

Cedar Creek Watershed ENHANCEMENT PLAN



Prepared by

UPPER THAMES RIVER
CONSERVATION AUTHORITY

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BACKGROUND

Cedar Creek originates about eleven kilometres south of Woodstock, Ontario. 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.

The Cedar Creek Watershed Project was initiated in the summer of 1996 by the Woodstock Environmental Advisory Committee and the Upper Thames River Conservation Authority (UTRCA). The goals of the project are to improve the health of the Cedar Creek watershed and educate and involve the community. A management strategy was developed by the community in 1997 and 1998. This strategy includes a background study and a plan for improving watershed health. Community concerns were addressed through action plans.

This enhancement plan addresses two action plans of the Cedar Creek Watershed Management Strategy:

- target waterways for enhancement
- target woodlot areas for enhancement.

Sites in the watershed were evaluated and prioritized for rehabilitation and enhancement projects, such as naturalization and bioengineering, and community education programs for landowners and local residents.

GOALS AND OBJECTIVES

The goal of the enhancement plan is to evaluate and prioritize areas in the Cedar Creek watershed for enhancement projects. The objectives of the plan are to identify sites that will benefit the entire watershed by:

1. increasing the amount of natural vegetation cover,
2. maximizing the overall quality and biodiversity of natural areas,
3. protecting groundwater, and
4. improving the health of watercourses.

SITE SELECTION

The Cedar Creek Watershed Project Technical Subcommittee identified several criteria to evaluate potential project sites in the Cedar Creek watershed. These criteria reflect issues and concerns raised by the community at open houses, community days and public meetings. Areas of the watershed were identified and scored as high, medium, or low priority in relation to each criterion. All criteria scores were then combined using Geographical Information Systems modelling to prioritize areas in the watershed for

enhancement work.

Biological criteria outlined below were developed from results of the Oxford County Terrestrial Ecosystems Study (OCTES). OCTES is a study of forest-dominated ecosystems in Oxford County which was completed by the UTRCA in 1997. The study inventoried plants and breeding birds in 71 sample woodlots across the County. Methodologies were applied to determine the quality, diversity, degree of disturbance and habitat function of the woodlots sampled. The OCTES results established the landscape ecology principles used to identify priorities for terrestrial restoration and enhancement.

Criteria

Each criterion is explained below with corresponding maps in Appendix A.

Groundwater Recharge Areas

Protecting the quality and quantity of groundwater is important to the local community for social, economic, and environmental reasons. Groundwater resources provide a clean water supply for urban, agricultural, and industrial uses and also provide baseflow to surface water resources.

Recharge areas are susceptible to contamination. Protection zones prevent contamination and provide a time frame for contingency plans if a spill occurs (Charlesworth and Associates 1995).

Groundwater recharge areas are mapped in Appendix A - Map 1. Based on a draft study by International Water Consultants (1997) for the Woodstock Public Utilities Commission, one and three year recharge zones for the city wells are outlined. The one-year zone is the area where surface water could reach the wells within one year, and is considered high priority. The three-year zone is the area where surface water could reach city wells in one to three years, and is considered medium priority. The remaining groundwater recharge areas outlined by Charlesworth and Associates (1995) are low priority. Areas outside groundwater recharge areas receive a score of zero.

The community identified the protection of groundwater and the city's water supply as the most important issue during the development of the Cedar Creek Watershed Management Strategy (Upper Thames River Conservation Authority 1998). The County of Oxford is committed to protecting groundwater (County of Oxford 1995).

City Well Heads

Areas directly adjacent to well heads are susceptible to contamination due to short travel time of water to the well, possible damage to the well, and leakage around a well

casing (Charlesworth and Associates 1995). Well head protection areas are outlined in Appendix A - Map 2. An arbitrary 300 metre buffer around the well was determined by the UTRCA to be considered high priority.

Erosion-prone Areas

Areas prone to erosion identified using the universal soil loss equation (Geomatix International Inc. 1991) are outlined in Appendix A - Map 3. Areas with soil loss greater than five tonnes per hectare per year are considered erosion-prone areas. Areas with sediment delivery to watercourses are defined as having erosion-prone areas within 20 metres of both sides of a watercourse. Sediment delivery areas are considered high priority and erosion-prone areas outside of the sediment delivery areas are considered medium priority.

Evaluated Wetlands

Existing studies such as the Provincial Wetland Evaluation System provide one measure of woodlot significance in the study area. The location and extent of these natural features identifies the core areas for restoration and enhancement strategies in the watershed. In the OCTES these are referred to as the “building blocks” of the landscape.

Three provincially significant and three locally significant wetlands are located in the Cedar Creek watershed. These wetlands were evaluated in the 1980s under the Provincial Wetland Evaluation System for Ontario South of the Canadian Shield (Ontario Ministry of Natural Resources 1983). The wetland evaluation system was updated in 1993 and several wetland boundaries and evaluations were updated. The updated wetland boundaries are outlined in Appendix A - Map 4. Provincially significant wetlands are high priority and locally significant wetlands are medium priority.

Maximizing Forest Interior

Basic landscape ecology theory states that woodlots closest to the shape of a circle contain maximum amounts of forest interior. Maximizing forest interior, the protected area inside of a woodlot, will increase habitat areas for forest interior specific and area sensitive breeding birds (Adams and Dove 1989, King 1997).

Areas are identified for maximizing forest interior through a circle analysis and a woodlot buffer. Forest patches divided by roads are considered as one woodlot for the purpose on analysis. A 100 metre buffer is mapped around all woodlots in the watershed. Areas for “bulking up” or increasing forest interior are identified using a circle analysis on woodlots that currently have forest interior.

Woodlots with existing forest interior are determined using a method outlined in OCTES (King 1997). The existing

area of the woodlot is determined. A circle with the same area is created from the centre of the woodlot. Areas of the circle that fall outside the existing woodlot are considered high priority. Areas within the 100 metre buffer of a woodlot, excluding those areas identified in the circle analysis, are considered medium priority. The priority areas are outlined in Appendix A - Map 5.

Proximity to Water

Wildlife living in natural areas require water for survival. Diversity is often higher in natural areas near or around a body of water (Adams and Dove 1989). Enhancement projects near water provide better habitat for wildlife.

Many of the watercourses in the Cedar Creek watershed have been straightened and lack vegetation cover. The result is erosion and a decrease in the health of the aquatic community. Vegetation shading a watercourse lowers and stabilizes the water temperature in the stream creating better wildlife habitat in the stream and bank (Cumming Cockburn Ltd. 1993).

Two buffers were identified around all surface water in the Cedar Creek watershed. Areas within 100 metres of open water are considered high priority. Areas 100 to 200 metres from open water are considered medium priority. These areas are outlined in Appendix A - Map 6.

Proximity to Natural Areas / Corridor Creation

The OCTES found that more forest cover within a 2 kilometre radius of a woodlot increased the woodlot’s biological diversity of plants and birds (King 1997).

A circle with a radius of 2 kilometres was drawn around the centre of each woodlot greater than 4 hectares in area. The areas where the greatest density of woodlots exist, as determined by the intersection of the 2 kilometre radius circles, show where biodiversity will be maximized through naturalization. Areas of the watershed where 7 or more of the circles overlapped are considered high priority. Areas where 4 to 6 circles overlapped are considered medium priority. Areas within 2 kilometres of the centre of only 1 woodlot or where 2 to 3 circles overlapped are considered low priority. The areas are mapped in Appendix A - Map 7.

Land Use / Zoning

Enhancement projects are directly affected by land use in the area. Naturalization projects, in particular, are not possible or will have reduced success on lands zoned for certain uses.

Present land use zoning in the County of Oxford’s zoning by-laws is used to determine priority areas. Areas zoned as Open Space and Environmental Protection are considered high priority. Areas zoned Institutional and Agricultural are considered medium priority. Areas zoned Residential or

Industrial are considered low priority. These areas are mapped in Appendix A - Map 8.

Property Ownership

More than 90 percent of the land in the Cedar Creek watershed is in private ownership. Cooperation from landowners is necessary to implement enhancement projects. Several landowners are actively involved in the Cedar Creek Watershed Project and their properties have been mapped. However, the identification of these properties does not assume that consent to undertake enhancement projects is in place. Public property is considered high priority. Properties owned by individuals participating in the Cedar Creek Watershed Project are considered medium priority. These areas are outlined in Appendix A - Map 9.

Visibility

Sites near major roadways will be seen by more people. This will increase the visibility and awareness of a project and promote enhancement projects to other landowners (Flegel and Jacob 1996).

Areas within 300 metres of highly travelled roads are prioritized. Areas along Highway 401, County Road 2, and County Road 59 are high priority. Areas along Sweaburg Road and Curries Road are medium priority, and areas along Parkinson Road and Springbank Avenue are low priority. These areas are outlined in Appendix A - Map 10.

Criteria Scoring and Weighting

Criteria scoring and weighting is summarized in Appendix B. Within each criterion, an area is ranked high, medium, or low. High scores receive a value of 5, medium scores receive a value of 3, and low scores receive a value of 1. Areas that did not fit the criterion receive no score (O).

Criteria weighting was determined by members of the Cedar Creek Watershed Project Technical Subcommittee using a paired comparison analysis (Appendix C). The committee's analysis of the criteria was compiled and the final weighting was rounded to the values in Appendix B.

Geographical Information System Model

A Geographical Information System (GIS) model is used to create a detailed series of maps. Using the criteria scoring and weighting, each map is assigned a value for the GIS model to weight the importance of each map's information and criteria. The GIS then overlays all maps using a formula which generates a map that defines priority areas.

PRIORITY AREAS

Two priority areas maps can be found in Appendix D. The first map shows the area rankings and the second map includes the locations of the existing natural areas. Areas ranked as very high are located near Cedar Creek Swamp. High priority areas occur around woodlots and wetlands, most frequently in gaps in the forest edge. Sections along watercourses are ranked as high and medium priority.

IMPLEMENTATION

The community will be highly involved in implementation, both in the development of site plans and the actual in-field implementation of projects. Monitoring by local students will document changes in the health of the watershed over time.

Some work has begun already and other work is being planned for priority areas. Two very high priority areas, one located south of Rivers Road and the other located southwest of Old Stage Road and Sweaburg Road were reforested by the Woodstock Public Utility Commission (PUC) over the last twenty years. The PUC is also retiring all the agricultural land it manages around Cedar Creek Swamp, and is scheduled to begin a three-year reforestation plan in the spring of 2000. High priority areas will be planted first, followed by medium priority areas.

Other landowners who own property in high and medium priority areas will be contacted about participating in the enhancement plan. The areas along Lampman Drain and Cedar Creek south/Waite Drain will be targeted first, along with other high and medium priority areas.

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- King L. 1997. *The Oxford County Terrestrial Ecosystems Study*. Upper Thames River Conservation Authority, London, Ontario.
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- Upper Thames River Conservation Authority. 1998. *Cedar Creek Watershed Management Strategy*. Upper Thames River Conservation Authority, London, Ontario.

Mapping

Base Mapping:

Upper Thames River Conservation Authority under licence with the Ontario Ministry of Natural Resources © Queens Printer 1994" 1996

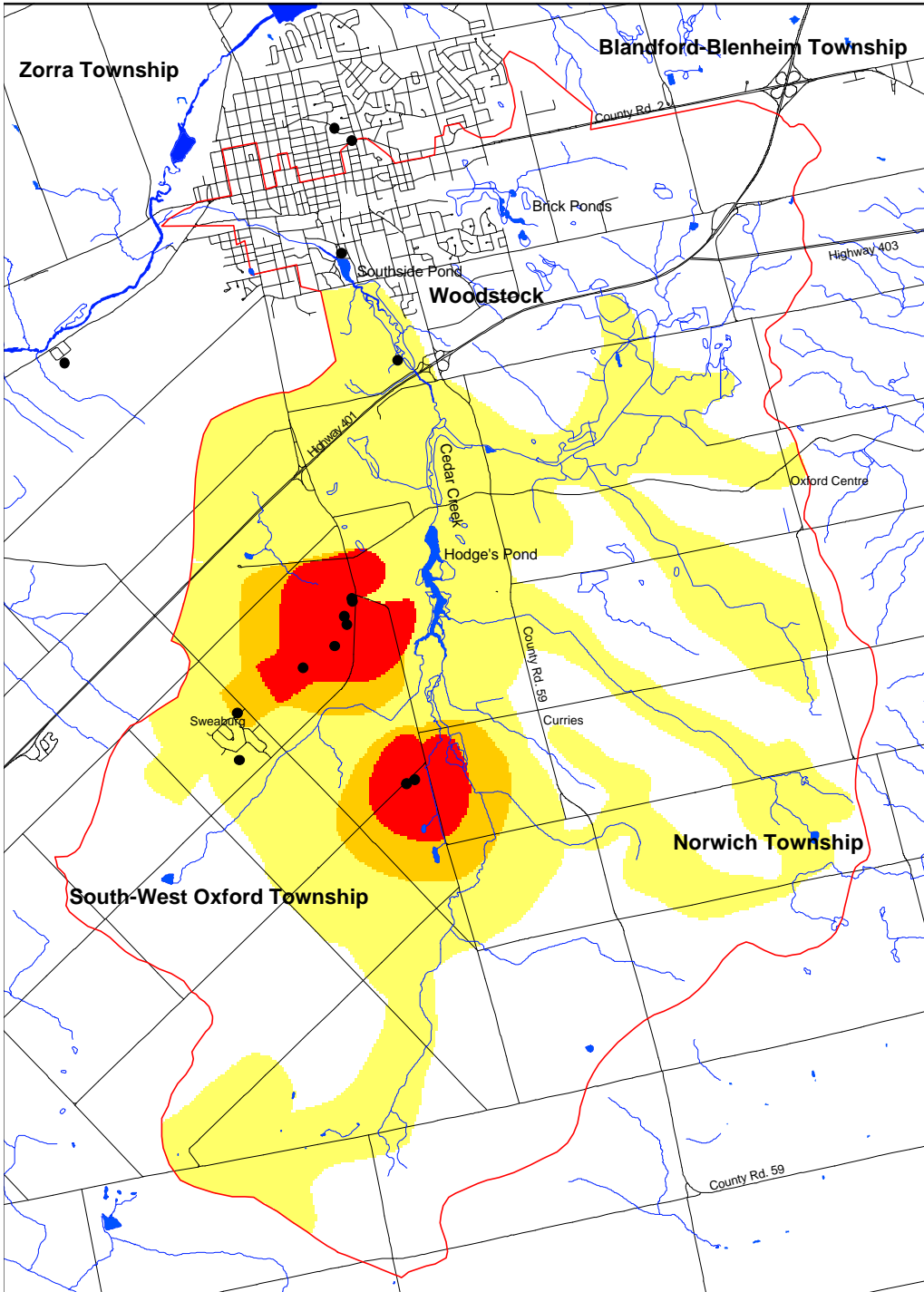
Groundwater Delivery:

Woodstock Public Utility Commission

Groundwater Recharge:

County of Oxford Planning Department

Appendix A - Criteria Maps



Cedar Creek Watershed Groundwater Recharge Areas



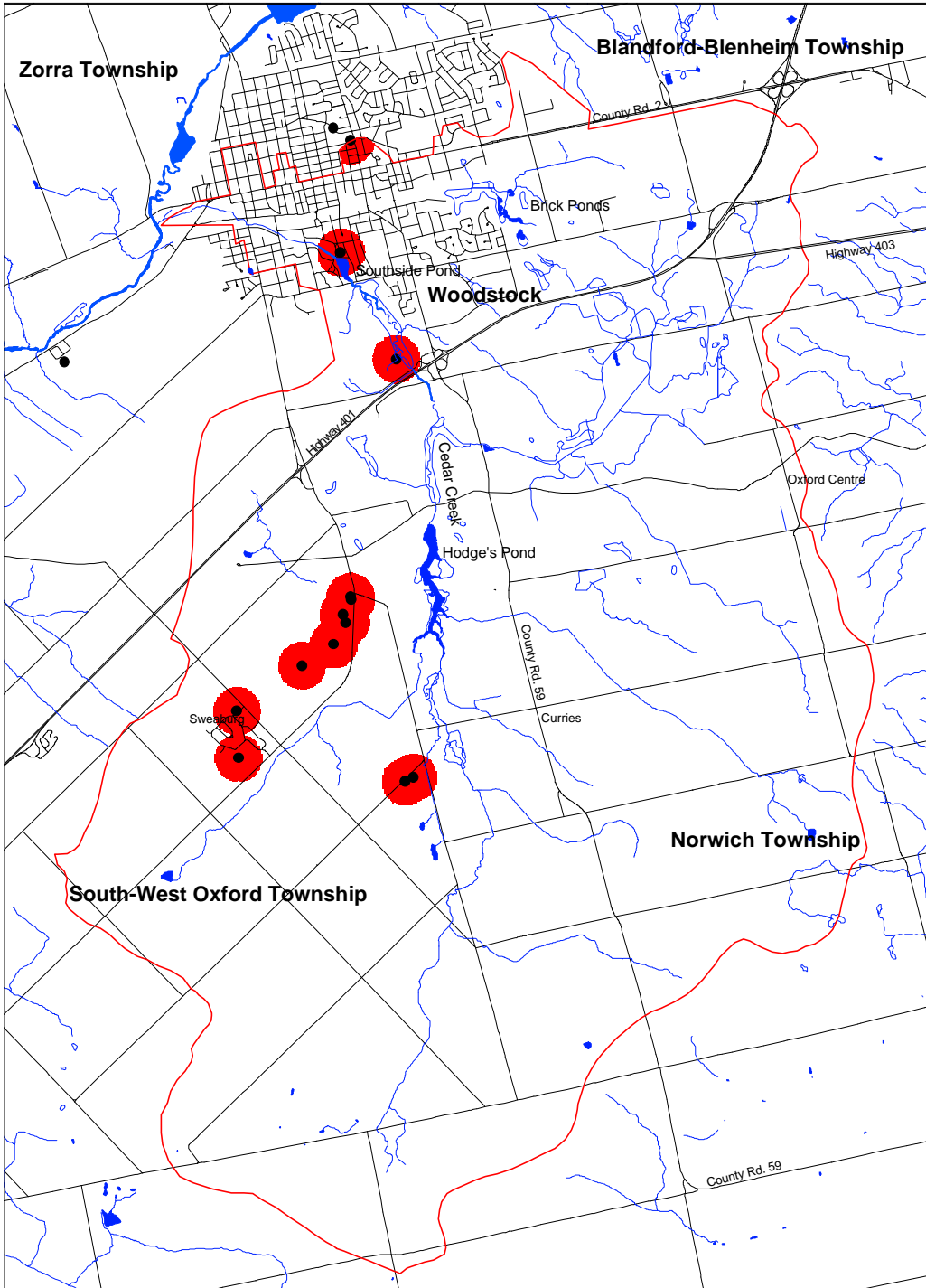
Groundwater Information

- High Concern (1 year)
- Medium Concern (3 year)
- Low Concern (Recharge Area)
- Municipal Wells

Map Reference

1. Base Mapping" Produced by UTRCA under licence with the Ontario Ministry of Natural Resources © Queens Printer 1994" 1999
2. Groundwater Information supplied by County of Oxford Lands Related Information System Department and City of Woodstock Public Works Department

Map created by:
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Watershed GIS Services



Cedar Creek Watershed Well Head Protection Areas



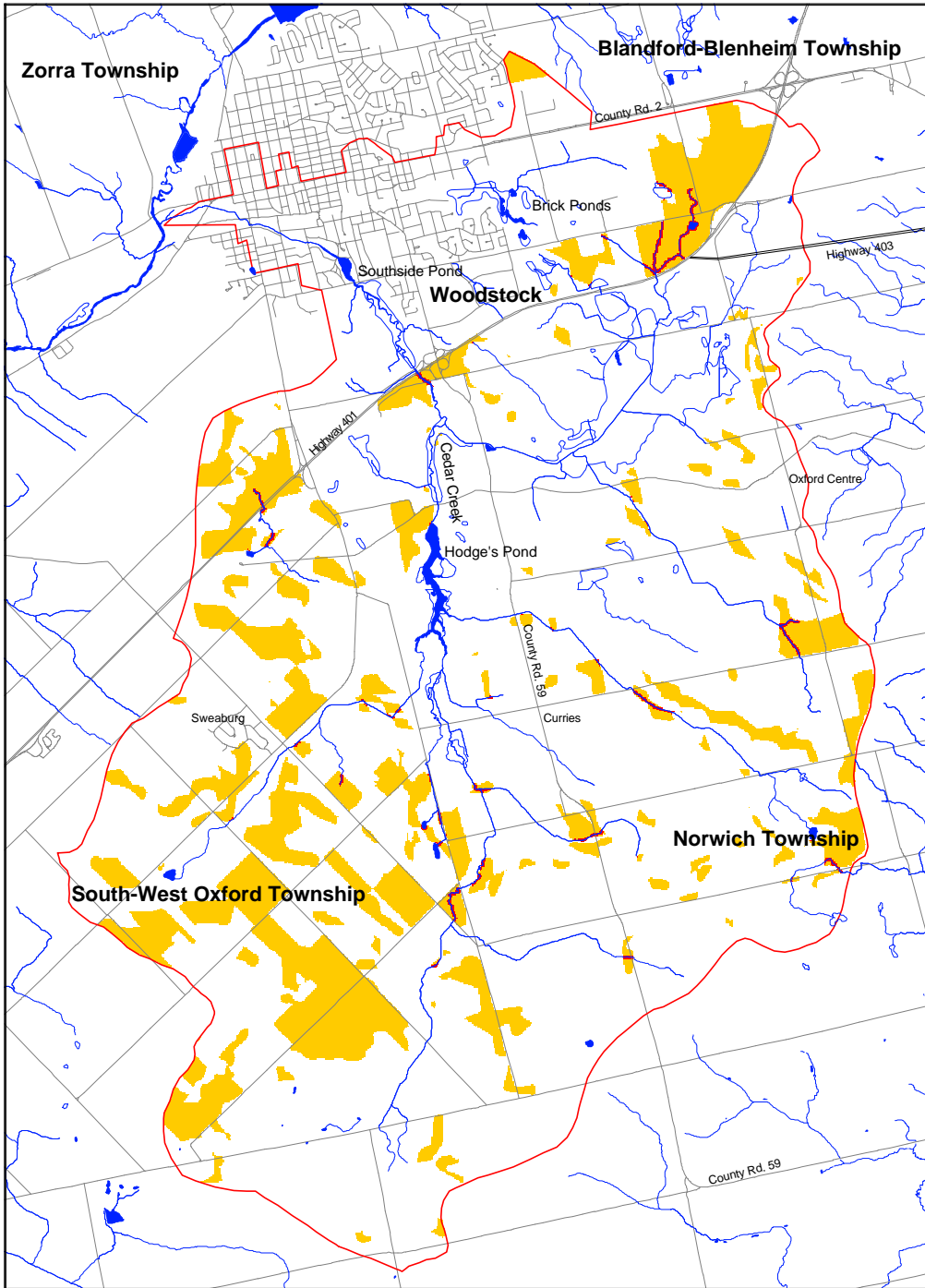
Buffered Area	
	High (300 m)
	Well Locations

Map Reference

1. Base Mapping" Produced by UTRCA under licence with the Ontario Ministry of Natural Resources © Queens Printer 1994" 1999
2. Well locations supplied by the County of Oxford Land Related Information Systems department.

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Cedar Creek Watershed
High Erosion Areas
 Defined Through the Universal Soil Loss Equation

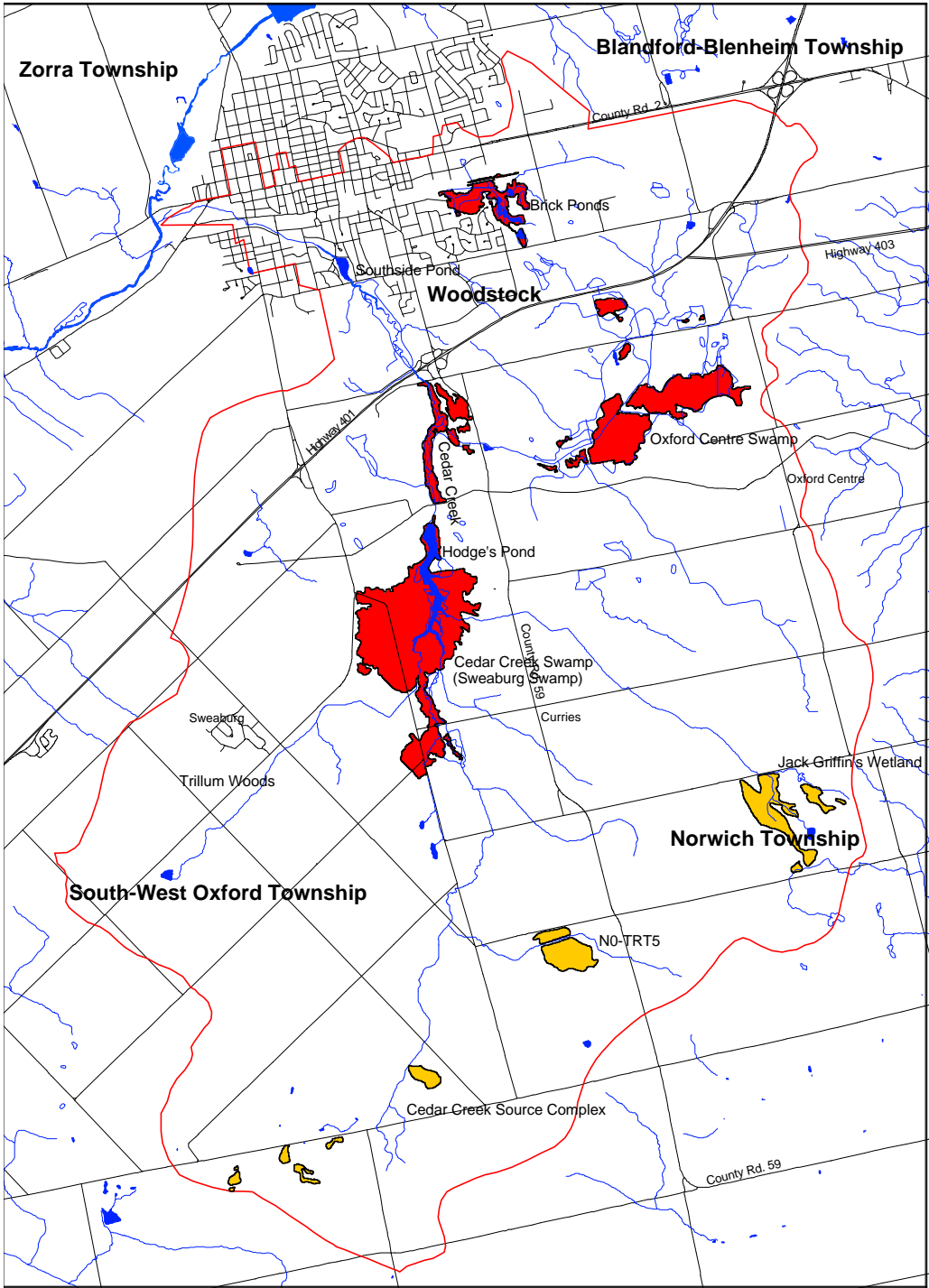


Legend

- Medium (> 5 tonnes/hectare/yr)
- High (> 5 (t/h/yr + 20 m)

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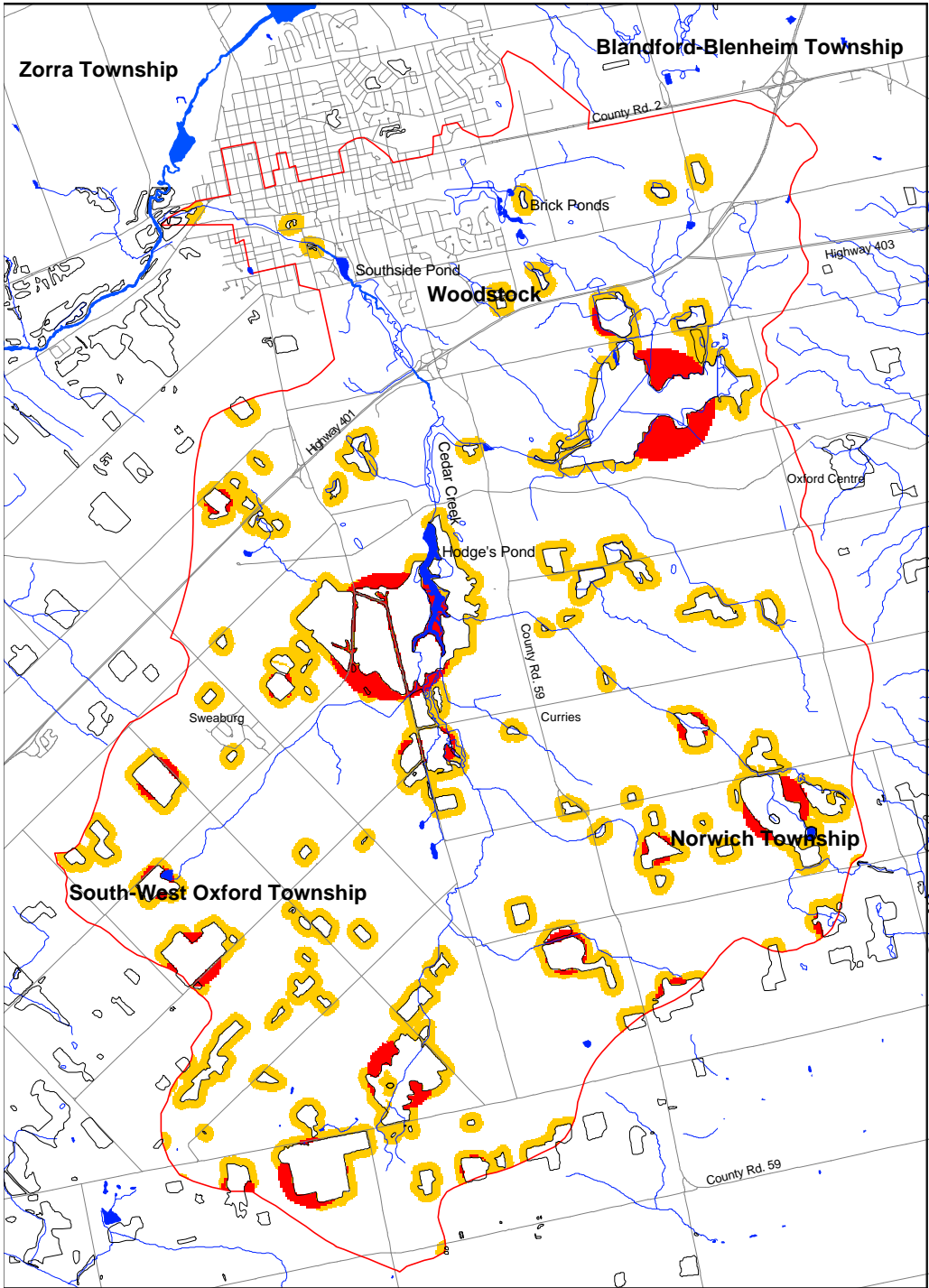
Cedar Creek Wetlands
Wetlands Defined using Provincial OMNR Standards



Wetland Classification	
	Locally Significant
	Provincially Significant

Map Reference
Base Mapping and Wetlands Information
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Cedar Creek Watershed
 Increase Interior of Woodlot

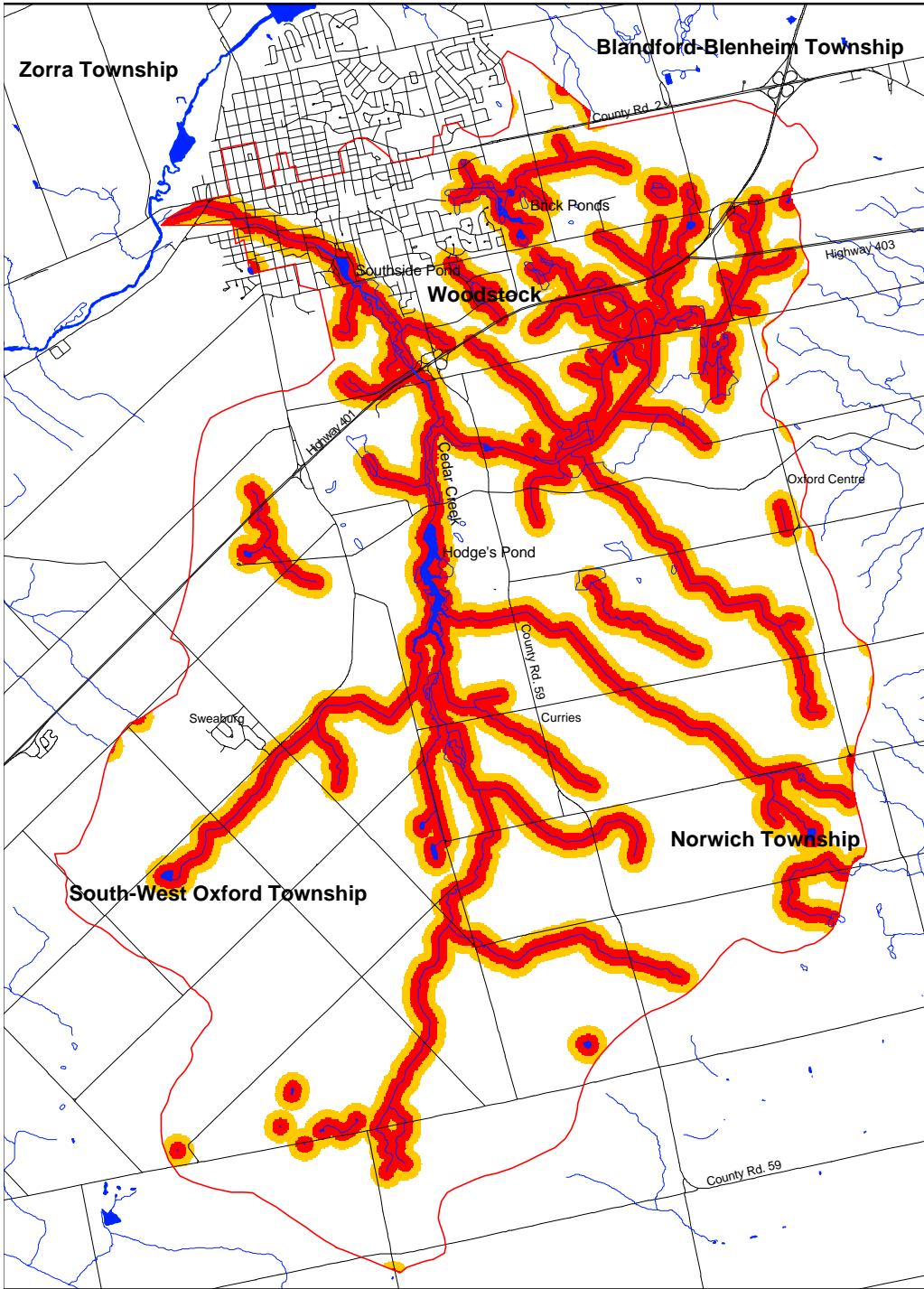


Reforestation Locations

- High (Interior Potential)
- Medium (100m buffer)

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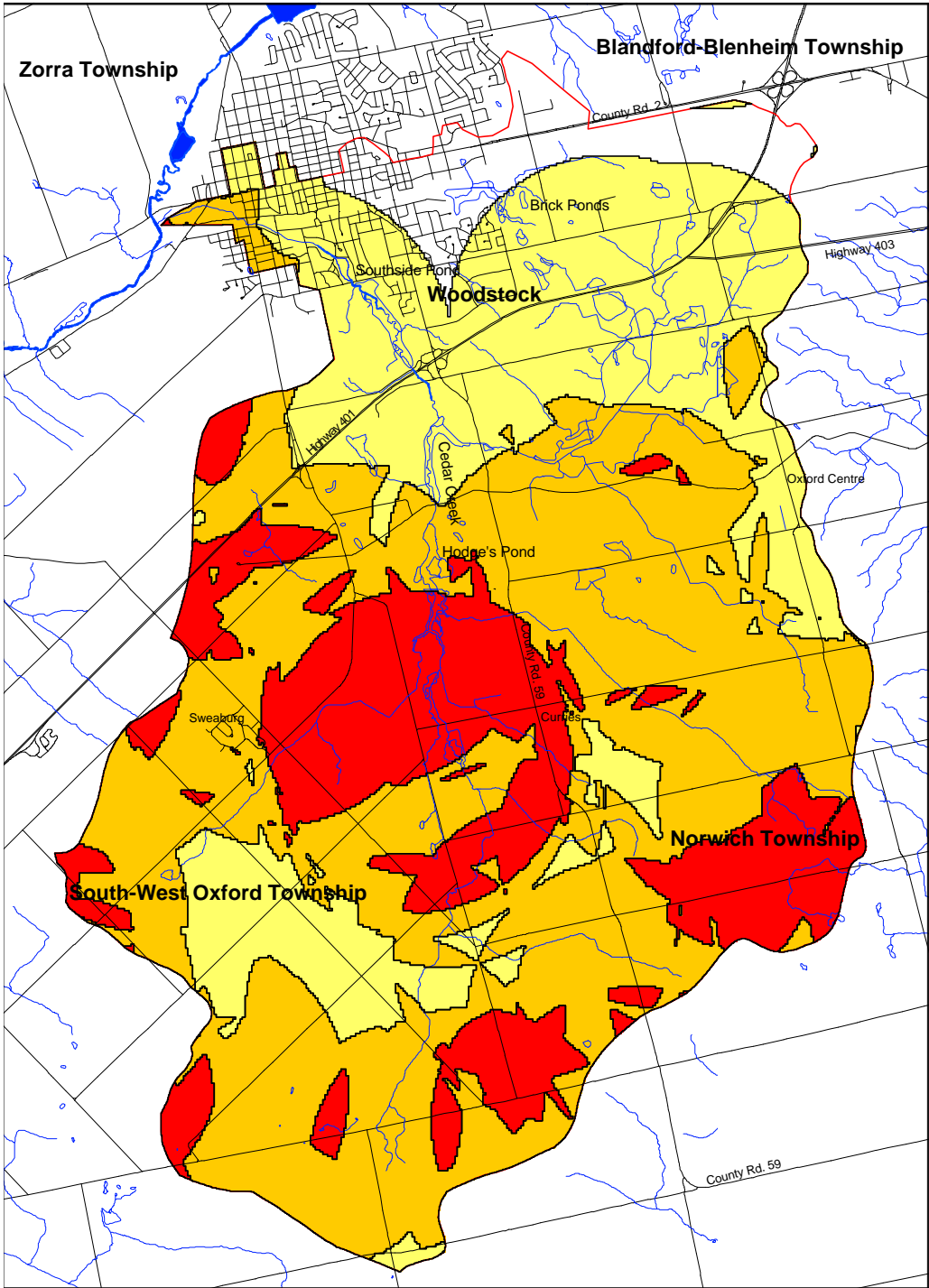
Cedar Creek Watershed Watercourse Protection Zones



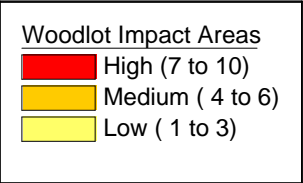
Watercourse Buffers	
	High (100m)
	Medium (200 m)

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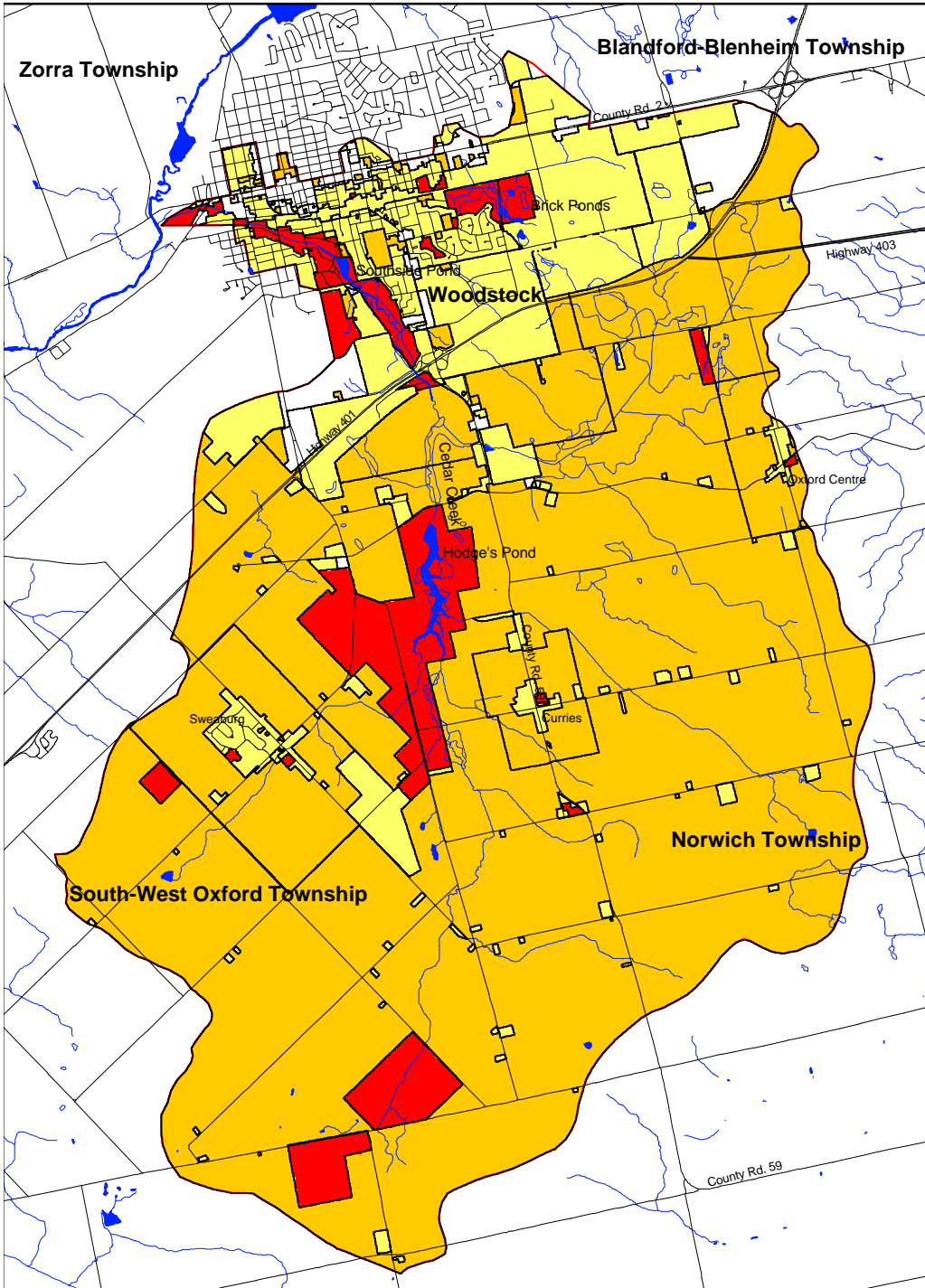


Cedar Creek Watershed
 Woodlots Area of Influence, Defining Priority Areas



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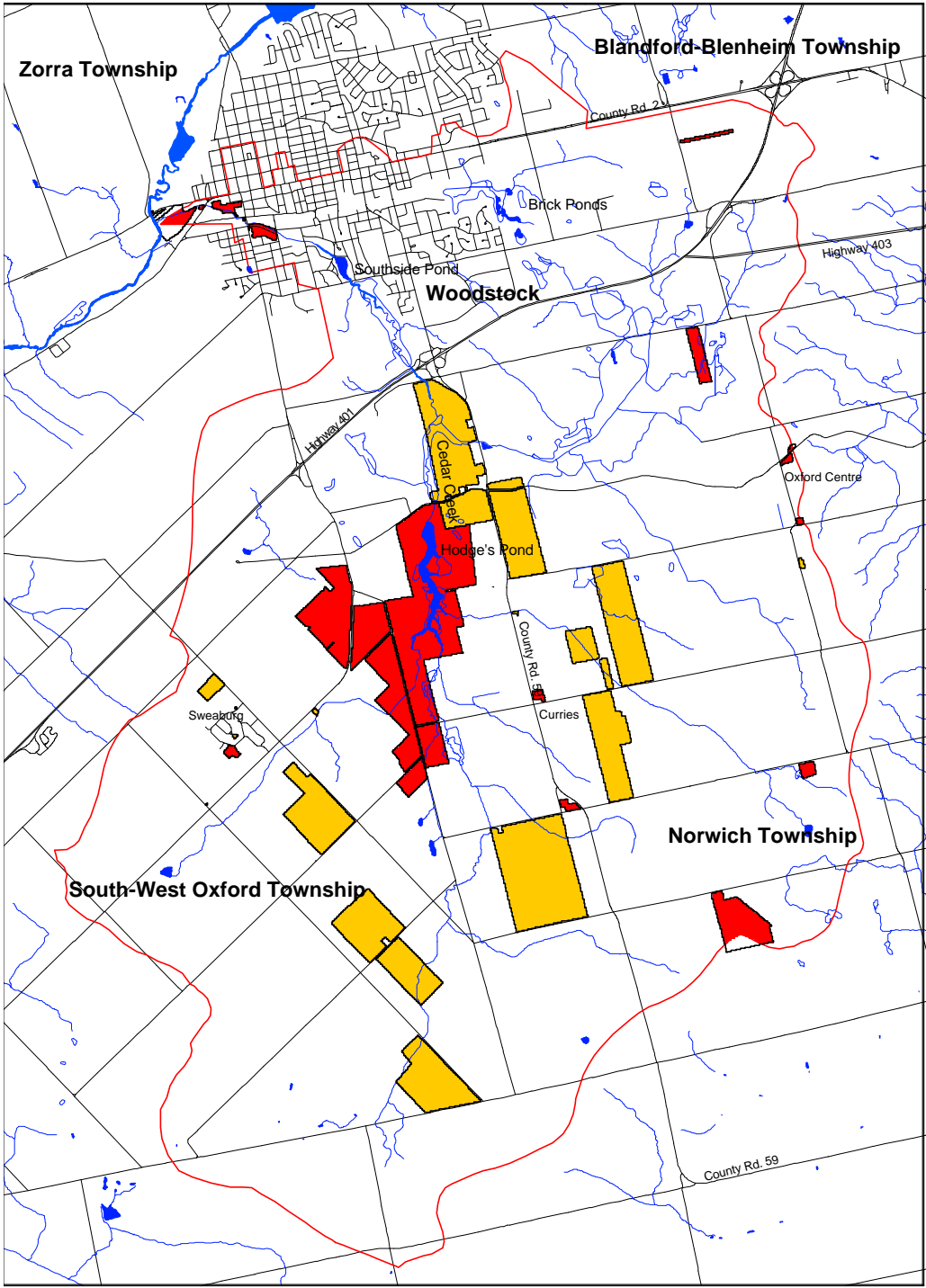
Cedar Creek Watershed Zoning Information Breakdown



Zoning Categories	
	High
	Medium
	Low

Map Reference
 1. Base Mapping" Produced by UTRCA under licence with the Ontario Ministry of Natural Resources © Queens Printer 1994" 1999
 2. Original Zoning Information Supplied by County of Oxford, Land Related Information Systems department

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Cedar Creek Watershed
Property Information

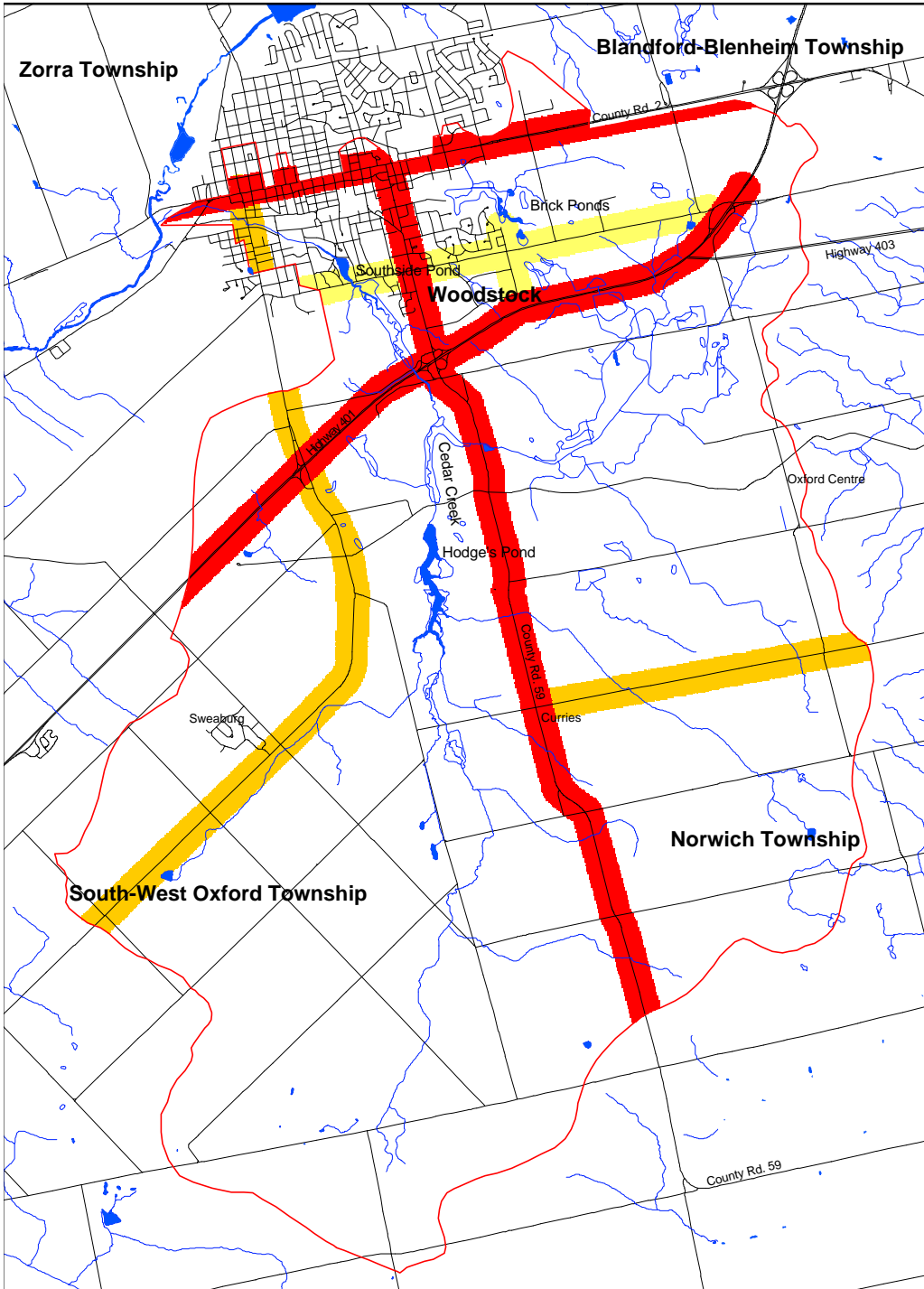


Legend

- High-Public Property
- Medium-Private Interest

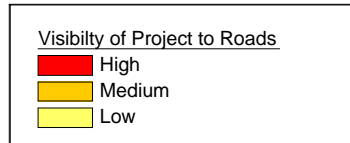
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Cedar Creek Watershed

Visibility of Project to Public



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Appendix B - Criteria Scoring and Weighting

Criteria	High (5)	Medium (3)	Low (1)	Weight
Groundwater Recharge	1 year zone	3 year zone	other recharge areas	18%
Well Heads	within 300m of well	—	—	18%
Erosion	high erosion area and within 20m of watercourse	high erosion area and more than 20m from watercourse	—	18%
Wetlands	Provincially Significant	Locally Significant	—	12%
Forest Interior	identified through circle analysis	within 100m buffer of woodlot	—	10%
Watercourse Buffer	within 100m of watercourse	between 100m and 200m of watercourse	—	8%
Corridor - 2km radius	7 to 10 circles overlap	4 to 6 circles overlap	1 to 3 circles overlap	8 %
Land Use Zoning	Environmental Protection, Open Space	Institutional, Agricultural	Industrial, Rural Residential	3%
Property Ownership	Public Property	landowners with interest in the project	—	2.5%
Visibility	within 300m of County Road 2, County Road 59, Highway 401	within 300m of Sweaburg Road, Mill Street, Curries Road	within 300m of Parkinson Road, Springbank Avenue	2.5%

Appendix C - Paired Comparison Analysis

The paired comparison analysis is used to determine the weighting of the criteria in the study. Using this method, Technical Subcommittee members were asked to compare each criterion to every other criterion in the study and determine the relative importance of the criterion.

The letter of the more important criteria is entered into the comparison box on the grid. A number is given based on the criterion's degree of importance:

1 = slightly more important

2 = moderately more important

3 = much more important

The numbers for each criterion are summed to determine the criterion's score. This score is then expressed as a percentage of the sum of all the scores to determine the criterion's weight.

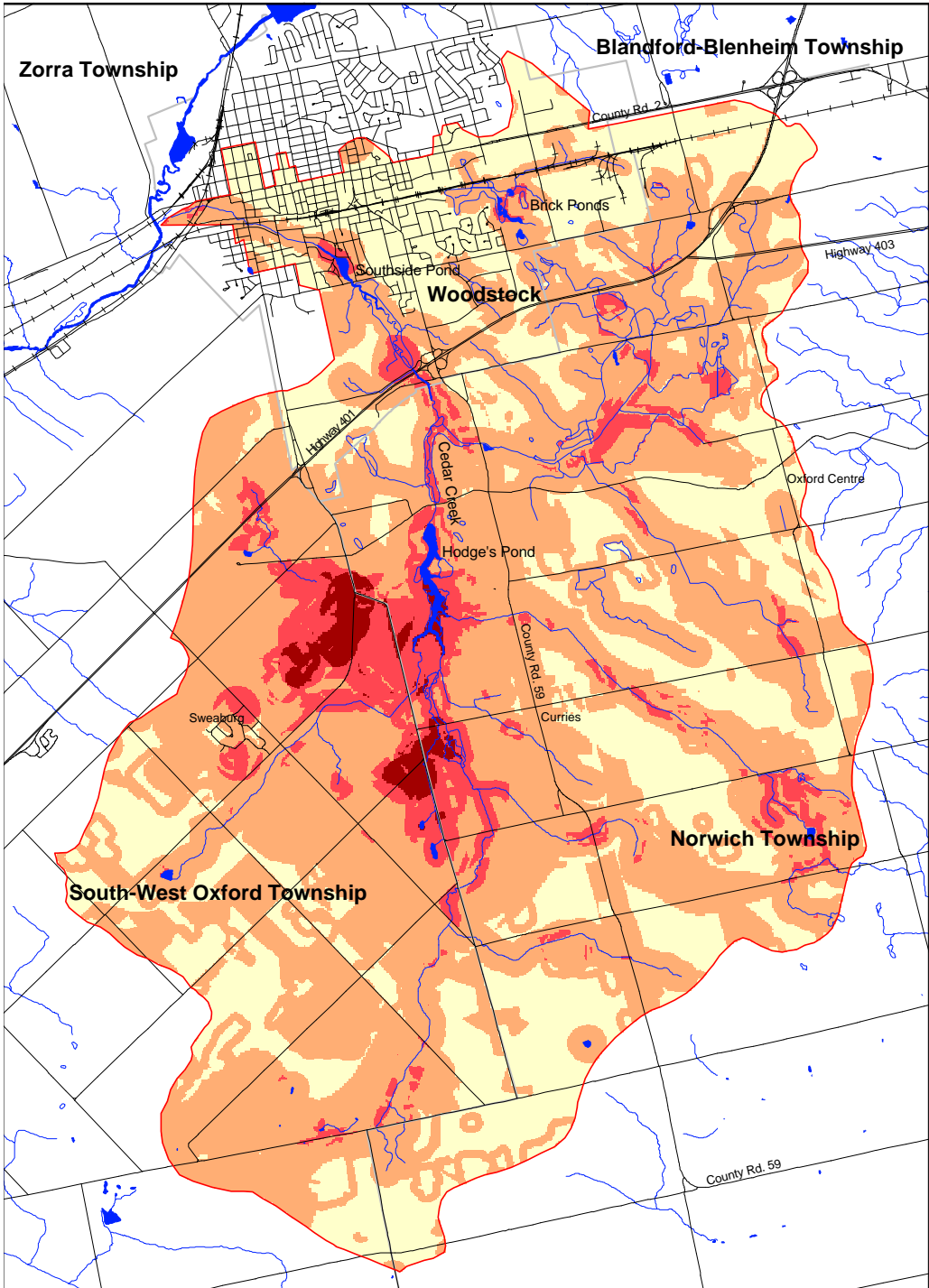
Using the example below, Criteria A, B, and C are compared to each other. A was considered to be more important than B, and A was entered into the AB comparison cell in the grid. A was considered to be much more important than B so 3 was also entered into the cell. A was then compared to C. C was considered to be moderately more important than A so C2 was entered into the comparison cell. B was compared to C and considered only slightly more important than C and B1 was entered into the cell. The numbers associated with each letter were summed in the second table and a weight assigned for each criterion.

EXAMPLE:

A	B	C
A	A3	C2
	B	B1
		C

Criterion	Sum	Weight
A	3	50%
B	1	17%
C	2	33%

Appendix D - Watershed Priority Maps



Cedar Creek Watershed

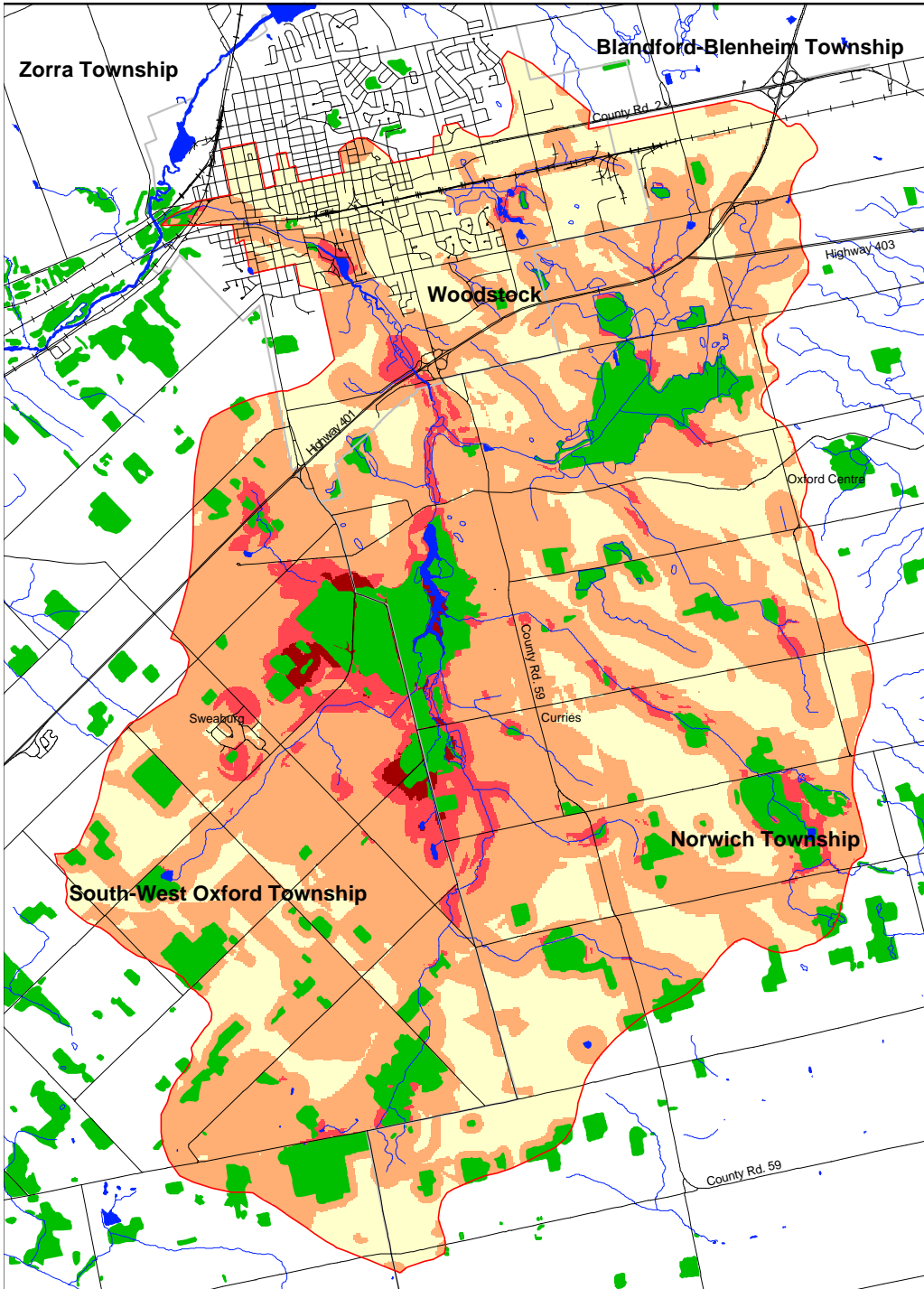
Priority Selection Map derived from Model



Rankings	
	Very High
	High
	Medium
	Low
	Watershed Boundary
	Township Boundaries

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Cedar Creek Watershed

Priority Selection Map derived from Model



Rankings

- Very High
- High
- Medium
- Low
- Existing Vegetation
- Watershed Boundary
- Township Boundaries

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