Ellice Swamp & Gads Hill Swamp

Guiding Document

March, 2004

Ellice Swamp and Gads Hill Swamp

Conservation Management Guiding Document
March 2004

Copies of this report may be obtained from:

The Upper Thames River Conservation Authority

1424 Clarke Road, London, ON N5V 5B9

Phone: (519) 451-2800 Fax: (519) 451-1188

A pdf version of this report may downloaded from the UTRCA web site at www.thamesriver.on.ca

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- Emma Boersen, Neighbouring Landowner
- Jane Boyce, Stratford Field Naturalists
- Jackie Catania, Neighbouring Landowner
- Elaine & Roger Cook, Stratford Field Naturalists, Upper Avon River Conservation Club
- Bob Faulhafer, Local Outdoor Opportunities Partners (LOOP)
- Milt Illman, LOOP
- Tony Jackson, LOOP
- Ken Maronets, Perth Stewardship Network, staff member
- Gary Marsh, Neighbouring Landowner
- Dave McLachlin, Ducks Unlimited Canada, staff member
- Scott Nahrgang, LOOP
- Dwight Satchell, Neighbouring Landowner
- Gayle Schmidt, Neighbouring Landowner
- Robin Van De Lande, Grand River Conservation Authority (GRCA), staff member
- George Wicke, Neighbouring Landowner, Perth Stewardship Network, GRCA Board Member, LOOP

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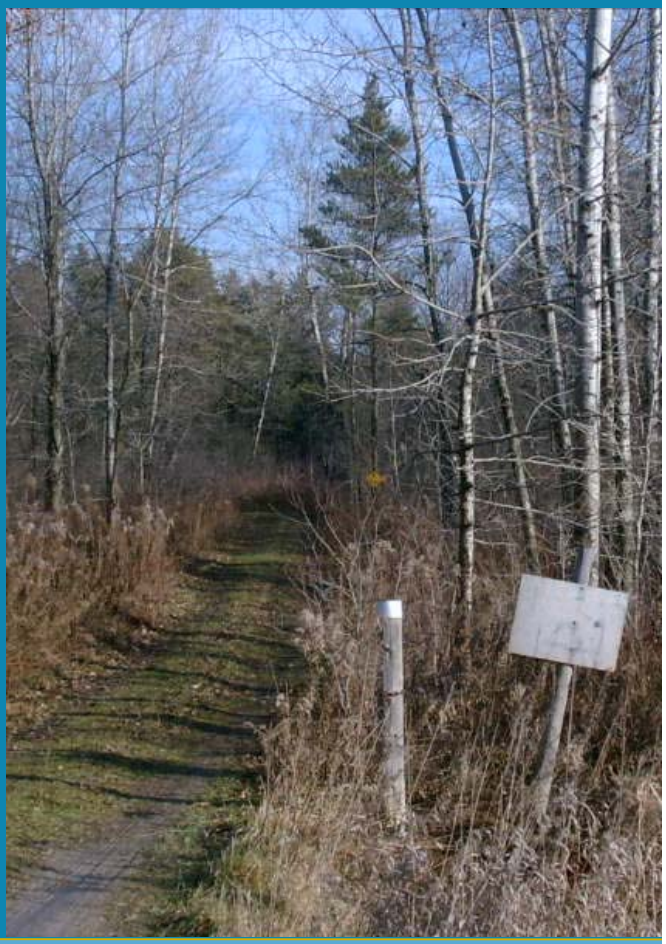
UTRCA staff supporting the Conservation Management project:

- Brenda Gallagher, Forestry and Vegetation Assessment Technician
- Bill Mackie, Superintendent Support Services and Properties
- Steve Sauder, Strategy Specialist
- Tara Tchir, Ecologist
- Karen Wilkie, Support Services and Properties Technician

Table of Contents



Size & Location

- Ellice Swamp – 1,014 hectares (2,504 acres)
- Gads Hill Swamp – 705 hectares (1,741 acres) there are north and south parcels, the northern parcel is not publicly accessible
- The swamps are located between Milverton and Stratford
- Ellice Swamp is part of the watershed divide for the Grand and Upper Thames watersheds

Purpose of Management Plan

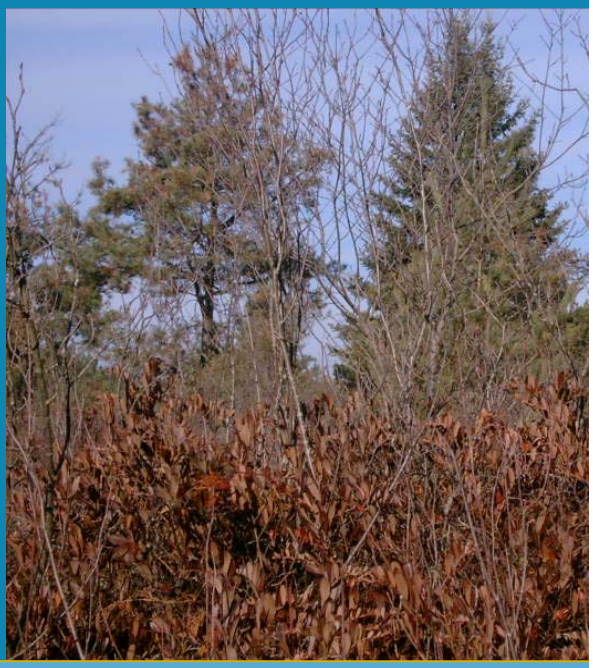
- Provides direction for future policies and management
- Ensures sustainability of the resource

History - Ellice Swamp

- Originally known as Ellice Huckleberry Swamp
- Peat extraction occurred in the 1930's
- Experimental tree planting occurred in the 1950's
- Drains have been established through the swamp
- Traditionally used as hunting areas

Property Ownership

- Ellice Swamp and Gads Hill Swamp are primarily owned by the Upper Thames River Conservation Authority
- The most northern section of Ellice Swamp is owned by the Grand River Conservation Authority
- This is not crown land, crown land is owned by the federal government
- UTRCA is primarily responsible for the managing these wetlands and paying the taxes



Environmental Significance

- Provincially Significant Wetlands
- Significant water storage area in Perth County
- Largest natural areas within Perth County
- Provincially rare species: Northern Slender Ladies' Tresses
- Regionally rare species: Yellow Lady's Slipper, Velvet-leaf Blueberry, Adder's Tongue Fern, Cottongrass, Golden-winged Warbler
- One of the largest deer yards in Perth County

Partners

- Township of Perth East
- Neighbouring Landowners
- Stratford Field Naturalists
- Local Outdoor Opportunities Partners
- Swampers Snowmobile Club
- Perth Stewardship Network
- Ducks Unlimited
- Ontario Ministry of Natural Resources
- Grand River Conservation Authority
- Upper Thames River Conservation Authority

Management Plan Process

February 2002

-Visited stakeholders
- Identified issues/challenges

May 2002

- Hosted community meeting
- Identified priority issues/challenges
- Shared background information

June 2002 – May 2003

- Local Advisory Committee established
- Mission, goals, targets and key actions developed
- Tours hosted of Hullet Marsh and Ellice Swamp

Mission

Working with the community to protect the ecosystem health of Ellice Swamp and Gads Hill Swamp through the wise use and management of these long term resources

Principles

- Ecological integrity
- Ecological sustainability
- Shared responsibility
- Public participation
- Awareness & education
- Wise use

Perceived Priority Issues heard at Public Meetings

- Impact of All Terrain Vehicles
- Lack of access control
- Lack of designated uses
- Impact of beavers
- Impact of drains on hydrology
- Poaching
- Perth East Landfill Site

Management Plan Goals & Targets

Goal A

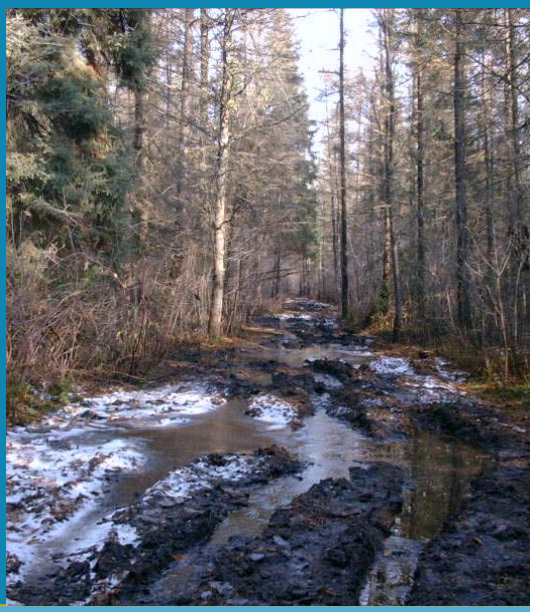
To develop and implement strategies that protect or improve the ecosystem health of Ellice Swamp and Gads Hill Swamp

Targets:

- Develop measures (indices) of ecosystem health for plant and wildlife habitat, and hydrology

- Identify the impact of Ellice Swamp and Gads Hill Swamp on the surrounding landscape

- Establish baseline monitoring



Management Plan Goals & Targets

Goal B

To develop strategies for community participation, awareness, and ongoing learning

Targets:

- Establish a Friends of Ellice Swamp and Gads Hill Swamp Committee with representation from a variety of sectors
- Develop signs and pamphlets with information about Ellice Swamp and Gad Hill Swamp
- Develop community education opportunities

Goal C

To develop strategies for public safety and wise use

Target:

- Establish designated uses with the Local Advisory Committee

Criteria for Decision Making

- Complements the management plan goals
- Does not disturb the ecological sensitivity of the area
- Meets UTRCA public safety requirements
- Complies with existing Federal, Provincial, Municipal, and Conservation Authority acts and regulations
- Is manageable
- Follows Forest Best Management Practices
- Respects traditional acceptable uses

Perceived Top Current Acceptable Uses

- Hunting
- Hiking/Bird Watching
- Snowmobiling

Considerations for Hunting

- Should signs be posted during hunts?
- Consider using the MNR Guardians Program as a Communication/Education method
- Need to develop enforcement program that includes MNR/OPP/UTRCA/Guardians
- Is trapping currently occurring? Need to consider safety
- Should provide education materials to Hunting/Hiking Clubs
- Should post MNR Hunting Regulations with dates of hunts
- Should develop designated parking/access areas
- Need to consider various hunting seasons
- Tree stands should not be permanent
- Should respect traditional hunting seasons
- Should use orange vests
- Consideration should be given for people with physical challenges

Considerations for Hiking/Bird Watching

- Should consider using the abandoned railway bed for hiking – possible access from GRCA property
- Should hiking trails be marked and separate from the snowmobile trail?
- Should make information available regarding different seasons for activities
- Need to look for feasible access points

Considerations for Snowmobiling

- Should continue UTRCA / Snowmobile Club Agreement
- Continue to use existing trail
- Should consider trail restoration for ATV damage
- Should develop pruning protocol with members of the Ellice Swampers Snowmobile Club

Examples of Current Perceived Unacceptable Uses

- All Terrain Vehicles
- Other motorized vehicles (except snowmobiles)
- Unauthorized dumping
- Tree harvesting

Considerations for Enforcing Perceived Unacceptable Uses

- Should policies that ban motorized vehicles (except snowmobile on designated trails) be developed?
- Should signs that show permitted uses be developed?
- Should control gates at entrances be installed?
- Consider developing an education / enforcement program

Management Plan - Next Steps

- Revise the document based upon public and stakeholder review
- Establish Friend's Committee
- Develop policies and implementation guidelines based upon this document

Friends of Ellice Swamp and Gads Hill Swamp

- Could be responsible for local management recommendations / implementation in partnership with UTRCA /GRCA
- Could include volunteer work at Ellice Swamp & Gads Hill Swamp
- Could involve fund-raising if money needs to be spent
- Could be an incorporated organization / gain charitable status
- Could include supporting community education and awareness of wise use

Technical Summary

Maps

Table of Contents

LIST OF TABLES

LIST OF MAPS

EXECUTIVE SUMMARY

Ellice and Gads Hill Swamps, located between Stratford and Milverton in Perth County, are recognized as Environmentally Sensitive Areas (ESAs) in Perth County. As well, South Gads Hill and Ellice Swamps are Provincially Significant Wetlands while North Gads Hill Swamp is a Locally Significant Wetland. Several provincially and regionally rare plant and animal species occur in the Swamps. Ellice and Gads Hill Swamps drain into the headwaters of the Thames River. Ellice Swamp also drains into a tributary of the Grand River.

Ownership of these wetlands rests with the Upper Thames River and Grand River Conservation Authorities. Responsibility for the Swamps' future rests with these public agencies, as well as with community interest groups, the local townships and the broader county. This community based Management Strategy is the product of the interests and ideas of a broad cross-section of these groups.

Ecological and land use recommendations were developed based on information compiled from biological field inventories, literature reviews and public consultation. Ecological recommendations include:

- increase the amount of forest cover in marginal lands adjacent to the Swamps to enhance wildlife corridors and interior habitat;
- monitor surface water and groundwater quantity and quality upstream, within and downstream of the Swamps to determine the hydrological cycle; and
- enhance open water areas for waterfowl.

Land use recommendations include:

- develop and maintain trails for passive recreational activities such as hiking, snowmobiling and crosscountry skiing;
- review hunting and trapping activities annually to ensure that Conservation Authority guidelines are appropriate and being followed; and
- mitigate abandoned or unnecessary drainage activities through the swamp.
- All Terrain Vehicles (ATVs), unsupervised dog running, camping, peat extraction, tree harvesting and drainage are not appropriate land use activities given the sensitive features and functions that the Swamps support.

PURPOSE

The purpose of the ecological study is to describe the abiotic, biotic (terrestrial and aquatic) and cultural features and functions of Ellice and Gads Hill Swamps. Information collected from field inventories, literature reviews and public consultation is presented here to assist the Local Advisory Group (LAG), called Friends of Ellice and Gads Hill Swamps, and the Conservation Authorities (UTRCA and GRCA) in identifying issues, appropriate land uses, and management strategies for Ellice and Gads Hill Swamps.

The UTRCA and GRCA will work in partnership with Friends of Ellice and Gads Hill Swamps to ensure that the lands owned by each Authority in the Swamps are managed carefully and consistently by implementing the management plan. The Ontario Ministry of Natural Resources (OMNR), in cooperation with the UTRCA and GRCA, will continue to be involved in the monitoring and protection of these wetland areas.

INTRODUCTION

Swamps, such as Ellice and Gads Hill, are defined as treed wetlands (deciduous and/or coniferous) that contain standing water all or most of the time (Lee *et al.* 1998). They are neither wholly firm land nor water bodies. Wetlands act as natural filtering systems that improve water quality. Wetland plants absorb nutrients and help cycle them through the food chain. Plants also slow down flowing water and thereby cause silt to settle out.

Wetlands also act to mitigate floods by slowing down and holding the runoff of spring meltwater and storm water. This ability to hold back spring runoff and slowly release it during the normal low summer flow in rivers can help prevent serious water supply problems. Wetlands not only help in preserving a more even flow in streams throughout the year, but aid in maintaining the natural level of the water table in the soil through groundwater infiltration and replenishment. The more wetlands in a drainage area, the higher the likelihood that serious water shortages can be prevented. Ellice and Gads Hill Swamps were identified as three of only 15 areas in the Upper Thames watershed that serve as natural groundwater water storage areas (UTRCA 1952).

Finally, wetlands have high biodiversity of both plant and animal species. As a result of extensive drainage and clearing, wooded wetlands (*i.e.* swamps) are relatively rare in southern Ontario and the species associated with them are susceptible to further loss through wetland fragmentation and degradation.

STUDY AREA

Ellice and Gads Hill Swamps are owned and managed as protected natural areas by the Upper Thames River and Grand River Conservation Authorities. These Swamps are located between Stratford and Milverton and drain into Black Creek and the Avon River, tributaries and headwaters of the Thames River (Map 1). Ellice Swamp is situated west of the Village of Gads Hill and bridges the watershed divide between the Upper Thames River and the Grand River. The portion of Ellice Swamp in the Grand River watershed drains toward the Nith River (Map 1). The Gads Hill Swamps are located just east of the village and are found entirely within the Upper Thames River watershed. Land is flat to undulating with little relief.

Ellice Swamp is 1,014 hectares (2,504 acres) and is the largest remaining wetland both in Perth County and in the Upper Thames River watershed. It is located on the flat to undulating Stratford Till Plain. The soils in this area are primarily composed of muck and peat (Map 2). These organic or hydric soils vary from less than 40 cm to greater than one metre in depth. The shallow overburden is made up of silt loam to clayey silt till with shallow deposits of sand. Underlying this zone is a higher clay content that is more impervious, restricting lateral flow and maintaining the wetland. Bedrock occurs at a depth of approximately 40 m below ground. A perched groundwater table occurs near the surface throughout Ellice Swamp within the sandy lens above the clay. The groundwater eventually discharges into two stream channels, one of which drains into the North Branch of the Thames River via the East Black Creek Drain and the other of which drains into the Nith River, a tributary of the Grand River system (Maps 1 and 3).

The Perth County Groundwater Management Study highlighted Ellice Swamp as a significant groundwater recharge zone. It is also recognized by the Ontario Ministry of Natural Resources (OMNR) as a Provincially Significant Wetland (PSW) and is classified as an Environmentally Sensitive Area (ESA) in Perth County.

The Gads Hill Swamps are 705 hectares (1,741 acres) and consist of two wooded blocks, a southern section (495 hectares) and a northern section (120 hectares). Both are located on a sand plain, with clay and silt loam underlying muck soils (Map 2). South Gads Hill Swamp is the largest wooded area in the Avon River watershed and is one of the main sources of water for the Avon River, which drains into the North Branch of the Thames River (Map 1). It feeds the Seip Drive and Western Drains which flow into the large Court Drain beside Highway 19 (County Road 119) and eventually enter the Avon River 13 km away at the eastern outskirts of Stratford (Maps 1 and 3). North Gads Hill Swamp supplies water to Black Creek via the Corcoran Drain (Maps 1 and 3). Black Creek eventually drains into the North Branch of the Thames River.

Both South and North Gads Hill Swamps are designated as ESAs in the County of Perth. South Gads Hill Swamp is recognized by the OMNR as a Provincially Significant Wetland (PSW) while North Gads Hill Swamp is recognized by the OMNR as a Locally Significant Wetland (LSW).

METHODS

Cultural Use

To describe the cultural heritage landscape of Ellice and Gads Hill Swamps, a review of current and adjacent land uses was undertaken. This entailed reviewing historical and current land use maps, historical literature such as Conservation Authority reports and newspaper articles, as well as consulting with the public, various stakeholders and agency staff to identify the multi-use demands of local residents and tourists who enjoy the wetland areas.

Field Surveys

A vegetation inventory was conducted in the field throughout the spring and summer of 2002 in Ellice and South Gads Hill Swamps. The classification of vegetation communities followed the Ecological Land Classification (ELC) system for Southern Ontario (Lee *et al.* 1998). This system was designed to standardize the way vegetation communities are described and labelled throughout southern Ontario, depending on the composition of dominant tree species, soil types, hydrology and understorey vegetation. Vegetation communities in Ellice and South Gads Hill Swamps were classified to the ecosite level (*i.e.* green level of the ELC) wherever possible (UTRCA database). North Gads Hill Swamp was not inventoried because of time restraints. Since there is no public access, it is believed that land use pressures are not as great for North Gads Hill Swamp.

The vegetation field work was efficient and unobtrusive. Plants and animals were not removed from the site. Each community was surveyed on foot. A description of the top four species by presence for each vegetation layer (canopy, sub-canopy, shrub and herbaceous) was recorded, as well as descriptions of the physiography. An evaluation of ecological community features, such as the presence of seeps, healthy watercourses, dead standing snags and fallen logs, *etc.*, was conducted. There was no formal quantitative analysis of the vegetation during this survey (*i.e.* no sampling quadrats or measured transects). Prism sweeps, used to determine basal area (or tree density by species and size), were recorded at least once in each treed community. Given time and budget constraints, a detailed assessment of the vegetation and of wildlife was not possible. Wildlife species were recorded opportunistically during the vegetation surveys. Significant breeding areas for birds, amphibians and reptiles were presumed, but not confirmed, in this study.

Benthic samples were obtained from 1997 to 2003 in three streams and drains downstream and adjacent to the Swamps (Map 3) 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 0.5 mm mesh "D"- frame net. Samples are preserved in the field and analysed in the lab to randomly select subsamples for 200 individuals, which are identified to the Family taxonomic level. Fish samples were collected within Ellice Swamp in the fall of 2003 at the same time as the benthic sampling, using an electro shocker to temporarily stun the fish for capture. Fish were identified in the field and released.

Data Analysis

Natural resource inventories including wetland evaluations, forest resource inventory maps, Conservation Authority reports, water quality reports, benthic surveys and other background data were synthesized to establish a baseline of information. Since woodland community boundaries determined in the field are recognizable on air photos, both natural and cultural feature boundaries (*i.e.* roads, railroads, trails) within and surrounding the Swamp areas were mapped onto 1:2000 OBM maps. These maps were then overlayed to determine land use activities compatible with the natural resource.

A biotic index was assigned to the benthic invertebrate taxa, indicating their pollution sensitivity and tolerance on a scale from 0 to 10 (Appendix A). Lower numbers indicate pollution sensitivity and high numbers indicate pollution tolerance. A value of -1 indicates that no biotic index value has been assigned to these taxa. The Family Biotic Index (FBI) is the weighted average of the biotic index and number of bugs in each taxa in the sample. Table 1 shows the water quality ranges for the FBI values.

Table 1. Water Quality Ranges for FBI values.

Good	<5.00
Fair	5.00-5.75
Fairly Poor	5.75-6.50
Poor	>6.50

RESULTS

Cultural Use of Ellice Swamp

Ellice Swamp, which was once so large it hindered the township's early development, has a rich cultural history. To enable settlers to move into the area, Ellice Swamp was eventually drained by several large ditches (Babb 1974). A great deal of what was once swamp wilderness is now among the most productive sections of Perth County.

In the pioneer days, the Swamp was rich in flora and fauna. It was used by the pioneers for berry picking and for peat extraction (Wicke, pers. comm.). Wolves and deer were plentiful and ran throughout the Swamp while large water snakes moved through the black muck. Many interesting pioneer families lived adjacent to the Swamp. Frank Ruston came to Canada from Ireland in the mid 1800s. He arrived in Toronto, but soon set off on foot in search of work (Babb 1974). After brief stops in Brampton, Guelph and then Wartburg, he continued his journey on foot and eventually settled near Kinkora where he married. Ten years later he bought a farm on a small clearing on the edge of Ellice Swamp from the Canada Company. He lived here until he moved to Stratford in 1909. He died two years later. His son took over the farm in 1909 but then sold it in 1918.

Another interesting pioneer was Mr. Middleditch who purchased a 100 acre tract within Ellice Swamp from the Canada Company in the early 1870s in the hopes of curing his wife from tuberculosis. It was believed that she would be cured by breathing in the fragrant pine and cedar trees. A squatter's cabin within the 100 acres was enlarged, and Mr. Middleditch went about clearing and draining his land. The family's few belongings were carried from the Ruston home located two miles west of the 100 acre tract, which was the closest dwelling that could be reached by wagon and oxen. Mrs. Middleditch eventually recovered, and went on to organize a Sunday School in her home. This eventually resulted in a little brick chapel a few yards from her door that remained active until 1940. Today, there is no bush on the property and all the land is tillable.

The Upper Thames River Conservation Authority (UTRCA) recognized the importance of Ellice Swamp to the watershed and began purchasing it in 1948. In 1954, the Grand River Conservation Authority (GRCA) purchased 78 acres (approximately 32 ha) of land from John and Nancy Nafziger for $1000, who had purchased the land in Ellice Swamp from the Crown in 1939. The original intent of both Conservation Authorities in purchasing the lands was to secure areas prone to flooding. More recently, the Conservation Authorities have broadened their interest in Ellice Swamp because of its importance as a Provincially Significant Wetland (PSW) and as one of the largest natural areas in south-central Ontario. The Authorities are also exploring other uses of the site, such as passive recreation and hunting.

In the 1950s, Dr. Wellwood, a biology professor at the University of Guelph, discovered many rare plants in Ellice Swamp that were not found anywhere else in Canada. He later contacted the Upper Thames River Conservation Authority in the hopes of securing their protection during the reforestation program.

Today Ellice Swamp is completely surrounded by agricultural lands (Map 4). A few isolated woodland patches remain scattered within this agricultural matrix. In addition to the publicly owned lands of the UTRCA and GRCA, the Swamp is divided into a number of private land holdings as well as a large forest block owned by the Township of Perth East (Map 5). This township property contains a small bridge and trail operated by the Ellice Swampers snowmobile club (a member of the Ontario Federation of Snowmobile Clubs). A township landfill site that is in full operation is located at the north end of the Swamp in the Grand River watershed (Map 5).

Vegetation Change Within Ellice Swamp

Ellice Swamp was originally a mixed coniferous and deciduous swamp forest, composed chiefly of Eastern White Cedar, hemlock, Silver Maple, Black Ash and White Elm (UTRCA 1952). It was also known as the Ellice Huckleberry Marsh due to the large number of huckleberries growing in the area. Most of the original vegetation was cleared and drained for agricultural purposes around 1900. As well, Ellice Swamp was repeatedly burned after drains were put through it to make the edges useable for agriculture. Several attempts at agricultural use occurred, including pasturing and orchard plantings. Repeated fires and peat extraction operations in the 1930s contributed to the altered forest composition of the Swamp. In the 1950s, the MNR undertook experimental tree planting of both coniferous and deciduous species in large areas throughout Ellice Swamp, altering the Swamp's original character.

Although Ellice Swamp was inventoried for the 1952 Upper Thames Valley Conservation Report, the inventory was not very detailed. Only four forest cover types were recognized: wet scrub, aspen (extensive and widely distributed throughout the Swamp), willow (found on wet sites) and Silver Maple-White Elm (found on poorly drained soils but relatively common in the Swamp). Over 50% of the area was described as woodland, 20% as open or marsh land, 20% as scrub land and 5% as bogs and lakes (UTRCA 1952). The lands in the Grand River watershed were composed mostly of deciduous swamp, shrub thicket and open water marsh with a small section of upland plantation near the township road. Most of the water reaching Ellice Swamp at this time was from precipitation. Since precipitation is low in nutrients and has a low pH (more acidic), peat soils and bog vegetation developed.

In 1982, Ellice Swamp was again evaluated, this time for the Perth County Preliminary Environmentally Sensitive Areas Survey (Hoffman and Lamb 1982). In the less disturbed areas of the Swamp, it was noted that poplar, Black Ash and Silver Maple scrub dominated. Dogwoods, willows, meadowsweets, chokeberries and blueberries were prevalent in the understorey. The centre of the Swamp was covered with sphagnum moss and Leather-leaf underlain with peat, indicators of a bog. Few remnants of the original bog vegetation existed and huckleberries appeared to be extirpated. Woody vegetation had rapidly invaded the drier, drained soils at the expense of the wet bog species. At the edges, dense thickets of trembling aspen occurred, but decreased toward the centre. As a result of drainage and attempts at farming, the wetland communities were altered or lost, resulting in a shift from marsh to swamp communities, a reduction in open water habitats and an increase in woody species. Large areas of the marsh were also planted in coniferous tree species. Ironically, it is the degraded condition of the Swamp from drainage activities that increased habitat diversity. This diversity attracted large numbers of bird species and was one of the reasons why the Swamp was designated as an Environmentally Sensitive Area (ESA) in Perth County.

In 1985 Ellice Swamp was evaluated for its wetland characteristics. According to the OMNR wetland evaluation, there were approximately 13 different swamp communities in Ellice Swamp. The vegetation survey conducted in the spring and summer of 2002 for this management plan confirmed that these wetland habitats are still present and appear to have expanded in size since the wetland evaluation, with the exception of some of the wetland habitats adjacent to the landfill site (Map 6). The Upper Thames portion of Ellice Swamp is currently comprised of three cultural community types in which approximately 0.3% of the entire Swamp is cultural meadow, 16% is cultural plantation and 0.2% is cultural thicket. A number of old field and orchard communities are present. Only 2% of the Swamp is upland deciduous forest. The other four community types are wetlands. Approximately 23% is deciduous swamp, 1% is mixed swamp, 41% is swamp thicket with deciduous over storey and 7% is swamp thicket with coniferous over storey. The rail line on both properties is mostly gravel and is only sparsely vegetated. Some of the significant plant species found in Ellice Swamp include the provincially rare Northern Slender Ladies' Tresses, *Carex trisperma* (sedge), Bog Fern, Swan's Sedge, Rugulose Grapefern, Yellow Screwstem and the regionally rare Cotton Grass and Adder's Tongue Fern (NHIC 2003).

Cultural Use of the Gads Hill Swamps

When the pioneers arrived in North Easthope, almost all the lots had soil types and moisture conditions that ranged from well drained to poorly drained (Robinson 1998). As a consequence, many varieties of trees including white pine, white cedar and hemlock, as well as other plants, flourished.

The first settlers in the area arrived in the late 1850s (Robinson 1998). Land adjacent to North Gads Hill Swamp was used for crops, grain and hay. Woodlands adjacent to South Gads Hill Swamp were used in a variety of ways, including the operation of small seasonal sawmills that took pine and hemlock, pasture lands, harvested for fuel and tiled and drained for crops.

Many of the first buildings built by the early settlers were made of white pine because of its resistance to rot and the ease with which it could be cut and shaped with hand tools (Robinson 1998). White cedar was used for roof shingles and rail fences. Old growth cedar rails, if off the ground and well ventilated, lasted for hundreds of years. Hemlock, less desirable for framing and finishing houses, was used extensively for framing and siding barns because of its resistance to rot (Robinson 1998). As a result, many of the pine, cedar and hemlock trees have become extinct on farm woodlands, although there still is a sampling of each throughout the North Easthope township.

Recognizing that the main natural water storage area for the Avon River is the Gads Hill Swamp and that most of the land within the Gads Hill Swamps is not suitable farmland, the UTRCA purchased a number of properties in the late 1950s to ensure the protection of this important water recharge area. These small parcels of land help to keep the small streams flowing while providing habitat for songbirds and animals.

Vegetation Change Within the Gads Hill Swamps

The UTRCA began purchasing lands within the Gads Hill Swamps in 1951. The 1952 Upper Thames Valley Conservation Report characterized North Gads Hill Swamp by three forest cover types: wet scrub, aspen (throughout) and Silver Maple-White Elm (relatively common but on poorly drained soils). Over 80% of the area was comprised of woodland, 15% was open or poorly drained marginal land and 5% was scrub land (UTRCA 1952).

The 1952 Upper Thames Valley Conservation Report characterized South Gads Hill Swamp as more diverse than either North Gads Hill or Ellice Swamps. South Gads Hill Swamp had nine forest cover types: wet scrub, aspen (distributed throughout), Tamarack (which was uncommon and found on muck soils with little drainage), Black Ash-White Elm-Red Maple (found on moist to wet soils), Silver Maple-White Elm (found on poorly drained soils but relatively common), White Elm (also found on poorly drained soils and relatively common), beech-Sugar Maple (found throughout), Eastern White Cedar (on sites of slow drainage that are not strongly acidic) and willow (on wet sites). Although South Gads Hill Swamp had already been mostly cut over, there were some stands of larger White Elm, Silver Maple and Eastern White Cedar trees (UTRCA 1952).

Over half of South Gads Hill Swamp was woodland in 1952, while 20% was open land and 20% was scrub land. The wooded area of the Swamp enclosed some vigorous springs and at least one pool where inflowing water entered the ground, since there was no visible surface outlet. Most of the water reaching South Gads Hill Swamp was replenished by precipitation, although there was also this groundwater discharge component in the form of springs. The groundwater component provided nutrients to the wetland which made the vegetation at South Gads Hill Swamp different than the bog vegetation at Ellice Swamp.

In 1982, South Gads Hill Swamp was evaluated as part of the Perth County Preliminary Environmentally Sensitive Areas Survey (Hoffman and Lamb 1982). The most notable community types recorded at that time were early successional stands of Silver Maple, ash and aspen found throughout the Swamp. Along its perimeter, a young spruce plantation was established by the Ontario Ministry of Natural Resources (OMNR). A high quality upland maple-beech forest was found on higher ground. At the south east edge of the woods, a hemlock-Eastern White Cedar swamp, several wet willow-dogwood thickets, an Eastern White Cedar bog forest and small pockets of Tamarack were recorded. The coniferous forest associations on moist and hummocky ground contained a large number of boreal species not commonly found in southern Ontario.

In 1985 the Gads Hill Swamps were evaluated for their wetland community characteristics. According to the OMNR wetland evaluation, there were only nine wetland community types in the Gads Hill Swamps. North Gads Hill Swamp had two organic swamp communities and appeared to be drying up while South Gads Hill Swamp had seven organic swamp wetland communities and was thought to be hydrologically connected by surface water to other wetlands. As well, South Gads Hill Swamp contained regionally significant plant species. The Gads Hill Swamps were re-evaluated for their wetland community characteristics in 1994. According to the OMNR wetland evaluation, over 20 wetland community types were recognized. Fifteen swamp wetlands on humic / mesic organic soil were recorded in North Gads Hill Swamp while ten individual organic swamp and marsh wetlands on humic / mesic soil and clay / loam soil were recorded for South Gads Hill Swamp. South Gads Hill Swamp had both palustrine and riverine site types, and provincial as well as regionally significant plant species. South Gads Hill Swamp was no longer thought to be hydrologically connected by surface water to other wetlands.

A detailed terrestrial inventory of South Gads Hill Swamp was conducted as part of the Court Drain Subwatershed Plan Study for the City of Stratford (Aquafor Beech Ltd. 2002). The Court Drain study described South Gads Hill Swamp as a deciduous wetland. The vegetation survey conducted in the spring and summer of 2002 for this management plan confirmed the findings of the Court Drain

study (Map 7). The majority of the woodland lies in a large shallow depression on table land that is poorly drained, which results in a plant community dominated by Red, Silver and Manitoba Maple that experiences extensive flooding after spring melt, but gradually dries up by mid to late summer. The degree of seasonal flooding has probably been reduced over time due to the construction of drainage systems. Over the past 100 years, the wetland forest on the western half of the site has been undergoing succession to a drier deciduous swamp with more Sugar Maple (Aquafor Beech Ltd. 2002). This is consistent with the age of the stand as most trees are less than a hundred years old. Canopy cover is > 90% throughout most of this area. The soil in the Swamp is homogeneous and consists of a wet medium silty loam with a depth of > 40 m to bedrock.

The drier, more upland areas on the eastern side of South Gads Hill Swamp consist of a mix of tree species that reflect the historical uses of this land. Local records show that farming was practised unsuccessfully on this land for a few generations. Therefore, much of the area is still in a mid-successional phase. Remnants of apple orchards can be found near the southeast side. Most trees on the upland areas are relatively young, under 70 years. Since these areas are slightly higher, they dry up and consequently do not experience seasonal flooding. Canopy cover is less than 50% in most of these upland areas, and in some parts there are still large patches of old field communities comprised of weeds and grasses.

Wildlife

Ellice Swamp contains regionally significant bird species. The open water marsh habitat in the GRCA watershed is a critical area for waterfowl staging and production, as well as an active feeding area for colonial waterbirds. In 1985, several significant bird species were recorded in Ellice Swamp, including the regionally significant Golden-winged Warbler, found nowhere else in Perth County. Other regionally significant species found in Ellice Swamp at this time include the Red-headed Woodpecker, the Yellow-billed Cuckoo and the Yellow Warbler.

In 1985, Ellice Swamp also contained several bird species of concern (NHIC), including:

- Blue-gray Gnatcatcher
- Blue-winged Warbler
- Cerulean Warbler
- Northern Water Thrush
- Red-shouldered Hawk
- White-throated Sparrow
- Yellow-breasted Chat

The Golden-winged Warbler, Yellow Warbler, Yellow-breasted Chat, Blue-gray Gnatcatcher and White-throated Sparrow were recorded again in Ellice Swamp by Jane Boyce between 2001 and 2003 (Appendix B).

The Gads Hill Swamps are also significant areas for breeding birds. The diversity of habitat types, ranging from old field communities to dense deciduous forests, provide significant feeding and breeding grounds for a wide variety of indigenous birds. For example, the Northern Harrier, a provincially significant bird species, uses South Gads Hill Swamp for breeding and feeding habitat. South Gads Hill Swamp is also locally significant for waterfowl production and for waterfowl breeding habitat. Great Blue Heron rookeries are present in both swamp areas.

In addition to bird species, Ellice and Gads Hill Swamps contain a high diversity of wildlife. The large open water marsh area in Ellice Swamp contains perhaps the highest diversity of wildlife, including fish and amphibians. Reptile and amphibian species recorded opportunistically from Ellice and Gads Hill Swamps during the vegetation survey conducted in the spring and summer of 2002 include:

- American Toad
- Bullfrog
- Garter Snake
- Green Frog
- Leopard Frog
- Snapping Turtle
- Snowshoe Hare
- Spring Peeper
- Western Chorus Frog
- Wood Frog

Wildlife tracks from the following mammal species were found in Ellice and Gads Hill Swamps during the vegetation survey conducted in the spring and summer of 2002:

- American Mink
- Beaver
- Cottontail
- Coyote
- Meadow Vole
- Muskrat
- Red Fox
- Red Squirrel
- Striped Skunk
- Raccoon
- Virginia Oppossum
- White-tailed Deer

Insect species recorded during the vegetation survey conducted during the spring and summer of 2002 include:

- Azure species
- Cicada
- Eastern Tent Caterpillar
- Fritillary species
- Great Spangled Fritillary
- Mourning Cloak
- Red Spotted Purple
- Sulphur
- Swallowtail species

A total of nine species of fish were sampled during benthic surveys in and adjacent to Ellice Swamp in the fall of 2003. This is a fairly high total for such a small water body. The sample included the Pearl Dace and Brassy Minnow, two species that are fairly uncommon in the Thames, although abundant elsewhere. Other species included the Creek Chub, Mudminnow, Stickleback, Red-bellied Dace, Stoneroller, Fathead Minnow and Common Shiner.

Benthic Organisms

Table 2 through to Table 4 summarize the benthic sampling data presented in Appendix A. Map 3 shows the locations of the 3 benthic sampling sites. The Family Biotic Index (FBI) values and water quality conditions for tributaries of Black Creek from 2000 and 2002 are presented in Table 5. Corresponding water quality conditions were determined from Table 1. Table 5 shows that between 2000 and 2002, the tributaries of Black Creek had poor FBI values.

Table 2. Benthic Diversity Results from the West Tributary of Black Creek (combined samples from 2000 and 2002 at Site 1, Map 3).

Taxonomic Name	Common Name	Year Sampled
Acariformes	Water Mite	2002
Asellidae	Sow Bug	2000/02
Ceratopagonidae	Biting Midge	2002
Chironomidae	Midge	2000/02
Corixidae	Water Boatmen	2002
Cyclopoida	Fish Lice	2002
Dytiscidae	Predacious Diving Beetle	2000/02
Elmidae	Riffle Beetle	2000/02
Erpobdellidae	Leech	2000/02
Haliplidae	Crawling Water Beetle	2000/02
Hydropsychidae	Net-spinning Caddisfly	2000
Lymnaeidae	Pond Snail	2000/02
Muscidae	Muscid Fly	2000
Nematoda	Thread Worm	2000/02
Oligochaeta	Aquatic Worm	2000/02
Ostracoda	Seed Shrimp	2000
Physidae	Pouch Snail	2000
Planorbidae	Orb Snail	2000
Simuliidae	Black Fly	2002
Sphaeriidae	Fingernail Clam	2002
Tabanidae	Horse Fly	2002

Table 3. Benthic Diversity Results from the East Tributary of Black Creek (combined samples from 2000 and 2002 at Site 2, Map 3).

Taxonomic Name	Common Name	Year Sampled
Acariformes	Water Mite	2002
Chironomidae	Midge	2000/02
Coenagrionidae	Narrow-winged Damselfly	2000
Corixidae	Water Boatmen	2002
Cyclopoida	Fish Lice	2000
Dytiscidae	Predacious Diving Beetle	2002
Elmidae	Riffle Beetle	2000/02
Haliplidae	Crawling Water Beetle	2000/02
Hydraenidae	Minute Moss Beetle	2002
Hydrozoa	Hydra	2002
Lymnaeidae	Pond Snail	2002
Nematoda	Thread Worm	2000/02
Oligochaeta	Aquatic Worm	2000/02
Ostracoda	Seed Shrimp	2000/02
Perlidae	Stonefly	2002
Physidae	Pouch Snail	2000/02
Planorbidae	Orb Snail	2000/02
Simuliidae	Black Fly	2002
Sphaeriidae	Fingernail	2000

Table 4. Benthic Diversity Results from the East Upstream Tributary of Black Creek (samples from 2002 at Site 3, Map 3).

Taxonomic Name	Common Name
Acariformes	Water Mite
Asellidae	Sow Bug
Baetidae	Small Mayfly
Cambaridae	Crayfish
Chironomidae	Midge
Collembola	Springtail
Corixidae	Water Boatmen
Curculionidae	Snout Beetle
Cyclopoida	Fish Lice
Dytiscidae	Predacious Diving Beetle
Elmidae	Riffle Beetle
Gammaridae	Sideswimmer
Gomphidae	Clubtail Dragonfly
Haliplidae	Crawling Water Beetle
Hydrozoa	Hydra
Leptophlebiidae	Mayfly
Libellulidae	Skimmer Dragonfly
Lymnaeidae	Pond Snail
Nematoda	Thread Worm
Oligochaeta	Aquatic Worm
Ostracoda	Seed Shrimp
Physidae	Pouch Snail
Planorbidae	Orb Snail
Simuliidae	Black Fly
Sphaeriidae	Fingernail Clam

Table 5. The FBI values and water quality conditions for tributaries of Black Creek from 2000 and 2002 (refer to Map 3). Corresponding water quality conditions were determined from Table 1.

Date	Black Creek Drain	FBI Value	Condition (refer to Table 1)
June 2000	W. Trib (Site 1)	6.67	poor
	E. Trib (Site 2)	7.48	very poor
June 2002	W. Trib (Site 1)	6.65	poor
	E. Trib (Site 2)	6.70	poor
	E. Trib Upstream (Site 3)	6.66	poor

DISCUSSION AND RECOMMENDATIONS ON ECOLOGICAL ELEMENTS

Ecosystem management strategies have been developed to protect, maintain or enhance the integrity of Ellice and Gads Hill Swamps. Generally, these strategies:

- identify protection and enhancement opportunities for natural heritage features;
- encourage wise land use and source water protection planning;
- promote best management practices; and
- identify opportunities for land acquisition, rehabilitation or restoration.

These strategies are discussed below.

Natural Heritage Features

The Upper Thames watershed, like many southwestern Ontario watersheds, has been extensively modified for agricultural production and urban growth. Land use practices over the past century have reduced the natural areas in the watershed to remnants of their original extent. Only about 13% of the original forest cover and 5% of the original wetland area remain in the watershed (Riley and Mohr 1994).

Forest cover in Perth County, currently at 9%, is lower than the average for the watershed. The remaining forest cover is comprised mainly of woodlands and wetlands on poorly drained soils, steep slopes, stream corridors or other "inoperable land." As well, vegetation species such as white pine, white cedar and hemlock that were once commonly found in woodlands, have rapidly declined throughout Perth County because they were prized as sources of good construction material (Cook, pers. comm.).

As a result of the low forest cover and the absence of major river systems and large lakes, bird habitat diversity is low in Perth County compared to other counties in southwestern Ontario. This landscape supports few forest and field species and instead favours edge, open space and habitat generalist species. Although Perth County does not have any major migration corridors remaining on the landscape, the natural areas surrounding Ellice and Gads Hill Swamps can play a critical and necessary role in maintaining wildlife populations and functions by providing habitat refuge for birds and mammals that use the Swamps.

Historical records suggest that Perth County once contained large areas of suitable habitat for reptiles and amphibians, including marshes, swamps, bogs, large upland forests and meadows. Many of these wetland and woodland habitats have been drained and cleared for agricultural production and rural/urban settlement. The management recommendations for Ellice and Gads Hill Swamps will focus on opportunities to protect and enhance remaining natural heritage features and will identify potential opportunities to reclaim or rehabilitate adjacent areas to contribute to specific forest cover targets and a desired future condition.

Recommendations

- Conduct vegetation surveys every 10 years to monitor vegetation change occurring in the Swamps. Measures including prism sweeps, species counts, weediness scores, wetness and diversity indices can be used to determine changes in plant and animal species composition. These surveys are intended to identify long term trends and changes in vegetation communities within the Swamps.

- Reforest marginal lands adjacent to the Swamps (Map 8) with native tree or shrub species suited to the prevailing soil conditions (refer to Appendix C) to increase the amount of interior habitat for area sensitive species and to buffer the more sensitive habitats found within the Swamps.

- Pursue the possibility of securing marginal land adjacent to the Swamps (Map 8).

- Develop wildlife corridors (Map 8) through woodrows or community planting efforts with native tree or shrub species suited to the prevailing soil conditions (refer to Appendix C) to reconnect Ellice and Gads Hill Swamps to nearby woodlands, buffer watercourses and enhance wildlife habitat.

- Further explore the concept of establishing corridors and connectivity through proximity rather than physical linkages. This work will involve understanding specific requirements of various species with respect to travel and dispersal distances.

- Partner with the OMNR to re-evaluate South Gads Hill Swamp to determine opportunities for wetland complexing with the large wetland forest located immediately south of it.

Surface Water Quantity and Quality

Ellice and Gads Hill Swamps contribute to surface water quality through base flow, flood attenuation and maintaining the water table level in the soil. Base flow describes flow conditions during periods of dry weather and typically originates from groundwater discharge, surface water discharge from wetlands and surface water discharge from urban areas. Base flows are critical to the survival of aquatic systems during periods of dry weather.

Peat and muck, of which the Swamps are largely composed, have tremendous water holding capabilities and slowly release water during low flow periods. The slow release of water by the peat and muck soils in the Ellice and Gads Hill Swamps attenuate floods by providing a more evenly distributed flow throughout the year in the creek system and by recharging the water table level in the soil. Forest cover also enhances the water storage role of the area by reducing the rate of snow melting.

Wetland vegetation is very efficient in purifying water by removing nutrients and sediment. Surface water quality is assessed using a suite of indicators including water chemistry, water organisms and invertebrate community structure. Water chemistry analysis includes measurements of nutrients (nitrates, phosphorus), metals (copper, lead, zinc), temperature, pH, flow rate, suspended solids and chloride. Water organisms, such as amphibians, fish and invertebrates, can also be used to assess stream health since individual species have different pollution sensitivities. A change in numbers and types of fish in the water is usually a sign that their habitat is in trouble. Finally, invertebrate community structure can be used as an indicator since more diverse invertebrate communities indicate healthier streams.

One recent surface water quality monitoring initiative within the streams downstream from Ellice and Gads Hill Swamps is a surface water chemistry site that has been selected as part of the Provincial Water Quality Monitoring Network (PWQMN). The site is in the Black Creek Subwatershed close to the outlet on County Road 20 (Map 1). Although monitoring at this site is relatively recent, it can be used to indicate baseline conditions of the stream. If additional water quality monitoring stations are placed closer to the Swamps, this site can be used in assessing the impact of the Swamps on water quality by comparing water quality differences between stations.

Another relatively recent surface water quality monitoring initiative is the monitoring of benthic invertebrates. Table 5 shows that the tributaries of Black Creek have poor Family Biotic Index (FBI) values and a simple invertebrate community structure, both of which indicate impaired water quality. This is typical of agricultural drains which tend to dry up during minor droughts, resulting in an impaired habitat. On the other hand, preliminary results gathered from the three drains in the fall of 2003 indicate that the upstream drain (Site 3), located partially within Ellice Swamp, has a more diverse invertebrate community than the other two sampled tributaries, with several taxa not commonly found in streams in this area. Although benthic data from the fall of 2003 have not been fully analysed, these preliminary results indicate that Ellice Swamp may be functioning as a permanent wetland community.

Recommendations

- Continue to monitor surface water chemistry at the three selected benthic sites (Map 3) to detect any changes to water quality.
- Monitor surface water chemistry at locations upstream of the Swamps to assess inputs to the stream.
- Monitor surface water chemistry at locations along the open drain section within the Swamps to understand wetland function.
- Monitor surface water chemistry at locations immediately downstream of the Swamps to assess changes to water quality within the wetland.
- All additional surface water chemistry sites should be located at similar locations as benthic invertebrate monitoring sites and possibly the groundwater test sites for a complete understanding of the hydrological elements of the Swamps.
- Surface water chemistry samples should be analysed for a standard suite of chemical parameters developed by the Ministry of the Environment (MOE) which include key indicators of nutrients (nitrates, phosphorus), metals (copper, lead, zinc), suspended solids and chloride. This would complement the work begun by the PWQMN. It is recommended that a minimum of eight samples per year be conducted, over a minimum period of five years.
- Increase forest cover in marginal areas around the Swamps and along stream corridors (Map 8) with native tree or shrub species suited to the prevailing soil conditions (refer to Appendix C). Vegetated buffer strips are excellent filters around wetlands, ensuring wetlands receive cleaner surface water.
- Follow Best Management Practices (BMPs) for Nutrient, Soil, Water and Habitat Management (booklets available from Ontario Ministry of Agriculture and Food).

Groundwater Quantity and Quality

Water is in constant motion, continually recycling through the environment in a series of pathways called the water cycle. Underground areas where large quantities of water are found are called aquifers. The draining of swamps and bogs has resulted in a reduction in the amount of water infiltrating into the ground to recharge local and / or regional aquifers. Combined with the recent drought of the past years, water tables appear to be in decline. This has important implications for the 80 percent of wells in Perth County that recover water from aquifers. It also has important implications on base flow and water quality conditions in streams.

Water is a universal carrier. Pollutants can be carried with water through all phases of the water cycle. In wetland areas, where water is held by soil or vegetation, water will infiltrate through soil materials to be stored as groundwater. Groundwater can then slowly move to lakes, rivers, ponds, other wetlands or to the soil surface. Since groundwater moves so slowly, contamination may take a long time to detect. As well, it is very difficult to clean up a contaminated aquifer. Given that Ellice and Gads Hill Swamps are at or near the source headwaters of the Upper Thames River watershed, source water protection of both surface and ground water quality and quantity is very important in these areas.

In 2003 a shallow well was drilled within Ellice Swamp (Map 3). Although it is too early to analyse monitoring results, this shallow well will provide some important baseline information regarding the quality and quantity of groundwater in the aquifer.

Recommendations

- To understand the groundwater resources and hydrologic cycle in this area, undertake a study to describe all aquifers, their interconnectedness and estimates of groundwater flow and potential paths using additional shallow wells within or adjacent to the Swamps. Given the soil conditions and sensitive habitats within the Swamps, it may not be possible to use heavy machinery to drill wells within the Swamps. Instead, other methods of drilling should be explored (*e.g.* probes).

- Monitor all wells twice a year to account for seasonal variability.

Open Water Habitat

The Swamps provide habitat for many types of bird and animal species. Protecting the hydrologic regime of these areas will ensure that these wildlife habitats are sustained. Some important considerations are the maintenance of open water habitat for waterfowl, the control of Beaver activities and the concern over stagnant pools as potential mosquito breeding habitat.

Waterfowl

It is important to maintain and enhance the open water areas found within and adjacent to the Swamps for waterfowl. The only large open water area in the Swamps is a large marsh area in the GRCA portion of Ellice Swamp (Map 6). It is approximately 9 ha in size.

Recommendation

- Work with Ducks Unlimited (DU), Department of Fisheries and Oceans (DFO), Ontario Ministry of Agriculture and Food (OMAF), Ontario Ministry of Natural Resources (OMNR) Wetland Drain Restoration Project coordinators and drainage superintendents to determine the feasibility of putting control devices on the drainage network to maintain the open water areas in the Swamps and recover swamp hydrology.

Beavers

Beavers can have an enormous impact on hydrology by blocking drainage channels (natural and man-made) and cutting down trees. In Ellice Swamp, Beavers can be beneficial if their populations are kept in balance since they help to maintain higher water levels and create open water habitats. However, most of their natural predators have been reduced in number. The Fish and Wildlife Conservation Act (1997) regulates hunting and trapping activities. Hunters and some adjacent landowners have noticed recently that the Beavers have been less active in the Swamps. For example, between 2001 and 2002 only one dam removal was necessary, compared to as many as five removals a year prior to this (LOOP Board of Directors meeting May 2nd, 2002).

Recommendations

- For more information regarding effective means of keeping nuisance wildlife populations in balance, contact the local Ontario Ministry of Natural Resources (OMNR) office. They can suggest appropriate management actions to maintain these numbers.

- Ensure all nuisance animal issues be brought to UTRCA, GRCA and OMNR before specific actions are taken by individual landowners.

Mosquitoes

One misconception regarding mosquito breeding habitats is that any type of standing water, such as wetlands and waterways, may produce large numbers of virus-infected mosquitoes. Although many species of mosquitoes are commonly found in wetlands, healthy wetlands are not the

preferred habitat of the type of mosquito species that are primarily responsible for transmitting WNv. Instead, healthy wetlands have features that reduce the number of mosquitoes. Mosquitoes are an important part of the wetland food chain and healthy wetlands are home to hundreds of mosquito-eating insects, birds, frogs, fish, turtles and bats. This balanced predator - prey relationship provides natural mosquito control. In addition, water levels naturally fluctuate in wetlands or are stirred by the wind, which helps reduce the number of mosquitoes. Therefore, not all open water habitats should be drained, filled, sprayed or managed to eliminate the possible transmission of West Nile virus (WNv). If a wetland is disturbed by humans or if other life forms are eliminated through the incorrect use of pesticides or an alteration in the natural hydrology, it is possible that the number of mosquitoes in a wetland may actually increase.

Recommendation

- Visitors and users of the Swamps should wear long sleeved shirts and apply DEET. Avoiding the Swamps from dusk through dawn is an effective way to reduce the risk of exposure to WNv. Contact the Perth District Health Unit for more information on personal protective measures for WNv.

DISCUSSION AND RECOMMENDATIONS ON LAND USE ACTIVITIES

Recreational Use

Existing recreational and resource use activities were evaluated to identify opportunities and constraints.

Trails for Hiking / Snowmobiling / Cross-Country Skiing

There are no official trails designated in Ellice Swamp, although a couple of trails have been created within the Swamp and are well used (Map 6). The snowmobile club currently marks and grooms the trails from fall to spring to ensure they are safe for their users. This also ensures that users remain on the designated trail. The trails within Ellice Swamp run north - south from concession road to concession road and have been widened over time because of the organic soil conditions. Large ruts have also developed in some areas. Where these ruts have become so large that the trail is no longer useable, new trails have developed adjacent to the old trail.

The UTRCA would like to develop a fully integrated trail system within Ellice Swamp. It has been suggested that the 12.1 acre portion of abandoned railway bed that runs through Ellice Swamp (Map 6) could be used as a recreation/ nature trail. CN originally sold the entire railway to the Township of Perth East (formerly Ellice Township) in 1996 when it abandoned its line between Stratford and Milverton. The Township then sold each parcel to the respective landowners adjacent to the rail line. The UTRCA was able to purchase its portion of the land with financial assistance from Roger and Elaine Cook of the Stratford Field Naturalists Club. The GRCA purchased the rail line easement that bisected its 78 acre parcel of land.

The purchase of the abandoned rail line allows for the possibility of creating a looped trail within the Swamp. Abandoned railway corridors, characterized by their easy grades and substantial width over large uninterrupted distances, are suitable for hiking, snowmobiling, snowshoeing, cross-country skiing and possibly cycling and horseback riding. This type of trail has the societal benefit of connecting human and natural communities for nature appreciation and education.

The difficulty in using the rail line as a potential trail is that there is no public right of way to access it. Although the UTRCA and GRCA now own the section of abandoned rail line within Ellice Swamp, they were not able to purchase title to the entire rail line.

Recommendations

- Trails should not be placed in areas of peat and muck since compaction and exposure to oxygen from upturning associated with trail use would cause further damage to the organic soils. It may be possible to design a board walk to protect the sensitive soil conditions.

- Maintain existing official trails and reduce the widening of these trails by using small, light equipment that minimizes impact to the environment as much as possible. Part of snowmobile trail maintenance includes pruning to keep the trail from being overgrown. Branches that are hanging over the trail or hindering trail access should be removed so that walking, skiing and snowmobiling can be done safely. A pruning protocol that minimizes impact to the environment (refer to Appendix D) should be developed with members of the snowmobile club.

- Hiking, snowmobiling and cross-country skiing should continue to be permitted by the UTRCA and GRCA.

All Terrain Vehicles (ATVs)

All Terrain Vehicles (ATVs) cause severe damage to soil through compaction and the aeration of peat and muck soil. Muck tends to occur in low areas with no surface drainage and is defined as an accumulation of greater than 18 inches of decomposed material. Peat soils occur where the water table is permanently high and the organic material is not able to decompose. If exposed to air, peat and muck rapidly degrade and the entire ecosystem is destroyed.

Recommendation

- ATVs should not be permitted within the Swamps due to the sensitivity of the organic soils throughout the area.

Dog Running

Unsupervised dogs running loose can cause problems by scaring, injuring or killing wildlife. However, there is minimal disruption to the ecology of the Swamps in supervised dog training or trialing.

Recommendation

- Dogs should not be permitted to run unsupervised through the Swamps.

Camping

Overnight camping is not an appropriate activity given the sensitivity of the soils to compaction. As well, campfires may start peat fires, which can burn undetected for years.

Recommendation

- Camping should not be permitted in the Swamps.

Hunting and Trapping

Hunting and trapping are traditional activities in Ellice and Gads Hill Swamps. The OMNR has a variety of wildlife management regulations and controls in place to allow for the sustainable use of the resource, and to ensure that hunting and trapping are safe and ethical pursuits. Hunters and trappers:

- require licences;
- are restricted by seasons and time of day regulations;
- have specialized training in hunter safety;
- have a variety of gear restrictions to ensure the safe, ethical and humane use of their equipment; and
- follow codes of conduct to strive for enjoyable experiences in the woods along with fellow hunters and other outdoor recreationalists.

Hunting and trapping are important tools that OMNR utilizes to manage wildlife populations. This has become more important over the past two decades as many wildlife species have become highly abundant and generated increasing concern especially in an agricultural landscape. The common species hunted include deer, grouse, raccoon, rabbit, Ring-necked Pheasant, ducks, geese, woodcock and Wild Turkey. Trappers commonly harvest Muskrat, mink, beaver, and raccoon.

The swamps are located in wildlife management unit 86A which includes that part of Perth County north of Highway 8. Information on harvests is assembled on a WMU basis; therefore, specific information on the swamps is not available.

OMNR closely manages the deer harvest, and plans on heavy harvesting rates in order to control the population, to alleviate agricultural crop damage and vehicle collisions. About 250 deer are harvested annually in WMU 86A, and a large portion of that harvest occurs in or within close proximity to Ellice and Gads Hill Swamps. Deer are present in the swamps throughout the year, and are harvested by archery hunters beginning in October. By the December shotgun hunt, most of the corn crop has been harvested from the neighbouring landscape, and many deer have migrated to larger woodlots especially the Ellice and Gads Hill deer yards. These areas provide the major harvest of deer in the unit.

Wild Turkeys have been reestablished throughout Perth County over the past five years, and populations have been expanding well. Turkeys prefer large expanses of forested land, a feature that is not well represented in Perth County. Perth's first Wild Turkey hunting season in over 100 years was held in 2003. A total of 39 birds were harvested, with 10 birds harvested in North Easthope and eight birds in Ellice. Close to half of the County's harvest would have come from in or within close proximity to Ellice and Gads Hill Swamps.

Recommendations

- Hunting should continue to be permitted by the UTRCA and GRCA in accordance with the OMNR Hunting Regulations (OMNR 2003).

Resource Use

Peat Extraction

In Ellice and South Gads Hill Swamps there is evidence of past peat extraction activities. This is not a sustainable use of the area, as it takes many centuries for peat and muck soils to develop. Many of the unique plants found in the Swamps only grow on peat and muck soils.

Recommendation

- Peat extraction should not be permitted in the Swamps.

Tree Plantation Harvesting

In the past, trees were planted to establish forest cover and support wildlife. However, forest management activities have been sparse and much of the forest cover is in an overstocked condition. As well, some of the tree species planted in the Swamps in the 1950s are not compatible with the soil conditions and are naturally dying back. This die

back is allowing appropriate native tree species better suited to the wetland conditions, such as Black Spruce and Tamarack, to establish in the old plantations. Currently there are no plans to thin the plantation to facilitate a more healthy diversity of tree species.

Recommendations

- Selective logging is not recommended in the wetland habitats of the Swamps at this time since damage to the soil from the logging machinery would be more detrimental than the benefits derived from thinning the planted stands.

- Although most trees in the upland communities of the Swamps are too small to be marketable at this time, there may be opportunity in the future to thin the plantations.

Drains

Historically, both Ellice and Gads Hill Swamps have been drained to varying degrees over the past century in order to increase productive agricultural land area and control flooding (Map 3). Most of the open drains occur on the edges of these Swamps, while some interior areas appear to have been tiled. In general, drains impact wetlands by diverting water out of the wetland, drastically reducing hydrological function and negatively impacting the vegetation and wildlife supported by the original wetland. Alterations to watercourses have resulted in a much higher drainage density and flashier flow regime than in pre-settlement times, which has greatly altered habitat for aquatic and semi-aquatic animals.

The majority of drains coming out of Ellice and Gads Hill Swamps are dry by late August, with occasional isolated pools remaining. The few drains that have been pushed into the Swamps are detrimental since they drain water out of these natural water storage areas without creating soil conditions dry enough for cultivation, or even pasture. As well, the ongoing maintenance and cleaning of drainage ditches does a lot of damage to adjacent riparian habitat and water quality. Most drain maintenance occurs along concession roads in roadside ditches adjacent to the Swamps.

Recommendations

- Abandon all drains and tiles within the Swamps that would not significantly affect fish or fish habitat (Class F drains on Map 3). This action would require consultation with the Ontario Ministry of Agriculture and Food (OMAF), drainage superintendents, Department of Fisheries and Oceans (DFO) and landowners.

- Work with the Ontario Ministry of Natural Resources (OMNR) Wetland Drain Restoration Project coordinators to determine the feasibility of putting control devices on the drains and recovering swamp hydrology.

- Work with drainage superintendents to develop best management practices for prioritizing and cleaning drains, especially those immediately adjacent to the Swamps.

Landfill Site

The Ellice landfill is located at line 52 and road 126, south of Brunner in the Township of Perth East (Map 5). The landfill is 40.5 ha in size and its operation predates the early 1980s. Currently it is operated by the Township of Perth East and collects approximately 700 cubic metres of residential, commercial and industrial waste from the township per year as well as garbage from Milverton.

There is concern that the landfill site is having an impact on the wetland ecosystem. However, the landfill site is in compliance with the Certificate of Approval for the Ministry of the Environment (MOE). According to the Ellice Landfill Monitoring Report (Azimuth Environmental Consulting Inc. 2003), the landfill has had minimal impact on the surrounding environment since leachates were not detected in either the groundwater or surface water.

According to Azimuth Environmental Consulting Inc. (2003), there are three explanations as to why there appears to be little environmental impact from the landfill. One reason could be the fact that the landfill is located on a high piece of land with a non-porous clay bottom that does not allow water (and leachates) to infiltrate. Another reason could be that the high organic content of the soil in the Swamp (greater than 5 m thickness) completely attenuates the organics from the waste pile. The third reason that the potential for unacceptable environmental impacts is thought to be low could be due to the small amount of waste currently being disposed of at the landfill site.

Recommendations

- The landfill report recommends that surface water at the landfill site be monitored twice a year.

- An assessment of the groundwater system should be conducted in the event that leachates do leave the landfill area. This means that there should be at least one up gradient well to establish ambient groundwater conditions and one down gradient well at the boundary of the landfill to detect impacts. Given the soil conditions and sensitive habitats within Ellice Swamp, it may not be possible to use heavy machinery to drill wells within the Swamp. Instead, other methods of drilling should be explored (*e.g.* probes).

- Groundwater should be monitored twice a year to demonstrate that the landfill is performing as designed and to account for seasonal variability. Since groundwater moves so slowly, contamination may take a long time to detect.

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APPENDIX A. UTRCA 1997- 2002 Benthic Sampling Data

BLACK CREEK WEST TRIB (SITE 1)

Sampled 6/22/00 UTM X: 501441 UTM Y: 4811760

Taxonomic Name	Common Name REP: 1	Life Stage	# in Subsample	Biotic Index
Chironomidae	Midge	P	2	5.4
Chironomidae	Midge	L	34	5.4
Coenagrionidae	Narrow-winged Damselfly	N	2	9
Cyclopoida	Fish Lice	A	1	-1
Elmidae	Riffle Beetle	L	4	4.5
Elmidae	Riffle Beetle	A	10	4.5
Haliplidae	Crawling Water Beetle	L	1	4
Nematoda	Thread Worm	A	2	-1
Oligochaeta	Aquatic Worm	A	48	8
Ostracoda	Seed Shrimp	A	2	-1
Physidae	Pouch Snail	A	7	8
Planorbidae	Orb Snail	A	10	-1
Sphaeriidae	Fingernail Clam	A	1	8
Stream Health	**Poor**		**Family Biotic Index**	**6.67**

Sampled 6/6/02

Taxonomic Name	Common Name REP: 1	Life Stage	# in Subsample	Biotic Index
Acariformes	Water Mite	A	7	4
Chironomidae	Midge	L	49	5.4
Chironomidae	Midge	P	5	5.4
Corixidae	Water Boatmen	A	8	-1
Dytiscidae	Predacious Diving Beetle	L	6	-1
Elmidae	Riffle Beetle	L	3	4.5
Elmidae	Riffle Beetle	A	3	4.5
Haliplidae	Crawling Water Beetle	L	3	4
Hydraenidae	Minute Moss Beetle	L	1	-1
Hydrozoa	Hydra	A	1	-1
Lymnaeidae	Pond Snail	A	7	6
Nematoda	Thread Worm	A	9	-1
Oligochaeta	Aquatic Worm	A	87	8
Ostracoda	Seed Shrimp	A	21	-1
Perlidae	Stonefly	N	2	1
Physidae	Pouch Snail	A	6	8
Planorbidae	Orb Snail	A	2	-1
Simuliidae	Black Fly	L	2	6
Stream Health	**Poor**		**Family Biotic Index**	**6.65**

BLACK CR EAST TRIB (SITE 2)

Sampled 6/22/00 UTM X: 502116 UTM Y: 4811280

Taxonomic Name	Common Name REP: 1	Life Stage	# in Subsample	Biotic Index
Asellidae	Sow Bug	A	33	8
Chironomidae	Midge	L	5	5.4
Chironomidae	Midge	P	1	5.4
Dytiscidae	Predacious Diving Beetle	L	2	-1
Elmidae	Riffle Beetle	L	6	4.5
Erpobdellidae	Leech	A	1	-1
Haliplidae	Crawling Water Beetle	L	3	4
Hydropsychidae	Net-spinning Caddisfly	L	2	4.5
Lymnaeidae	Pond Snail	A	18	6
Muscidae	Muscid Fly	L	1	6
Nematoda	Thread Worm	A	1	-1
Oligochaeta	Aquatic Worm	A	20	8
Ostracoda	Seed Shrimp	A	4	-1
Physidae	Pouch Snail	A	93	8
Planorbidae	Orb Snail	A	187	-1
Stream Health	**Very Poor**		**Family Biotic Index**	**7.48**

Sampled 6/6/02

Taxonomic Name	Common Name REP: 1	Life Stage	# in Subsample	Biotic Index
Acariformes	Water Mite	A	1	4
Asellidae	Sow Bug	A	3	8
Ceratopagonidae	Biting Midge	L	2	6
Chironomidae	Midge	L	71	5.4
Chironomidae	Midge	P	1	5.4
Corixidae	Water Boatmen	A	8	-1
Cyclopoida	Fish Lice	A	6	-1
Dytiscidae	Predacious Diving Beetle	L	4	-1
Elmidae	Riffle Beetle	L	9	4.5
Erpobdellidae	Leech	A	1	-1
Haliplidae	Crawling Water Beetle	A	1	4
Lymnaeidae	Pond Snail	A	7	6
Nematoda	Thread Worm	A	4	-1
Oligochaeta	Aquatic Worm	A	84	8
Planorbidae	Orb Snail	A	3	-1
Simuliidae	Black Fly	L	1	6
Sphaeriidae	Fingernail Clam	A	11	8
Tabanidae	Horse Fly	L	2	6
Stream Health	**Poor**		**Family Biotic Index**	**6.70**

BLACK CR EAST TRIB UPSTREAM (SITE 3)

Sampled	**6/6/02**	UTM X:	503924	UTM Y:	4812698

Taxonomic Name	**Common Name** REP: 1	**Life Stage**	**# in Subsample**	**Biotic Index**
Acariformes	Water Mite	A	5	4
Asellidae	Sow Bug	A	1	8
Baetidae	Small Mayfly	N	1	4
Cambaridae	Crayfish	A	1	6
Chironomidae	Midge	L	34	5.4
Collembola	Springtail	A	1	-1
Corixidae	Water Boatmen	A	1	-1
Curculionidae	Snout Beetle	A	1	-1
Cyclopoida	Fish Lice	A	16	-1
Dytiscidae	Predacious Diving Beetle	L	10	-1
Elmidae	Riffle Beetle	A	1	4.5
Gammaridae	Sideswimmer	A	2	4
Gomphidae	Clubtail Dragonfly	N	1	-1
Haliplidae	Crawling Water Beetle	L	3	4
Hydrozoa	Hydra	A	3	-1
Leptophlebiidae	Mayfly	N	2	2
Libellulidae	Skimmer Dragonfly	N	1	9
Lymnaeidae	Pond Snail	A	14	6
Nematoda	Thread Worm	A	3	-1
Oligochaeta	Aquatic Worm	A	55	8
Ostracoda	Seed Shrimp	A	40	-1
Physidae	Pouch Snail	A	12	8
Planorbidae	Orb Snail	A	3	-1
Simuliidae	Black Fly	L	1	6
Sphaeriidae	Fingernail Clam	A	1	8

Stream Health	**Poor**	**Family Biotic Index**	**6.66**

APPENDIX B. Bird Species Records from 2001 to 2003 for Ellice Swamp by Jane Boyce (Bird Studies Canada Atlas 17NJ01 Region 6), and opportunistically during vegetation survey conducted in the spring and summer of 2002.

Common Name	Breeding Evidence	Observed
Pied-billed Grebe	X	
Tundra Swan		X
Canada Goose	X	
Mallard	X	
Wood Duck	X	
Blue-winged Teal	X	
Herring Gull	X	
Ring-billed Gull	X	
Great Blue Heron	X	
Green Heron	X	
Sandhill Crane		X
Killdeer	X	
American Woodcock	X	
Common Snipe	X	
Upland Sandpiper	X	
Wild Turkey		X
Ruffed Grouse		X
Common Bobwhite		X
Sharp-shinned Hawk	X	
Northern Harrier (Marsh Hawk)	X	
Red-tailed Hawk	X	
Rough-legged Hawk		X
Broad-winged Hawk	X	
Turkey Vulture	X	
American Kestrel	X	
Eastern Screech Owl		X
Great Horned Owl		X
Mourning Dove	X	
Rock Pigeon	X	
Black-billed Cuckoo	X	
Ruby-throated Hummingbird	X	
Belted Kingfisher	X	
Pileated Woodpecker	X	
Northern Flicker	X	
Red-bellied Woodpecker		X
Downy Woodpecker	X	
Hairy Woodpecker	X	
Great Crested Flycatcher	X	
Eastern Kingbird	X	
Eastern Phoebe	X	
Eastern Pewee		X
Least Flycatcher	X	
Horned Lark	X	
Barn Swallow	X	
Tree Swallow	X	
American Crow	X	
Blue Jay	X	
Black-capped Chickadee	X	
White-breasted Nuthatch		X
House Wren	X	

Common Name	Breeding Evidence	Observed
Golden-crowned Kinglet		X
Blue-gray Gnatcatcher	X	
Gray Catbird	X	
American Robin	X	
Veery	X	
Wood Thrush	X	
Cedar Waxwing	X	
Warbling Vireo	X	
Red-eyed Vireo	X	
Golden-winged Warbler	X	
Nashville Warbler	X	
Yellow Warbler	X	
Chestnut-sided Warbler	X	
Magnolia Warbler	X	
Yellow-rumped Warbler	X	
Blackburnian Warbler	X	
Bay-breasted Warbler	X	
American Redstart	X	
Ovenbird	X	
Mourning Warbler	X	
Common Yellowthroat	X	
Wilson's Warbler	X	
Yellow-breasted Chat		X
Bobolink	X	
Red-winged Blackbird	X	
Brown-headed Cowbird	X	
Common Grackle	X	
European Starling	X	
Baltimore Oriole	X	
Scarlet Tanager	X	
House Sparrow		X
Dark-eyed Junco		X
Northern Cardinal	X	
Purple Finch	X	
House Finch		X
American Goldfinch	X	
Indigo Bunting	X	
Rose-breasted Grosbeak	X	
Eastern (Rufous-sided) Towhee	X	
White-throated Sparrow	X	
White-crowned Sparrow		X
Chipping Sparrow	X	
Field Sparrow	X	
Swamp Sparrow	X	
American Tree Sparrow		X
Grasshopper Sparrow		X
Vesper Sparrow	X	
Savannah Sparrow	X	
Song Sparrow	X	

APPENDIX C. List of Native Plant Species Recommended for Reforestation/ Planting (compiled by Brenda Gallagher).

SHADE TOLERANCE OF TREE SPECIES

Common Name	Scientific Name	Tolerance to Shade
Red Maple	*Acer rubrum*	Tolerant
Silver Maple	*Acer saccharinum*	Tolerant
Green Ash	*Fraxinus pennsylvanica*	Tolerant
Eastern White Cedar*	*Thuja occidentalis*	Tolerant
American Basswood	*Tilia americana*	Tolerant
Yellow Birch	*Betula alleghaniensis*	Intermediate
Bitternut Hickory	*Carya cordiformis*	Intermediate/Intolerant
Hackberry	*Celtis occidentalis*	Intermediate
White Spruce	*Picea glauca*	Intermediate
Eastern White Pine	*Pinus strobus*	Intermediate
Burr Oak	*Quercus macrocarpa*	Intermediate
White Ash	*Fraxinus americana*	Intolerant
Black Ash	*Fraxinus nigra*	Intolerant
Black Walnut	*Juglans nigra*	Intolerant
Black Cherry	*Prunus serotina*	Intolerant
Tamarack	*Larix laricina*	Very Intolerant
Balsam Poplar	*Populus balsamifera*	Very Intolerant
Eastern Cottonwood	*Populus deltoides*	Very Intolerant
Largetooth Aspen	*Populus grandidentata*	Very Intolerant
Quaking Aspen	*Populus tremuloides*	Very Intolerant

* cannot tolerate acidic conditions

SHRUBS THAT CAN BE USED FOR NATURALIZING

Common Name	Scientific Name	Plant Form
Downy Serviceberry	*Amelanchier arborea*	Tree / Shrub
Alternate-leaved Dogwood	*Cornus alternifolia*	Shrub
Grey Dogwood	*Cornus foemina*	Shrub
Red-osier Dogwood	*Cornus stolonifera*	Shrub
Common Blackberry	*Rubus allegheniensis*	Shrub
Red Raspberry	*Rubus idaeus*	Shrub
Black Raspberry	*Rubus occidentalis*	Shrub
Staghorn Sumac	*Rhus typhina*	Shrub
Black Elderberry	*Sambucus canadensis*	Shrub
Nannyberry	*Viburnum lentago*	Shrub
Highbush Cranberry	*Viburnum trilobum*	Shrub

AGGRESSIVE WOODY PLANTS THAT SHOULD BE AVOIDED (DO NOT PLANT)

Common Name	Scientific Name
Norway Maple	*Acer platanoides*
Tree of Heaven	*Ailanthus altissima*
Black Alder	*Alnus glutinosa*
Barberry	*Berberis sp.*
European Birch	*Betula pendula*
Autumn Olive	*Elaeagnus umbellata*
Honey Locust	*Gleditsia triacanthos*
Privet	*Ligustrum vulgare*
Honeysuckle	*Lonicera sp.*
White Mulberry	*Morus alba*
Scots Pine	*Pinus sylvestris*
White Poplar	*Populus alba*
Common Buckthorn	*Rhamnus cathartica*
Glossy Buckthorn	*Rhamnus frangula*
Multiflora Rose	*Rosa multiflora*
Black Locust	*Robinia pseudoacacia*
White Willow	*Salix alba*
European Mountain Ash	*Sorbus aucuparia*
Lilac	*Syringa vulgaris*
Siberian Elm	*Ulmus pumila*

AGGRESSIVE HERBACEOUS PLANTS THAT SHOULD BE AVOIDED (DO NOT PLANT)

Common Name	Scientific Name
Goutweed	*Aegopodium podagraria*
Garlic Mustard	*Alliaria petiolata*
Lily of the Valley	*Convallaria majalis*
Crown Vetch	*Coronilla varia*
Orange Daylily	*Hemerocallis fulva*
Dame's Rocket	*Hesperis matronalis*
Moneywort	*Lysimachia nummularia*
Purple Loosestrife	*Lythrum salicaria*
Japanese Knotweed	*Polygonum cuspidatum*
Periwinkle	*Vinca minor*

NATIVE SHRUBS AND TREES THAT PROVIDE FOOD AND/OR SHELTER FOR BIRDS AND MAMMALS

E = excellent
G = good
F = fair

Summer food sources

Common Name	Scientific Name	Rating
Red Maple	*Acer rubrum*	G
Silver Maple	*Acer saccharinum*	F
Serviceberry	*Amelanchier spp.*	E
Yellow Birch	*Betula alleghaniensis*	F
Ninebark	*Physocarpus opulifolius*	G
Cottonwood	*Populus deltoides*	F
Black Cherry	*Prunus serotina*	E
Choke Cherry	*Prunus virginiana*	E
Black Currant	*Ribes americanum*	G
Prickly Gooseberry	*Ribes cynosbati*	G
Blackberry	*Rubus allegheniensis*	E
Black Raspberry	*Rubus occidentalis*	E
Red Raspberry	*Rubus idaeus*	E
Sandbar Willow	*Salix exigua*	G
American Elderberry	*Sambucus canadensis*	E
Basswood	*Tilia americana*	F

Fall food sources

Common Name	Scientific Name	Rating
Alternate-leaved Dogwood	*Cornus alternifolia*	G
Gray Dogwood	*Cornus racemosa*	E
Red-osier Dogwood	*Cornus stolonifera*	E
White Ash	*Fraxinus americana*	E
Black Ash	*Fraxinus nigra*	E
Green Ash	*Fraxinus pennsylvanica*	E
Winterberry	*Ilex verticillata*	E

Winter food sources

Common Name	Scientific Name	Rating
Chokeberry	*Aronia melanocarpa*	G
Hackberry	*Celtis occidentalis*	E
Largetooth Aspen	*Populus grandidentata*	F
Quaking Aspen	*Populus tremuloides*	E
Staghorn Sumac	*Rhus typhina*	E
Nannyberry	*Viburnum lentago*	G
Highbush Cranberry	*Viburnum trilobum*	E

Nut trees

Common Name	Scientific Name	Rating
Bitternut Hickory	*Carya cordiformis*	E
Beaked Hazelnut	*Corylus cornuta*	E
Black Walnut	*Juglans nigra*	E

Evergreens for winter cover

Common Name	Scientific Name	Rating
Tamarack	*Larix laricina*	E
Eastern White Pine	*Pinus strobus*	E
Eastern White Cedar*	*Thuja occidentalis*	F

* cannot tolerate acidic conditions

APPENDIX D. Pruning Recommendations.

Given the fragile nature of organic soils, caution must be exercised when bringing large or heavy machinery into the Swamp areas.

Timing

The best time to prune live branches is in the late winter during the dormant season. Pruning in the spring or fall is not recommended. Spring pruning may result in sap loss which puts the tree under a great deal of stress. In the autumn, pruning scars callus more slowly and unclosed wounds are subjected to severe winter temperatures, resulting in dieback, cankers or cracks on the pruning cuts. Fall pruning also leaves the scar susceptible to airborne fungal spores which are common at that time of the year.

Dead wood and hazardous branches can be removed at any time of year.

What Should Be Pruned

Do not remove more than one third of the live branches from a tree at any one time. Removing too much may result in sun scalding on the newly exposed bark tissue. Broken, dead or diseased branches should be removed. However, nothing should be cut that cannot be reached safely from the ground.

How to Make the Cut

Rapid wound closure is important in reducing the chance of pathogen and insect entry. Ensure all pruning tools are sharp so that pruning cuts are clean and precise, allowing wounds to close rapidly. Ragged or torn tissue will not callus as easily as smooth cuts. The wound-closing process is quicker when the scar is small and the tree is healthy.

Where to Make the Cut

In order for new callus tissue to form properly, pruning cuts must be made in the right place. "Collar pruning" is the best way to work with the tree's natural defenses for wound closure. The branch collar is the bark ridge located where the branch meets the trunk or another large branch. The live tissue in the collar contains cells that callus rapidly and produce chemicals that resist disease and infection.

The cut should be made just beyond the branch collar. If a branch is removed properly, new callus tissue will grow quickly over the exposed wood. In time, the scar will be covered completely. Cutting into the branch collar or leaving wood beyond the branch collar will seriously slow the tree's ability to grow over the wound. Never leave a stub since it will often die back, rot and become infested with insects.

Removing Large Branches

When large branches are removed by a single cut, they often split and tear the bark below the limb, resulting in a large wound. To avoid this, make three separate cuts to minimize damage and leave a less exposed surface area that will seal rapidly.

Cut 1: Make a cut partway through from the underside of the branch about 6 inches out from the trunk.
Cut 2: Cut the branch off completely about 1 inch beyond the first cut (cut into the topside of the branch).
Cut 3: Cut the remaining stub off at the outer edge of the branch collar.

Sealing the Wounds

Since trees do not heal there is no need for a bandage. Wounds do not benefit from the application of wound dressings or tree paints. Tars, house paints and other sealers inhibit callusing and wound closure and are not recommended.

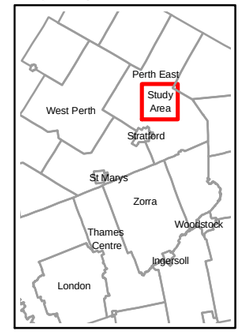
Maps

Map 1: Location of Ellice and Gads Hill Swamps

- PWQMN Site
- Municipal Boundary
- Watershed Boundary
- Wetland
- Watercourse

MILVERTON
WELLESLEY
WEST PERTH
MITCHELL
PERTH EAST
GADS HILL
PERTH SOUTH
STRATFORD
Ellice Swamp
Gads Hill Swamp North
Gads Hill Swamp South
Whirl Creek
Black Creek
Avon River
Nith River
MVCA
UTRCA
GRCA
COUNTY RD 55
COUNTY RD 131
COUNTY RD 121
COUNTY RD 72
REGIONAL RD 11
COUNTY RD 119
COUNTY RD 44
COUNTY RD 135
COUNTY RD 7 & 56
COUNTY RD 43
COUNTY RD 107
COUNTY RD 37
COUNTY RD 32
COUNTY RD 20
COUNTY RD 130
COUNTY RD 33
COUNTY RD 112
7 & 8
QUINLAN
MORNINGTON
COLOMBE
HURON
ONTARIO
ROMEO
DOMINE
LORNE
ERIE

Key Map



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S

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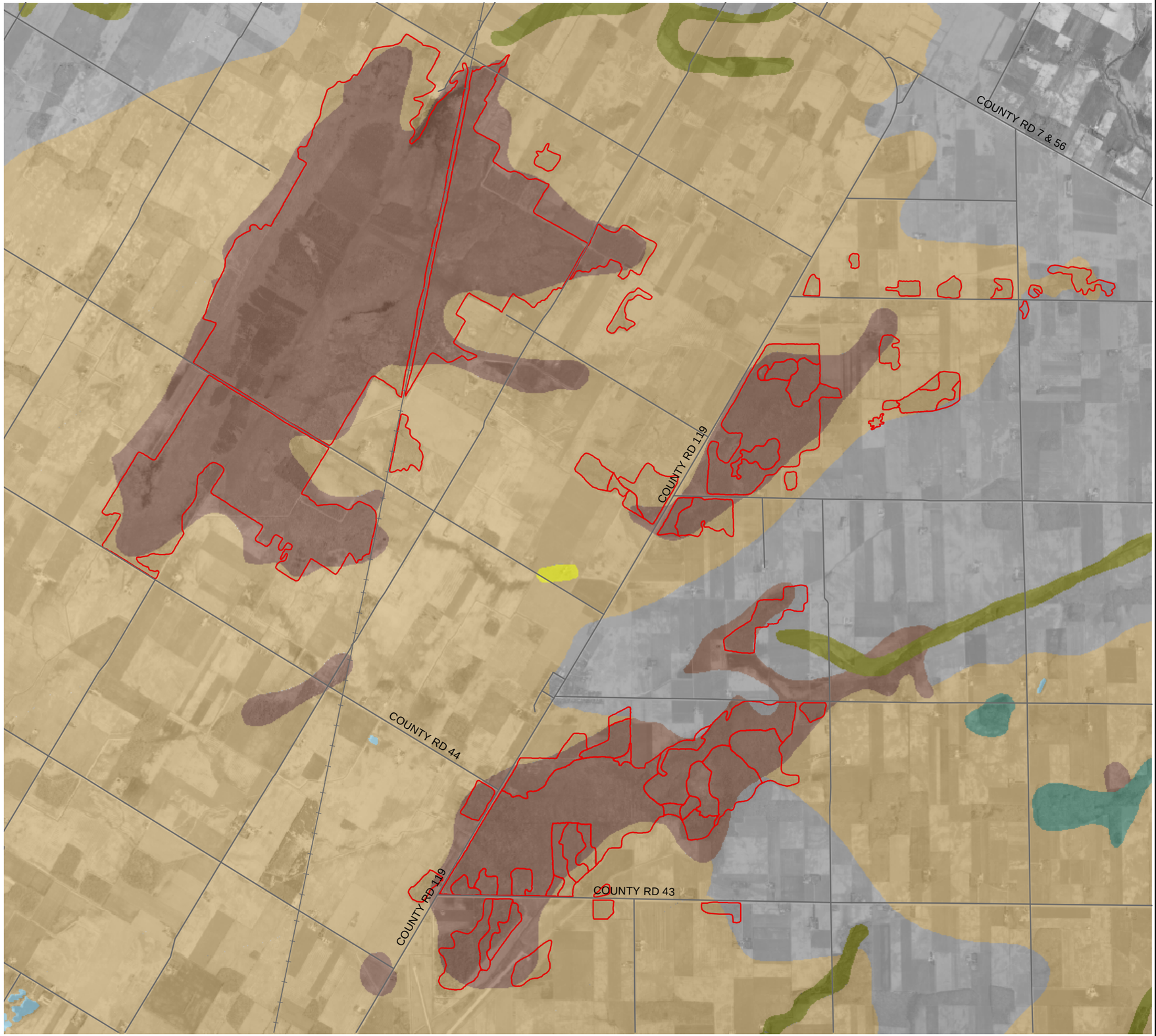
2,500 1,250 0 2,500 Meters

UPPER THAMES RIVER CONSERVATION AUTHORITY

Map 2:
Soils of Ellice and Gads Hill Swamps



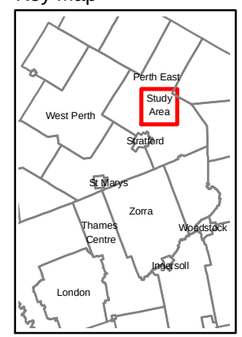
Soils

- Water
- Clay
- Loam
- Organic (Muck and Peat)
- Silt Loam
- Sand Loam
- Variety
- Former Railway
- Wetland Boundary

Soil Mapping:

Ontario Ministry of Agriculture, Food and Rural Affairs. Resources and Regulations Branch, Geographic Information Systems Unit, 1951.

Key Map



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990 495 0 990 Meters

UPPER THAMES RIVER CONSERVATION AUTHORITY

Map 3:
Drain Classification for Drains Surrounding Ellice and Gads Hill Swamps

Draft Drain Classification

- A
- B
- C
- D
- E
- F
- Natural
- Tiled
- Watercourse (Classification Unknown)

Monitoring Sites

- Benthic (3 Sites)
- Shallow Well
- Subwatershed Boundaries

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.

Department of Fisheries and Oceans Drain Classification Definitions

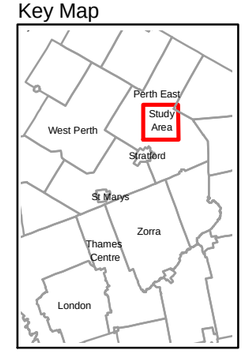
Class	Definitions	Authorisation Required
A	permanent cold water flow without trout or salmon present	class authorisation
B	permanent warm water flow, gamefish present, unstable habitat	class authorisation
C	permanent warm water flow, baitfish only present	class authorisation
D	permanent cold water flow 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.

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 Resource 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 Class 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 IE: 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.

Key Map



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UPPER THAMES RIVER CONSERVATION AUTHORITY

Map 4: Land Use Surrounding Ellice and Gads Hill Swamps

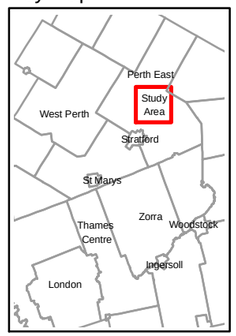
- Built Up / Urban Areas
- Crops
- Extraction
- Grazing
- Idle Agriculture (5-10y)
- Idle Agriculture (1y +)
- Reforestation
- Water
- Open
- Woodlot
- Wetland Boundary
- Former Railway
- Municipal Boundary
- Trails
- Watercourse

Generalized Land Use Mapping:

Ontario Ministry of Agriculture, Food and Rural Affairs. Resources and Regulations Branch, Geographic Information Systems Unit, 1951.

Perth County Official Plan, County of Perth Planning and Development

Key Map



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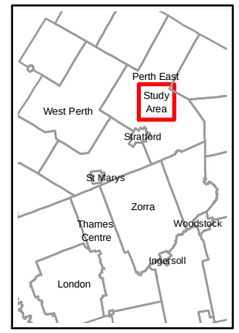
UPPER THAMES RIVER CONSERVATION AUTHORITY

Map 5: Property Ownership of Ellice and Gads Hill Swamps

Private Property Ownership Boundary
GRCA Property Boundary
UTRCA Property Boundary
Wetland Boundary
Former Railway

Key Map



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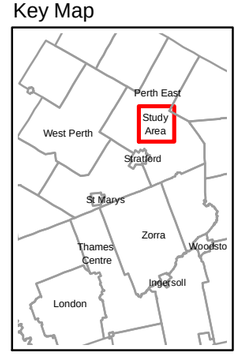
UPPER THAMES RIVER CONSERVATION AUTHORITY

Map 6:
Vegetation Communities of Ellice Swamp

Vegetation Communities

- Deciduous Forest (24.6 ha.)
- Cultural Plantaion (167.3 ha.)
- Deciduous Swamp (248.8 ha.)
- Mixed Swamp (9.3 ha.)
- Swamp Thicket with Deciduous Overstorey (412.7 ha.)
- Swamp Thicket with Coniferous Overstorey (66.8 ha.)
- Cultural Thicket (1.9 ha.)
- Cultural Meadow (2.9 ha.)
- Marsh (0.1 ha.)
- Wet Areas
- UTRCA Property
- GRCA Property
- Former Railway
- Trail
- Existing Access Point

Key Map



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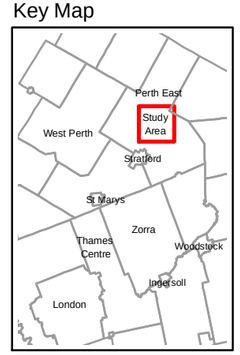
UPPER THAMES RIVER CONSERVATION AUTHORITY

Map 7: Vegetation Communities of South Gads Hill Swamp

Vegetation Communities

- Deciduous Forest - 11.93 hectares
- Cultural Plantation - 3.42 hectares
- Deciduous Swamp - 180.86 hectares
- Swamp Thicket - 33.25 hectares
- Cultural Meadow - 0.61 hectares
- UTRCA Property

Key Map



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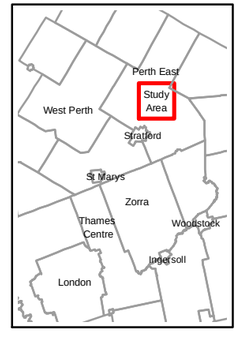
UPPER THAMES RIVER CONSERVATION AUTHORITY

Map 8: Potential Naturalization areas surrounding Ellice and Gads Hill Swamps

Corridor
Buffer
Existing Woodlot
Former Railway

Key Map



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UPPER THAMES RIVER
CONSERVATION AUTHORITY