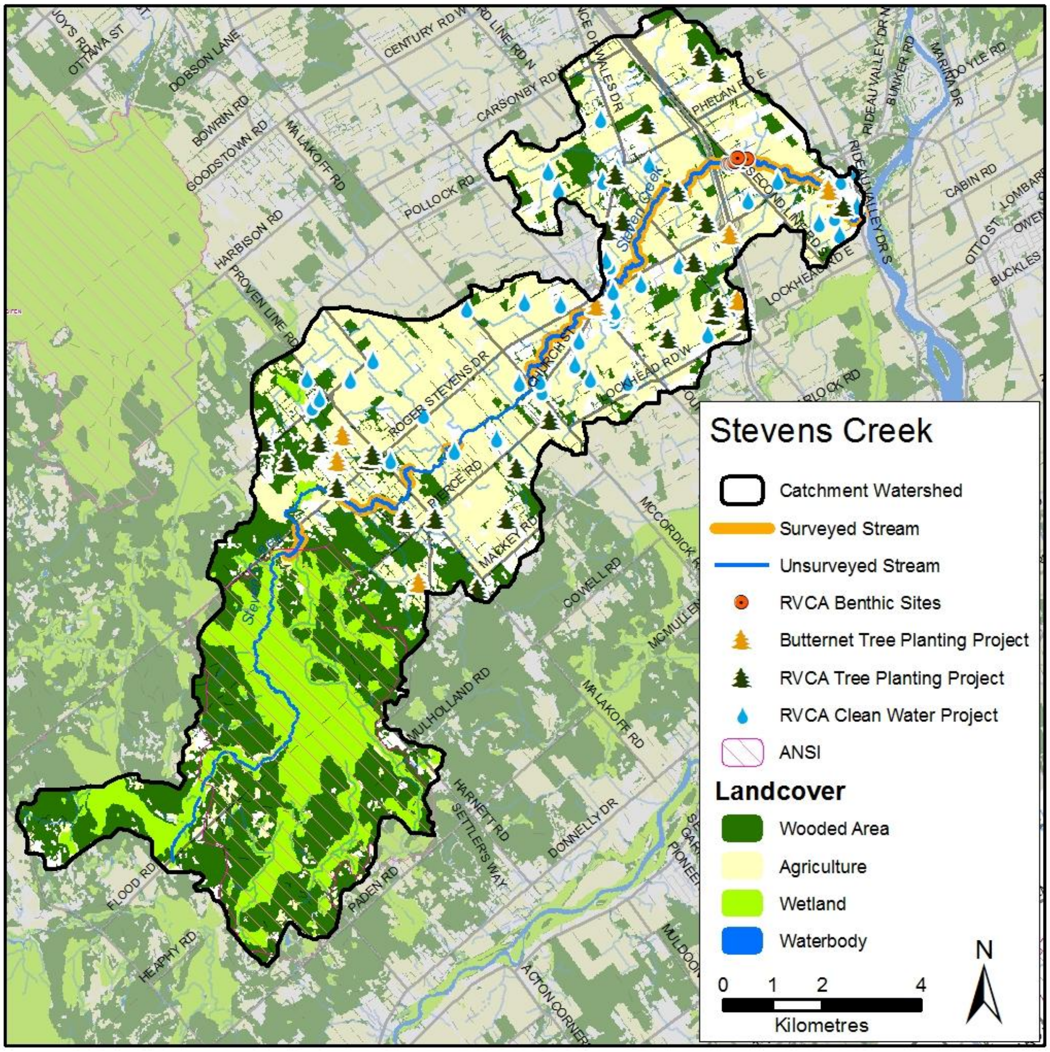
Stevens Creek 2011 Summary Report



Watershed Features

Area	100 square kilometres, 2.37% of the Rideau River watershed
Land Use	40% agriculture 5% urban 30% forest 10 % rural land-use 0.1 % waterbody 15% wetlands 1% unclassified
Surficial Geology	35% clay 23% diamicton 2% gravel 18% organic deposits 21% bedrock 2% sand
Watercourse Length and Type	*Total length*: 33 km *Watercourse type*: 97% natural 3% channelized *Flow type*: 100% permanent
Invasive Species	There were seven invasive species observed by CSW staff in 2011.
Fish Community	25 fish species were sampled in 2011. Game fish present include largemouth bass, Northern pike, brown bullhead and yellow perch.
Species at Risk	Species at risk documented in the Stevens Creek subwatershed include bridle shiner, Eastern musk turtle, snapping turtle, Blanding's turtle, bobolink, red-headed woodpecker, loggerhead shrike, black tern, Henslow's sparrow, whip-poor-will and butternut.

Vegetation Cover

Types	Hectares	% of Cover
Wetlands	1476	33
Wooded areas	2903	64
Hedgerow	94	2
Plantation	21	1
TOTAL COVER		**100%**

Woodlot Cover

Size Category	Number of Woodlots	% of Woodlots
<1 ha	850	**99.2**
1-9 ha	6	0.7
10-30 ha	1	0.1
>30 ha	0	0

Wetland Cover

15% of the watershed is wetland.

Wetlands make up 33% of the vegetation cover.

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

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The Stevens Creek subwatershed drains approximately 100 square kilometres of land. Stevens Creek is 33 kilometres in length and begins in the Marlborough Forest. It flows east, through the towns of North Gower and Kars, crossing Roger Steven's Drive four times before its confluence with the Rideau River. Land use in the subwatershed is mainly agricultural, natural and rural. A network of municipal drains outlet into Stevens Creek. Stevens Creek is used for recreational boating (mainly canoe and kayak) and also by anglers. The headwaters of Stevens Creek begin in the Marlborough Forest, which is an important area for hunting and recreational activity. The stream catchment area includes the Stevens Creek Wetland, which is a Class 1 Provincially Significant Wetland. The wetland includes 1,344 hectares of coniferous swamp and mixed hardwoods and serves as an important deer wintering area. The swamp is fed by several beaver ponds, one of which was part of a Ducks Unlimited project to enhance wetland and wildlife habitat. The wetland is home to regionally significant species (lesser scaup, manna grass, floating bur reed) and provincially significant species (black tern, marsh wren, river otter and blue spotted salamander). The wetland has also been nominated as an Area of Scientific Interest (ANSI) and includes areas outside of the Steven's Creek catchment which includes the oldest stands of trees within the entire Marlborough Forest. In 2011, 140 sections along Stevens Creek were surveyed. The areas along the creek that were not surveyed were areas where the program did not have permission to access. The following is a summary of the 140 macro-stream assessment forms completed by technicians and volunteers.

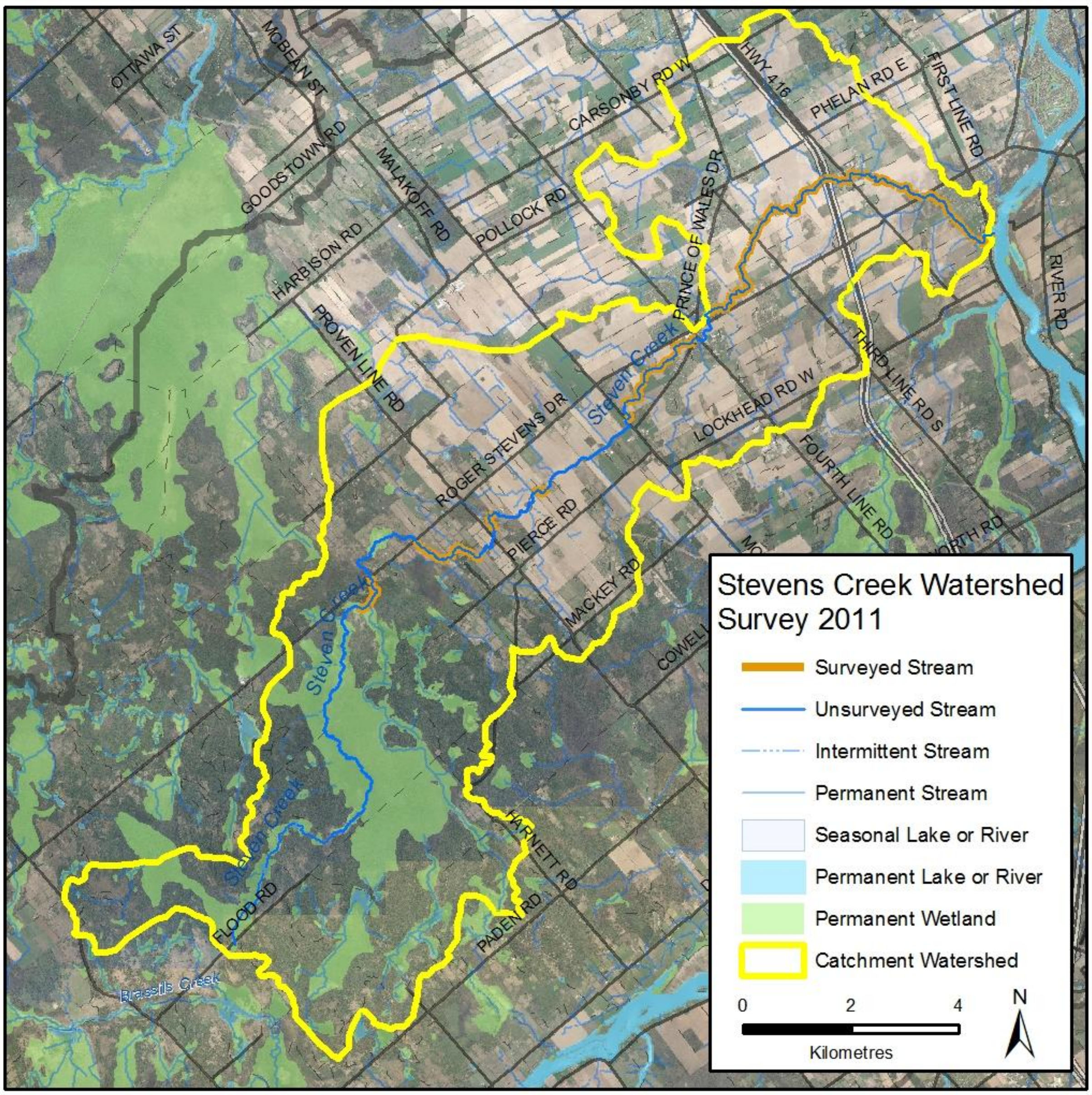

Figure 1. Air photo of Stevens Creek Subwatershed and Surveyed Area

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Anthropogenic Alterations to Stevens Creek

Figure 2 illustrates the classes of anthropogenic alterations observed along Stevens Creek. Of the 140 sections sampled, 18 percent of the stream remained without any human alteration. Sections considered natural, but with some anthropogenic changes made up 21 percent of the sections sampled, and 36 percent accounted for sections that were considered “altered” but still had natural features. Twenty-six percent of the sampled areas were “highly altered” with few natural portions. Areas that were listed as “altered” or “highly altered” were associated with road crossings, culverts, channelized sections or areas that had little or no buffer and little aquatic or wildlife habitat.

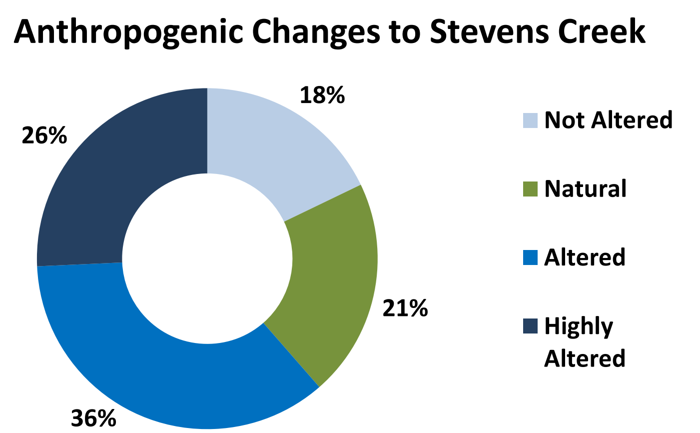

Photo of an anthropogenic change on Stevens Creek

Land Use Adjacent to Stevens Creek

Eleven different land uses were identified along the banks adjacent to Stevens Creek. Surrounding land use is considered from the beginning to end of the survey section (100m) and up to 100m on each side of the creek. Land use outside of this area is not considered for the surveys but is nonetheless part of the subwatershed and will influence the creek. The largest land use (40%) was agricultural. Natural areas made up 43 percent of the stream, characterized by forest, scrubland, wetland and meadow. The remaining land use consisted of residential, pasture, infrastructure, abandoned agriculture, and industrial/ commercial.

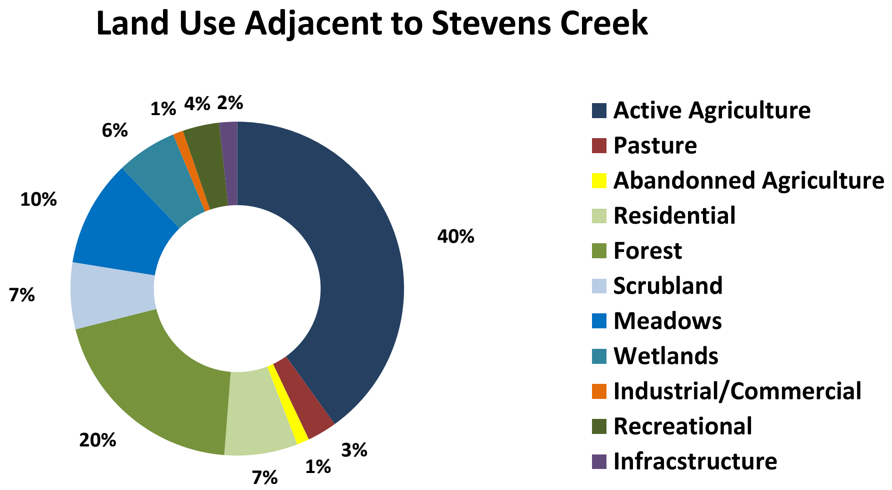

Figure 2. Classes of Anthropogenic Alterations Occurring along Stevens Creek

Photo of land use along Stevens Creek

Channel Type

Streams are naturally meandering systems and move over time, and there are varying degrees of sinuosity (curviness), depending on the watercourse. However, in the past, humans have altered creeks and straightened areas, which can be quite detrimental to stream function and health. Only three percent of Stevens Creek was considered channelized. This was mainly in areas where the creek had been straightened at road crossings.

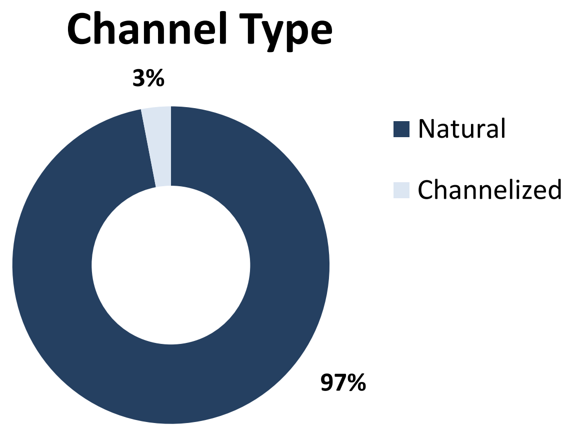

Figure 4. Channel Type Observed Along Stevens Creek

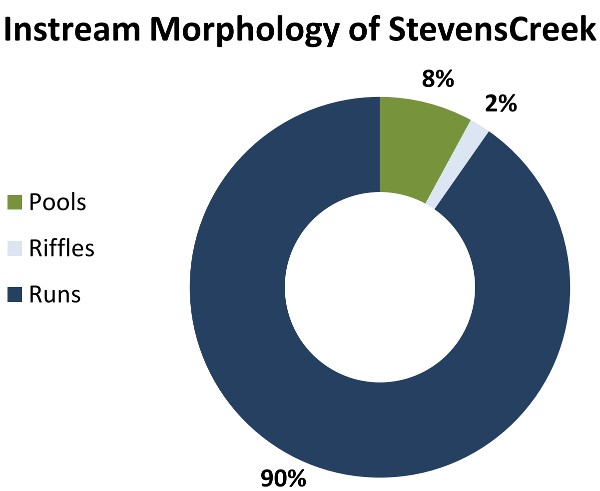

Figure 5. Instream Morphology of Stevens Creek

Instream Morphology

Pools and riffles are important features for fish habitat. Riffles are areas of agitated water, and they contribute higher dissolved oxygen to the stream and act as spawning substrate for some species of fish, such as walleye. Pools provide shelter for fish and can provide refuge in the summer if water levels drop and water temperatures in the creek increases. Pools also provide important over-wintering areas for fish. Runs are usually moderately shallow, with unagitated water surfaces, and areas where the thalweg (deepest part of the channel) is in the center of the channel. Stevens Creek is fairly uniform; ninety percent consists of runs with eight percent pools and only two percent riffles, illustrated in Figure 5. Most of the riffles along Stevens Creek occur in the headwaters, west of Malakoff Road.

Instream Substrate

Diverse substrate is important for fish and benthic invertebrate habitat because some species will only occupy certain types of substrate and will only reproduce on certain types of substrate. Boulders create instream cover and back eddies for large fish to hide and/or rest out of the current, and cobble provides important over wintering and/or spawning habitat for small or juvenile fish. Other substrates also provide instream habitat for fish and invertebrates. A variety of substrate can be found instream along Stevens Creek, although 50 percent was considered clay and muck. Other types of substrate that occurred in smaller proportions include gravel, sand, cobble, boulder, silt, detritus and bedrock.

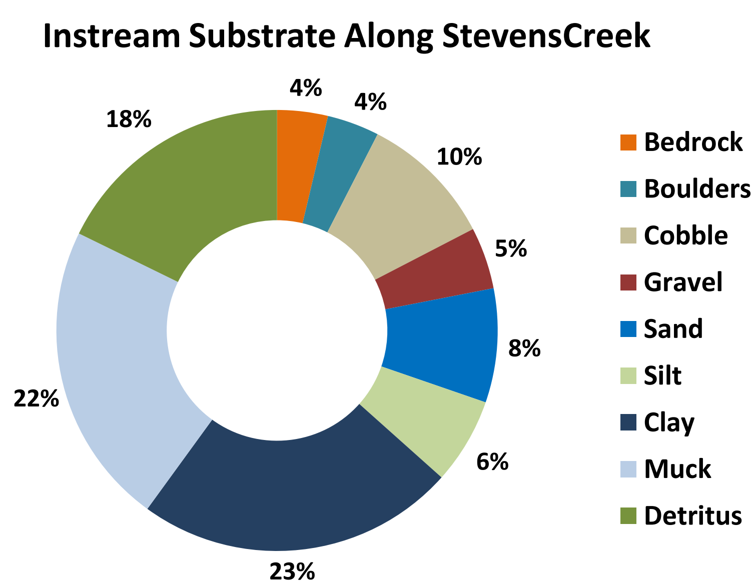

Figure 6. Types on Instream Substrate Along Stevens Creek

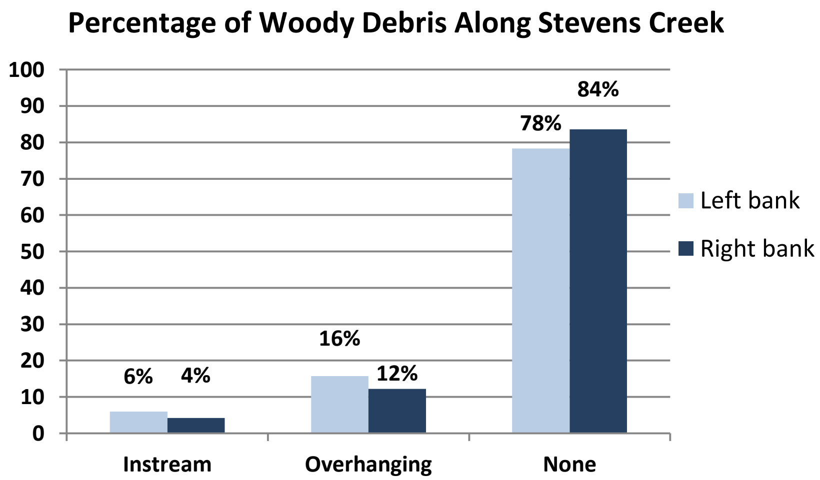

Figure 7. Amount of Woody Debris Observed Along Stevens Creek

Instream woody debris (logs, branches) is important for fish and benthic habitat, by providing refuge and feeding areas. Overhanging branches and trees provide a food source, nutrients and shade. The majority of Stevens Creek has a low percentage of instream woody debris and few overhanging branches and trees. Seventy-eight percent of the left bank and 84 percent of the right bank have no instream woody debris.

Photo of instream woody debris along Stevens Creek

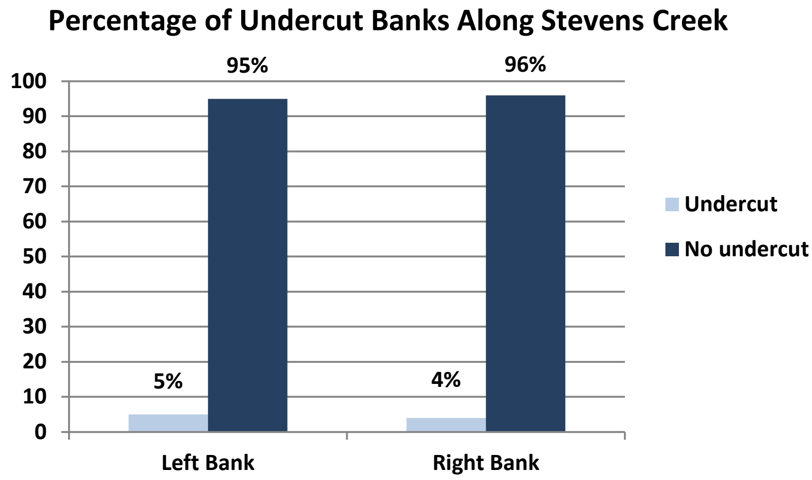

Figure 8. Amount of Undercut Banks Along Stevens Creek

Undercut banks are a normal and natural part of stream function. The overhanging banks provide excellent refuge areas for fish. Stevens Creek has a low percentage of undercut banks, with only five percent undercut along the left bank and four percent undercut along the right bank.

Photo of shaded area near the headwaters of Stevens Creek

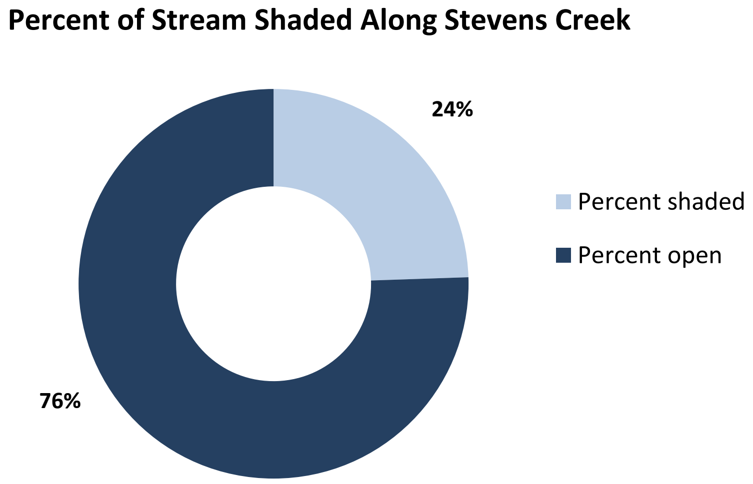

Figure 9. Overall Shading Along Stevens Creek

Grasses, shrubs and trees all contribute towards shading a stream. Shade is important in moderating stream temperature, contributing to food supply and helping with nutrient reduction within a stream. Along Stevens Creek, only 24 percent was shaded. Seventy-six percent was considered open.

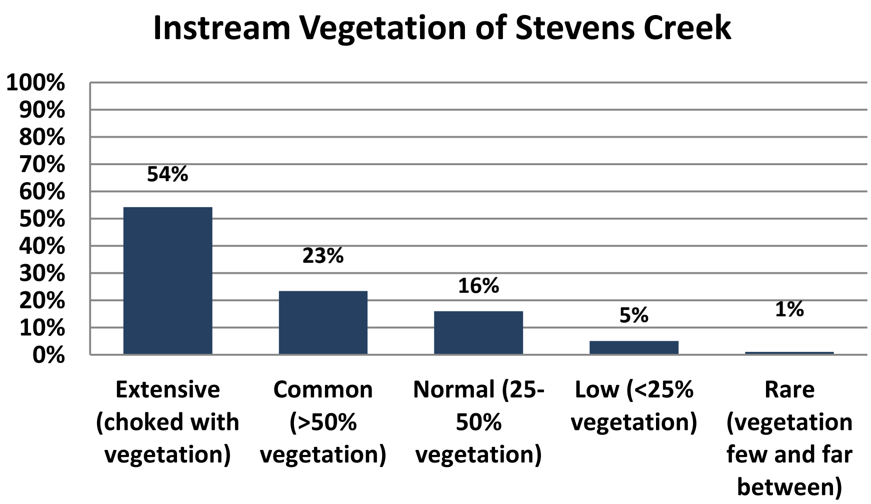

Figure 10. Amount of Instream Vegetation in Stevens Creek

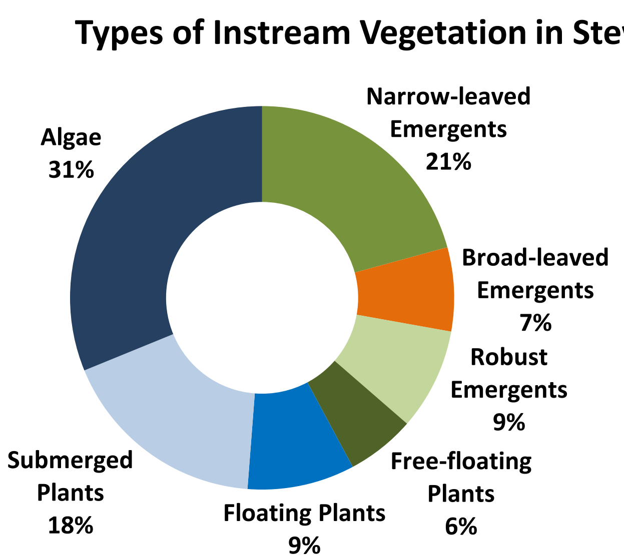

Figure 11. Types of Instream Vegetation in Stevens Creek

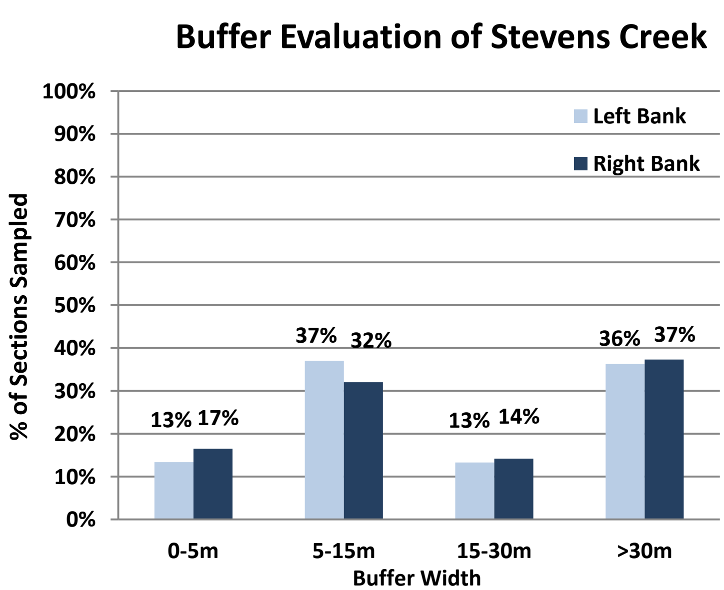

Figure 12. Buffer Evaluation of Stevens Creek

Amount of Instream Vegetation

Instream vegetation is an important factor for a healthy stream ecosystem. Vegetation helps to remove contaminants from the water, contributes oxygen to the stream, and provides habitat for fish and wildlife. However, too much vegetation can be detrimental. Figure 10 demonstrates the frequency of instream vegetation in Stevens Creek. Overall, Stevens Creek had a high amount of vegetation; only 39 percent was considered to have common or normal levels and six percent was considered in the low or rare category. Fifty-four percent of the surveyed areas had extensive levels (choked with vegetation), which can be an indication of high amounts of nutrients entering the stream. In some areas, it flowering rush, an invasive species, which was choking the stream and outcompeting native vegetation.

Types of Instream Vegetation

The majority of Stevens Creek had a high diversity in types of instream vegetation. Only 31 percent of sections surveyed consisted of algae. The other two types of vegetation most commonly found were narrow-leaved emergents (21 percent) and submergents (18 percent). Other types of vegetation observed less often were broad-leaved, robust, free-floating and floating.

Buffer Evaluation

Natural buffers between watercourses and human alterations are extremely important for filtering excess nutrients running into the creek, infiltrating rainwater, maintaining bank stability and providing wildlife habitat. Natural shorelines also shade the creek, helping maintain baseflow levels and keeping water temperatures cool. According to the document *How Much Habitat Is Enough* (Environment Canada, 2004), it is recommended that a stream have a minimum of 30 metres of riparian area or more (the more the better). Along Stevens Creek, 13 percent of the left bank and 17 percent of the right bank had a buffer of only zero to five metres. Thirty-seven percent of the left bank and thirty-two percent of the right bank had a buffer of five to 15 metres. Thirteen percent to 14 percent had a buffer of 15 to 30 metres. Just over one third of Stevens Creek had a buffer of greater than 30 metres, which is the minimum recommended buffer from the Environment Canada document.

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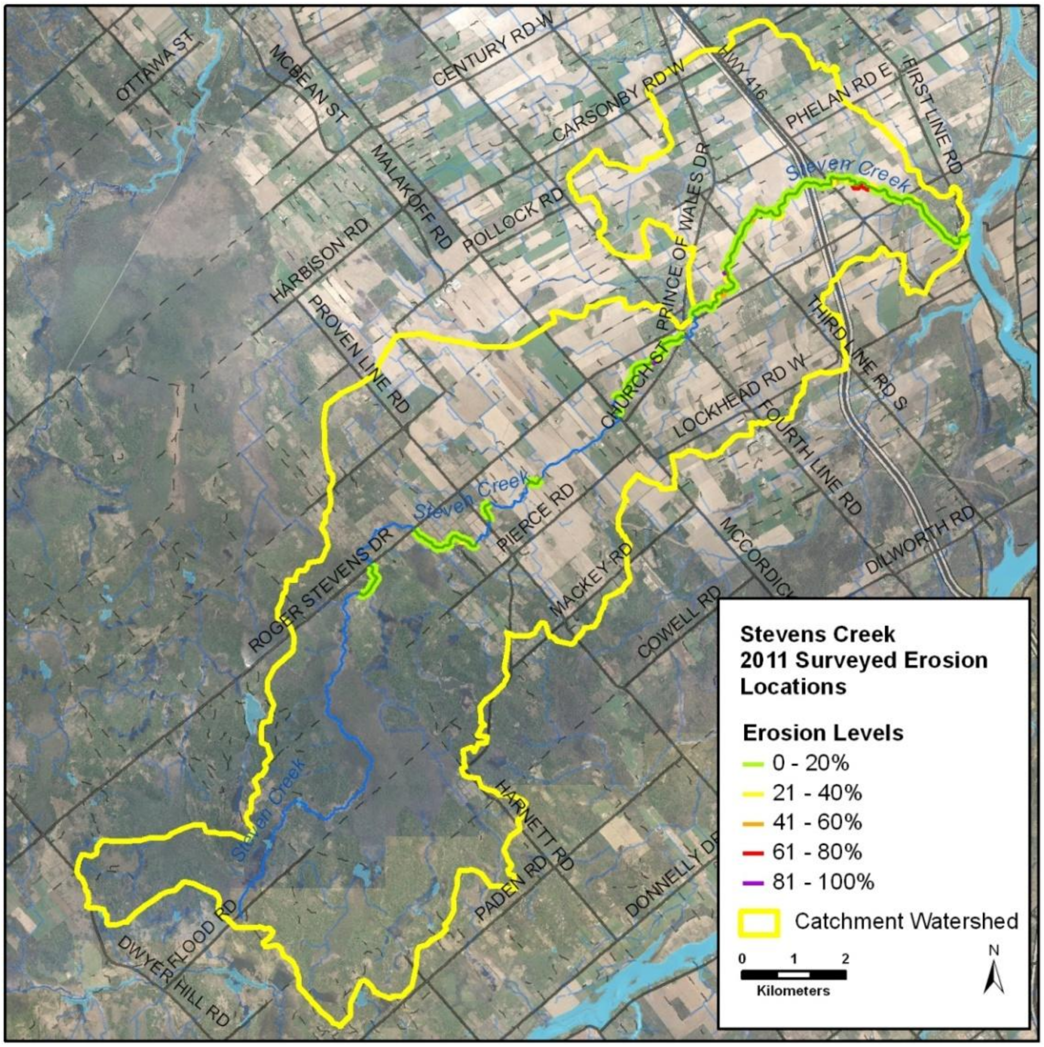

Figure 13. Left and Right Bank Stability of Stevens Creek

Erosion Along Stevens Creek

Erosion is a normal, important stream process and may not affect actual bank stability; however, excessive erosion and deposition of sediment within a stream can have detrimental effects to important fish and wildlife habitat. Bank stability indicates how much soil has eroded from the bank into the stream. Poor bank stability can greatly contribute to the amount of sediment carried in a waterbody as well as loss of bank vegetation due to bank failure, resulting in trees falling into the stream and the removal of aquatic plants, which provide habitat.

Wildlife Along Stevens Creek

The diversity of fish and wildlife populations can be an indicator of water quality and overall stream health. Table 1 is a summary of all wildlife observed during stream surveys. Many amphibians were observed.

Wildlife	Observed
Birds	Mallard ducks, great blue heron, belted kingfisher, red-winged blackbirds, gull, ospreys, chickadees, grackle, cowbird, mourning doves, blue jays, robin, swallows, song sparrows, goldfinch, cardinals, phoebe, field sparrows, warbling vireo, crows, grey catbirds, cedar waxwing, pileated woodpecker, hummingbird, bohemian waxwing, hawk, grouse
Mammals	Squirrel, raccoon, deer, beaver, muskrat, small mammal tracks/scat, bear tracks/scratches, chipmunks
Reptiles/Amphibians	Green frogs, bullfrogs, turtle, tadpoles, gray treefrog, northern water snake, mink frog
Aquatic Insects	Whirlygig beetles, dragonfly nymphs, water striders, giant water bugs, diving beetles, mayfly larva, amphipods, water boatman, *hemipteran spp.*, crayfish, gastropods, stoneflies, freshwater mussels, caddisflies, chironomids
Other	Mosquitoes, horseflies, no see ums, spiders, leeches, red ants, bees, deerflies, dragonflies, damselflies, river jewelwing, harvestman (daddy longlegs), cicada, banded mystery snail, ebony jewelwing, cabbage whites, bumblebees, monarchs, crickets, bluets, moths, grasshoppers, *gomphus spp.*, campeloma snails

Table 1. Wildlife Observed Along Stevens Creek

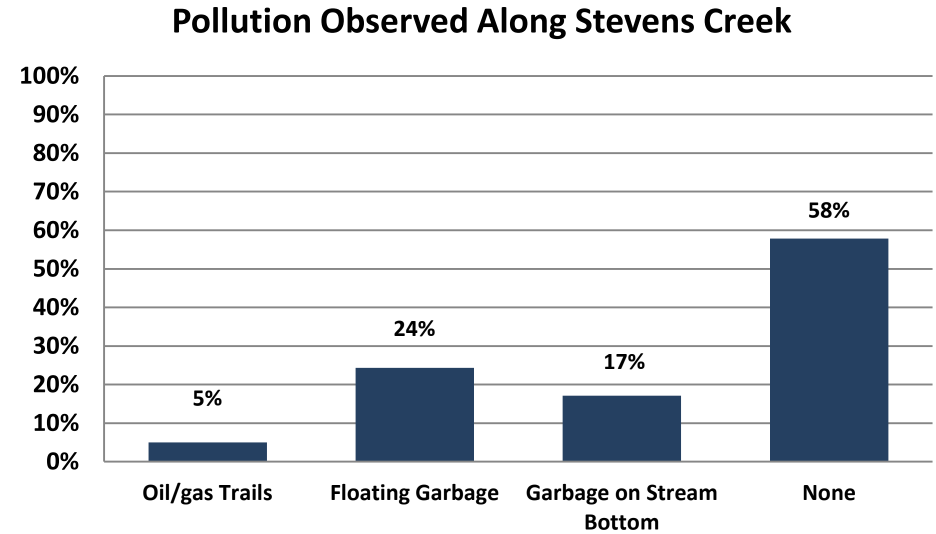

Figure 14. Frequency of Pollution/Garbage Occurring in Stevens Creek

Pollution/Garbage

Figure 14 demonstrates the incidence of pollution/garbage in Stevens Creek. Pollution and garbage in the stream is assessed visually and noted for each section where it is observed. Fifty-eight percent of sections surveyed did not have any garbage. Twenty-four percent had floating garbage and 17 percent had garbage on the stream bottom, although it was not observed in large quantities. In five percent of the sections, oil and gas trails were observed. Garbage observed along Stevens Creek included plastic items (wrappers, cups, bottles) fishing gear, floats, lines, beer bottles, recreational gear (soccer balls, tennis ball), lumber, wooden structures, styrofoam, rebar, oil containers, scrap metal, tires, many cigarette packages, plastic barrels, traffic cone, bricks, cans, steel pipe, car parts and clothing.

Invasive Species

Invasive species can have major impacts on streams and species diversity. Invasive species are one of the largest threats to ecosystems throughout Ontario and can outcompete native species, having negative effects on local wildlife, fish and vegetation populations. It is estimated that costs to control and mitigate damage from 16 invasive species amounts to between $13.3 and $34.5 billion (Government of Canada, 2004). Over 180 non-native species have been found in the Great Lakes area, with a new aquatic species arriving in the Great Lakes on average of every six to nine months (Government of Canada, 1999). These species originate from other countries and are introduced through shipping, ballast water, pet trades, aquarium and horticultural activities, live bait industry, recreational boats, boat trailers, fishing equipment, etc. (OMNR, 2008). Invasive species were observed in 95 percent of the surveyed sections, and often more than one species was present in the same area. Out of the seven species observed, the most common were purple loosestrife (*Lythrum salicaria*), flowering rush (*Butomus umbellatus*), European Frog-Bit (*Hydrocharis morsus-ranae*), curly-leaved pondweed (*Potamogeton crispus*) and banded mystery snail (*Viviparus cf. georgianus*). Manitoba maple (*Acer negundo*), garlic mustard (*Alliaria petiolata*) were also observed.

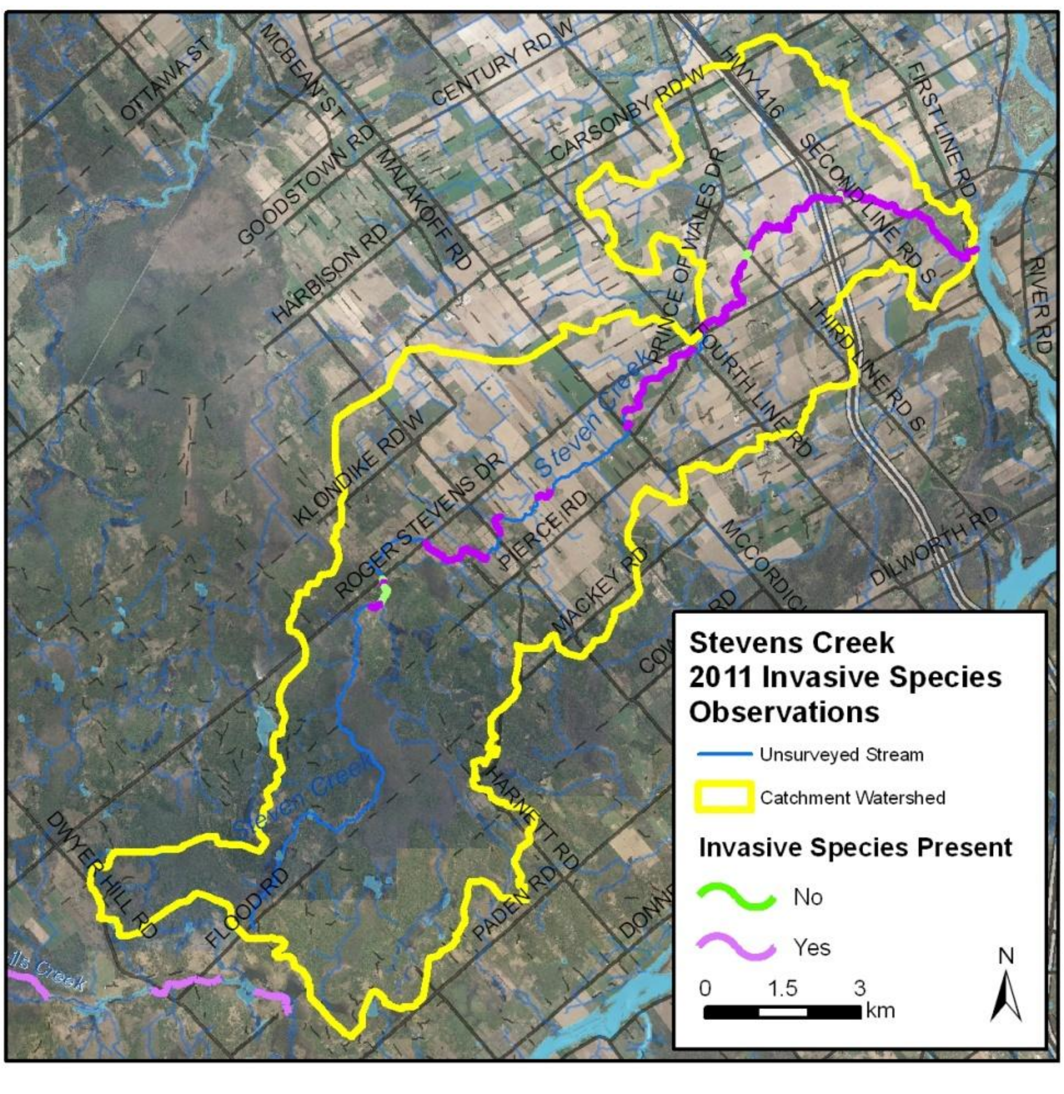

Figure 15. Locations of Invasive Species Along Surveyed Sections of Stevens Creek

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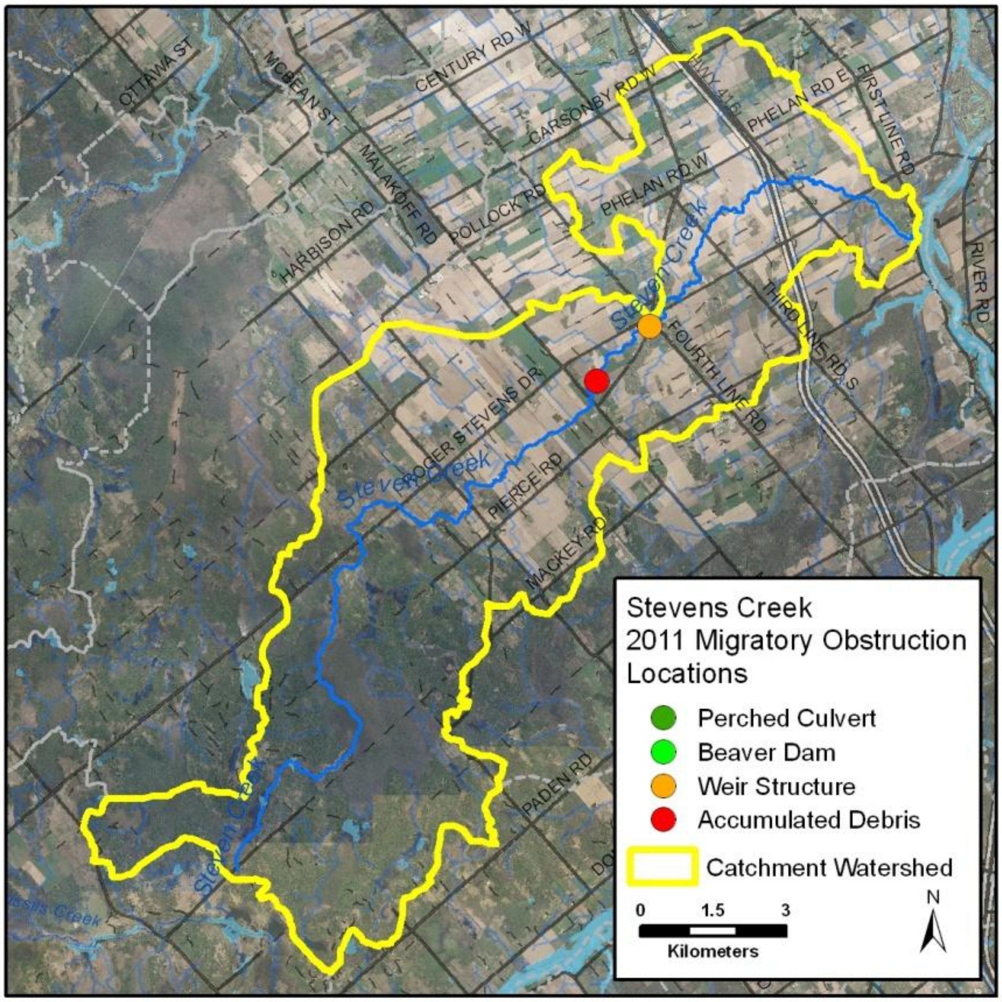


Figure 16. Location of Migratory Obstructions to Fish Passage Along Stevens Creek

Migratory Obstructions

It is important to know locations of migratory obstructions because these can prevent fish from accessing important spawning and rearing habitat. Only two migratory obstructions to fish passage were observed along Stevens Creek. The weir in North Gower is a permanent obstruction. The other obstruction is accumulated woody material. Often, woody debris floating downstream can get caught on fallen trees or branches and build up, possibly creating a seasonal migration barrier. The water levels in 2011 were extremely low, and the accumulated debris may not have been an obstruction in other years with normal water levels.

Photo of weir structure

Thermal Classification

Temperature is an important parameter in streams as it influences many aspects of physical, chemical and biological health. Many factors can influence fluctuations in stream temperature such as:

- Springs (groundwater and surface water interaction)
- Tributaries
- Precipitation runoff
- Discharge pipes
- Stream shading from riparian vegetation

The greatest factor of fluctuating temperature is solar radiation and runoff from developed areas. Typically, streams with large amounts of riparian canopy cover will yield lower temperatures while areas with no trees may be warmer. The method for temperature classification is taken from Stoneman and Jones, which is an accepted method by both Ministry of Natural Resources and Department of Fisheries and Oceans for assigning thermal classification. Classification is based on temperature data for each stream, taken at 4:00pm, anywhere between July 1 and August 31, on days where maximum air temperature exceeds 24.5°C and the previous two or three days have had similar temperatures. Although dataloggers are set to record temperatures between April and October, only the days that meet the temperature requirements are used in classification. The water temperature is used along with the maximum temperature of those days to classify as warmwater, coolwater or cold water.

Another important methodology of temperature classification is through fish community data. Fish have different temperature requirements, and these are also considered when classifying the stream. For example, if a species is recorded in a stream that requires cold water, there could be cold water inputs influencing that stream, at that location.

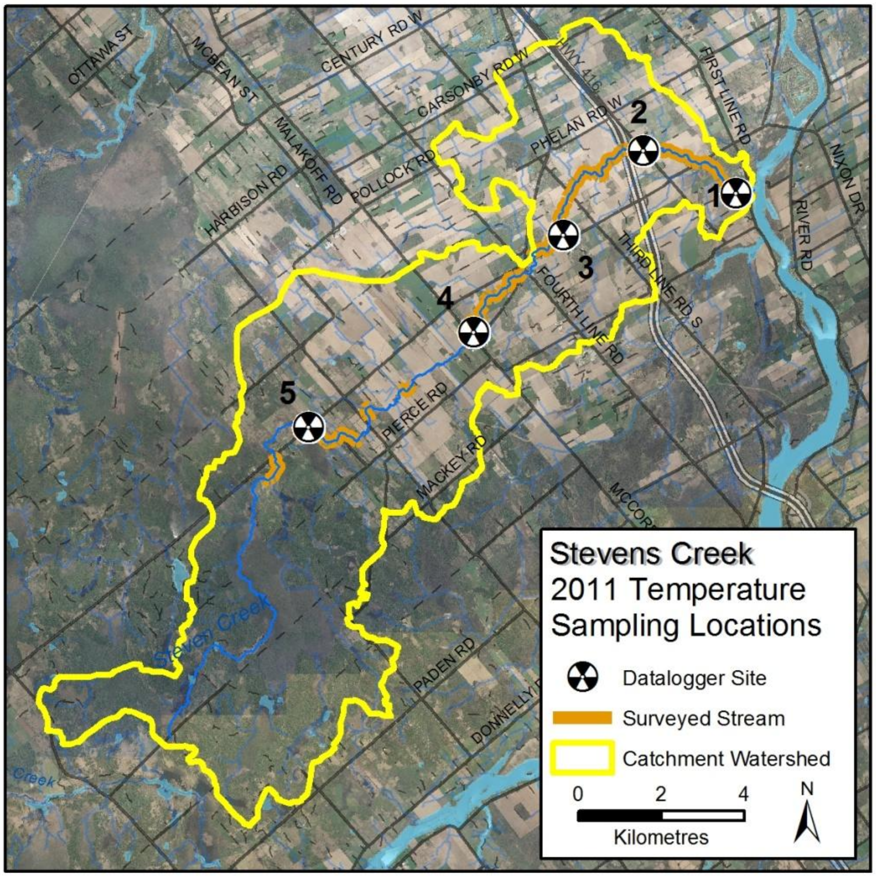
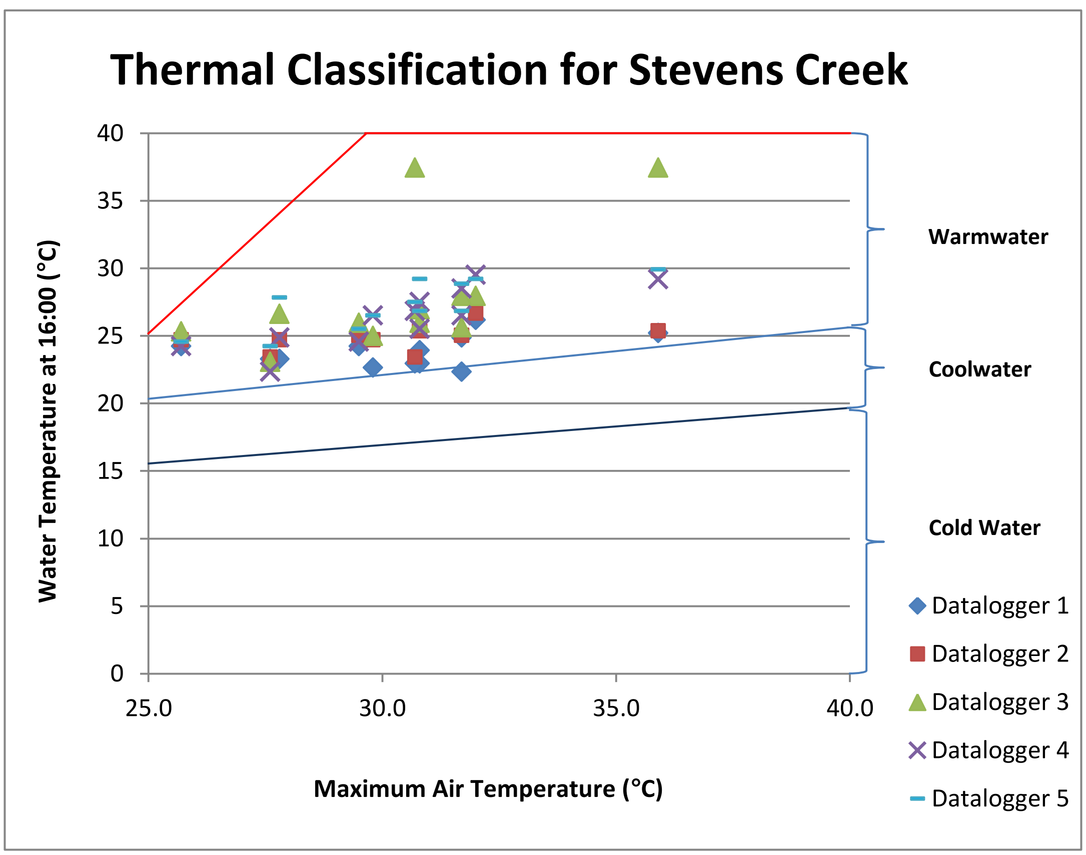


Figure 17. Temperature Datalogger Locations Along Stevens Creek

Five temperature dataloggers were deployed in Stevens Creek to give a representative sample of how temperature fluctuates and differs along the stream. The dataloggers were installed in April and retrieved in late September. Dataloggers are either secured to blocks on the bottom of a stream or attached to rebar secured to the bottom.

Photo of datalogger deployed in Stevens Creek on a block



When analyzed on the nomograph (Figure 18), it appears that Stevens Creek is a warmwater system. All temperature dataloggers were within that range, aside from one which was within the coolwater classification. This logger was located near the mouth of Stevens Creek.

There were two temperatures from Datalogger 3 that were likely out of water for a period of time and were recording air temperature instead of water temperature. These were discounted for the classification.

Figure 18. Thermal Classification Nomograph for Stevens Creek

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Month	Range	DO (mg/L)	DO (%)	Conductivity (μs/cm)	pH
May	low	5.45	63	203	7.56
	high	8.17	87	601	7.76
June	low	3.35	38	506	7.4
	high	12.5	145	659	8.58
July	low	3.38	36	322	7.22
	high	9.15	108	765	8.32
August	low	3	31	163	7.25
	high	10.32	110	515	8.5

Table 2. Maximum and minimum Levels of Dissolved Oxygen, Conductivity and pH in Stevens Creek during 2011 surveys

Water Chemistry

During surveys, a YSI probe was used to collect values on dissolved oxygen, conductivity and pH. In 2011, RVCA issued a Level 1 Drought for the watershed, beginning September 26, 2011 and ending January 10, 2012. Low water levels were observed during monitoring. Drought conditions would have had an effect on the parameters below. The 2011 data is summarized in Table 2.

Dissolved Oxygen: A measure of the amount of oxygen dissolved into a medium, such as water. The lowest acceptable concentration of dissolved oxygen is 6.0 mg/L for early stages of warmwater fish and 9.5mg/L for cold water fish (CCME, 1999). A saturation value of 90% or above is considered healthy (WOW, 2004).

Conductivity: The ability of a substance to transfer electricity. This measure is influenced by the presence of dissolved salts and other ions in the stream.

pH: A measure of relative acidity or alkalinity, ranging from 1 (most acidic) to 14 (most alkaline/basic) , with 7 occupying a neutral point.

Ontario Benthic Biomonitoring Network (OBBN) Data Summary for Stevens Creek

Freshwater benthic invertebrates are animals without backbones that live on the stream bottom and include crustaceans such as crayfish, molluscs and immature forms of aquatic insects. Benthos represents an extremely diverse group of aquatic animals and exhibit wide ranges of responses to stressors such as organic pollutants, sediments and toxicants, which allows scientists to use them as bioindicators.

RVCA Ontario Benthic Biomonitoring Network Data

RVCA collects benthic invertebrates on Stevens Creek at one location. This site has been surveyed each spring and fall since 2004. Results for family richness (FR), family biotic index (FBI) and percent EPT (*Ephemeroptera, Plecoptera and Trichoptera*) are defined and shown below. From the FBI results, it appears Stevens Creek has poor to very poor water quality. Family richness has been increasing since 2008; however percent EPT has been declining, which indicates that species tolerant of moderately poor to poor water quality conditions are moving in.

Photo of OBBN site, Replicate 1, spring

Photo of OBBN Site, Replicate 2, spring

Photo of OBBN site, Replicate 3, spring

Family Richness (FR)	2004		2005		2006		2007		2008		2009		2010	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
	9.7	12.3	8	9	10.3	10	10	NA	17.7	18.3	14	22	10.6	15.2

Table 3. Family Richness for Stevens Creek

Family Richness (FR) indicates the health of the community through its diversity, and increases with increasing habitat diversity suitability, and water quality (Plafkin et al., 1989). FR is equivalent to the total number of families found within the sample. The healthier the community is, the greater the number of families found within the community.

Family Biotic Index (Hilsenhoff):	2004		2005		2006		2007		2008		2009		2010	
Time of sampling	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Index	6.789	6.88	6.009	5.995	6.428	6.482	5.565	NA	7.069	7.025	7.407	6.549	7.074	7.077
Water Quality Rating	Poor	Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fairly Poor	Fair	NA	Poor	Poor	Very Poor	Poor	Poor	Poor

Table 4. FBI Results for Stevens Creek

Family Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 3.75	Excellent	Organic pollution unlikely
3.76 - 4.25	Very Good	Possible slight organic pollution
4.26 - 5.00	Good	Some organic pollution probable
5.01 - 5.75	Fair	Fairly substantial pollution likely
5.76 - 6.50	Fairly Poor	Substantial pollution likely
6.51 - 7.25	Poor	Very substantial pollution likely
7.26 - 10.00	Very Poor	Severe organic pollution likely

Table 5. FBI Reference Table

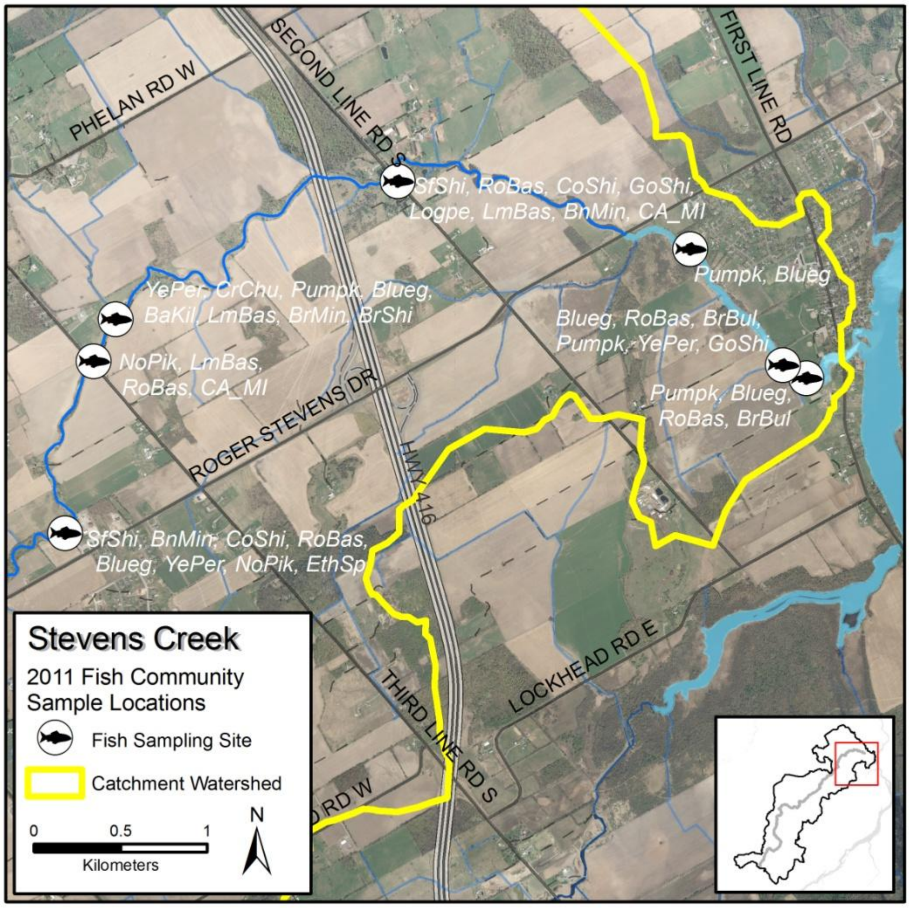
Photo of a dragonfly (*Odonata*) nymph in upper reaches of Stevens Creek

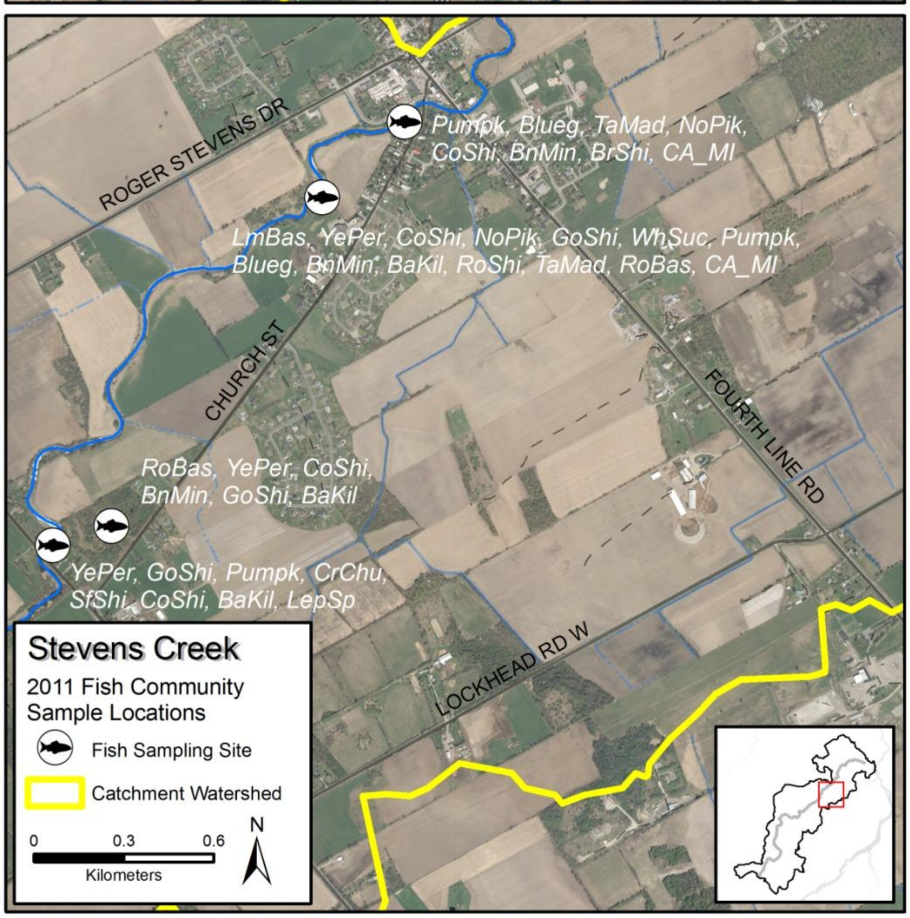
Photo of a mayfly in upper section of Stevens Creek where the habitat is more suitable

Ephemeroptera, Plecoptera, Trichoptera Richness Index (% EPT) *Ephemeroptera* (Mayflies), *Plecoptera* (Stoneflies), and *Trichoptera* (Caddisflies) are all species that are considered to be very sensitive to poor water quality conditions, therefore the presence of these organisms are indicators of good water quality sites. Higher populations of these organisms in a sample typically indicate improved conditions at the site.

% EPT Index:	2004		2005		2006		2007		2008		2009		2010	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
	15.18	10.1	6.45	11.85	5.22	9.72	20.34	NA	2.2	26.49	4.44	17.44	2.87	5.25

Table 6. % EPT Results for Stevens Creek





Fish Sampling

A total of fourteen sites between the mouth and headwaters of Stevens Creek were sampled for fish between May and July. The two sites near the confluence of the Rideau River were sampled for multiple days in May, using large fyke nets. The other sites were sampled one to two times between May and July using a variety of equipment, including a windemere trap, seine net and an electrofisher. The fish sampling sites are shown in Figures 19, 20 and 21. Habitat and spawning information on the species captured are listed in Table 7.

Species Legend

BaKil - banded killifish
Blueg - bluegill
BnMin - bluntnose minnow
BnShi - blacknose shiner
BrBul - brown bullhead
BrMin - brassy minnow
BrShi - bridle shiner
BrSti - brook stickleback
CA_MI - Cyprinid spp.
CeMud - central mudminnow
CoShi - common shiner
CrChu - creek chub
EthSp - *Etheostoma spp.*
GoShi - golden shiner
LepSp - *Lepomis spp.*
LmBas - largemouth bass
LogPe - logperch
NoPik - Northern pike
NRDac - Northern redbelly dace
Pumpk - pumpkinseed
RoBas - rock bass
RoShi - rosyface shiner
SfShi - spottail shiner
SUNFI - *Centrarchid spp.*
TaMad - tadpole madtom
WhSuc - white sucker
YePer - yellow perch

Figures 19 &20. Locations and of Fish Sampling and Species Recorded on Stevens Creek

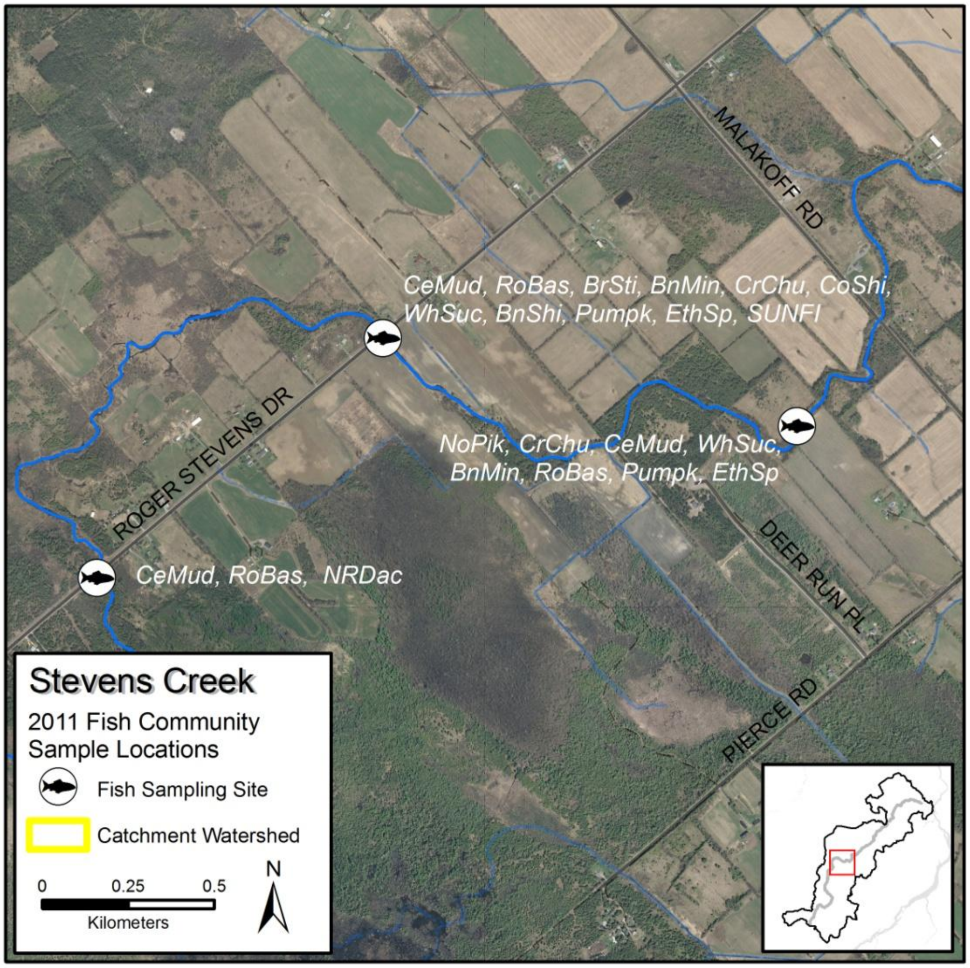
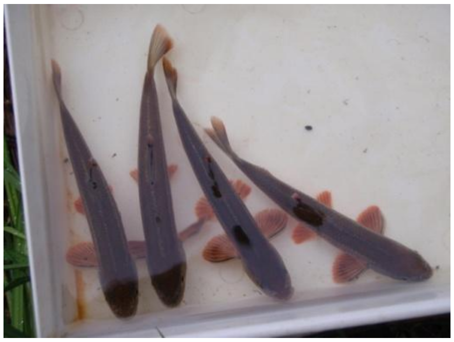


Figure 21. Locations and of Fish Sampling and Species Recorded on Stevens Creek

Species Legend

Blueg - bluegill
BnMin - bluntnose minnow
BnShi - blacknose shiner
BrSti - brook stickleback
CeMud - central mudminnow
CoShi - common shiner
CrChu - creek chub
EthSp - *Etheostoma spp.*
NoPik - Northern pike
NRDac - Northern redbelly dace
Pumpk - pumpkinseed
RoBas - rock bass
SUNFI - *Centrarchid spp.*
WhSuc - white sucker



Common shiner with spawning colours

Photo of a volunteer pulling a seine net

Fish Community Summary

A total of twenty-six different fish species were collected. All fish were live released back to the stream after fish sampling. *Etheostoma spp.* indicates that either Johnny Darters or Tessellated Darters were captured. To differentiate between those species, the fish must be removed from the system and brought back to lab; to avoid this, they are only identified to genus level. Minnow species that were caught but too small to identify are classified as *Cyprinid spp*. Two sunfish species were captured that were too small to identify. One was only identified to family level and is listed as *Centrarchid spp*. The second species was either Pumpkinseed or Bluegill, and is therefore listed further, as *Lepomis spp*. Six volunteers spent a total of 29.5 hours fish sampling on Stevens Creek and learned how to use a seine net.

Species Name	Latin Name	General Habitat	Spawning Period	Spawning Temp (°C)
banded killifish	*Fundulus diaphanous*	calm ponds or lakes	spring	21-32
blacknose shiner	*Notropis heterolepis*	still, shallow, clear streams or bays with abundant aquatic vegetation	spring	n/a
bluegill	*Lepomis macrochirus*	ponds, lakes or calm rivers and streams with heavy aquatic vegetation	spring	19-27
bluntnose minnow	*Pimephales notatus*	bottoms of shallow lakes or ponds or gravelly streams with little aquatic vegetation	spring	20-28
brassy minnow	*Hybognathus hankinsoni*	streams or cool, dark bog ponds with acidic waters	spring	10-13
bridle shiner	*Notropis bifrenatus*	still, clear streams with abundant submergent vegetation	late spring	14-26
brook stickleback	*Culaea inconstans*	spring-fed ponds or cold streams with heavy aquatic vegetation or wetland areas of lakes	spring	8-19
brown bullhead	*Ameiurus nebulosus*	bottom of shallow, warmwater bays, lakes or ponds and larger slow-moving rivers with abundant aquatic vegetation	spring	14-29
central mudminnow	*Umbra limi*	ponds or pools in streams with heavy aquatic vegetation and organic substrate	spring	~13
common shiner	*Luxilus comutus*	prefers streams or shorelines of clear lakes	spring	14-28
creek chub	*Semotilus atromaculatus*	prefers small creeks or shorelines of small lakes	spring	13-27
golden shiner	*Notemigonus crysoleucas*	clear, still areas in shallower, larger watercourses with abundant aquatic vegetation	spring	20-27
largemouth bass	*Micropterus salmoides*	shallow bays, lakes or calm rivers with woody debris, soft substrate and abundant aquatic vegetation	spring to summer	14-21
logperch	*Percina caprodes*	lakes, rivers or streams with sand, gravel or cobble substrate	spring to summer	10-15
Northern pike	*Esox Lucius*	calm, warm rivers or bays with heavy aquatic vegetation	spring	2-18
Northern redbelly dace	*Phoxinus eos*	quiet beaver ponds, small lakes or pools in streams	June to July	21-27
pumpkinseed	*Lepomis gibbosus*	bays, lakes, ponds or calm streams with abundant submergent vegetation	spring to summer	13-29
rock bass	*Ambloplites rupestris*	rocky areas of shorelines along lakes or warm water reaches of streams	May to July	14-24
rosyface shiner	*Notropis rubellus*	calm lakes or ponds or flowing rivers and streams	spring	20-29
spottail shiner	*Notropis hudsonius*	lakes or larger streams and rivers	spring	18-22
tadpole madtom	*Noturus gyrinus*	calm, clear ponds, streams, shallow lakes with soft bottoms and heavy aquatic vegetation	spring to summer	n/a
white sucker	*Catostomus commersonii*	warmer, shallow bays, lakes or large tributaries	spring	6-23
yellow perch	*Perca flavescens*	warm or cool ponds, lakes or rivers with moderate levels of aquatic vegetation	spring	7-22

Table 7. Species List with Habitat and Spawning Requirements for Stevens Creek Fish Community

Fish Species Status, Trophic and Reproductive Guilds and Sensitivity to Sediment/Turbidity – Stevens Creek

Table 8 was generated by taking the fish community structure of Stevens Creek and classifying the fishery type, Species at Risk status, thermal classification, trophic guild (feeding preference) and their sensitivity to sediment and turbidity for reproduction, feeding, and respiration. Four game fish species were captured between sites one and twelve, spread throughout the system. There is a small weir between sites seven and eight, which would be a migratory obstruction to fish passage in times of low water. According to Cudmore-Vokey and Minns (2002), most species within Stevens Creek are significant to the baitfish fisheries aside from seven species that are significant to the recreational industry and one that is significant to the commercial industry. The fish community structure consists of 11 cool water species, six warm water species and six cool/warm species. One species at risk fish species was captured. All species captured in Stevens Creek had low to medium sensitivity to turbidity for reproduction. Most species had a low to medium sensitivity to turbidity for feeding, aside from banded killifish, Northern pike, rock bass, largemouth bass and yellow perch, which have a high sensitivity. For respiration, most species had high or unknown sensitivity to turbidity except for central mudminnow, golden shiner, brown bullhead, spottail shiner, white sucker, Northern redbelly dace and Northern pike, which have a low sensitivity.

Photo of a Northern pike

Photo of volunteers seining on Stevens Creek

MNR Code	Common Name	Scientific Name	Fishery Type	Status	Thermal Class	Trophic Guild	Sensitivity to Sediment/Turbidity		
							Reproduction	Feeding	Respiration
261	banded killifish	*Fundulus diaphanous*	bait	none	cool	piscivore/ insectivore	M	H	unknown
200	blacknose shiner	*Notropis heterolepis*	bait	none	cool/ warm	insectivore	M	M	H
314	bluegill	*Lepomis macrochirus*	recreational	none	cool/ warm	insectivore	L	M	Unknown
208	bluntnose minnow	*Pimephales notatus*	bait	none	warm	omnivore	L	M	unknown
189	brassy minnow	*Hybognathus hankinsoni*	bait	none	cool	omnivore/ herbivore	M	L	unknown
197	bridle shiner	*Notropis bifrenatus*	bait	special concern	cool	piscivore/ insectivore	M	M	L
281	brook stickleback	*Culaea inconstans*	bait	none	cool	insectivore	L	M	Unknown
233	brown bullhead	*Ameiurus nebulosus*	recreational/limited commercial	none	warm	insectivore	L	L	L

MNR Code	Common Name	Scientific Name	Fishery Type	Status	Thermal Class	Trophic Guild	Sensitivity to Sediment/Turbidity		
							Reproduction	Feeding	Respiration
141	central mudminnow	*Umbra limi*	bait	none	cool/ warm	insectivore/ omnivore	M	M	L
198	common shiner	*Luxilus comutus*	bait	none	cool	insectivore	M	M	unknown
212	creek chub	*Semotilus atromaculatus*	bait	none	cool	insectivore/ generalist	M	M	H
194	golden shiner	*Notemigonus crysoleucas*	bait	none	cool/ warm	omnivore	M	M	L
317	largemouth bass	*Micropterus salmoides*	recreational/past commercial	none	warm	insectivore/ piscivore	L	H	H
342	logperch	*Percina caprodes*	bait	none	cool	insectivore	M	M	H
131	Northern pike	*Esox Lucius*	recreational	none	cool	piscivore	M	H	L
182	Northern redbelly dace	*Phoxinus eos*	bait	none	cool/ warm	herbivore	M	L	L
313	pumpkinseed	*Lepomis gibbosus*	recreational	none	cool/ warm	insectivore	L	M	unknown
311	rock bass	*Ambloplites rupestris*	recreational	none	warm	insectivore	L	H	unknown
202	rosyface shiner	*Notropis rubellus*	bait	none	warm	insectivore	M	M	H
201	spottail shiner	*Notropis hudsonius*	bait	none	cool	insectivore	M	M	H
236	tadpole madtom	*Noturus gyrinus*	limited recreational	none	warm	insectivore	M	L	unknown
163	white sucker	*Catostomus commersonii*		none	cool	insectivore/ omnivore	M	L	H
331	yellow perch	*Perca flavescens*	recreational	none	cool	insectivore/ piscivore	M	H	unknown

Table 8. Summary of Status, Sensitivity and Classification for Fish Community in Stevens Creek

Comparison of Stevens Creek Between 2005 and 2011

The following tables provide a comparison of Stevens Creek between the 2005 and 2011 survey years. Different sections were surveyed in 2011 and 2005; therefore, a comparison has only been made for sections between the mouth and McCordick Road.

Anthropogenic Alterations	2005	2011
None	72	12
"Natural" conditions with minor human alterations	25	14
"Altered" with considerable human impact but significant natural portions	2	41
"Highly altered" by humans with few natural portions	1	33

Between 2005 and 2011, anthropogenic alterations along Stevens Creek have increased significantly. Much of the change can be related to a difference in the macro stream protocol used. In 2010, anthropogenic alterations were further defined, which would have caused some land uses to shift categories. Most of the alterations along Stevens Creek can be attributed to its reduced buffer between the creek and human influence, which occurs in many areas that were surveyed. Other areas classified as altered include road crossings, shoreline armouring and tile drains.

Table 9. Comparison of Anthropogenic Alterations Between 2005 and 2011

Bank Stability	2005 (%)	2011 (%)
Stable	96	89LB, 94RB
Unstable	4	11LB, 6RB

Table 10. Comparison of Bank Stability Between 2005 and 2011

Bank stability has not changed much since 2005. Stability on the right bank has decreased by two percent. Stability on the left bank has decreased by seven percent.

Instream Vegetation	2005	2011
Extensive	11	65
Common	44	21
Normal	24	12
Low	21	2
Rare	0	0
None	n/a	0

Table 11. Comparison of Instream Vegetation Levels Between 2005 and 2011

The amount of instream vegetation has increased. The percentage of common, normal and low levels of vegetation have decreased, and the percentage of extensive levels has increased. Rare levels of vegetation were observed in both 2005 and 2011, but not in the sections being compared.

Photo of the extensive vegetation in Stevens Creek. The vegetation is flowering rush, an invasive species, choking out the stream bed.

Pollution/Garbage	2005	2011
None	82	63
Floating Garbage	11	30
Garbage on Stream Bottom	7	13
Oil or Gas Trails	0	7
Unusual Colouration	n/a	0

Table 12. Comparison of Pollution/Garbage Levels Between 2005 and 2011

The incidence of garbage has increased. In 2005, 82 percent of the sections surveyed were free from garbage which has decreased by almost 20 percent in 2011. There were increases to both floating garbage and garbage on the stream bottom. In 2011, unusual colouration of the stream bed was observed in five percent of the sections surveyed. This category was added to the field protocol in 2008, and therefore cannot be compared with 2005. No oil or gas trails were observed in 2005, compared to seven sections in 2011.

CSW staff and volunteers weighing captured fish

Fish Species	2005	2011
banded killifish		X
blacknose shiner		X
bluegill		X
bluntnose minnow		X
brassy minnow		X
bridle shiner		X
brook stickleback		X
brown bullhead	X	X
central mudminnow		X
Centrarchid spp.	X	X
common shiner		X
creek chub		X
Cyprinid spp.	X	X
Etheostoma spp.		X
golden shiner		X
largemouth bass	X	X
Lepomis spp.	X	X
logperch		X
Northern pike		X
Northern redbelly dace		X
pumpkinseed	X	X
rock bass	X	X
rosyface shiner		X
spottail shiner	X	X
tadpole madtom		X
white sucker		X
yellow perch	X	X
Total	**9**	**27**

Fish sampling was conducted along Stevens Creek in 2005 and 2011. In 2005, two sites were surveyed with a seine net, concentrated at the Roger Stevens crossing closest to the mouth of the stream. Eight species were caught. In 2011, fourteen sites were sampled using a variety of methods (large fyke net, seine net, electrofisher, windemere traps). These sites were spread out between the mouth and the headwaters, and a total of 26 species were captured. The large increase in species caught can be contributed to increased sampling effort and a greater variety of sampling equipment, allowing staff to sample all different types of habitat.

Table 13. Comparison of Fish Species Between 2005 and 2011

The following table highlights past monitoring and restoration efforts that have been carried out in the Stevens Creek subwatershed.

Highlight of Monitoring and/or Restoration Work

Year	Accomplishment	Description
2005	City Stream Watch monitoring	144 macro stream surveys were completed on Stevens Creek by City Stream Watch staff and volunteers.
2005	Two sites sampled for fish by City Stream Watch staff and volunteers	Volunteers and staff captured eight species of fish, including young of the year largemouth bass and juvenile Northern pike
2006	City of Ottawa fish sampling	The City of Ottawa conducted fish sampling between the mouth of Stevens Creek and 2nd Line Road, capturing a total of 18 species over 10 sites. Another site farther upstream was sampled and a total of six species were caught.
2011	14 sites along Stevens Creek were sampled by City Stream Watch staff and volunteers; a total of 25 fish species were captured.	6 volunteers spent a total of 29.5 hours assisting with seine netting and electrofishing. All fish were released live back into the creek.
2011	140 macro stream surveys were completed on Stevens Creek by City Stream Watch staff and volunteers	43 volunteers spent a total of 324 hours carrying out stream habitat surveys on Stevens Creek.
ongoing	RVCA Stewardship projects	RVCA has provided incentive grants for landowners within Stevens Creek subwatershed for a total of 24 tree plantings, 7 butternut plantings and 43 rural clean water projects
ongoing	OBBN monitoring	RVCA staff monitor benthic invertebrates for water quality at one site along Stevens Creek; since 2003 benthos are collected by staff each spring and fall and analyzed in a lab

Table 14. Monitoring and Restoration Highlights in the Stevens Creek subwatershed

Bridle shiner, a species at risk, caught in Stevens Creek

Black swallowtail butterfly

Based on data collected by City Stream Watch staff and volunteers, a variety of projects have been identified along Stevens Creek to help improve environmental conditions. Figure 22 illustrates the potential instream projects, and Figure 23 illustrates the potential shoreline restoration projects. Table 15 summarizes the numbers and details of the projects identified on both maps.

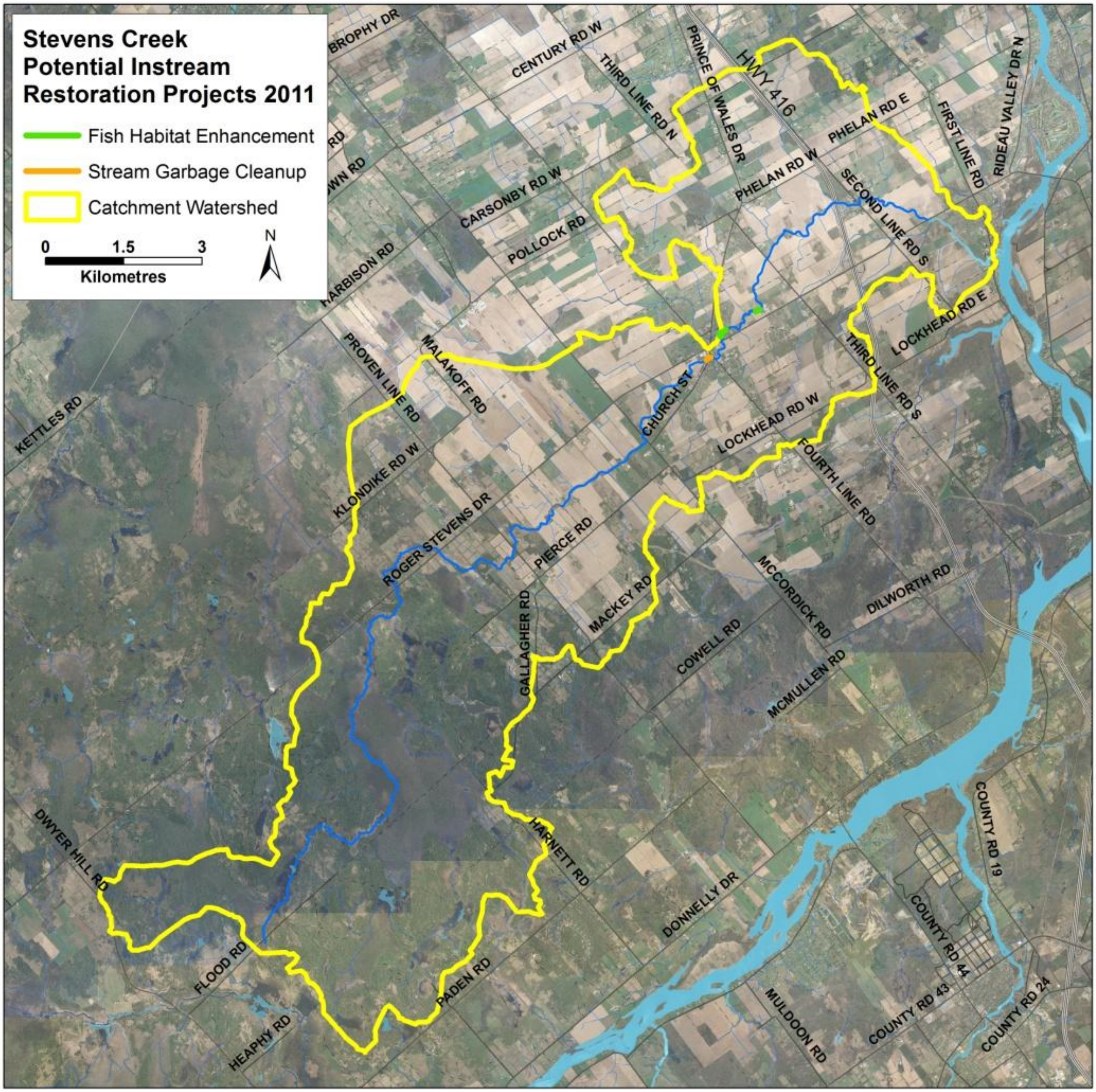


Figure 22. Map of Potential Instream Projects Along Stevens Creek

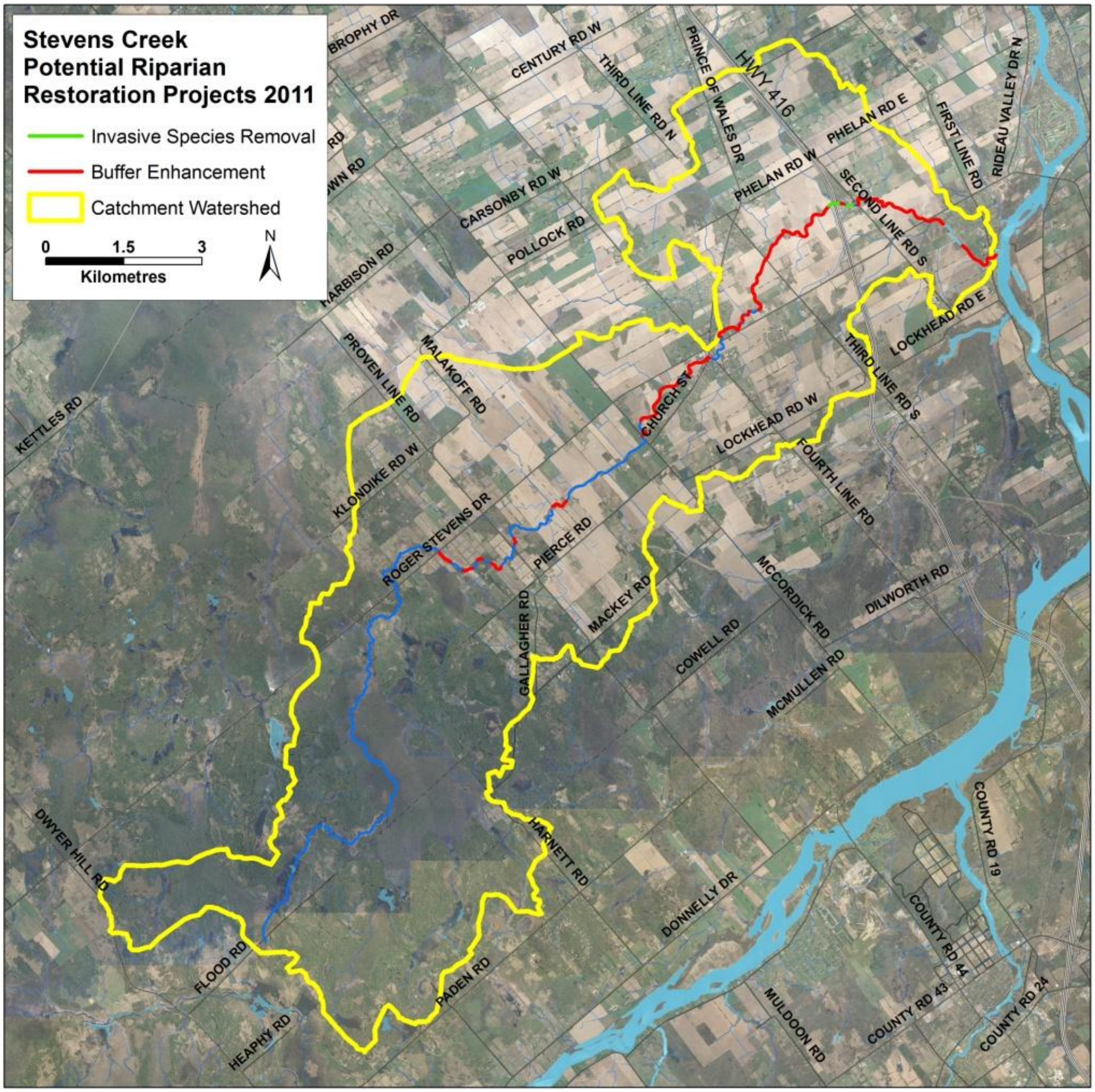


Figure 23. Map of Potential Shoreline Projects Along Stevens Creek

Local Actions for Improvement of Stevens Creek

Type of Project	Description
Riparian Planting/Buffer Enhancement	Riparian plantings and buffer improvements with native species have been identified for 17 sites, for a total of 9.9km of stream
Fish Habitat Enhancement	2 sites have been identified for fish habitat improvements, for a total of 200m of stream; these sites include creating instream habitat structure (root wads, etc.).
Stream Garbage Cleanup	There has been one site identified for a stream garbage cleanup.
Invasive Species Removal	3 sites were identified for flowering rush removal, by following the most up-to-date information on removal methods. If you see a suspected invasive species, you can report it to the Ontario Federation of Anglers and Hunters **invading species hotline: 1-800-563-7711**

Table 15. Potential Enhancement Opportunities Along Stevens Creek

Stevens Creek 2011 Summary Report

For information on the overall 2011 City Stream Watch Program and the volunteer activities, please refer to the City Stream Watch Summary report, 2011. To view the macrostream protocol used, please see the City Stream Watch website:
http://www.rvca.ca/programs/streamwatch/index.html

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