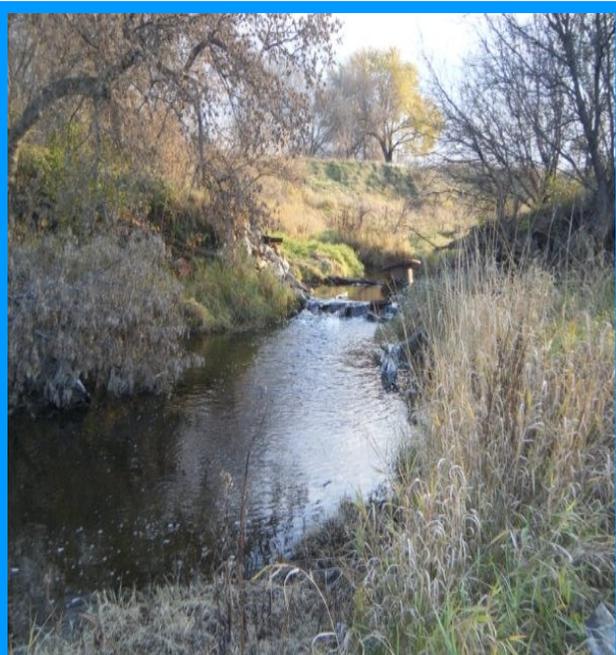


Poole Creek

Macro Stream Assessment Report

Summer 2009



In the summer of 2009, Mississippi Valley Conservation completed a macro stream assessment of Poole Creek. Poole Creek is located along the south-eastern boundary of the Mississippi Valley watershed within the City of Ottawa, in the community of Stittsville (Township of Goulbourn). Poole Creek's headwaters are located in a large Provincially Significant Wetland that is known as the Upper Poole Creek Wetland Complex. This complex is connected with the Goulbourn Wetland Complex, just west of Stittsville. From there, the waterbody drains north-easterly through the village of Stittsville into the Carp River.

Poole Creek Watershed Features

- area of 19.85 km² which covers 0.45% of the entire Mississippi Valley Watershed.
- upper portion typically cold or cool-water stream
- lower reaches considered warm water habitat the closer the watercourse gets to its outlet at the Carp River.

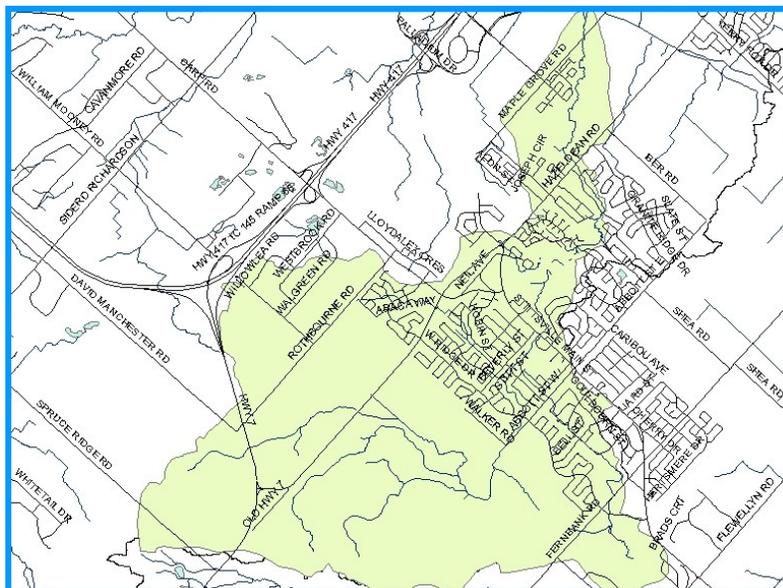


Table 1: Poole Creek Assessment Facts

Poole Creek Assessment Facts				
Assessment was started: June 23, 2009				
Assessment was completed: August 10, 2009				
	MIN	MAX	AVERAGE	
Air Temperature (oC):	11.2	32.9	15.1	26.2
Water Temperature (oC):	15.2	25.5	18.5	
Stream Width (m)	1.39	16.0	4.97	
Stream Depth (m)	0.02	1.20	0.39	

The macro stream assessment was completed using a protocol that divides the entire length of the creek into 100 meter sections and an evaluation package is completed for each 100 meter section that is wadeable. If a section of the creek is un-wadeable because of such factors as the water being too deep or too much sediment deposition, that particular section

of the creek is bypassed and the assessment is continued at a location where the creek becomes wadeable again. The evaluation package assessed such parameters of the watercourse as General Land Use, Bank Stability and In stream Morphology, all which will be discussed in further detail in this report.

Anthropogenic Alterations to Poole Creek

Given the location of the Poole Creek watershed—within the City of Ottawa, in the community of Stittsville—its surroundings are generally urbanized and it is one of the few remaining cold water tributaries within the City of Ottawa. Some sections of the creek have been channelized, or altered, with the spread of urban development in the Stittsville area, but some of the areas remain

considerably natural and provide significant vegetation, wildlife and fish habitat. Anthropogenic alterations to the creek do not only include changes to the creek’s channel itself, but also the riparian vegetation found along the banks of Poole Creek. Over 31 percent of Poole Creek was considered to have no anthropogenic alterations, with the remainder of the creek being divided between two other classifications noted in Chart 1 below. The fourth category, which is not shown in the graph, is highly altered with few areas considered natural environments. It is not in the graph because these conditions were not found along Poole Creek.

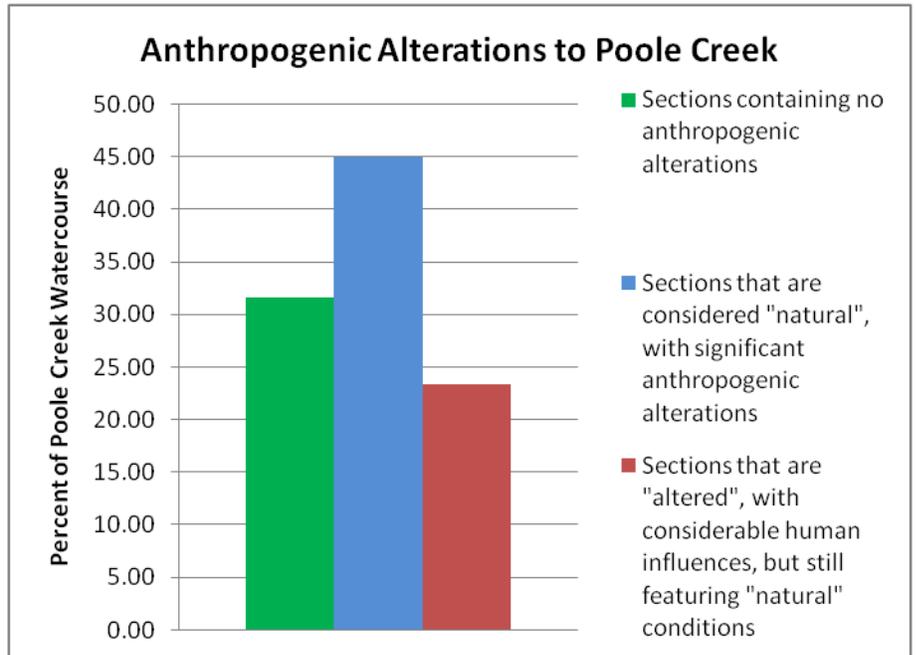


Chart 1: Anthropogenic Alterations to Poole Creek

General Land Use

The macro stream assessment protocol divided the General Land Use criteria into nine different categories adjacent to Poole Creek. The assessment found 68 percent of the land use adjacent to Poole Creek to be natural, which is excellent considering the creek’s urban location. The majority of the natural sections were found closer to the headwaters of Poole Creek as this area has been minimally developed. There are a number of wooded areas that have been maintained throughout the surrounding development along the watercourse of Poole Creek. Some of these areas are found as part of the development upstream of Stittsville Main Street to the headwaters and in the reach between Springbrook Drive and Sweetnam Drive. The other land use categories for the protocol criteria that are found adjacent to Poole Creek included residential, industrial/commercial and recreational and are outlined in Chart 2. The remaining five protocol categories (active agricultural, pasture, abandoned agricultural fields and other) were not apparent in the Poole Creek Watershed at the time of the assessment’s completion.

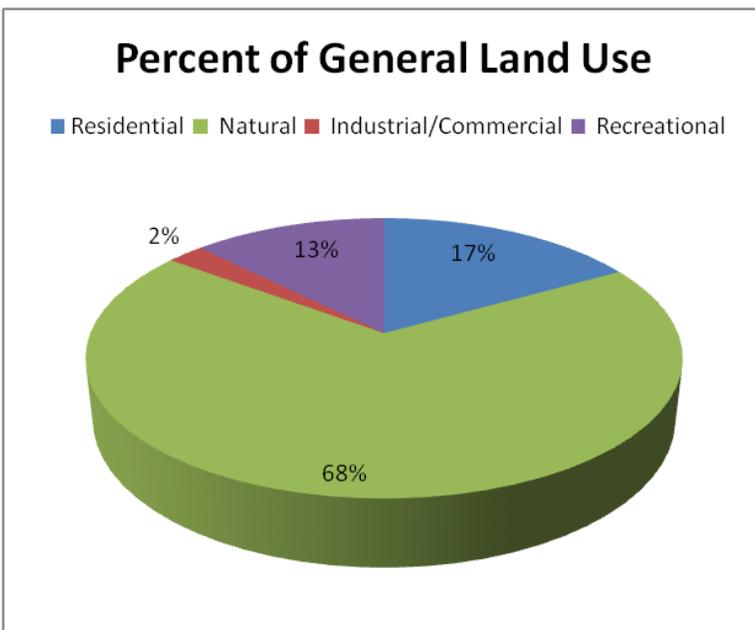


Chart 2: General Land Use Adjacent to Poole Creek

Instream Characteristics

Instream Structure and Substrate

Poole Creek contains various kinds of substrate throughout the watershed. This assessment looked at nine different substrate types and ranked them from 1 to 3 based on their dominance in each section with a ranking of 1 being the most dominant and 3 being the least dominant. Diverse substrate is important for fish and benthic macroinvertebrate communities because some of the species can only live in certain types of substrate and some species require certain types of substrate for reproduction. Therefore complex variations in the substrate allows for a more diverse fish and benthic community by providing the necessary habitats for these species; which in return allows for an overall healthier and more resilient stream.

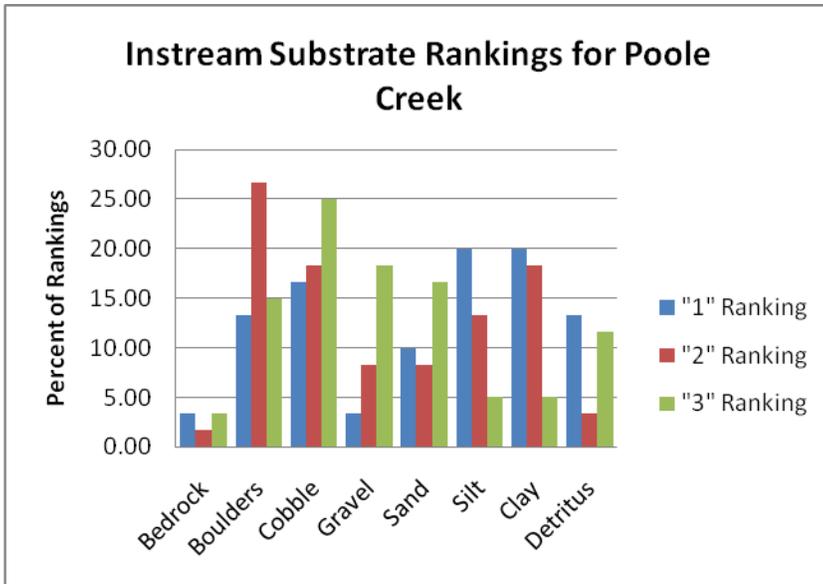
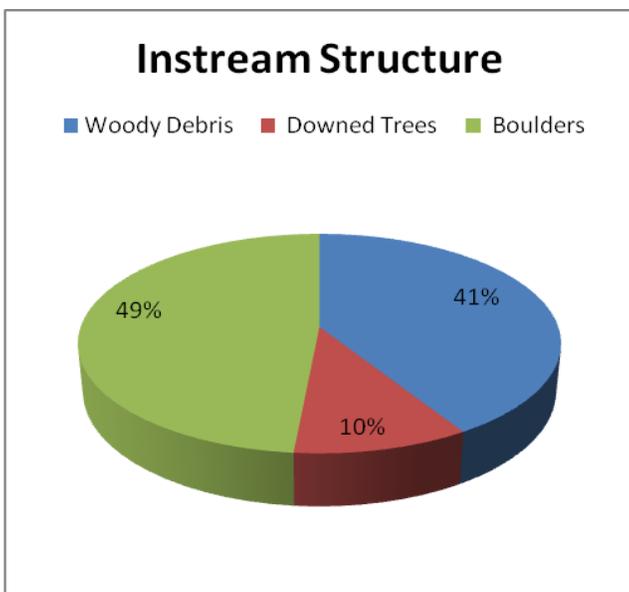


Chart 3: Instream Substrate Rankings for Poole Creek

As Chart 3 outlines, the diversity in the amount of different substrate types is exceptionally good. With Poole Creek being a free flowing cool/cold water stream, the dominance of the boulders and cobble substrate is typical. Boulders and cobble provide needed shelter for fish species and also provides essential habitat for benthic species such as caddisflies, stoneflies and mayflies. The gravel substrate was also fairly abundant throughout the creek, and is a very important substrate as it provides critical nursery habitat for fish species found within Poole Creek.

The structure found within the stream was characterized and evaluated in three different categories; woody debris, downed trees, and boulders. Boulders were looked at in more depth as they provide significant shelter habitat for fish and benthic species, but also can enhance the flow of water as well as the amount of dissolved oxygen in parts of the creek where they are found. When water flows over boulders and it drops off of the boulder, this creates a rolling section of water at the base of the boulder which allows for more dissolved oxygen to be created.

Woody debris and downed trees within the creek also provide fish habitat, and can have an effect on water movement within the creek. Trees and woody debris can block waterways and impede water movement creating pooling, as well as providing cover from predators. The breakdown of woody material within the creek adds to the presence of detritus which feeds the food chain.



Poole Creek was found to have boulders through almost half of its watercourse. A large number of the boulders



within the stream were located in the more free flowing stretches that are found in the sections of Poole Creek located near its headwaters by West Ridge Drive to Stittsville Main Street and from Sweetnam Drive to Hazeldean Road.

Stream Morphology

The morphology of Poole Creek was characterized the same way as the previous assessment categories have been evaluated, by estimating a percent value for the amount of each feature contained within the creek. Riffles and pools are extremely important for fish habitat. Riffles are sections of moving or agitated water that provide dissolved oxygen for the stream. Riffles also provide spawning habitat for some species of fish such as brown trout that are found within Poole Creek as they like to spawn in shallow, gravelly, well oxygenated waters. Pools provide shelter for fish species and with pools being generally deeper than riffles, they provide refuge for fish species in the summer months when water levels tend to drop and water temperatures increase. Runs in a creek tend to be noted as the moderately shallow areas that have unagitated surfaces of water. The deepest part of the channel (known as the thalweg) usually is located in the center of the channel in run areas of a creek. Poole Creek was assessed as being almost completely composed of run morphology, with 88 percent of the overall creek length being considered runs. Riffles and pools made up the rest of morphology characteristics at 8 and 4 percent, respectively, of the entire length of Poole Creek.

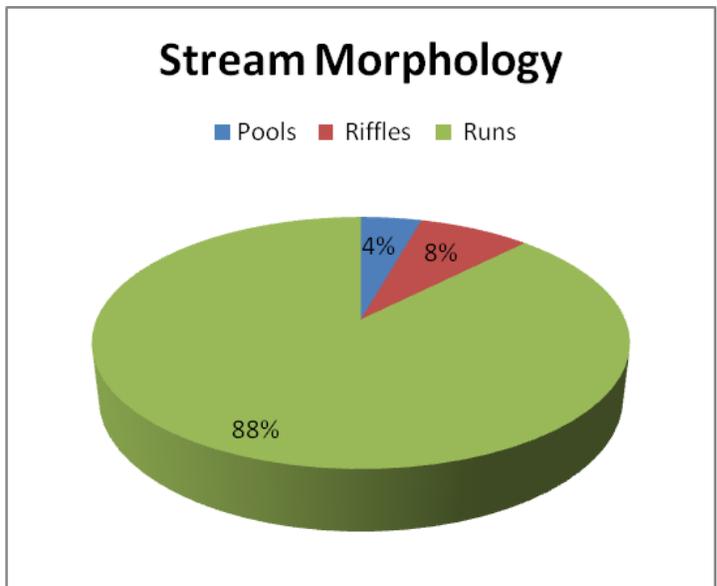


Chart 5: Stream Morphology of Poole Creek

Instream Vegetation of Poole Creek

Instream vegetation for Poole creek was categorized in 5 different categories. These categories classified the instream vegetation as being extensive (choked with weeds), common (more than 50% vegetation), normal (25-50% vegetation), low (less than 25% vegetation) and rare (instream plants are scarce). The assessment categorized the instream vegetation as being normal and rare category for 28 percent of the creek and low for 25 percent of the creek.

The remainder of the sections sampled classified instream vegetation as being common for 15 percent and extensive for 4 percent of Poole Creek. A moderate amount of instream vegetation is important because it

provides habitat for fish and wildlife and also enhances dissolved oxygen within the creek. It provides bank stability and prevents bank erosion by creating a root base that holds soil particles together.

Little or no vegetation can have negative effects on fish and wildlife species that inhabit the creek by not providing enough cover, or refuge areas. Extensive vegetation can have a negative impact because it can "choke" a water way and reduce the movement of aquatic organisms in the creek. Too much vegetation can also deplete the dissolved oxygen within the creek when it decomposes. There is a fine balance between these categories and having the full spectrum represented provides a diverse habitat for the wildlife to take advantage of for each stage of life and needs to forage, shelter, and reproduce.

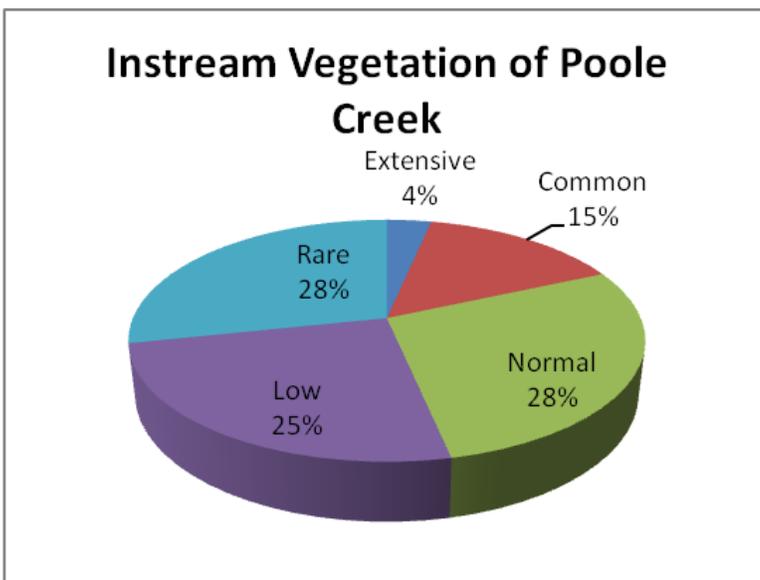


Chart 6: Instream Vegetation of Poole Creek

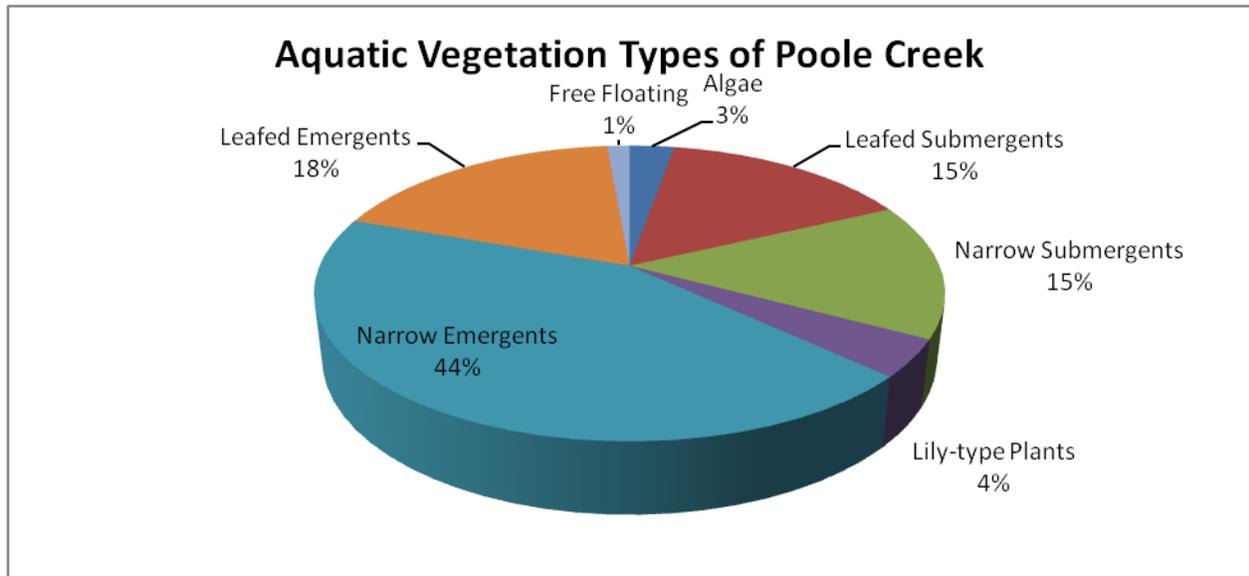


Chart 7: Aquatic Vegetation Types of Poole Creek

The types of aquatic vegetation were categorized into seven different vegetation categories. These categories were algae, leafed and narrow submergents, lily-type plants, narrow and leafed emergents, and free floating vegetation. As seen in Chart 7, narrow emergent vegetation was the most dominant of all vegetation types found in the sections

sampled with a value of 44 percent. Leafed emergent vegetation was next with 18 percent, narrow and leafed submergents both had values of 15 percent and lily-type plants were found in 4 percent of the sections sampled. Algae and free floating vegetation made up the remainder of Poole Creek’s vegetation at 3 and 1 percent respectively.

Bank Characteristics

Bank Stability

The banks of Poole Creek for the majority were found to be stable with 84 percent of the banks having little or no erosion. The categories of unstable and undercut banks were tied at 8 percent a piece. The majority of Poole Creek banks are considered to be of a low slope, leading to generally more stable banks. If the banks tend to be of steeper grade there is a significant amount of pressure put upon the banks when there is a significant rise in both the water level and flow, which leads to bank erosion. If the banks are of a lower grade, there is not as much resistance when water levels and flows increase, therefore there is less bank erosion occurring, which leads to more stable banks. The bank slope of both the right and left banks was looked at more in depth to categorize the severity of the bank slope in each section. The categories evaluated the banks as being either very steep (>25%), steep (16-25%), moderate (9-15%), low (4-8%) and broad flat banks. As mentioned above, the majority of Poole Creek banks were considered to be low slope. Of the sections sampled, 31.67 percent of the left bank and 30 percent of the right bank were in the low bank slope category. Moderate and broad flat banks made up the next two biggest values and a minimal amount of the sections sampled were considered to have steep or very steep banks.

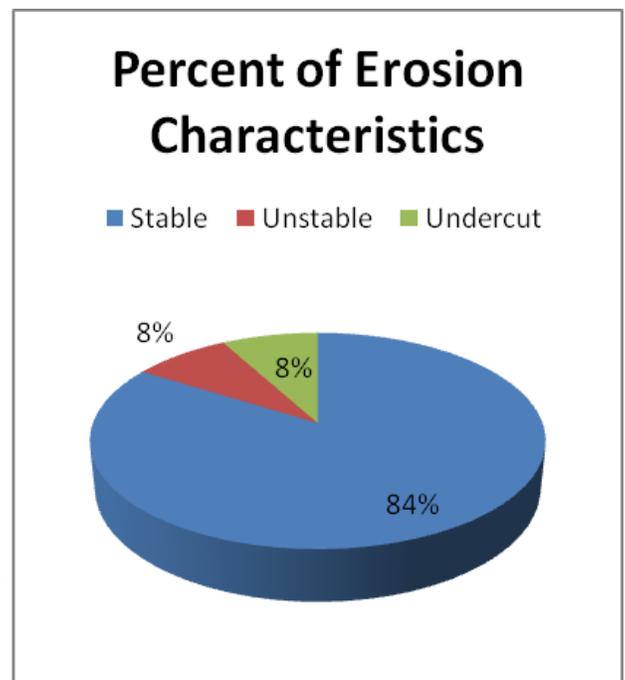


Chart 8: Percent of Erosion Characteristics

Bank Composition

The composition of the left and the right banks were looked at to evaluate the materials that the banks were composed of and the materials potential to create future erosion. The composition of both the left and right banks seemed to be almost identical to one another with organic material being the most abundant of all bank materials at 46.83 and 46.67 percent, respectively, of all the sections sampled. Clay (18.25, 18.33), silt (20.25, 20.08) and sand (24.33, 27.67) were the other three major types of bank materials to make up Poole Creek's bank composition. The high amount of organic material composing Poole Creek's banks shows that there is a significant amount of root base from vegetation holding the banks together, which as outlined previously, leads to generally more stable banks. Clay type soil consists of very fine particles that have a tendency to bind together, therefore making for even greater bank stability and resistance to erosion.

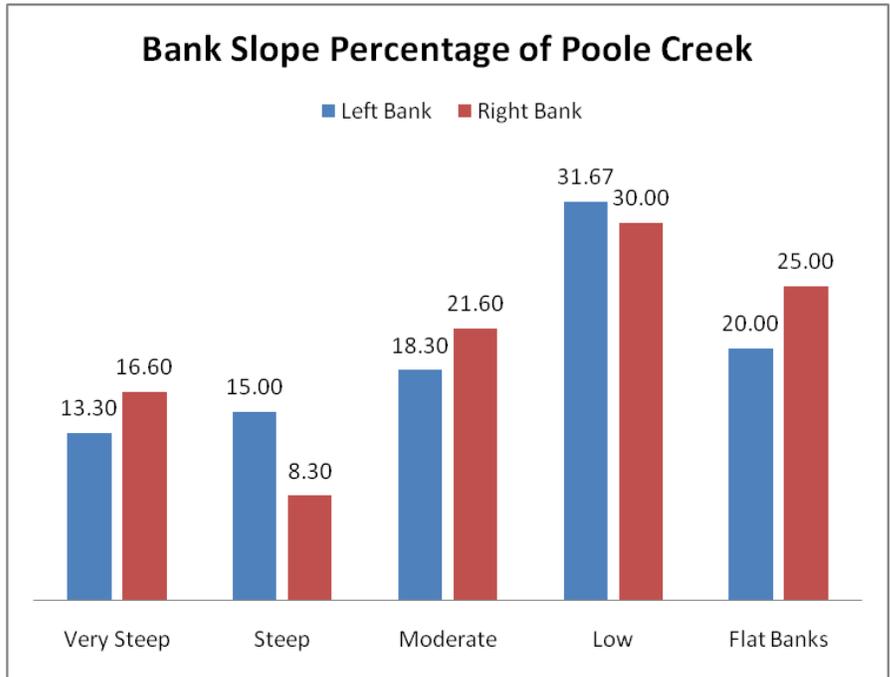


Chart 9: Bank Slope Percentage of Poole Creek

The bank vegetation along Poole Creek was also evaluated to assess the different types of plant communities that inhabit Poole Creek. Riparian vegetation along a stream is very important in preventing bank erosion as the roots dramatically increase the stability of the stream banks by holding soil particles together. Vegetation whose roots have a greater tensile strength makes for increased bank stability. The increased tensile strength holds soil particles together more efficiently which enhances the prevention of bank erosion. This assessment looked at ten different vegetation communities which included coniferous tree, deciduous tree, dead trees, woody shrubs, tall and short grasses, agricultural crops, wetland

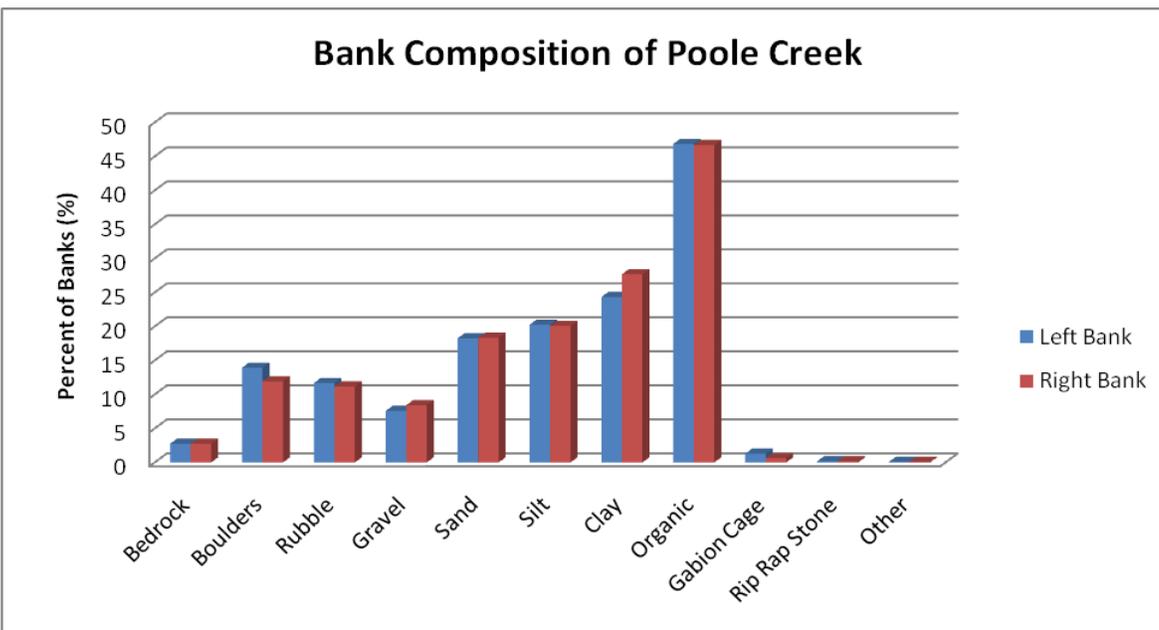


Chart 10: Bank Composition of Poole Creek

vegetation, ferns and mosses (Chart 11). Tall grass species was the most noted vegetation type found along the banks of Poole Creek with values of 46.5 percent for the left bank and 47.33 percent for the right bank of all sections sampled.

Bank Vegetation

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Short grass and woody shrubs were the next most abundant vegetation types with values ranging from 21 to 26 percent of all sections sampled. Wetland vegetation species were present along the creek but as the above chart outlines not to a great extent. This result is mainly because the areas where the majority of the wetland vegetation species were present were non-navigable. Most wetland areas were unable to be evaluated during the assessment, leading to a reduced percentage of wetland vegetation species in the sections sampled.

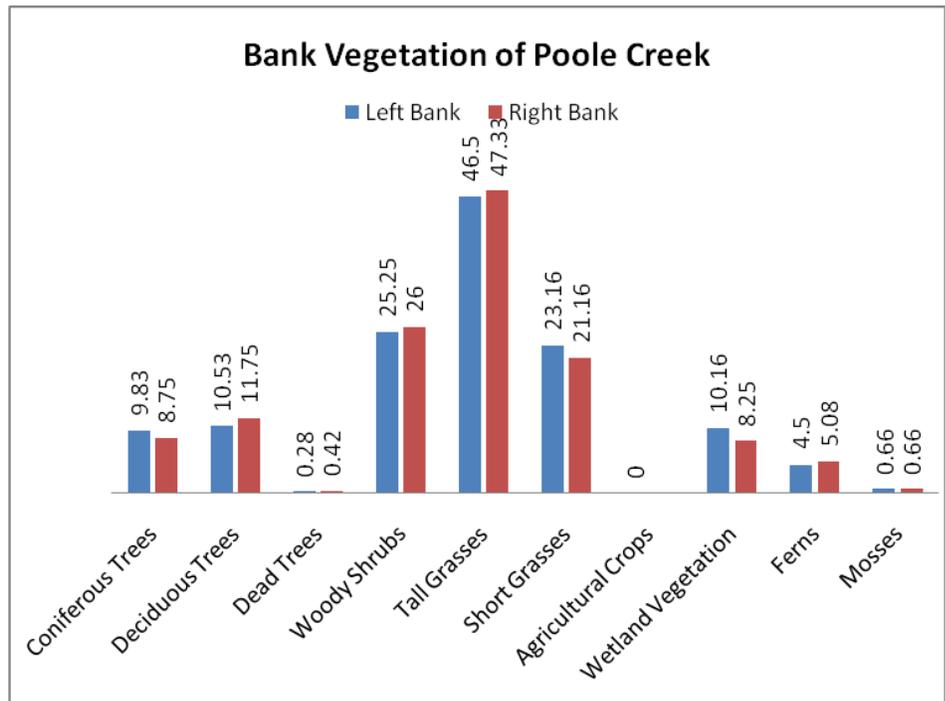


Chart 11: Bank Vegetation of Poole Creek

Pollution and Garbage in Poole Creek



Pollution and garbage within Poole Creek was very substantial and apparent in certain areas. Given Poole Creek's urban location, the potential for residential

waste entering the creek is fairly high. There were a lot of building materials (ie. Lumber, wood pallets, concrete blocks, etc.) found within the creek, some of which had created "dams" in certain areas gathering debris and impeding natural flow. There was also a lot of other residential waste found within the creek which included bicycles, glass and plastic bottles, road signs, shopping carts and tires. There were minimal amounts of oil or gas trails noticed in the water of Poole Creek. Overall, the amount of garbage within Poole Creek can be a cause for concern as it can negatively affect fish and wildlife habitat and also the quality of the water.

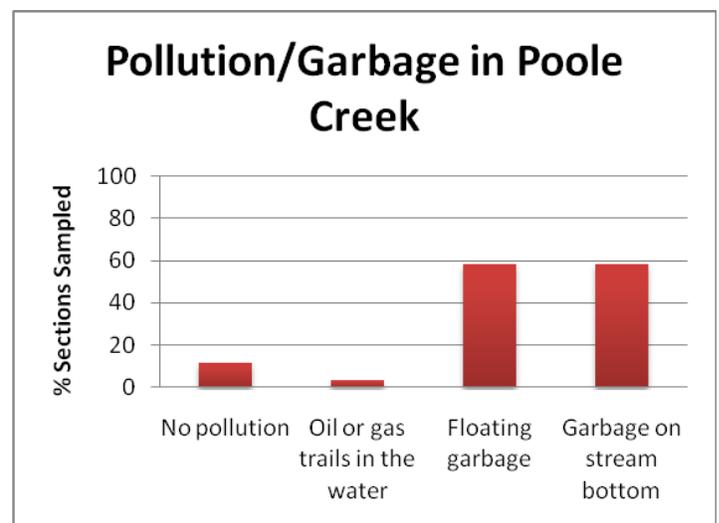


Chart 12: Pollution/Garbage in Poole Creek

Fish Habitat

Poole Creek is one of a handful of cool/cold water bodies within the City of Ottawa area and it provides critical nursery habitat for fish species located within Poole Creek. With the upper portion of Poole Creek being of a cool/cold water nature, it is able to support such cold water fish species as mottled sculpin and brown trout. These species favor the cooler, clear, more-oxygenated water. However past urban development has degraded the aquatic habitat of Poole Creek. The two primary constraints on the fish habitat are stream temperature and lack of baseflow, which are creating stressors on fish species such as the brown trout.



The Kemptville Ministry of Natural Resources (MNR) has stocked Poole Creek with 4,100 brown trout from 2001 to 2009. The trout have been stocked in the upper portions of Poole Creek located upstream of Sweetnam Drive, where the creek tends to have cooler temperatures, and more suitable habitat. MVC completed a fish community survey with an electrofisher on a stretch of Poole Creek upstream of Hazeldean Road in August of 2009. In total, 89 fish were collected and identified. There was a great diversity of species collected that included golden shiner, creek chub, pumpkinseed, rock bass, finescale dace, blacknose dace, common shiner, central mudminnow, Johnny darter, Iowa darter, bluntnose minnow and mottled sculpin.

In 2005, the City of Ottawa, in cooperation with MVC, completed creek improvements on the stretch of Poole Creek located between Jonathon Pack Street and Wildpine Court. The creek improvements were done to enhance the overall aquatic habitat and included the removal of fish barriers and the construction of fish habitat features such as cover boxes for the brown trout to use as shelter.

Water Quality

Water quality samples have been collected on Poole Creek since 2005 at the Johnathan Pack Road crossing as part of the Provincial Water Quality Monitoring Network (PWQMN). Samples are grab samples that are collected monthly from April to November and are tested for 34 parameters such as biochemical oxygen demand (BOD), pH, conductivity, total phosphorous, total suspended solids (TSS) and nitrites (Table 2).

Benthic macroinvertebrates are small animals without back bones that inhabit stream bottoms and include immature forms of aquatic insects such as dragonfly and stonefly nymphs as well as crustaceans such as crayfish and mollusks. These are great indicators of water quality because they do not migrate far and different species have varying

tolerances to stressors such as organic pollutants, low oxygen levels, etc.

Once the benthos are identified and counted, the numbers of each taxa are put into a spread sheet to determine a numerical value from the Hilsenhoff Index. The Hilsenhoff index uses biotic indices (BI) of organic pollution to evaluate water quality by producing tolerance values for benthic families creating a family-level biotic index (FBI). The FBI determines the overall water quality for the sampling location where the benthos were collected. Poole Creek was sampled for benthos at the Hazeldean Road crossing in October of 2009 using the OSAP guidelines for benthic sampling. The site was determined to have a Hilsenhoff index value of 6.04 for the site, categorizing the site to have fairly poor water quality. Table 3 shows the full range of FBI values and how that correlates to water quality.

Table 2: Poole Creek Water Quality Data

Poole Creek Water Quality Data								
Parameter	Units	*MDL	April	May	June	August	September	October
Biochemical Oxygen Demand (BOD)	mg/L	1	<1	5	2	<1	<1	<1
Conductivity	uS/cm	5	897	1030	1040	972	856	216
pH			8.06	8.22	7.98	8.11	8.03	8.03
Total Phosphorous	mg/L	0.01	<0.01	0.01	0.04	0.02	0.02	<0.01
Total Suspended Solids (TSS)	mg/L	2	4	7	9	2	<2	<2

* Method Detection Limits

Water Quality cont'd

Table 3: Family Biotic Index (Hilsenhoff)

Family Biotic Index (Hilsenhoff)		
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 - 10.0	Very Poor	Severe organic pollution likely

Wildlife Observed

There were various species of wildlife spotted during the 2009 assessment period of Poole Creek.

Various bird species such as American and Least Bitterns, robins, kingfishers, red-winged blackbirds and blue jays were observed as well as some mammal species such as meadow voles and red squirrels. There were a few different types of aquatic benthos observed like leeches, crayfish and water striders. Amphibians such as green frogs and leopard frogs were noticed and also some painted turtles were observed.

References

- Upper Poole Creek Subwatershed Study, City of Ottawa. Marshall Macklin Monaghan, 2000. http://www.ottawa.ca/residents/environment/city_hall/getgreen/development/subwatershed/completed/upper_poole_en.html
- Mississippi Valley Conservation Authority (MVCA). (2009). Ontario Stream Assessment Protocol (OSAP) Benthic Sampling.
- Mississippi Valley Conservation Authority (MVCA). (2009). Ontario Stream Assessment Protocol (OSAP) Fish Community Survey.



Mississippi Valley Conservation