

City of Stratford: Natural Heritage Inventory (June 2004)

Prepared by the Upper Thames River Conservation Authority

Primary Authors:

Jeff Brick, Coordinator
Hydrology and Regulatory Services

Tara Tchir, Ecologist



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Executive Summary

The Stratford Natural Heritage Study (June 2004) includes a description of the natural heritage resources of the City of Stratford and provides discussion and recommendations. The study covers both terrestrial and aquatic natural heritage resources. The study involved the compilation of existing information and the collection of some new information to assist with characterizing the natural heritage system of Stratford. While the study focuses on the expanded urban boundary of Stratford, the interaction of natural heritage features and functions with surrounding areas is also discussed.

The terrestrial natural heritage component of the study focuses on the amount and quality of natural woodland cover in the City of Stratford. For the purposes of the study, natural woodland is considered to be remnant woodland patches that exhibit natural habitat characteristics and recently planted areas that are being encouraged to regenerate into natural woodland cover. The study found that there is 2.3 % existing natural woodland cover and 0.3 % of re-naturalized woodland for a total of 2.6 % natural woodland cover. While a total natural woodland cover of 2.6 % considered on its own appears to be low when compared to the woodland cover for rural areas in the region (11 % for the Avon River watershed) and to recommended targets of 25 - 30 % cover that are commonly cited in landscape ecology literature, this number must be balanced against the following factors:

- The study identified 0.3 % of Stratford as being manicured woodlands. The addition of these areas brings the total to 2.9 %.
- The report identifies a number of areas in the City that are being managed with a more natural approach and as time passes, these areas will increase the natural cover of the City of Stratford. No coverage area was assigned for these sites.
- The study did not attempt to assess the percent of cover or the health of individual trees in the City. It is recognized that there is a significant amount of tree cover that is provided by individual trees and groupings of trees on City parkland, boulevards and privately owned land. These “individual” trees will generally provide a complimentary function to the natural heritage system in addition to their important air quality improvement, shading and aesthetic contributions.
- The amount of natural woodland cover in the City of Stratford must be balanced with the role that Stratford plays as a designated urban growth centre for the region.

The aquatic natural heritage component of the study consists of a compilation of existing information. The study provides a summary of benthic invertebrate monitoring data, fish sampling data, fish habitat assessments and long term water quality monitoring. All of this information assists with characterizing the aquatic ecosystem health of the Avon River and its tributaries. This information summary provides a benchmark for future comparison and can support ongoing watershed planning and implementation for the Avon watershed.

The report includes discussion and recommendations on the terrestrial and aquatic natural heritage resources of the City of Stratford. Strategies for protecting and enhancing natural heritage resources are discussed and specific recommendations are included.

1.0 Introduction

The Upper Thames River Conservation Authority (UTRCA) submitted a proposal to the City of Stratford in July of 2002 to undertake a Natural Heritage Inventory for the City. The City accepted the proposal and the UTRCA proceeded with background information collection and field work. The study area includes all lands that will be within the corporate boundary of the City of Stratford at the end of the phased annexation (January 1, 2007).

The project scope involves the assembly of existing natural heritage information and the collection of new information to provide a summary of the natural heritage resources of the City. The study includes terrestrial natural heritage (natural and “naturalized” woodlands and riparian areas) and aquatic natural heritage. The terrestrial findings incorporate the results from recent studies with new information that was collected in the fall of 2002. The terrestrial natural heritage work was limited to those woodlands and riparian areas that exhibited natural woodland characteristics. Landowner permission was obtained for sites where new information was collected. This report includes discussion of the terrestrial findings, recommendations and a discussion on implementation options. The aquatic information provided in this report is a summary of field inventory and monitoring data.

2.0 City of Stratford - Landscape Context

The Provincial Policy Statement (PPS, 1997) provides municipalities with a framework to guide land use planning decisions. Section 2.3 of the PPS addresses Natural Heritage and identifies the components of a natural heritage system as being:

- wetlands
- endangered and threatened species and their habitat
- fish and their habitat
- woodlands
- valley lands, and
- wildlife habitat

The natural heritage that remains on the southern Ontario landscape is largely contained within the remaining woodland patches, open water wetlands, watercourses and vegetated riparian buffers. For this reason, natural heritage inventories generally focus on the remaining natural woodland patches and aquatic habitat.

The City of Stratford is located within the Avon River Watershed. Information on the forest conditions, surface water quality and watershed features is summarized in the Avon River Watershed Report Card (2001). This report card is included with this report as Appendix 1. Highlights are as follows:

- the Avon watershed area is 169 sq. km. The post annexation area of Stratford will be 26.48 sq. km (2648 Ha).
- it is estimated that 76 % of the land use in the Avon watershed is agriculture with 14 % urban and 11 % woodland
- 54 % of the woodlots in the Avon watershed are very small (< 4 Ha)

- 19 % of the woodlots are small (4-10 Ha)
- 14 % are mid-sized (10-30 Ha)
- 3 % are large (30-40 Ha)
- 10 % are very large (>40 Ha)
- The Gads Hill South Swamp and the Stratford Wetland Complex are two large natural areas that are found within the catchment.
- The water quality in the Avon River watershed has improved since the 1970's. The improvement is attributed to many factors including improvements in sewage treatment technology and infrastructure and the implementation of rural best management practices such as those promoted by the Avon Conservation Club. Despite these improvements, water quality in the Avon is still generally poor.

The woodland and aquatic natural heritage areas that remain in the City of Stratford consist of:

- remnant woodland patches that are associated with golf courses and City owned open space lands
- remnant woodland patches that are found in residential neighbourhoods or that are associated with large industrial parcels
- remnant woodland patches that are surrounded by agricultural uses, particularly in the areas that are being annexed into the City
- areas that have been planted in native species and encouraged to naturalize
- larger watercourses and associated flood plain areas such as the Avon River and Court Drain
- small watercourses and open municipal drains with their associated riparian zones

Natural woodlands are defined as both remnant woodland patches that have not been manicured into parklands and areas that have been replanted and left to naturalize. It is noted that while the City of Stratford has a relatively small amount of natural woodland area, the City does have a significant tree cover that is comprised of individual trees or groupings of trees. The understorey of these areas is typically manicured and as a result, no significant habitat function is provided. While it is accepted that this “individual” tree cover will generally provide a complimentary function to the natural heritage system, the individual trees and groupings of trees have not been included in this natural heritage inventory. It is also noted that Stratford is an urban growth centre and that this must be considered when identifying future woodland cover targets or when comparing existing natural woodland cover for the City of Stratford to the surrounding rural areas.

3.0 Natural Heritage - Woodlands

3.1 Woodlands Sampling Methodology

3.1.1 Preliminary Site Reconnaissance

April 2000 air photography and 1:2,000 and 1:10,000 Ontario Base Mapping (OBM) was reviewed to identify candidate woodland and riparian areas for investigation. Candidate woodlands include all forested areas in the City of Stratford. Figure 1 is a map showing all of the woodland cover for the City of Stratford. The total area of all woodlands is approximately 76.7 ha. With a post annexation area of 2648 ha, the maximum woodland coverage for the City of Stratford is 2.9 %.

A preliminary field investigation was undertaken on August 19, 2002 to determine which woodland patches exhibited natural vegetation features and habitat function and which woodland patches were being anthropogenically managed (*i.e.* understorey mowed, planting of showy non-natives, *etc.*). The preliminary field investigation involved viewing all of the woodland patches in Figure 1 from road allowances. Based on this reconnaissance, all anthropogenically managed patches were removed from the list to be inventoried. The area of the patches removed was 7.6 ha which equates to 0.3 % of the total area. This leaves 69.1 ha of natural and naturalized woodland cover for the City of Stratford, which equates to 2.6 % of the post annexation land area (Figure 2).

Of the 69.1 ha of natural woodland cover, approximately 11.4 ha have been planted by the City of Stratford or the UTRCA and left to naturalize (Figure 3). These woodland patches have features and functions that are more similar to natural woodlands than manicured parks. For this reason, these “naturalized” woodland patches are included as part of the overall woodland cover for the City of Stratford. Detailed planting records were available for these sites and this information is included in this report.

3.1.2 Landowner Contact

City of Stratford staff provided landowner information for the patches identified for detailed field investigation. A sample of the letter mailed to the landowners is included as Appendix 2. Follow up phone calls were made as necessary to secure permission to access the identified sites. Permission was granted for all but two of the woodland areas identified for inventory. Landowners will be provided with a summary of the findings for their woodland area once the final study is delivered to the City of Stratford.

3.1.3 Detailed Site Inspections

To determine the ecological significance of each woodland in relation to its surrounding region, woodlands were evaluated based on their size and position within the surrounding landscape. These measures are based on principals of landscape fragmentation. In addition, a qualitative assessment of their composition was conducted in the fall of 2002. Ontario’s Ecological Land Classification (ELC) scheme (Lee *et al.* 1998) was used to classify the woodlands to the ecosite level (*i.e.* green level of the ELC) where possible. Ecosite boundaries are distinguished by vegetation cover types and are recognizable on air photos. The ELC scheme is designed to help standardize the categorization of natural areas throughout the province by assigning sites to specific ecological community types depending upon the composition of their dominant tree species, soil types, hydrology and understorey vegetation. Important riparian vegetation was similarly assessed in the City of Stratford Court Drain Subwatershed Study (Aquafor Beech 2002) and in the biological survey of the TJ Dolan riparian area conducted by the UTRCA (2001). Both study results are summarized in this report.

Sampling conditions and procedures in this study are comparable to those used in the City of Stratford Court Drain Subwatershed Study (Aquafor Beech 2002). The methodology is consistent with the full ELC process (Lee *et al.* 1998). Each woodlot was surveyed on foot and a description of the top four species by presence for each vegetation layer (canopy, sub-canopy, shrub and herbaceous), as well as descriptions of the physiography, estimates of intensity and extent of disturbance, descriptions of the soil profile and evaluation of ecological community features, was recorded. No formal quantitative analysis of the vegetation was performed during this survey and no sampling quadrats or measured transects were taken. Prism sweeps, used to determine basal area (or tree density by species and size), were recorded at least once in each community.

A detailed assessment of the ground cover vegetation was not possible at the time of the survey (late autumn) since frost events would have caused most of the ground vegetation to die back. Further, the ability to detect significant avian, reptile and amphibian diversity is reduced at this time since most of these species have stopped calling and breeding, having either migrated south or begun their quiescent period. Instead, wildlife species were noted opportunistically during the vegetative surveys and significant breeding areas for birds, amphibians and reptiles were presumed but not confirmed in this study.

3.2 Woodlands Results

The City of Stratford lies within the Great Lakes - St. Lawrence forest region, which includes a mixture of deciduous species and some representatives of Carolinian and Boreal species. In general, the City of Stratford has few remaining natural heritage vegetation patches within the corporate boundary. However, this is typical of most of the municipalities in southern Ontario. The natural heritage that remains on the southern Ontario landscape is largely contained within the remaining woodland patches, wetland areas too wet to drain, riparian lands adjacent to watercourses that could not be altered as municipal drains and some plantations, either deciduous orchards or coniferous (red pine, Scotch pine, etc.). Although all communities found in the City of Stratford are common and typical within the regional landscape, it is evident from the cultural use of some of these woodland areas that they are important “natural areas” within the City of Stratford. As well, the woodlands, plantations and riparian features are utilized by a number of mammals, birds, amphibians, snakes and other reptiles which are common near urban settings.

Based on the preliminary field investigation, natural and “naturalized” woodlands cover approximately 69.1 ha and range in size from 0.11 ha to 5.95 ha. Fifteen of these woodlands were surveyed in this study. The rest of the woodlands were surveyed in the City of Stratford Court Drain Subwatershed Study (Aquafor Beech 2002), in the biological survey of the TJ Dolan riparian area conducted by the UTRCA (2001) or were planted by UTRCA and City staff.

The majority of woodland patches are small and they are scattered within the agricultural and urban landscape and as a result, many do not exhibit a full range of ecological functions. The majority of woodlands are surrounded by either intensively used agricultural lands, roads and / or urbanization with no forested corridors or linkages between them.

Figure 2 shows the patches that were identified for detailed field study, the “naturalized” sites planted by the UTRCA and the City and the riparian areas of TJ Dolan and the Court Drain. Approximately 4.5 ha of the inventoried woodlands are deciduous swamp (wetland) forests, and consist primarily of silver maple, willow, cottonwood, ash and elm. The lowland forest patches appear to be no older than mid-aged, although there are some remnant larger (i.e. >50 cm dbh) and older (i.e.> 100 year) trees still remaining near the centres of some of the woodlands.

Approximately 10.5 ha of the inventoried woodlands are upland deciduous forest communities. The upland woodlands are young and generally consist of mixed polewood and small hardwoods dominated by soft (silver) maple, ash and elm in their interior with the forest edge dominated by species such as black cherry, hawthorn, trembling aspen, beech and occasionally sugar maple, oak, hickory and hop hornbeam. The edges of these woodlands are moderately to heavily disturbed by selective cutting and wind blow down. Human trails, and garbage are prevalent.

Approximately 2 ha of the inventoried woodlands are young to mid-aged conifer plantations and 2 ha are young to mid-aged mixed plantations. Conifer plantations are either polewood pine or polewood pine and spruce. Mixed plantations consist primarily of polewood spruce and ash.

Two woodland patches had riparian forest communities. The riparian areas occurred along streams as long, linear strips of varying width and are mid-aged, with some larger (*i.e.* >50 cm dbh) and older (> 100 year) willows along the stream banks. The riparian vegetation along the middle and lower Court Drain (R1) are typically limited to the flood plain and valley wall and extend 5 - 10 m from the stream on either side (Aquafor Beech 2002 report). The communities in the lower reach have less disturbance than those in the middle reach. The typical community consists of willow, white ash, American beech, white elm. There are a number of very large willows interspersed along the middle and lower reaches. In the lower Court Drain just upstream of Kelly's Lane (R2), the riparian area is wider, up to 25 m on each side of the stream and there is an old orchard and red pine plantation adjacent to the riparian zone on the east side of the creek. The removal of vegetation along the Court Drain through the golf course has reduced the habitat value of this riparian area and has the potential to reduce other riparian functions that may include bank stabilization and stream shading. In the TJ Dolan area, the riparian area is very wide, approximately 150 m on each side of the stream. There are 22 different vegetation communities found within this corridor, with willow, poplar and maple found along the length of the river.

Figure 3 shows the sites planted by the UTRCA and /or City of Stratford. These areas have been planted with native tree, shrub and /or herbaceous species and left to naturalize (*i.e.* no mowing). By planting these areas with native species, the intent is to establish native plant communities that will be able to out compete the suite of non-native plants that have adapted to establishing on disturbed and abandoned sites. Table 1 provides information on these planting sites.

Figure 3 also identifies a number of sites that are being managed by the City of Stratford with a more natural approach. While these areas continue to be managed with limited mowing, over the course of time, they will provide more natural heritage function. Some areas for potential regeneration have also been identified on Figure 3. The size of these areas has not been calculated and included in the percent coverage calculations.

Table 1 Community forestry planting projects in the City of Stratford (refer to Figure 3).

Site	Primary Partners	Species Planted	Comments
TJ Dolan	Stratford's Civic Beautification and Environmental Awareness Committee, City of Stratford, UTRCA	Silver maple, green ash, red maple, staghorn sumac, white ash, black walnut, elderberry, nannyberry, chokecherry, bitternut hickory, shagbark hickory, bur oak, basswood, kentucky coffee, grey dogwood	Over 5000 shrubs and trees have been planted. Most of the available area has been planted.
Cooper Standard	Stratford's Civic Beautification and Environmental Awareness Committee, Cooper Standard, City of Stratford, UTRCA	Fragrant sumac, red osier dogwood, staghorn sumac, sugar maple, red maple, basswood, chokecherry, bur oak, green ash, red oak, serviceberry, silky dogwood, elderberry, american plum, white ash	3 butterfly meadows, a constructed wetland and a mix of 1350 native shrubs and trees
Stratford Education and Recreation Centre (SERC)	Northwestern Secondary School, St Michaels Secondary School, City of Stratford, UTRCA	Arrowwood, chokecherry, highbush cranberry, red oak, staghorn sumac, service berry, elderberry, american plum, red osier dogwood, aquatic plants	330 native shrubs and trees planted and 240 aquatic plants installed
Stratford Watershed Excellence Centre (SWEC)	Stratford's Civic Beautification and Environmental Awareness Committee, Ontario Clean Water Agency, City of Stratford, UTRCA	Highbush cranberry, american plum, green ash, pasture rose, red oak, red osier dogwood, serviceberry, silky dogwood, white ash, red maple	225 native trees and shrubs planted, 1400 native wildflower and grass plugs and possible 225 more shrubs and trees to be planted

3.3 Woodlands Analysis

The woodlands results of this study can be used to provide context for site specific Environmental Impact Statements (EIS's) that may be required for proposed land use changes adjacent to, or within, these natural heritage features. Although many of the remaining woodland patches do not contain natural features or functions of provincial or regional significance that would constrain development, local woodlands in urban areas provide a number of important benefits, including the opportunity for

a local “woodland” experience. These benefits may reduce development pressure which, in turn, may have a significant impact on the larger woodlands where the preservation of ecological functions are more important. Recognizing that urban areas tend to have limited woodland cover, it is recommended that ecological, socio-economic and aesthetic values be considered when planning for development in order that woodlands remain for recreational purposes as well as for natural heritage functions.

Table 2 highlights some of the important features and functions of the woodlands surveyed. The presence of a diversity of community types and conservative species, as well as habitat features such as tree cavities, a reliable source of water and aquatic features, a variety of topographic forms and linkage opportunities in the surrounding matrix, indicates higher quality woodlands.

Table 2. Summary of ecological features and functions for each woodland surveyed. Higher quality woodlands are in bold.

Patch ID #	Size (ha)	Age	Features	Matrix	Topography	Aquatic Features
C	2.5	mid	- 3 communities - large trees (live / dead)	- golf course	rolling ridges	stream
CC	3.4	pioneer / mid	- 2 communities - conservative species - large trees (live / dead)	- golf course - agriculture - old orchard	rolling ridges	vernal pools
CD	1.5	pioneer / young / mature	- 3 communities - conservative species - large trees (live)	- golf course - agriculture - old orchard	flat to hummocky	swamp with vernal pools
D	1.4	mid	- 1 community	- industry - residential	steep ridges	stream and flood plain
G	1.3	young / mid	- 1 community - large trees (live)	- agriculture - parks	flat	drainage ditch
H	2.3	mid	- 3 communities - large trees (live)	- industry - agriculture	flat to hummocky	swamp and remnant pool
I	2.3	pioneer / mid	- 3 communities - large trees (live) - link to woodland	- industry - agriculture	flat	swamp with stream
J	0.2	pioneer	- 2 communities - link to woodland	- industry - agriculture	flat	wet meadow with intermittent channel

Patch ID #	Size (ha)	Age	Features	Matrix	Topography	Aquatic Features
K	0.5	young	- 1 community	- residential - agriculture	flat	drainage channel
L	0.3	young	- 1 community	- residential - agriculture	flat	no aquatic features
M	1.4	mid	- 1 community - conservative species	- agriculture	flat	swamp
N	1.5	mid	- 2 communities - conservative species - large trees (live) - link to woodland	- golf course - residential - woodland	undulating	no aquatic features
P	0.7	mid	- 1 community - large trees	- agriculture	flat	swamp
Q	1.2	mid	- 2 communities	- residential	flat	no aquatic features
R	0.4	young	- 2 communities	- residential	flat	no aquatic features
O <i>note 1</i>	1.62		- 1 community	- residential - golf course	flat	deciduous forest
F <i>note 2</i>	1.25	unknown	unknown	- industry	unknown	unknown

Note 1: Landowner permission was not granted for woodland patch O. This patch was clearly visible from the road allowance and specifics about the patch were identified and included in the study.

Note 2: Landowner permission was not granted for woodland patch F and therefore specific information for this site is not available.

The most promising woodlands in terms of diversity of community types, presence of conservative species, varying topography and habitats, woodland stand maturity and landscape connectivity are woodlands CC, CD, M and N. These woodlands have greater tree species and size diversity than other woodlands and are more closely linked to neighbouring woodlands or riparian zones.

Woodland patches C, G, H, I, J, K, O and P have some of the ecological features and functions present in healthy woodlands. If planted with buffers and protected from further human impacts, there is a good chance that many of these woodlands would return to a more natural or healthy state.

Woodlands D, L, Q and R are the most impacted by human disturbance, with a high number of non-native or edge species. Intense and extensive human disturbance, combined with isolation from other natural features, reduces the chances for wildlife to migrate into them.

Riparian habitats are also very important for a variety of animal species, for human recreation and for aesthetic values. The presence of a diversity of community types and habitat features such as size of the riparian patch, tree cavities and a reliable source of water, make riparian areas attractive locations for breeding birds. The relatively deep (20 - 30 cm) and fast flowing characteristics of the stream create a highly suitable and permanent habitat for frogs, snakes and aquatic insect prey. Small mammal tracks, such as skunk, racoon, chipmunk, squirrel and groundhog, were found along the stream bank in all riparian zones within the City of Stratford.

3.4 Woodlands Discussion and Recommendations

The natural woodlands information in this study is provided to assist the City of Stratford with comprehensive planning for these areas. This study identifies a number patches as being natural woodland and detailed data is provided for all but one of the patches targeted. None of the natural woodland patches assessed in this inventory contains features or woodland functions that would justify identification of the patch as being provincially or regionally significant. While no threatened or endangered species were found in the patches inventoried, it must be noted that the study methodology is not rigorous enough to rule out the possibility that threatened or endangered species may be found in the patches. The requirement for more rigorous site assessment, including the need for more comprehensive three season field inventories, could be a prerequisite for any future development proposals in, or adjacent to, the natural woodlands. If threatened or endangered species were found through more rigorous assessment, the specific site may be considered to take on regional or provincial significance.

While this study concludes that there are likely no Provincially or regionally significant natural woodlands within the expanded boundary of Stratford, this finding does not suggest that the remaining woodlands and riparian areas in Stratford have no significance. Given the low percentage cover of natural woodlands within the City, the maintenance of the remaining natural woodlands and riparian areas for their natural heritage function and local community value is encouraged.

3.4.1 Options for Protection and Enhancement

There are several options available for protecting and enhancing natural woodland areas. The following options are provided for discussion.

Options for protection and enhancing natural woodlands include:

Regulatory Measures - measures to control an individual's freedom to act for the benefit of the individual, the community or the broader public interest. Two regulatory measures that are applicable in this case are:

- i) the regulation of land use through official plan policy and zoning by-law regulation under the jurisdiction of the Planning Act
- ii) the regulation of tree cutting and site alteration under the Trees Act or the Municipal Act

Stewardship - providing the tools to landowners and the community to undertake measures which sustain and improve resources

Education - creating a broad awareness of the importance of the resource and actions that can be taken to maintain and restore the resource. Education and stewardship are closely linked.

Incentives - measures that reward good management practices. The incentive can be financial or simply recognition.

Acquisition - outright purchase of land or easements as a means of obtaining management control.

A comprehensive program to achieve the goals identified for natural woodlands in the City of Stratford could involve elements of each of these measures and it may involve strategies which go beyond the ones that are listed. This study does not lay out a comprehensive implementation plan but rather, provides a standard information baseline which can be used as a starting point for the City to consider options for protecting and enhancing natural woodlands.

3.4.2 Natural Heritage (Woodlands) Recommendations

Based on the findings of this study, we recommend:

1. That all remaining natural woodlands in the City of Stratford be maintained. It is further recommended that the range of options for protecting and enhancing natural woodlands be assessed and that a comprehensive City plan be developed.
2. That existing natural woodlands that are not currently zoned and designated for development be protected in the official plan and zoning by-law.
3. That the City develop policies for the management of City owned natural woodlands and other natural habitats that are aimed at protecting and enhancing natural features and functions.
4. That the City's policies regarding individual trees and landscaping measures be integrated with the City's natural woodland policies
5. That the City continue to identify potential naturalization sites and take steps to encourage the establishment of new natural woodlands.

4.0 Aquatic Natural Heritage

Aquatic information is included with this report to complete the natural heritage picture of the City of Stratford. Aquatic information is provided in the following four topic areas:

- Benthic Monitoring (Section 4.1)
- Fish Sampling (Section 4.2)
- Fish Habitat (Section 4.3) and
- Long Term Water Quality Monitoring (Section 4.4)

Information on each of the above noted topics is included in the body of this report with detailed data included in the Appendices.

4.1 Benthic Sampling

4.1.1 Methodology

Benthic macroinvertebrates (BMIs) are excellent indicators of aquatic habitat at the site sampled and of the water quality being contributed by the upstream catchment. Because BMIs are present at the site for much or all of their lives and have fairly well known sensitivity and tolerance to water quality impairment, the BMIs found at a site provide a long-term indicator of aquatic ecosystem health. For example they can allow detection of water quality or habitat disruption occurring in the period prior to sampling.

Sampling was conducted as a cooperative project with the University of Western Ontario (UWO) using a rapid bioassessment protocol developed by the USA Environmental Protection Agency as modified by Dr. Robert Bailey for local conditions. A timed travelling kick was used to capture BMI samples which were preserved at the site and then analysed at the UWO benthic laboratory. BMI were identified to the Family taxonomic level which allowed calculation of the Family Biotic Index, a weighted average of their individual pollution tolerance indices.

4.1.2 Findings

Benthic monitoring sampling site locations are shown on Figure 4. Water quality in Stratford was found to be within the range, but toward the lower extreme, of levels of impairment encountered in the Upper Thames watershed. Although limited sampling has been conducted upstream (sampled in 1997 and 1998 only), a trend towards declining water is evident as the Avon passes through Stratford. Benthic analysis provides a reliable indicator of water quality and general aquatic ecosystem health but does not identify specific sources of water quality impairment. Obvious potential sources include sewage treatment plant discharge, stormwater run-off, and the negative impacts of two impoundments. Elevated water conductivity readings noted during sampling at the downstream Avon site indicate that industrial discharge may also be contributing to the level of impairment and could be further investigated.

Court Drain findings were fairly consistent at the upstream site, but varied considerably at the downstream site indicating a possible response to disturbances within Stratford. The poor quality noted in the two Court Drain tributaries is fairly typical of that found in small, intermittent agricultural drains.

Appendix 4 includes a summary of benthic sampling activities 1997-2003 and specific sampling details on a tributary basis.

4.2 Fish Sampling

4.2.1 Methodology

Fish community information is based on data extracted from the Royal Ontario Museum (ROM) fish database (eight samples at five sites), sampling conducted by UTRCA staff (fourteen samples at ten sites) and a joint Ministry of Environment (MOE)/UTRCA sampling venture. Sampling done by the ROM typically involves use of seine nets and back pack electrofishers. Sampling conducted by the UTRCA utilized a backpack electrofisher to temporarily stun, net and identify fish species encountered. All fish were then released unharmed. A boat electrofisher was utilized to sample Victoria Lake in the

fall of 2003. Appropriate specimens were collected for analysis to provide information for MOE's next edition of the "Guide to Eating Ontario Sport Fish".

4.2.2 Findings

The Avon and its tributaries in Stratford support a very diverse fish community (33 species observed) fairly typical of warmwater streams in the Upper Thames watershed area. Species such as white sucker, creek chub, common shiner, bluntnose minnow, johnny darter, and brook stickleback were encountered frequently and are representative of this habitat type. Typical gamefish sampled were rock and smallmouth bass. Atypical species more common in pond and lake habitat included largemouth bass, yellow perch, and golden shiner which appear to be thriving in the impoundments. Other atypical species included stocked rainbow trout, sampled at two locations late in the year, and pearl dace, which are sometimes considered a coldwater indicator. This indicates that one or more coldwater refuges may exist in the Avon system in Stratford. Significant species encountered included the greenside darter which is assigned a Canadian status of "Special Concern" (formerly vulnerable) but is abundant in the Thames River system. Species of wide distribution, but considered rare in the Thames River system are the previously mentioned pearl dace and golden shiner, plus the Iowa darter and rainbow darter. The latter hasn't been found during recent sampling and is likely extirpated from the Avon River and most of the rest of the Thames River watershed, possibly due to the increase in greenside darter numbers.

Appendix 5 is the UTRCA/Royal Ontario Museum Fish Species Summary for Stratford.

4.3 Fish Habitat

4.3.1 Methodology

Habitat parameters such as flow, substrate conditions and thermal regimes were examined primarily through the recently completed Municipal Drain Classification Project. A visual assessment, along with a few simple measurements were completed at road crossings over most watercourses. Thermal regime on suspected coldwater tributaries was completed using an accepted DFO protocol. For selected tributaries, fish sampling (as described in Section 4.2.1) was utilized to establish the presence of fish species.

4.3.2 Findings

In July 2001, fish habitat assessments were completed at 34 sites in Stratford. Five of the 34 sites were sampled for fish species indicators. The data indicates that the Avon River system provides warm water habitat. The Avon River and Court Drain have habitat to support top level predators such as largemouth bass, rock bass and other sunfish species. Other tributaries of the Avon and Court Drain are supporting baitfish which includes minnows (common shiner, creek chub, and white sucker) and darters (johnny, blackside and greenside). Approximately five of the tributaries sampled were found to be intermittent in nature (dry for part of the year). Two of the tributaries visited were closed systems. The Municipal Drain Classification Project information has been provided to the City of Stratford in draft form and as new information is collected, the fish habitat database will be updated.

Appendix 6 is a Draft Municipal Drain Classification Map for the City of Stratford.

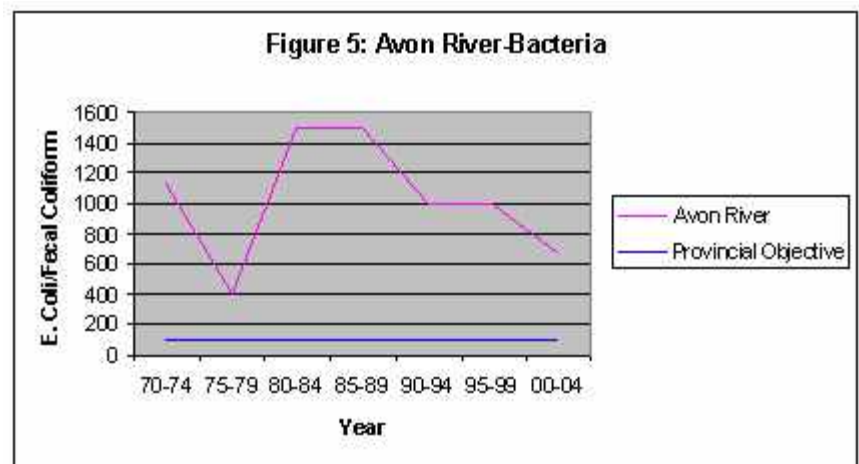
4.4 Long Term Water Quality Monitoring

4.4.1 Methodology

Since 1967, the Avon River has been monitored for water quality as part of the Provincial Water Quality Monitoring Network (PWQMN) of the Ontario Ministry of the Environment. The monitoring site is located downstream of Stratford at Perth Road 32 (figure 4). The sampling frequency and sample parameters have varied somewhat over the years with changing environmental priorities. Currently samples are taken once a month, eight times per year. A partnership with the Ministry of Health Laboratory and local health units currently provides the bacteria analysis. The long term nature of this data gives a valuable assessment of trends in Avon river water quality over the past 40 years. PWQMN samples are analysed for 37 parameters. The results of 6 key indicator parameters are summarized below. Figures 5 through 12 show the 75th percentile for each five-year block of data for the years sampled.

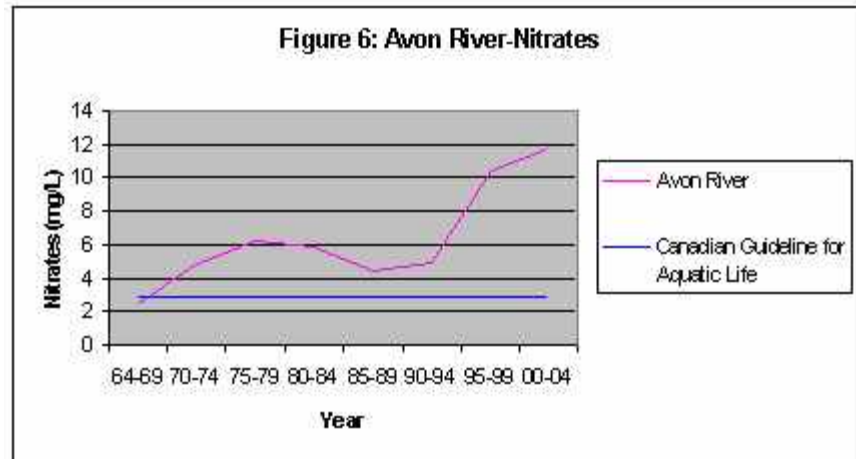
4.4.2 Results

4.4.2.1 Bacteria



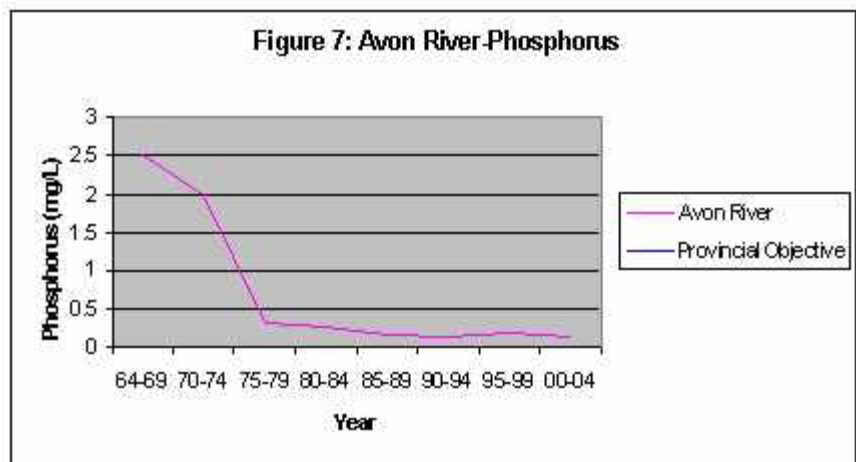
Fecal bacteria levels in the Avon River have shown a significant decline from 1980 to present (figure 5). While bacteria levels have greatly improved, the current levels are consistently well above the provincial objective of 100 *E.coli* per 100 ml sample. These numbers indicate that there continues to be significant sources of human and animal fecal waste entering the Avon River. Potential sources in the watershed include runoff from land applied sewage or livestock waste, faulty private septic systems, inadequate manure storage, and urban stormwater runoff. *E.coli* (the current type of fecal bacteria measured) is an indicator of the presence of pathogenic bacteria in the river.

4.4.2.2 Nitrates



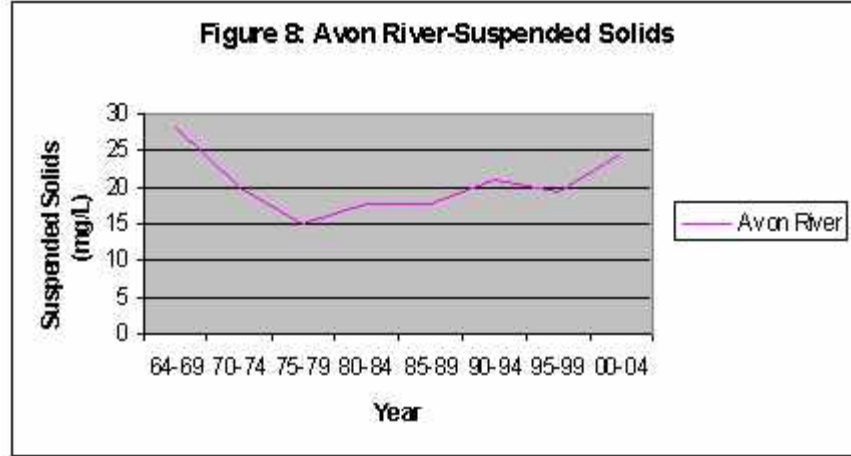
Over the past forty years nitrate levels in the Avon river are showing an increasing trend (figure 6). Since 1970, all nitrate levels are above the Canadian guideline for the protection of aquatic life. Amphibians are particularly affected by nitrates. This increasing trend in nitrates is seen throughout the Upper Thames River watershed and in many parts of the province. Potential sources of nitrate include sewage sludge, industrial wastewater, livestock waste, urban and agricultural pesticide and fertilizer runoff, and atmospheric deposition.

4.4.2.3 Phosphorus



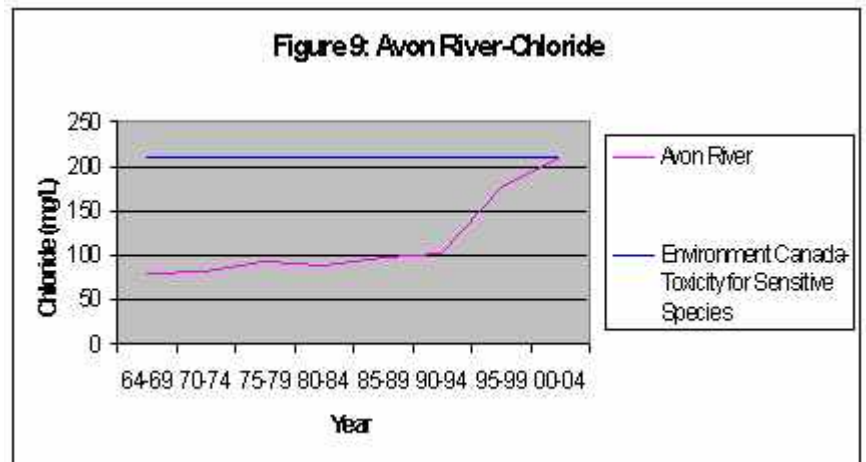
Phosphorus levels in the Avon River show a significant decline through the 1960's and 1970's and continue to show a gradual downward trend (figure 7). Current levels remain well above the provincial guideline of .03 mg/l. This indicates the presence of phosphorus sources within the watershed which can include domestic and industrial effluents (including soaps, cleaning products) and other inputs including pesticides and fertilizers. Phosphorus is used by aquatic plants and algae and excessive levels can lead to algae blooms and oxygen depletion in the river system.

4.4.2.4 Suspended Solids



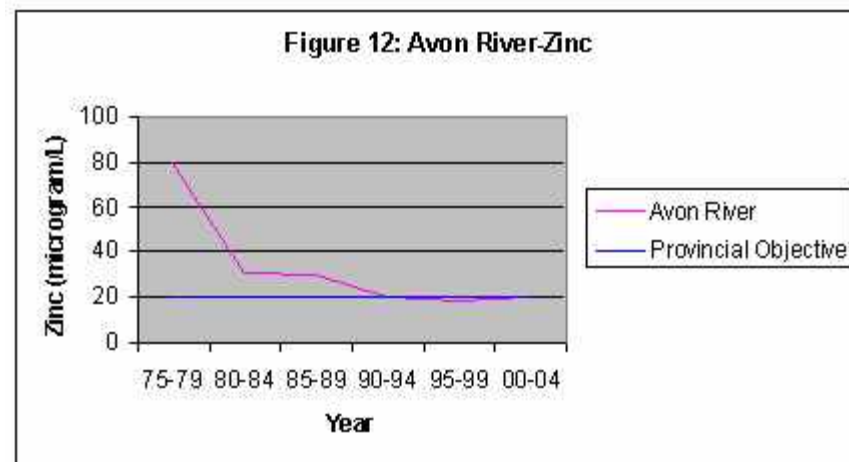
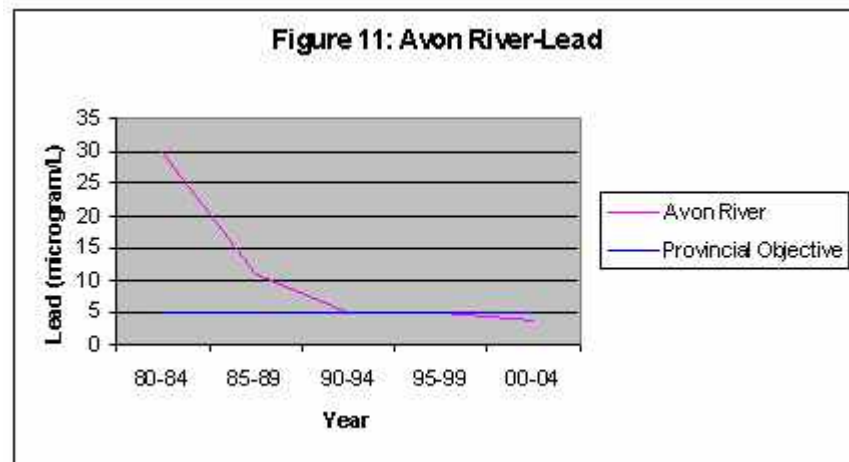
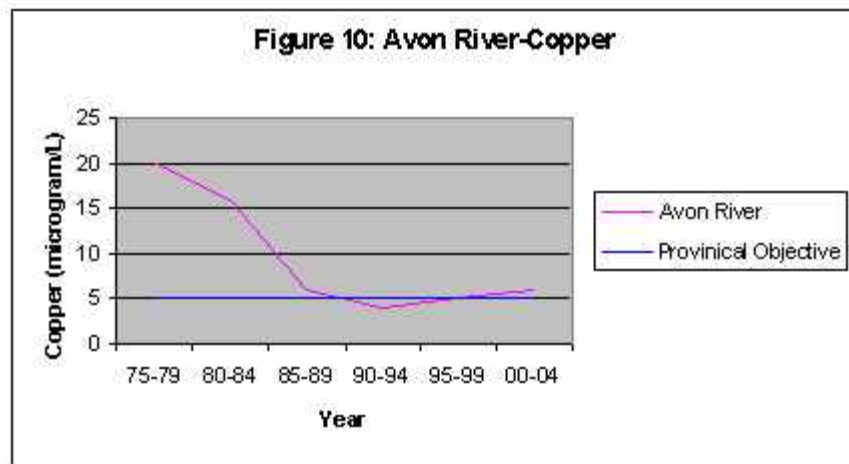
Suspended solids, consisting of silt, clay, and other fine particles, can be significant carriers of pollutants in a river system and can impair the habitat of aquatic life. There was a decline in suspended solids levels in the 1960's and 1970's, but the last 25 years have shown an increasing trend (figure 8). While there are natural levels of suspended solids in a river, soil erosion is the most common source of suspended solids to a watercourse. Sediment loadings from construction sites, agriculture, and industrial wastewater are potential sources.

4.4.2.5 Chloride



Chloride levels have shown a continual increase over 40 years with a significant increase since 1990 (figure 9). Levels in the Avon River are currently at the Environment Canada level of toxicity for sensitive aquatic species. Road salt is a significant source of chloride to rivers. Watercourses in urban areas tend to have the highest chloride contamination.

4.4.2.6 Metals



Metal concentrations (zinc, lead, and copper) in the Avon River are all showing a significant decline over the last 30 years with current values close to the provincial objectives (figures 10 - 12). While remaining close to the provincial objective, copper levels have shown some increase since 1990. Metals are long-lasting in the environment and tend to accumulate in stream bed sediments and can be a cumulative toxin in fish and wildlife. Sources of copper, lead, and zinc can include stormwater/urban runoff, certain pesticides, industrial wastewater, and sewage sludge. of long term monitoring site is shown on Figure 4.

4.5 Aquatic Natural Heritage Discussion and Recommendations

Although water quality in the Avon River is generally improving, it is still considered to be poor. It is recommended that the City of Stratford continue to support initiatives that are aimed at improving point and non-point source water quality. The ongoing planning and implementation of water quality measures should continue on a watershed basis and involve the City of Stratford and the upstream and downstream municipalities. The planning and implementation needs to continue to focus on private and public landowners in the watershed, including both urban and rural, as key partners in achieving the goal of a healthy watershed ecosystem.

5.0 References




- Aquafor Beech Limited. 2002. City of Stratford Court Drain Subwatershed Plan Study (Phase 1 to 5) Final Report. 96pp. + Appendices
- Lee, H., W. Bakowsky, J. Riley, J. Bowles, M. Puddsiter, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario. First Approximation and Its Application. Ontario Ministry of Natural Resources, South-Central Science Section, Science Development and Transfer branch. SCSS Field Guide FG-02.
- Upper Thames River Conservation Authority (UTRCA). 2001. The Upper Thames River Watershed Report Cards. 24 pp. + Appendices
- Upper Thames River Conservation Authority (UTRCA). 2001. Ecological Inventory for the TJ Dolan Natural Area - Final Report. 5pp. + Appendices

City of Stratford Natural Heritage Inventory

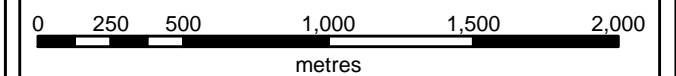
June 2004

Figure 1:
Woodland Cover

Legend

-  Natural and Naturalized Woodlands
-  Anthropogenic Woodlands
-  Post Annexation Boundary

Note:
Total Post Annexation Area of Stratford is 2648 ha
Total Area of the Anthropogenic Woodlands is 7.6 ha (0.3%)
Total Area of Natural and Naturalized Woodlands is 69.1 ha (2.6 %)



Aerial photography flown April 2000.

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City of Stratford Natural Heritage Inventory

June 2004

**Figure 2:
Natural and Naturalized Woodlands**



Legend

- Post Annexation Boundary
- No Permission Granted (Evaluated from Road)
- No Permission Granted (Not Evaluated)
- Vegetation that has been Inventoried

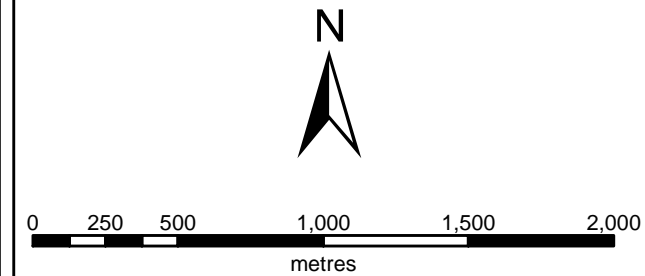
Riparian Areas

- R1 - Riparian Area 1 - Upper Court Drain
- R2 - Riparian Area 2 - Lower Court Drain
- R3 - Riparian Area 3 - T.J. Dolan Natural Area

Naturalized (Planted) Sites

- Cooper Standard
- Stratford Education and Recreation Centre (SERC)
- Stratford Watershed Excellence Centre (SWEC)
- T.J. Dolan

Note: Area calculated in hectares



Aerial photography flown April 2000.

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City of Stratford Natural Heritage Inventory

June 2004

Figure 3:
Naturalized Woodlands



Legend

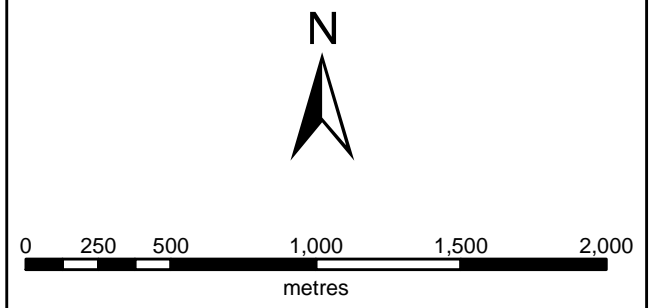
- Post Annexation Boundary
- Natural Woodlands

Naturalized (Planted) Sites

- Cooper Standard
- Stratford Education and Recreation Centre (SERC)
- Stratford Watershed Excellence Centre (SWEC)
- T.J. Dolan

Potential Naturalized Areas

- 1, Meadowrue Garden
- 2, Burnham Wood Arboretum
- 3, Greenwood Park
- 4, Battershall Park Planting (2003)
- 5, Battershall Park Planting (2004)
- 6, Packham Road
- 7, Devon Street Potential Naturalization
- 8, Marsh Pond Potential Naturalization
- 9, Dufferin Park Potential Natural Area Expansion






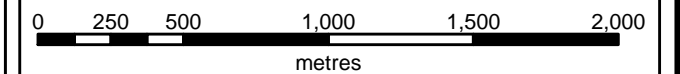
Aerial photography flown April 2000.
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**City of Stratford
Natural Heritage Inventory**
June 2004

**Figure 4:
Benthic and Long Term
Water Quality Sampling Sites**

Legend

-  Benthic Sampling Sites
-  Long Term Water Quality Monitoring Site
-  Post Annexation Boundary

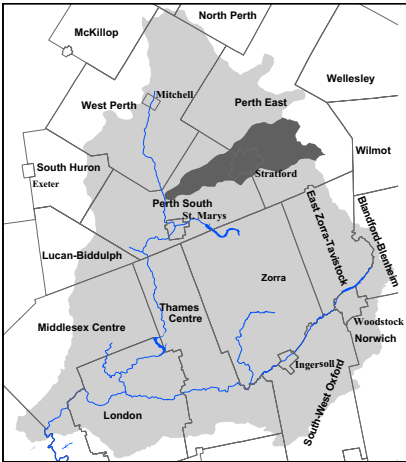


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Appendix 1: Avon Watershed Report Card

Avon River Watershed Report Card

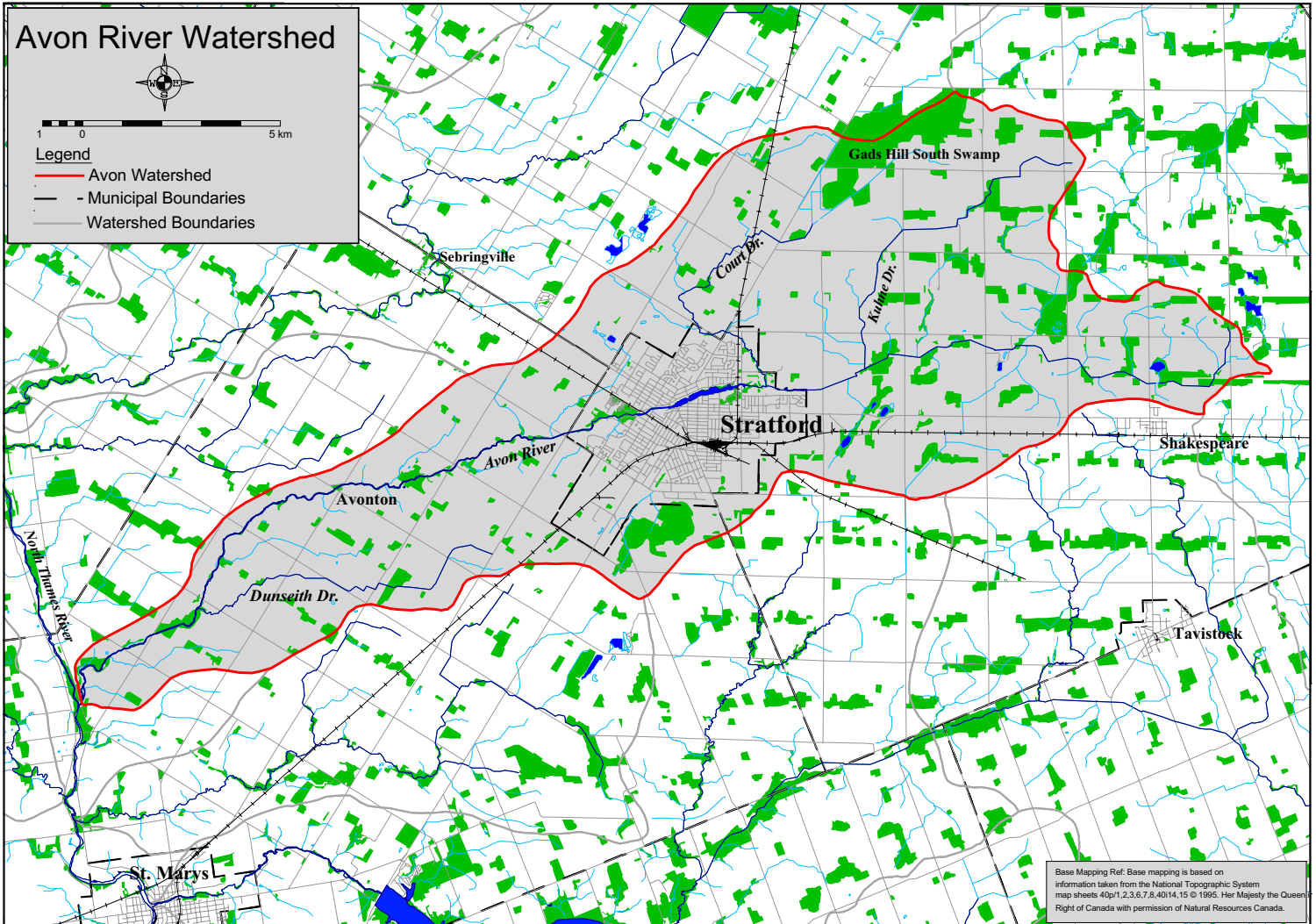


This report card outlines environmental information for the Avon River watershed. This watershed is graded against 27 other subwatersheds within the Upper Thames River watershed. The information provides a description of forest and water parameters and ideas for local action to assist agency staff, municipalities and interested parties working for the protection of local forest and water resources. These report cards are part of a larger report titled *The Upper Thames River Watershed Report Cards* (UTRCA, 2001) that is posted on the Upper Thames River Conservation Authority (UTRCA) web site. (See back)

Grades:

D Forest Conditions

D Surface Water Quality



Municipalities: Perth East (93 sq. km), Perth South (55 sq. km), Stratford (21 sq. km)
Watercourses: Avon River (tributary of North Thames River), Court Drain, Dunseith Drain, Kukhe Drain



Grade
D

Forest Conditions

Overall, forest conditions in the Avon River watershed score a D grade and the grades for the three indicators range from B to D- (see table below). The amount of forest cover (11%) is average for the Upper Thames watershed, but still considered too low for sustainability. The ideal for southern Ontario is 25-30% natural cover (Carolinian Canada, 2000). Forest density is very low indicating the woodlots are isolated

from each other making it difficult for seeds to be transported and wildlife to move between them. The amount of forest interior is relatively good suggesting that several very large woodlots are providing habitat for sensitive species that need to live in large, protected forests. Many of the larger woodlots are located in the northeast end of the watershed.

Indicators	Avon River Results		Upper Thames Watershed Average		Indicator Description
	Value	Grade	Value	Grade	
Forest Cover	11%	D	12%	D	Forest cover is the percentage of the watershed that is forested. It is believed there should be 25-30% natural cover in southern Ontario's landscape to sustain our native plants and animals.
Forest Density	41%	D-	55%	D	Forest density is a measure of how close woodlots are to each other. Woodlots that are near several other woodlots tend to have greater species diversity than those that are isolated. The movement of seeds and animals between woodlots ensures a healthy gene pool.
Forest Interior	2.4%	B	1.8%	D	Forest interior refers to the protected core area found inside a woodlot that some bird species require to nest and breed successfully. The outer 100m perimeter of a woodlot is considered 'edge' habitat and prone to high predation, alien species invasion, sun and wind damage, etc.

Local Actions Needed for Improvement:

- Protection of all woodlands and Locally Significant Wetlands at the municipal planning level is a very important and effective method of preserving local forest cover. This goal can be achieved through designations in Official Plans, enforcement of tree cutting by-laws, restrictive zoning and other appropriate planning measures.
- Connections can be made between woodlots and other habitats by planting hedgerows and windbreaks along fields, watercourses and roads.
- Forest interior can be increased by “bulking up” woodlots to make them larger and rounder by planting native trees and shrubs around existing woodlots or allowing the edges to naturalize on their own (e.g. retire land near woodlot edges).
- To increase natural plant cover in Stratford, target the naturalization of school yards, public parks and open spaces, river valleys, residential and industrial/commercial properties.
- Forest cover along the Avon River is sparse except for the downstream end near the confluence with the North Thames River. This area could become an excellent wildlife corridor with additional tree planting and naturalization efforts.
- To improve the health of individual woodlots, woodlot owners should prepare and follow Woodlot Management Plans.
- Gads Hill South Swamp is the largest wooded area in the Avon River watershed and thus it holds the greatest potential for wildlife. Much of it is publically owned. Biological inventory work should be targeted here as well as wildlife enhancement projects and the planting of corridors to connect it to nearby woodlands.



The Avon River joins the North Thames River north of St. Marys

Grade
D

Surface Water Quality

Water quality in the Avon River watershed ranks a D with the four indicators ranging from C to D- (see table below). Conditions are poor upstream of Stratford with a further deterioration in water quality immediately downstream of the city. Water quality improves further downstream of Stratford where more natural stream conditions help to

improve the water. Fecal coliform bacteria levels are high in the Avon River indicating on-going contamination from human and animal waste. Phosphorus levels are poor but have improved significantly since the 1970's. There have been 45 spills reported in the Avon River watershed since 1988 which is high in comparison to other watersheds in the area.

Indicators	Avon River Results		Upper Thames Watershed Average		Provincial Guideline	Indicator Description
Benthic Score (FBI)	5.23	C	5.66	C	---	Benthic organisms are the aquatic invertebrates that live in stream sediments and are a good indicator of water quality and stream health. The 'Family Biotic Index' (FBI) scores each species according to its pollution tolerance.
Phosphorus (mg/l)	0.12*	D -	0.08*	D	0.03 (Provincial Objective)	Phosphorus is found in such products as soaps, detergents, fertilizers and pesticides, and contributes to excess algae and low oxygen in streams and lakes.
Bacteria (per 100 ml)	711*	D	304*	C	100 (Recreational Swimming Guideline)	Fecal coliform bacteria are found in human and animal waste and their presence in water indicates fecal contamination. Fecal coliform bacteria are a strong indicator for the potential to have other disease-causing organisms in the water.
Conductivity (μs/cm)	900*	D-	642*	D	---	Conductivity is a measure of water's ability to conduct an electrical current and is an indicator of the level of dissolved solids and pollutants in water.

*10 year average concentration, 1990-2000 (Ministry of the Environment data)

Local Actions Needed for Improvement:

- Implement recommendations from the *Stratford-Avon River Environmental Management Project* (SAREMP, 1984).
- Implement recommendations from the *Court Drain Subwatershed Study*, especially with respect to urban stormwater management.
- Plant buffers (grassed or treed) along all open drains, creeks and rivers to filter runoff, and provide shade to streams. Enhancing vegetative cover is a priority in this watershed. Target rehabilitation of the three coldwater streams.
- Conduct further study on fish habitat and stream characteristics.
- Encourage environmentally sustainable practices on golf courses (e.g. Audubon Cooperative Sanctuary Program).
- Address the high number of spills and other urban/industrial pollution inputs through education, regulation, and improved response.
- Within the City of Stratford the following actions should be targeted:
 - upgrade sewer systems where risk of contamination is greatest (e.g. combined sanitary/storm sewers), extend sanitary sewers to urban properties on septic systems, and repair or replace faulty existing septic systems;
 - implement stormwater management plans for new urban developments and implement projects to reduce stormwater runoff (e.g. infiltration ponds, pavement alternatives, etc);
 - encourage river clean-up /stream stewardship projects to improve stream habitat; and
 - educate urban residents regarding urban Best Management Practices such as reduction and proper use of pesticides and fertilizers, and proper household hazardous waste disposal.
- The following actions should be targeted in rural areas:
 - encourage landowners to repair or replace faulty septic systems;
 - encourage agricultural Best Management Practices in the areas of manure storage and spreading, soil conservation practices, fertilizer and pesticide storage and application, fuel storage, milkhouse washwater disposal, and cattle access restriction; and
 - promote the completion of Environmental Farm Plans and Nutrient Management Plans.

Groundwater Quality

The Groundwater Management Study for the City of Stratford (PUC, 2000) identified known and potential sources of groundwater contamination including: automobile fuelling stations, manufacturing/industry, municipal/provincial sites, landfills, snow dumps, and septic systems. Most impacts are from fuels and metals. Impacts from deep non-aqueous phase liquids such as coal tar and solvents are a concern.

- Recommendations from *The Groundwater Management Study for the City of Stratford* (PUC, 2000) should be implemented (e.g. properly decommissioning contaminated

sites, restricting spreading of sewage sludge and developing a public involvement/education program to address groundwater protection.)

- Implement protection of identified infiltration zones, and continue with groundwater research and monitoring (refer to *Perth County Groundwater Study, 2000*)
- Encourage the decommissioning of abandoned wells according to Ministry of the Environment standards.

Avon River Watershed Features

Area	169 sq. km (5% of Upper Thames River watershed)
Land Use	76% agriculture, 14% urban, 11% wooded (GIS derived using OMAFRA Landuse Systems, 1983)
Soil Type	78% silty loam soil, 10% clay loam, 7% bottomland, 4% organic, 1% sandy loam, 1% not mapped (urban) (GIS derived using county soil maps)
Soil Erosion/Delivery	6% of the watershed is classified as highly erodible, meaning lands that contribute over 7 tonnes/ha of soil to a watercourse per year. The average for the Upper Thames River watershed is 9%. (GIS derived using 1991 Geomatics data)
Physiography	75% undrumlinized till plain, 12% spillway, 6% kame moraine, 4% til moraine, 3% peat muck, 1% water. (Chapman and Putnam, 1984)
Stream Flow	2.0 cubic metres/sec is the mean annual flow 8 km downstream of Stratford. The Avon River contributes 5% of the flow to the Thames downstream of London. (Environment Canada)
Groundwater	There is a fairly large shallow overburden aquifer (< 18m) southwest of Stratford and along the Avon River. The rest of the watershed taps into the deeper bedrock aquifers. (MOE 1981)
Fishery Resources	34 species of fish have been recorded in the Avon watershed including Smallmouth and Largemouth Bass. Three coldwater streams have been identified in this watershed.
Dams	Four dams are present on watercourses in this watershed including Thomas Orr Dam, Shakespeare Conservation Area Dam, and John Street Weir (UTRCA, 1991).
Sewage Treatment	The Stratford Wastewater Pollution Control Plant discharges treated effluent to the Avon River. Rural residences in the watershed are serviced by private septic systems.
Woodlot Size	54% of the woodlots are very small (<4 ha), 19% are small (4-10 ha), 14% are mid-sized (10-30 ha), 3% are large (30-40 ha) and 10% are very large (>40 ha). (GIS derived using 1997 NTS maps)
Riparian Forest	19% of the Riparian Zone (20 metres on either side of all watercourses) is forested. The average for the Upper Thames watershed is 24%. (GIS derived using 1997 NTS maps)
Rare Species	Fish – Greenside Darter (UTRCA and DFO 2000)
Significant Natural Sites	Provincially Significant Wetlands – Little Lakes & Swamp Forest Complex, Gads Hill South Wetland Locally Significant Wetlands – Shakespeare Hills & Avon Banks, Stratford Wetland Complex Significant Natural Areas – Avonbank Woods (MNR and UTRCA 1996)

References: For a complete listing of references, see the full report: *The Upper Thames River Watershed Report Cards* (UTRCA, 2001).

Appendix 2: Sample Landowner Contact Letter

October 7, 2002

FIELD(Name)
FIELD(Address)
FIELD(City/Province)
FIELD(Postal Code)

Dear FIELD(Salutation):

Re: Request for Access to Property for Life Science Inventory, Stratford Natural Heritage Study

The City of Stratford and the Upper Thames River Conservation Authority are working together to conduct a life science (biological) inventory of the natural woodlands within Stratford this year. Information on the health and species characteristics of these woodlands will be collected. This data will assist the City and the Conservation Authority in working with landowners to develop strategies to maintain these natural areas in the future. Currently, the City has approximately 2% natural woodland cover.

We are writing you to request consent for access to your property at FIELD(Street Address) to conduct a survey of the woodland area. The field work is quick and unobtrusive. The field survey team will consist of an experienced forester/botanist and one or two field assistants. The team records plant species, animals, soil type and moisture, tree size, and other ecological variables. Plants and animals are not removed from the site, except in rare circumstances where verification is required. Each site is surveyed only once and this usually takes less than one day. Staff hope to complete the work between September and December of this year. Staff carry liability insurance so there is no risk to the landowner.

As part of the thank-you package, all landowners who permit the Conservation Authority access to their property will receive a summary of the information collected in their woodlot and the other Stratford woodlots. This information may assist you in understanding and managing the important characteristics of your woodlot.

We would greatly appreciate your reply on the enclosed consent form (this applies whether you agree to consent or not) by October 16th^h or as soon as possible. If you have any information about the plants, animals or nesting birds on your property that could assist in this study, please check the appropriate space on the consent form and a representative from the Conservation Authority will contact you at your convenience. As well, I would be pleased to answer any questions you may have and can be reached at (519) 451-2800 ext. 261 between 8:15 a.m. and 4:30 p.m. If I am out of the office, please leave a message and I will return your call as soon as possible. The City of Stratford contact for this project is Barbara Dembek, Director of Building and Planning, (519) 271-0250 ext. 221.

Thank you very much for your time.

Yours truly,
UPPER THAMES RIVER CONSERVATION AUTHORITY

Tara Tchir
Planning Ecologist

Encl.

LANDOWNER CONSENT FORM FOR ACCESS TO PROPERTY
2002 Stratford Natural Heritage Study/Life Science Inventory

Please complete this form and return it in the enclosed stamped, self-addressed envelope by September 30th or as soon as possible. Thank-you very much for your assistance with this inventory study.

Permission is granted for qualified personnel, employed by the Upper Thames River Conservation Authority, to be on lands described **FIELD**(Street Address) owned by **FIELD**(Name) between September 30th, 2002 and December 1st, 2002 for the purpose of conducting life science (biological) inventories. It is understood that Conservation Authority staff carry the necessary liability insurance for this project.

YES

NO (please explain): _____

—

—

—

_____ I/We have records or information about the plants, animals or nesting birds on my/our property.

Contact Person(s): _____

Telephone: _____

Signed by: _____

Date: _____

Appendix 3a: Detailed Woodland Descriptions

The following is a brief summary for each woodland patch that was surveyed. Each woodland area is identified with a unique identification letter.

Woodland C (average woodland patch)	
<i>Location:</i> 53 Romeo Street North	<i>Ownership:</i> Private
<i>Size:</i> linear patch, approximately 2.5 ha	<i>Number of Communities:</i> 3 (conifer plantation, riparian forest, mixed forest)
<i>Successional Age:</i> all communities early mid-age	
<i>Forest Description:</i> Conifer plantation canopy is closed and is dominated by Scots pine >> black cherry. Most canopy trees are less than 38 cm DBH. There are a few scattered apple, Norway spruce and hawthorn that are less than 24 cm DBH. As well, there are a few standing snags less than 24 cm DBH. The understory vegetation cover is sparse (15% cover). The riparian forest canopy is open and is dominated by willow. Most willows are greater than 40 cm DBH with several individuals greater than 50 cm DBH. There are a few scattered black cherry, hawthorn, ash and Manitoba maple that are less than 24 cm DBH. As well, there are a few standing snags greater than 50 cm DBH. The understory vegetation is relatively closed (60%). The mixed forest canopy is closed and is dominated by black cherry = Norway spruce. Most canopy trees are less than 38 cm DBH, with a few spruce 40 - 48 cm DBH. There are also scattered elm, black cherry and hawthorn that are less than 24 cm DBH and white pine that are 40 - 48 cm DBH. The understory vegetation cover is greater than 60%.	
<i>Basal Area (m² / ha):</i> The conifer plantation has a basal area of 22 for polewood and 16 for small trees. The riparian forest community has a basal area of 11 for polewood, 3 for small trees, 4 for medium trees, 3 for large trees and 1 for extra large trees. The mixed forest has a basal area of 16 for polewood, 7 for small trees and 5 for medium trees.	
<i>Soil Type:</i> Silty to Sandy Clay Loam with gravel occurring at 25 to 45 cm.. Rolling topography.	
<i>Predominant ELC Classification:</i> CUP 3-3, FOD 7-3, FOM	
<i>Animal Habitat:</i> medium diversity consisting of mast trees, fallen logs, snags, dens and watercourse. The flood plain habitat in the riparian forest is ideal for reptiles, herps and small mammals.	
<i>Disturbance:</i> extensive non-native species, moderate wind throw, artificial drainage along the edge, some light dumping and earth movement, faint trails.	

Woodland CC (one of the better woodland patches)	
<i>Location:</i> 53 Romeo Street North	<i>Ownership:</i> Private
<i>Size:</i> rectangular patch, approximately 3.4 ha	<i>Number of Communities:</i> 2 (deciduous forest, deciduous thicket)
<i>Successional Age:</i> deciduous forest community is mid-aged and the deciduous thicket community is pioneer	
<i>Forest Description:</i> Deciduous forest is closed and is dominated by sugar maple >>> beech = black cherry. Canopy trees are between 26 - 38 cm DBH, with some sugar maple < 50 cm DBH. There are also a few scattered hop hornbeams, hickory and ash that are less than 38 cm DBH. The understory vegetation cover is between 50 - 60%. The deciduous thicket is open with sugar maple > ash = black walnut. There are also a few scattered elm and hawthorn. All trees are less than 24 cm DBH. There are also a few standing dead snags that are less than 24 cm DBH. The understory is relatively open (30 - 40% cover).	
<i>Basal Area (m² / ha):</i> The deciduous forest has a basal area of 12 for polewood and 15 for small trees. The deciduous thicket has a basal area of 14 for polewood.	
<i>Soil Type:</i> Sandy Clay Loam on rolling topography.	
<i>Predominant ELC Classification:</i> FOD 5-1, FOD 7-2	
<i>Animal Habitat:</i> relatively diverse with cavity and mast trees, fallen logs, snags, dens, remnant pools	
<i>Disturbance:</i> abundant non-native species, well marked and widespread trails, some wind throw, artificial drainage, moderate dumping and logging activities, intermediate canopy gaps throughout, lots of mountain biking activities.	
<i>Landowner Comment:</i>	The landowner expressed concern that this woodland patch staddles the new City limit and the County/Township. He is concerned that this split between jurisdictions for the woodland may lead to disjointed management of the woodland in the future.

WoodlandCD (above average woodland patch with a lot of potential to regenerate if left to naturalize)	
<i>Location:</i> 53 Romeo Street North	<i>Ownership:</i> Private
<i>Size:</i> roughly square shaped patch that is approximately 1.5 ha	<i>Number of Communities:</i> 3 (conifer plantation, deciduous forest, deciduous swamp)
<i>Successional Age:</i> young conifer plantation community, a pioneer deciduous forest community and a mature swamp community.	
<i>Forest Description:</i> Conifer plantation canopy is closed and is dominated by Scots pine. All canopy trees are less than 24 cm DBH and very dense. Understory very open, less than 10%. Deciduous forest is closed and is dominated by trembling aspen that is less than 24 cm DBH. There are also some elm scattered throughout that are less than 38 cm DBH. The understory vegetation cover is relatively open (30 - 40%). Deciduous swamp is open and is dominated by soft maple >> willow. Soft Maple are primarily less than 38 cm DBH, but there are a several very large (> 62 cm DBH) individuals in the community. Willow also tend to be quite large (> 50 cm DBH). Large individuals (> 50 cm DBH) of Bur oak are also present. There is very sparse vegetation cover in the understory (< 10%).	
<i>Basal Area (m² / ha):</i> The conifer plantation has a basal area of 26 polewood trees. The deciduous forest has a basal area of 32 for polewood and 2 for small trees. The deciduous swamp has a basal area of 2 for polewood, 8 for small trees, 6 for large trees and 6 for extra large trees.	
<i>Soil Type:</i> Fine sandy loam and clay loam on flat to hummocky topography. Many vernal pools in the swamp area.	
<i>Predominant ELC Classification:</i> CUP 3-3, FOD 3, SWD 3-2	
<i>Animal Habitat:</i> mast trees, fallen logs, snags, dens, remnant pools	
<i>Disturbance:</i> occasional non-native species, disease in small plantation trees, localized flooding in swamp community and some trail use	

Woodland D (very disturbed riparian area with lots of dumping)	
<i>Location:</i> 520 Erie Street	<i>Ownership:</i> Private
<i>Size:</i> two linear strips separated by railroad tracks, approximately 1.4 ha	<i>Number of Communities:</i> 1 (deciduous riparian community)
<i>Successional Age:</i> mid-age community	
<i>Forest Description:</i> Open riparian community with tall willows (> 25 m ht) in the canopy. Understory vegetation cover is approximately 40%.	
<i>Basal Area (m² / ha):</i> not applicable.	
<i>Soil Type:</i> not applicable	
<i>Predominant ELC Classification:</i> FOD 7-3	
<i>Animal Habitat:</i> plenty of dead cavity trees, fallen logs and snags. Also found a nest and a few dens, remnant pools and a watercourse.	
<i>Disturbance:</i> abundant non-native species, heavy dumping in flood plain, heavy trail and recreational use in upland areas, local trails in flood plain, large canopy gaps and heavy flooding.	

Woodland G (average woodland patch)	
<i>Location:</i> Packham / Dunn Road	<i>Ownership:</i> City of Stratford
<i>Size:</i> primarily rectangular with a small strip separated by a drain. Size is approximately 1.3 ha	<i>Number of Communities:</i> 1 (deciduous forest)
<i>Successional Age:</i> young to mid-age closed deciduous forest	
<i>Forest Description:</i> Deciduous forest canopy is closed with Ash >> silver maple. There are also a few scattered elms. Most of the canopy trees are less than 24 cm DBH, although there are several extra large silver maple (greater than 62 cm DBH) and a couple of large ash (50 - 60 cm DBH). Also there are several dead standing snags that are less than 24 cm DBH. The understory is quite open, with approximately 10% cover.	
<i>Basal Area (m² / ha):</i> The deciduous forest has a basal area of 20 for polewood and 12 for small trees.	
<i>Soil Type:</i> Clay with mottles at 32 cm. Flat topography	
<i>Predominant ELC Classification:</i> FOD 7-2	
<i>Animal Habitat:</i> fallen logs, snags, dens	
<i>Disturbance:</i> abundant and widespread non-native species, artificial drainage, light dumping, localized flooding, some wind throw and death of small polewood trees.	

Woodland H (average woodland patch)	
<i>Location:</i> Packham Road and Wright Boulevard	<i>Ownership:</i> City of Stratford
<i>Size:</i> barbell shaped, approximately 2.3 ha	<i>Number of Communities:</i> 3 (two deciduous forest communities, one deciduous swamp community)
<i>Successional Age:</i> two mid aged closed deciduous forest communities and one mid-aged closed deciduous swamp community	
<i>Forest Description:</i> One deciduous community is closed and is dominated by silver maple > ash. Most canopy trees are less than 38 cm DBH, although there are a couple of silver maple that are 40 - 60 cm DBH. There are also scattered elm that are less than 24 cm DBH. The understory vegetation cover is approximately 50%. The other deciduous forest community is dominated by basswood > trembling aspen >> beech. Except for a few basswood and beech that are between 40 - 48 cm DBH, all canopy trees are less than 38 cm DBH. There are also scattered large (50 - 60 cm DBH) black cherry. Standing dead snags between 10 - 24 cm DBH are also present. The understory is very open, approximately 10 % cover. The deciduous swamp community is dominated by silver maple > ash. Most trees are less than 24 cm DBH, although there are a few individuals that range in size from 26 cm to > 62 cm DBH. The understory is very sparse (< 10 % cover).	
<i>Basal Area (m² / ha):</i> The silver maple and ash deciduous forest has a basal area of 14 for polewood, 18 for small trees, 2 for medium trees and 2 for large trees. The basswood and trembling aspen deciduous forest has a basal area of 16 for polewood, 10 for small trees, 2 for medium trees and 4 for large trees. The deciduous swamp community has a basal area of 26 for polewood, 2 for small trees, 2 for medium trees, 2 for large trees and 2 for extra large trees.	
<i>Soil Type:</i> Clay and silty clay with mottles at 27 to 35 cm. Hummocky topography.	
<i>Predominant ELC Classification:</i> FOD 6-1, FOD, SWD 3-2	
<i>Animal Habitat:</i> cavity trees, mast trees, large fallen logs, dens, remnant pools	
<i>Disturbance:</i> occasional non-native species, heavy and extensive wind throw, moderate disease in understory conifers, localized and light logging and dumping.	

Woodland I (average woodland patch, with potential to link to Woodland J)	
<i>Location:</i> Wright Boulevard	<i>Ownership:</i> City of Stratford
<i>Size:</i> L-shaped patch, approximately 2.3 ha	<i>Number of Communities:</i> 3 (deciduous swamp, two deciduous thickets)
<i>Successional Age:</i> two pioneer deciduous thicket communities and one mid-aged closed swamp community	
<i>Forest Description:</i> The deciduous swamp community is closed and is dominated by soft maple >>> eastern cottonwood. There are also ash and willow scattered throughout. Except for a couple of extra large (> 62 cm DBH) cottonwoods, all trees are less than 38 cm DBH. The understory vegetation is dense, greater than 60 % cover. One deciduous thicket is sparsely treed, with trembling aspen = ash. There are also some soft maples present. All trees are less than 38 cm DBH. The understory vegetation is dense, greater than 60% cover. The other deciduous thicket has no tree cover, but is sparsely (< 10%) covered by shrubs. Here, ash = soft maple and there is no understory vegetation.	
<i>Basal Area (m² / ha):</i> The deciduous swamp has a basal area of 8 for polewood, 8 for small trees and 2 for extra large trees. The aspen and ash deciduous thicket has a basal area of 15 for polewood and 1 for small trees. The ash and soft maple deciduous thicket does not have any tree cover.	
<i>Soil Type:</i> Silty loam and clay loam. Flat topography	
<i>Predominant ELC Classification:</i> SWD 3-2, SWD 2, SWD 2	
<i>Animal Habitat:</i> mast trees, fallen logs, snags, watercourse	
<i>Disturbance:</i> occasional non-native species, extensive and intense noise, widespread dumping, wind throw and flooding.	

Woodland J (average woodland patch, with potential to link to Woodland I)	
<i>Location:</i> 193 Lorne Avenue	<i>Ownership:</i> Private
<i>Size:</i> circular, approximately 0.2 ha	<i>Number of Communities:</i> 2 (deciduous thicket, wetland meadow with sparse deciduous trees)
<i>Successional Age:</i> one pioneer deciduous forest community and one pioneer wetland meadow	
<i>Forest Description:</i> Deciduous thicket is closed and is dominated by ash. There are also willows present. All canopy species are less than 38 cm DBH. The understory vegetation cover is greater than 60 %. The wet meadow is primarily open with a few eastern cottonwoods. The understory vegetation cover is approximately 15 %.	
<i>Basal Area (m² / ha):</i> The deciduous thicket has a basal area of 28 for polewood and 4 for small trees. The wetland meadow has no trees.	
<i>Soil Type:</i> Silty sand in the deciduous forest community and clay loam with mottles at 15 cm in the wetland meadow. Flat topography.	
<i>Predominant ELC Classification:</i> FOD 7-2, FOD 8	
<i>Animal Habitat:</i> slash piles and an intermittent channel	
<i>Disturbance:</i> occasional non-native species, artificial drainage and dumping. Seasonal flooding in wet meadow community.	

Woodland K (average woodland patch)	
<i>Location:</i> 456 Lorne Avenue West	<i>Ownership:</i> Private
<i>Size:</i> rectangular, approximately 0.5 ha	<i>Number of Communities:</i> 1 (mixed plantation community)
<i>Successional Age:</i> young mixed plantation community	
<i>Forest Description:</i> Mixed plantation with closed canopy of Norway spruce = red oak = soft maple. There is also an inclusion of Scots pine = white pine = white spruce = cedar. The majority of canopy trees are less than 24 cm DBH, although some red oak and soft maple are between 40 - 48 cm DBH. There are also small (10 - 24 cm DBH) standing dead snags. The understory vegetation cover is approximately 10 %.	
<i>Basal Area (m² / ha):</i> The mixed plantation has a basal area of 39 for polewood, 7 for small and 3 for medium.	
<i>Soil Type:</i> Clay loam with mottles at 32 cm on flat topography	
<i>Predominant ELC Classification:</i> CUP 2	
<i>Animal Habitat:</i> mast trees, snags and watercourse	
<i>Disturbance:</i> entire forest is a plantation, dominant and extensive non-natives, localized drainage channel in middle of woodland, light dumping and light wind throw in west side of woodland.	

Woodland L (below average and isolated woodland patch)	
<i>Location:</i> Perth East	<i>Ownership:</i> Private
<i>Size:</i> circular, approximately 0.3 ha	<i>Number of Communities:</i> 1 (deciduous forest community)
<i>Successional Age:</i> young deciduous open forest	
<i>Forest Description:</i> Deciduous forest is open and is dominated by soft maple >> ash. The majority of canopy trees are less than 38 cm DBH, although there are some soft maple between 40 - 48 cm DBH. There are also dead standing snags that are less than 38 cm DBH. There is no understory vegetation.	
<i>Basal Area (m² / ha):</i> The deciduous forest has a basal area of 16 for polewood, 8 for small and 1 for medium.	
<i>Soil Type:</i> no soil analysis conducted. Flat topography.	
<i>Predominant ELC Classification:</i> FOD	
<i>Animal Habitat:</i> snags	
<i>Disturbance:</i> dominant and extensive non-natives in the ground layer, light dumping, moderate earth movement, widespread logging, possible livestock grazing throughout, heavy wind throw, moderate and widespread canopy gaps and some light disease of canopy trees.	

Woodland M (one of the better woodland patches)	
<i>Location:</i> 75 Kelly's Lane (woodland is located off Vivian Street)	<i>Ownership:</i> Private
<i>Size:</i> rectangular, approximately 1.4 ha	<i>Number of Communities:</i> 1 (Deciduous swamp)
<i>Successional Age:</i> mid-aged deciduous organic swamp	
<i>Forest Description:</i> Closed deciduous swamp dominated by soft maple ranging in size from 10 to 60 cm DBH. There are also scattered ash, elm, basswood and bur oak. Most are less than 24 cm DBH, but there are a few medium sized trees between 26 to 48 cm DBH. There are also a couple of dead snags less than 24 cm DBH. The understory vegetation cover is sparse (less than 10%).	
<i>Basal Area (m² / ha):</i> The deciduous swamp has a basal area of 12 for polewood, 8 for small trees, 9 for medium trees and 2 for large trees.	
<i>Soil Type:</i> Silty clay loam with some organic material at the surface. Flat topography.	
<i>Predominant ELC Classification:</i> SWD 3-2	
<i>Animal Habitat:</i> mast trees, fallen logs, snags	
<i>Disturbance:</i> occasional non-native species, light logging, light wind throw and light disease.	

Woodland N (one of the better woodland patches with potential to link to Woodland O)	
<i>Location:</i> 221 Norfolk Street	<i>Ownership:</i> City of Stratford
<i>Size:</i> rectangular shape, approximately 1.5 ha	<i>Number of Communities:</i> 2 (two deciduous forest)
<i>Successional Age:</i> both mid-aged closed deciduous forest, one dominated by ash in the canopy, the other by bur and red oaks with shagbark hickory	
<i>Forest Description:</i> One closed deciduous forest dominated by Ash >> Shagbark Hickory = Trembling Aspen > Red Oak = Bur Oak. There is also some elm and hawthorn in the canopy. All trees are less than 38 cm DBH, except for a couple of large ash between 50 - 60 cm DBH. Understory cover is approximately 45%. The other closed deciduous forest is dominated by bur oak = red oak >> shagbark hickory > sugar maple = ash= hickory. The red oaks are greater than 50 cm DBH while the bur oaks range in size from 10 to 60 cm DBH. The rest of the canopy trees are less than 38 cm DBH. There are also some black cherry and blue beech that are less than 24 cm DBH. The understory cover is approximately 45%.	
<i>Basal Area (m² / ha):</i> The ash deciduous forest has a basal area of 12 for polewood, 10 for small trees and 2 for large trees. The oak deciduous forest has a basal area 11 for polewood, 6 for small trees, 2 for medium trees, 3 for large trees and 1 for extra large trees.	
<i>Soil Type:</i> hard packed clay loam with mottles at 25 to 35 cm. Hummocky and undulating terrain.	
<i>Predominant ELC Classification:</i> FOD 9, FOD 1	
<i>Animal Habitat:</i> cavity trees, mast trees, fallen logs, snags	
<i>Disturbance:</i> widespread non-native species in understory, widespread trails, moderate dumping, light recreation, light wind throw and intermediate canopy gaps.	

Woodland P (average woodland patch with a lot of potential to regenerate into healthy wetland if left to naturalize. Within 750 m of Stratford Wetland Complex)	
<i>Location:</i> 863 Erie Street	<i>Ownership:</i> Private
<i>Size:</i> rectangular shape, approximately 0.7 ha	<i>Number of Communities:</i> 1 (deciduous swamp)
<i>Successional Age:</i> one mid-aged deciduous swamp community	
<i>Forest Description:</i> Closed deciduous swamp with soft maple >> elm >> ash. The soft maple ranges in size from 10 to > 62 cm DBH. The rest of the canopy trees are less than 24 cm DBH. There are also some bur oak that are less than 24 cm DBH. Elms appear to be dying off at the west side. Understory vegetation cover is approximately 55 %.	
<i>Basal Area (m² / ha):</i> Deciduous swamp has a basal area of 16 for polewood, 6 for small trees, 8 for medium trees and 4 for extra large trees.	
<i>Soil Type:</i> hard packed clay and clay loam. Flat topography.	
<i>Predominant ELC Classification:</i> SWD 2	
<i>Animal Habitat:</i> cavity trees, fallen logs, snags, remnant pools, dens and burrows	
<i>Disturbance:</i> elms dying off on west side, extensive non-natives, faint but extensive trails, heavy dumping, localized earth movement, widespread recreation, light wind throw, intermediate canopy gaps.	

Woodland Q (below average woodland)	
<i>Location:</i> Maple Avenue	<i>Ownership:</i> City of Stratford
<i>Size:</i> long and linear rectangle, approximately 1.2 ha	<i>Number of Communities:</i> 2 (conifer plantation and a deciduous forest)
<i>Successional Age:</i> both communities are mid - aged	
<i>Forest Description:</i> Conifer plantation canopy is closed and consists of Norway spruce > Scots pine = white spruce > soft maple = ash = red pine. All canopy trees are less than 38 cm DBH. Understory cover is greater than 60 %. The deciduous forest is closed with ash primarily in the canopy. There are also scattered individuals of Norway spruce and trembling aspen. All trees are less than 38 cm DBH. There are also some small standing snags less than 24 cm DBH. Understory cover is greater than 60 %	
<i>Basal Area (m² / ha):</i> The conifer plantation has a basal area of 22 polewood and 10 small trees. The deciduous forest has a basal area of 19 polewood and 5 small trees.	
<i>Soil Type:</i> Sandy clay loam with hard clay at 37 cm. Flat topography	
<i>Predominant ELC Classification:</i> CUP 3, FOD 4-2	
<i>Animal Habitat:</i> mast trees, fallen logs, snags	
<i>Disturbance:</i> extensive non-native species, well marked and extensive trail use, moderate garbage dumping, heavy recreational use, moderate noise, light disease and small canopy gaps.	

Woodland R (below average woodland)	
<i>Location:</i> Maple Avenue	<i>Ownership:</i> City of Stratford
<i>Size:</i> bar bell shaped, approximately 0.4 ha	<i>Number of Communities:</i> 2 (mixed plantation)
<i>Successional Age:</i> two young mixed plantations	
<i>Forest Description:</i> One mixed plantation is closed with white spruce >> ash = elm. All trees are less than 38 cm DBH. The understory is greater than 60 % cover. The second plantation is also closed with White spruce = ash >> Norway spruce = soft maple = Scots pine. All trees are less than 38 cm DBH. There are some standing dead snags that are less than 38 cm DBH	
<i>Basal Area (m² / ha):</i> The white spruce plantation has a basal area of 12 for polewood and 8 for small trees. The white spruce and ash plantation has a basal area of 38 for polewood and 4 for small trees.	
<i>Soil Type:</i> Clay and flat topography	
<i>Predominant ELC Classification:</i> CUP	
<i>Animal Habitat:</i> mast trees and snags	
<i>Disturbance:</i> extensive non-native species, well marked but localized trail use, light garbage dumping, moderate noise, light wind throw and disease and small canopy gaps.	

Woodland O (above average woodland patch with potential to link to woodlot # N)	
<i>Location:</i> Lorne Avenue	<i>Ownership:</i> Private
<i>Size:</i> rectangular shaped, approximately 1.6 ha	<i>Number of Communities:</i> 1 (deciduous forest)
<i>Successional Age:</i> mid - aged	
<i>Forest Description:</i> Closed canopy where ash >> bur oak > Shagbark Hickory. Most trees are less than 40 cm DBH although there are a few individuals that are between 45 to 60 cm DBH.	
<i>Basal Area (m² / ha):</i> Not assessed	
<i>Soil Type:</i> Flat topography. Soil texture not assessed.	
<i>Predominant ELC Classification:</i> FOD 9	
<i>Animal Habitat:</i> mast trees and snags, fallen logs, roosting evidence	
<i>Disturbance:</i> abundant non-native species, well marked but localized trail use, light garbage dumping, moderate noise, light wind throw and small canopy gaps.	

Woodland F - Permission For Inventory Not Granted by Owner	
<i>Location:</i> 976 Erie Street	<i>Ownership:</i> Private
<i>Size:</i> circular shaped, approximately 1.3 ha	<i>Number of Communities:</i> not assessed
<i>Successional Age:</i> not assessed	
<i>Forest Description:</i> not assessed	
<i>Basal Area (m² / ha):</i> not assessed	
<i>Soil Type:</i> not assessed	
<i>Predominant ELC Classification:</i> not assessed	
<i>Animal Habitat:</i> not assessed	
<i>Disturbance:</i> not assessed	

Appendix 3b: Riparian Descriptions

The following is a brief summary of the riparian areas that were surveyed for the Aquafor Beech 2002 report and by the UTRCA in 2001 for the City of Stratford. Each riparian area is identified with a unique identification letter and number.

Riparian Zone #R1: (summarized from Aquafor Beech 2002 report)

The riparian forest in this area is narrow and restricted to stream banks with only a few patches extending 5 - 10 m on either side. The forest is limited to a zone within 5 m on either side of the Court Drain, which flows through a shallow river valley <3 m deep and runs east - west in this area through mixed use agricultural and suburban landscape. Immediately adjacent to the riparian zone (*i.e.* within 5 - 10 m of the stream bank), the land has either been cut or cultivated for mixed-grain and forage crops. The forest community is typical of terrestrial eastern deciduous forest growing on surficial deposits in a low-lying riverine habitat. It is dominated by willow and white ash. It is classified as a Fresh- Deciduous Forest (ELC classification FOD7-3). The stand is mid-aged, but mixed, with some very old willow trees along the stream bank intermixed with 20-40 yr old white ash and Manitoba maples. Soil is homogenous and consists of a dry to fresh fine silty loam with a depth of > 120 cm to bedrock.

The canopy layer is dominated by crack willow = white ash > American beech = white elm. The oldest willows in the forest stand are approximately 60 cm DBH. Several large white ash trees and willows (50-60 cm DBH) are located along the stream banks as well. The subcanopy layer is comprised of Manitoba maple, white ash, pin cherry and white elm. The understory is white ash, pear hawthorn, willow and dogwood. The ground layer is heavily shaded on the south side of the creek but with many sunlit patches created by gaps in the tree canopy on the north side. The shaded areas contain Canada violet, sweet coltsfoot and red osier dogwood. The sunlit areas were dominated by old field weeds such as Canada thistle, cow vetch, goldenrod, white clover, stinging nettle and grasses.

It is likely that the riparian zone is used as a movement corridor for a variety of small mammals including weasels, skunks, rabbits, coyotes, racoons, foxes and deer. Raccoon tracks were seen in several locations along the stream bank. Habitat would provide suitable nesting sites for a variety of birds. The presence of some large trees (> 50 cm DBH) could provide roosting and nesting habitats for owls such as the Great horned and Screech owl. Cavities observed in dead trunks and limbs could provide ideal nesting habitat for a wide variety of birds including woodpeckers and warblers. Finally, the presence of permanent running water and a mix of open and forested banks creates ideal habitat for frogs and snakes.

Riparian Zone #R2: (summarized from Aquafor Beech 2002 report)

The riparian zone occupies 10 - 15 m on either side of the stream in a shallow river valley less than 4 m deep. It is a relatively natural, unchannelized reach. In general, the riparian forest is more extensive in the south, occupying the stream banks as well as a low flood plain at the base of the ravine. The creek also cuts a deeper ravine at this point. A 25 - 35 m wide zone of open forest interspersed with an old field community and relic apple orchard extends from the stream valley in the southwest. The dominant tree species are pear hawthorn, white ash, sugar maple and crack willow. The patches of open meadow are dominated by tall flat-topped aster, purple stemmed aster, milkweed, goldenrod, stinging nettle and Canada thistle. A stand of mature red pine also runs west from the stream valley.

The plant community of the riparian zone is typical of a terrestrial eastern deciduous forest growing on a surficial deposit in a low lying riverine habitat dominated by willow and white ash (ELC classification FOD7-3). It is bordered on the southwest by a residential development and to the northeast by intensively cultivated agricultural land. The stand is mid-aged, with some very old willow trees along the stream bank intermixed with young white ash and Manitoba maples. Soil is homogeneous and consists of a fresh to wet fine silty loam with a depth of > 120 cm to bedrock.

The canopy layer is dominated by crack willow = white ash > Manitoba maple. The largest willows are approximately 60 cm DBH. Several large white ash trees (50 - 60 cm DBH) are located along the southwest stream bank as well. The subcanopy layer is comprised of Manitoba maple, white ash, pear hawthorn and pin cherry. The understorey is composed of white ash, pear hawthorn, willow and red osier dogwood. The ground layer is heavily shaded except at the margins and is dominated by seedlings of white ash and Manitoba maple, shoots of willow and herbs such as sweet coltsfoot and large-leafed avens. There are many standing snags and dead logs throughout the forest. Near the forest margins where more light can penetrate, the ground cover becomes dominated by open field species such as goldenrod, grass, thistle and purple stemmed aster.

The presence of a diversity of habitats, including large trees, big decaying limbs and fallen logs makes this an attractive location for burrowing and cavity nesting mammals such as skunks, racoons, chipmunks, squirrels and groundhogs. Several large and active groundhog burrows were detected on the eastern streambank. Fresh deer scat and racoon tracks were found along the stream bank. It is expected that a variety of breeding birds would use this area given the variety of habitats, the presence of tree cavities and snags and the location near a reliable source of water. The deep (20 - 30 cm) and fast flowing characteristics of the stream creates highly suitable and permanent habitat for frogs, snakes and aquatic insect prey.

Riparian Zone #R3: (summarized from UTRCA 2001 report)

This is a heavily used and easily accessible corridor along the Avon River. An extensive trail system runs throughout the riparian zone, and several individual species of trees were planted in this area.

Approximately half of the species recorded in this area are non-native plants. The total area of the riparian corridor is 23 ha, with a maximum vegetated width between 222 m - 358 m. Approximately 15 ha of the 23 ha corridor is covered by forest. In total, 22 vegetation communities were found in the corridor. The community nearest to the river is dominated by willow, poplar and maple. This community is found along the entire length of the river, providing shade, wildlife habitat and erosion control along the banks of the Avon. Other communities found within the TJ Dolan Natural Area corridor include: Sugar Maple Hardwood Deciduous Forest, Willow Lowland Deciduous Forest, Norway Spruce - European Larch Coniferous Plantation, Red Pine Coniferous Plantation, Dry - Moist Old Field Meadow, Silver Maple Mineral Deciduous Swamp, Sugar Maple - White Elm Deciduous Forest and a White Elm Lowland Deciduous Forest.

Appendix 4: UTRCA Benthic Sampling Sampling Protocol and Data Summary

Detailed Description of UTRCA Benthic Sampling Protocol

The UTRCA benthic monitoring program utilizes a slightly modified version of the Type II Rapid Assessment Protocol as developed by Plafkin et al (and updated by Barbour et al - <http://www.epa.gov/owow/monitoring/rbp/>) for the U.S. Environmental Protection Agency . Adjustments to the protocol (to accommodate local conditions) and direction of the sampling are provided by Dr. Robert Bailey of the University of Western Ontario Biology Department

Sampling consists of a timed kick sample following a transverse transect of the stream centred on a riffle or flowing water, if available. Sampling is conducted by travelling upstream on a 45 degree angle, disturbing the substrate and capturing dislodged invertebrates and debris in a D-net (approximately 12"x9" with 500 micron mesh). Sampling is conducted from shore to shore for 3 minutes. All available habitats should be sampled. Soft substrates (i.e. silt or muck) are sampled by gently skimming the surface with the net to capture the approximately .5-1.0 cm of material. Samples are stored in sample bottles clearly labelled with site code, stream name, date, and location, and preserved in 10% buffered formalin. The formalin should be replaced with 70% ethanol 24-72 hours after sampling. In the lab, 2% subsamples are randomly selected and identified to the Family Taxonomic Level until 200 invertebrates have been identified. Water chemistry measurements and a detailed habitat and riparian zone description are also completed at each site. This allows calculation of a number of different indices to characterize aquatic ecosystem health of the site and upstream catchment.

The methods used for sample taking and handling are identical to those recommended by Reynoldsen et al of Environment Canada's National Water Research Institute (NWRI) in their "Field Protocols for Invertebrate Sampling" manual. Currently a committee coordinated by NWRI is working to develop a Southern Ontario Benthic Monitoring Network with consistent sampling protocols and appropriate training. This committee includes representation from NWRI, MOE, MNR, Universities (Waterloo, Western, Toronto) , and several Conservation Authorities. This monitoring network is being developed as part of the Canadian Aquatic Biomonitoring Network (CABIN), also being coordinated by NWRI.

UTRCA Benthic Water Quality Sampling Summary " 97-01

STREAM NAME	LOCATION	DATE	FBI	QUALITY
AVON R	2 KM DOWNSTREAM OF STRATFORD	6/18/98	6.344	Fairly Poor
		6/3/99	6.932	Poor
		6/21/00	7.373	Very Poor
		6/19/01	7.314	Very Poor
AVON R	FIRST ROAD EAST OF STRATFORD	6/19/97	5.726	Fair
ROADHOUSE DR	LOWER SITE	6/3/99	7.050	Poor
		10/2/01	6.404	Fairly Poor
ROADHOUSE DR	UPSTREAM SITE	6/3/99	6.606	Poor
		10/2/01	6.425	Fairly Poor
COURT DR	NORTH OF STRATFORD	7/2/98	5.561	Fair
		6/3/99	6.645	Poor
		6/21/00	6.955	Poor
COURT DR	EAST END OF STRATFORD	7/2/98	5.420	Fair
		6/3/99	5.967	Fairly Poor
		6/21/00	7.259	Very Poor
		10/2/01	5.458	Fair
COURT DR TRIB	UPSTREAM, SOUTH OF ROAD	6/21/00	6.730	Poor
BANNERMAN DR	COURT DR TRIB JUST E OF HWY 19	6/3/99	6.915	Poor
		6/21/00	6.588	Poor

Biotic indices are values assigned to benthic invertebrate taxa indicating their pollution sensitivity and tolerance on a scale from 0 to 10. Lower numbers indicate pollution sensitivity and high numbers tolerance. The Family Biotic Index (FBI) is the weighted average of the biotic index and number of bugs in each taxa in the sample. The water quality ranges for the FBI values are as follows: <5.00 = Good; 5.00-5.75 = Fair; -5.75-6.50 = Fairly Poor; >6.50 = Poor.

Friday, November 15, 2002

UTRCA 1997- 2001 Benthic Sampling Data

Taxonomic Name	Common Name	Life Stage	# in Subsample	Biotic Index
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AVON R

2 KM DOWNSTREAM OF STRATFORD

Sampled 6/18/98

REP: 1				
Asellidae	Sow Bug	A	19	8
Caenidae	Crawling Mayfly	N	1	7
Chironomidae	Midge	P	3	5.4
Chironomidae	Midge	L	55	5.4
Copepoda	Fish Lice	A	1	-1
Glossiphoniidae	Leech	A	5	10.5
Hydropsychidae	Net-spinning Caddisfly	L	4	4.5
Hydroptilidae	Micro-caddisfly	L	16	4
Leptoceridae	Long-horned Caddisfly	L	2	4
Oligochaeta	Aquatic Worm	A	15	8
Physidae	Pouch Snail	A	11	8
Simuliidae	Black Fly	L	2	6
Sphaeriidae	Fingemail Clam	A	7	8
Stream Health		Fairly Poor	Family Biotic Index	6.34
				4285

Sampled 6/3/99

REP: 1				
Acariformes	Water Mite	A	2	4
Asellidae	Sow Bug	A	21	8
Caenidae	Crawling Mayfly	N	2	7
Chironomidae	Midge	L	35	5.4
Chironomidae	Midge	P	3	5.4
Cyclopoida	Fish Lice	A	3	-1
Daphnidae	Water Flea	A	1	-1
Elmidae	Riffle Beetle	L	3	4.5
Glossiphoniidae	Leech	A	1	10
Hydropsychidae	Net-spinning Caddisfly	L	1	4.5
Nematoda	Thread Worm	A	3	-1
Oligochaeta	Aquatic Worm	A	39	8
Physidae	Pouch Snail	A	3	8
Planorbidae	Orb Snail	A	2	-1
Pyralidae	Pyralid Moth	L	1	5
Sphaeriidae	Fingemail Clam	A	3	8
Talitridae	Sideswimmer	A	2	8
Stream Health		Poor	Family Biotic Index	6.93
				2758

Sampled 6/21/00

REP: 1				
Ancylidae	Limpet	A	1	6
Asellidae	Sow Bug	A	14	8
Chironomidae	Midge	L	15	5.4
Chironomidae	Midge	P	2	5.4
Hydropsychidae	Net-spinning Caddisfly	L	1	4.5
Hydrozoa	Hydra	A	1	-1
Oligochaeta	Aquatic Worm	A	74	8
Simuliidae	Black Fly	L	12	6
Simuliidae	Black Fly	P	2	6
Sphaeriidae	Fingemail Clam	A	2	8
Talitridae	Sideswimmer	A	1	8
Stream Health		Very Poor	Family Biotic Index	7.37
				3387

Sampled 6/19/01

		REP: 1		
Acariformes	Water Mite	A	3	4
Asellidae	Sow Bug	A	40	8
Chironomidae	Midge	L	27	5.4
Chironomidae	Midge	P	1	5.4
Elmidae	Riffle Beetle	L	2	4.5
Gammaridae	Sideswimmer	A	4	4
Hydropsychidae	Net-spinning Caddisfly	L	2	4.5
Hydrozoa	Hydra	A	13	-1
Leptoceridae	Long-horned Caddisfly	L	1	4
Nematoda	Thread Worm	A	4	-1
Oligochaeta	Aquatic Worm	A	73	8
Physidae	Pouch Snail	A	1	8
Planaria	Flatworm	A	1	-1
Simuliidae	Black Fly	L	3	6
Sphaeriidae	Fingemail Clam	A	25	8
Stream Health		Very Poor	Family Biotic Index	7.31
				4285

AVON R

FIRST ROAD EAST OF STRATFORD

Sampled 6/19/97

		REP: 1		
Acariformes	Water Mite	A	12	4
Caenidae	Crawling Mayfly	N	2	7
Ceratopogonidae	Biting Midge	L	1	6
Chironomidae	Midge	P	6	5.4
Chironomidae	Midge	L	66	5.4
Elmidae	Riffle Beetle	L	4	4.5
Hydroptilidae	Micro caddisfly	P	1	4
Lymnaeidae	Pond Snail	A	1	6
Nematoda	Thread Worm	A	7	-1
Oligochaeta	Aquatic Worm	A	2	8
Sphaeriidae	Fingemail Clam	A	19	8
Stream Health		Fair	Family Biotic Index	5.72
				6315

ROADHOUSE DR

LOWER SITE

Sampled 6/3/99

		REP: 1		
Asellidae	Sow Bug	A	5	8
Baetidae	Small Mayfly	N	1	4
Chironomidae	Midge	P	2	5.4
Chironomidae	Midge	L	44	5.4
Cyclopoida	Fish Lice	A	6	-1
Daphnidae	Water Flea	A	1	-1
Dytiscidae	Predacious Diving Beetle	L	3	-1
Elmidae	Riffle Beetle	L	1	4.5
Leptoceridae	Long-horned Caddisfly	L	1	4
Oligochaeta	Aquatic Worm	A	75	8
Ostracoda	Seed Shrimp	A	2	-1
Physidae	Pouch Snail	A	9	8
Stream Health		Poor	Family Biotic Index	7.05
				0000

Sampled 10/2/01

		REP: 1		
Asellidae	Sow Bug	A	27	8
Baetidae	Small Mayfly	N	5	4

Caenidae	Crawling Mayfly	N	6	7
Ceratopogonidae	Biting Midge	L	3	6
Chironomidae	Midge	L	54	5.4
Chironomidae	Midge	P	1	5.4
Chordata	Incidentals	A	1	-1
Coenagrionidae	Narrow-winged Damselfly	N	3	9
Corixidae	Water Boatmen	A	4	-1
Cyclopoida	Fish Lice	A	4	-1
Dytiscidae	Predacious Diving Beetle	L	1	-1
Elmidae	Riffle Beetle	A	3	4.5
Elmidae	Riffle Beetle	L	21	4.5
Gammaridae	Sideswimmer	A	6	4
Halipidae	Crawling Water Beetle	A	2	4
Halipidae	Crawling Water Beetle	L	1	4
Hydropsychidae	Net-spinning Caddisfly	L	1	4.5
Leptoceridae	Long-horned Caddisfly	L	1	4
Lymnaeidae	Pond Snail	A	1	6
Oligochaeta	Aquatic Worm	A	10	8
Ostracoda	Seed Shrimp	A	3	-1
Physidae	Pouch Snail	A	43	8
Planaria	Flatworm	A	2	-1
Planorbidae	Orb Snail	A	12	-1
Sphaeriidae	Fingernail Clam	A	1	8

Stream Health Fairly Poor Family Biotic Index 6.40
4761

ROADHOUSE DR

UPSTREAM SITE

Sampled 6/3/99

REP: 1				
Acariformes	Water Mite	A	1	4
Asellidae	Sow Bug	A	8	8
Chironomidae	Midge	L	60	5.4
Corixidae	Water Boatmen	A	2	-1
Cyclopoida	Fish Lice	A	4	-1
Elmidae	Riffle Beetle	L	3	4.5
Elmidae	Riffle Beetle	A	1	4.5
Gammaridae	Sideswimmer	A	1	4
Hydrophilidae	Water Scavenger Beetle	L	9	-1
Oligochaeta	Aquatic Worm	A	16	8
Ostracoda	Seed Shrimp	A	2	-1
Physidae	Pouch Snail	A	22	8
Planorbidae	Orb Snail	A	2	-1
Simuliidae	Black Fly	L	3	6
Sphaeriidae	Fingernail Clam	A	17	8

Stream Health Poor Family Biotic Index 6.60
6060

Sampled 10/2/01

REP: 1				
Asellidae	Sow Bug	A	6	8
Baetidae	Small Mayfly	N	13	4
Ceratopogonidae	Biting Midge	L	3	6
Chironomidae	Midge	L	12	5.4
Coenagrionidae	Narrow-winged Damselfly	N	5	9
Cyclopoida	Fish Lice	A	3	-1
Erpobdellidae	Leech	A	1	-1
Gammaridae	Sideswimmer	A	2	4
Halipidae	Crawling Water Beetle	L	1	4
Halipidae	Crawling Water Beetle	A	1	4
Lymnaeidae	Pond Snail	A	94	6
Oligochaeta	Aquatic Worm	A	40	8

Planorbidae	Orb Snail	A	15	-1
Sphaeriidae	Fingernail Clam	A	6	8
	Stream Health	Fairly Poor	Family Biotic Index	6.42
				5136

COURT DR

NORTH OF STRATFORD

Sampled 7/2/98

	REP: 1			
Acariformes	Water Mite	A	1	4
Asellidae	Sow Bug	A	2	8
Caenidae	Crawling Mayfly	N	2	7
Chironomidae	Midge	L	64	5.4
Chironomidae	Midge	P	1	5.4
Corixidae	Water Boatmen	A	1	-1
Elmidae	Riffle Beetle	L	16	4.5
Elmidae	Riffle Beetle	A	2	4.5
Glossiphoniidae	Leech	A	3	10
Hydrophilidae	Water Scavenger Beetle	L	1	-1
Hydropsychidae	Net-spinning Caddisfly	L	3	4.5
Leptoceridae	Long-horned Caddisfly	L	1	4
Oligochaeta	Aquatic Worm	A	8	8
Planaria	Flatworm	A	13	-1
Sialidae	Alderfly	N	3	4
	Stream Health	Fair	Family Biotic Index	5.56
				1320

Sampled 6/3/99

	REP: 1			
Capniidae	Stonefly	N	1	1
Chironomidae	Midge	L	46	5.4
Cyclopoida	Fish Lice	A	13	-1
Daphnidae	Water Flea	A	1	-1
Dytiscidae	Predacious Diving Beetle	L	5	-1
Elmidae	Riffle Beetle	L	4	4.5
Elmidae	Riffle Beetle	A	3	4.5
Lymnaeidae	Pond Snail	A	3	6
Nematoda	Thread Worm	A	1	-1
Oligochaeta	Aquatic Worm	A	59	8
Ostracoda	Seed Shrimp	A	2	-1
Planaria	Flatworm	A	1	-1
Planorbidae	Orb Snail	A	3	-1
	Stream Health	Poor	Family Biotic Index	6.64
				5689

Sampled 6/21/00

	REP: 1			
Chironomidae	Midge	L	29	5.4
Chironomidae	Midge	P	1	5.4
Cyclopoida	Fish Lice	A	1	-1
Dytiscidae	Predacious Diving Beetle	L	3	-1
Elmidae	Riffle Beetle	A	2	4.5
Hydrophilidae	Water Scavenger Beetle	L	1	-1
Hydropsychidae	Net-spinning Caddisfly	L	1	4.5
Hydrozoa	Hydra	A	6	-1
Lymnaeidae	Pond Snail	A	3	6
Nematoda	Thread Worm	A	3	-1
Oligochaeta	Aquatic Worm	A	56	8
Simuliidae	Black Fly	L	5	6
Talitridae	Sideswimmer	A	3	8
	Stream Health	Poor	Family Biotic Index	6.95
				5000

COURT DR**EAST END OF STRATFORD****Sampled 7/2/98**

REP: 1				
Acariformes	Water Mite	A	2	4
Asellidae	Sow Bug	A	5	8
Chironomidae	Midge	L	53	5.4
Chironomidae	Midge	P	1	5.4
Corixidae	Water Boatmen	A	2	-1
Elmidae	Riffle Beetle	A	1	4.5
Elmidae	Riffle Beetle	L	19	4.5
Hydrophilidae	Water Scavenger Beetle	L	1	-1
Hydropsychidae	Net-spinning Caddisfly	L	5	4.5
Hydroptilidae	Microcaddisfly	L	8	4
Leptoceridae	Long-horned Caddisfly	L	3	4
Oligochaeta	Aquatic Worm	A	3	8
Physidae	Pouch Snail	A	1	8
Planaria	Flatworm	A	3	-1
Sphaeriidae	Fingernail Clam	A	8	8
Tabanidae	Horse Fly	L	1	6
Tipulidae	Crane Fly	L	2	4.5

**Stream Health Fair Family Biotic Index 5.42
0535**

Sampled 6/3/99

REP: 1				
Acariformes	Water Mite	A	1	4
Asellidae	Sow Bug	A	10	8
Caenidae	Crawling Mayfly	N	2	7
Ceratopogonidae	Biting Midge	L	1	6
Chironomidae	Midge	L	116	5.4
Chironomidae	Midge	P	1	5.4
Corixidae	Water Boatmen	A	2	-1
Cyclopoida	Fish Lice	A	2	-1
Dytiscidae	Predacious Diving Beetle	L	2	-1
Elmidae	Riffle Beetle	A	1	4.5
Elmidae	Riffle Beetle	L	8	4.5
Hydroptilidae	Micro-caddisfly	L	2	4
Nematoda	Thread Worm	A	1	-1
Oligochaeta	Aquatic Worm	A	30	8
Planaria	Flatworm	A	3	-1
Simuliidae	Black Fly	L	2	6
Sphaeriidae	Fingernail Clam	A	1	8
Tabanidae	Horse Fly	L	1	6

**Stream Health Fairly Poor Family Biotic Index 5.96
7613**

Sampled 6/21/00

REP: 1				
Asellidae	Sow Bug	A	22	8
Ceratopogonidae	Biting Midge	L	1	6
Chironomidae	Midge	L	20	5.4
Chrysomelidae	Leaf Beetle	L	1	-1
Cyclopoida	Fish Lice	A	1	-1
Elmidae	Riffle Beetle	L	3	4.5
Elmidae	Riffle Beetle	A	3	4.5
Halipidae	Crawling Water Beetle	L	2	4
Hydropsychidae	Net-spinning Caddisfly	L	4	4.5
Oligochaeta	Aquatic Worm	A	72	8
Sphaeriidae	Fingernail Clam	A	3	8
Talitridae	Sideswimmer	A	1	8

		Stream Health	Very Poor	Family Biotic Index	7.25 9541
Sampled 10/2/01		REP: 1			
Acariformes	Water Mite	A		26	4
Asellidae	Sow Bug	A		21	8
Berosus sp.	Water Scavenger Beetle	L		1	-1
Capniidae	Stonefly	N		4	1
Chironomidae	Midge	P		2	5.4
Chironomidae	Midge	L		59	5.4
Elmidae	Riffle Beetle	A		5	4.5
Elmidae	Riffle Beetle	L		51	4.5
Empididae	Dance Fly	L		1	6
Hydropsychidae	Net-spinning Caddisfly	L		1	4.5
Oligochaeta	Aquatic Worm	A		2	8
Planaria	Flatworm	A		43	-1
Sphaeriidae	Fingemail Clam	A		22	8
Tipulidae	Crane Fly	L		1	4.5
Veliidae	Ripple Bug	A		1	-1
		Stream Health	Fair	Family Biotic Index	5.45 8461

COURT DR TRIB

UPSTREAM, SOUTH OF ROAD

Sampled 6/21/00		REP: 1			
Ceratopogonidae	Biting Midge	L		1	-6
Chironomidae	Midge	P		5	5.4
Chironomidae	Midge	L		149	5.4
Cyclopoida	Fish Lice	A		2	-1
Dytiscidae	Predacious Diving Beetle	L		2	-1
Ephydriidae	Shore Fly	L		3	6
Hydropsychidae	Net-spinning Caddisfly	L		1	4.5
Hydrozoa	Hydra	A		1	-1
Lymnaeidae	Pond Snail	A		15	6
Nematoda	Thread Worm	A		3	-1
Oligochaeta	Aquatic Worm	A		173	8
Ostracoda	Seed Shrimp	A		2	-1
Planorbidae	Orb Snail	A		2	-1
Sphaeriidae	Fingemail Clam	A		1	8
		Stream Health	Poor	Family Biotic Index	6.73 0172

BANNERMAN DR

COURT DR TRIB JUST E OF HWY 19

Sampled 6/3/99		REP: 1			
Asellidae	Sow Bug	A		15	8
Ceratopogonidae	Biting Midge	L		1	6
Chironomidae	Midge	P		3	5.4
Chironomidae	Midge	L		43	5.4
Cyclopoida	Fish Lice	A		7	-1
Dytiscidae	Predacious Diving Beetle	L		7	-1
Glossiphoniidae	Leech	A		2	10
Hemiptera	Water Bug	A		3	-1
Hydrophilidae	Water Scavenger Beetle	L		1	-1
Lymnaeidae	Pond Snail	A		3	6
Nematoda	Thread Worm	A		4	-1
Oligochaeta	Aquatic Worm	A		45	8
Ostracoda	Seed Shrimp	A		1	-1

Physidae	Pouch Snail	A	2	8
	Stream Health	Poor	Family Biotic Index	6.91
				5789
Sampled 6/21/00				
	REP: 1			
Asellidae	Sow Bug	A	21	8
Ceratopogonidae	Biting Midge	L	1	6
Chironomidae	Midge	P	6	5.4
Chironomidae	Midge	L	114	5.4
Coenagrionidae	Narrow-winged Damselfly	N	1	9
Corixidae	Water Boatmen	A	2	-1
Dytiscidae	Predacious Diving Beetle	L	7	-1
Glossiphoniidae	Leech	A	1	10
Halipidae	Crawling Water Beetle	L	1	4
Hydrophilidae	Water Scavenger Beetle	L	4	-1
Hydropsychidae	Net-spinning Caddisfly	L	1	4.5
Lymnaeidae	Pond Snail	A	4	6
Nematoda	Thread Worm	A	16	-1
Oligochaeta	Aquatic Worm	A	74	8
Ostracoda	Seed Shrimp	A	4	-1
Physidae	Pouch Snail	A	8	8
Simuliidae	Black Fly	L	4	6
Sphaeriidae	Fingemail Clam	A	1	8
	Stream Health	Poor	Family Biotic Index	6.58
				8607

Benthic Samples were obtained using a Rapid Bioassessment Protocol developed by the United States Environmental Protection Agency and modified by Dr. Robert Bailey of the University of Western Ontario Zoology Department. A representative section of stream is selected, incorporating a riffle if present, and sampled by moving upstream along a diagonal transect, dislodging and capturing invertebrates with a .5 mm mesh "D"-frame net. Samples are preserved in the field and analyzed in the lab to randomly select a 100 bug subsample which is identified to the Family taxonomic level.

The biotic index is a value assigned to benthic invertebrate taxa indicating their pollution sensitivity and tolerance on a scale from 0 to 10. Lower numbers indicate pollution sensitivity and high numbers tolerance. A value of -1 indicates that no biotic index value has been assigned to these taxa.

The Family Biotic Index is the weighted average of the biotic index and number of bugs in each taxa in the sample. The water quality ranges for the FBI values are as follows: <5.00 = Good; 5.00-5.75 = Fair; -5.75-6.50 = Fairly Poor; >6.50 = Poor. The FBI mean values for all UTRCA sites sampled in 1997 through 2000 which were 5.91, 5.83 and 6.18, and 6.61, respectively.

Report prepared - Friday, November 15, 2002

Appendix 5:

UTRCA/Royal Ontario Museum (ROM) Fish Species Summary for Stratford

UTRCA/ROM Fish Species Summary - Stratford

Species		Status - Global	Can	Ont.	Thame	Thames Distribution
<u>Avon River</u>						
Blacknose Dace	Rhinichthys atratulus	G5		S5	A	widespread
Blackside Darter	Percina maculata	G5		S4	C	widespread
Bluntnose Minnow	Pimephales notatus	G5		S5	A	widespread
Brassy Minnow	Hybognathus hankinsoni	G5		S5	A	widespread
Brook Stickleback	Culaea inconstans	G5		S5	A	widespread
Central Stoneroller	Campostoma anomalum	G5	NAR	S2	C	locally common
Common Carp	Cyprinus carpio	G5		SE	A	widespread
Common Shiner	Notropis cornutus	G5		S5	A	widespread
Creek Chub	Semotilus atromaculatus	G5		S5	A	widespread
Fantail Darter	Etheostoma flabellare	G5		S4	C	widespread
Fathead Minnow	Pimephales promelas	G5		S5	A	widespread
Golden Redhorse	Moxostoma erythrurum	G5	NAR	S3	C	widespread
Golden Shiner	Notemigonus crysoleucas	G5		S5	R	localized
Green Sunfish	Lepomis cyanellus	G5	NAR	S4	A	widespread
Greenside Darter	Etheostoma blennioides	G5	VUL	S3	C	widespread
Hornyhead Chub	Nocomis biguttatus	G5	NAR	S4	A	widespread
Iowa Darter	Etheostoma exile	G5		S5	R	localized
Johnny Darter	Etheostoma nigrum	G5		S5	A	widespread
Least Darter	Etheostoma microperca	G5	NAR	S4	C	widespread
Longear Sunfish	Lepomis megalotis	G5	NAR	S3	U	declining
Pearl Dace	Margariscus margarita	G5		S5	R	localized
Pumpkinseed	Lepomis gibbosus	G5		S5	C	widespread
Rainbow Darter	Etheostoma caeruleum	G5		S4	U	localized
Rock Bass	Ambloplites rupestris	G5		S5	A	widespread
Smallmouth Bass	Micropterus dolomieu	G5		S5	A	widespread
Striped Shiner	Notropis chrysocephalus	G5	NAR	S3?	C	widespread
White Sucker	Catostomus commersoni	G5		S5	A	widespread
Yellow Perch	Perca flavescens	G5		S5	C	widespread
<u>Bannerman Drain</u>						
Brook Stickleback	Culaea inconstans	G5		S5	A	widespread
Johnny Darter	Etheostoma nigrum	G5		S5	A	widespread
<u>Court Drain</u>						
Black Bullhead	Ameiurus melas	G5		S3	C	widespread
Blacknose Dace	Rhinichthys atratulus	G5		S5	A	widespread
Blackside Darter	Percina maculata	G5		S4	C	widespread
Bluntnose Minnow	Pimephales notatus	G5		S5	A	widespread
Brassy Minnow	Hybognathus hankinsoni	G5		S5	A	widespread
Brook Stickleback	Culaea inconstans	G5		S5	A	widespread
Central Mudminnow	Umbra limi	G5		S5	A	widespread
Central Stoneroller	Campostoma anomalum	G5	NAR	S2	C	locally common
Common Shiner	Notropis cornutus	G5		S5	A	widespread
Creek Chub	Semotilus atromaculatus	G5		S5	A	widespread
Fantail Darter	Etheostoma flabellare	G5		S4	C	widespread
Fathead Minnow	Pimephales promelas	G5		S5	A	widespread
Green Sunfish	Lepomis cyanellus	G5	NAR	S4	A	widespread
Greenside Darter	Etheostoma blennioides	G5	VUL	S3	C	widespread
Iowa Darter	Etheostoma exile	G5		S5	R	localized
Johnny Darter	Etheostoma nigrum	G5		S5	A	widespread
Largemouth Bass	Micropterus salmoides	G5		S5	C	widespread

Species		Status - Global	Can	Ont.	Thame	Thames Distribution
Pearl Dace	<i>Margariscus margarita</i>	G5		S5	R	localized
Pumpkinseed	<i>Lepomis gibbosus</i>	G5		S5	C	widespread
Rainbow Trout	<i>Oncorhynchus mykiss</i>	G5		SE	C	locally common in spring
Rock Bass	<i>Ambloplites rupestris</i>	G5		S5	A	widespread
Striped Shiner	<i>Notropis chrysocephalus</i>	G5	NAR	S3?	C	widespread
White Sucker	<i>Catostomus commersoni</i>	G5		S5	A	widespread
Yellow Perch	<i>Perca flavescens</i>	G5		S5	C	widespread

JONES LAKE

Golden Shiner	<i>Notemigonus crysoleucas</i>	G5		S5	R	localized
Green Sunfish	<i>Lepomis cyanellus</i>	G5	NAR	S4	A	widespread

Roadhouse Drain

Brook Stickleback	<i>Culaea inconstans</i>	G5		S5	A	widespread
Creek Chub	<i>Semotilus atromaculatus</i>	G5		S5	A	widespread
Johnny Darter	<i>Etheostoma nigrum</i>	G5		S5	A	widespread
Northern Redbelly Dace	<i>Phoxinus eos</i>	G5		S5	A	widespread
White Sucker	<i>Catostomus commersoni</i>	G5		S5	A	widespread

unknown

Blackside Darter	<i>Percina maculata</i>	G5		S4	C	widespread
Bluntnose Minnow	<i>Pimephales notatus</i>	G5		S5	A	widespread
Fathead Minnow	<i>Pimephales promelas</i>	G5		S5	A	widespread
Golden Shiner	<i>Notemigonus crysoleucas</i>	G5		S5	R	localized
Green Sunfish	<i>Lepomis cyanellus</i>	G5	NAR	S4	A	widespread
Johnny Darter	<i>Etheostoma nigrum</i>	G5		S5	A	widespread
Largemouth Bass	<i>Micropterus salmoides</i>	G5		S5	C	widespread
Pumpkinseed	<i>Lepomis gibbosus</i>	G5		S5	C	widespread
White Sucker	<i>Catostomus commersoni</i>	G5		S5	A	widespread

VICTORIA LAKE

Green Sunfish	<i>Lepomis cyanellus</i>	G5	NAR	S4	A	widespread
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UTRCA/ROM Fish Sampling Data - Stratford

Location			UTM x		UTM y	Sample Date
Species	Status -	Global	Can	Ont.	Thame	Thames Distribution
AVON RIVER						
NO DATA						
Creek Chub				502714 S5	4803367 A	8/17/53 widespread
	Semotilus atromaculatus	G5				
NO DATA						
Fantail Darter				502714 S4	4803367 C	1/1/65 widespread
	Etheostoma flabellare	G5				
Greenside Darter				VUL S3	C	widespread
	Etheostoma blennioides	G5				
Hornyhead Chub				NAR S4	A	widespread
	Nocomis biguttatus	G5				
Least Darter				NAR S4	C	widespread
	Etheostoma microperca	G5				
Rainbow Darter				S4	U	localized
	Etheostoma caeruleum	G5				
GOLF COURSE AT COUNTRY CLUB NORTH END STRATFORD						
Greenside Darter				503403 S3	4802275 C	8/1/53 widespread
	Etheostoma blennioides	G5				
GOLF COURSE AT COUNTRY CLUB NORTH END STRATFORD						
Blackside Darter				503403 S4	4802275 C	8/12/53 widespread
	Percina maculata	G5				
Golden Redhorse				NAR S3	C	widespread
	Moxostoma erythrurum	G5				
Green Sunfish				NAR S4	A	widespread
	Lepomis cyanellus	G5				
EASTHOPE TWP AVON R ***						
Least Darter				505373 S4	4803387 C	6/19/73 widespread
	Etheostoma microperca	G5				
Road 111						
Blacknose Dace				505046 S5	4802627 A	11/4/98 widespread
	Rhinichthys atratulus	G5				
Bluntnose Minnow				S5	A	widespread
	Pimephales notatus	G5				
Brassy Minnow				S5	A	widespread
	Hybognathus hankinsoni	G5				
Brook Stickleback				S5	A	widespread
	Culaea inconstans	G5				
Central Stoneroller				NAR S2	C	locally common
	Campostoma anomalum	G5				
Common Shiner				S5	A	widespread
	Notropis cornutus	G5				
Creek Chub				S5	A	widespread
	Semotilus atromaculatus	G5				
Green Sunfish				NAR S4	A	widespread
	Lepomis cyanellus	G5				
Iowa Darter				S5	R	localized
	Etheostoma exile	G5				
Johnny Darter				S5	A	widespread
	Etheostoma nigrum	G5				
Least Darter				NAR S4	C	widespread
	Etheostoma microperca	G5				
Rock Bass				S5	A	widespread
	Ambloplites rupestris	G5				
Stratford STP						
Blacknose Dace				499735 S5	4801900 A	9/5/02 widespread
	Rhinichthys atratulus	G5				
Bluntnose Minnow				S5	A	widespread
	Pimephales notatus	G5				
Central Stoneroller				NAR S2	C	locally common
	Campostoma anomalum	G5				
Common Carp				SE	A	widespread
	Cyprinus carpio	G5				
Common Shiner				S5	A	widespread
	Notropis cornutus	G5				
Creek Chub				S5	A	widespread
	Semotilus atromaculatus	G5				
Fathead Minnow				S5	A	widespread
	Pimephales promelas	G5				
Golden Shiner				S5	R	localized
	Notemigonus crysoleucas	G5				
Greenside Darter				VUL S3	C	widespread
	Etheostoma blennioides	G5				
Johnny Darter				S5	A	widespread
	Etheostoma nigrum	G5				
Longear Sunfish				NAR S3	U	declining
	Lepomis megalotis	G5				
Pumpkinseed				S5	C	widespread
	Lepomis gibbosus	G5				
Rock Bass				S5	A	widespread
	Ambloplites rupestris	G5				

Location			UTM x		UTM y		Sample Date
Species	Status -	Global	Can	Ont.	Thame	Thames	Distribution
Smallmouth Bass		Micropterus dolomieu	G5	S5	A		widespread
Striped Shiner		Notropis chrysocephalus	G5	NAR	S3?	C	widespread
White Sucker		Catostomus commersoni	G5	S5	A		widespread
Yellow Perch		Perca flavescens	G5	S5	C		widespread

u/s of golf course				504212	4802495	9/5/02	
Blacknose Dace		Rhinichthys atratulus	G5	S5	A	widespread	
Blackside Darter		Percina maculata	G5	S4	C	widespread	
Bluntnose Minnow		Pimephales notatus	G5	S5	A	widespread	
Central Stoneroller		Campostoma anomalum	G5	NAR	S2	C	locally common
Common Shiner		Notropis cornutus	G5	S5	A	widespread	
Creek Chub		Semotilus atromaculatus	G5	S5	A	widespread	
Fantail Darter		Etheostoma flabellare	G5	S4	C	widespread	
Fathead Minnow		Pimephales promelas	G5	S5	A	widespread	
Golden Shiner		Notemigonus crysoleucas	G5	S5	R	localized	
Greenside Darter		Etheostoma blennioides	G5	VUL	S3	C	widespread
Iowa Darter		Etheostoma exile	G5	S5	R	localized	
Johnny Darter		Etheostoma nigrum	G5	S5	A	widespread	
Least Darter		Etheostoma microperca	G5	NAR	S4	C	widespread
Pearl Dace		Margariscus margarita	G5	S5	R	localized	
Rock Bass		Ambloplites rupestris	G5	S5	A	widespread	
White Sucker		Catostomus commersoni	G5	S5	A	widespread	
Yellow Perch		Perca flavescens	G5	S5	C	widespread	

Bannerman Drain

Vivian Street				502674	4804098	9/5/02
Brook Stickleback		Culaea inconstans	G5	S5	A	widespread
Johnny Darter		Etheostoma nigrum	G5	S5	A	widespread

Court Drain

Kelly's Lane - upstream				503487	4803032	10/20/00	
Blacknose Dace		Rhinichthys atratulus	G5	S5	A	widespread	
Blackside Darter		Percina maculata	G5	S4	C	widespread	
Bluntnose Minnow		Pimephales notatus	G5	S5	A	widespread	
Brook Stickleback		Culaea inconstans	G5	S5	A	widespread	
Central Stoneroller		Campostoma anomalum	G5	NAR	S2	C	locally common
Common Shiner		Notropis cornutus	G5	S5	A	widespread	
Creek Chub		Semotilus atromaculatus	G5	S5	A	widespread	
Fantail Darter		Etheostoma flabellare	G5	S4	C	widespread	
Fathead Minnow		Pimephales promelas	G5	S5	A	widespread	
Green Sunfish		Lepomis cyanellus	G5	NAR	S4	A	widespread
Iowa Darter		Etheostoma exile	G5	S5	R	localized	
Johnny Darter		Etheostoma nigrum	G5	S5	A	widespread	
Largemouth Bass		Micropterus salmoides	G5	S5	C	widespread	
Pumpkinseed		Lepomis gibbosus	G5	S5	C	widespread	
Rock Bass		Ambloplites rupestris	G5	S5	A	widespread	
Striped Shiner		Notropis chrysocephalus	G5	NAR	S3?	C	widespread
White Sucker		Catostomus commersoni	G5	S5	A	widespread	

Kelly's Lane - upstream				503487	4803032	6/21/00
Blacknose Dace		Rhinichthys atratulus	G5	S5	A	widespread
Blackside Darter		Percina maculata	G5	S4	C	widespread

Location			UTM x		UTM y		Sample Date
Species	Status -	Global	Can	Ont.	Thame	Thames Distribution	
Bluntnose Minnow		Pimephales notatus	G5	S5	A	widespread	
Brook Stickleback		Culaea inconstans	G5	S5	A	widespread	
Central Mudminnow		Umbra limi	G5	S5	A	widespread	
Central Stoneroller		Campostoma anomalum	G5	NAR	S2	C	locally common
Common Shiner		Notropis cornutus	G5	S5	A	widespread	
Creek Chub		Semotilus atromaculatus	G5	S5	A	widespread	
Fantail Darter		Etheostoma flabellare	G5	S4	C	widespread	
Fathead Minnow		Pimephales promelas	G5	S5	A	widespread	
Green Sunfish		Lepomis cyanellus	G5	NAR	S4	A	widespread
Johnny Darter		Etheostoma nigrum	G5	S5	A	widespread	
Pearl Dace		Margariscus margarita	G5	S5	R	localized	
Pumpkinseed		Lepomis gibbosus	G5	S5	C	widespread	
Rock Bass		Ambloplites rupestris	G5	S5	A	widespread	
Striped Shiner		Notropis chrysocephalus	G5	NAR	S3?	C	widespread
White Sucker		Catostomus commersoni	G5	S5	A	widespread	
Kelly's Lane				503487	4803032	10/20/00	
Blacknose Dace		Rhinichthys atratulus	G5	S5	A	widespread	
Blackside Darter		Percina maculata	G5	S4	C	widespread	
Bluntnose Minnow		Pimephales notatus	G5	S5	A	widespread	
Central Stoneroller		Campostoma anomalum	G5	NAR	S2	C	locally common
Common Shiner		Notropis cornutus	G5	S5	A	widespread	
Creek Chub		Semotilus atromaculatus	G5	S5	A	widespread	
Green Sunfish		Lepomis cyanellus	G5	NAR	S4	A	widespread
Iowa Darter		Etheostoma exile	G5	S5	R	localized	
Johnny Darter		Etheostoma nigrum	G5	S5	A	widespread	
Largemouth Bass		Micropterus salmoides	G5	S5	C	widespread	
Pumpkinseed		Lepomis gibbosus	G5	S5	C	widespread	
Rainbow Trout		Oncorhynchus mykiss	G5	SE	C	locally common in spring	
Rock Bass		Ambloplites rupestris	G5	S5	A	widespread	
White Sucker		Catostomus commersoni	G5	S5	A	widespread	
Kelly's Lane				503487	4803032	6/21/00	
Blacknose Dace		Rhinichthys atratulus	G5	S5	A	widespread	
Brook Stickleback		Culaea inconstans	G5	S5	A	widespread	
Central Mudminnow		Umbra limi	G5	S5	A	widespread	
Central Stoneroller		Campostoma anomalum	G5	NAR	S2	C	locally common
Common Shiner		Notropis cornutus	G5	S5	A	widespread	
Creek Chub		Semotilus atromaculatus	G5	S5	A	widespread	
Johnny Darter		Etheostoma nigrum	G5	S5	A	widespread	
Largemouth Bass		Micropterus salmoides	G5	S5	C	widespread	
Pumpkinseed		Lepomis gibbosus	G5	S5	C	widespread	
Rock Bass		Ambloplites rupestris	G5	S5	A	widespread	
White Sucker		Catostomus commersoni	G5	S5	A	widespread	
Yellow Perch		Perca flavescens	G5	S5	C	widespread	
Perth Line 36				501899	4804189	6/21/00	
Black Bullhead		Ameiurus melas	G5	S3	C	widespread	
Blacknose Dace		Rhinichthys atratulus	G5	S5	A	widespread	
Bluntnose Minnow		Pimephales notatus	G5	S5	A	widespread	
Brassy Minnow		Hybognathus hankinsoni	G5	S5	A	widespread	
Brook Stickleback		Culaea inconstans	G5	S5	A	widespread	
Central Mudminnow		Umbra limi	G5	S5	A	widespread	
Central Stoneroller		Campostoma anomalum	G5	NAR	S2	C	locally common

Location			UTM x		UTM y		Sample Date
Species	Status -	Global	Can	Ont.	Thame	Thames	Distribution
Common Shiner							
Creek Chub							
Fantail Darter							
Fathead Minnow							
Iowa Darter							
Johnny Darter							
Pearl Dace							
Pumpkinseed							
White Sucker							

Kelly's Lane - upstream			503487	4803032	11/4/98	
Blacknose Dace	Rhinichthys atratulus	G5	S5	A	widespread	
Blackside Darter	Percina maculata	G5	S4	C	widespread	
Bluntnose Minnow	Pimephales notatus	G5	S5	A	widespread	
Brassy Minnow	Hybognathus hankinsoni	G5	S5	A	widespread	
Brook Stickleback	Culaea inconstans	G5	S5	A	widespread	
Central Stoneroller	Camptostoma anomalum	G5	NAR	S2	C	locally common
Common Shiner	Notropis cornutus	G5	S5	A	widespread	
Creek Chub	Semotilus atromaculatus	G5	S5	A	widespread	
Fantail Darter	Etheostoma flabellare	G5	S4	C	widespread	
Fathead Minnow	Pimephales promelas	G5	S5	A	widespread	
Green Sunfish	Lepomis cyanellus	G5	NAR	S4	A	widespread
Greenside Darter	Etheostoma blennioides	G5	VUL	S3	C	widespread
Iowa Darter	Etheostoma exile	G5	S5	R	localized	
Johnny Darter	Etheostoma nigrum	G5	S5	A	widespread	
Pearl Dace	Margariscus margarita	G5	S5	R	localized	
Pumpkinseed	Lepomis gibbosus	G5	S5	C	widespread	
Rock Bass	Ambloplites rupestris	G5	S5	A	widespread	
White Sucker	Catostomus commersoni	G5	S5	A	widespread	

Perth Line 36			501899	4804189	11/27/95	
Blacknose Dace	Rhinichthys atratulus	G5	S5	A	widespread	
Bluntnose Minnow	Pimephales notatus	G5	S5	A	widespread	
Central Stoneroller	Camptostoma anomalum	G5	NAR	S2	C	locally common
Johnny Darter	Etheostoma nigrum	G5	S5	A	widespread	
White Sucker	Catostomus commersoni	G5	S5	A	widespread	

JONES LAKE

STRATFORD			502835	4803201	7/30/1929	
Green Sunfish	Lepomis cyanellus	G5	NAR	S4	A	widespread

STRATFORD			502835	4803201	8/30/1929	
Golden Shiner	Notemigonus crysoleucas	G5	S5	R	localized	
Green Sunfish	Lepomis cyanellus	G5	NAR	S4	A	widespread

Roadhouse Drain

0'Lone Ave			499224	4802442	9/5/02
Brook Stickleback	Culaea inconstans	G5	S5	A	widespread
Creek Chub	Semotilus atromaculatus	G5	S5	A	widespread
Johnny Darter	Etheostoma nigrum	G5	S5	A	widespread
Northern Redbelly Dace	Phoxinus eos	G5	S5	A	widespread

Location			UTM x		UTM y	Sample Date
Species	Status -	Global	Can	Ont.	Thame	Thames Distribution
White Sucker		Catostomus commersoni	G5	S5	A	widespread

unknown

William Street			501988		4802612	9/5/02
Blackside Darter		Percina maculata	G5	S4	C	widespread
Bluntnose Minnow		Pimephales notatus	G5	S5	A	widespread
Fathead Minnow		Pimephales promelas	G5	S5	A	widespread
Golden Shiner		Notemigonus crysoleucas	G5	S5	R	localized
Green Sunfish		Lepomis cyanellus	G5	NAR S4	A	widespread
Johnny Darter		Etheostoma nigrum	G5	S5	A	widespread
Largemouth Bass		Micropterus salmoides	G5	S5	C	widespread
Pumpkinseed		Lepomis gibbosus	G5	S5	C	widespread
White Sucker		Catostomus commersoni	G5	S5	A	widespread

VICTORIA LAKE

NORTH EASTHOPE TWP VICTORIA LAKE ***			501351		4801534	9/5/73
Green Sunfish		Lepomis cyanellus	G5	NAR S4	A	widespread

Location	Status - Global	UTM x	UTM y	Sample Date
Species	Can	Ont.	Thame	Thames Distribution

Global Rank (GRANK)

Global ranks are assigned by a consensus of the network of natural heritage programs (conservation data centres), scientific experts, and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species, subspecies or variety. The most important factors considered in assigning global (and provincial) ranks are the total number of known, extant sites worldwide, and the degree to which they are potentially or actively threatened with destruction. Other criteria include the number of known populations considered to be securely protected, the size of the various populations, and the ability of the taxon to persist at its known sites. The taxonomic distinctness of each taxon has also been considered. Hybrids, introduced species, and taxonomically dubious species, subspecies and varieties have not been included.

G1 Extremely rare; usually 5 or fewer occurrences in the overall range or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.

G2 Very rare; usually between 5 and 20 occurrences in the overall range or with many individuals in fewer occurrences; or because of some factor(s) making it vulnerable to extinction.

G3 Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

G4 Common; usually more than 100 occurrences; usually not susceptible to immediate threats.

G5 Very common; demonstrably secure under present conditions.

COSEWIC Status:

Status assigned by the Committee on the Status of Endangered Wildlife in Canada.

EXT Extinct. A species that no longer exists.

EXP Extirpated. A species no longer existing in the wild in Canada, but occurring elsewhere.

END Endangered. A species facing imminent extirpation or extinction throughout its Range.

THR Threatened. A species likely to become endangered if limiting factors are not reversed.

VUL Vulnerable. A species of special concern because of characteristics that make it particularly sensitive to human activities or designation.

NAR Not At Risk. A species that has been evaluated and found to be not at risk.

Provincial Rank (SRANK):

Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario. By comparing the global and provincial ranks, the status, rarity, and the urgency of conservation, needs can be ascertained. The NHIC evaluates provincial ranks on a continual basis and produces updated lists at least annually. The NHIC welcomes information which will assist in assigning accurate provincial ranks.

S1 Extremely rare in Ontario; usually 5 or fewer occurrences in the province or very few remaining individuals; often especially vulnerable to extirpation.

S2 Very rare in Ontario; usually between 5 and 20 occurrences in the province or with many individuals in fewer occurrences; often susceptible to extirpation.

S3 Rare to uncommon in Ontario; usually between 20 and 100 occurrences in the province; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances. Most species with an S3 rank are assigned to the watch list, unless they have a relatively high global rank.

S4 Common and apparently secure in Ontario; usually with more than 100 occurrences in the province.

S5 Very common and demonstrably secure in Ontario.

SE Exotic; not believed to be a native component of Ontario's flora.

S? Unranked, or, if following a ranking, rank uncertain (e.g. S3?). S? species are thought to be rare in Ontario, but there is insufficient information available to assign a more accurate rank.

Prepared - Thursday, March 06, 2003

Appendix 6: Draft Municipal Drain Classification Map

Fisheries Act authorization of HADD's (Harmful Alteration, Disruption or Destruction of Fish Habitat) is required for all drain cleanout activities and alterations. The Municipal Drain Classification Project effectively streamlined the authorization process for open surface drains that have resilient (or little) fish habitat while protecting open surface drains that support significant or sensitive fish stocks.

Department of Fisheries and Oceans Drain Classification Definitions

Class	Definitions	Authorization Required
A	permanent cold water flow without trout or salmon present	class authorization
B	permanent warm water flow, gamefish present, unstable habitat	class authorization
C	permanent warm water flow, baitfish only present	class authorization
D	permanent cold water flow with trout present	project specific authorization
E	permanent warm water flow, gamefish present, stable habitat	project specific authorization
F	intermittent flow	authorized if works are completed when dry, when location is wet, contact CA

See DFO Fact Sheet # 2 for the protocol used to classify the municipal drains.

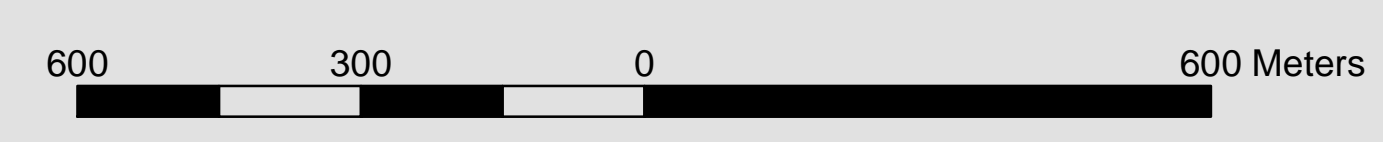
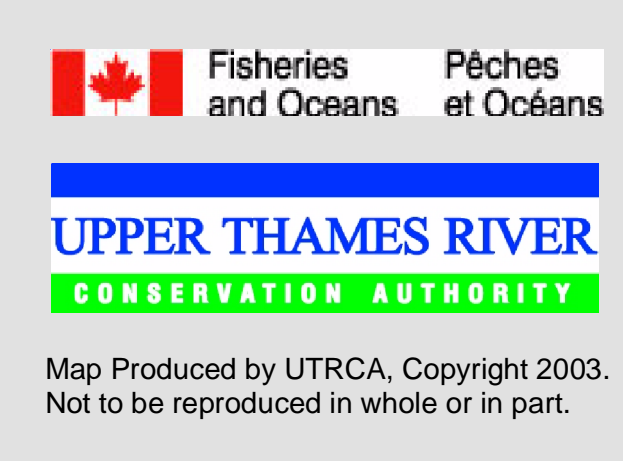
The Drain Classification maps were created from the digital flow layer that was received from the Ontario Ministry of Natural Resources in accordance with their data sharing agreement. The drainage flow layer used in the mapping was the result of updating Ontario Base Mapping drainage features, dated 1983-5 based on 1:10,000 air photo interpretation. This update was done throughout the Province of Ontario through a Ministry of Natural Resources initiative to develop a provincial digital elevation model and delineate watersheds. The UTRCA updated the flow layer in 1999 using 1989 air photos and National Topographic Survey (NTS) mapping. Through the Geomatics portion of the Drain Classification Project this layer was manipulated and updated with respect to open surface drains that had been altered to a closed/tiled system based on 2000 aerial photography interpretation.

It should be noted that not all drains are found on the maps, with specific reference to closed/tiled systems. Some of the closed/tiled systems are found on the maps due to the aerial interpretation of the flow layer, the closing in of open surface drains, and the original consideration of closed/tiled systems to be watercourses, i.e. they convey water, hence they would be included in the flow layer. Newly constructed drains have not been incorporated into the flow layer, as the majority have been tiled making the interpretation and accuracy of the closed systems more difficult.

Stratford

DRAFT Drain Classification

- A
- B
- C
- D
- E
- F
- Natural
- Tiled
- Subwatershed Boundaries
- Roads
- Lots & Concessions



STRATFORD

DRAFT Drain Classification Maps

Fisheries Act authorisation of HADD's (Harmful Alteration, Disruption or Destruction of Fish Habitat) is required for all drain cleanout activities and alterations. The Municipal Drain Classification Project effectively streamlined the authorisation process for open surface drains having resilient (or little) fish habitat while protecting open surface drains supporting significant or sensitive fish stocks.

Class	Definitions	Authorisation Required
A	permanent cold water flow without trout or salmon present	class authorisation
B	permanent warm water flow, gamefish present, unstable habitat	class authorisation
C	permanent warm water flow, bassfish only present	class authorisation
D	permanent cold water flow with trout present	project specific authorisation
E	permanent warm water flow, gamefish present, stable habitat	project specific authorisation
F	intermittent flow	class authorisation

See DFO Fact Sheet # 2 page 3 for the protocol used to classify the municipal drains.

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