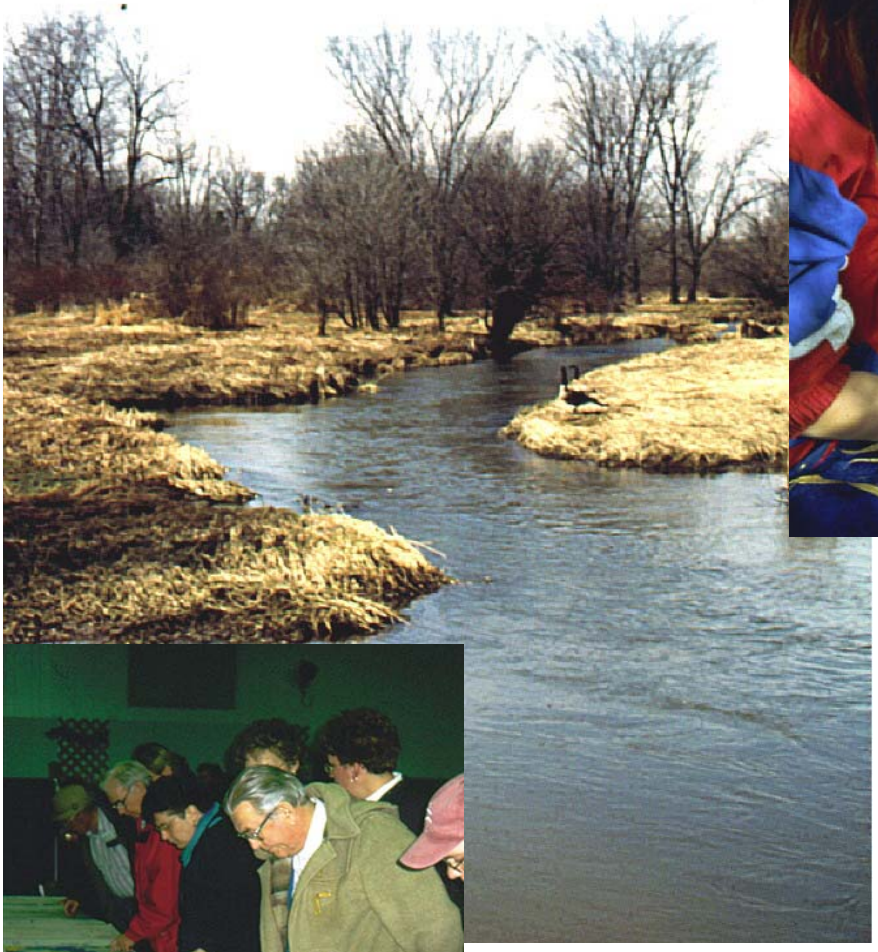
Cedar Creek

Watershed Management Strategy

April 1998



"To improve the health of the Cedar Creek watershed and educate and involve the community"

Cedar Creek

WATERSHED PROJECT

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

Several groups and individuals from all facets of the community have assisted in the development of the Cedar Creek Watershed Management Strategy. These groups are listed in Appendix I. In addition, many organizations provided facilities free of charge for meetings and open houses, including the Southside Aquatic Centre, Oxford County Health Unit, Fanshawe College, and the Oxford County Board of Education Field Studies Centre. Thanks also goes to the City of Woodstock Parks Division for providing the venue (Southside Park) for the Community Day in 1997. Many local landowners have also volunteered their time and property for school monitoring programs. Students from Huron Park Secondary School, under the direction of Gary Topolie, have included the Cedar Creek Watershed Project on a web site about Woodstock, as part of the Canadian Communities Atlas Project: <www.woodstock.net>. Several students from Oliver Stephens Senior School, East Oxford School, and North Norwich School submitted entries in a logo design contest. A design by Sophia Newman from East Oxford School was chosen by the community. A special thank you is extended to the project sponsors listed in Appendix I. The printing of this report was funded by the Shell Environmental Fund.

BACKGROUND

The Cedar Creek watershed is located in Oxford County and includes areas in Norwich and South-West Oxford Townships, part of the City of Woodstock, and the villages of Sweaburg and Oxford Centre.

The watershed is culturally and ecologically significant. It includes a mix of rural and urban areas. Most of the rural land is used for agriculture. An Area of Natural and Scientific Interest (ANSI) is located on the west side of the watershed. There are also three provincially significant and three locally significant wetlands in the watershed. The City of Woodstock's water supply comes from one of these wetlands.

The Cedar Creek Watershed Project began in the summer of 1996 when the Woodstock Environmental Advisory Committee (WEAC) approached the Upper Thames River Conservation Authority about implementing a Global Rivers Environmental Education Network (GREEN) project in the Woodstock area. GREEN originated in Michigan in 1984 as a watershed monitoring and education program for elementary and secondary school students. Today, students from 135 countries participate in GREEN and share their information via the World Wide Web.

The Cedar Creek Watershed Project Coordinating Committee formed in the summer of 1996 and defined the mission of the project:
To improve the health of the Cedar Creek watershed, and educate and involve the community.

In February 1997, the Project Coordinating Committee created subcommittees to work on different aspects of the project. The Education Subcommittee developed the elementary and secondary school watershed education and monitoring program which began in the 1997-98 school year. The Technical Subcommittee determined the location for the monitoring sites in the watershed and initiated the watershed technical summary.

Presentations were made to the councils of Norwich and South-West Oxford Townships, the City of Woodstock, and the County of Oxford. All councils support the goals of the project.

An open house was held in March 1997 to enlist community support and participation in the project. The open house was well attended.

The project was launched at a Community Day held in Southside Park in May 1997. Ceremonial trees were planted by local dignitaries and several environmental monitoring techniques were demonstrated for the public.

Community input was gathered at an open house and at community meetings. A second open house was held in November 1997 to present the watershed technical summary (Section A) and to generate a list of community concerns and issues. This preliminary list of issues was expanded at two community meetings held in January 1998, and each issue was discussed in detail. Comments were compiled into a draft management strategy. The community provided comments at a meeting in February 1998 to finalize the priorities and action plans.

The development of the management strategy is outlined in Figure 1.

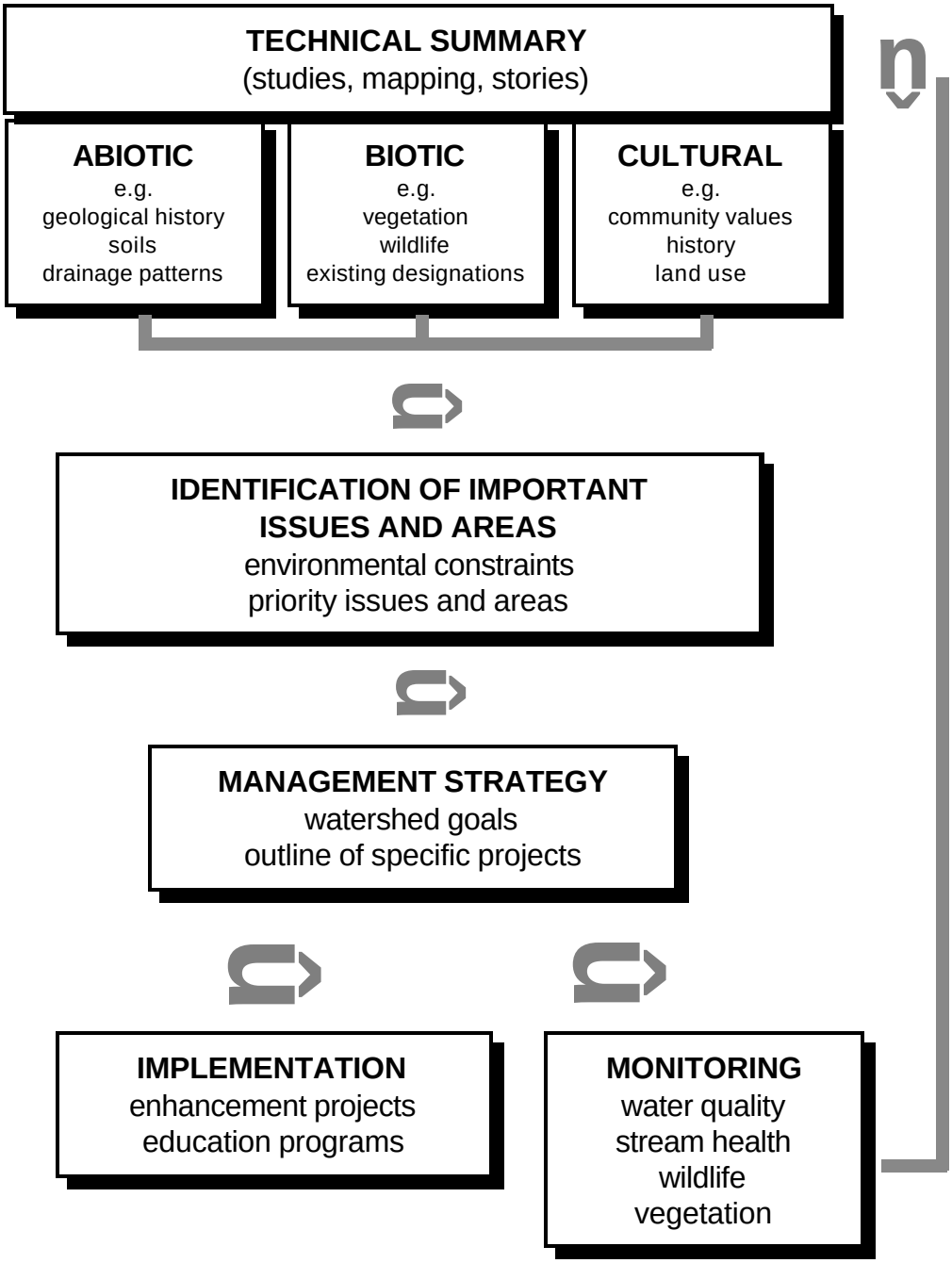


Figure 1. Steps to implementing the Cedar Creek Watershed Project

CEDAR CREEK WATERSHED TECHNICAL SUMMARY

Introduction

A technical report was undertaken to compile background information on the Cedar Creek watershed. The report was completed using the ABC Method: an analysis of abiotic (A), biotic (B) and cultural (C) information as separate components (Bastedo et al. 1984, Daigle and Havinga 1996). In 1997, technical experts from the Upper Thames River Conservation Authority completed each component by compiling information from maps, studies and interviews with local residents. This information was combined and used by the Cedar Creek Watershed Project committees to identify issues and concerns and to prioritize action plans to enhance the health of the watershed.

Four maps follow this section: abiotic resources, biotic resources, cultural features, and drainage information.

Study Area

Cedar Creek begins about eleven kilometres south of Woodstock and flows north through the city, supplying water to Hodge's Pond and Southside Pond before emptying into the Thames River. The 93 square kilometre watershed includes areas in Norwich and South-West Oxford Townships, part of the City of Woodstock, and the villages of Sweaburg and Oxford Centre (Table 1).

Table 1. Area of Municipalities in Watershed.

Municipality	Area (sq. km)	% of watershed
City of Woodstock	11.5	12
Township of Norwich	52.8	57
Township of South-West Oxford	28.7	31

References

Bastedo, J D, G Nelson and N D Theberge. 1984. Ecological Approach to Resource Survey and Planning for Environmentally Significant Areas: The ABC Method. Environmental Management 8(2): 125-134.

Daigle, J-M and D Havinga. 1996. *Restoring Nature's Place: A Guide to Naturalizing Ontario Parks and Greenspace*. Ecological Outlook Consulting and Ontario Parks Association, Schomberg, Canada.

ABIOTIC RESOURCES

Bedrock

The Precambrian bedrock of the Canadian Shield lies more than 1500 metres (5000 feet) below the existing land surface. In general, the surface slopes toward the southwest as a result of the bowl-like structure formed by the granitic Precambrian rock. Between the granite and the surficial soil layers are many layers of sedimentary rock. The upper layer of bedrock is a limestone and dolostone mixture from the Amherstburg Formation.

Physiography

Glacial ice covered all of Ontario during the Wisconsinan glaciation period. In the early stages of melting, land was first exposed in the Orangeville area before a second opening developed in the Waterloo area. Sand and gravel was deposited by meltwater flowing into these openings. As melting proceeded, the opening extended from the Windsor area through London and Waterloo north past Orangeville. Melting continued both north and south of this dividing line while the meltwater drained toward the southwest into a glacial lake.

Initially, three distinct channels or spillways were carved into the land's surface by the meltwater. The northern channel east of St. Marys is now occupied by Trout Creek. The southern spillway is occupied by the South Branch of the Thames River, and the Middle Branch of the Thames River is found in the other spillway. Meltwater drained through these channels until other spillways, such as the Grand River, were developed.

As the glacier receded toward the south, it paused several times creating the Mount Elgin Ridges across South-West Oxford and Norwich Townships. Heading south from Highway 401, the Ingersoll Moraine is the first ridge followed by the St. Thomas, Norwich and Tillsonburg recessional moraines. All of these were created by the deposition of sediment into a mound along the front of the melting ice.

After the Ingersoll moraine was created, glacial recession toward the south continued to produce meltwater, which drained north into the South Branch of the Thames River through a channel that is now occupied by Cedar Creek. The St. Thomas moraine created a drainage divide, though, and meltwater was

diverted through other channels toward the southeast. Although the volume of water was reduced at that time, Cedar Creek continued to carry glacial meltwater for some time, probably until the Grand River system was fully developed.

Soil Texture

Each of the physiographic features has a distinct soil texture resulting from the forces involved during their formation. Moving water deposited sand and gravel in the spillway while standing water deposited clay-rich till between the Ingersoll and St. Thomas moraines. Erosion of the glacial deposits in the 10,000 years since the Wisconsinan glaciation has levelled the topography and mixed the soil textures from the various deposits.

The Oxford County soil map was revised with the aid of Geographic Information System (GIS) technology to produce a simplified soil map (included in the abiotic resources map). This groups the various soil series according to the predominant textural classification. Only clay, silt, sand, loam and organic classifications were illustrated on the resulting map. Approximately 50 percent of the Cedar Creek watershed consists of the silt-rich soil of the Woodstock drumlin field and the Ingersoll Moraine. There is sandy soil in the spillway near the headwaters and from Hodge's Pond into Woodstock. Clay-rich soil comprises the southern boundary of the watershed along the St. Thomas moraine. Organic deposits are found around Hodge's Pond and along one of the southeastern branches of the Creek. Soil texture information is not available for the portion of the watershed within the City of Woodstock boundaries.

Sediment Delivery

Soil texture, surface slope, vegetative cover, precipitation and crop/tillage practices are factors which affect soil erosion and sediment delivery to surface watercourses. Fine-grained sandy soils and silty soils are more susceptible to erosion than coarse sand or clay-rich soil. Steep slopes, row crops (e.g., corn and soybeans) and poor crop/tillage practices will also contribute to soil erosion and soil loss. Potential soil loss is calculated through the Universal Soil Loss Equation to determine a value in tons/acre/year (tonnes/hectare/year).

The proportion of available eroded sediment which reaches a stream is defined as the delivery ratio. The sediment delivery ratio depends on the distance to a stream, the slope, the roughness of the landscape or the amount of vegetation the runoff must flow through, the ability of an area to generate runoff (hydrologic activity) and the hydraulic characteristics of the sediment itself. By applying GIS technology, maps can be produced to illustrate the terrain's capability to transport sediment to a stream. Much of the headwater area will have high potential for erosion and delivery of sediment.

Aggregate Resources

In the Cedar Creek watershed, the soil layers (overburden) between the bedrock and the surface range in thickness from 30 to 60 metres. Although the bedrock is limestone, mining is not practised within the watershed due to the thickness of the overburden and possibly as a result of the purity of the limestone itself.

Sand and gravel are extracted at several locations, especially in the southwest area of the watershed between Hodge's Pond and Oxford County Road 46. Extraction also occurs southwest of the City of Woodstock's boundary, just outside of the watershed boundaries. Primary and secondary aggregate resource areas were recently mapped in preparation for the County's new Official Plan. These areas represent high quality deposits of a size where commercial extraction is likely to occur. The identified areas are not marked or designated for extraction through the Official Plan.

Groundwater Resources

All residents of the Cedar Creek watershed and in the City of Woodstock rely on groundwater as their source of water for drinking, cooking, bathing and other domestic uses. Groundwater is also used by commercial, industrial and institutional facilities in the Village of Sweaburg and surrounding area. Woodstock obtains water from seven wells in the Sweaburg area and four wells within the City itself. Rural residents in the watershed rely on both deep and shallow wells.

In Cedar Creek Swamp, the Thornton Springs and Tabor Springs well fields are located within 260 hectares of Woodstock PUC owned land. Wells number 1, 3, 5 and 8 are located in the Thornton Springs well field and wells number 2 and 4 are in the Tabor Springs well field. Water is piped to the Southside Park pumping station by gravity flow. Additional water is available from well number 6 at Southside Park and well number 7 at Sutherland Park during peak demand periods. These wells are drawing water from both shallow aquifers in sand and gravel deposits, and deep aquifers in the bedrock.

An intensive review of the existing information pertaining to groundwater resources was completed in 1990 by MacLaren Engineers (D. Charlesworth and Associates) as part of a Water Supply Master Plan for the County of Oxford. The final report was used extensively in the preparation of groundwater policies for the Official Plan. The County recognized the importance of groundwater as a resource and established policies for groundwater protection (Schedule C-2, Environmental Constraints).

To protect the groundwater resources, approximately 50 percent of the watershed was identified as a groundwater recharge area. Specific policies relating to water quality deal with land use, buffer strips, building setbacks from riparian zones, and intensification of livestock operations. To ensure the quantity of groundwater is not diminished, new policies outline the need for availability studies, water taking permits, conservation plans and stormwater infiltration.

Water Quality

A number of studies that have taken place in the Cedar Creek watershed give some indication of current and historical water quality. In general, however, water quality information for Cedar Creek is quite limited.

The Oxford County Health Unit monitored the water quality at Southside Pond for 19 years (1973-1991) to determine its safety for public swimming. Most samples taken over the years showed bacteria levels well above the safe guideline for swimming (more than 100 fecal coliform bacteria per 100 ml water sample). Throughout the 19 years of monitoring, the bacterial pollution in Cedar Creek at Southside Pond remained fairly constant and unfit for safe recreational use (Figure 2).

Cedar Creek was monitored at two separate locations over a 26 year period (1965-1991) as part of the Provincial Water Quality Monitoring Network of the Ministry of Environment and Energy (MOEE). Fecal coliform was monitored from 1972 to 1991 and levels were high throughout the monitoring period indicating continuous inputs of contamination from human or animal waste (Figure 3). Nitrate levels were generally in the acceptable range but showed a steady increase from 1965-1991. Virtually all samples taken showed total phosphorus concentrations as increasing and above the MOEE guideline for recreational waters. This indicates that there are sources of phosphorus (e.g., detergents, fertilizers) contaminating Cedar Creek.

The Thames River Basin Water Management Study conducted from 1970-1973 assessed benthic invertebrate populations as an indication of water quality. Only 12 organisms of six different types were found at the mouth of Cedar Creek in Woodstock, which indicates poor water quality. Very low levels of dissolved oxygen (1 ppm) in the creek typified the presence of toxic wastes and was reflected by the limited scope of aquatic life in the creek.

The Woodstock PUC is currently undertaking a nitrate investigation at 40 locations in the Cedar Creek watershed including municipal wells, domestic wells, and surface water samples. This study is assessing any nitrate contaminations to the wells which supply water to the City of Woodstock and wells which supply rural residents. The study was initiated in May 1996 and is in progress.

Figure 2. Fecal coliform levels in Southside Pond from 1973 to 1991 (County of Oxford Health Unit).

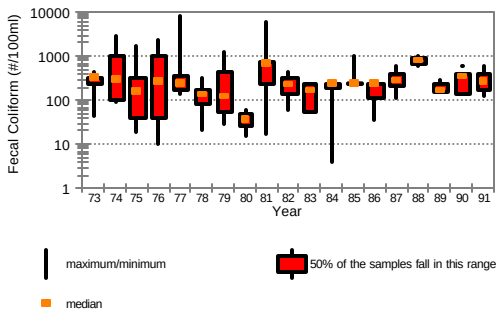
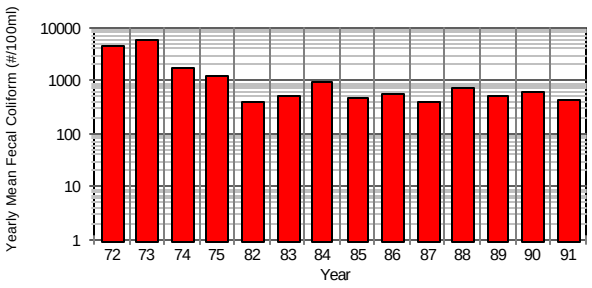


Figure 3. Fecal coliform levels in Cedar Creek at Ingersoll Road (1972-1975) and at Old Stage Road (1982-1991) (Provincial Water Quality Monitoring Network of the Ministry of Environment and Energy).



To address the need for a better understanding of the water quality of Cedar Creek two monitoring programs were initiated in 1997. A water quality monitoring program was started that involves student collecting benthic invertebrate samples at eight locations in the watershed. Chemical water analysis will be done on water samples from eleven locations. The Upper Thames River Conservation Authority with the University of Western Ontario is also conducting a more detailed assessment of benthic invertebrates at four locations along Cedar Creek. The water quality ranged from fair to poor. One sample ranked in the bottom five out of 80 sites sampled in the upper Thames River watershed.

References

Chapman, L J and D F Putnam. 1984. *The Physiography of Southern Ontario*. Ontario Geologic Survey, Special Volume 2, Accompanied by Map p. 2715 (coloured) scale 1:600,000.

County of Oxford. 1995. Oxford County Official Plan.

County of Oxford Board of Health. Southside Park Water Quality Data (1973-1991)

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BIOTIC RESOURCES

Vegetation Cover Characteristics

The Cedar Creek watershed has approximately 11.7 percent vegetation cover based on National Topographic Series maps at 1:50,000 scale (Natural Resources Canada, Geomatics). This is slightly lower than the total vegetation cover for Oxford County of 12 to 14 percent of the landscape. More than 16 percent of the vegetation cover is encompassed by Cedar Creek Swamp, a provincially significant wetland complex. The vegetation cover in the Cedar Creek watershed is detailed in Table 2.

The size class distribution of vegetation patches in the Cedar Creek watershed are atypical for Oxford County. Across the county, patches less than 4 hectares are most common, representing more than 50 percent of the total vegetation cover. At the opposite end of the spectrum, patches greater than 40 hectares are uncommon in Oxford County and represent less than 5 percent of the vegetation patches. Based on this comparison, the Cedar Creek watershed is unique and contains a number of significant vegetation patches. These may be considered as key natural features upon which to base watershed enhancement strategies.

Table 2. Patch size class distribution in the Cedar Creek watershed.

Patch Size Class	Area of Vegetation	% of Total Area of Vegetation
Less than 4 ha	75.3 ha	6
4 to 10 ha	110.1 ha	10
10 to 20 ha	189.1 ha	17
20 to 30 ha	26.9 ha	2
30 to 40 ha	83.1 ha	7
greater than 40 ha	654.4 ha	57

Significance

The Cedar Creek watershed contains six wetlands which have been evaluated under the Ministry of Natural Resources Wetland Evaluation System and assigned a wetland class (1 through 7) based on their significance. Three of these wetlands are Class 1, 2 or 3 and are therefore provincially significant. The other three evaluated wetlands are locally significant (Class 4 to 7). The wetland class relates to provincial policies made under the Planning Act related to wetland protection.

The watershed also contains Trillium Woods, which has been identified as a Provincial Nature Reserve and an Area of Natural and Scientific Interest.

Table 3 identifies significant attributes which should be considered in developing restoration plans adjacent to these areas.

Forest Interior

Forest interior refers to the protected core area found inside a woodlot that some bird species require to nest and breed successfully. Generally, woodlots or patches greater than 30 hectares in size and closest to a circle in shape contain the most forest interior and, thus, habitat for these area sensitive bird species. Forest interior birds are rare in southern Ontario and in Oxford County. As such, increasing forest interior in the watershed is important.

The Cedar Creek watershed has eight vegetation patches that are greater than 30 hectares in size and contain some forest interior. Seven of these are

portions of the evaluated wetlands listed in the Table 3. It would be beneficial to target irregularly shaped areas through naturalization projects around the perimeter to enhance and increase the forest interior bird habitat.

"Bulking up" these areas by filling in gaps around their perimeter will make the woodlot's shape closer to that of a circle, reduce the amount of forest edge, and increase the amount of forest interior.

Table 3. Significant natural areas in the Cedar Creek watershed.

Name	Significant Features/Functions
Brick Wetlands	< Class 2, provincially significant wetland complex < biologically diverse < 4 provincially significant bird species < 5 regionally significant plants < 2 regionally significant bird species
Cedar Creek Swamp Complex (formerly known as Sweaburg Swamp)	< Class 1, provincially significant wetland complex < Significant Natural Area (Hilts, 1976) < large area (184 ha patch) < 2 provincially significant bird species < active feeding area for colonial waterbirds (waterfowl) < great blue heronry < water storage/detention area (Woodstock's main water source) < extensive bird records exist < most of the site and adjacent lands owned by Woodstock PUC < remnant coniferous swamp association
Oxford Centre Swamp	< Class 3, provincially significant wetland < Significant Natural Area (Hilts, 1976) < large area (90 ha patch) < deciduous swamp < used for educational and recreational purposes < headwaters of Cedar Creek
Cedar Creek Source Complex	< Class 6, locally significant wetland complex < Significant Natural Area (Hilts, 1976) < headwaters of Cedar Creek < deciduous swamp and marsh
Jack Griffin's Wetland (NO3B)	< Class 6, locally significant wetland complex < deciduous swamp and marsh < headwaters of Cedar Creek
(NO-TRT5)	< Class 7, locally significant wetland < deciduous swamp and marsh < headwaters of Cedar Creek
Trillium Woods	< Provincial Nature Reserve < Crown Land < Area of Natural and Scientific Interest (ANSI) < deciduous upland forest

Restoration Ideas

The six evaluated wetlands in the watershed represent the primary building blocks upon which to connect and restore gaps and holes in the surrounding landscape. In areas where woodlots are narrow or irregular in shape, it is important to work with landowners to "bulk up" areas through naturalization and tree planting efforts.

Vegetation patches between 30 and 40 hectares are also a priority for "bulking up" because they already have some interior forest and the potential for greater significance. Adding to these areas will buffer and protect them by decreasing the edge to area ratio.

It is important to create corridors and linkages between core areas wherever possible. Vegetation buffers along watercourses help to improve water quality through shading and filtration of sediments from runoff during heavy rain. Corridors and linkages between woodlots provide opportunities for wildlife shelter and movement between areas. They also promote seed dispersal and biodiversity in the watershed.

Ecological benefits are maximized by naturalizing land which is close to existing natural areas and between existing woodlots or vegetation patches. Increasing local and total forest cover in the watershed is another broader goal which arose from the Oxford County Terrestrial Ecosystems Study (UTRCA 1997). The County of Oxford's intent is to increase forest cover in the County to 15 percent by the year 2010 and this is a reasonable goal for the Cedar Creek subwatershed. For reference, 30 percent forest cover is considered a healthy level for stable ecosystems.

Fisheries

Fisheries surveys were completed by the Ministry of Natural Resources in 1974 and Ecologistics in 1991. Species found during these surveys are listed in Table 4.

Table 4. Fish species present in Cedar Creek in 1974 and 1991 (from Ecologistics Limited 1991).

Family	Common Name	Scientific Name
Catostomidae	White Sucker	*Catostomus commersoni*
Centrarchidae	Rock Bass	*Ambloplites rupestris*
	Green Sunfish	*Lepomis cyanellus*
	Longear Sunfish	*Lepomis megalotis*
	Pumpkinseed	*Lepomis gibbosus*
Cyprinidae	Northern Redbelly Dace	*Phoxinus eos*
	Blacknose Dace	*Rhinichthys atratulus*
	Bluntnose Minnow	*Pimephales notatus*
	Brassy Minnow	*Hybognathus hankinsoni*
	Fathead Minnow	*Pimephales promelas*
	Common Shiner	*Notropus cornutus*
	Golden Shiner	*Notemigonus crysoleucas*
	Redfin Shiner	*Notropis umbratilis*
	Rosyface Shiner	*Notropis rubellus*
	Creek Chub	*Semotilus atromaculatus*
	Hornyhead Chub	*Nocomis biguttatus*
	Carp	*Cyprinus carpio*
Gasterosteidae	Brook Stickleback	*Culeae inconstans*
Percidae	Greenside Darter	*Etheostoma blennioides*
	Johnny Darter	*Etheostoma nigrum*
	Least Darter	*Etheostoma microperca*
	Rainbow Darter	*Etheostoma caeruleum*

References

Ecologistics Limited. 1991. MTO Stream Crossing W. P. 509-90-00. Report prepared for Ministry of Transportation, Planning and Design Section, London, Ontario.

Hanna, R. 1976. Trillium Woods, Area of Natural and Scientific Interest (ANSI): A Life Science Inventory. In S. Hilts. *Significant Natural Areas in Oxford County*.

King L. 1997. *The Oxford County Terrestrial Ecosystems Study*. Upper Thames River Conservation Authority, London, Ontario.

Ontario Ministry of Natural Resources. 1983. Ministry of Natural Resources, Wetland Evaluations for Brick Wetlands, Cedar Creek Swamp Complex, Oxford Centre Swamp, Cedar Creek Source Complex, NO3B, NO-TR5.

Mapping

Earth Science Areas of Natural and Scientific Interest

Oxford County Terrestrial Ecosystems Study: Abiotic Groups

Oxford County Terrestrial Ecosystems Study: Historical Forest Cover for Soil Moisture and Stage of Succession

Oxford County Terrestrial Ecosystems Study: 1952 Forest Inventory

Oxford County Terrestrial Ecosystems Study: Forest Patch Size Classification.

CULTURAL FEATURES

A large amount of historical information was supplied by local residents and members of the Oxford Historical Society. Pamphlets, newspaper articles and historical maps reflect the changes in the Cedar Creek watershed in the 1800s and 1900s.

Settlement

Etienne Brule was the first European to view the Woodstock site (Evans pers. comm.). In 1793, Lieutenant Governor John Graves Simcoe marked the hill east of the Thames River on a survey as a perfect site for a town (McLeod 1984). The "town plot" was named Woodstock after his hometown in England. Zacharias Burtch was the first settler near the town plot. He arrived in 1800 and built a cabin on the present site of the Woodstock YMCA (Evans pers. comm.).

Sweaborg (Sweaburg) and Oxford Centre appear on maps from the late 1800s. Four schools were located in the Cedar Creek watershed: north of Sweaborg, south of Oxford Centre, south of Woodstock and on present day Gunn's Hill Road. Two cheese factories were located in the Cedar Creek watershed, both in East Oxford Township. G. N. Long owned the cheese factory next to Cedar Creek south of Woodstock near the present day 401 crossing. The second cheese factory in the south end of the watershed was owned by Alexander Cuthbert. Oxford Centre boasted two churches. There was also a church at Curries, which is still standing, and at the corner of the present day Beaconsfield Road and Highway 59. A furniture factory and a tannery were located opposite each other on the corner of Main and Mill Streets in Woodstock.

The Brick Ponds Wetland Complex got its name from a brickyard that was located east of Beard's Lane in Woodstock (Evans pers. comm.). Peers owned the brickyard and supplied bricks to Woodstock in the 1850s and 1860s (Bennett pers. comm.). Red bricks made at this brickyard were used to build St. Paul's Church and other buildings in the area (Evans pers. comm.). When the yard closed, bricks were brought in from Hamilton (Bennett pers. comm.).

There were several mills in the Cedar Creek watershed. In Woodstock, a grist mill was located at Dundas and Wilson Streets and a planing mill was located at Wilson and Cedar Streets. A grist mill was built at Hodge's Pond and photographs indicate that it was still standing in the 1950s (Butler pers. comm.). Hodge owned property at the curve in Old Stage Road and the pond was named after him (Piper pers. comm.). Peter Meek owned a sawmill southwest of Sweaborg. A woolen mill was located on Mill Street south of the railway in the present day McIntosh Park, Woodstock. McIntosh Pond was a man-made pond at the mill. A canal supplied water to this pond and bypassed the natural path of Cedar Creek beginning near the location of present day Southside Pond. Ice was cut from this area for refrigeration in the summer. Harry McIntosh ran the ice house. The pond was also used for swimming in the summer (Bennett pers. comm.). This pond and canal no longer exist. Hatch's Mill (1825) was located near the Great Western Railway (CNR) on Bay Street. A waterway, known as Hatch's Creek, flowing from the east end of Woodstock was dammed and a series of ponds was formed at the mill (Domett date unknown). Maps show the creek originating from the Brick Ponds area.

The Journal of Alfred Domett describes the natural features of the Woodstock, Beachville and Ingersoll areas in the early 1830s. Domett spent some time at Hatch's Mill, including duck hunting in the ponds. With a companion, he chopped down cedar trees to be split for rails. He describes a swamp south of Hatch's Mill where they cut down the cedars. The trees were very short and appeared to be in the entire area. He recorded sightings of partridges, blue jays, nuthatches, woodpeckers, and quails. He also recounts trips he made from Hatch's Mill to Beachville and Oxford (Ingersoll). His descriptions indicate that the south end of the Cedar Creek watershed was cleared for farming before the swampy areas in the northern end.

Transportation

In the early 1800s, most travel was by water as overland routes were not common and stage coach travel over bumpy roads was uncomfortable. In 1830, people living near Woodstock proposed a canal to link Cedar Creek to the Thames River. The canal would bypass the rapids at the mouth of Cedar Creek and avoid the portage. The proposed canal would begin just before the rapids and run south of Cedar Creek to the Thames River. It was hoped that a village of trade and commerce would emerge northwest of the canal. (Evans pers. comm.). The canal plans were cancelled when the railway went through (Bennett pers. comm.).

Old Stage Road runs east-west through the Cedar Creek watershed. It was originally a foot path used by Aboriginals travelling from Hamilton to Lake St. Clair. Because the foot path took the route of least resistance, it is a very winding road. After the war of 1812, stage coaches used this road to travel from Hamilton to London. In the 1850s the first railroad was built and the stage coach business died out (Rural Routes 1992).

The first railroad built in the area was the Great Western Railway, now the Canadian National Railway (Rural Routes 1992). The Port Dover and Lake Huron Railroad ran north-south parallel to present day Highway 59 and intersected the Great Western Railway near the ponds at Hatch's Mill on Bay Street, Woodstock. The railway closed in the 1950s. The ponds at Hatch's Mill were covered in 1939 by a train platform (Bennett pers. comm.). The Credit Valley Railway running from Beachville to the west end of Woodstock is now the Canadian Pacific Railway.

Two streetcars provided transportation between Woodstock and Ingersoll in the early 1900s. The streetcar Estelle began running in 1901 and Miss Woodstock was added in later years. The trolley cars could hold about 24 passengers each and were also used as a delivery service for farmers who lived along the line. The service stopped in 1925 and was replaced with automobiles. The streetcar line was removed in 1928 (Evans date unknown, McLeod 1984).

As car usage increased, more roads were built. Today, the Cedar Creek watershed is crossed by many major roads and highways. Highway 401 from Toronto to Windsor crosses the north end of the watershed just south of Woodstock. Highway 403 to Brantford begins at Highway 401 on the east edge of the watershed. County Road 2 (Dundas Street, formerly Highway 2) is on the northern boundary and County Road 59 South (Highway 59) divides the watershed in half. Oxford County Road 12 (Sweaburg Road) is located in the west corner of the watershed and County Road 40 (Curries Road) runs east-west through the middle.

Water Supply

Up until the 1880s, private dug wells were the main source of water for Woodstock residents. As housing density (and outhouse density) increased in the town, the surface water and the wells were becoming polluted. Frequent epidemics of typhoid fever resulted (Williams and Baker 1967, Evans 1975, Evans pers. comm.). The epidemics motivated the citizens to build a hospital in Woodstock and to look for a better water supply (Evans 1975a).

James Hay Jr. developed his own waterworks system as fire protection for his furniture factory on the corner of Main and Mill Streets (Williams and Baker 1967). This system pumped water from Cedar Creek (Woodstock PUC 1996). As part of an 1880 agreement, he also supplied part of Woodstock with water from his waterworks (Williams and Baker 1967, Evans 1975a). The Water Commission formed in 1885 and began looking for an alternate source of water, as Cedar Creek was considered unsatisfactory (Williams and Baker 1967). In 1890, the Commission bought springs in East Oxford from Harton and on Sweaburg Road from Thornton. By 1892, more than thirteen miles of water mains were established (Williams and Baker 1967, Evans pers. comm.). By 1907, every area of Woodstock was receiving water. The city forced residents to stop using dug wells. This was met with some opposition from the residents, but as typhoid cases declined, the citizens began to accept it (Williams and Baker 1967).

Once Woodstock became a city in 1901, the Water and Light Commission was formed to supply the city with water and electricity. In 1921, this commission was renamed the Public Utility Commission (PUC). Currently the PUC has seven wells near Cedar Creek Swamp and four wells in the city. Water is pumped out of the wells and flows into the pumping station in Southside Park by gravity and pressure. Today, about 188 kilometres of water mains bring water to the residents of Woodstock (Woodstock PUC 1996).

As Woodstock's population has grown, so has its water consumption. The city's annual water consumption has increased from 2.3 billion litres (510 million gallons) in 1935 to 7.4 billion litres (1.6 billion gallons) in 1995 (Woodstock PUC 1996).

Natural Disasters

Floods and other natural occurrences have affected the Cedar Creek Watershed. Woodstock has experienced flooding from Cedar Creek. Photographs from the 1937 flood show a large portion of the west end of Woodstock under water. Car access to Woodstock via eastbound Highway 2 is disrupted on an almost annual basis by Cedar Creek and Thames River flooding. The Woodstock tornado in 1979 caused damage to some areas of Oxford Centre Swamp.

Current Land Use

More than 90 percent of the land in the Cedar Creek watershed is privately owned. Table 5 summarizes land use based on 1996 zoning data from the County of Oxford Planning Department.

Table 5. 1996 Land Use in the Cedar Creek Watershed.

Land Use	Area (sq. km)	% of Watershed
Agriculture	56.6	60
Residential	13.5	14
Urban - City of Woodstock **	11.5	12
Environmental Protection / Open Space	7.7	8
Industrial / Commercial	4.1	4
Other	1.2	1

** Urban - City of Woodstock includes all uses in the City of Woodstock, such as residential, industrial and open space

Recreation and Education

Parks and Natural Areas

In 1909, the Woodstock Parks Commission began to acquire property along Cedar Creek. The land was not attractive to the local residents because of the lack of wildlife due to the pollution from a local tannery, and the area was often flooded and swampy. A dam was built and Southside Pond was created in 1914 to control the flooding (source unknown). For more than 50 years, overnight camping was permitted north of Southside Pond. The campground was once considered across Ontario as one of the best campgrounds in North America. Tourists participated in various activities, such as dances and concerts. The boathouse once held canoes and other equipment for tourists to use (Evans 1975b).

The shape of Southside Pond was not ideal and the water in several sections remained stagnant and clogged with algae. Some corners were filled in and rip-rap was added to the edge of the pond (Piper pers. comm.). Water quality in the pond has been poor for more than 25 years (Bragg pers. comm.). Plans to improve the water quality through planting wetland species met with opposition from Southside Park neighbours. The project included a plan to plant cattails and bulrushes and create a sediment basin to improve water quality, prevent erosion and control waterfowl use of the pond. Neighbours felt that the project was too costly, would restrict canoeing and skating on the pond, and create a swamp that would attract mosquitoes, snakes, muskrats and turtles (Cantera date unknown). The project was put on hold. In 1997, a windmill and aerators were erected in the pond to improve the water quality. A master plan for landscaping the park is being created and reviewed. (Major pers. comm.).

In 1997, the City of Woodstock and local groups launched a proposal to create a new activity complex in Southside Park near the aquatic centre (Janssen 1997). Southside Pool, opened in 1974 (Evans 1975b), is the basis for a complex that will contain a seniors' centre, a lawn bowling club and a YM/YWCA (Janssen 1997).

Most of the Brick Ponds Wetland Complex was turned over to the City of Woodstock as part of a development agreement (Piper pers. comm.) A policy for the Brick Wetlands is outlined in the Oxford County Official Plan. The following are the only permitted activities in the Brick Wetland Complex: conservation and enhancement of soils, wetland area and wildlife habitat, and the establishment of storm water management facilities approved by the City of

Woodstock, the Ministry of Natural Resources and the Upper Thames River Conservation Authority. The land within the wetland complex that is currently used for agriculture will be retired and allowed to naturally regenerate. The timing of this will be determined by the landowner and the City of Woodstock. Woodstock established a storm water diversion channel along the south side of the Canadian National Railway to carry peak storm water flows from the east side of Springbank Avenue to the west (County of Oxford 1995). Water quantity and quality, vegetation, wildlife and aquatic life will be monitored to measure changes over time. The City will oversee this monitoring program in conjunction with the Ministry of Natural Resources and the Upper Thames River Conservation Authority. The City will also initiate an education program for landowners in the Brick Wetlands drainage area, with the purpose of reducing impact on the wetland from activities in the surrounding area (County of Oxford 1995).

Trillium Woods Provincial Nature Reserve is located on Trillium Line west of Sweaburg. This 10 hectare Provincial Nature Reserve is owned and managed by the Ministry of Natural Resources. Hiking is permitted on the trails in the area.

Hodge's Pond is located in the Cedar Creek Swamp. A Rotary Club once ran a day camp on the northwest side of the pond. The area is rich with wildlife but hunting is not allowed. The dam at Hodge's Pond was breached and fixed sometime in the last ten years. There is a large amount of silt in Cedar Creek between the dam and Highway 401 (Piper pers. comm.). The Woodstock Public Utility Commission, for safety reasons, does not adjust the dam structure or control the water level in the pond (Gow pers. comm.)

Hunting and Fishing

Hunting and fishing has been popular in the Cedar Creek watershed since the 1800s. The Oxford Fish and Game Protection Association owns land in the Oxford Centre Swamp on Old Stage Road. Wild turkeys were released in the Cedar Creek Swamp about twelve years ago and the population has remained constant at about 50. Deer, mink, muskrat and raccoon are also common in the swamp. Hodge's Pond is a staging area for teal and mallards (Piper pers. comm.). Cormorants and Canada geese also use the pond (pers. obs.). The Ontario Federation of Anglers and Hunters installed wood duck and bluebird boxes and an osprey platform in Cedar Creek Swamp. Carp are very common in the creek (Piper pers. comm.). A picture from 1947 shows a boy holding a trout caught by his father from Southside Pond (Woodstock Sentinel Review date unknown). Trout could still be caught in Cedar Creek in Woodstock in the early 1990s, but they are no longer common today (Piper pers. comm.).

Hiking and Canoeing

There are a few hiking trails in the watershed. David Butler maintains a network of trails along Cedar Creek and Mud Creek on his property between Pattullo Avenue and Old Stage Road. A rough, undeveloped trail runs from Southside Park to the natural area at the mouth of Cedar Creek. In 1997, all-terrain-vehicle (ATV) trails were created in the natural area at the mouth of the creek. Efforts are being made to stop this activity, as the damage to the natural area has become quite extensive (pers. obs.).

Canoeing is also popular in Cedar Creek through Woodstock. A photograph in the Woodstock Sentinel Review (1997) shows three teenagers returning home after four hours of paddling and portaging in Cedar Creek from Southside Park to the edge of town. Cedar Creek and its tributaries south of Woodstock are usually too shallow or too overgrown with vegetation to canoe (pers. obs., Piper pers. comm.).

Golfing

The Downs at Cedar Creek Golf Club is a nine-hole public golf course located along Cedar Creek between Parkinson Road and Highway 401. No fertilizers are used on the course and pesticides are only used for dandelion control (Bruin pers. comm.) The natural path of the creek was not drastically changed when the golf course was built.

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Personal Communications

Edwin Bennett, Oxford Historical Society

Michael Bragg, Oxford County Health Unit and Oxford County Planning Department

Herman Bruin, The Downs at Cedar Creek Golf Club

David Butler, local landowner

Mary Evans, Oxford Historical Society

Murray Gow, Woodstock Public Utility Commission

Dan Major, City of Woodstock Parks Division

Russ Piper, Ontario Federation of Anglers and Hunters

Doug Symons, Oxford Historical Society

Mapping

Historical Maps (1800s) of Woodstock, East Oxford Township, West Oxford Township

PRIORITIES AND ACTIONS

Introduction

The local community was involved in the development of the Cedar Creek Watershed Management Strategy through a questionnaire, open houses, and community meetings. The action plans that follow address the issues that were expressed by the community. They are not listed in order of priority as many plans will be implemented simultaneously.

The implementation of some action plans has already begun. Others will be initiated in 1998. Action plans may be added or revised to deal with issues and concerns that arise throughout project implementation.

PRIORITIES

Priority Issues

Abiotic

- Groundwater Protection
- Surface Water Quality Improvement

Biotic

- Woodlot Health and Enhancement
- Fisheries / Wildlife
- Cedar Creek Swamp / Hodge's Pond
- City of Woodstock Creek Water Quality Improvement
- Brick Ponds

Cultural

- Water Wells / Source
- History of Watershed
- Southside Pond
- Balance between Conflicting Interests
- Conflicting Legislation
- Adopt-a-Stream
- Enforcement
- Education
- Monitoring

Priority Actions

Nutrient Management
Groundwater Research and Monitoring
Well Head Definition
Surface Water Quality Research and Monitoring
Community Education on Water Supply
Target Waterways for Enhancement
Target Woodlot Areas for Enhancement
Study of Dam at Hodge's Pond
Research History of Watershed
Brick Ponds Community Education
Brick Ponds Environmental Monitoring
Southside Park / Pond
Watershed Education Program for Local Schools

ACTION PLANS

Nutrient Management

Action:
- Partner in a cooperative effort to implement a nutrient management strategy for the Townships of South-West Oxford and Norwich.
- Monitor and develop this pilot project so that it can be adopted on a province wide basis.
- Achieve local surface and groundwater quality improvements.

How:
- Initiate public education programs about farming practices.
- Carry out research and disseminate practical information.
- Landowner extension programs.
- Improve municipal land use planning tools.
- Develop incentive programs.
- Promote local farm tours.

Potential Partners:
landowners, general public, Oxford County Nutrient Management and Water Protection Committees, Christian Farmers Federation, Ontario Ministry of Agriculture, Food and Rural Affairs, Oxford Federation of Agriculture, Ontario Ministry of the Environment, County of Oxford, Township of Norwich, Township of South-West Oxford, Upper Thames River Conservation Authority

When: Beginning in 1998.

Possible Funding / In-kind Contributions:
Great Lakes 2000, Ontario Pork, partners listed above

Notes:
- One page proposal outline has been prepared and distributed to the Oxford County Nutrient Management and Water Protection Committees.
- To be done in conjunction with groundwater and surface water quality monitoring.

Measure of Success / Products:
- Number of landowners educated through program.

- < Number of improvement projects implemented.
- < Surface water and groundwater quality improvements.

Groundwater Research and Monitoring

Action:
- < Develop a better understanding of the groundwater hydrology around the Woodstock and Sweaburg water wells and private wells in the Cedar Creek Watershed.
- < Determine if there is a pollution problem and identify sources.
- < Identify, in detail, groundwater recharge areas for the Cedar Creek watershed.

How:
- < Compile all groundwater research done in area and undertake research to fill in any information gaps.

Potential Partners:
landowners, general public, Oxford County Nutrient Management and Water Protection Committees, University of Waterloo Centre for Groundwater Research, Upper Thames River Conservation Authority, Woodstock Public Utility Commission, Ontario Ministry of the Environment, County of Oxford Planning Department, County of Oxford Health Unit

When: Beginning in 1998.

Possible Funding / In-kind Contributions:
partners listed above

Notes:
- < To be done in conjunction with Nutrient Management and Well Head Definition.

Measure of Success / Products:
- < An understanding of the groundwater hydrology and quality near the Woodstock and Sweaburg water wells and private wells.

Well Head Definition

Action:
- < Identify the groundwater recharge areas that feed the Woodstock and Sweaburg water wells and private wells in the Cedar Creek watershed.

Potential Partners:
Oxford County Nutrient Management and Water Protection Committees.

When: Started in 1997.

Possible Funding / In-kind Contributions:
County of Oxford, City of Woodstock

Notes:
- < The Oxford County Nutrient Management and Water Protection Committees are undertaking this for the whole county.

Measure of Success / Products:
- < A map of the City of Woodstock's recharge areas.

Surface Water Quality Research and Monitoring

Action:
- < Monitor the surface water quality to obtain an overall picture of the health of the watershed and identify "good" and "poor" areas.

How:
- < Surface water quality monitoring using chemical analysis and benthic invertebrate surveys.
- < UWO/UTRCA benthic invertebrate monitoring includes sites in Cedar Creek.
- < Data from Ministry of the Environment sampling.
- < Review of stormwater drainage and sewers in the City of Woodstock.
- < Review of possible pollution sources in the watershed, such as industry, residences and agriculture.
- < Research the effects of road drainage on water quality, including Highways 401 and 403.
- < Students from local elementary and secondary schools and Fanshawe College participate in monitoring to "red flag" yearly changes in monitoring results.
- < Sample the sediment in Southside Pond and Hodge's Pond.

Potential Partners:
local landowners, local schools, Fanshawe College, Department of Fisheries and Oceans, County of Oxford Health Unit, City of Woodstock Parks Division, City of Woodstock Engineering Department, Woodstock Public Utility Commission, University of Western Ontario Department of Zoology, Ontario Ministry of the Environment, Ontario Ministry of Transportation, local industries, Canadian National and Canadian Pacific Railways, Upper Thames River Conservation Authority, Woodstock District Chamber of Commerce

When: Started in 1997. Ongoing program.

Possible Funding / In-kind Contributions:
Shell Canada Limited, London Community Foundation, Woodstock Public Utility Commission, Philip Analytical Services Corporation, partners listed above

Notes:
- < Technical Subcommittee responsible for determining sampling locations.

Measure of Success / Products:
- < Detailed picture of stream health for the watershed.

Community Education about Water Supply

Action:
- < Develop a program to educate Woodstock residents and rural landowners about the water supply.

How:
- < Woodstock Sentinel Review articles.
- < Inserts in PUC water bills.
- < Post information on the Woodstock web site.
- < Develop curriculum materials for the schools.
- < Implement an education program for rural residents.
- < Organize public tours of the water pumping station and the sewage treatment plants as part of community participation days.

Potential Partners:
Woodstock Public Utility Commission, County of Oxford, City of Woodstock, Thames Valley District School Board, Oxford County Separate School Board, Huron Park Secondary School, Ontario Ministry of the Environment, Woodstock Sentinel Review, Upper Thames River Conservation Authority

When: Beginning in 1998.

Possible Funding / In-kind Contributions:
Woodstock Public Utility Commission, Execulink

Notes:
- < Education about the water supply is part of the grade nine curriculum.
- < Woodstock Public Utility Commission is delivering an education program from the American Waterworks Association to grade four to seven classes.
- < Communications Subcommittee could be responsible for coordinating this action plan.

Measure of Success / Products:
- < Number of Woodstock residents receiving information about the water supply.

Target Waterways for Enhancement

Action:
- < Develop and implement a plan for targeting waterway enhancement projects.

How:
- < Develop criteria for choosing enhancement sites and prioritize them.
- < Analyze costs and benefits of waterway rehabilitation.
- < Rehabilitate sections of Cedar Creek or tributaries on a drain by drain basis.
- < Plan may include stream buffering, bioengineering, drain cleanouts, and in-stream enhancement projects.
- < Determine potential for coldwater fisheries through thermal stability testing.
- < Investigate new ways of cleaning drains to minimize environmental impact.
- < Educate rural landowners about drain care.

Potential Partners:
City of Woodstock Parks Division, private landowners, local residents, Township of Norwich, Township of South-West Oxford, Upper Thames River Conservation Authority, City and Township Councils, industries, schools, volunteer and community groups, Ontario Federation of Anglers and Hunters, Oxford Fish and Game Association, Department of Fisheries and Oceans, Ontario Ministry of Natural Resources

When: Cedar Creek Woodstock Corridor Enhancement Project already underway. Other projects beginning in 1998.

Possible Funding / In-kind Contributions:
City of Woodstock Parks Division, Action 21, Canada Trust Friends of the Environment Foundation, Canada Trust Corporate Funding, partners listed above

Measure of Success / Products:
- < Improved water quality.
- < Decrease in erosion and sedimentation.
- < Improved habitat for wildlife.
- < Increased vegetation cover.

Target Woodlot Areas for Enhancement

Action:
- < Develop a plan to enhance and protect woodlots in watershed.

How:
- < Develop criteria for choosing sites, such as potential for creating corridors and increasing woodlot size.
- < Prioritize sites based on criteria.
- < Enhance woodlots in watershed through tree planting and naturalization.
- < Educate landowners, public and municipal councils about the

importance of natural areas.

Potential Partners:
Upper Thames River Conservation Authority, Ontario Ministry of Natural Resources, private landowners, Ducks Unlimited, Woodstock Public Utility Commission, County of Oxford, Ontario Federation of Anglers and Hunters

When: Beginning in 1998.

Possible Funding / In-kind Contributions:
Wetland Habitat Fund, Scouts Canada, partners listed above

Measure of Success / Products:
- < Increased forest cover.
- < Increased overall quality of woodlots.

Study of Dam at Hodge's Pond

Action:
- < Review the need for the dam at Hodge's Pond.

How:
- < Determine the implications of repairing or removing the dam on the Woodstock water wells, wetland, and upstream and downstream areas through a feasibility study.
- < Review 1991 dam inventory.
- < Perform sediment and water quality sampling.
- < Evaluate the liability and costs of removing or repairing the dam.
- < Develop a long term plan for managing the dam or dam removal.

Potential Partners:
Woodstock Public Utility Commission, Upper Thames River Conservation Authority, Ontario Ministry of Natural Resources, Ontario Ministry of the Environment, upstream and downstream landowners, County of Oxford, Township of South-West Oxford, Township of Norwich, City of Woodstock, Ontario Federation of Anglers and Hunters, Ducks Unlimited, University of Waterloo Centre for Groundwater Research

When: Review to begin in 1998.

Possible Funding / In-kind Contributions:
Woodstock Public Utility Commission, Ducks Unlimited

Notes:
- < A working group could be set up to look at this issue.

Measure of Success / Products:
- < A plan for the dam that considers all environmental effects, interests and concerns.

Research History of Watershed

Action:
- < Develop a comprehensive report or document that describes the cultural and natural history of the Cedar Creek watershed to be distributed to the public, including local schools.

How:
- < Collect information about the watershed from historical documents, books and stories from local residents.
- < Prepare a book or report available to local residents and distribute to the schools.
- < Periodic articles in the Woodstock Sentinel Review.
- < Post information on the web site.

Potential Partners:
Oxford Historical Society, Oxford County Library, Huron Park Secondary School, Woodstock Sentinel Review, Upper Thames River Conservation Authority

When: Beginning in 1998.

Possible Funding / In-kind Contributions:
Partners listed above.

Measure of Success / Products:
- < A book or document with a comprehensive history of the Cedar Creek watershed.

Brick Ponds Community Education

Action:
- < Educate landowners living near Brick Ponds about protecting the wetland.
- < Community awareness program about Brick Ponds.

How:
- < Brochures about Brick Ponds and living next to natural areas.
- < Community event to raise awareness.
- < Presentations to local schools.
- < Signage and a viewing platform for the wetland.

Potential Partners:
Brick Ponds Education Program Committee (Grassroots Woodstock, Woodstock City Council, Woodstock Environmental Advisory Committee, Upper Thames River Conservation Authority)

When: Started in 1995.

Possible Funding / In-kind Contributions:
City of Woodstock, Canada Trust Friends of the Environment Foundation, Aquatic Habitat Fund

Notes:
- < Drafts of brochures have been completed.

Measure of Success / Products:
- < Brochures.
- < Number of people at community events.
- < Number of people who receive information.

Brick Ponds Environmental Monitoring

Action: < Develop and implement a plan for monitoring ecological changes in Brick Ponds.

How:
- < Compile all background data from past studies done at Brick Ponds.
- < Monitoring program to include wildlife, vegetation, aquatic life, water quality and water quantity.

Potential Partners:
Upper Thames River Conservation Authority, City of Woodstock, County of Oxford, Ontario Ministry of Natural Resources, Reeves Development, St. Mary's Cement

When: Beginning in 1998, ongoing program.

Possible Funding / In-kind Contributions:
Partners listed above.

Notes: < Outlined in Oxford County Official Plan that a monitoring program is to be implemented at Brick Ponds.

Measure of Success / Products:
- < A detailed picture of the state of Brick Ponds.
- < Identification of rehabilitation or enhancement projects.

Southside Park / Pond

Action: < Develop a plan for Southside Park that addresses aesthetic, recreational and environmental issues in the park and pond.

How:
- < Collect Information on past planning and research activities and historical uses for the park.
- < Community input through a park users survey.
- < Plans to deal with water quality and waterfowl problems in the pond.

Potential Partners:
Southside Park neighbours and users, City of Woodstock Parks Division, Upper Thames River Conservation Authority, Woodstock Public Utility Commission, County of Oxford Health Unit, Ontario Ministry of the Environment, City of Woodstock Council

When: Beginning in 1998

Possible Funding / In-kind Contributions:
Partners listed above.

Notes:
- < A small Pond Committee has been formed to discuss the issues surrounding the pond and park.
- < A master plan for the park is currently being developed through the City of Woodstock Parks Division.

Measure of Success / Products:
- < A plan for the park that addresses aesthetic, recreational and environmental needs.

Watershed Education Program for Local Schools

Action: < Develop and implement an education and monitoring program for local schools based around the Cedar Creek watershed.

How:
- < Develop a guidebook that contains lesson plans and information about watersheds and rivers systems, enhancement projects, aquatic life, and the Cedar Creek watershed.
- < Implement a program where students participate in environmental education and monitoring in the watershed and share their information.
- < Public education through this program, e.g., web site, media coverage.

Potential Partners:
local elementary and secondary school classes (grade 6 to OAC), Upper Thames River Conservation Authority, local landowners, Oxford County Board of Education Field Studies Centre, Thames Valley District Board of Education, Oxford County Separate School Board

When: Pilot projects in 1997-98 school year, ongoing program.

Possible Funding / In-kind Contributions:
London Community Foundation, Union Gas, Shell Canada Limited, partners listed above.

Notes: < Education Subcommittee coordinates the education program.

Measure of Success / Products:
- < Number of Students participating in the program.
- < Quality information being collected about the watershed.
- < Web site.

APPENDIX I

Partners

- many landowners and local residents
- City of Woodstock
- County of Oxford, Board of Health
- County of Oxford, Planning Department
- East Oxford School
- Fanshawe College - Woodstock Campus
- Grassroots Woodstock
- Huron Park Secondary School
- North Norwich School
- Oliver Stephens School
- Ontario Federation of Anglers and Hunters
- Ontario Ministry of Natural Resources
- Ontario Ministry of the Environment
- Oxford County Board of Education - Field Studies Centre
- Oxford County Federation of Agriculture
- Oxford Historical Society
- Township of Norwich
- Township of South-West Oxford
- University of Western Ontario Department of Zoology
- Upper Thames River Conservation Authority
- Woodstock District Chamber of Commerce
- Woodstock Environmental Advisory Committee
- Woodstock Public Utility Commission

Sponsors

- Canada Trust Friends of the Environment Foundation
- Canadian Council for Human Resources in the Environment Industry (CCHREI)
- Human Resources Development Canada
- Philip Analytical Services Corporation
- Shell Environmental Fund

CEDAR CREEK WATERSHED PROJECT
LEVELS OF INVOLVEMENT

COMMITTEE MEMBERS

- Include people and groups who attend meetings of one of the four committees
- Provide advice and assistance
- Coordinate the implementation of project components

COORDINATING COMMITTEE

- Oversees the project and links the subcommittees
- Coordinates community involvement in the project
- Organizes project fundraising

TECHNICAL SUBCOMMITTEE

- Compiles and organizes information to determine state of the watershed
- Coordinates the technical aspects of the monitoring program

EDUCATION SUBCOMMITTEE

- Coordinates the community education and watershed monitoring program
- Updates project web site

COMMUNICATIONS SUBCOMMITTEE

- Promotes the project to the community

STAKEHOLDER

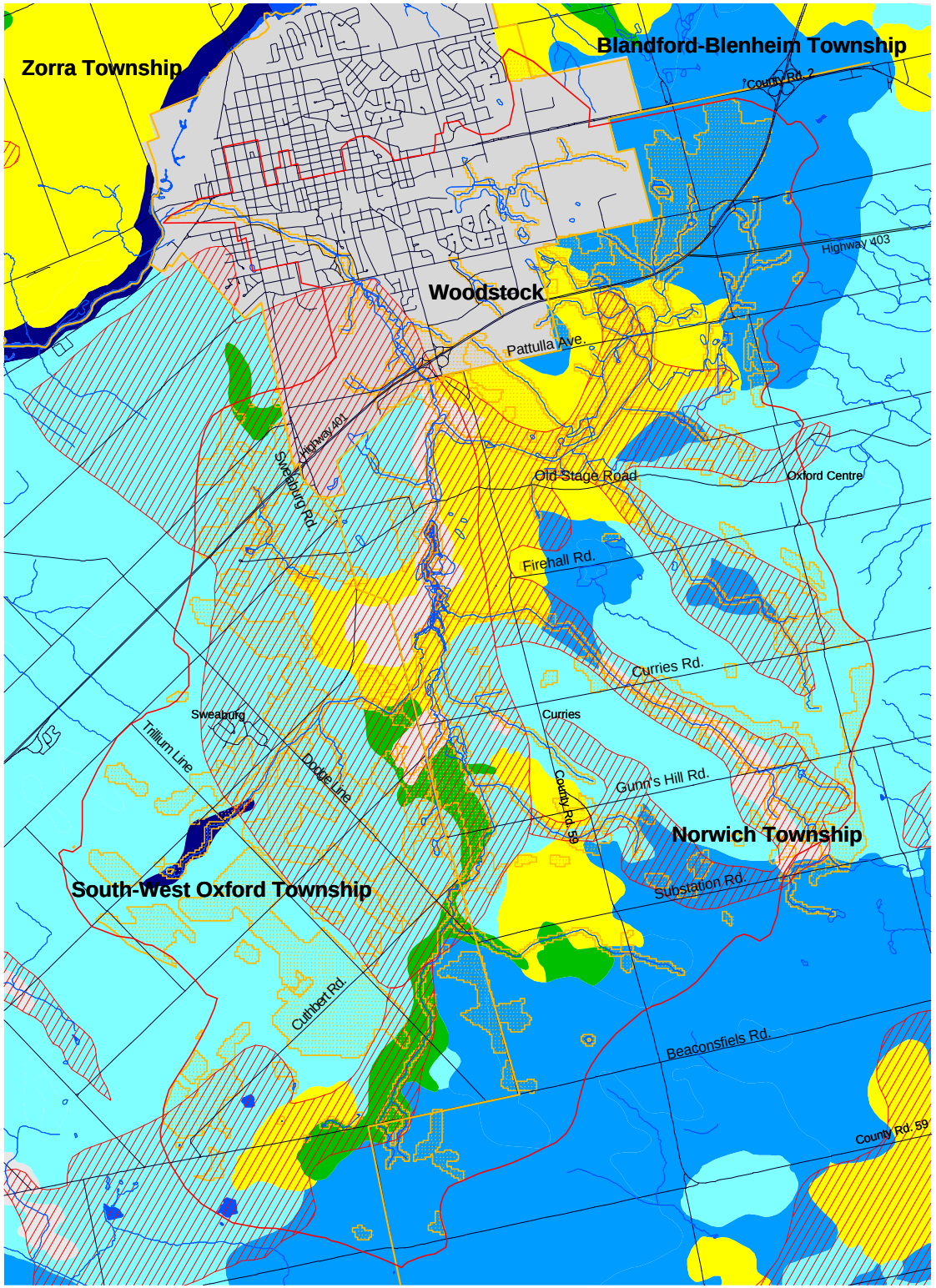
- Person or group who has a specific interest in project but does not attend meetings
- May provide technical advice or assistance
- Receives project updates, notice of events, etc.

COMMUNITY PARTICIPANT

- Person or group interested in participating in the implementation of project components, such as community tree planting
- Receives notice of events

SPONSOR

- Group or person that is providing funding, project materials or equipment, or the use of land for enhancement projects



Cedar Creek Watershed
Abiotic Resources

1 0 4 km

Legend

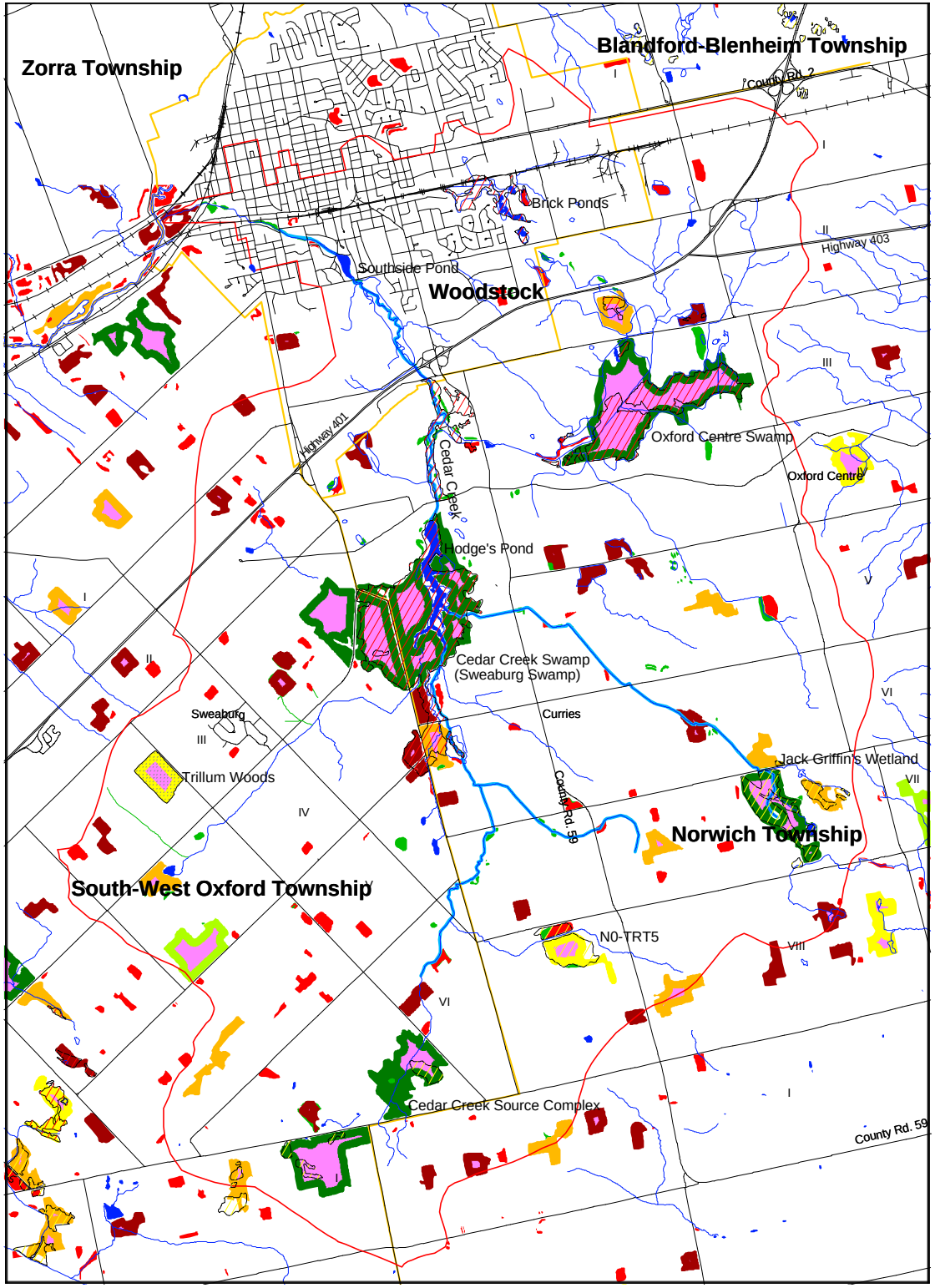
- Bottom Land
- Clay Loam
- Loam
- Loamy Sand
- Muck
- Not Mapped
- Sandy Loam
- Silt Loam
- Urban
- Water
- Groundwater Recharge Areas
- Areas of High Erosion Potential
- Municipal Boundaries
- Watershed Boundaries

Map Reference

1. Base mapping, Produced by UTRCA under license with the the Ontario Ministry of Natural Resouces Copyright Queen's Printer 1994." 1996

2. Soils Information: Ontario Ministry of Agriculture, Food and Rural Affairs, Resources and Regulations Branch, Geographical Information System Unit

3. Groundwater Recharge Areas obtained from the County of Oxford Land and Related Information System



Cedar Creek Watershed
Biotic Resources

1 0 4 km

Size of Woodlot in Hectares

- < 4
- 4 to 10
- 10 to 20
- 20 to 30
- 30 to 40
- 40 +

Woodlot Information

- Interior Forest (Using 100m Buffer)
- Additional Woodlot Information
  (1989 Air photos)

Natural Significance

- Provincially Significant Wetlands
- Locally Significant Wetlands
- Area of Natural and Scientific Interest
- Potential Cold Water Streams
- Watershed Boundary

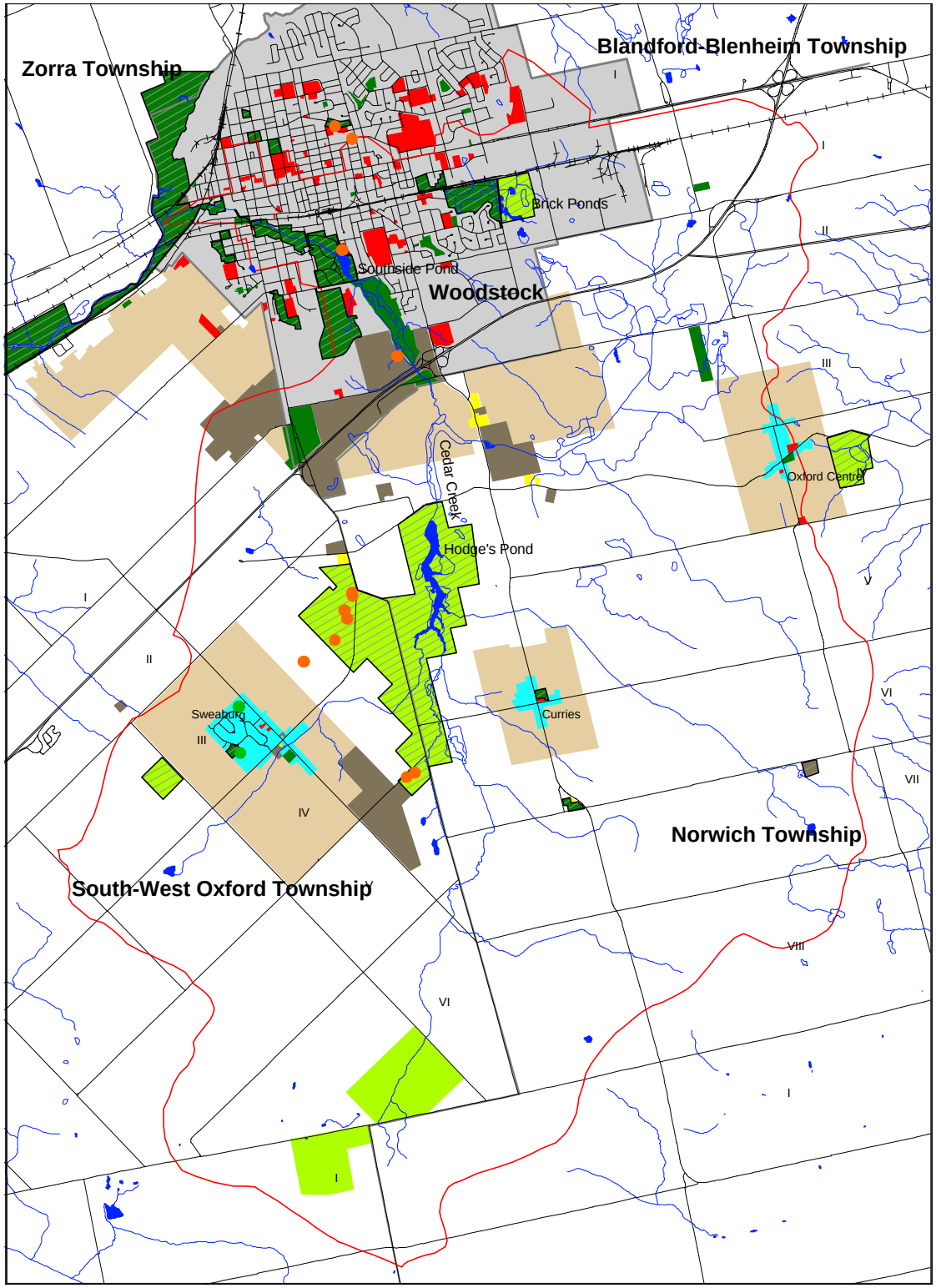
Other Information

- Township/Municipal Boundaries

Map Reference

1. Base Mapping, "'Produced by UTRCA under license with the Ontario Ministry of Natural Resources Copyright Queen's Printer 1994." 1996.
2. Wetland boundaries assumed from OMNR wetland mapping 1986 and UTRCA wetland evaluation 1986.

UPPER THAMES RIVER
CONSERVATION AUTHORITY



Cedar Creek Watershed
Cultural Features

N
W E
S

1 0 4 km

Land Use / Zoning Information

- Commercial
- Environmental Protection
- Industrial
- Institutional
- Open Space
- Rural Residential
- Urban Area

(could include agricultural, residential and commerical areas)

- Agriculture
- Restricted Agriculture

Public Water Source Areas

- Sweaburg
- Woodstock

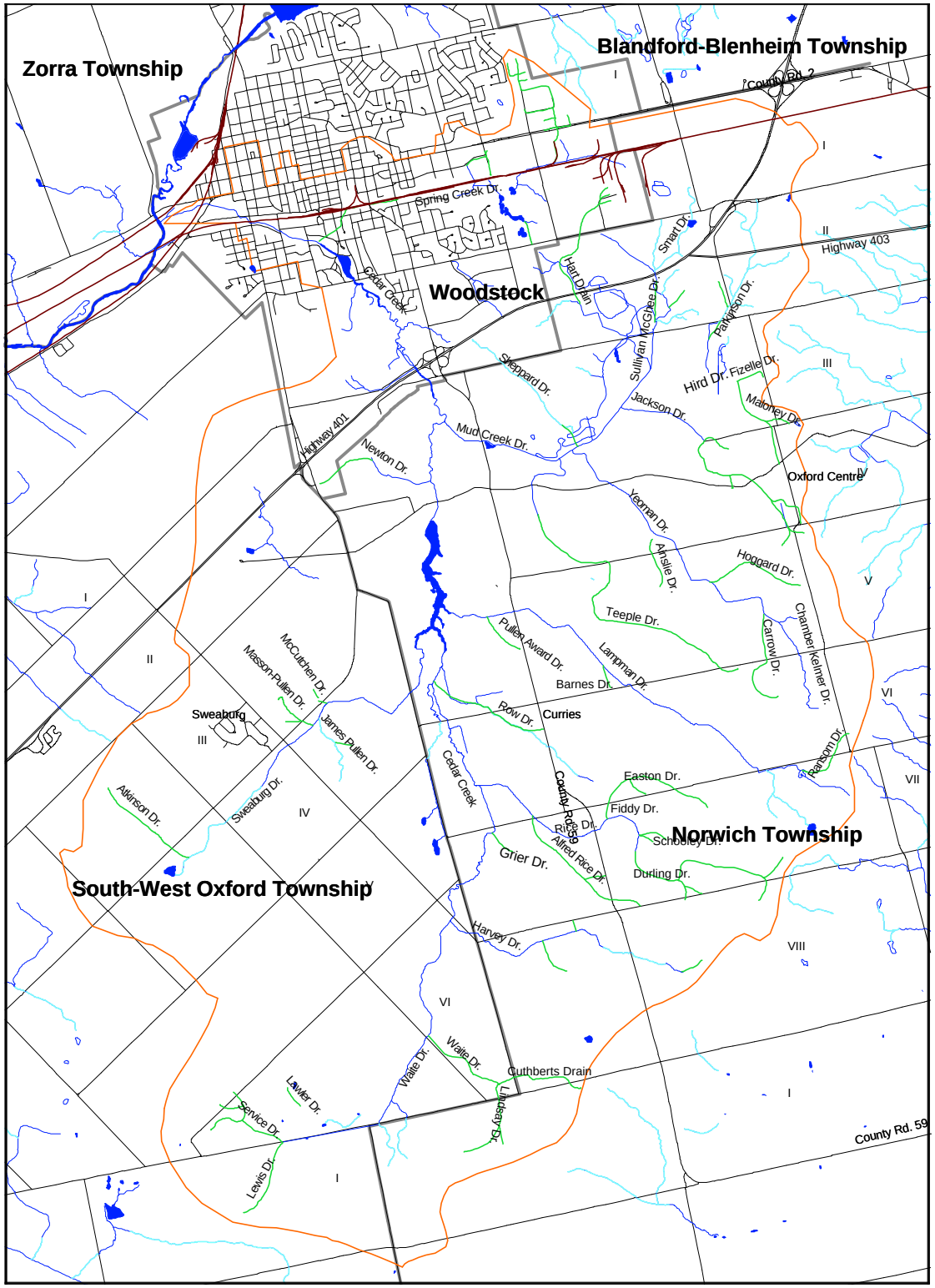
Other Information

- Municipal Boundaries
- Watershed Boundary
- Public Lands

Map Reference

1. Base Mapping " Produced by the UTRCA under licence with the Ontario Ministry of Natural Resources copyright Queens Printer 1994" 1996.
2. Land use and Municipal Water Well information was derived from County of Oxford, Land Related Information System, 1995.

UPPER THAMES RIVER CONSERVATION AUTHORITY



Cedar Creek Watershed Drainage Information

1 0 4 km

Legend

- Drains and Natural Watercourse
- Closed Drains
- Intermittent Streams
- Watershed Boundary
- Township Boundary

Map Reference

1. Base Mapping " Produced by UTRCA under license with the Ontario Ministry of Natural Resources Copyright Queens Printer 1994." 1996
2. Further drainage infomation derived from 1989 aerial photography and Municipal drainage maps.

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