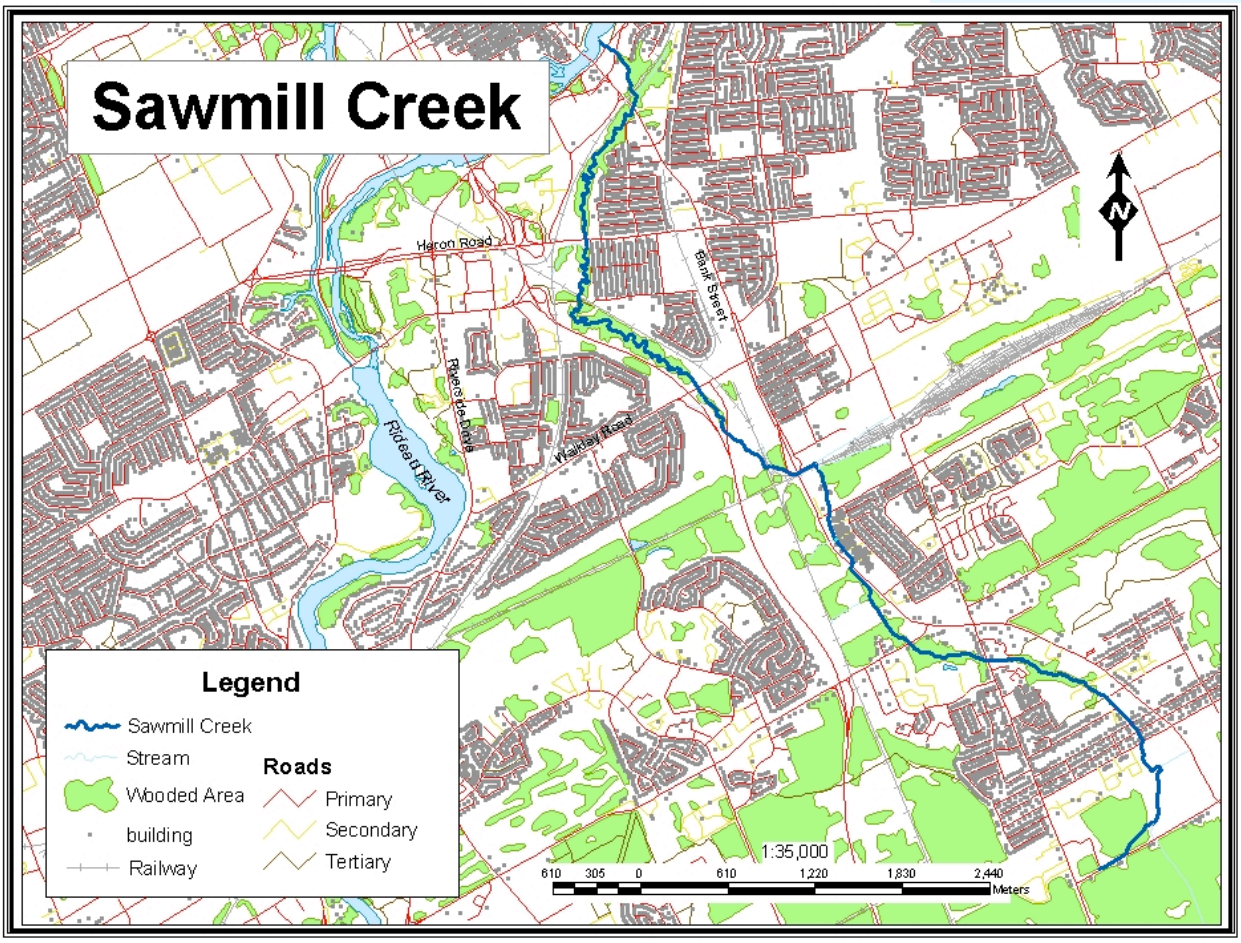

Figure 2. Map of Sawmill Creek and surrounding area.

Heron Park before emptying into the Rideau River. A total of 5.4 kilometers of Sawmill Creek was sampled during the 2003 season. Caution was needed when sampling the creek after periods of rain, as it experienced large, fast fluctuations in water discharge. The dramatic fluctuation in water discharge is characteristic of urban streams, as storm sewers shorten runoff travel time to stream channels while total runoff volume is increased with an increase in impervious surfaces.

The following is a summary of the 54 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

Of the 54 sections of stream sampled, volunteers identified just eighteen that displayed no human alterations. Half of the sampled sections of Sawmill Creek were either altered or highly altered waterways. These alterations include stream diversions, shoreline modification and armoring, storm water inputs, and lack of riparian vegetation due to development. Figure 3 illustrates the classes of anthropogenic alterations that volunteers observed on Sawmill Creek.

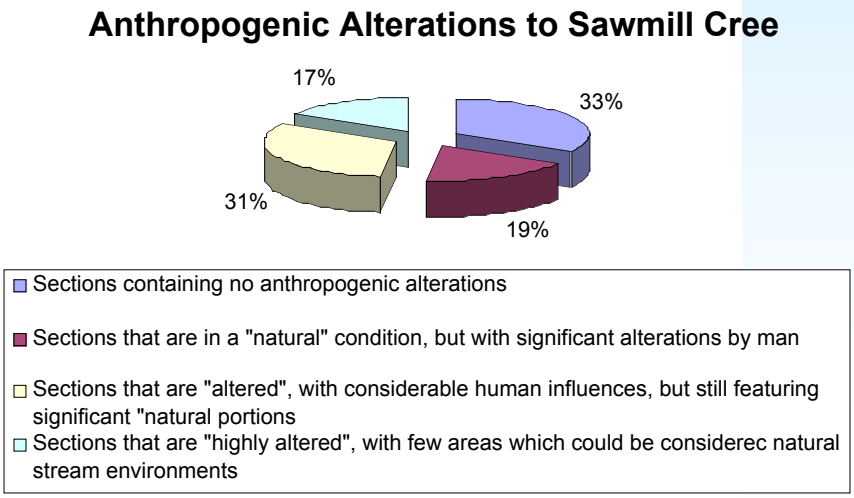

Figure 3. Classes of anthropogenic alterations occurring on Sawmill Creek.

Volunteers identified five major land uses along the creek. Natural areas exist along one third of the creek, while residential, industrial/commercial, roadways, and recreational areas comprise the remaining two thirds. Figure 4 demonstrates the different land uses recognized adjacent to Sawmill Creek.

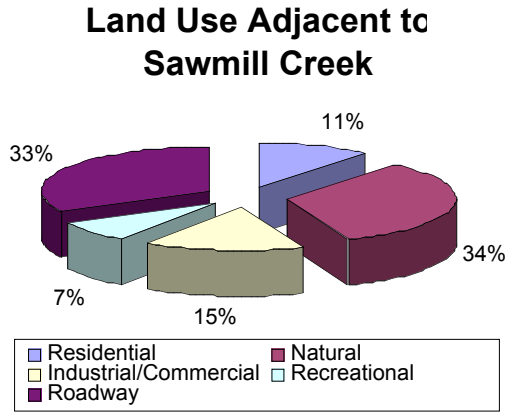

Figure 4. Various land use volunteers identified occurring on Sawmill Creek.

2. Observations of Instream Vegetation

Instream vegetation provides habitat for fish and wildlife, aids in removing contaminants from the water, and contributes oxygen to the stream.

Figure 5 demonstrates the incidence of instream vegetation abundance in Sawmill Creek. Instream vegetation was categorized as being low in abundance in 60% of sections sampled, and either low or rare in abundance in over 90% of sections sampled. No sections were sampled that had extensive growth in instream vegetation. In the six percent of sections where vegetation was common or normal in abundance, leafed submergents dominated.

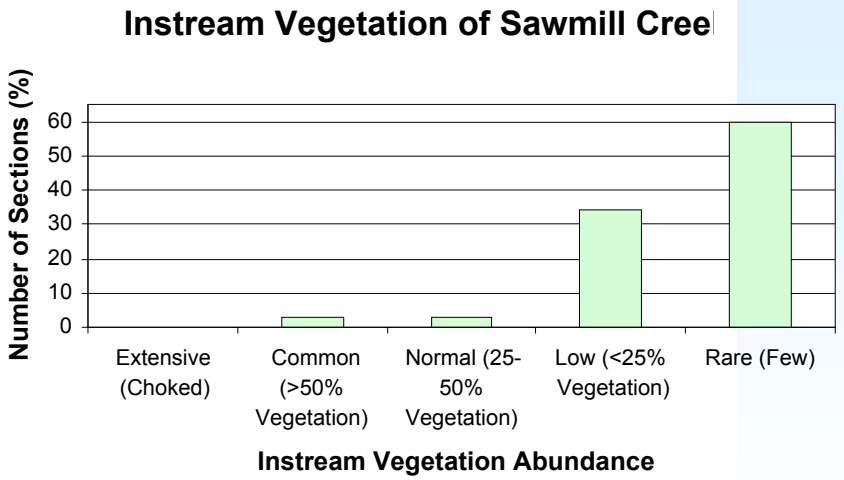

Figure 5. Frequency of instream vegetation abundance in Sawmill Creek.

3. 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. Excessive excavation and deposition of sediment within a stream can have detrimental affects on its fish and wildlife populations.

Figure 6 demonstrates the overall bank stability of Sawmill Creek. Evidence of excavation of material from the stream bank was observed along 19% of the shoreline, coinciding with areas of little or no vegetation. The most extensive areas of instability occurred in sections 13, 14, 21, and 22. In both sections 21 and 22, 80% of the shoreline was recorded as being steep and unstable.

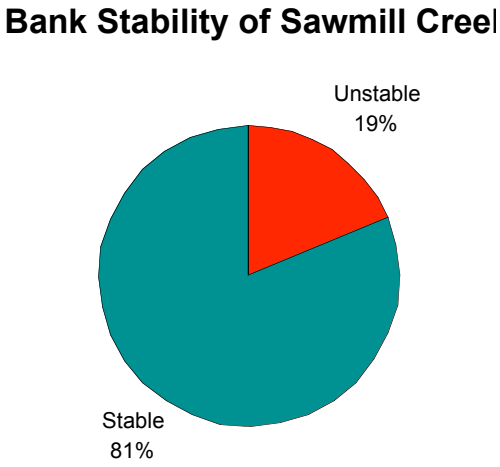

Figure 6. Bank stability of Sawmill Creek, in percent.

4. 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 Sawmill Creek. Table 2 is a summary of all wildlife observed.

	Observed
Birds	*Mallard duck with chicks, black duck, great blue heron, green heron, robin, american goldfinch, red-wing blackbird, grackle, crow, pileated woodpecker, flicker, sparrow, cardinal, starling*
Mammals	*Chipmunk, raccoon, rabbit, groundhog, muskrat, porcupine, grey squirrel*
Reptiles/Amphibians	*Green frog, tadpoles*
Fish	*Minnow species*
Aquatic Insects	*Water strider, whirligig beetle, damselfly, dragonfly, mosquitoes*
Other	*Crayfish, clams, snails, leeches, cicadas, butterflies*

Table 2. Wildlife observed on Sawmill Creek.

5. Observations of Pollution

Figure 7 demonstrates the incidence of pollution in Sawmill Creek. Pollution was observed in 98% of sampled sections. Of the 54 sections sampled, garbage on the stream bottom was observed in 87%, while floating garbage was observed in 80%.

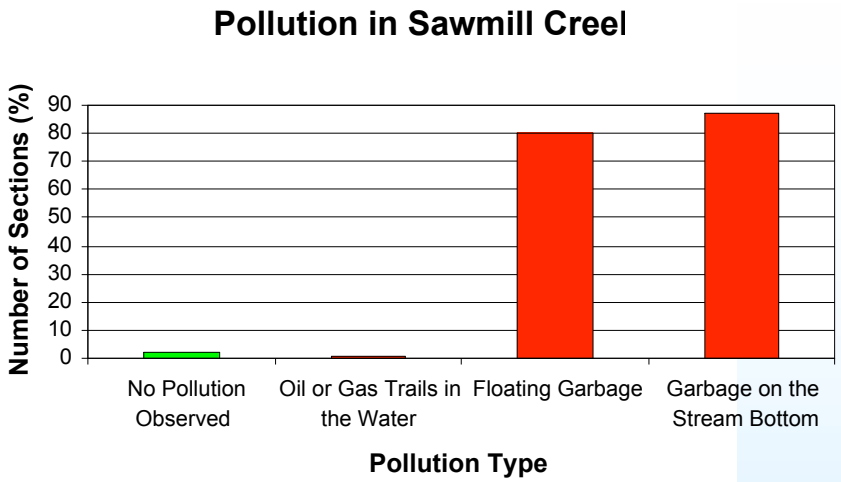

Figure 7. Frequency of pollution occurring in Sawmill Creek.

Large amounts of floating garbage, including plastic bags/containers and Styrofoam, seemed to accumulate in front of large jams of woody debris. Diverse types of garbage on the stream bottom were observed, including tires, hubcaps, bikes, shopping carts, pieces of vehicle engines, pylons, broken glass bottles, lumber and building materials, sandbags, chunks of concrete, garbage cans, and a recycle box.

3.2.2 Black Rapids Creek

Black Rapids Creek flows east, under Woodroffe Avenue and Merivale Road, before emptying into the Rideau River south of Black Rapids locks. Figure 3 shows a more detailed look at the creek. Black

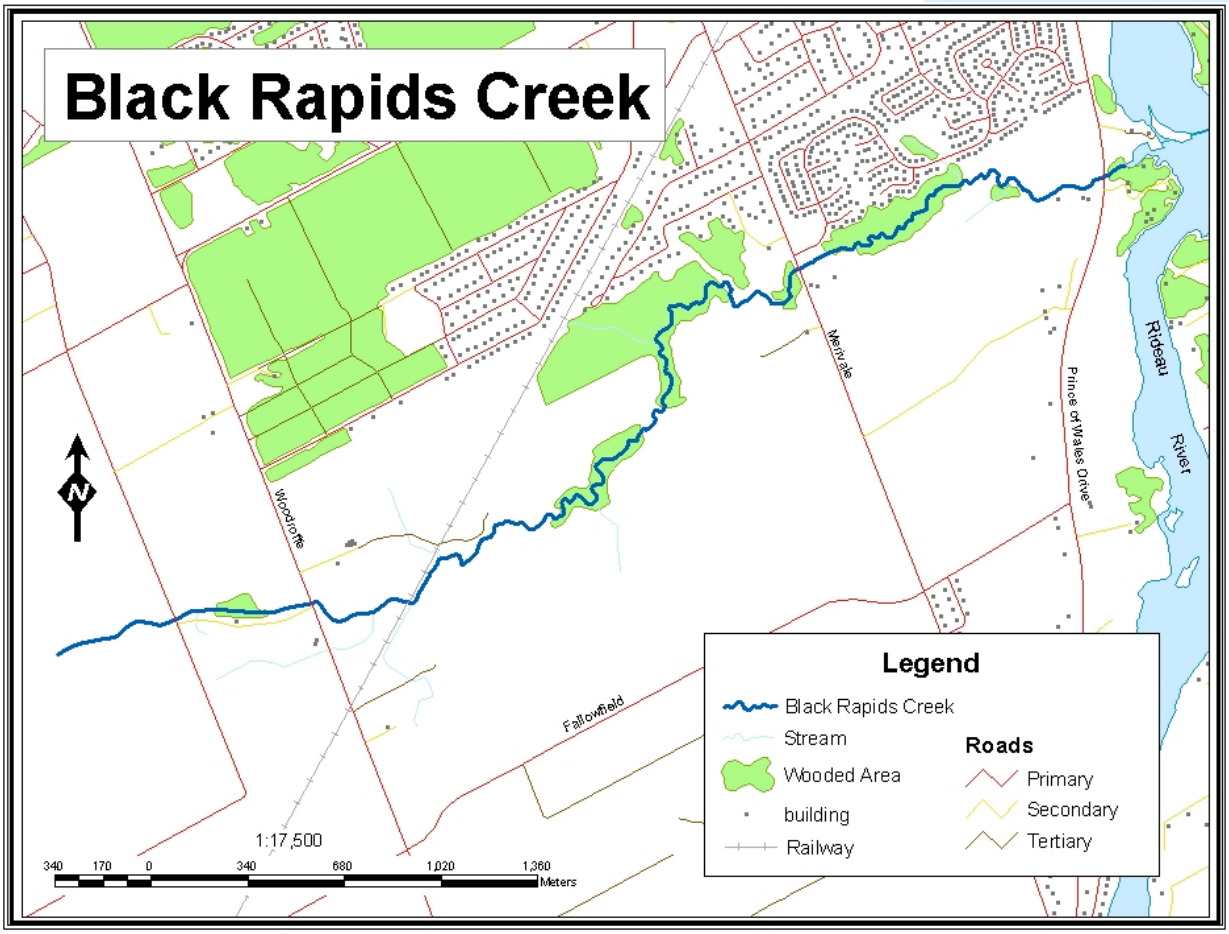

Figure 8. Map of Black Rapids Creek and surrounding area.

Rapids Creek was sampled in its entirety during the 2003 season, for a total of 5.7 kilometers or 57 sections. The dramatic fluctuation in water discharge that was observed on Sawmill Creek after periods of precipitation did not occur on Black Rapids Creek. As a result, sampling opportunities on Black Rapids Creek remained much more flexible throughout the summer than those opportunities on Sawmill Creek.

The following is a summary of the 57 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 9 illustrates the classes of anthropogenic alterations that volunteers observed on Black Rapids Creek. Of the 57 sections of stream sampled, volunteers identified 51 that displayed no human alterations. Only 10% of the sampled sections of Black Rapids Creek had some sort of alteration, 5%

of which were still considered in a natural condition. The altered sections that were recorded coincide with bridge structures for roadways that pass over the creek.

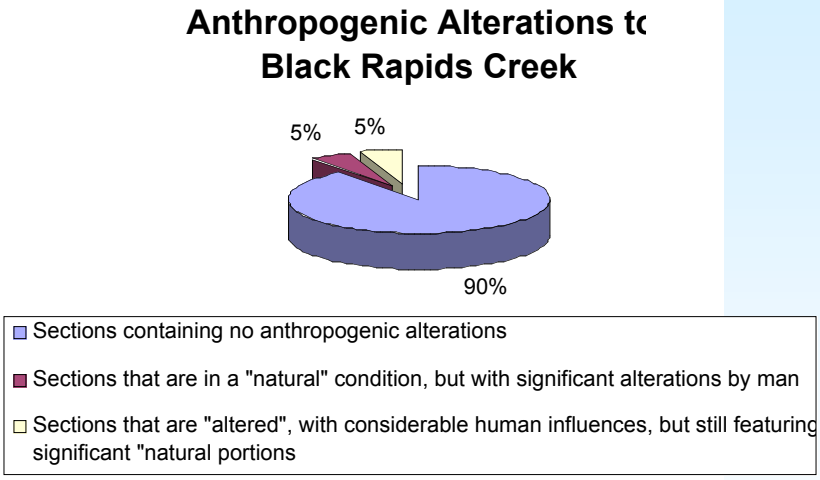

Figure 9. Classes of anthropogenic alterations occurring on Black Rapids Creek.

Figure 10 demonstrates the different land uses recognized adjacent to Black Rapids Creek. Volunteers identified three major land uses along the creek. Natural areas exist along over four fifths

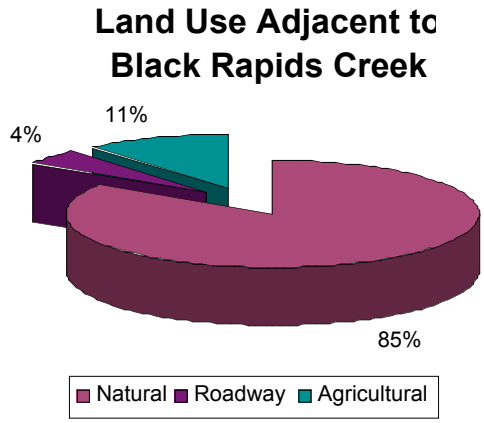

Figure 10. Various land use volunteers identified occurring on Black Rapids Creek.

of the creek, while roadway and active agricultural lands comprise the remaining 15%.

2. Observations of Instream Vegetation

Figure 11 demonstrates the incidence of instream vegetation abundance in Black Rapids Creek. Instream vegetation was categorized as being rare in abundance in just 4% of sections sampled, and either low or rare in abundance in 26% of sections sampled. Vegetation was extensive or common in 56% of sections.

Dominant types of instream vegetation varied throughout the stream. Vegetation types that were recorded as being dominant include narrow emergents, narrow submergents, leafed emergents, and leafed submergents. Although algae and lily-type plants were observed, they rarely dominated the

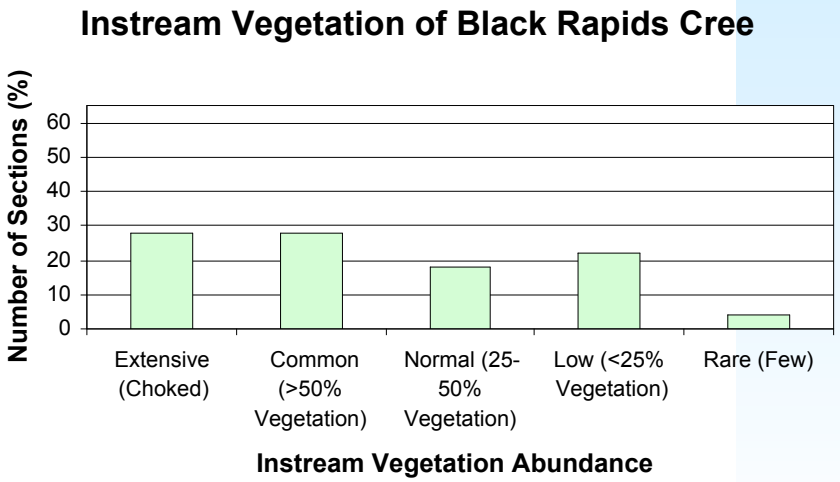

Figure 11. Frequency of instream vegetation abundance in Black Rapids Creek.

plant community.

3. Observations of Bank Stability

Figure 12 demonstrates the overall bank stability of Black Rapids Creek. Evidence of excavation of material from the stream bank was observed along only 5% of the shoreline, coinciding with areas of little or no vegetation.

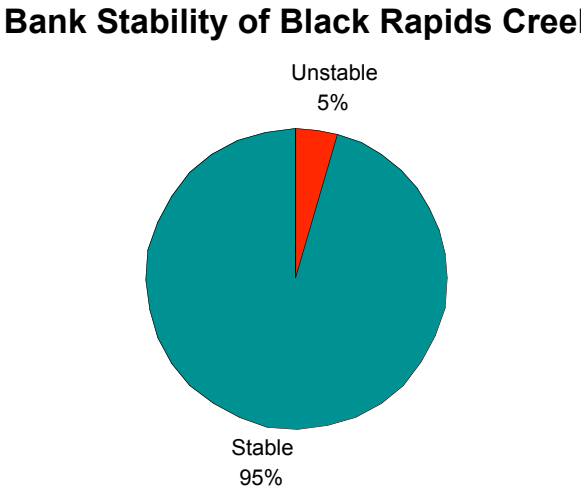

Figure 12. Bank stability of Black Rapids Creek, in percent.

4. Observations of Wildlife

Volunteers recorded the presence of many types of wildlife in and around Black Rapids Creek. Table 3 is a summary of wildlife observed. Fish were observed in 88% of sections sampled. Frogs and tadpoles were observed in 72% of sections sampled.

	Observed
Birds	*Mallard duck with chicks, great blue heron, green heron, robin, american goldfinch, red-wing blackbird, grackle, crow, flicker, sparrow, cardinal, starling, kingfisher, blue jay, red-tailed hawk, mourning dove, sand piper, chickadee, swallows, rose-breasted grosbeak*
Mammals	*Raccoon, chipmunk, deer, red squirrel*
Reptiles/Amphibians	*Green frogs, tadpole, leopard frogs*
Fish	*(As observed through seining) largemouth bass, white sucker, mottled sculpin, creek chub, common shiner, brook stickleback, red-bellied dace, blacknose shiner, bluntnose minnow*
Aquatic Insects	*Water strider, whirligig beetle, damselfly, dragonfly, mosquitoes, black flies*
Other	*Crayfish, clams, snails, leeches, monarch butterflies, honey bees, bumble bees, deer flies*

Table 3. Wildlife observed on Black Rapids Creek.

5. Observations of Pollution

Figure 13 demonstrates the incidence of pollution in Black Rapids Creek. Pollution was observed in 70% of sampled sections. Of the 57 sections sampled, garbage on the stream bottom was observed in 56%, while floating garbage was observed in 26%. Oil trails occurred in 2% of sampled sections.

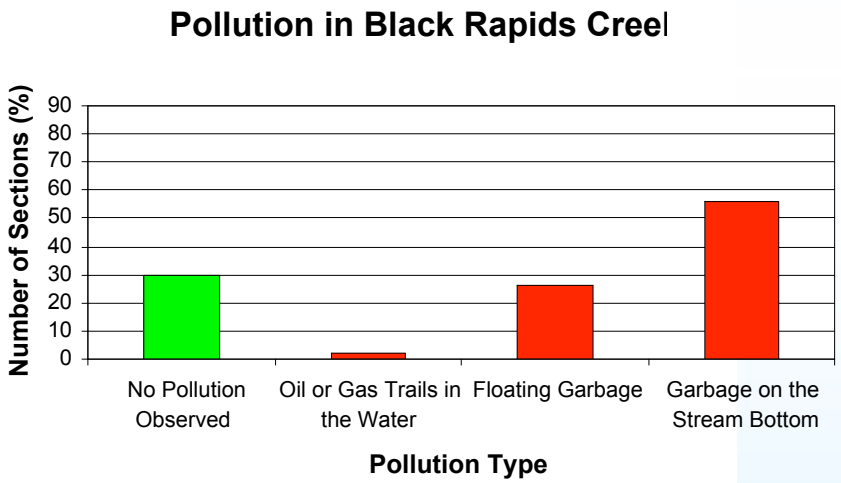

Figure 13. Frequency of pollution occurring in Black Rapids Creek.

Garbage occurred singly, and did not accumulate in large amounts in certain parts of the stream. Floating garbage included plastic bags, plastic bottles, styrofoam, and lumber. Garbage on the stream bottom included tires, a roll of fencing, a bedframe, and part of an engine. One particularly large metal tank (1m X 2m X 0.5m) was observed in section 6 and would be too heavy to remove by hand.

3.2.3 Mud Creek

Mud Creek flows north under Highway 416 and Bankfield Road before emptying into the Rideau River northwest of Manotick. Figure 14 shows a more detailed look at Mud creek and its surrounding area. A

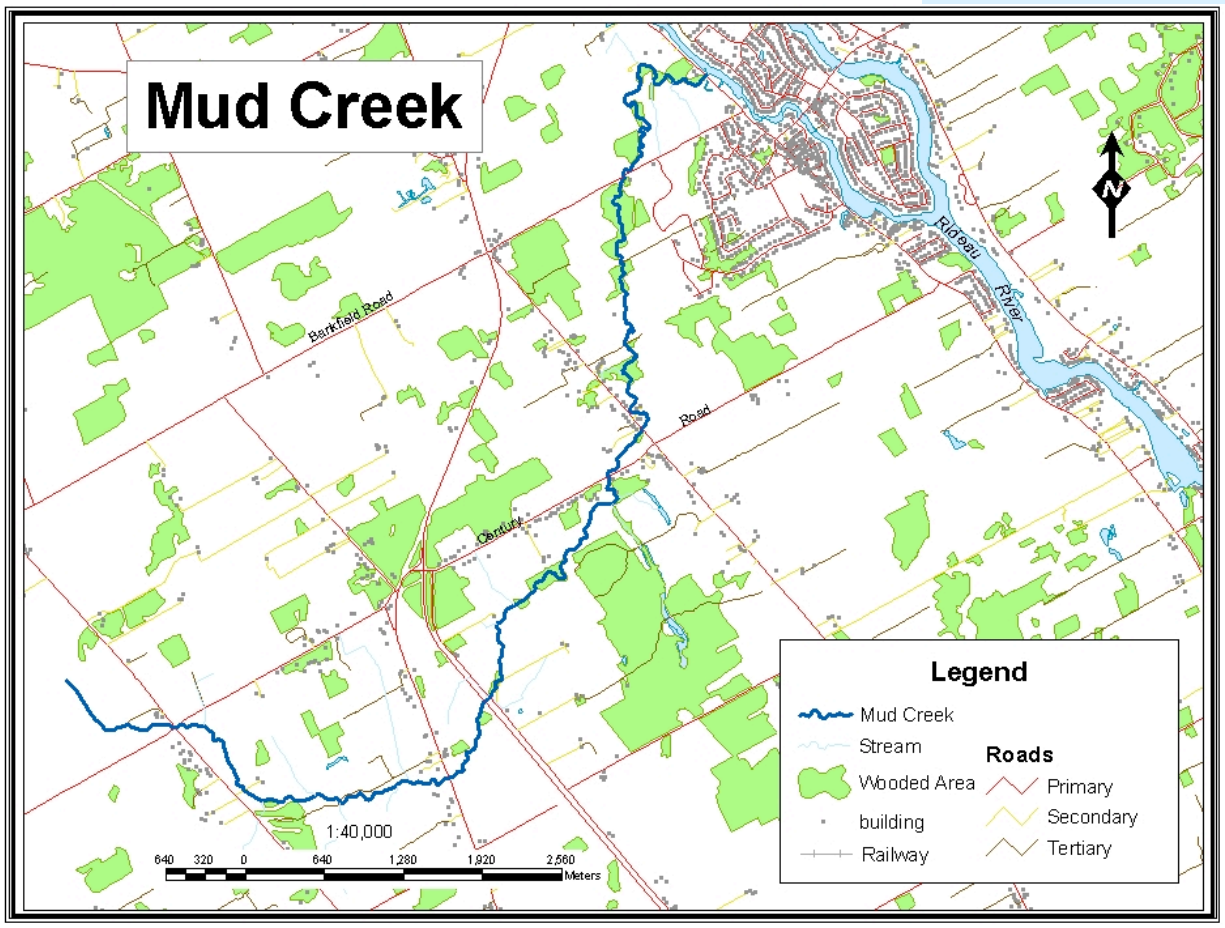

Figure 14. Map of Mud Creek and surrounding area.

total of 3.7 kilometers, or 37 sections, of Mud Creek was sampled during the 2003 season. Like Black Rapids Creek, Mud Creek did not display the dramatic fluctuation in water discharge that was observed on Sawmill Creek after periods of precipitation. As a result, sampling opportunities on Mud Creek remained very flexible throughout the summer.

The following is a summary of the 37 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 15 illustrates the classes of anthropogenic alterations volunteers classified occurring on Mud Creek. Of the 37 sections of stream sampled, volunteers identified 21 that displayed no human alterations. 40% of the sampled sections of Mud Creek had some sort of alteration, 37% of which were still considered in a natural condition. No sampled sections of Mud Creek were reported as being highly altered. The altered sections of stream coincide with bridge structures for roadways that

pass over the creek, shoreline modification and armoring along residential stretches, and the reduction of riparian vegetation due to development along the stream.

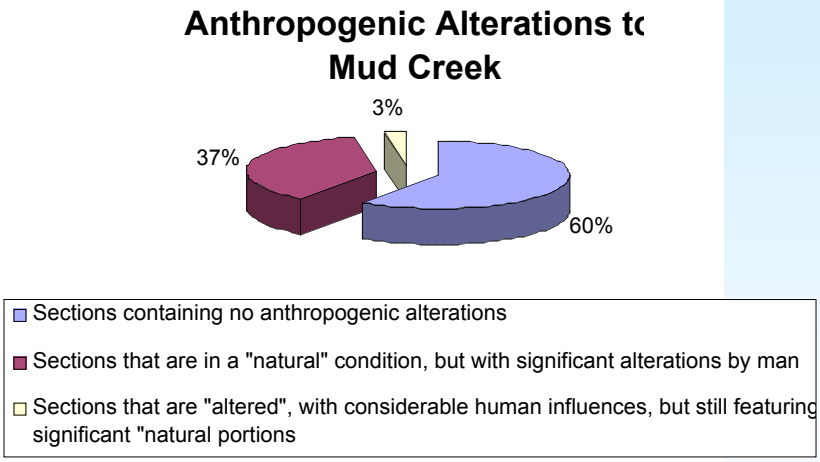

Figure 15. Classes of anthropogenic alterations occurring on Mud Creek.

Figure 16 demonstrates the different land uses recognized adjacent to Black Rapids Creek. Volunteers identified seven major land uses along the creek. Active agricultural lands occur along

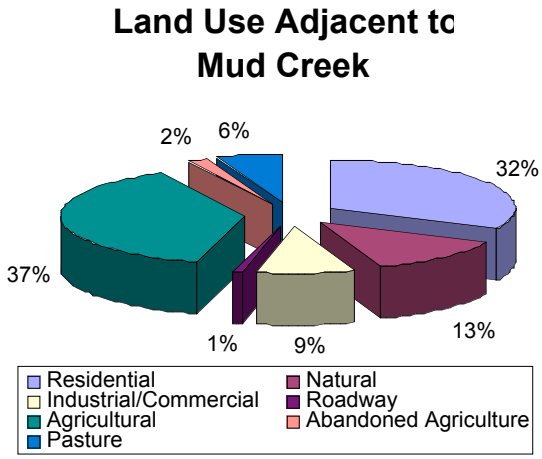

Figure 16. Various land use volunteers identified occurring on Mud Creek

37% of sections sampled, residential along 32 %, and natural areas along 13%. Industrial/Commercial, pasture, abandoned agricultural lands, and roadways combine for the remaining 18%.

2. Observations of Instream Vegetation

Figure 17 demonstrates the incidence of instream vegetation abundance in Mud Creek. Instream vegetation was categorized as being common in abundance in 49% of sections sampled. Vegetation was extensive or common in 61% of sections. No sections were recorded as having rare vegetation abundance.

Dominant types of instream vegetation varied throughout the stream. Vegetation types that were recorded as being dominant include narrow emergents, narrow submergents, leafed emergents, and leafed submergents, and algae. Although lily-type plants were observed, they rarely dominated the

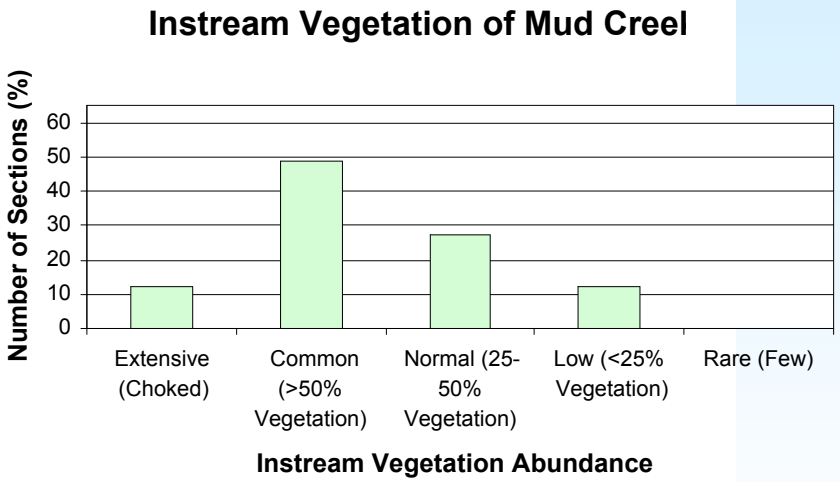

Figure 17. Frequency of instream vegetation abundance in Mud Creek.

plant community.

3. Observations of Bank Stability

Figure 18 demonstrates the overall bank stability of Mud Creek. Evidence of excavation of material from the stream bank was observed along 10% of the shoreline, coinciding with areas of little or no vegetation.

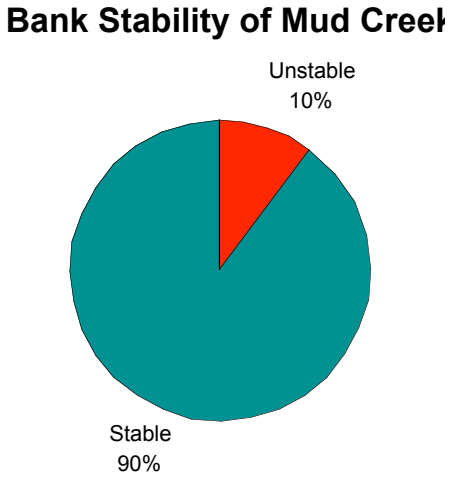

Figure 18. Bank stability of Mud Creek, in percent.

4. Observations of Wildlife

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

	Observed
Mammals	*Raccoon, chipmunk, deer, red squirrel*
Reptiles/Amphibians	*Green frogs, tadpole, leopard frogs*
Aquatic Insects	*Water strider, whirligig beetle, damselfly, dragonfly, mosquitoes, black flies.*
Fish	*(As observed through seining) white sucker, creek chub, common shiner, bluntnose minnow, blacknose shiner, rock bass, johnny darter, mottled sculpin.*
Birds	*Mallard duck, great blue heron, green heron, robin, american goldfinch, redwing blackbird, grackle, crow, flicker, sparrow, cardinal, starling, blue jay, red-tailed hawk, mourning dove, chickadee.*
Other	*Crayfish, clams, snails, leeches*

Table 4. Wildlife observed in Mud Creek.

5. Observations of Pollution

Figure 19 demonstrates the incidence of pollution in Mud Creek. Pollution was observed in 41% of sampled sections. Of the 37 sections sampled, garbage on the stream bottom was observed in 27%, while floating garbage was observed in 32%. Oil trails occurred in 3% of sampled sections.

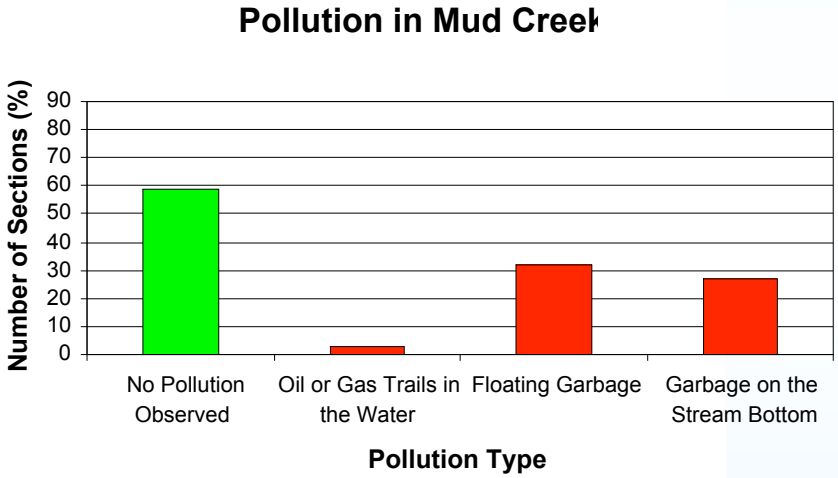

Figure 19. Frequency of pollution occurring in Mud Creek.

Garbage occurred singly, and did not accumulate in large amounts in certain parts of the stream. Floating garbage included plastic bags, plastic bottles, styrofoam, and lumber. Garbage on the stream bottom included tires, glass bottles, and snow fencing.

3.2.4 Cardinal Creek

Cardinal Creek flows northwest under Innus Road and Highway 417 before emptying into the Ottawa River east of Petrie Island. Figure 20 demonstrates a more detailed look at the creek and its surrounding area. A total of 5.1 kilometers, or 51 sections, of Cardinal Creek was sampled during the 2003 season.

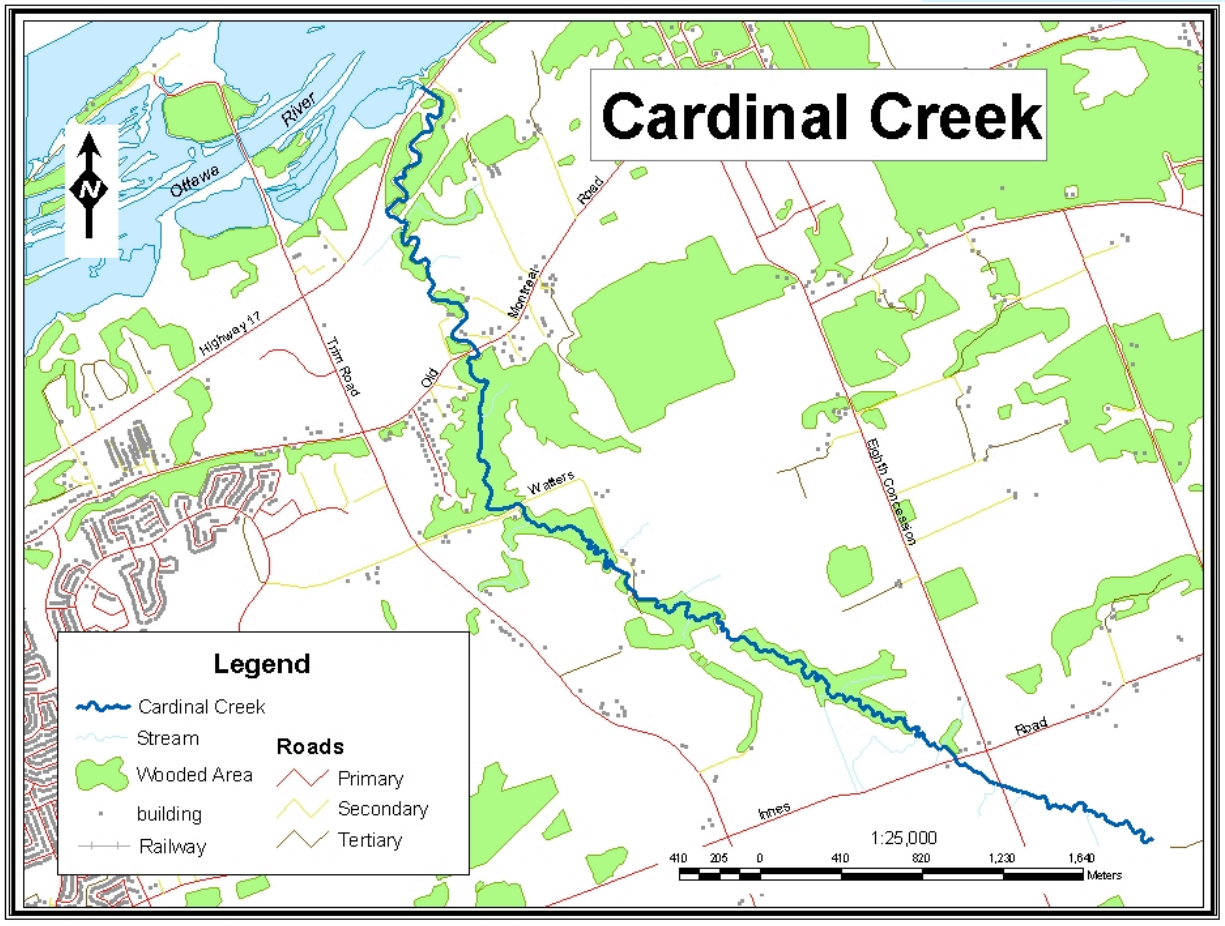

Figure 20. Map of Cardinal Creek and surrounding area.

Like Black Rapids Creek and Mud Creek, Cardinal Creek did not display the dramatic fluctuation in water discharge that was observed on Sawmill Creek after periods of precipitation. As a result, sampling opportunities on Cardinal Creek remained very flexible throughout the summer.

The following is a summary of the 51 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 21 illustrates the classes of anthropogenic alterations volunteers classified occurring on Cardinal Creek. Of the 51 sections of stream sampled, volunteers identified 35 that displayed no human alterations. 32% of the sampled sections of Cardinal Creek had some sort of alteration, 12% of which were still considered in a natural condition. 4% of sampled sections of Cardinal Creek were reported as being highly altered. The altered sections of stream coincide with bridge structures for

roadways that pass over the creek, shoreline modification and armoring along residential stretches, and the reduction of riparian vegetation due to development along the stream.

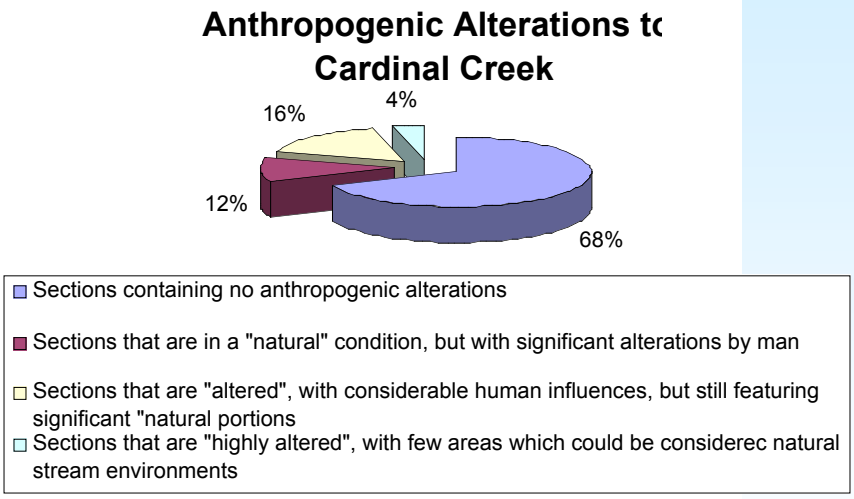

Figure 21. Classes of anthropogenic alterations occurring on Cardinal Creek.

Figure 22 demonstrates the different land uses recognized adjacent to Cardinal Creek. Volunteers identified six major land uses along the creek. Natural and residential lands both occur along 39%

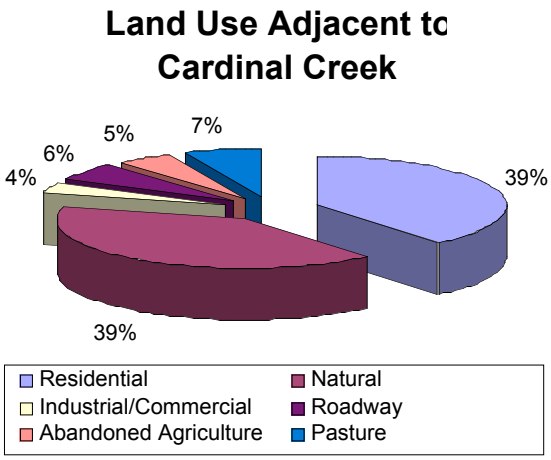

Figure 22. Various land use volunteers identified occurring on Mud Creek.

of sampled stream. Industrial/Commercial, abandoned agricultural lands, roadways, and pasture combine for the remaining 22%.

2. Observations of Instream Vegetation

Figure 23 demonstrates the incidence of instream vegetation abundance in Cardinal Creek. Instream vegetation was categorized as rare and low in 39% and 29% of sections respectively. Instream vegetation was normal or common in abundance in 32% of sections sampled. No sections were recorded as having extensive vegetation abundance.

Dominant types of instream vegetation varied throughout the stream. Vegetation types that were recorded as being dominant include narrow emergents, narrow submergents, leafed emergents, and leafed submergents, and algae. Although lily-type plants were observed, they rarely dominated the

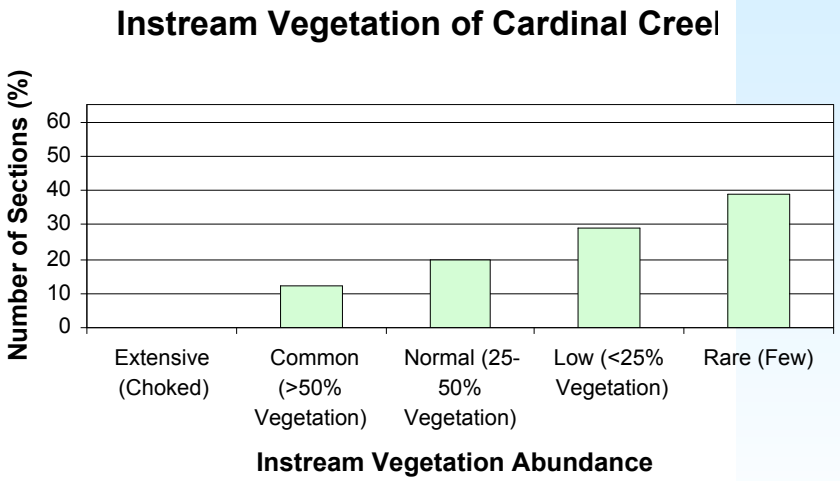

Figure 23. Frequency of instream vegetation abundance in Cardinal Creek.

plant community.

3. Observations of Bank Stability

Figure 24 demonstrates the overall bank stability of Mud Creek. Evidence of excavation of material from the stream bank was observed along 10% of the shoreline, coinciding with areas of little or no vegetation.

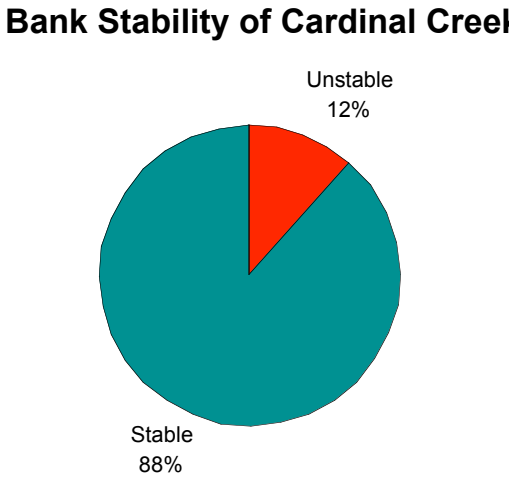

Figure 24. Bank stability of Cardinal Creek, in percent.

4. Observations of Wildlife

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

	Observed
Mammals	*Raccoon, chipmunk, deer, red squirrel*
Reptiles/Amphibians	*Green frogs, tadpole, leopard frogs, snapping turtle*
Aquatic Insects	*Water strider, whirligig beetle, damselfly, dragonfly, mosquitoes, black flies.*
Fish	*(As observed through seining) white sucker, creek chub, common shiner, brown bullhead, brook stickleback, longnose dace, spottail shiner*
Birds	*Mallard duck, great blue heron, green heron, robin, american goldfinch, redwing blackbird, rose-breasted grosbeak, crow, flicker, sparrow, cardinal, starling, blue jay, red-tailed hawk, mourning dove, chickadee.*
Other	*Crayfish, clams, snails, leeches*

Table 5. Wildlife observed in Cardinal Creek.

5. Observations of Pollution

Figure 25 demonstrates the incidence of pollution in Cardinal Creek. Pollution was observed in 59% of sampled sections. Of the 51 sections sampled, garbage on the stream bottom was observed in 49%, while floating garbage was observed in 22%. No oil or gas trails occurred in the sampled sections.

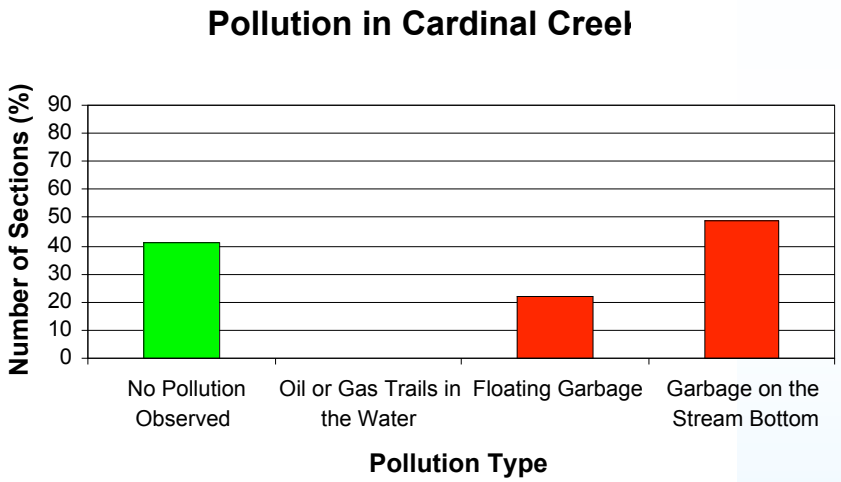

Figure 25. Frequency of pollution occurring in Cardinal Creek.

Garbage tended to occur singly, and did not accumulate in large amounts in certain parts of the stream. Floating garbage included plastic bags, plastic bottles, styrofoam, and lumber. Garbage on the stream bottom included tires, glass bottles, and snow fencing.

4.0 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 year. 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 that is 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.

The following are recommendations to improve the program.

The Community

- Continue to develop creative means in order to contact, as well as insure the involvement and ongoing interest of, all concerned members of the community.
- Continue collaboration with the Ottawa RiverKeeper to maximize community involvement and stream assessment.
- Begin contacting community earlier in the year to maximize both the involvement and the diversity of participants.
- Foster relationships with high school groups and clubs (i.e. environmental, geography, biology) to facilitate student involvement.
- Continue to insure that the needs of the participating community are satisfied as they relate to their continued involvement in the program.

Environmental Monitoring

- Consider altering the macro stream assessment protocol from sampling 100-meter sections of stream to 50-meter sections of stream. This will improve the accuracy and precision of the data collected, as well as the ease in which volunteers can interpret and categorize existing stream conditions.
- Reduce sampling to three creeks per season in order to ensure that each creek is sampled in its entirety.
- Consider hiring a student to fill an assistant position to assist the coordinator. The student would assist community volunteers with sampling, allowing the coordinator to concentrate more on community outreach and volunteer recruitment.

In addition, opportunities for the creation of several independent projects were identified as a result of the completion of the macro stream assessment forms during the 2003 season.

ACTION - A well-organized project could be undertaken to facilitate the proper and safe collection, removal, and disposal of garbage from each of the four creeks.

ACTION - A stewardship activity could be initiated to restrict cattle from Mud Creek in sections 36 and 37.

ACTION - A project could be undertaken to restore riparian vegetation, and consequently improve bank stability and reduce the erosion of sediment, through replanting of native flora in sections of stream where high levels of bank instability occur.

Appendix A

Waiver for Volunteers of the Rideau Valley Conservation Authority's City Stream Watch Program

I agree to indemnify and save harmless the Rideau Valley Conservation Authority from all claims or demands of any kinds due to personal injury to myself arising as a result of my volunteer work with the Rideau Valley Conservation Authority.

Date: _____

Volunteer: Signature: _____
Print Name: _____
Phone #: _____
E-mail: _____

RVCA Representative: _____

1. **Do you have a particular stream or streams that you would prefer to work on?**
   - ❑ **Yes** **Please Circle:** **Sawmill Creek**, **Mud Creek**, **Black Rapids Creek**, **Cardinal Creek**
   - ❑ **No**

2. **Are there other volunteers with whom you would prefer to sample with?**
   - ❑ **No, please group me with other volunteers.**
   - ❑ **Yes** **Specify:**_____
     _____
     _____

3. **Are there specific days you would prefer to sample?**
   - ❑ **Weekends**
   - ❑ **Weekdays**
   - ❑ **No Preference**

4. **Are there specific times you would prefer to sample?**
   - ❑ **Mornings**
   - ❑ **Afternoons**
   - ❑ **Evenings**
   - ❑ **No Preference**

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 Afew 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

1 handheld GPS unit
1 50-meter length of polypropylene 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 five other agencies, is conducting surveys that are designed to document basic geomorphological and biological characteristics of four city streams. 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 your lands. The work will involve a crew of 3-5 people working for approximately 1 hour on the site. We will respect all private property and leave the site clean and with minimal disturbance.

We ask that you sign two copies of this form and keep one for yourself. Please indicate whether you have any special considerations or conditions and whether you would consider future visits an option. We may wish to repeat the surveys at a later date. If you would like more information on the project or have any concerns, feel free to contact me.

Thank you for your cooperation.

Brian Bezaire
City Stream Watch Coordinator
580-2424 Ext. 33550
Brian.Bezaire@ottawa.ca

Landowner Name: _____
Phone Number: _____
E-mail: _____
Address: _____
City/Town: _____
Postal Code: _____
Special Considerations:

Please check all that apply:
One Visit Only Please: ___ Repeat Visits: ___ Call First: ___ Other: _____

Landowner Signature: _____
Date: _____

RVCA Signature: _____
Stream Name: _____