

**Drain Classification Project Report
For
Kawartha Conservation,
City of Kawartha Lakes, and
Department of Fisheries and Oceans**



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1.0 Introduction

1.1 Background

This report address drains that are commonly referred to as “municipal” drains, which are drains constructed under the Drainage Act, RSO 1990, Chapter D.17. For a municipal drain an Engineer’s report defines a drain to be constructed. The report is adopted by a municipal bylaw and the municipality arranges for the construction of the drain. After the drain is constructed the municipality is required under section 74 of the Drainage Act to maintain the municipal drain in the future to the standard as established in the Engineer’s report.

Several thousand municipal drains criss-cross Ontario and are vital to agriculture. In the past three decades, hundreds of millions of dollars have been spent in Ontario to develop the agricultural drainage infrastructure. Much of the agricultural land was previously subject to poor drainage and overland flooding. The drainage programs provided effective field drainage systems with adequate outfall for connecting channels and an adequate standard of flood control. Siltation and vegetation growth dictate that maintenance is required to allow these systems to continue to function.

The Federal Fisheries Act requires that there be no harmful alteration, disruption or destruction (HADD) of fish habitat unless it is authorized by the Minister of Fisheries and Oceans. It is acknowledged that some of the municipal drains may be fish habitat. This is particularly true of Eastern Ontario, where much of the agricultural drainage system incorporates natural watercourses within Municipal By-laws under the Drainage Act.

The Department of Fisheries and Oceans Canada (DFO) have entered into a partnership with the Conservation Authorities (CA) with the goal of expediting the municipal drain maintenance review and approval process. Under this agreement, Conservation Authority staff receives applications for in stream/shoreline work and determine the sensitivity of the watercourse and the amount of the maintenance work.

Currently DFO is establishing working arrangements with individual Conservation Authorities that are interested in, and capable of, undertaking reviews. The level of review depends on the agreements negotiated with DFO. There are three levels of agreement. In level 1 the CA is able to perform an initial assessment to identify any impact on fish habitat. A level 2 agreement includes the same components as a level 1, but the CA also determines how the proponent can mitigate any impacts. At level 3, the CA also works with the proponent to prepare a compensation plan.

Currently Kawartha Conservation has a level 3 agreement with DFO. Kawartha Conservation has a number of drains through out the watershed and are frequently asked to review drainage issues and cleanout.

The Municipal Drain Classification Project is a class authorization system that assesses drains based on several parameters. The parameters include drain stability, thermal regime, presence of fish and type of fish (top predator vs. bait fish).

1.2 Objective

The value of conducting a Drain Classification Study in the Kawartha Watershed is essential for delivering expedient and fair decisions when reviewing Municipal Drain projects. The Class Authorization System, as developed by DFO, is intended to strike a balance between the need to protect fish habitat and the need to provide drainage for agricultural lands.

The purpose of the Kawartha Region Conservation Authority (KRCA) Drain Classification Study is to create a tool that will act as a guide for Authority, DFO staff, Municipal staff while conducting Municipal Drain maintenance reviews. This study will also assist in determining the types of activities and time constraints that will be applied to drain cleanout procedures.

The objectives that have been identified for the KRCA Drain Classification Study are as follows:

- Identify and list all existing drains in KRCA watershed
- Map all existing drains in GIS format
- Follow the DFO Drain Classification Protocol on all drains
- Map results of Drain Classification study
- Complete Drain Classification report for use by DFO, Conservation Authority Staff and Municipal Staff

Record of drainage in the City of Kawartha Lakes indicates a number of drains that were constructed in the late 1800s and early 1900s. The Status of some of these drains with respect to the current Drainage Act is not clear. Drains with bylaws from the early 1900s would not be maintained by the municipality without first obtaining a new engineers report. Therefore, in consultations with the Drainage Superintendent for the City of Kawartha Lakes these older drains have not been included in the drain classification report.

2.0 Data Collection and Protocol

2.1 Sampling Protocol

The sampling protocol has been put together by The Department of Fisheries and Oceans. The protocol is used as a standard to ensure that all data collected during the drain classification project is consistent and current.

2.1.1 Location of the Fisheries Data Collection

Sampling will generally take place upstream of road crossings. Sampling should begin at least 20 metres upstream of a road crossing, and work upstream. This is due to the fact that culverts and bridges often change the habitat characteristics of the watercourse. However, in dry periods, plunge pools downstream of culverts provide important refuge habitat and thus will be important sampling locations.

For drains scheduled for maintenance, data will be collected in the work zone and impact zone of the drain.

- Work zone is the length of the drain where maintenance activities are to occur.
- Impact zone is the area extending from the downstream end of the work zone area to one kilometre downstream.

If there is a difference in species caught from the headwater site to the downstream site, an additional site should be sampled between these sites mid-point to determine species presence.

2.1.2 Protocol

The methods chosen for fisheries data collection are based upon the characteristics of the site and the purpose of the sampling. The intent of the classification system is to determine if there are certain species of fish using the drains for habitat and not to determine the population or abundance of fish. The main characteristic of the sample sites is that they are narrow, channelized streams that do not hold the natural habitat features of larger streams and rivers. The original engineers reports for the construction of the drain dictated a design, which would act as a conduit for transport of water. Due to the construction costs and low degree of environmental awareness when most drains were constructed, the idea of creating a naturalized channel was not considered; consequently the drainage systems created are not intended to be optimal fish habitat.

2.2 Introduction

In order to maintain drainage efficiency, drainage superintendents must maintain the municipal drains according to the specified designs from the engineers report. These maintenance activities, while improving drainage flow, will also alter the essential habitat components by the changing the riparian vegetation, substrate composition and width:depth ratios. These activities often result in a disruption of fish migrations; degradation of water quality and fish habitat may be permanently damaged.

Habitat is recognized as any component that contributes to its aquatic system. Some of these components include the cover, food, and water quality it provides. Other components provide specific conditions, which enable reproduction and permit migration of fish to spawning and feeding components.

Since the sensitivity of fish habitat for drains will vary from site to site it is necessary to determine the extent to which each drain might be susceptible to habitat loss. The sensitivity of fish habitats can be recognized according to the habitat types. Some drains are habitat for resilient species of fish, feeding habitat, and will not take a long time to recover from regular maintenance activities. Other drains, such as spawning habitats, are very sensitive habitats and take a long time to recover or may never recover at all. As time passes these may be lost completely and that is the reason it is necessary to locate and identify those drains that are characteristic of such a vulnerable habitat.

After field and background information is gathered the flow chart, provided by the DFO Class Authorization System publication, is used to determine the classification type for each drain. Each classification type gives authorization requirements needed for specific maintenance activities and conditions of mitigation that apply.

Where a specific characteristic is unknown the more sensitive option is assumed. For example if the species presence is unknown the drain is assumed to contain the presence of a top predator. The drain type can also be updated from year to year as more information becomes available.

2.3 DFO Sampling Protocol

Each drain classification was determined according to specific information ascertained from the sampling protocol. The protocol for the Class Authorization System states that there will be four characteristics, which a categorization can be derived from: Field sampling, flow determination, fish sampling, stability of drain and temperature. These are discussed in more detail under the field sampling section.

2.3.1 Field Sampling

Field sampling is the most critical aspect of the drain classification. The data collected in the field is a key component in determining classification system, and are described below.

2.3.1a Flow Determination

If the flow is determined as intermittent, temperature and drain clean-out/stability data are not required.

1. Each watercourse to be classified as permanent or intermittent.
2. Permanent systems flow year round. If a watercourse continues to flow (in an average year) during the dry summer months, it can be considered permanent.
3. Intermittent systems flow continuously for a period of the year, usually in the spring and/or fall. These systems have a defined channel but are dry for at least two months of the year.

2.3.1b Fish Sampling

The presence of sensitive fish species must be determined for both the work and impact zones. If it is impossible to collect fish data to confirm the absence of sensitive species, the species composition must be declared as unknown. There are two field methods employed, and anecdotal data can be used to confirm results.

A. Electrofishing procedure

1. Electrofish the required section moving against the flow in a zig-zag manner (Figure 1), crossing from bank to bank and sampling all habitat types (i.e. do not avoid pools)
2. On the data form, note the presence of top predator species found.
3. A listing of all species found can be included on a separate sheet.



Figure 1: This picture is an example of a proper three-man electrofishing crew procedure.

Electrofishing Constraints

In order to perform electrofishing on a drain the following characteristics were required:

- Water should have a low turbidity.
- Vegetation does not interfere with sampling efficiency.
(ie: duckweed cover, cattail and waterweed overgrowth)
- Water depth must be greater than 10cm.
- A stable substrate is required for the safe movement of the backpack operator.

B. Seining procedure

Electrofishing is the preferred sampling techniques. However, in some situations seining may be a more appropriate if conditions such as high turbidity and stream size result in an ineffective electrofishing effort.

Seining Constraints

In order to perform seine netting on a drain segment the following drain characteristics were required:

- Water depth must be greater than 1m but no greater than 2m.

- The streambed is even without limiting vegetation or obstructions. (ie: cattail or algae growth, logs and ice storm debris)
- Drain must be less than 9m wide.

C. Anecdotal Data

Anecdotal data may be used to confirm the presence of sensitive fish species, but cannot be used to confirm the absence of these species.

2.3.1c Stability of Drain (Time since last clean-out)

The stability of the drain may effect the classification that is applied to a drain segment as the

1. Talk to Drainage Superintendent to get information on date and extent of last cleanout.
2. Photograph(s) of the area sampled should be taken for further review and assessment. Note the location and viewpoint of the photograph (Figure 2)

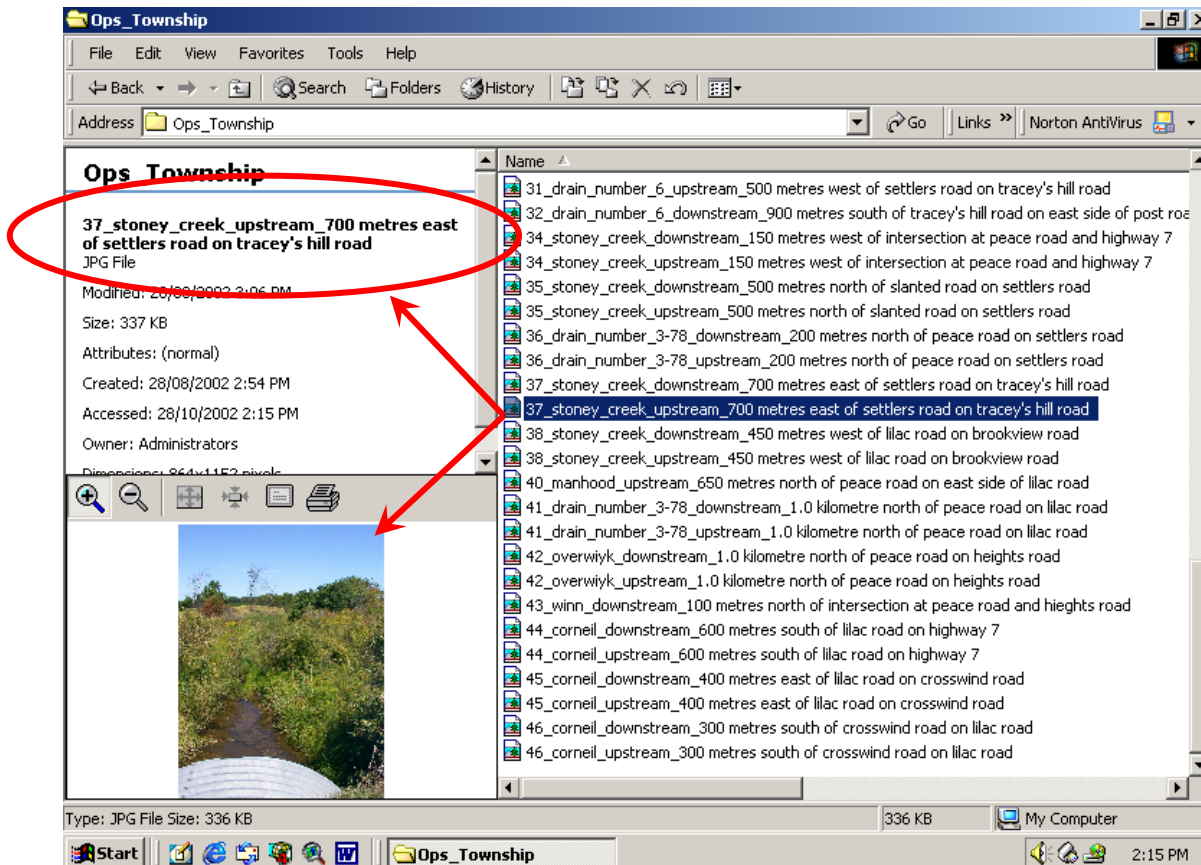


Figure 2: Above is a screen shot from windows explorer showing an example of the labelling of a photo taken in the field

2.3.1d *Temperature*

The sampling period extends from July 1st to August 31st. Prior to and after these dates, overnight cooling of streams does not allow for adequate separation between the three categories.

- Sample on days when maximum air temperatures have reached at least 24.5 C . During July and August the daily maximum air temperatures are often at least this high.
- Sample only when the previous 2-3 days are relatively similar in daily maximum air temperature. As an example, do not sample on a 25 C day that was preceded by two days of 32 C or 20 C weather. This bias can occur when waiting for a day that is finally "hot enough", or when a cold front moves in during the morning or early afternoon on a day scheduled for sampling.
- Obtain water temperature measurements between 16:00 and 16:30 hours, which represents the maximum daily water temperature. A reliable temperature recorder or minimum-maximum thermometer could also be placed at the site before 16:00 hours and removed and checked for maximum water temperature after 16:30 hours.
- Obtain the maximum air temperature for the day of sampling. This is not a measure of the air temperature at 16:00 hours. Daily air temperature maximums are usually available from Environment Canada weather stations. Locate the weather station closest to the stream site being sampled. Alternatively, a reliable temperature recording device or minimum-maximum thermometer could be placed at a nearby, shaded spot in the morning and checked at the end of the day.
- To increase the accuracy of site classification, several measurements can be taken on different days. Examine the data to ensure that the original water temperature measurement was not unusually cold or warm for that site

2.3.1e *Data Sheets*

A DFO data sheet (Agricultural Drains Classification Data Form) is provided with the protocol was used in this study. Any additional information collected by Kawartha Conservation was recorded on a second data collection form.

2.3.2 *Class Authorization System Categories*

The Department of Fisheries and Oceans have created this system in order to maintain the balance between the protection of fish habitat and the need to provide drainage to agricultural lands. The system streamlines the process of reviewing the effects of drain maintenance activities on fish habitat under the *Fisheries Act* (Figure 3). The following text identifies Drain Classes A-F and lists the authorized act and specific terms and conditions required for drain maintenance cleanouts

Class A

A permanent flowing cold or coolwater stream where there are no trout or salmon present.

Authorized Activities:

- Brushing of side slope
- Bottom cleanout
- Debris cleanout

Specific Terms and Conditions:

- Width:depth ratio not increased
- Shade producing side vegetation unaltered
- Specific trimming restrictions
- Sediment control required
- Work in water only when flows are not elevated
- Replanting of bank vegetation

Class B

A permanent flowing warmwater stream, which has been cleaned in less than 10 years, has a presence or an unknown presence of top predators.

Authorized Activities:

- Brushing of side slope
- Bottom cleanout
- Debris cleanout

Specific Terms and Conditions:

- Specific timing restrictions
- Vegetation can be removed on either bank, but must be replanted
- Width:depth ration can be increased, but channel must be as deep as possible
- Sediment control required
- Work in water only when flows are not elevated

Class C

A permanent flowing warmwater stream where there is only a presence of baitfish.

Authorized Activities:

- Brushing of side slope
- Bottom cleanout
- Debris cleanout
- Full clean out

Specific Terms and Conditions:

- Vegetation removal allowed on either bank, but must be replanted
- Bends in channel must be stabilized
- Specific timing restrictions
- Sediment control required
- Work in water only when flows are not elevated

Class D and E

Class D drains are permanent cold, cool or unknown water where there is a presence of trout or salmon species. Class E drains are permanent warmwater with top predators present and have not been cleaned out in more than ten years.

Project Specific Evaluations:

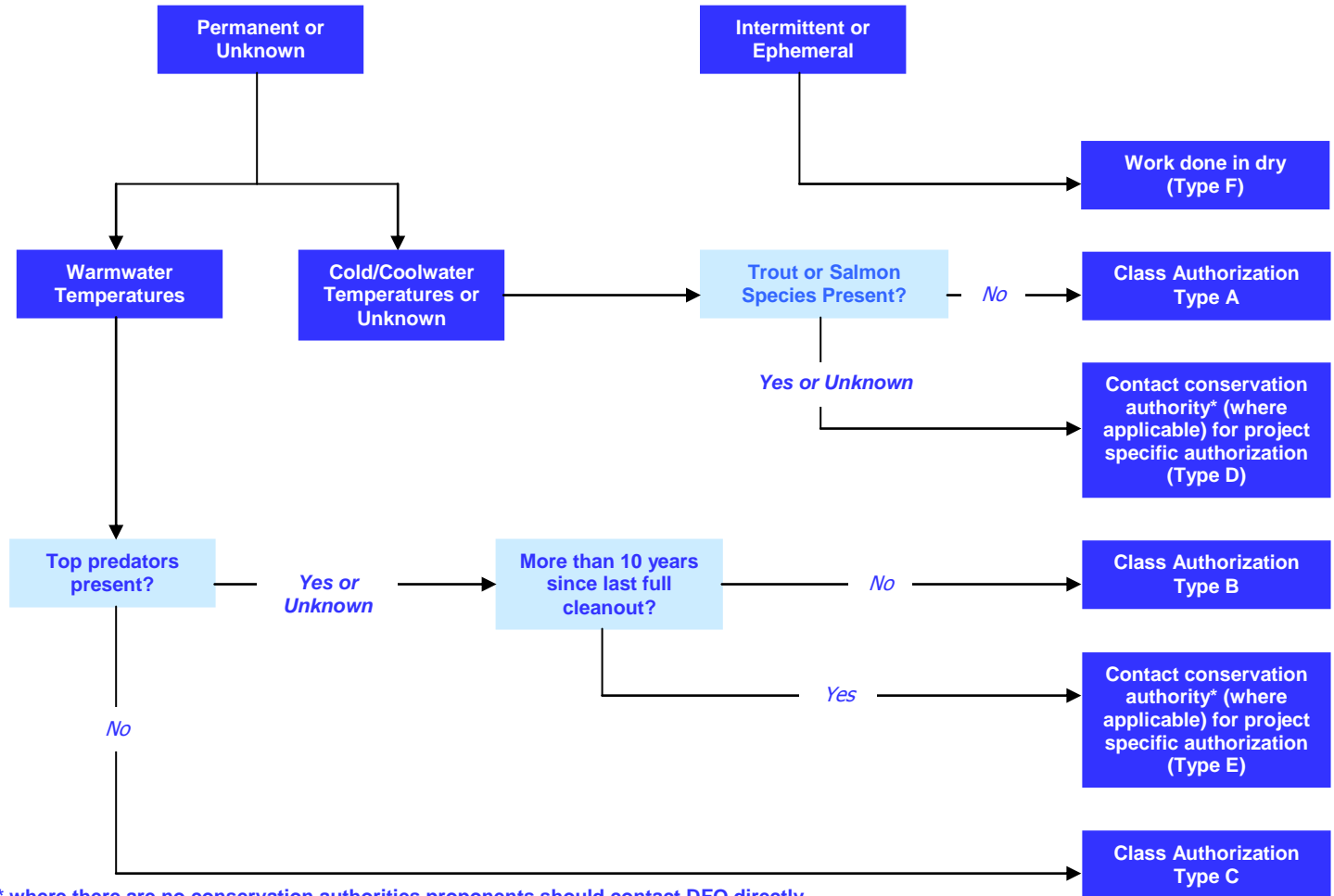
Drain types D and E are sensitive to maintenance activities. This, however, does not necessarily mean that work cannot proceed in these drains. These projects will be evaluated on a project to project basis to determine if the effects of maintenance can be mitigated. In some cases, a project specific authorization under the *Fisheries Act* may be required.

Class F

F drains are intermittent systems and therefore a harmful alteration, disruption or destruction of fish habitat will not occur in these systems for clean-out work provided the following conditions are met:

- Work is done in the dry
- All disturbed soils are stabilized upon completion of work

The Drains Classification System



* where there are no conservation authorities proponents should contact DFO directly

Type	Flow	Temperature	Species	Time Since Last Clean Out	Authorization
A	permanent	cold/cool/unknown	no trout or salmon	n/a	class A
B	permanent	warm	top predators (bass, pike, muskie, crappie)	less than 10 years	class B
C	permanent	warm	baitfish	n/a	class C
D	permanent	cold/cool/unknown	trout and/or salmon	n/a	project specific
E	permanent	warm	top predators (bass, pike, muskie, crappie)	n/a	project specific
F	intermittent	n/a	n/a	n/a	conditional (see back page)

Figure 3: The Drains Classification System flow chart

3.0 Data Analysis

3.1 Data Storage

The data that was collected from the original field data was input into a digital database created in Microsoft Access 2000. All of the digital information will be stored on a CD at the administrative building for Kawartha Conservation. Copies of the CD will be distributed to DFO and The City of Kawartha Lakes. In addition a series of maps have been created in Arcview 3.1 and will also be stored on the disc.

3.1.1 Database

All information collected by KRCA and DFO in 2002 was entered into a database for analysis and storage. The database data entry form was designed from information provided by DFO and adapted for the information requested by the City of Kawartha Lakes engineering department, DFO, and Kawartha Conservation.

3.1.2 GIS Link

GIS software Arcview 3.1 is used to produce an information-mapping database where any line feature (ie. drain segment) on the map can be linked to a table, which shows the database information collected during sampling.

3.1.3 Data Hard Copy Files

The field report information is recorded in the field report forms and placed into a separate file for each drain. All files will be kept in the KRCA office for future reference.

3.2 Analysis

A preliminary analysis of the drains is completed prior to the fieldwork. Field sampling occurred from late August to mid September. Compilation of collected data was completed in the KRCA office. Drain classifications were then determined using the four categories supplied by DFO. These categories include flow determination, fish sampling, channel stability and temperature. The categories are discussed in more detail below. The majority of the data analysis is done upon examination of the fieldwork. Fish species identification can be completed either in the field or in a lab. The actual classification process involves both going out to the field and then returning to the office and compiling all data that was collected.

3.2.1 Flow Results

The flow was investigated for 52 drains within the Kawartha Region Watershed. Of those, 63% were intermittent resulting in Class F designation as they would not support fish population year round. The remaining drains followed the DFO protocol for Drain Class A-E (Figure 4).

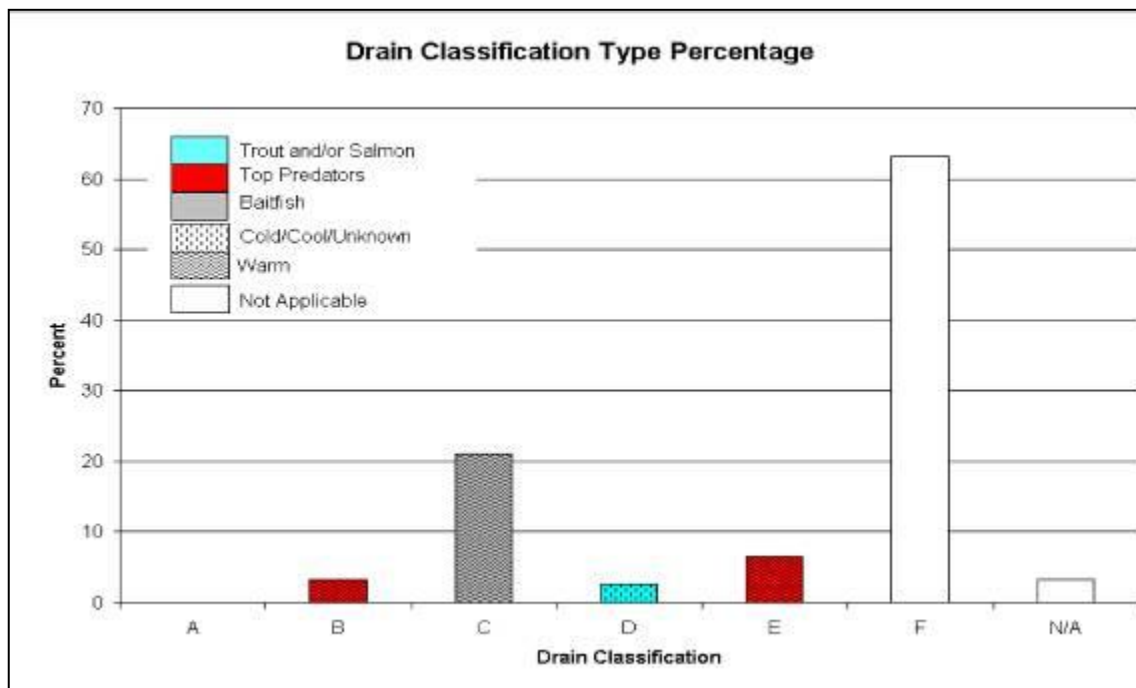


Figure 4: Percentage of Drain Classification types within Kawartha Conservation watershed boundaries.

3.2.2 Fisheries Results

In all the sampling stations, the only sampling method used was electrofishing. Some of the sampling sites, due to low water levels this year, were sampled at the downstream plunge pool. The plunge pool provided a refuge for fish during low water periods. Of the species sampled, the dominant species of fish found were the Creek Chub, Common Shiner, Brook Stickleback, Bluntnose Minnow and Central Mudminnow. Of the top predators the project is designed to find, only the Brook Trout, Largemouth Bass, Yellow Perch and Rock Bass were captured (Figure 5). Rainbow Trout, Brown Trout, Chinook Salmon, Coho Salmon, Atlantic Salmon, Northern Pike, Muskellunge, Black Crappie, Walleye, and Smallmouth Bass were not present.

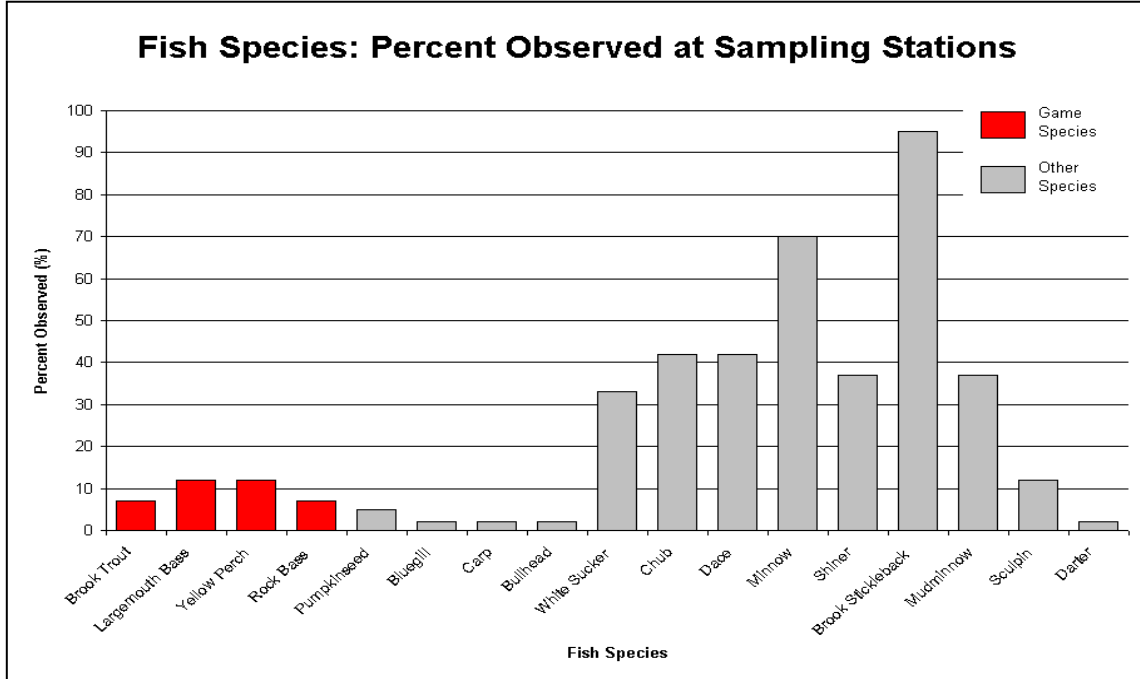


Figure 5: Percentage of fish species observed at sampling stations

3.2.3 Channel Stability Results

The drainage superintendent supplied information concerning the drain cleanout and maintenance that was used in the drain classification. In the classification process there is a portion where the time period of the drain cleanout is the deciding factor between a Class B and Class E type drain. In all other classifications the cleanout history is mainly used as strictly background information. Photos were taken as a reference for every site visited during field sampling. All photos with site location descriptions are located in Appendix A

3.2.4 Temperature Results

Sampling was completed at 52 drains within the Kawartha Conservation watershed. In the 52 drains sampled throughout the watersheds there were 155 sampling stations. The results show that 30% of the drains are warmwater, 3% of the drains are cool or coldwater and the remaining 66% are dry more than three months a year. The

3.3 Classification

The KRCA and DFO staff investigated 52 drains within the watershed. Of the 52 drains we were able to classify all of the drains under the classification system. There were approximately 12 drains within the Kawartha Watershed that could either not be located or have been converted to tile drainage over the years.

4.0 Conclusions

4.1 Data

4.1.1 Temperature

The fisheries data concludes that the majority of the drains were intermittent or warmwater drains. It assumed that the coldwater drains retain the cool temperatures as a result of natural springs and quarry water. It is assumed that if some of the temperatures are questionable additional sampling can be conducted for confirmation of regime status.

4.1.2 Fisheries Conclusions

For fisheries sampling we visited 155 sites we sampled 50 of those sites for presence or absence of top predator fish species. We found that of the available fisheries sampling sites only 24% contain a fish classed as a top predator, which represented 8% of all the drains classified during the project in 2002. This proves that the assumption of top predators using municipal drains for habitat is correct. The drains which contained baitfish represented 76% of the sampled drains and 25% of all the drains classified in 2002.

4.1.3 Flow

The results of flow determination conclude that 52% of the municipal drains sampled in 2002 were determined to be intermittent flowing drains. There are such a high percentage of intermittent drains because the intention of most drains is to transport water during high water level conditions in the spring and fall. The drains are not intended to act as permanent flowing watercourses.

4.1.4 Classifications

The drainage systems within the Kawartha Conservation watershed are generally intermittent (Class F) drains, which require the least amount of mitigation measures. Type C classification amounts to 25% of the drains within the watershed. The type B, D and E classifications constitute 8% of the total amount of drains within the watershed.

4.2 Mapping

Each sub watershed was given a drainage map indicating drain name, thermal classification, site temperatures, fish species found, and classification type for each drain which was sampled in 2002. These maps are located in the mapping section of the report. Kawartha Conservation staff digitized mapping with the database mapping information provided by the City Of Kawartha Lakes and the Ministry Of Natural Resources.

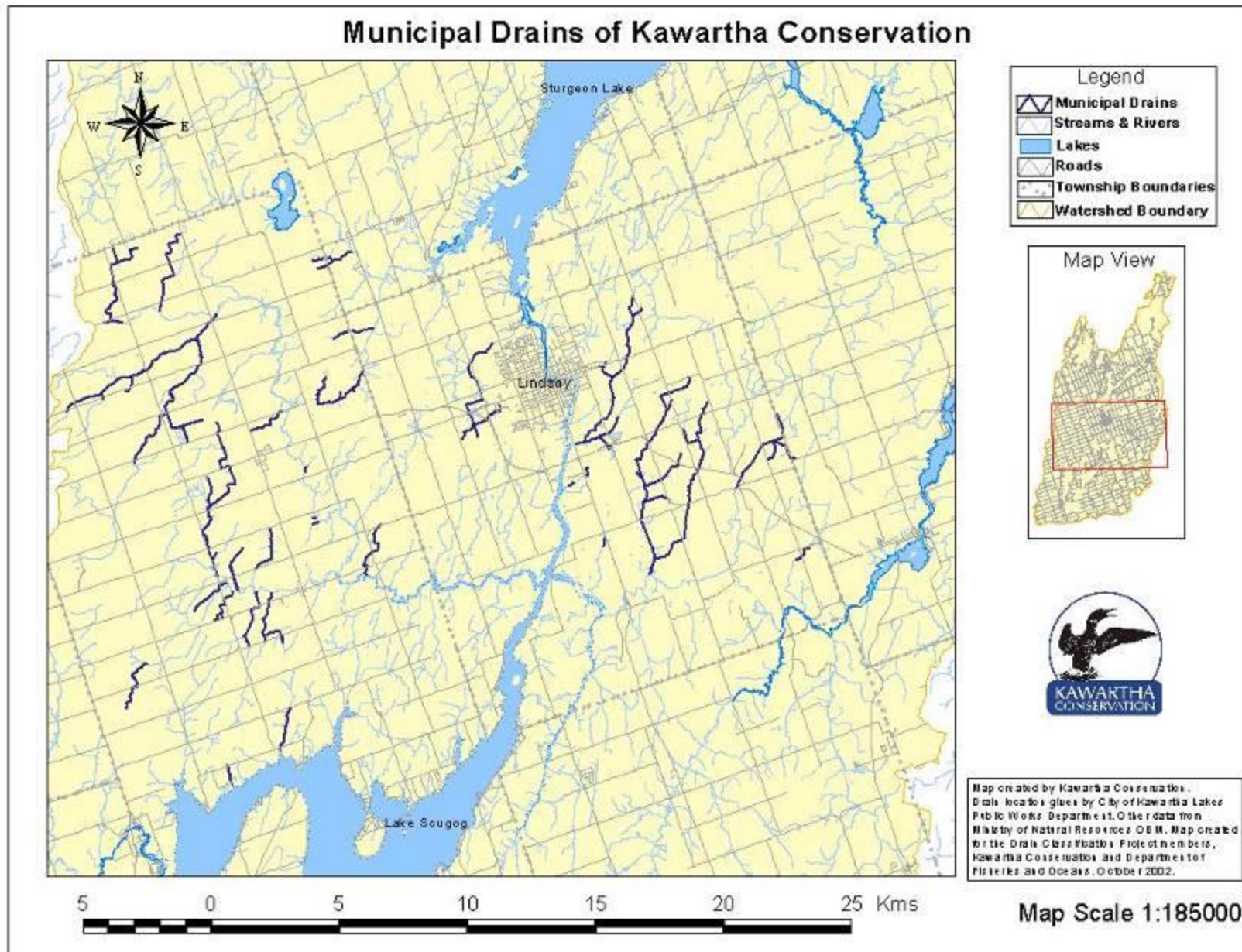
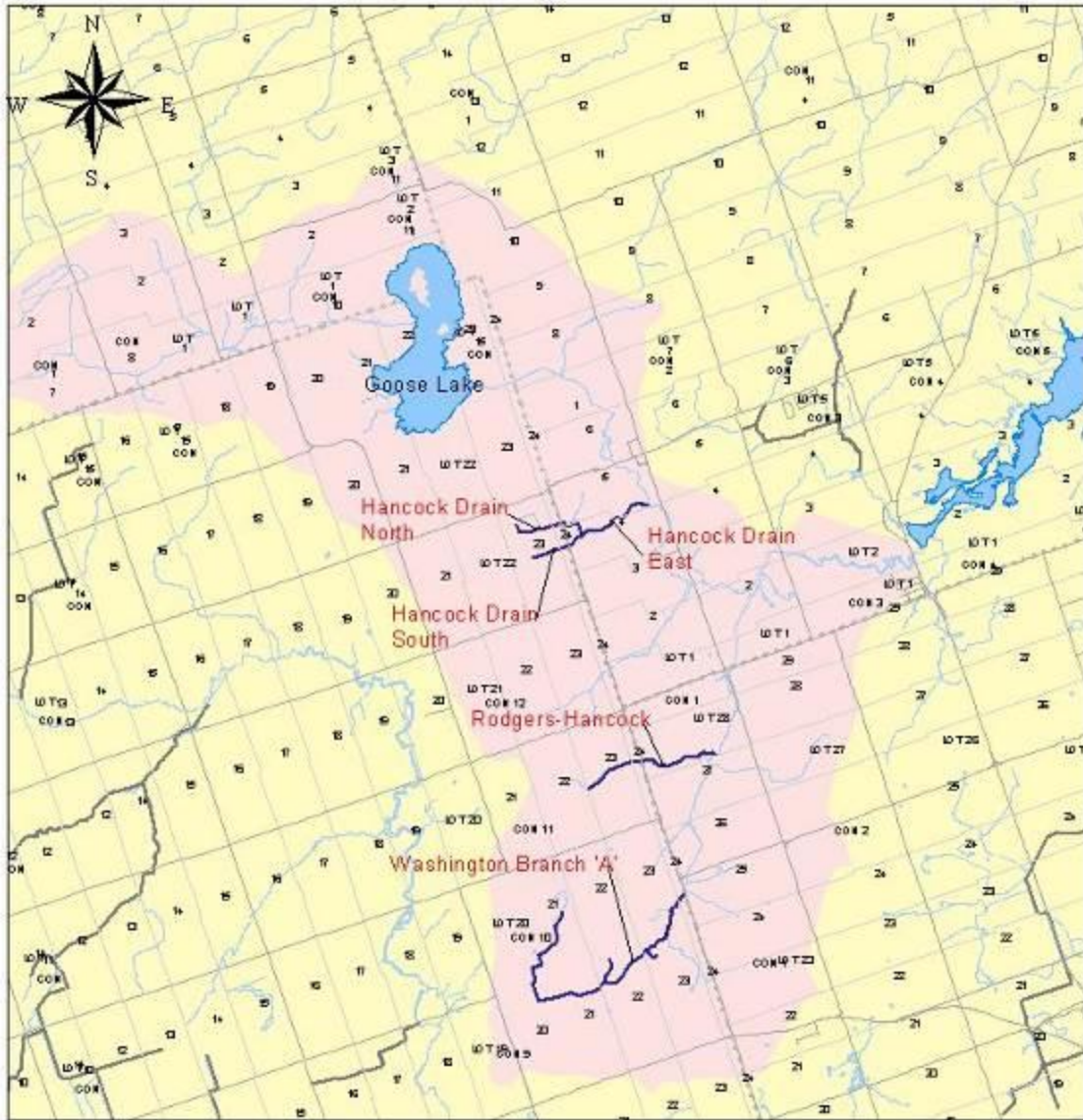


Figure 9. Municipal drains of Kawartha Conservation map

McLaren Creek Subwatershed Drains



Legend

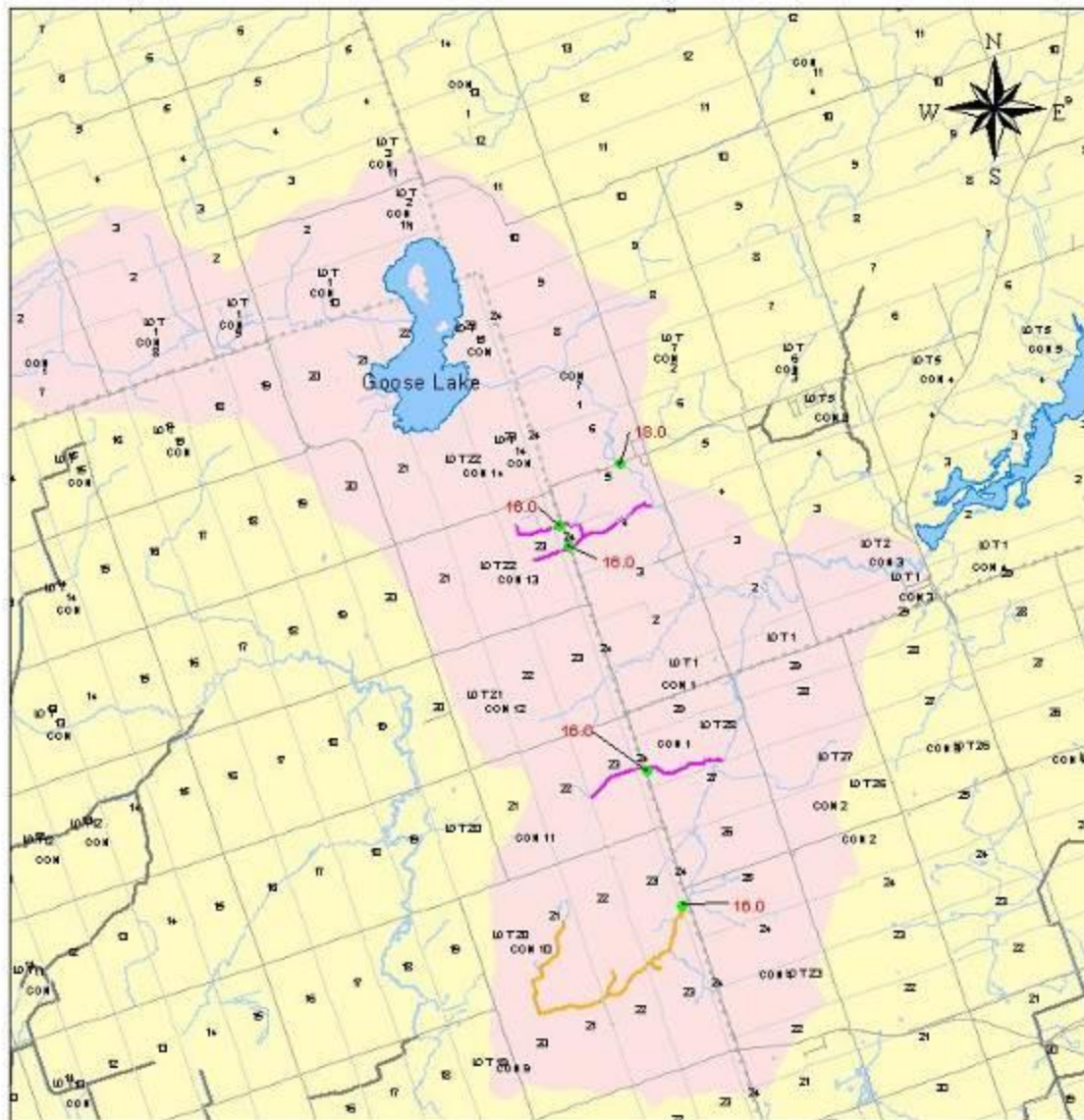
- McLaren Creek Drains
- Other Drains
- Streams & Rivers
- Lakes
- McLaren Creek Subwatershed
- Kawartha Conservation Watershed
- Roads
- Township Boundaries



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 7: McLaren Creek subwatershed drain names map

McLaren Creek Drains Thermal Classification



Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	McLaren Creek Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	Other Drains

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans, October 2002.

Figure 8: McLaren Creek subwatershed drains thermal classification map

McLaren Creek Subwatershed Drain Classification

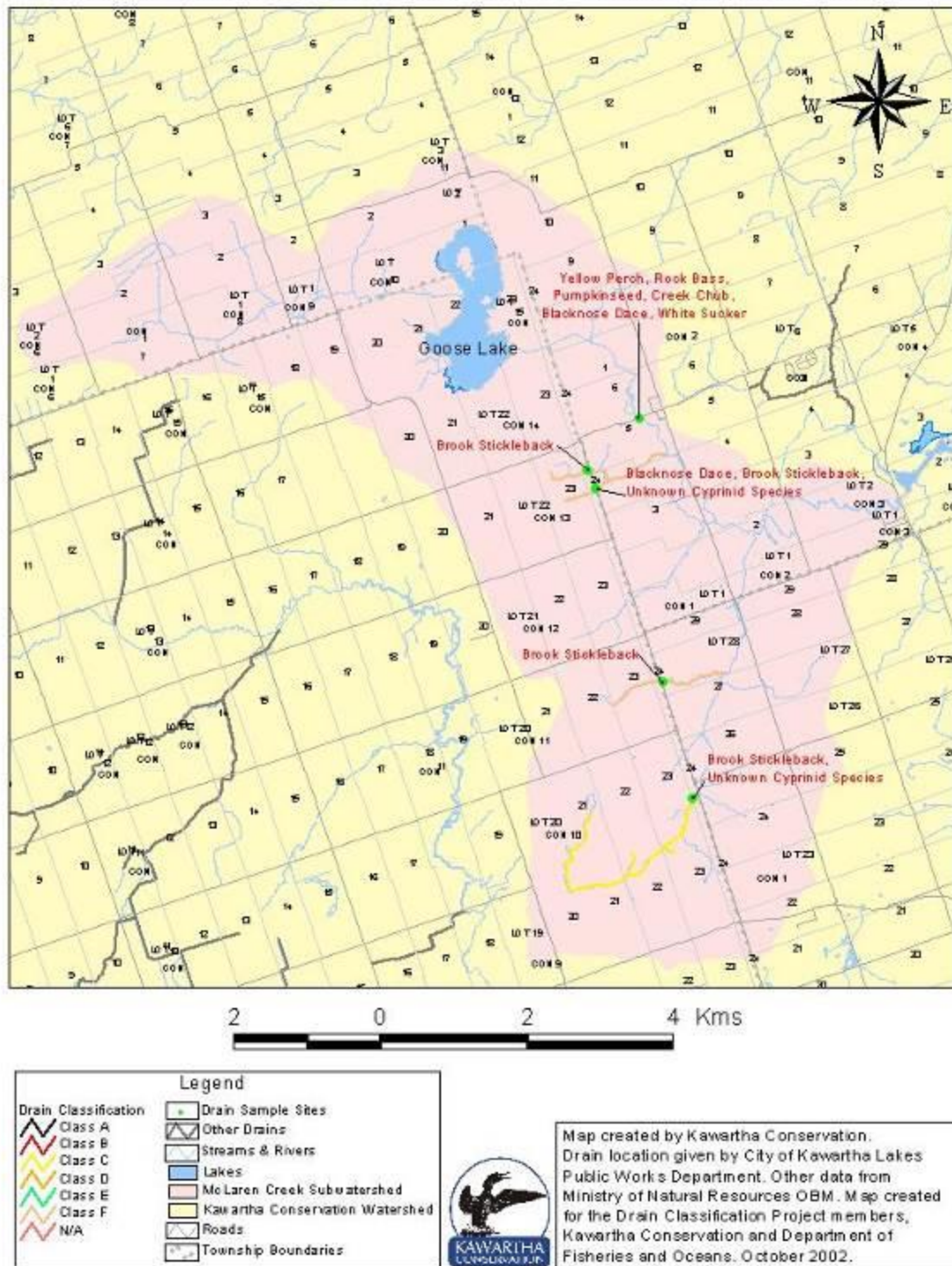


Figure 9: McLaren Creek Subwatershed drain classification map

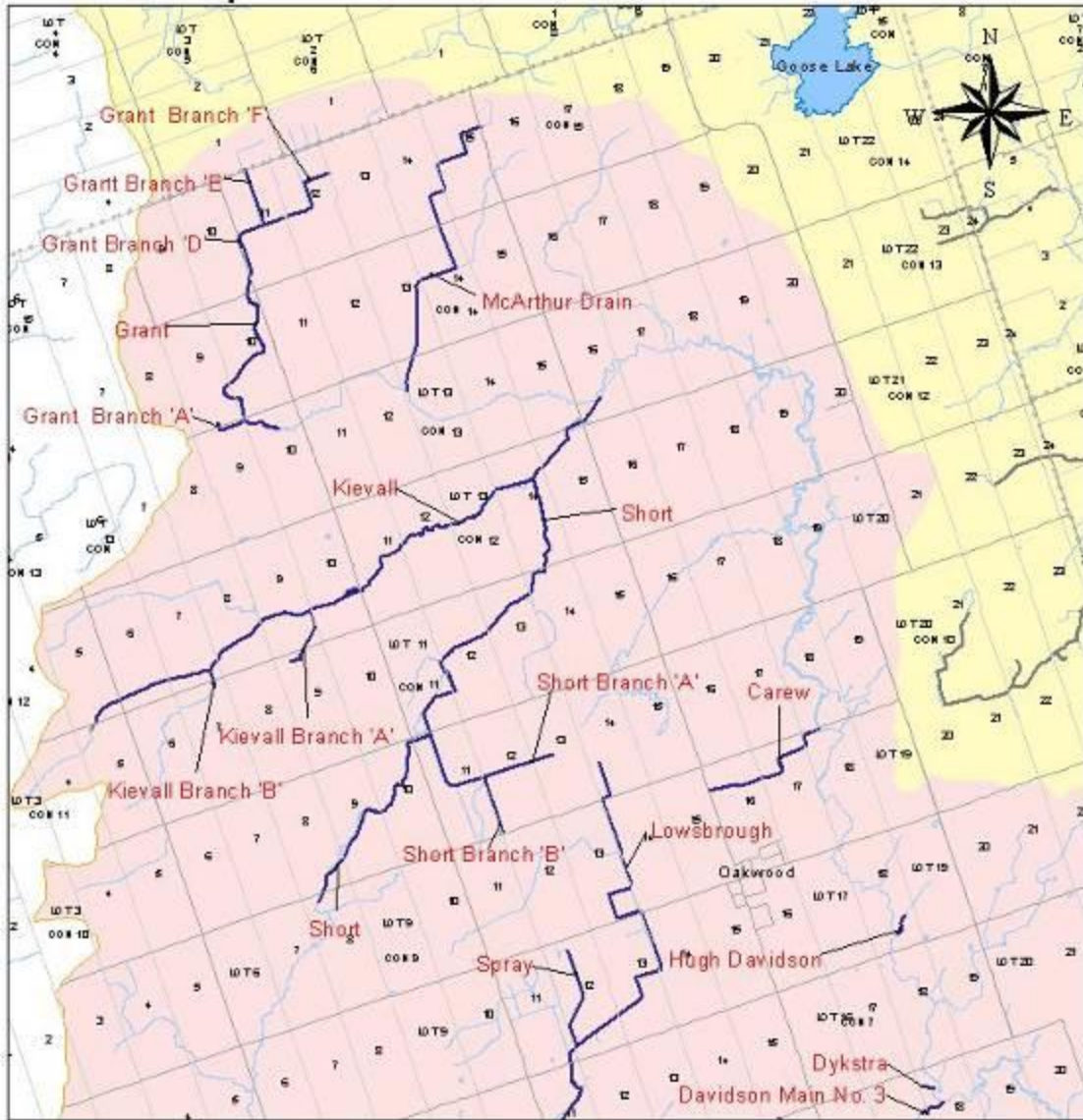
McLaren Creek Subwatershed General Drain Descriptions							
Drain Name	Length (Kms)	Average Width (Metres)	Average Slope	Last Engineer's Report	Last Cleanout Date	Characteristics	History
Hancock North	2.7	1.0 - 1.5	Unknown	1983	1999	no flow, overgrown with terrestrial vegetation	
Hancock East (Fenelon)	1.0	1.0 - 1.5	Unknown	1988	1999	no flow, overgrown with terrestrial vegetation	
Hancock South (Mariposa)	3.5	1.0 - 1.5	Unknown	1988	1999	no flow, overgrown with terrestrial vegetation	
Rodgers-Hancock (Mariposa)	0.8	1.0 - 1.5	Unknown	1970	1996	trampled banks from cattle crossing downstream, water very stagnant and muddy	
Rodgers-Hancock (Ops)	1.1	1.0 - 1.5	Unknown	1970	Unknown	trampled banks from cattle crossing downstream, water very stagnant and muddy	
Washington Branch 'A' (Mariposa)	4.6	1.5 – 2.0	Unknown	2000	1984	no flow, overgrown with cattails	

Table 1: McLaren Creek subwatershed general drain descriptions table

McLaren Creek Subwatershed Drain Classification Table					
Drain Name	Section of Drain	Cleanout in last 10 years	Fish Species	Thermal Class	Drain Class
Hancock North	HANC_M	Yes	Brook Stickleback	Unknown	F
Hancock East (Fenelon)	HANC_EAST	Yes	Blacknose Dace, Brook Stickleback, Unknown Cyprinid Species	Unknown	F
Hancock South (Mariposa)	HANC_S	Yes	Unknown Cyprinid Species	Unknown	F
Rodgers-Hancock (Mariposa)	ROHAN_01	Yes	Brook Stickleback	Unknown	F
Rodgers-Hancock (Ops)	ROHAN_01_OPS	Yes	Brook Stickleback	Unknown	F
Washington Branch 'A' (Mariposa)	WASH_A	No	Not Present	Warm	C

Table 2: McLaren Creek subwatershed drain classification table

Mariposa Brook Subwatershed Drains



Legend

-  Mariposa Brook Drains
-  Other Drains
-  Streams & Rivers
-  Lakes
-  Mariposa Brook Subwatershed
-  Kawartha Conservation Watershed
-  Roads
-  Township Boundaries

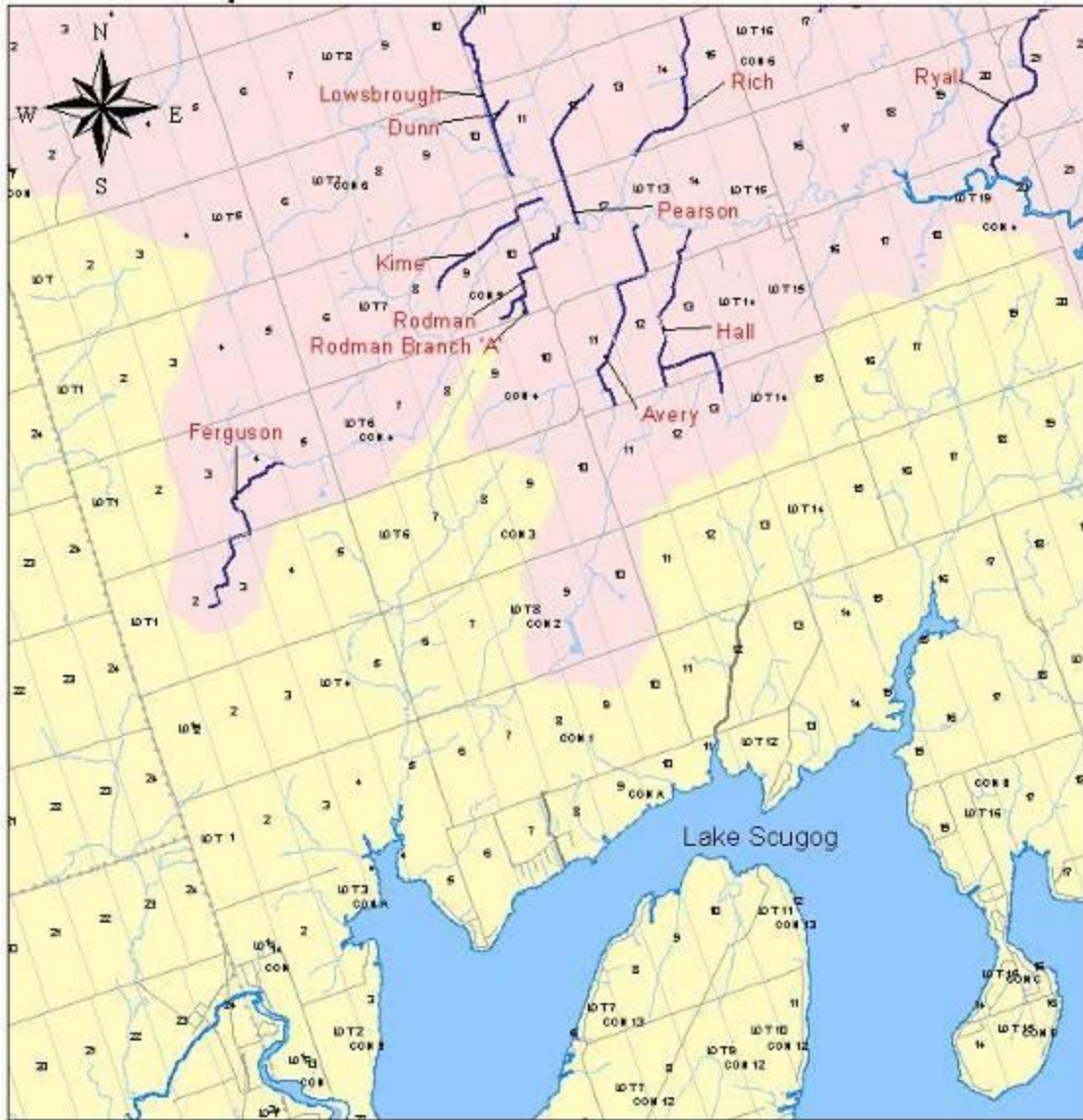
2 0 2 4 Kms




Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 10: Mariposa Brook subwatershed drain names map # 1

Mariposa Brook Subwatershed Drains



Legend

- Mariposa Brook Drains
- Other Drains
- Streams & Rivers
- Lakes
- Mariposa Brook Subwatershed
- Kawartha Conservation Watershed
- Roads
- Township Boundaries

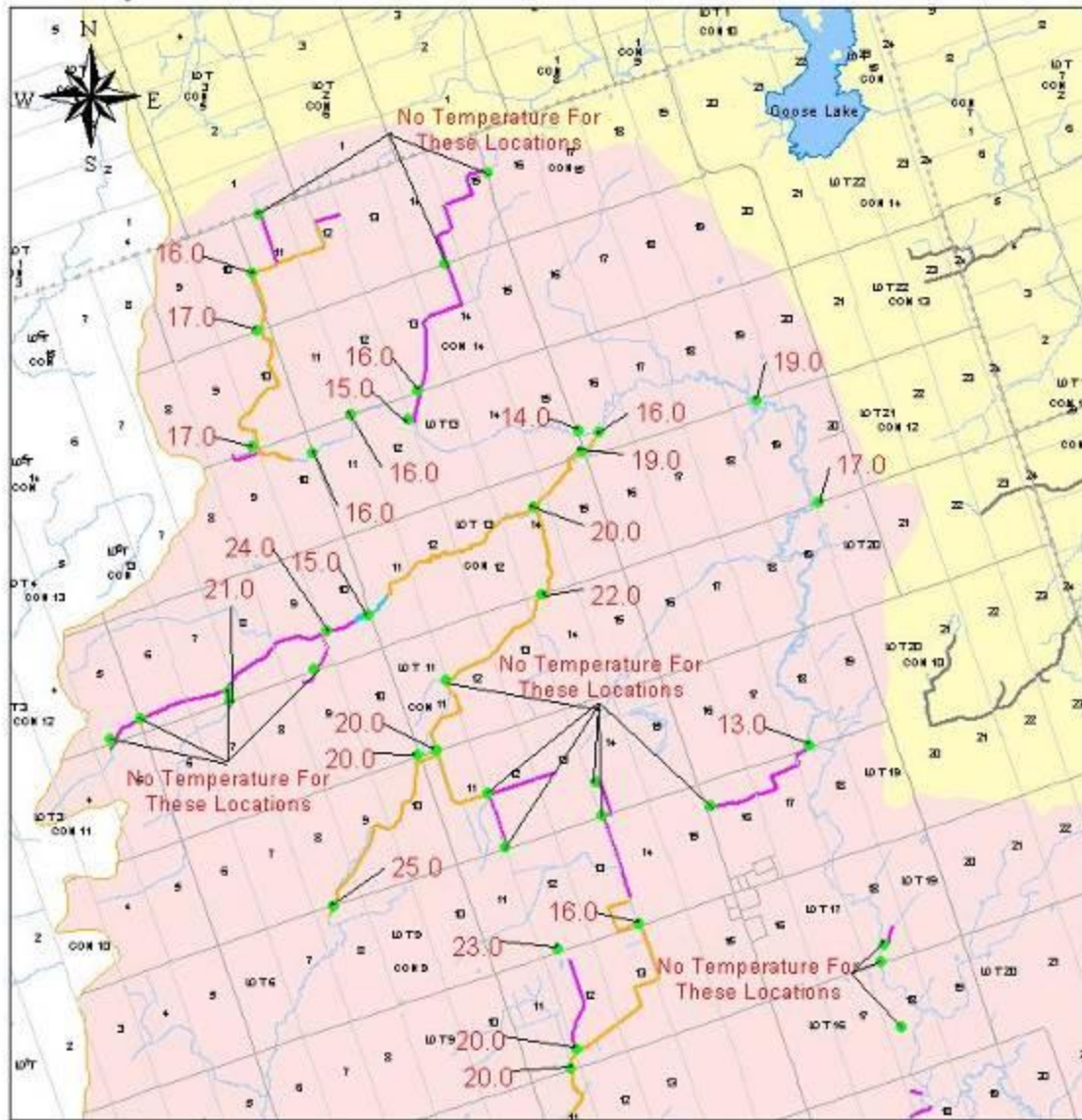
2 0 2 4 Kms



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 1.1: Mariposa Brook subwatershed drain names map #2

Mariposa Brook Drains Thermal Classification



2 0 2 4 Kms



Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	Mariposa Brook Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	Other Drains

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 12: Mariposa Brook Subwatershed Thermal Classification Map # 1

Mariposa Brook Drains Thermal Classification



2 0 2 4 Kms



Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	Mariposa Brook Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	Other Drains

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans, October 2002.

Figure 13: Mariposa Brook subwatershed thermal classification map #2

Mariposa Brook Subwatershed Drain Classification

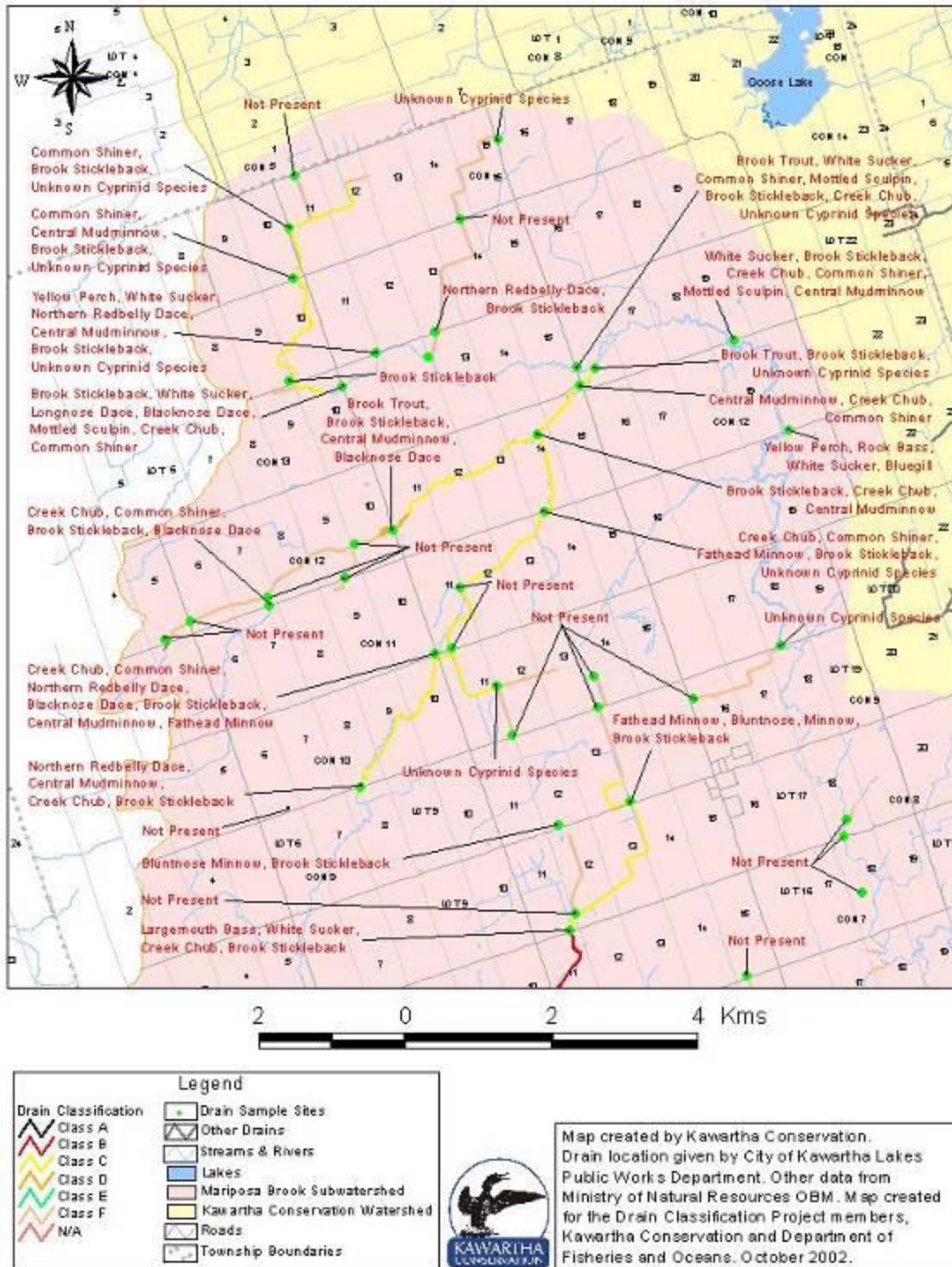


Figure 27. Mariposa Brook Subwatershed Drain Classification Map # 1

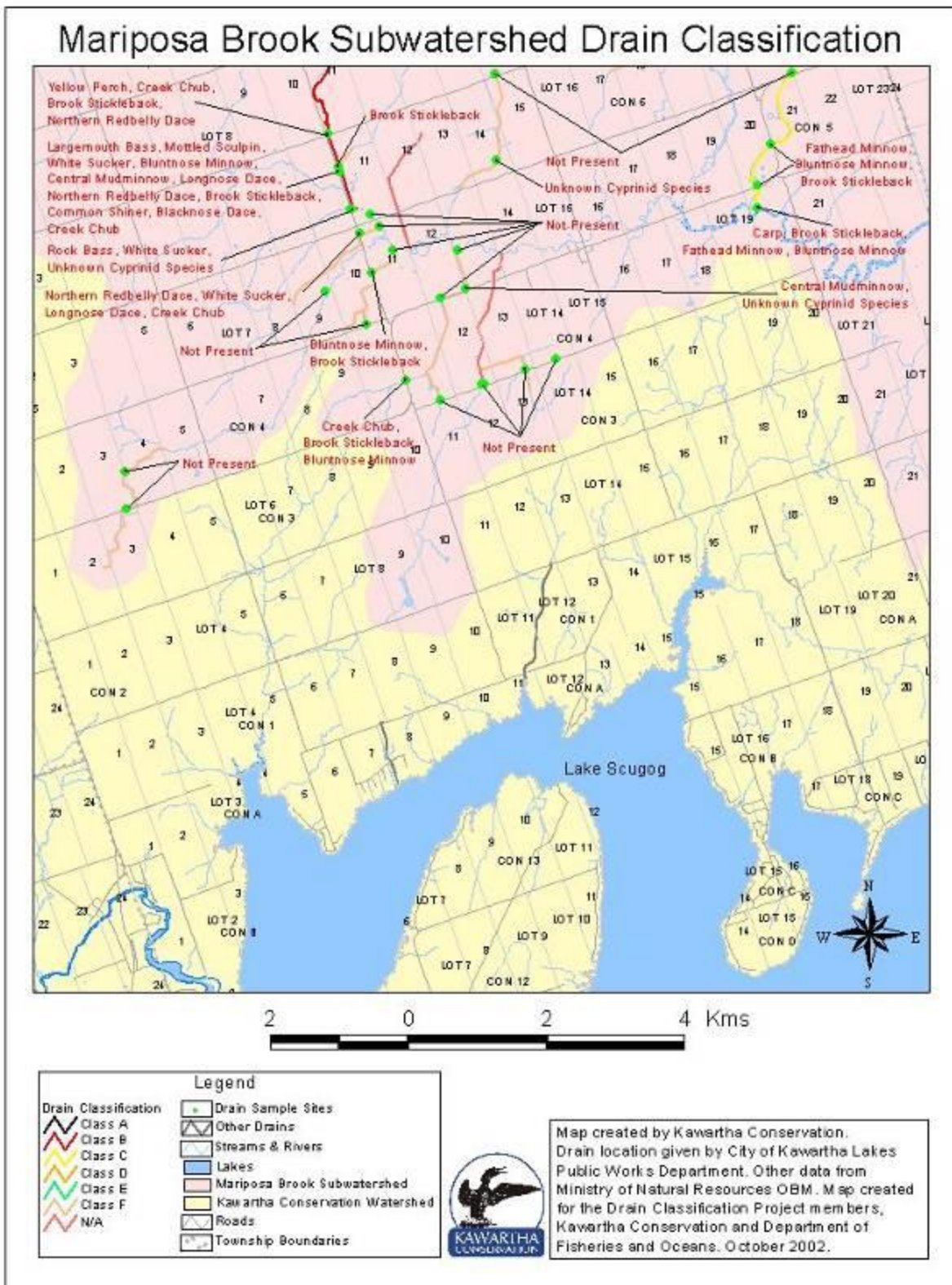


Figure 15: Mariposa Brook subwatershed drain classification map #2

Mariposa Brook Subwatershed General Drain Descriptions

Drain Name	Length (Kms)	Average Width (Metres)	Average Slope	Last Engineer's Report	Last Cleanout Date	Characteristics	History
Avery	3.0	1.0 – 1.5	Unknown	1923	1987	dry, overgrown with terrestrial vegetation	
Carew	1.5	0.5 – 1.0	Unknown	1973	Unknown	hard to see channel banks over grown with terrestrial vegetation	
Davidson Main No. 3	0.1	Unknown	Unknown	1981	Unknown		
Dunn	0.1	Unknown	Unknown	1975	1982	channel banks over grown with terrestrial vegetation	
Dykstra	0.1	Unknown	Unknown	1973	1982	mostly tile drainage up to outlet in to watercourse	
Ferguson	2.5	Unknown	Unknown	1968	Unknown	dry, overgrown with terrestrial vegetation	
Grant	6.0	1.5 - 2.0	Unknown	1980	1996	overgrown with cattails	
Grant Branch 'A'	0.4	1.5 - 2.0	Unknown	1980	1996	overgrown with cattails	
Grant Branch 'E'	0.7	1.5 - 2.0	Unknown	1980	1996	overgrown with cattails	
Grant Branch 'F'	0.3	1.5 - 2.0	Unknown	1980	1996	overgrown with cattails	
Hall	3.0		Unknown	1977	Unknown	dry, overgrown with terrestrial vegetation	Hall Drain Extension 1981
Hugh Davidson	0.1		Unknown	1977	Unknown		
Kievall	6.5	0.5 - 1.0	Unknown	1987	1998/2002	natural stream habitat features	
Kievall Branch 'A'	0.7	0.5 - 1.0	Unknown	1987	1998	dry, overgrown with terrestrial vegetation	
Kievall Branch 'B'	0.2	0.5 - 1.0	Unknown	1987	1998	intermittent on kievall drain branch b	
Kime	1.9	1.0 - 2.0	Unknown	1975	1983	dry, natural stream corridor, cobble bottom upstream	
Lowsbrough	7.9	1.0 - 1.5	Unknown	2000	2001	watercress present at confluence of dunn drain downstream, less defined channel, hasn't been cleaned out recently compared to upstream	
McArthur	3.9	0.3 – 0.5	Unknown	1926	1998	upstream looks intermittent, flow downstream	

Pearson	1.9	1.0 – 1.5	Unknown	1976	1987	dry, overgrown with terrestrial vegetation	
Rich	2.0	1.5 - 2.0	Unknown	1974	1999	standing water, stagnant	
Rodman	1.6	1.0 – 1.5	Unknown	1977	2000	tile drain feeding into drain on west side of white rock road	
Rodman Branch 'A'	0.2	1.0 – 1.5	Unknown	1977	2000	dry, overgrown with terrestrial vegetation	
Ryall	2.6	1.5 – 2.0	Unknown	1975	2000	recently cleaned out little vegetation	
Short	6.6	1.0 - 1.5	Unknown	1978	2000	stream habitat features	new report in progress
Short Branch 'A'	0.8	1.0 - 1.5	Unknown	2000	1998	no flow, stagnant pool of water, beaver dam	
Short Branch 'B'	0.7	1.0 - 1.5	Unknown	2000	1998	dry, overgrown with terrestrial vegetation	
Spray	1.2	1.0 - 1.5	Unknown	2000	2001	no flow, northern section recently cleaned out southern section overgrown with terrestrial vegetation	

Table 3: Mariposa Brook subwatershed general drain descriptions table

Mariposa Brook Subwatershed Drain Classification Table

Drain Name	Section of Drain	Cleanout in last 10 years	Fish Species	Thermal Class	Drain Class
Avery	AVER_01	No	Not Present	Unknown	F
Carew	CARE_01	Unknown	Not Present	Unknown	F
Davidson Main No. 3	DAV_M_03	Unknown	Not Present	Unknown	F
Dunn	DUNN_01	No	Brook Stickleback	Unknown	F
Dykstra	DYKS_01	No	Not Present	Unknown	F
Ferguson	FERG_01	Unknown	Not Present	Unknown	F
Grant	GRD_01	Yes	Common Shiner, Central Mudminnow, Brook Stickleback, Unknown Cyprinid Species	Warm	C
Grant Branch 'A'	GRD_A	Yes	Not Present	Unknown	F
Grant Branch 'E'	GRD_E	Yes	Not Present	Unknown	F
Grant Branch 'F'	GRD_F	Yes	Not Present	Unknown	F
Hall	HALL_01	Unknown	Not Present	Unknown	F
Hall	HALL_02	Unknown	Not Present	Unknown	F
Hugh Davidson	HUGH_01	Unknown	Not Present	Unknown	F
Kievall	KC_01	Yes	Not Present	Unknown	F
Kievall	KC_02	Yes	Brook Trout, Brook Stickleback, Central Mudminnow, Blacknose Dace	Cold	D
Kievall	KC_03	Yes	Creek Chub, Common Shiner, Brook Stickleback, Blacknose Dace	Warm	C
Kievall Branch 'A'	KC_A	Yes	Not Present	Unknown	F
Kievall Branch 'B'	KC_B	Yes	Not Present	Unknown	F
Kime	KIME_01	No	Not Present	Unknown	F
Lowsbrough	LOWS_01	Yes	Not Present	Unknown	F
Lowsbrough	LOWS_02	Yes	Fathead Minnow, Bluntnose Minnow, Brook Stickleback	Warm	C
Lowsbrough	LOWS_03	Yes	Largemouth Bass, Yellow Perch, Mottled Sculpin, White Sucker, Bluntnose Minnow, Central Mudminnow, Longnose Dace, Northern Redbelly Dace, Brook Stickleback, Shiner, Blacknose Dace	Warm	B
McArthur	MCAR_01	Yes	Not Present	Unknown	F
Pearson	PEAR_01	No	Not Present	Unknown	F
Rich	RICH_01	Yes	Not Present	Unknown	F
Rodman	RODM_01	Yes	Not Present	Unknown	F
Rodman Branch 'A'	RODM_A	Yes	Not Present	Unknown	F
Ryall	RYA_01	Yes	Carp (juvenile), Brook Stickleback, Fathead Minnow, Bluntnose Minnow	Warm	C

Short	SHO_02	Yes	Creek Chub, Common Shiner, Redbelly Dace, Blacknose Dace, Brook Stickleback, Central Mudminnow, Fathead Minnow	Warm	C
Short Banch 'A'	SHO_A	Yes	Not Present	Unknown	F
Short Branch 'B'	SHO_B	Yes			
Short	SHO_03	No	Brook Trout, Brook Stickleback, Unknown Cyprinid Species	Cold	D
Spray	SPRA_01	Yes	"Bluntnose Minnow, Brook Stickleback"	Unknown	F

Table 4: Mariposa Brook subwatershed drain classification table

Lake Scugog Subwatershed Drains



Legend

-  Lake Scugog Drains
-  Other Drains
-  Streams & Rivers
-  Lakes
-  Lake Scugog Subwatershed
-  Kawartha Conservation Watershed
-  Roads
-  Township Boundaries

500 0 500 1000 Metres

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans, October 2002.



Figure 10: Lake Scugog subwatershed drain names map

Lake Scugog Drains Thermal Classification



500 0 500 1000 Metres



Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	Lake Scugog Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	
Other Drains	

Map created by Kawartha Conservation, Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans, October 2002.

Figure 17. Lake Scugog Subwatershed Thermal Classification Map

Lake Scugog Subwatershed Drain Classification



500 0 500 1000 Metres



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 10. Lake Scugog Subwatershed Drain Classification map

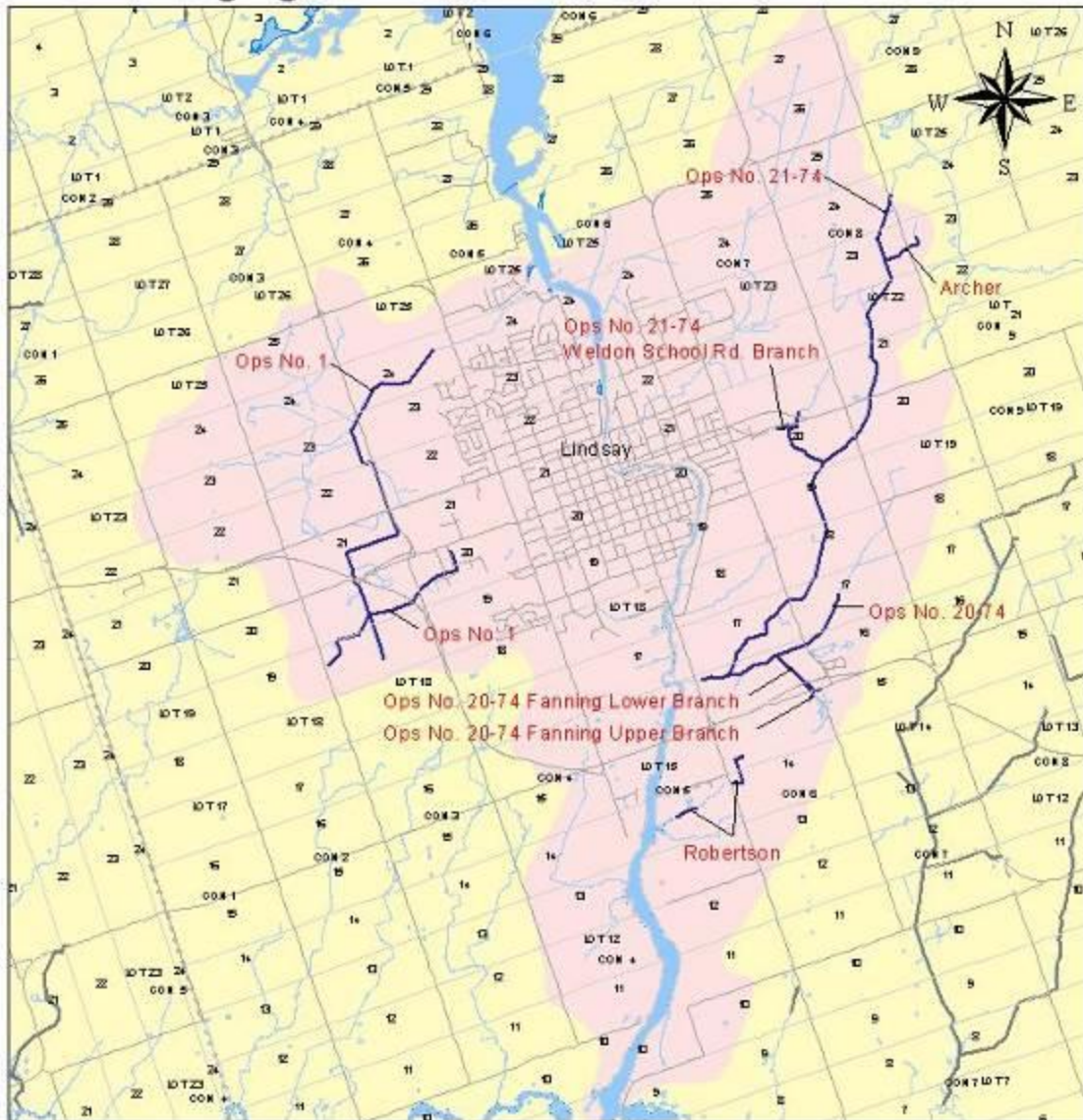
Lake Scugog Subwatershed General Drain Descriptions							
Drain Name	Length (Kms)	Average Width (Metres)	Average Slope	Last Engineer's Report	Last Cleanout Date	Characteristics	History
Miller	1.0	Unknown	Unknown	1975	1984	overgrown with terrestrial vegetation, no flow	
Murdoch	1.8	1.0 - 1.5	Unknown	1983	Unknown	northern section dry, overgrown with terrestrial vegetation, southern section outlet into lake scugog	

Table 5: Lake Scugog subwatershed general drain description table

Lake Scugog Subwatershed Drain Classification Table					
Drain Name	Section of Drain	Cleanout in last 10 years	Fish Species	Thermal Class	Drain Class
Miller	MILL_01	No	Not Present	Unknown	F
Murdoch	MURD_01	Unknown	Yellow Perch, Largemouth Bass, Central Mudminnow, White Sucker, Bluntnose Minnow	Warm	B
Murdoch	MURD_02	Unknown	Not Present	Unknown	F

Table 6: Lake Scugog subwatershed drain classification table

Scugog River Subwatershed Drains



Legend

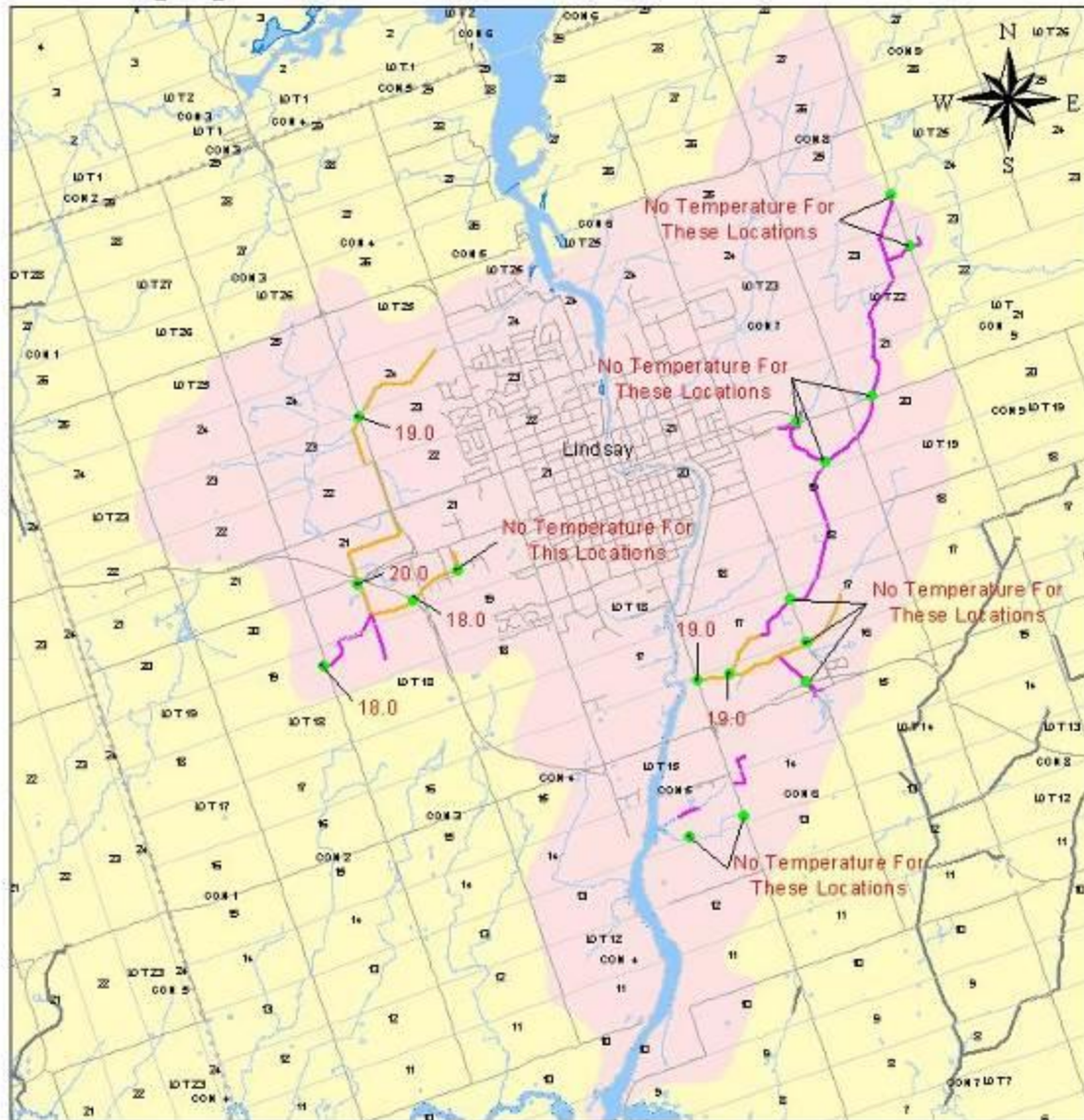
-  Scugog River Drains
-  Other Drains
-  Streams & Rivers
-  Lakes
-  Scugog River Subwatershed
-  Kawartha Conservation Watershed
-  Roads
-  Township Boundaries



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 19. Scugog River Subwatershed drain names map

Scugog River Drains Thermal Classification



2 0 2 4 Kms

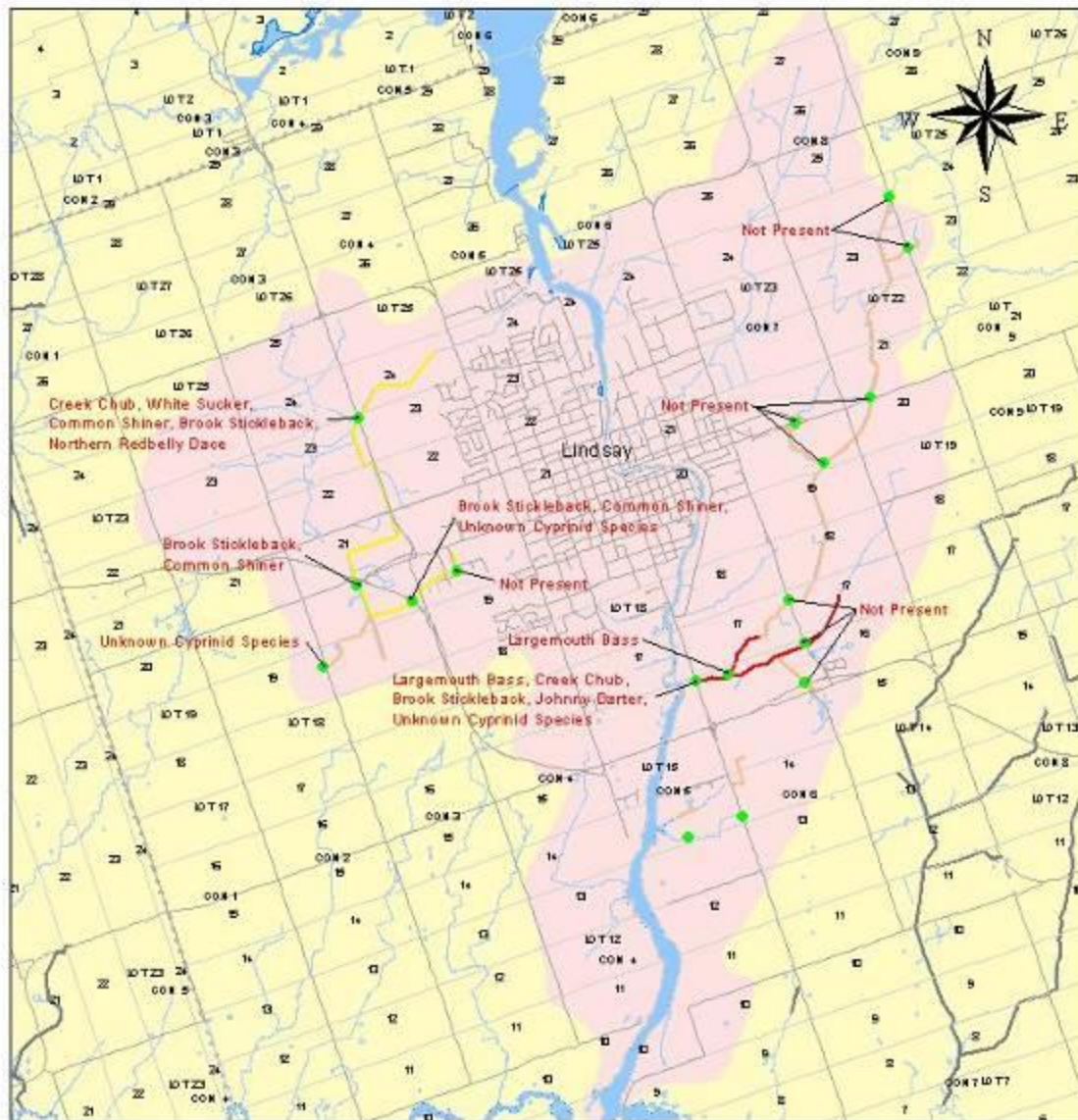


Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	Scugog River Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	
Other Drains	

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans, October 2002.

Figure 20. Scugog River Subwatershed Thermal Classification map

Scugog River Subwatershed Drain Classification



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 21: Scugog River subwatershed drain classification map

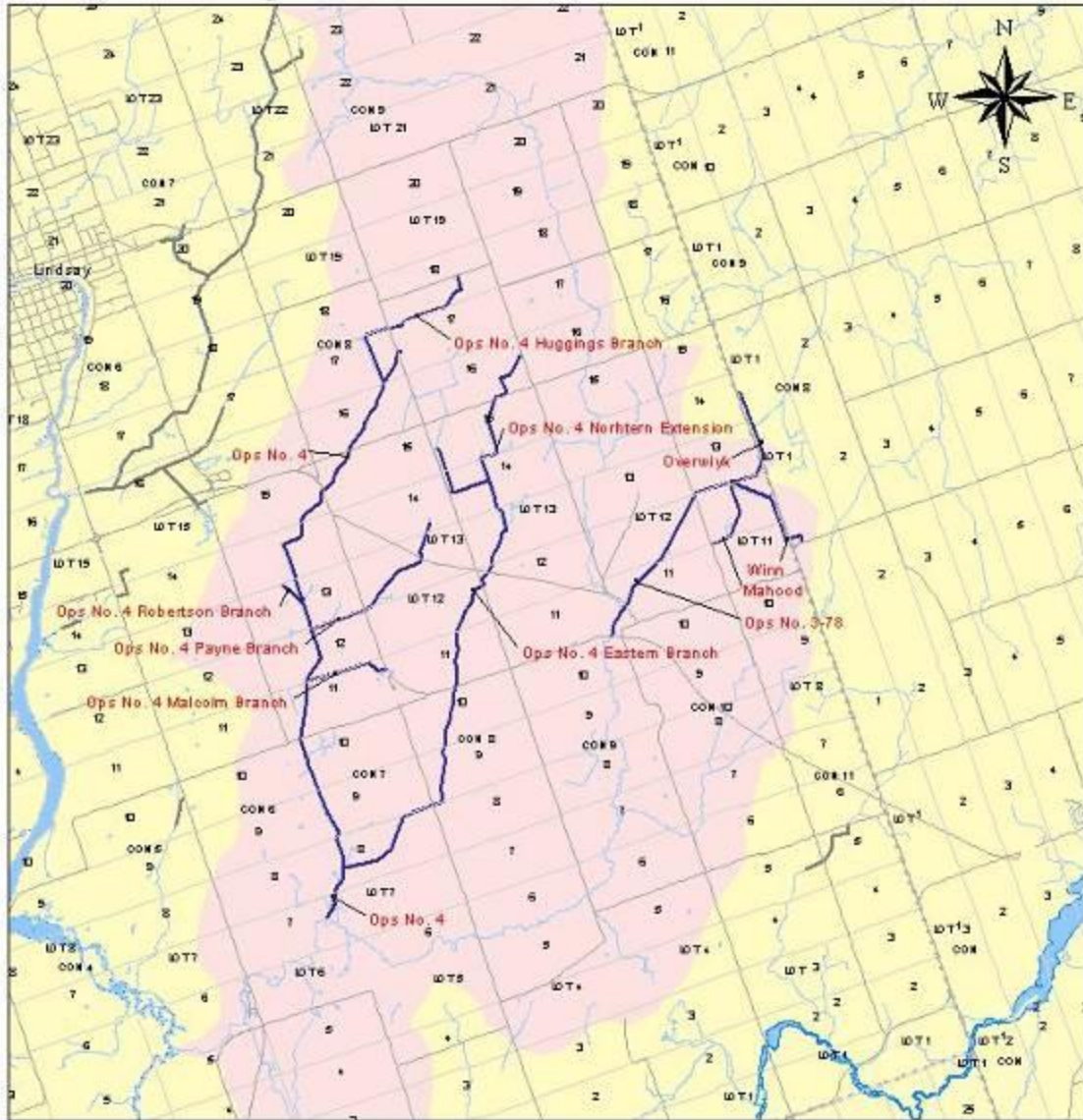
Scugog River Subwatershed General Drain Descriptions							
Drain Name	Length (Kms)	Average Width (Metres)	Average Slope	Last Engineer's Report	Last Cleanout Date	Characteristics	History
Archer	0.6		Unknown	Unknown	Unknown	dry, overgrown with terrestrial vegetation	
Ops No. 1	7.3	2.0 - 2.5	Unknown	1974	1985	very little flow, heavy cattail growth in channel	
Ops No. 20-74	2.1	0.5 – 1.0	Unknown	Unknown	Unknown	only fish presence is near outlet into scugog river, most of upstream drain is dry	
Ops No. 20-74 Fanning Lower Branch	0.7	0.5 – 1.0	Unknown	Unknown	1985	dry, overgrown with terrestrial vegetation	
Ops No. 20-74 Fanning Upper Branch	0.2	0.5 – 1.0	Unknown	Unknown	1985	dry, overgrown with terrestrial vegetation	
Ops No. 21-74	6.8	0.5 - 1.0	Unknown	Unknown	1985	low flow, natural stream habitat	
Ops No. 21-74 Weldon School Rd. Branch	1.1	0.5 – 1.0	Unknown	Unknown	Unknown	dry, overgrown with terrestrial vegetation	
Robertson	0.3		Unknown	1998	Unknown		

Table 7: Scugog River subwatershed general drain description table

Scugog River Subwatershed Drain Classification Table					
Drain Name	Section of Drain	Cleanout in last 10 years	Fish Species	Thermal Class	Drain Class
Archer	ARCHER_01	Unknown	Not Present	Unknown	F
Ops No. 1	MD1_01	No	Creek Chub, White Sucker, Common, Shiner, Brook Stickleback, Northern Redbelly Dace, Unknown Cyprinid Species	Warm	C
Ops No. 1	MD1_02	No	Not Present	Unknown	F
Ops No. 20-74	MD20-74_01	Unknown	Largemouth Bass, Creek Chub, Brook Stickleback, Johnny Darter, Unknown Cyprinid Species	Warm	B
Ops No. 20-74 Fanning Lower Branch	MD20-74_FANLOW	No	Not Present	Unknown	F
Ops No. 20-74 Fanning Upper Branch	MD20-74_FANUP	No	Not Present	Unknown	F
Ops No. 21-74	MD21-74_01	No	Not Present	Unknown	F
Ops No. 21-74	MD21-74_02	No	Largemouth Bass	Warm	B
Ops No. 21-74 Weldon School Rd. Branch	MD21-74_WELD	Unknown	Not Present	Unknown	F
Robertson	RD_01	Unknown	Not Present	Unknown	F

Table 8: Scugog River subwatershed drain classification table

Stoney Creek Subwatershed Drains



Legend

- Stoney Creek Drains
- Other Drains
- Streams & Rivers
- Lakes
- Stoney Creek Subwatershed
- Kawartha Conservation Watershed
- Roads
- Township Boundaries

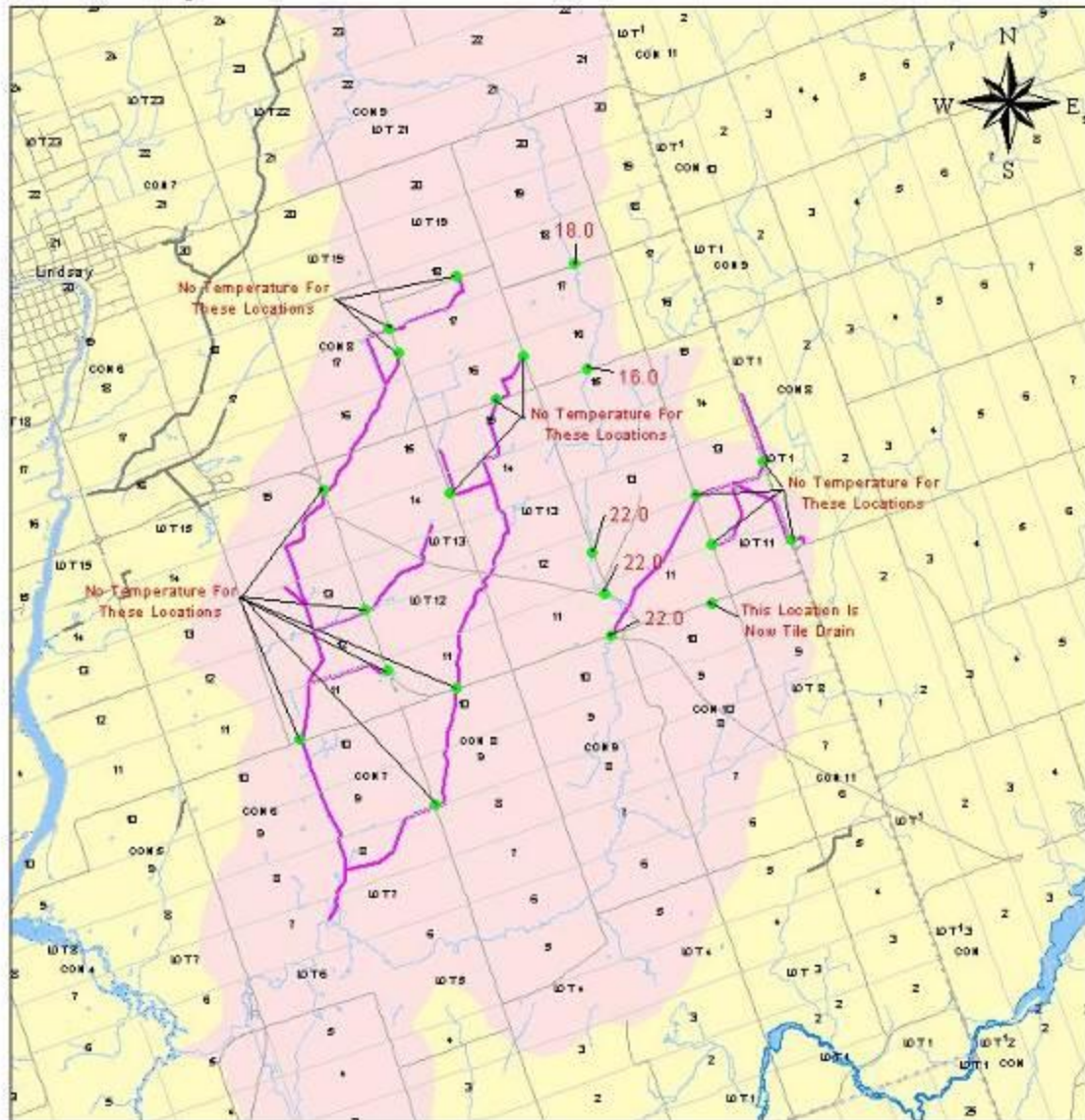
2 0 2 4 Kms



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 22: Stoney Creek subwatershed drain names map

Stoney Creek Drains Thermal Classification



2 0 2 4 Kms

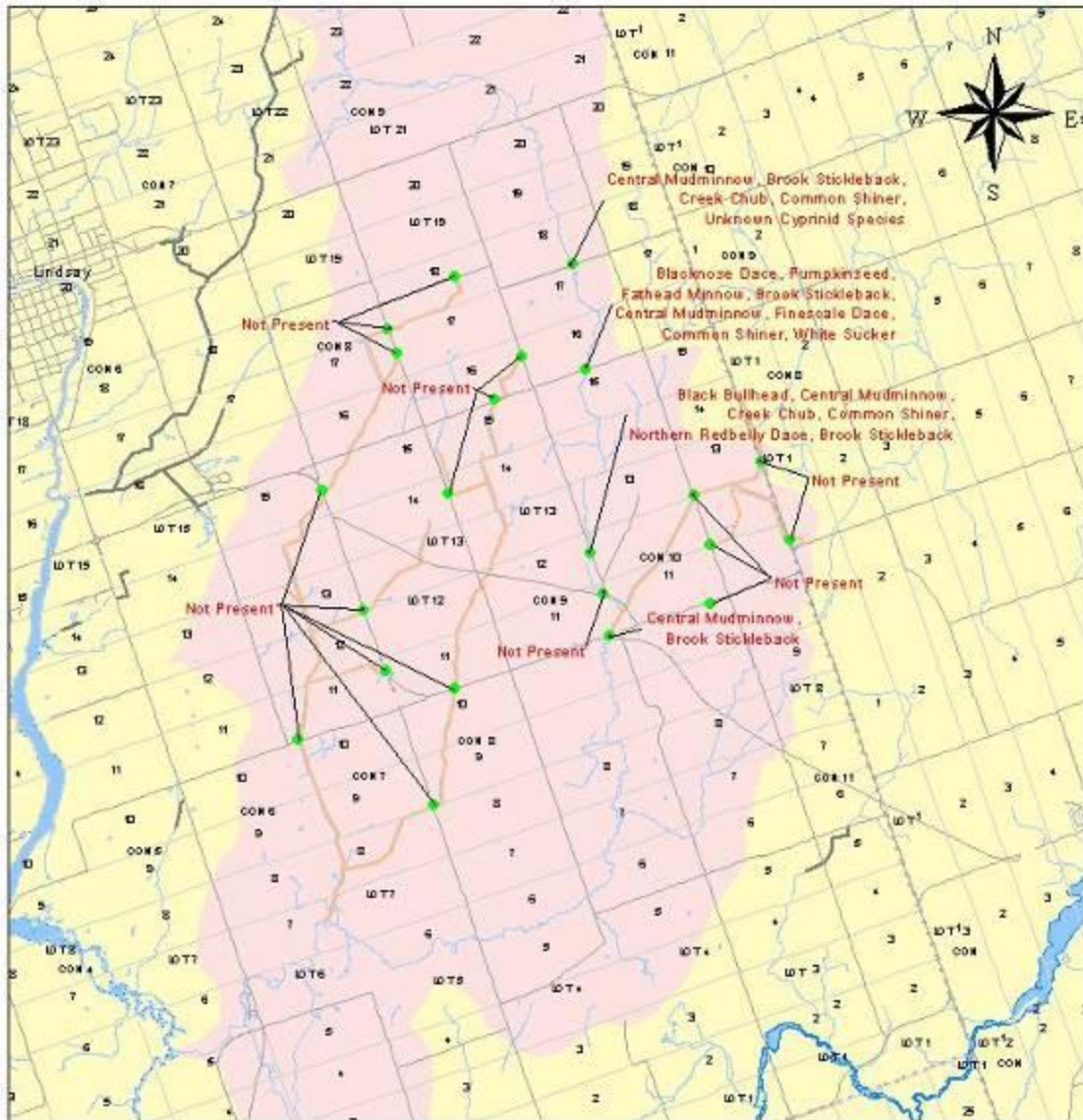


Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	Stoney Creek Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	
Other Drains	

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans, October 2002.

Figure 23: Stoney Creek Subwatershed Thermal Classification Map

Stoney Creek Subwatershed Drain Classification



2 0 2 4 Kms



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 24. Stoney Creek Subwatershed Drain Classification Map

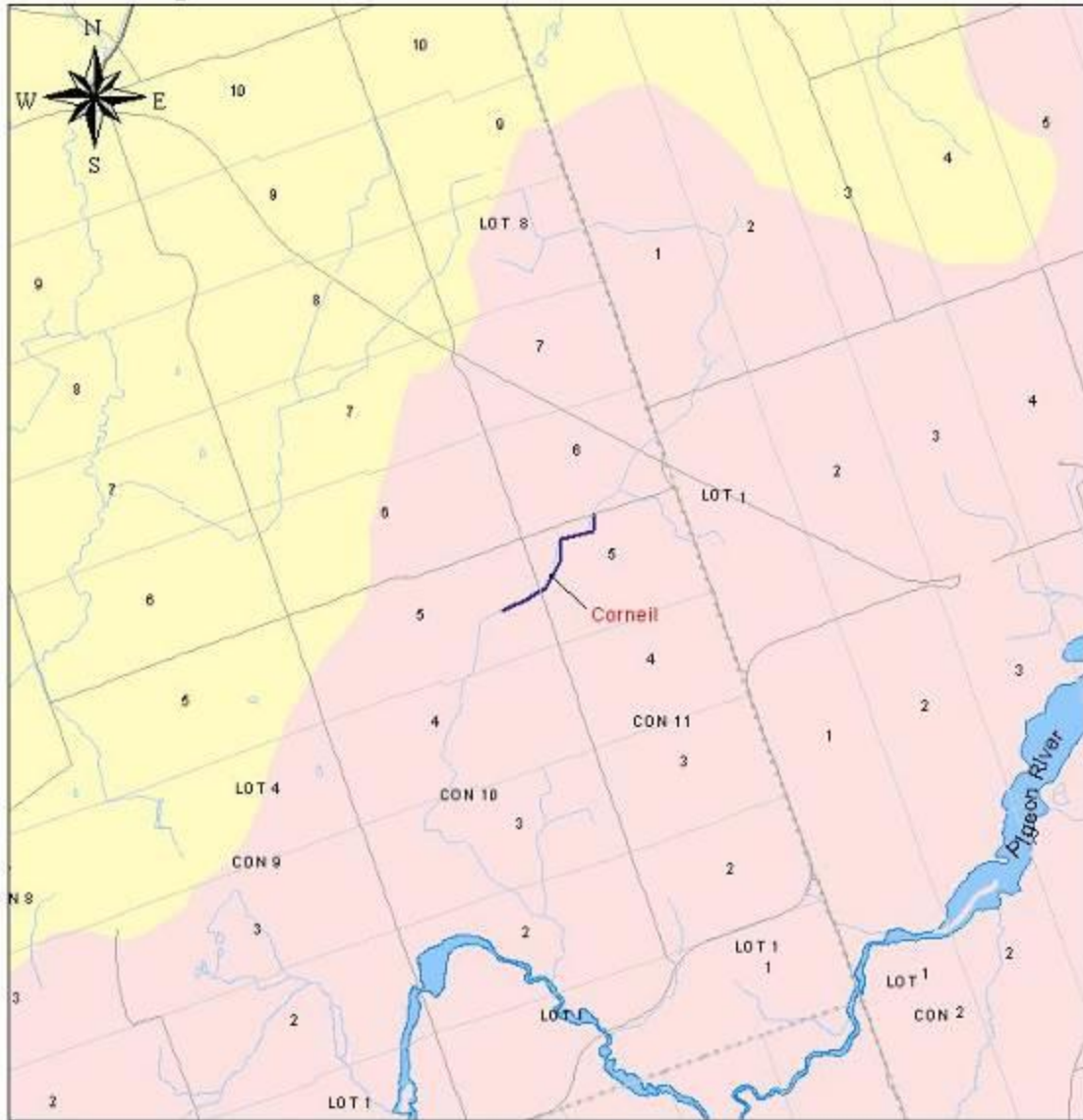
Stoney Creek Subwatershed General Drain Descriptions							
Drain Name	Length (Kms)	Average Width (Metres)	Average Slope	Last Engineer's Report	Last Cleanout Date	Characteristics	History
Mahood	1.0	Unknown	Unknown	Unknown	Unknown	dry, upstream portion of drain still exists, overgrown with terrestrial vegetation	
Ops No. 3-78	3.1	Unknown	Unknown	Unknown	1992	dry, overgrown with terrestrial vegetation, no flow at confluence of stoney creek, very stagnant water	
Ops No. 4	6.0	1.0 – 1.5	Unknown	1974	1981	dry, overgrown with terrestrial vegetation	
Ops No. 4 Huggings Branch	2.1	1.0 – 1.5	Unknown	1974	1981	dry, overgrown with terrestrial vegetation	
Ops No. 4 Malcolm Branch	0.8	1.0 – 1.5	Unknown	1998	Unknown	dry, overgrown with terrestrial vegetation	
Ops No. 4 Payne Branch	2.1	1.0 – 1.5	Unknown	1974	1981	dry, overgrown with terrestrial vegetation	
Ops No. 4 Robertson Branch	0.3	1.0 – 1.5	Unknown	1974	1981	dry, overgrown with terrestrial vegetation	
Ops No. 4 Eastern Branch	5.8	Unknown	Unknown	1974	1981	dry, overgrown with terrestrial vegetation	
Ops No. 4 Northern Extension	2.9	Unknown	Unknown	1974	1981	dry, overgrown with terrestrial vegetation	
Overwiyk	0.7	1.5 – 2.0	Unknown	Unknown	Unknown	dry, overgrown with terrestrial vegetation	
Winn	1.3	1.5 – 2.0	Unknown	Unknown	Unknown	dry, overgrown with terrestrial vegetation	

Table 9: Stoney Creek subwatershed general drain description table

Stoney Creek Subwatershed Drain Classification Table					
Drain Name	Section of Drain	Cleanout in last 10 years	Fish Species	Thermal Class	Drain Class
Mahood	MAHOOD	Unknown	Not Present	Unknown	F
Ops No. 3-78	MD3-78_01	No	Central Mudminnow, Brook Stickleback	Unknown	F
Ops No. 4	MD4_01	No	Not Present	Unknown	F
Ops No. 4 Huggings Branch	MD4_HUG	No	Not Present	Unknown	F
Ops No. 4 Malcolm Branch	MD4_MAL	No	Not Present	Unknown	F
Ops No. 4 Payne Branch	MD4_PAYNE	No	Not Present	Unknown	F
Ops No. 4 Robertson Branch	MD4_ROB	No	Not Present	Unknown	F
Ops No. 4 Eastern Branch	MD6_EAST	No	Not Present	Unknown	F
Ops No. 4 Norhtern Extension	MD6_NORTH	No	Not Present	Unknown	F
Overwiyk	OVER_01	Unknown	Not Present	Unknown	F
Winn	WINN_01	Unknown	Not Present	Unknown	F

Table 10: Stoney Creek subwatershed drain classification table

Pigeon River Subwatershed Drains



Legend

- Pigeon River Drains
- Other Drains
- Streams & Rivers
- Lakes
- Pigeon River Subwatershed
- Kawartha Conservation Watershed
- Roads
- Township Boundaries

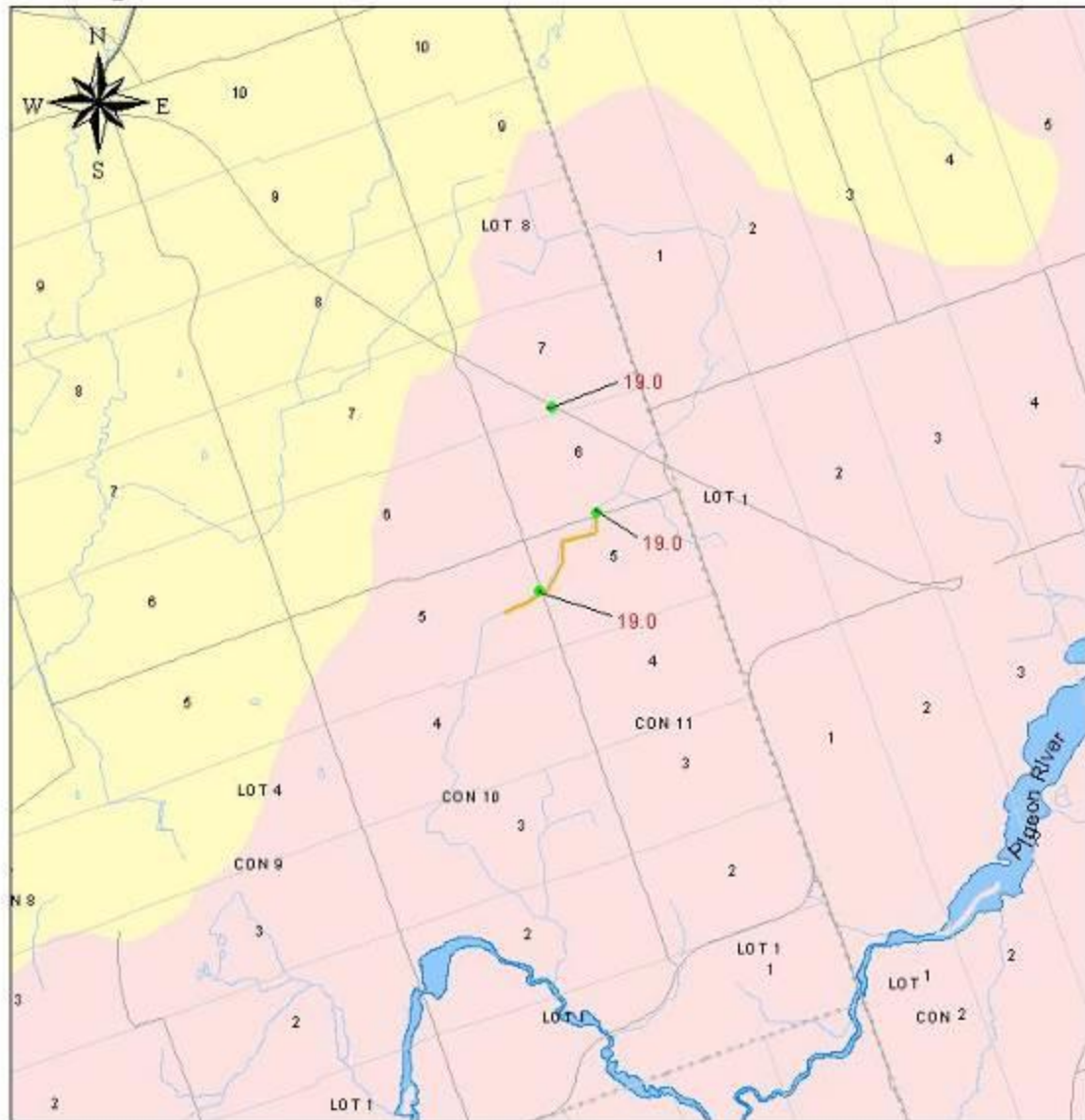
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Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 25: Pigeon River Subwatershed drain names map

Pigeon River Drains Thermal Classification



500 0 500 1000 Metres

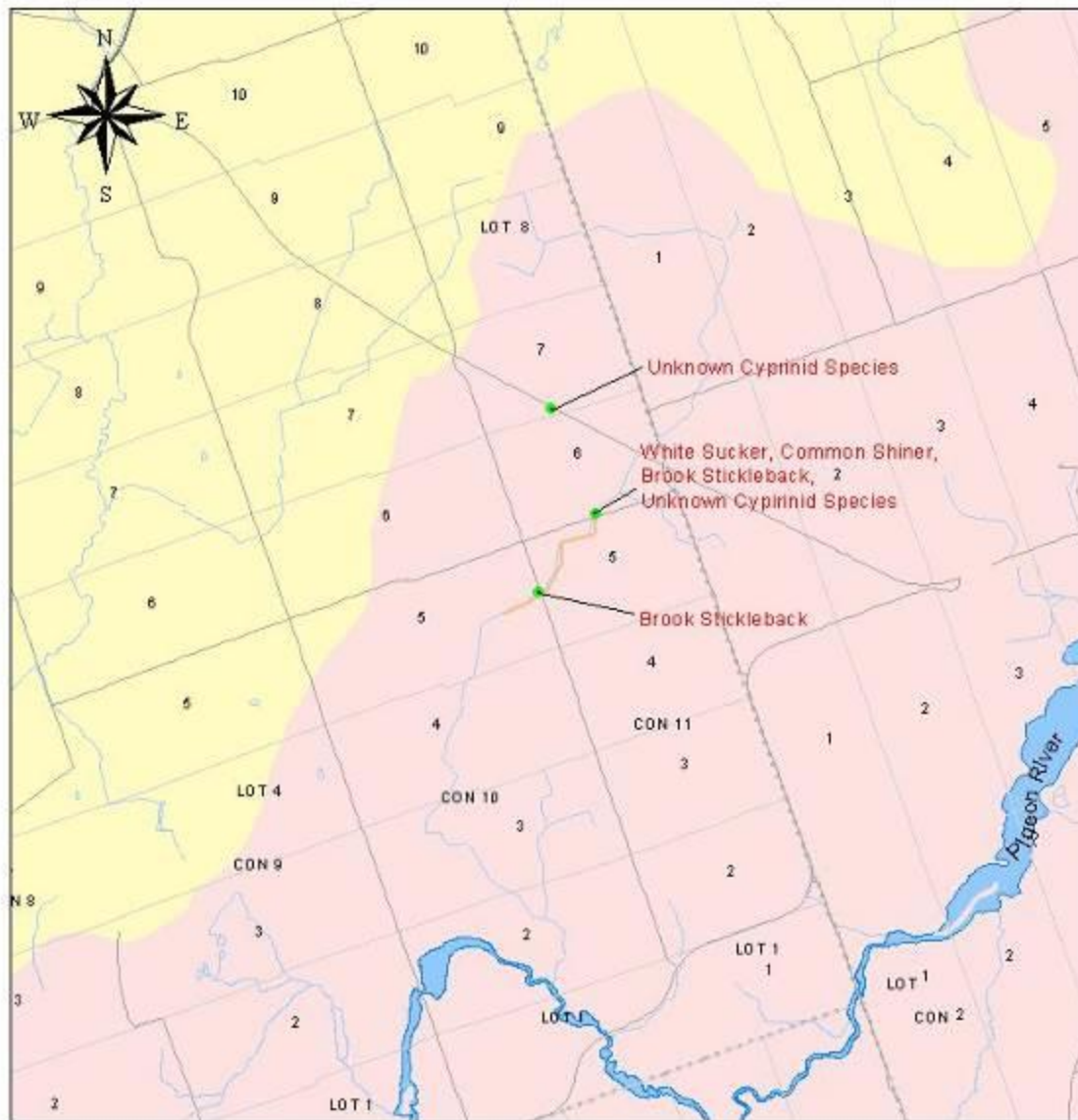


Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	Pigeon River Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	
Other Drains	

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans, October 2002.

Figure 20: Pigeon River subwatershed thermal classification map

Pigeon River Subwatershed Drain Classification



500 0 500 1000 Metres



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 27: Pigeon River subwatershed drain classification map

Pigeon River Subwatershed General Drain Descriptions							
Drain Name	Length (Kms)	Average Width (Metres)	Average Slope	Last Engineer's Report	Last Cleanout Date	Characteristics	History
Corneil	1.0	Unknown	Unknown	Unknown	Unknown	no flow, natural stream habitat	

Table 11: Pigeon River subwatershed drain classification table

Pigeon River Subwatershed Drain Classification Table					
Drain Name	Section of Drain	Cleanout in last 10 years	Fish Species	Thermal Class	Drain Class
Corneil	CORN_01	Unknown	White Sucker, Common Shiner, Brook Stickleback, Unknown Cyprinid Species	Unknown	C

Table 12: Pigeon River subwatershed drain classification table

East Cross Creek Subwatershed Drains



Legend

- East Cross Creek Drains
- Other Drains
- Streams & Rivers
- Lakes
- East Cross Creek Subwatershed
- Kawartha Conservation Watershed
- Roads
- Township Boundaries

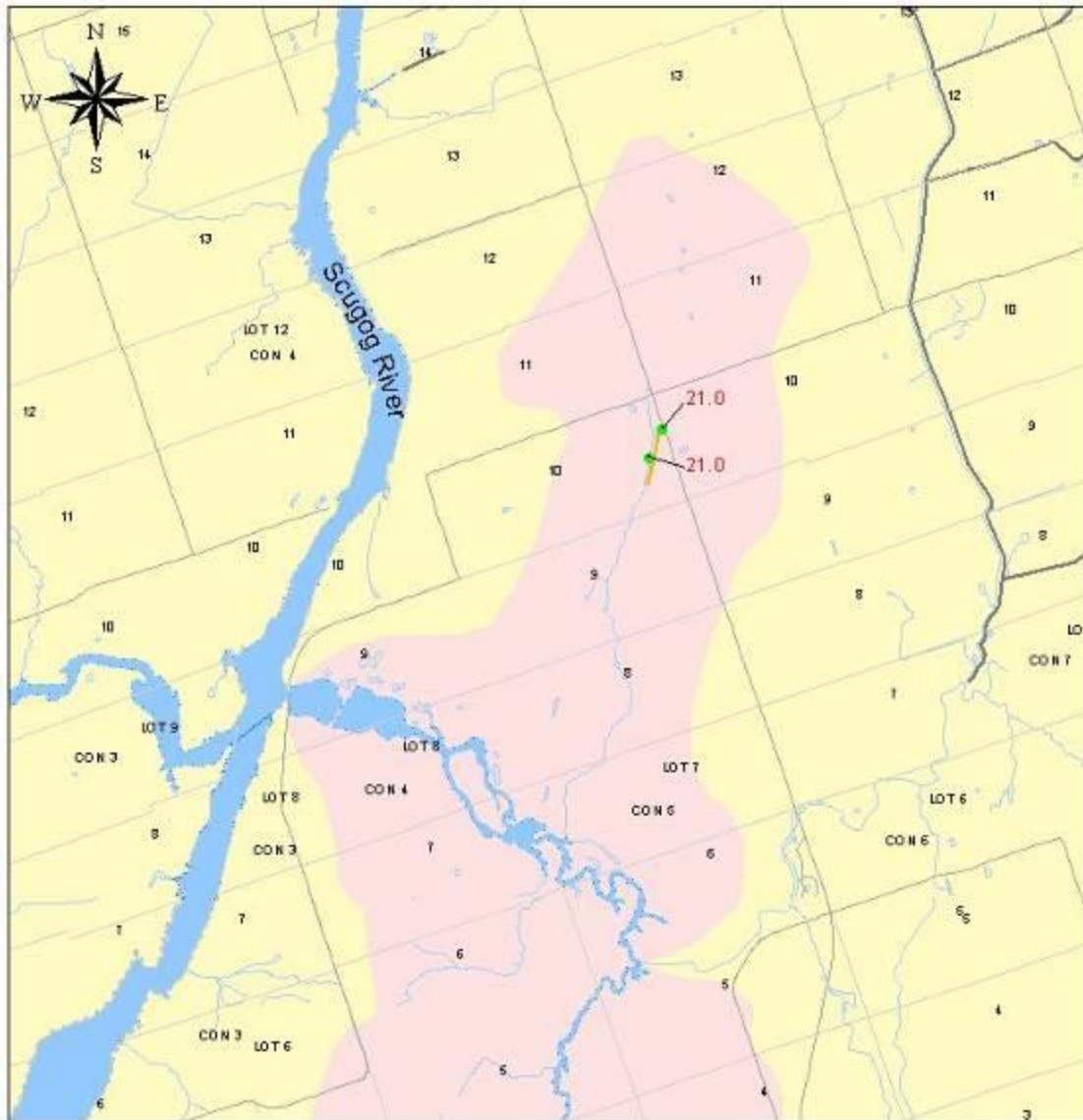
500 0 500 1000 Metres

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.



Figure 20: East Cross Creek Subwatershed Drain Names Map

East Cross Creek Drains Thermal Classification



500 0 500 1000 Metres



Legend	
Thermal Classification	Streams & Rivers
Cold	Lakes
Cool	East Cross Creek Subwatershed
Warm	Kawartha Conservation Watershed
Unknown	Roads
N/A	Township Boundaries
Drain Sample Sites	Other Drains

Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 29: East Cross Creek Subwatershed thermal classifications map

East Cross Creek Subwatershed Drain Classification



500 0 500 1000 Metres

Legend	
Drain Classification	Drain Sample Sites
Class A	Other Drains
Class B	Streams & Rivers
Class C	Lakes
Class D	East Cross Creek Subwatershed
Class E	Kawartha Conservation Watershed
Class F	Roads
Class N/A	Township Boundaries



Map created by Kawartha Conservation. Drain location given by City of Kawartha Lakes Public Works Department. Other data from Ministry of Natural Resources OBM. Map created for the Drain Classification Project members, Kawartha Conservation and Department of Fisheries and Oceans. October 2002.

Figure 30: East Cross Creek subwatershed drain classifications map

East Cross Creek Subwatershed General Drain Descriptions							
Drain Name	Length (Kms)	Average Width (Metres)	Average Slope	Last Engineer's Report	Last Cleanout Date	Characteristics	History
Ops No. 5	0.3	2.0 - 2.5	Unknown	1980	2001	no flow, stagnant, drain downstream fed by culvert, culvert dry, culvert fed by tile drainage in adjacent agricultural fields	

Table 13: East Cross Creek subwatershed general drain description table

East Cross Creek Subwatershed Drain Classification Table					
Drain Name	Section of Drain	Cleanout in last 10 years	Fish Species	Thermal Class	Drain Class
Ops No. 5	MD5_02	Yes	Northern Redbelly Dace, Central Mudminnow, Brook Stickleback, Unknown Cyprinid Species	Unknown	C

Table 14: East Cross Creek subwatershed drain classification table

Appendix A

McLaren Creek Subwatershed

Drain Name: Hancock

Site Location: 450 metres south of cambray road on opmar road

Photo Orientation: Upstream, South West



Site Location: 450 metres south of cambray road on opmar road

Photo Orientation: Downstream, North East



Drain Name: Rodgers-Hancock (Mariposa)

Site Location: 650 metres south of peniel road on opmar road

Photo Orientation: Downstream, North East



Site Location: 650 metres south of peniel road on opmar road

Photo Orientation: Upstream South West



Drain Name: Washington Branch 'A' (Mariposa)

Site Location: 200 metres south of
thunderbridge road on opmar road

Photo Orientation: Upstream, South



Site Location: 200 metres south of
thunderbridge road on opmar road

Photo Orientation: Downstream,
North



Mariposa Brook Subwatershed

Drain Name: Avery

Site Location: 2.5 kilometres west of Little Britain on county road 4 county
Photo Orientation: Upstream, South West



Site Location: 2.5 kilometres west of Little Britain on road 4
Photo Orientation: Downstream, North West



Drain Name: Carew

Site Location: 300 metres south of skyline road on county road 6
Photo Orientation: Downstream, North East



Site Location: 1.5 kilometres east of county road 6 on south side of skyline road
Photo Orientation: Upstream, South West



Drain Name: Dunn

Site Location: 500 metres south of cresswell road on white rock road

Photo Orientation: Upstream, North East



Drain Name: Ferguson

Site Location: 1 kilometre west of fingerboard road on county road 4

Photo Orientation: Upstream, South



Site Location: 1 kilometre west of fingerboard road on county road 4

Photo Orientation: Downstream, North West



Drain Name: Grant

Site Location: 125 metres west of white rock road on the glenn road

Photo Orientation: Upstream, North West



Site Location: 125 metres west of white rock road on the glenn road

Photo Orientation: Downstream, South East



Drain Name: Grant Branch 'E'

Site Location: 300 metres east of white rock road on south side of county road 9

Photo Orientation: Downstream, South East



Drain Name: Hall

Site Location: 2.0 kilometres east of beacroft road on ranch road

Photo Orientation: Downstream, North West



Site Location: 1.5 kilometres east of beacroft road on ranch road

Photo Orientation: Downstream, North West



Drain Name: Hugh Davidson

Site Location: 500 metres upstream on mariposa brook from farmstead road

Photo Orientation: Upstream, North East



Site Location: 500 metres upstream on mariposa brook from farmstead road

Photo Orientation: Downstream, South West



Drain Name: Kievall

Site Location: 400 metres north of penile road on white rock road

Photo Orientation: Upstream, North East



Site Location: 400 metres north of peniel road on white rock road

Photo Orientation: Downstream, South West



Drain Name: Kievall Branch 'A'

Site Location: 400 metres north of peniel road on white rock road

Photo Orientation: Upstream, South East



Site Location: 400 metres north of peniel road on white rock road

Photo Orientation: Downstream, North West



Drain Name: Kievall Branch 'B'

Site Location: 100 metres north of peniel road downstream on kievall drain branch b at confluence of kievall main drain

Photo Orientation: Upstream, West



Site Location: 400 metres north of peniel road downstream on kievall drain branch b at confluence of kievall main drain

Photo Orientation: Downstream, East



Drain Name: Kime

Site Location: 100 metres south of salem road on white rock road

Photo Orientation: Upstream, South West



Site Location: 100 metres south of salem road on white rock road

Photo Orientation: Downstream, North East



Drain Name: Lownsborough

Site Location: 500 metres east of white rock road on farmstead road

Photo Orientation: Upstream, North



Site Location: 500 metres east of white rock road on farmstead road

Photo Orientation: Downstream, South West East



Drain Name: McArthur

Site Location: 800 metres west of county road 6 on linden valley road

Photo Orientation: Upstream, North



Site Location: 800 metres west of county road 6 on linden valley road

Photo Orientation: Downstream, South West East



Drain Name: Rich

Site Location: 1.19 kilometres south on rich drain from cresswell road

Photo Orientation: Upstream, North



Site Location: 1.19 kilometres south on rich drain from cresswell road

Photo Orientation: Downstream, South East West



Drain Name: Rodman

Site Location: 1.0 kilometre south salem road on white rock road

Photo Orientation: Upstream, West



Site Location: 1.0 kilometre south salem road on white rock road

Photo Orientation: Downstream, East



Drain Name: Rodman Branch 'A'

Site Location: 300 metres west of white rock road
on royal oak road

Photo Orientation: Downstream,
North West



Drain Name: Ryall

Site Location: 1.0 kilometre south of
bush road on county road 4

Photo Orientation: Upstream, North
East



Site Location: 1.0 kilometre south of
bush road on county road 4

Photo Orientation: Downstream, South
West



Drain Name: Short

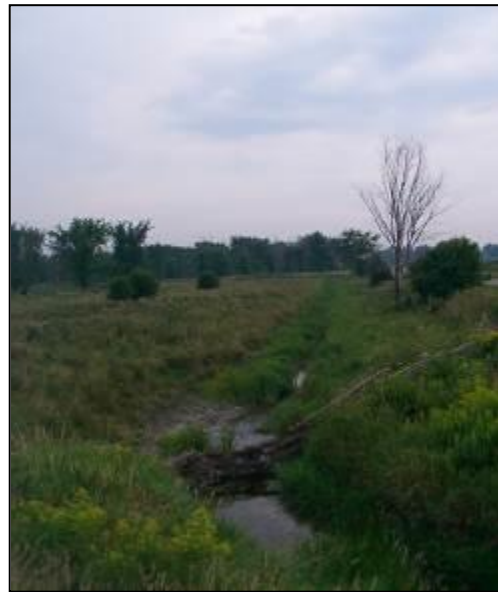
Site Location: intersection of quaker road and white rock road

Photo Orientation: Upstream, South West



Site Location: intersection of quaker road and white rock road

Photo Orientation: Downstream, North East



Drain Name: Spray

Site Location: 1 kilometre east of white rock road on south side of highway 7

Photo Orientation: Downstream, North West



Lake Scugog Subwatershed

Drain Name: Miller

Site Location: 400 metres east on pleasant point road before owl court

Photo Orientation: Downstream, South



Drain Name: Murdoch

Site Location: 300 metres east of beaucroft road on algonquin road

Photo Orientation: Upstream, North



Site Location: 300 metres east of beaucroft road on algonquin road

Photo Orientation: Downstream, South



Scugog River Subwatershed

Drain Name: Archer

Site Location: 1.5 kilometres north of county road 17 on west side of post road

Photo Orientation: Upstream, North East



Site Location: 1.5 kilometres north of county road 17 on west side of post road

Photo Orientation: Downstream, South West



Drain Name: Ops No. 1

Site Location: 1.0 kilometres north of colborne street west on highway 35 north

Photo Orientation: Upstream, North East



Site Location: 1.0 kilometres north of colborne street west on highway 35 north

Photo Orientation: Downstream, South West



Drain Name: Ops No. 20-74

Site Location: 500 metres north of highway 7 on highway 36

Photo Orientation: Downstream, South West



Drain Name: Ops No. 20-74 Fanning Lower Branch

Site Location: 300 metres west of highway 36 exit on highway 7

Photo Orientation: Upstream, North West



Drain Name: Ops No. 21-74

Site Location: 300 metres east of fieldside road on county road 17

Photo Orientation: Upstream, North



Site Location: 300 metres east of fieldside road on county road 17

Photo Orientation: Downstream, South



Drain Name: Ops No. 21-74 Weldon School Rd. Branch

Site Location: 150 metres west of county road 17
on south side of weldon road

Photo Orientation: Downstream, South East



Stoney Creek Subwatershed

Drain Name: Mahood

Site Location: 650 metres north of peace road
on east side of lilac road

Photo Orientation: Upstream, East



Drain Name: Ops No. 3-78

Site Location: 200 metres north of
peace road on settlers road

Photo Orientation: Upstream, North
East



Site Location: 200 metres north of
peace road on settlers road

Photo Orientation: Downstream, South
West



Drain Name: Ops No. 4

Site Location: 150 metres east of halter road on river road

Photo Orientation: Upstream, North



Site Location: 150 metres east of halter road on river road

Photo Orientation: Downstream, South East



Drain Name: Ops No. 4 Malcolm Branch

Site Location: 600 metres north of river road on west side of highway 7

Photo Orientation: Downstream, South West



Drain Name: Ops No. 4 Payne Branch

Site Location: 1.5 kilometres north of river road on highway 7

Photo Orientation: Upstream, North East



Site Location: 1.5 kilometres north of river road on highway 7

Photo Orientation: Downstream, South West



Drain Name: Ops No. 4 Eastern Branch

Site Location: 1.5 kilometres south of river road on hillhead road

Photo Orientation: Upstream, North East



Site Location: 1.5 kilometres south of river road on hillhead road

Photo Orientation: Downstream, South West



Drain Name: Ops No. 4 Northern Extension

Site Location: 900 metres south of tracey's hill road on east side of post road

Photo Orientation: Upstream, North West



Site Location: 900 metres south of tracey's hill road on east side of post road

Photo Orientation: Downstream, South East



Pigeon River Subwatershed

Drain Name: Corneil

Site Location: 400 metres east of lilac road on crosswind road

Photo Orientation: Upstream, North East



Site Location: 400 metres east of lilac road on crosswind road

Photo Orientation: Downstream, South West



East Cross Creek Subwatershed

Drain Name: Ops No. 5

Site Location: 350 metres south of river road on highway 35 west on driveway 100 metres

Photo Orientation: Upstream, North East

