AQUATIC ENVIRONMENTAL STUDY – KANATA WEST CONCEPT PLAN

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1.0 INTRODUCTION

The Kanata West Concept Planning Area is located in the headwaters of the Carp Watershed and the land base drains to the following tributaries:

- **Hazeldean Tributary** – a small intermittent drainage feature draining to the Carp River near the south boundary of the planning area (Photo 7);

- **Poole Creek** – a permanent tributary with headwaters in Stittsville, draining to the Carp River across the south third of the planning area south of the Queensway (Photos 1 to 3);

- **Feedmill Creek** – a permanent tributary with headwaters in the vicinity of the Carp Road interchange, draining across the north limit of the planning area, north of the Queensway (Photos 4 to 6); and

- **Carp River** – the permanently flowing headwater segment of the Carp River flowing north from the Glencairn flood control facility along the east boundary of the planning area (Photos 9, 10, 12 and 13) and continuing north across Richardson Road to ultimately discharge into the Ottawa River at Fitzroy Harbour.

The Carp River watershed occupies some 270 sq km of mostly rural and agricultural lands northwest of Ottawa, with its headwaters in former municipalities of Stittsville and Kanata. The watershed is currently the subject of a watershed study being carried out by the City of Ottawa in cooperation with its adjacent municipalities, Mississippi Valley Conservation Authority and provincial agencies. The environmental studies for the Kanata West Planning Area were completed in conjunction with studies of the Carp Watershed Study.

The drainage area of the Carp River at the downstream limit of the planning area is about 45 sq km including the drainage areas of Feedmill, Poole and Hazeldean Creeks which are about 12, 20 and 2 sq km, respectively. Roughly equal proportions of the planning area drain to Poole, Feedmill and the Carp headwaters segment.

2.0 AQUATIC COMMUNITIES

Fish and benthic invertebrate communities were sampled at selected stations within the planning area, as well as throughout the Carp River Watershed in 2001. Fish were sampled using an electrofisher and recording the area sampled and fishing time; invertebrates (aquatic insects, clams, crayfish, etc.) were collected using either a Ponar grab (fine sediments) or a Surber (coarse sediments).

The diversity and abundance of fish and aquatic invertebrates and the assessment of the condition of the habitats upon which they depend have long been recognized as “indicators” or “barometers” of the health/environmental condition of the stream and adjacent watershed through which it flows. Biological indices, which are methods of ranking the condition of a stream based on its biological community are also used to separate healthy streams from streams which have been negatively affected by land use changes and sources of contamination. Repeated monitoring of the biological communities in a stream can also be used to show trends in the quality of stream habitats, indicate whether conditions are improving or worsening and provide evidence as to the nature of the source of the problem, such as loss of physical habitat (lack of flow, sedimentation of substrates), nutrient enrichment, toxic substances, etc.

Sample locations relevant to the planning area are shown on Figure 1 as follows:

- **Carp River**: Station 5 (Photo 9) at Hazeldean Road, upstream of the Planning Area, and Stations 4, 4a at Richardson Road and Huntmar Drive, respectively, downstream of the planning area;
- **Poole Creek**: Station 6 at Maple Grove Road (Photo 1) near the creek mouth and Station 7 upstream of the planning area (Photo 2);
- **Feedmill Creek**: Station 9 at Huntmar Drive (Photo 4) near the creek mouth and Station 10 at Palladium Drive (Photo 5) near the upstream boundary of the planning area; and
- **Huntley Creek (Station 13) (Photo 8) and Glencairn Tributary (Station 11a) (Photo 11)**: These stations represent reference locations reflecting a rural tributary and an urban tributary, respectively.

Results of the fish inventory for all Carp watershed stations are provided in Appendix 1.

Based on the fish communities present in the Carp watershed, five communities were identified:

1. **Tolerant Coldwater Fish Community**: This community includes cold/cool water species, such as brown trout, slimy sculpin, hogsucker as well as some intolerant warmwater species such as rock bass, fantail/rainbow/Iowa darter. This community type occurs in Poole, Feedmill and Huntley Creeks.

2. **Diverse Moderately Tolerant Cool/Warmwater Fish Community**: This community includes rock bass, smallmouth bass, northern pike, walleye (seasonally), redhorse sucker species, and a number of sensitive minnow species (blackchin shiner, blacknose shiner, rosyface shiner, mimic shiner). This community occurs in the lower Carp River, but also in Poole Creek upstream of the planning area.

3. **Tolerant Warmwater Fish Community**: This community includes longnose dace, creek chub, white sucker, common shiner, pumpkinseed, mudminnow and Johnny darter. This community generally occurs in the mid-reaches of the Carp River, downstream of the planning area as well as the Glencairn tributary.

4. **Degraded Warmwater Fish Community**: This community includes fathead minnow, bluntnose minnow and brook stickleback. This community occurs in the Carp River through and upstream of the planning area.

5. **Intermittent Streams**: These streams do not support a fish community on a permanent basis. This includes the Hazeldean tributary.

A summary of the biological indices and indicators for the fish and invertebrate communities is provided in Table 1, including an overall ranking based on all the indicators.

The Poole (Photos 1 to 3) and Huntley Creek (Photo 8) stations had the highest IBI (fish index) score indicated good quality habitat conditions, followed by the Feedmill and Glencairn tributaries with fair conditions. Habitat conditions in the Carp River were poor at the upstream location, improving to fair at Richardson Side Road.

Based on an assessment of habitat conditions at these locations, the best stations (Poole and Huntley) were characterized as follows:

- good baseflow conditions;
- relatively well developed pool:riffle morphology with relatively deep pools and coarse substrates in the riffle;
- good diversity of in-stream habitats, including coarse substrates (cobble and boulders), overhanging banks and large woody debris in the channel;
- cool water temperatures; and
- relatively well vegetated streambanks with both woody species and grasses.

Feedmill Creek (Photos 4 to 6) also exhibited these conditions; however, it lacked the deeper pools that could harbour the basses. The Glencairn Tributary (Photo 11) exhibited poorer habitat conditions than Feedmill yet scored similarly in total species and IBI. It did, however, have good baseflow conditions, which was the primary factor limiting fish diversity.

The Carp River at Hazeldean (Station 5) (Photos 9 and 10) had the poorest habitat. The stream is wide and very shallow, with poor in-stream habitat consisting of soft substrates and algae. Water temperatures were high and there was no pool or riffle habitat. Some improvement occurred downstream at Station 4 (Photo 13) where water depths were greater and aquatic plants were abundant, providing in-stream habitat. There was also some large woody debris in the channel. At this location, the Carp River is a riverine wetland stream type.

The benthic invertebrate indices (EPT, WQI) are generally considered to reflect water quality conditions. The benthic invertebrate results were generally similar to the fish community results, although the Glencairn Tributary and Huntley Creek scores indicated poorer water quality conditions than Poole Creek and Feedmill Creek, and were more similar to the Carp River stations. These results indicate water quality impairment at these locations, likely nutrient enrichment.

In the overall ranking, Poole Creek stations ranked highest, followed by the Feedmill stations and Huntley Creek. The Glencairn Tributary and the downstream Carp River station ranked higher than the upstream Carp station.

Overall, the Poole Creek and Feedmill Creek are the most sensitive streams within the Carp Watershed, and exhibit a fish community that is considered to be a tolerant coldwater community. The Hazeldean Tributary does not provide fish habitat, and the main Carp River supports a degraded fish community.

3.0 AQUATIC HABITATS AND STREAM MORPHOLOGY

There is approximately 2,200 m of lower Feedmill Creek and about 2,000 m of Poole Creek that pass through the planning area. The eastern boundary of the planning area includes the floodplain and a 3,000 m segment of Carp River. There is also about 1,000 m of the Hazeldean Tributary within the planning area; however, the lower part of this tributary lacks a defined channel (Photo 7).

No areas of groundwater discharge were observed along the stream channels within the planning area; however, discharge areas were noted upstream of the planning area on Poole Creek and Feedmill Creek. Although no discharge areas were observed, some may still be present in the study area. The near-drought conditions in the summer of 2001 may have lowered the shallow groundwater table to eliminate discharge within the stream reaches in the planning area. Mottled sculpin, a cool/cold water fish, were captured in Feedmill Creek and Poole Creek in the study area despite water temperatures above their preferred range. Their presence suggests that they may use groundwater discharge areas as coolwater refuges under these conditions.

Poole Creek and Feedmill Creek

These watercourses exhibit generally similar morphology and habitat characteristics, although the drainage area of Poole Creek is roughly twice the size of the Feedmill Watershed. Through the planning area, these streams gradually transition from typical pool:riffle morphology with gravelly substrates (Rosgen C-E4 types) with gradients >0.2% to flooded riffle:flat morphology verging on braided/anastomosing channels or riparian wetlands with aggrading beds of fine (sand-silt) sediments and gradients (<0.2%).

Bankfull dimensions are as follows:

	Discharge (m^3/s)	Width (m)	Depth (m)
Poole Creek	2.0 to 2.5	2.5 to 3.0	0.7 to 1.0
Feedmill Creek	2.0	2.0 to 2.5	0.5 to 0.7

Fluvial geomorphology investigations (Robinson Consultants *et al.*, 2001) from the Carp Watershed Study indicate that both Feedmill Creek and Poole Creek in the planning area are not stable, and have insufficient stream power to carry current sediment loads leading to aggradation near the creek mouths. This accumulation of fine sediment is causing the streams to gradually lose their riffle:pool morphology (Photos 1, 2, 4 and 5) and transition into an anastosmosing or riparian wetland form (Photos 9, 12 and 13).

From a fish habitat perspective, a continuation of this process would cause a shift in the fish communities here from a sensitive cold/cool water type to a tolerant or degraded warmwater fish community. Efforts are required to manage stormwater within the planning area to offset this trend, which is further complicated by sediment accumulation that has occurred in the Carp River at the mouths of these creeks.

While both creeks exhibit typical "C" channel morphology upstream (Photos 1, 2, 4 and 5), it is apparent from examining the lower reaches of other tributaries, such as Huntley Creek and Corkery Creek, that the historic morphology in the lower reaches may have approached an "E" channel morphology (Photos 8 and 14). Using the Rosgen classification system as a guide, this would suggest that meander belt widths for these lower reaches historically were in the order of 20 to 40 times the bankfull width or 100 to 120 m for Poole Creek and 80 to 100 m for Feedmill Creek, which may extend beyond the floodplain limits of these watercourses.

Riparian vegetation adjacent to Poole Creek and Feedmill Creek through the planning area is generally grasses and forbs (about 40 to 60% of the stream length), with landscaped areas making up 10 to 30% and trees (white cedar, willow, other deciduous trees) making up <30% of the stream length. Efforts should be made to restore forested cover to about 70% to assist in providing stream shading.

In general, in-stream cover is adequate in the form of deep pools, woody debris and boulders/cobble in the upper sections of these streams in the planning area; however, some in-stream structure could be provided in the lower reaches, once instabilities have been addressed.

Carp River

The Carp River through the planning area is a wide, shallow, straightened "flat" with a substantial accumulation of soft (sandy silt) sediments in excess of 1 to 1.5 m on the streambed (Photos 3, 9 and 12). The stream margins are edged with cattails, and aquatic plants and algae are abundant in the stream channel. Much of the channel along the planning area and upstream to the Glencairn flood control facility has been dredged historically straightening and widening the channel and increasing the bank height beyond its historic elevation.

Currently, channel dimensions are about 5 to 7 m wide with depths of about 0.20 to 0.30 m. These are not bankfull dimensions, but likely reflect the dredged width. Historically, the Carp River in this area was likely a riparian wetland, perhaps even a large headwater wetland similar to the wetlands that occur in the upper reaches of Feedmill, Poole and Huntley Creeks.

The extensive accumulation of soft sediments in the streambed and the lack of flow create a degraded habitat for fish. This habitat is more or less unchanged until the confluence with Huntley Creek near Huntmar Road. Downstream of this point, the river appears to have more capacity to move its sediment load and the channel becomes deeper, more morphologically diverse and contains large woody debris which increases habitat complexity. This combination

of improved flow, habitat structure and stream depth creates habitat for species such as northern pike and basses, and larger minnow species such as common and redhorse suckers.

Riparian habitat consists of grasses and forbs and manicured area with no trees.

Efforts were made in the vicinity of Palladium Drive to create floodplain pools that would support spring spawning species, such as northern pike, and potentially create deeper refuge areas off the main channel. It is not clear whether these are used in spring; however, in summer, they appear to be stagnant and do not offer fish habitat.

The best enhancement opportunities for the Carp River through the planning area would appear to be restoring a riparian riverine wetland here. Because of the extensive dredging that would be required to adjust the bed slope to a lower historic elevation, dredging is not likely an option.

Possible enhancements could include:

- floodplain wetlands (aeration would be required or sited at discharge of stormwater management facilities);
- narrowing of the channel at intervals to allow the stream to create some scour pools;
- increasing channel sinuosity;
- riparian tree plantings; and
- placement of large woody debris in the channel to create habitat structure and promote channel scouring.

TABLE 1: SUMMARY OF FISH AND BENTHIC INVERTEBRATE ASSESSMENT

Station	Fish Community						Benthic Community				
	Sculpins	Basses	Darters	No. Species	IBI Score	IBI Rank	No. Species	EPT Index	WQI Index	Benthic Rank	Overall Rank
4[1]/4a		X	X	9	27	3	16	0	6.6	1	4
5[1]				9	19	2	29	0.5	3.4	1	3
6	X	X	X	20	35	4	37	7.5	6.8	3	7
7		X	X	13	37	4	38	13.5	9.3	3	7
9[1]	X		X	14	29	3	18	6.5	5.7	3	6
10	X			12	31	3	29	10	12.2	3	6
11a[1]			X	11	31	3	8	0	1.6	1	4
13[1]	X	X	X	16	37	4	37	2	3.8	2	6

[1] .....

APPENDIX A

Photo Legend

1. Poole Station 6
2. Poole Station 7
3. Poole at Maple Grove Road
4. Feedmill Station 9
5. Feedmill Station 10
6. Feedmill at Huntmar Road
7. Hazeldean Tributary
8. Huntley at Huntmar Road
9. Hazeldean Carp Station 5
10. Carp Downstream of Hazeldean Road
11. Glencairn Tributary
12. Carp at Maple Grove Road
13. Carp at Richardson Road
14. “E” Channel Morphology (Marathon)