Elgin Greenway Conservation Action Plan

Prepared by

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Carolinian Canada Coalition

In partnership with Ontario Nature & the Thames Talbot Land Trust

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ELGIN GREENWAY CONSERVATION ACTION PLAN

i. BACKGROUND & RATIONALE

Conservation Action Planning in Canada's Carolinian Life Zone

Elgin County is situated in the heart of Ecoregion 7E, an area extending from Toronto to Grand Bend, south to Niagara Falls and the western Lake Erie islands. This ecoregion is colloquially known as Canada's "Carolinian life zone", or simply "Carolinian Canada" because many plants and animals found in the eastern United States as far south as the Carolinas reach their northern limit in this part of Ontario.

The Carolinian life zone occupies less than 0.25% of Canada's landmass, yet it provides habitat for over 40% of Canada's plant species and an equally large proportion of vertebrate and invertebrate fauna. At the same time, one quarter of Canada's human population lives in the region, the nation's industrial and economic heartland. As a result, extensive conversion to human land uses has occurred. In southern Ontario, 94% of upland forests were cleared over the past two centuries, while more than 70% of all pre-settlement wetlands have been converted, and up to 99% of prairies and savannahs have been lost.

On a heavily-modified working landscape such as this, habitat fragmentation has reduced most natural areas to sizes much smaller than is required to maintain basic ecological functions and diverse, resilient biological communities. Overall, natural cover across the Carolinian life zone now ranges from less than 7% in some areas to below 18% in others, with Elgin County falling between these two extremes. These high levels of land conversion mean that many of the essential ecological processes needed for healthy soils, clean water and clean air have been severely compromised.

For these reasons, combined with the fact that many of the species found here are near the northern limits of their distribution, the ecoregion has the greatest number and concentration of Species At Risk (SAR) in Canada. At least 50 of them occur in Elgin County. More than 500 additional plant and animal species found in the zone are recognized to be at some level of risk, and many of these are just as threatened as "official" SAR but have not yet gone through the legislative process required to designate them. If historical trends continue, more and more species will end up designated as SAR, resulting in greater costs to protect them and increased regulatory demands on rural landowners.

The Carolinian Woodlands Recovery Team (CWRT), made up of representatives from various levels of government, non-government organisations, the academic research community and the private sector, was established in 2004 to address the recovery needs of the many woodland plant species that are at risk in the ecoregion. The CWRT recognized that many SAR occupy similar habitats and face similar threats. The CWRT also noted that there is an array of agencies and groups with an interest in conserving and enhancing the ecological health of the landscape of southern Ontario, and that often these organisations are working independently and not in a particularly coordinated or collaborative fashion—a situation that potentially compromises the effective utilization of limited funding and resources.

While some species face threats requiring species-specific actions, taking a broad ecosystem-based approach for Ontario's Carolinian woodlands was considered to be the most efficient and proactive way to improve the chances of recovery of entire suites of species and their habitats. To address the need for large-scale "natural heritage system" planning, since 2000 the Carolinian Canada Coalition (CCC) has been promoting a "Big Picture" vision for the ecoregion, a map-based network of core natural areas and connecting corridors (http://www.carolinian.org/ConservationPrograms_BigPicture.htm). And

between 2006 and 2008, a draft *National Recovery Strategy for Carolinian Woodland Ecosystems and Associated Species At Risk* (CWRS) was developed by the CWRT (Jalava et al. 2008). Recovery goals were set at the ecosystem level in order to address the threats to the ecological processes that support biodiversity "hotspots", SAR and their habitat, significant vegetation communities and natural areas. Restoring natural connectivity to such a network of core areas was deemed essential, as it would allow for genetic exchange between populations, adaptation and migration in response to climate change, and provide corridors for movement of wide-ranging species.

Strategies to address threats, recover habitats, and to monitor and evaluate recovery efforts were outlined in considerable detail. Ecosystem recovery would be directed along the following themes:

- refinement of the map-based template for an ecologically functioning network of core areas and corridors;
- better coordination of recovery efforts, with broad participation from agencies and stakeholders;
- improvements in databases, knowledge and understanding of Carolinian sites, SAR occurrences, and the biological needs of SAR;
- long term monitoring of sites, species and social trends;
- improvements in policy and legislation relating to conservation at all levels of government;
- net increases in overall woodland extent, average core area sizes, extent of forest interior, landscape connectivity, and extent of landscape protected through securement, easements, stewardship agreements and conservation plans;
- measurable reductions in threats to critical sites;
- improvement in population sizes, numbers of extant occurrences and habitat quality for SAR;
- significant increases in landowner participation in stewardship programs and incentives;
- municipalities applying natural heritage system design in official plans;
- enhanced public awareness and support for recovery of Carolinian ecosystems;
- community-based action plans developed for "biodiversity hotspots" to strategically implement ecosystem recovery objectives.

An Internationally-recognized Approach to Conservation Planning

It was determined that the Nature Conservancy (U.S.) Conservation Action Plan (CAP) approach (http://www.conservationgateway.org/topic/conservation-action-planning) would best address these themes strategically and efficiently. The approach has been developed and refined over three decades throughout the world by a remarkable diversity of jurisdictions and organisations, including The Nature Conservancy of Canada (e.g., Southern Norfolk Sand Plain Natural Area Conservation Plan). CAPs are tailored to the specific characteristics and needs of ecologically-important landscapes. By applying this approach to biodiversity "hotspots" in the Carolinian life zone, ultimately a network of linked conservation practitioners and action plans for each target landscape in the Carolinian life zone would be created. This network would:

- Address the urgent needs of priority SAR;
- Prevent increased numbers of species from being listed as SAR;
- Link SAR recovery strategies to watershed plans, official plans and a range of other key land use strategies and planning efforts;
- Heighten awareness, improve attitudes, and garner additional resources towards the recovery of species, communities and ecosystems at risk;
- Enhance community engagement in building a sustainable culture.

Identifying Biodiversity Hotspots

In 2007, a sophisticated analysis was undertaken in partnership between Carolinian Canada Coalition (CCC), The Nature Conservancy of Canada (NCC), Environment Canada (EC) and the Department of Fisheries and Oceans (DFO) to identify the "biodiversity hotspots" in southern Ontario, based on the best available information on the occurrences and concentrations of rare species and natural communities. A map was developed that identified at least fifteen such areas. This map would serve as the template for targeting efforts on areas within the life zone where the greatest return on investment would be gained.

Two of the fifteen areas (Western Erie Islands and Southern Norfolk Sand Plain) had action plans already being developed or implemented by NCC, while another (Skunks Misery) had an action plan that was being implemented by the Thames Talbot Land Trust in collaboration with the NCC. In 2008/2009, the CCC initiated the development of CAPs for six additional priority areas (Essex Forests and Wetlands; Ausable River – Pinery; Upper Thames River, Hamilton – Burlington and Short Hills and Niagara River Corridor) with an array of local stakeholder groups, agencies and organisations, including conservation authorities, First Nations, agricultural organisations, provincial and federal government agencies, non-government organisations, naturalist clubs and municipalities.

The Elgin Greenway Mapping Initiative

Concurrently with the development of Conservation Action Plans in the Carolinian life zone, Ontario Nature (ON), the province's largest non-profit conservation organisation, was developing "Greenway" mapping (http://www.ontarionature.org/protect/habitat/greenway_initiative.php) for other key landscapes in southern Ontario (e.g., Grey-Bruce). An extension of CCC's "Big Picture" vision, ON's Greenway initiatives are focused on protecting and restoring a connected landscape of key natural areas, or "cores," linked together through natural passageways, or "corridors". According to ON, successfully connecting these cores and corridors will:

- protect and restore large areas of natural heritage;
- ensure water systems remain clean and intact;
- provide and protect habitat for wildlife and species at risk;
- connect farmers, conservationists and communities; and,
- keep natural areas healthy for present and future generations;

thereby aligning perfectly with the objectives of the recovery initiative for Carolinian Canada's ecosystems.

In late 2009, the Thames Talbot Land Trust (TTLT) discussed the concept of developing a "Greenway" map for Elgin County with ON to help identify and prioritize areas in which TTLT would focus their land securement efforts, particularly in the ecologically significant corridor along the Lake Erie coastline, known as the "Erie Ravines". ON agreed that Elgin County would benefit from a Greenway mapping exercise, particularly in light of the fact that such mapping could help inform the Official Plan renewal process that was underway at the municipality.

The Elgin Greenway Conservation Action Plan

At the same time, additional synergies emerged in discussions between TTLT and CCC, in which these parties concluded that a conservation action plan (CAP) would be the ideal complement to the Greenway mapping, in that the CAP would identify and prioritize the conservation activities to be implemented within the Greenway context. In other words, the Elgin Greenway map would show *where* conservation work would best be done, and the CAP would identify and prioritize *what* would best be done and by *whom*, in order for conservation work to be most effective and efficient. In this regard, the CAP would build on the existing Elgin Landscape Strategy (Elgin Stewardship Council 2005).

A steering committee was convened in April 2010, consisting of representatives from TTLT, ON, CCC, Catfish Creek Conservation Authority, Long Point Region Conservation Authority, Kettle Creek Conservation Authority, Elgin Stewardship Council and Otter Valley Field Naturalists. The committee was introduced to the Greenway mapping and CAP methodologies, and the group discussed mapping options, roles and levels of involvement of the organisations present, and other stakeholders that should be invited to contribute to the process. There was broad support for the initiative, and widespread agreement that the agricultural community, the main landowners and stewards of the area, needed to be actively engaged in the process. Additional partners became involved, and each of the following organisations contributed to the development of the Greenway mapping and CAP in the meetings and workshops that ensued over the next 18 months: National Farmer's Union, Elgin Federation of Agriculture, Ontario Ministry of Natural Resources, St. Thomas Field Naturalists Club, Elgin County and the Lower Thames Valley Conservation Authority.

This report represents the results of the two-year planning process, which has drawn from the expertise and knowledge of a large and diverse group of local stakeholders. The long-term benefits of this approach include:

- Mapping tools are available to guide and prioritise site stewardship and ecological restoration activities in Elgin County.
- Resources and funding can be targeted toward the most important projects, activities and sites as identified through a consensus-based multi-stakeholder approach;
- Multiple agencies, organisations and local groups can work collaboratively and efficiently to recover and steward healthy ecosystems, particularly in the highest priority areas;
- Information on Best Management Practices for species and habitats can be widely shared, and community knowledge and capacity will be enhanced.

The Elgin Greenway mapping and the Elgin Greenway Conservation Action Plan essentially provide a workbook designed to help guide conservation activities and serve the community and stakeholder groups in the following ways:

- Landowner outreach, education, stewardship, restoration and site securement by conservation authorities, Thames Talbot Land Trust, Elgin Stewardship Council and other agencies and groups, can be targeted on the areas where the greatest ecological benefits will be gained;
- Conservation and recovery activities are prioritized based on sound science combined with the best local knowledge;
- Better coordinated, collaborative project proposals and funding applications, leading to greater likelihood of funding approval;
- Reduced duplication and competition for limited resources amongst the various agencies, groups and organisations;

- Clearly identified tasks and roles (developed on the basis of collaborative expertise) in conservation projects;
- Improved ability to measure progress and monitor results thanks to a mutually agreed-upon set of priorities and tasks;
- Greater transparency in conservation effort and greater buy-in from the community due to the collaborative nature of the approach.

This long-term, multi-faceted, targeted, coordinated approach will result in more vibrant, resilient ecosystems, healthier habitats and enhanced viability of flora and fauna across Elgin County. Recovery of the ecosystems will not only serve the needs of SAR and other imperiled species, but will contribute to climate change adaptation and enhanced ecosystem services. Healthy ecosystems correlate directly to cleaner water and air, productive soils, sustainable agriculture, and enhanced tourism and recreational opportunities. Ultimately, this initiative aims to build more prosperous communities, healthier citizens, and improved quality of life in Elgin County and across the deep south of Ontario.

Next Steps

This report and the associated mapping represent a template for conservation action that has been agreed upon by its developers, the Elgin Greenway CAP Development Team (listed on page iv). Objectives and strategic actions are described in detail in Section 3.

In order for the recommended activities to be undertaken strategically and effectively, and with the support of the collaborating organisations, the Elgin Greenway Steering Committee will continue to guide the project.

The Steering Committee will meet at least twice annually: 1. early in the fiscal year (April/May) when external funding allocations are known (to develop a concrete workplan for the year); 2. in the fall or early winter to review progress, plan for the following year, and apply for additional funding/support as needed. Additional meetings, conference calls, will be held as needed.

1. CONSERVATION CONTEXT

A. CONTEXT

1.i. GEOGRAPHIC CONTEXT

The Elgin Greenway Conservation Action Plan (CAP) area covers 188,100 ha (1,881 km^2) of land north of the central portion of Lake Erie, encompassing all of Elgin County (Figure 1.1). The Natural Area is part of Ontario's Ecodistrict 7E-2 (Figure 1.1.). The CAP area boundaries were developed through the Elgin Greenway mapping analysis undertaken by Ontario Nature (Carabetta and Cowie pers. comm. 2010, see appendix A for methodology), with the input of the CAP team and other participating organisations listed above. The CAP area includes portions of the Thames River, Otter Creek, Catfish Creek, Kettle Creek and watersheds. Parts of Southwest Oxford, Southwest Middlesex, London, Middlesex Centre, Chatham-Kent and Norfolk County are contained within a 10 km buffer that is mapped around the Elgin Greenway CAP area.

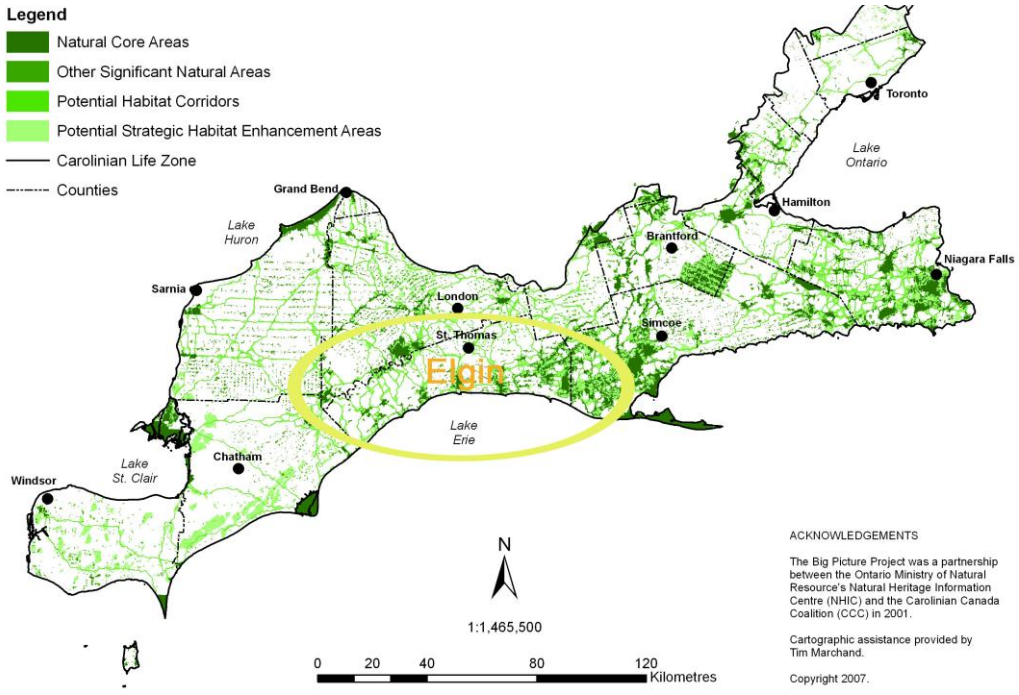


Figure 1.1. General location of the Elgin Greenway CAP Area

ii. HISTORICAL, CULTURAL AND SOCIOECONOMIC CONTEXT

Elgin County lies within the traditional hunting territory of the Attawandaron (a.k.a. Attiwandaronk or Neutral) aboriginal peoples whose main population until the 1600's was centred in southern Ontario east of the Grand River in the Niagara Peninsula – Hamilton area. Reville (1920) provides a remarkably detailed, albeit perhaps somewhat embellished, impression of the natural and cultural landscape of Attawandaron territory prior to European settlement, based on historic accounts:

> According to records left by Father Daillon, as translated by Dean Harris, no part of the American continent furnished a more healthy or luxuriant growth of staple timbers than the entire Attawandaron area. The great American pine, reaching to the height of sixty or seventy feet yielded large quantities of gum that served the Indian for seaming his canoe, and dressing his wounds and sores. Cedars, firs and spruce grew side by side with the tamarack and hemlock. All over were to be found magnificent growths of maple, birch, beech and linden, or basswood. The oak, ash and elm with the walnut tree and swamp maple furnished a safe retreat for a variety of wild animals which have long since disappeared.
>
> Aspens of all sorts on which the beavers fed, basswood that furnished valuable wood for preserving the Indian grain, and a species of hemlock out of which he made his rope, grew at convenient distances from each village. Chestnuts, mulberry and hazel trees grew side by side with the elder, hawthorne and plum. Willows and alders drooped over the winding streams. Wild fruit trees of vast variety, gooseberry, currant and other fruit producing bushes, covered the sides of the sloping hills. The raspberry, strawberry and blackberry plants, and wild vines rich in their wealth of grapes, furnished to the Indians in season, abundance and variety of…luxuries. Through this rank and luxurious growth of timber, vine, bush, and plant, there roamed countless numbers of animals of great variety and many species. Here in their native forest roamed the elk, caribou and black bear; deer, wolves, foxes, martens and wild cats filled the woods, the porcupine, ground hog, hares of different species, squirrels of great variety, including the almost extinct flying squirrel, were everywhere. Every stream gave hospitable shelter to the beaver, the otter and the muskrat, while weasels, moles and field mice burrowed under almost every tree. Snakes of various kinds, lizards of differing hues, frogs innumerable, added to the life of this wondrous land. The lakes, ponds and rivers were alive with swans, brant geese, wild geese, cranes, ducks, teal, divers of innumerable kinds, ernes [possibly Osprey, or Bald Eagle], bitterns, herons, white pelicans and trumpeter swans.
>
> Birds of varied plumage, the eagle, the wild turkey and different kinds of partridge filled the woods. Enormous flocks of wild pigeons, starlings, thrushes, robins and ortolans [finches] darkened the heavens when in flight; swallows, martins, jays and magpies, owls of many species, humming birds innumerable and myriads of plover and snipe added variety and life to a land already rich in everything that could tempt the covetousness of man. The streams, rivers and lakes furnished vast varieties of fish, on which the cormorant, and gull feasted with the indigenous [people]. Such was the land and such the opulence of animal and vegetable life that lay in the possession of the great Neutral tribe.
>
> They numbered in the neighbourhood of 20,000 to 30,000 souls as late as 1640, notwithstanding that for three years they had suffered severely from war, famine and sickness, they were able to send into the field four thousand fighting men. They were a sedentary people, living for the most part in villages, which were constructed with considerable skill. The men cut down the trees and cleared the land for sowing while the women did the seeding, weeding, the reaping and harvesting…[Women] molded the earthen pots, spun twine from hemp, wove the rush mats and made fishing nets…extracted oil from fish and the sunflower, embroidered moccasins with quills of hedgehog [porcupine], tilled the fields and bore burdens of the chase. The Neutrals…utilized herbs, sassafras roots and barks of certain trees for medicinal purposes.

Perhaps the best archaeological example of First Nation settlement in Elgin is found at the Southwold Prehistoric Earthworks, near St. Thomas, which was recognized as a National Historic Site in 1923 and is now under the care of Parks Canada (Parks Canada 2011). The earthworks are the only visible remains of a native village of about 800 to 900 people, inhabited around 1500 A.D. The 2.2 ha site is situated in an

area of fertile farmland, once the western portion of the Attiwandaron Nation, which stretched from Kent County to the Niagara Peninsula.

By the mid- to late 1800's, the natural vegetation of much of Southern Ontario had been cleared by European settlers (Langman 1971). Today, over 80% of Ecodistrict 7E-2, in which the Elgin Greenway CAP is found, has been converted to agriculture (756,586 ha), with an additional 11,046 ha having been altered for residential, industrial and infrastructure uses (Henson and Brodribb 2005). Only about 16% of 7E-2 remains naturally-vegetated, most of this being forest (Henson and Brodribb 2005).

Approximately 85% (1,593 km^2) of Elgin County was reported as farmland in 2006 (Statistics Canada 2007). The rich soils are ideal for growing a wide variety of crops. These are primarily but not limited to, corn, soybeans and wheat, as well as fruits and vegetables near St. Thomas, and tobacco on the sandy soils in the east part of the county. The lake-moderated climate provides long growing seasons and relatively mild winters, and, in most years, adequate rainfall.

The population of Elgin County in 2006 was 85,351, for a density of 45.4/km^2. Of this total, 62.9% lived in urban centres and 37.1% were in rural households. The Elgin Greenway CAP area includes one city (St. Thomas), one town (Aylmer) and many small communities (Table 1.1). Communities within the Elgin Greenway CAP area include the City of St. Thomas (population 36,110), and the smaller towns of Aylmer (7,069), Dutton/Dunwich (Wallacetown) (3,821), Port Stanley (2,115), Belmont (1,885), West Lorne (1,419), and a number of villages with populations of approximately 1,000 or less, including Rodney, Port Bruce, Port Burwell and Vienna. Outside the few main centres the population density is low (<20/km^2) reflecting the largely rural nature of the CAP area.

Table 1.1. Summary of Population Information in the Elgin Greenway CAP area
Only centres within the CAP area are included; all information is from the 2006 census (Statistics Canada 2007).

Name	Population	2001-2006 Population Change (%)	Population Density (persons/km^2)	% of Dwellings as Secondary Homes
St. Thomas	36,110	+8.4	1,017.7	3.3
Aylmer	7,069	-1.2	1,135.7	3.5
Dutton/Dunwich (Wallacetown)	3,821	+3.4	13.0	4.5
Central Elgin Municipality (includes Port Stanley, Belmont)	12,723	+3.5	45.4	6.6
West Elgin Municipality (includes West Lorne, Rodney)	5,349	-2.1	16.6	6.2
Malahide Township (includes Port Bruce)	8,828	+0.6	22.3	5.6
Bayham Municipality (includes Port Burwell, Vienna)	6,727	+5.5	27.5	4.8
Southwold Township	4,724	+5.3	15.7	1.8

The main industry today in Elgin County is manufacturing, concentrated in St. Thomas. Other major employers include business services, health care and social services, retail trade, agriculture, and "other services" (Statistics Canada 2007).

The shores of Lake Erie are desirable locations for cottages, water activities, nature appreciation and camping. Several port towns (Port Stanley, Port Burwell, Port Bruce, Port Glasgow) and three provincial parks (Port Bruce, Port Burwell, John E. Pearce) along Lake Erie offer recreational activities such as boating, fishing, hiking, camping and beaches. Elgin County is locally known as "the railway capital of Canada" attracting many tourists to visit historical sites and to ride some of Ontario's oldest railways.

iii. ECOLOGICAL CONTEXT

Carolinian Canada

The Elgin Greenway CAP area is located in the south-central portion of Ecoregion 7E, colloquially known as the Carolinian life zone of Canada, which falls south of a line running between Grand Bend and Toronto. This life zone encompasses the northernmost edge of the deciduous forest region of eastern North America, and though smaller than other Canadian ecological zones (0.25% of Canadian land area), it has greater numbers of species of flora and fauna than any other ecosystem in Canada (Norfolk Environmental Advisory Committee 2006). This zone is characterized by mainly deciduous-dominated forests including some conifer species [*e.g.*, Eastern Red-cedar (*Juniperus virginiana*), White Pine (*Pinus strobus*)], as well as many southern trees at their northern range limits such as Tulip Tree (*Liriodendron tulipifera*), along with shrubs and herbaceous species not found in other parts of Canada (Lindsay 1984). Over 2,200 plant species, 70 native tree species, and more than half of all Canadian bird species can be found in Carolinian Canada (Solymár et al. 2008).

Ecodistrict 7E-2

Within Ecoregion 7E is Ecodistrict (formerly, Ecological Site District) 7E-2 (Chatham), the largest ecodistrict in the ecoregion, extending from the Long Point – Norfolk County area west to Chatham and Grand Bend (reviewed in detail in Henson and Brodribb 2005). This ecodistrict consists predominantly of sand plains, with some kame moraines. Approximately 16% of the ecodistrict remains naturally-vegetated, most of this being forest. Sand plain deciduous forest complex comprises 43% of this remaining natural cover, followed by clay plain deciduous forest complexes and till plain forest complexes, each with 14% of the remaining natural cover. Another 12% of the remaining natural cover is wetland, with two-thirds composed of swamp complexes. There are also 2,430 ha of prairies and savannahs remaining in 7E-2, approximately 68% of the total area of all remnants known in southern Ontario. Over 80% of 7E-2 has been converted to agriculture (756,586 ha), with an additional 11,046 ha of residential, industrial and infrastructure development.

Despite the widespread conversion of natural cover, Ecodistrict 7E-2 remains biologically diverse, with among the highest numbers of globally rare species and communities in Ontario (Henson and Brodribb 2005). More than 60 COSEWIC Species At Risk (SAR) are found in the ecodistrict. Despite its high conservation value, conservation lands make up only approximately 4% of the total area of the Ecodistrict 7E-2 (39,875 ha). Provincially significant life science Areas of Natural and Scientific Interest (ANSIs) account for nearly half of this, with a total of 18,517 hectares (2% of the ecodistrict). Forty-three percent of all documented occurrences of species and vegetation community targets in 7E-2 are within identified conservation lands; more than half of these are within provincially significant life science ANSIs. Six of the 27 significant vegetation communities identified within 7E-2 are globally rare (dunes, savannahs and

tallgrass prairie), 14 are provincially rare, and 12 are considered to be high-quality representative vegetation communities that are important to conservation.

Elgin Greenway CAP Area

The Elgin Greenway CAP area extends across the central part of Lake Erie's north coast (188,100 ha, Figure 1.2). Elgin County is entirely within the CAP but mapping includes an additional 10 km buffer into neighbouring Kent, Oxford, Middlesex and Norfolk counties to display landscape connectivity with natural features in adjacent municipalities (e.g. watersheds, natural areas). The northern boundary of the CAP area is the Thames River, the second largest river in southern Ontario, home to one of the most diverse faunal assemblages within the Great Lakes drainage (Cudmore *et al.* 2004). Several smaller rivers and streams within the CAP area (Figure 1.3) drain into Lake Erie, which forms its southern boundary. Forests are the dominant ecosystems in the Elgin Greenway CAP area, but wetland and prairie habitats of high conservation value also occur.

Physiography and Glacial History

The Elgin Greenway CAP overlaps with four physiographic regions of southern Ontario: the Mount Elgin Ridges in the northeast are surrounded to the west and east by Ekfrid Clay Plains, with Bothwell Sand Plains in the west and Norfolk Sand Plains in the east (Chapman and Putnam 1984). The bedrock of the Elgin Greenway CAP dates to the middle Devonian consisting of softer sedimentary limestones, shales and sandstone. This softer material was greatly eroded by advance and recession of glaciers through the area in the last major glaciation. During the recession of the Wisconsinan glacier, much of the Elgin Greenway CAP area was under glacial lakes.

The majority of the Lake Erie shore contains high bluffs (up to 40 m in height) with the creeks cutting deep, steep sided but usually flat-floored gullies as they flow toward the lake. The shoreline here is receding and the gullies are constantly growing upslope (Figure 1.4).

Mount Elgin Ridges

The Mount Elgin Ridges are a succession of ridges and vales found between the Thames Valley and the Norfolk Sand Plain (Chapman and Putnam 1984). The ridges are moraines deposited during the recession of the Wisconsinan glacier and reach 305 masl in the northeast corner of the CAP (Figure 1.2). The ridges are typically clay or silty clay while the vales contain alluvium of gravel, sand or silt (Chapman and Putnam 1984). The ridges are well drained and well-aerated allowing prosperous agriculture, while the vales are poorly drained. This area forms the divide between the Thames River system and the south flowing rivers that flow into Lake Erie (e.g. Kettle Creek, Catfish Creek).

Ekfrid Clay Plain

The nearly level Ekrid Clay Plain is found to the west and east of the Mount Elgin Ridges (Chapman and Putnam 1984). Some areas of clay are superimposed by silty sediments leading to very good agricultural soils (e.g. near Fingal, Elgin County) and most natural vegetation in this physiographic region has been cleared (Kanter et al. 1993). Knolls and low smooth ridges of sand and gravel can also be found throughout the area.

Figure 1.2. Elgin Greenway CAP Area.

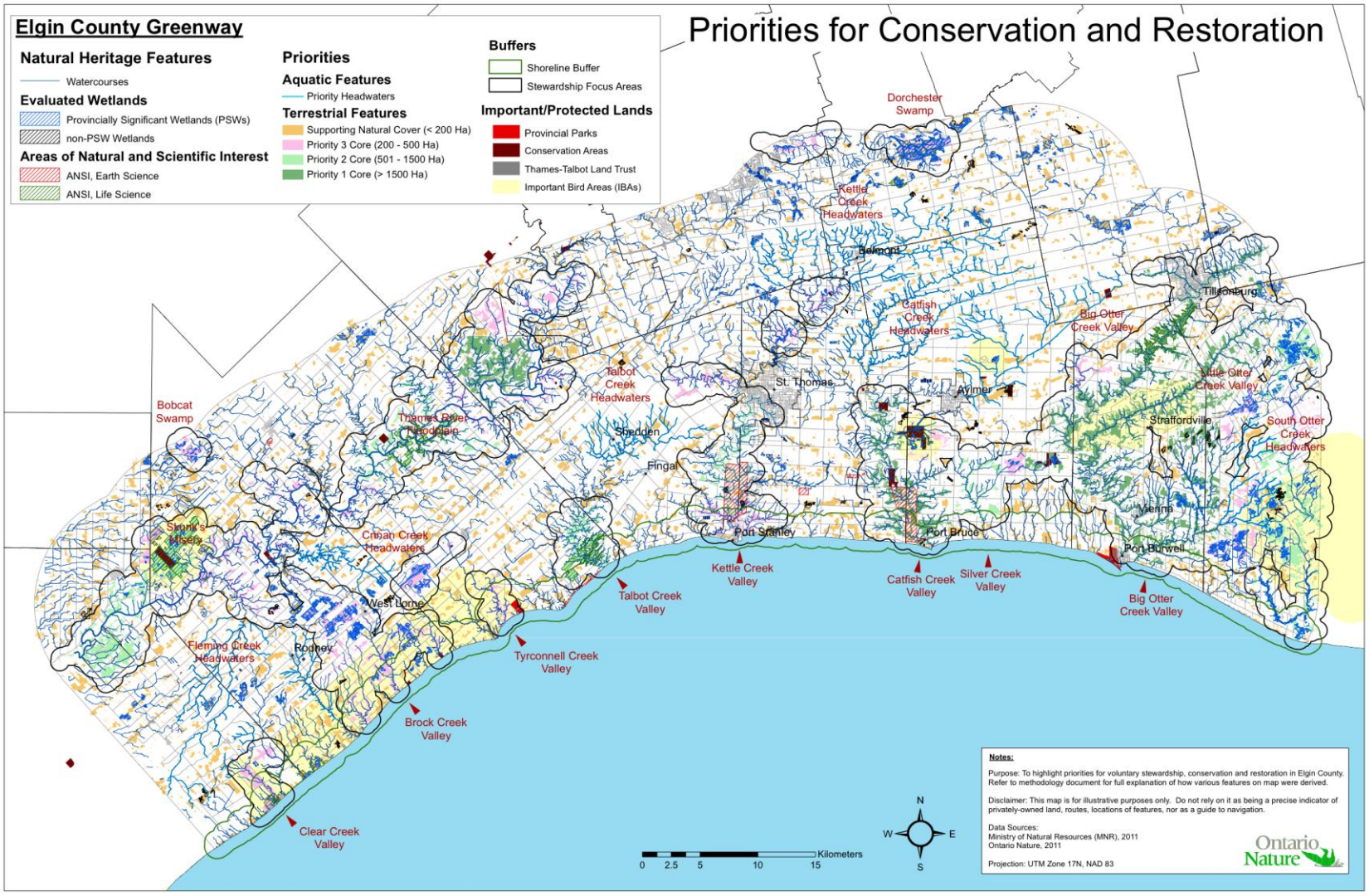


Photo: Stan Caveney

Figure 1.3. Kettle Creek, one of several creeks in Elgin County that drain into Lake Erie

Bothwell Sand Plain

The southern portion of the Bothwell Sand Plain, south of the Thames River, is found within the western half of the CAP. The area was the former delta of the Thames River as it joined the glacial Lake Warren (Chapman and Putnam 1984). The sand is spread thinly over clay resulting in water accumulation above the clay layer. Many depressions in the area are very moist creating swamp complexes. The generally level topography results in a large floodplain where the Thames River flows, although a few deeply cut valleys are clearly visible. The Bothwell Sand Plain has generally high agricultural value (Class 3 agricultural lands), with a high water table.

Norfolk Sand Plain

The eastern portion of the CAP is within the large Norfolk Sand Plain. The sands and silts of this area were deposited by the Grand River as it flowed into glacial Lakes Whittlesey and Warren, resulting in a delta built from west to east (Chapman and Putnam 1984). The topography is generally flat with some steep valleys cut by rivers flowing towards Lake Erie (e.g. Otter Creek). The well drained soils drew farmers to the area early but many found that the fine layer of sand on the surface is prone to wind erosion once vegetation is cleared. Tobacco became the most common crop grown in Norfolk County between the 1960's and early 1980's, but most of these farms have converted to other cash crops or non-agricultural uses.

Biodiversity

The Elgin Greenway CAP is situated in one of the southernmost portions of Canada and is home to a remarkable diversity of southern flora and fauna, many of them at the northern limits of their ranges. Despite the fact that much of the area has undergone conversion to agricultural and urban land uses, a total of at least 129 species of breeding birds, 16 reptiles, 16 amphibians, 33 mammals, 79 butterflies and more than 1500 plants have been recorded in Elgin County (Kanter et al. 1993). The area provides habitat

for at least 50 extant terrestrial and aquatic Species at Risk (SAR), with another 17 SAR having occurred historically. Several globally and provincially rare ecological communities also occur (e.g. Moist - Fresh Tallgrass Prairie Type, Dry Tallgrass Prairie Type).

Southern vegetation types in the area include forests dominated by Chinquapin Oak (*Quercus muhlenbergii*), Sugar Maple (*Acer saccharum*) – Red Elm (*Ulmus rubra*), Shagbark Hickory (*Carya ovata*), Black Walnut (*Juglans nigra*) and Eastern Cottonwood (*Populus deltoides*). Southern plant species include trees such as Sassafras (*Sassafras albidum*), Black Oak (*Quercus velutina*), American Chestnut (*Castanea dentata*), Eastern Flowering Dogwood (*Cornus florida*) and Red Mulberry (*Morus rubra*). Many southern herbaceous plants, sedges and grasses also reach their northern limits in this area. Prairie ecosystems are rare in Elgin County and those remnants that exist are small and disjunct (Kanter et al.1993). Typical prairie species include Big Bluestem (*Andropogon gerardii*), Little Bluestem (*Schizachyrium scoparium*), Indian Grass (*Sorghastrum nutans*), Dense Blazing-star (*Liatris spicata*) and Butterfly Weed (*Asclepias tuberosa*).

Characteristic southern fauna of the area include breeding birds such as Red-bellied Woodpecker (*Melanerpes erythrocephalus*), Tufted Titmouse (*Baeolophus bicolor*), Carolina Wren (*Thryothorus ludovicianus*), Northern Mockingbird (*Mimus polyglottos*), Hooded Warbler (*Wilsonia citrina*), Yellow-breasted Chat (*Icteria virens*) and Orchard Oriole (*Icterus spurious*) (Kanter et al. 1993, Cadman et al. 2005), and mammals such as Virginia Opossum (*Didelphis virginiana*), Southern Flying Squirrel (*Glaucomys volans*) and Woodland Vole (*Mictrotus pinetorum*) (Kanter et al. 1993).

Forests

Deciduous forests were the dominant ecosystem historically in the Elgin Greenway CAP area. Only approximately 10% forest cover remains in the CAP. Nonetheless, these forests maintain more than 30 SAR such as the Acadian Flycatcher (*Empidonax virescens*, Endangered), American Badger (*Taxidea taxus*, Endangered), Eastern Flowering Dogwood (Endangered), Crooked-stem Aster (*Symphyotrichum prenanthoides*, Threatened), Spoon-leaved Moss (*Bryoandersonia illecebra*, Endangered), and Drooping Trillium (*Trillium flexipes*, Endangered).

Rivers, Marshes and Wetlands

Wetlands and rivers are major features in the Elgin Greenway CAP. A portion of the Thames River and several streams that flow into Lake Erie support aquatic SAR such as the Spiny Softshell Turtle (*Apalone spinifera spinifera*, Threatened), Northern Madtom (*Noturus stigmosus*, Endangered) and Eastern Sand Darter (*Ammocrypta pellucida*, Threatened). Wetlands form a substantial part of the CAP, with 1,820 hectares of the CAP being Provincially Significant Wetland. Most of Southern Ontario wetlands have been drained (Snell 1987), hence the remaining wetlands provide a refuge for many SAR. Reptiles such as snakes and turtles are particularly dependent on wetlands and many reptile SAR are found in the wetlands of the CAP [e.g. Blanding's Turtle (*Emydoidea blandingii*, Threatened), Spotted Turtle (*Clemmys guttata*, Endangered), Eastern Hog-nosed Snake (*Heterodon platyrhinos*, Threatened), Eastern Foxsnake (*Pantherophis gloydi*, Endangered)].

Prairies and Savannahs

Prairies and savannahs are a rare ecosystem in Southern Ontario and few natural remnants remain (Bakowsky and Riley 1994). The Elgin Greenway CAP has small pockets of prairie and savannah ecosystems, which support SAR such as the Dense Blazing-star (Threatened), Colicroot (*Aletris farinosa*, Threatened), Willowleaf Aster (*Symphyotrichum praealtus*, Threatened), and nesting Eastern Ribbonsnake (*Thamnophis sauritus*, Special Concern). One of the largest intact prairies in southern Ontario is found in Elgin County (Dutton-Dunwich Prairie, 10 hectares).

Lake Erie Shoreline

A prominent feature of the Elgin Greenway CAP is the Lake Erie Shoreline running along the southern boundary of the CAP area. The associated river, wetland and forest habitats support many migratory birds and insects in addition to resident species. Most of the shoreline is steep bluffs but the few areas of sandy coastline (e.g. Port Burwell Provincial Park) support rare dune and marsh ecosystems (Kanter et al.1993).

Photo: John St. Pierre

Figure 1.4. Rapidly eroding bluffs along the Lake Erie shoreline

Natural Areas

The Elgin Greenway CAP area contains many natural areas of various sizes and designations that support the remaining natural cover. Approximately 14% of the CAP area is within protected or designated natural areas. Most protected areas are small and distributed throughout the CAP area but significant tracts of protected lands are present, often associated with swamps or stream valleys that are unsuitable for agricultural purposes. Various natural heritage designations apply to these natural areas, as summarized in Table 1.2. For a more complete list of the Natural Heritage sites in the Elgin Greenway CAP area, please see Appendix B.

Table 1.2. Natural Heritage Designations – Elgin Greenway CAP area

Designation	IUCN Protected Area Management Category[1]	Area in hectares (acres)	Percentage of Natural Area	Reference
Conservation Authority Area	II	863	3.2	Various CA's
Provincial Parks	II	301	1.1	Ontario Parks
Earth Science Area of Natural and Scientific Interest	VI	1,695	6.4	NHIC 2011
Provincial Life Science Area of Natural and Scientific Interest	VI	1,619	6.1	NHIC 2011
Regional Life Science Area of Natural and Scientific Interest	N/A	790	3.0	NHIC 2011
Life Science Site	N/A	4,881	18.3	NHIC 2011
Locally Significant Life Science Site	N/A	265	1.0	NHIC 2011
Provincially Significant Wetland	VI	1,820	6.8	NHIC 2011
Other Wetland	N/A	741	2.8	NHIC 2011
Carolinian Canada Site	N/A	204	0.8	NHIC 2011
International Biological Program Site	N/A	137	0.5	NHIC 2011
Important Bird Areas	N/A	13,595	51.0	NHIC 2011
TOTAL		**26,611**		

[1] IUCN Categories: Ia. Nature Reserve or wilderness area nature reserve*; Ib. Wilderness area*; II. National/provincial park*; III. Natural monument; IV. Habitat/species management areas, V. Protected landscape or seascape, VI. Managed resource protected areas; * Strictly regulated protected areas. Some areas may have more than one IUCN category because of internal zoning.

iv. NATURAL COVER / ECOSYSTEM TYPES

Twenty-seven vegetation communities have been identified within ecodistrict 7E-2 (Henson and Brodribb 2005). Of these, nine are forest types, eleven are wetlands (swamps or marshes), and seven are prairies, savannahs, grasslands or open woodlands. Eastern Deciduous Forests are the dominant ecosystem with pockets of other types of communities dispersed throughout where conditions are appropriate. Elements of the more northern Great Lakes – St. Lawrence Forest Region are found in the area as well (e.g. Eastern White Cedar).

As noted, only about 10% of pre-settlement forest remains in the Elgin Greenway CAP area (Kanter et al.1993). The different physiographic regions support slightly different assemblages of plants and hence different vegetation communities. Deeply incised stream valleys, especially in the Norfolk Sand Plain, provide a variety of conditions resulting in floodplain, bottomland, ravine slope, and upland, tableland and valley rim communities. Floodplain forests are typified by Black Maple, American Beech, White Ash and White Elm. Valley and slope forests are represented by variants of Sugar Maple – American Beech forests (Figure 1.5).

Photo: Stan Caveney

Figure 1.5. Deciduous forest at Bayham Ravine, East Elgin

The cool ravines in eastern Elgin host some species with northern affinities, including Eastern White Pine and Eastern Hemlock, but these species are rare to absent in the western part of the county. Tableland, valley rim and upper slope communities are typically represented by Sugar Maple, American Beech, and White Ash, sometimes with Red Oak. Two potentially rare forest types are found in Elgin County: Moist - Fresh Sugar Maple - Black Maple Deciduous Forest Type (G? S3?) and Dry - Fresh Mixed Oak Deciduous Forest Type (G? S3S4) (table 1.3).

The poor drainage of the Bothwell Sand Plain results in wet-mesic forests and swamps. These wet forest communities are usually dominated by Silver Maple forming associations with a variety of other species. The rare Buttonbush Organic Thicket Swamp Type (G4 S3) and Poison Sumac Organic Thicket Swamp Type (G4? S3) occur in Elgin County (table 1.3).

Only small remnant prairie habitats remain in Elgin County representing some of the rarest ecosystems in southern Ontario. Pockets of prairie are scattered throughout the CAP area. Typical species include Big Bluestem, Little Bluestem, Indian Grass, Dense Blazing-star and Butterfly Weed. Two globally and provincially rare grassland ecosystems occur in the CAP area: Moist - Fresh Tallgrass Prairie Type (G2, S1) and Dry Tallgrass Prairie Type (G3, S1). In addition, the globally and provincially rare Graminoid Coastal Meadow Marsh Type (G2?, S2) and Little Bluestem - Switchgrass - Beachgrass Dune Grassland Type (G?, S2) occur along the sandy shores of Port Burwell Provincial Park (Table 1.3).

Table 1.3. Globally and Provincially Rare Vegetation Communities - Elgin Greenway CAP Area

Ontario Name*	Global Common Name*	Global & Provincial Rank*	Comments**
Moist - Fresh Tallgrass Prairie Type	*Andropogon gerardii - Sorghastrum nutans - Schizachyrium scoparium - Aletris farinosa* herbaceous vegetation	G2; S1	This community occurs in the southern Great Lakes region of the United States and Canada. Stands occur on level sandy glacial outwash, sandy glacial lake plains, valley trains, and in dune areas. Soils are sandy loams, loamy sands, and sands. They are moderately well-drained to imperfectly or somewhat poorly drained. Stands of this community may be dominated by grasses, mixtures of grasses and forbs, forbs, or low shrubs and grasses. Many sites of this type have been eliminated by agricultural development.
Dry Tallgrass Prairie Type	*Schizachyrium scoparium - Sorghastrum nutans - Andropogon gerardii - Lespedeza capitata* sand herbaceous vegetation	G3; S1	Stands occur on flat to moderately sloping sites with sand, loamy sand, or, rarely, sandy loam soils. The deep, well-drained soils formed from eolian sand, glacial outwash, old dunes, alluvium, or sandy glacial lakeplains. Sparse to moderately dense mid and tall grasses dominate the community. Woody species tolerant of dry conditions, such as *Salix humilis*, *Populus tremuloides*, and *Acer rubrum*, are sometimes found in this community.
Graminoid Coastal Meadow Marsh Type	*Cladium mariscoides - Juncus balticus - Rhynchospora capillacea* herbaceous vegetation	G2?; S2	The total number of occurrences is unknown. Has been documented to some extent in U.S. Great Lakes states (approx. 525 ha/1300 acres), but not fully documented in Ontario, where it is known to occur (S2). The community is generally found on soils comprised of 75-100% sand in wet depressions of wind-deposited dune systems of the Great Lakes. Found in Port Burwell Provincial Park
Little Bluestem - Switchgrass - Beachgrass Dune Grassland Type	*Schizachyrium scoparium - Panicum virgatum - Ammophila breviligulata* herbaceous vegetation	G?; S2	Community occurrence is along shores of the Great Lakes shores in both the U.S. and Canada on stabilized foredunes, and some occurrence along Lake Champlain shores in Vermont. Sand deposition and erosion, as well as tension with forest edges helps define this community type further. Found in Port Burwell Provincial Park

Ontario Name*	Global Common Name*	Global & Provincial Rank*	Comments**
Moist - Fresh Sugar Maple - Black Maple Deciduous Forest Type	*Acer saccharum - Fraxinus spp. - Tilia americana / Osmorhiza claytoni - Caulophyllum thalictroides* forest	G?; S3?	This rich sugar maple - white ash - basswood forest occurs on nutrient-rich, mesic or wet-mesic settings on sloped to rolling terrain. The surface soils are deep sand, loamy sand, or loam and may be underlain by sandy clay loam to clay loam. The sites are somewhat poorly drained to well-drained and can have a water table 0.4-2 m below the surface. Has a well-developed tree canopy composed of deciduous species. Shrubs are scattered, but the herbaceous stratum is generally extensive. The ground flora (spring ephemerals) is diverse and fern richness is often high. Many examples of this community have probably been destroyed for agriculture and altered by past logging.
Buttonbush Organic Thicket Swamp Type	*Cephalanthus occidentalis / Carex spp.* northern shrubland	G4; S3	Stands occupy shallow water depressions, oxbow ponds, and backwater sloughs of stream and river floodplains. Inundation is usually continuous throughout the year, but these sites can become dry in mid or late summer or during periods of prolonged drought. Soils are deep (>100 cm) consisting of peat or muck over alluvial parent material. The shrub layer can vary from very open to closed (20-80%). *Cephalanthus occidentalis* typically comprises nearly 90% of the shrub layer in waters 1-2 m deep. The herbaceous layer can be very sparse, due to flooding. A scattered tree canopy may occur.
Dry - Fresh Mixed Oak Deciduous Forest Type	*Quercus alba - Quercus rubra - Quercus velutina / Trientalis borealis* forest	G?; S3S4	Dry to dry-mesic oak forest community found in the central regions of the Great Lakes in both Canada and the U.S., from Minnesota east to Ontario. Stands typically occur on well-drained sandy and sandy loam moraines, ice-contact topography, and fine-textured glacial lakebeds. More work needed to classify across range.
Poison Sumac Organic Thicket Swamp Type	*Cornus spp. - Salix spp. - Vaccinium corymbosum - Rhamnus alnifolia / Toxicodendron vernix* shrubland	G4?; S3	Stands are found in kettle lakes associated with kettle-kame-end moraine topography. Soils are saturated peat. The tall-shrub zone occupies the most consolidated peat. The vegetation is dominated by tall shrubs, with at least 25% cover, and a fairly continuous covering of sphagnum moss. Herbaceous cover is variable, and tree cover is less than 10%. A sphagnum mat is fairly continuous. The herbaceous layer is not well characterized.

* Information from NHIC (2011)
** Community descriptions from NatureServe (2011)

v. DOMINANT ENVIRONMENTAL PROCESSES

The deciduous forests that historically formed the dominant matrix community throughout southern Ontario, including Elgin County, were relatively stable, and supported wide-ranging species (Davis 1996;

Anderson and Bernstein 2003). Nested within these large forests were large and small patch habitat types (Anderson and Bernstein 2003) that often resulted in response to unique or specific terrain. Within the Carolinian life zone large patch communities include marshes, savannahs and prairies.

Minimum Dynamic Area

Minimum dynamic area (MDA) is often used to determine the minimum area needed to maintain natural ecological processes and to ensure that examples of all successional stages will exist within a given habitat type under all disturbance regimes (e.g. wind, fire, insects) (Pickett and Thompson 1978). Most forests in southern Ontario experienced average disturbances of less than 2 hectares (4 acres), and early successional stages were limited to gaps created in the canopy by windstorms, downbursts and ice-storms (Riley and Mohr 1994; Larson *et al.* 1999). It has been estimated that protected landscapes must be 50 to 100 times larger than average disturbance patches in order to maintain a relative equilibrium of habitats (Shugart and West 1981). In such landscapes, the proportions of different successional stages (e.g. young forest, old growth forest) would be relatively constant over time, even though the sites occupied by different stand types would change. On this basis, minimum recommended area for core forests in southern Ontario would be between 100 and 200 hectares (~250 and 500 acres). Given projections for larger, more frequent storms due to climate change, a conservative strategy would recommend cores of at least 200 hectares (~500 acres) in size.

Fire

Primary disturbance regimes in the prairies and savannahs of southern Ontario were largely driven by drought and fire cycles. Most of these tallgrass systems occurred on sand plains that experienced fires every 5-15 years. Fire is a significant process in the functioning and maintenance of Ontario's remaining prairies (areas which historically supported grasses and herbs with few trees), grasslands (anthropogenic communities of grasses which occur as a result of abandoned cultural use such as farming) and savannahs [grasslands with 25-35% cover of woody species (Lee et al. 1998)]. Fire encourages species that respond to newly burned and open conditions and that benefit from the lack of competition from woody species, which cannot populate burned areas as quickly and efficiently. Natural fire regimes in southern Ontario have been suppressed or altered since European settlement, and as a result, many valuable natural areas have been, and continue to be, lost to succession. Succession is defined as the eventual encroachment of woody species, especially trees, into areas which will cause the cover to eventually become a woodland or forest. In this setting, woody species dominate and prairie or grassland species often die out due to shading or competition from these plants.

Savannahs exist as a delicate balance between scattered woody species and grassland species, and grow specifically in areas wet enough to support trees but dry enough to be subject to fire. They rely on frequent fire events to prevent forested oak woodland cover from becoming dominant. No current records exist for savannahs in Elgin County although they may have been present in the past.

Grasslands and prairies are similar to savannahs but have less cover of fire-tolerant oak species and greater expanses of open land carpeted in herbaceous, fire-tolerant grasses. Fire is usually an essential component in maintaining grasslands, prairies and savannahs. Burning tallgrass prairies has been shown to stimulate growth of prairie plants and the mycorrhizae that aid plants in nutrient acquisition (Bentivenga and Hetrick 1991). Periodic fires would historically have maintained the oak – pine savannahs and open woodlands on the dune systems in the coastal areas in the Norfolk Sand Plain (e.g. at Port Burwell Provincial Park).

Hydrology

The Elgin Greenway CAP includes several watersheds whose rivers drain into Lake Erie (see Figures 1.3, 1.6 and 1.7). The Kettle Creek, Catfish Creek, Talbot Creek, Tyrconnel Creek, Brock Creek, 16-Mile Creek, 52 Creek and South Otter Creek watersheds are entirely contained within the Elgin Greenway CAP. A major portion of the Big Otter Creek watershed is also within the CAP. The rivers in the Elgin Greenway CAP cut deep valleys as they flow toward Lake Erie.

Photo: Stan Caveney

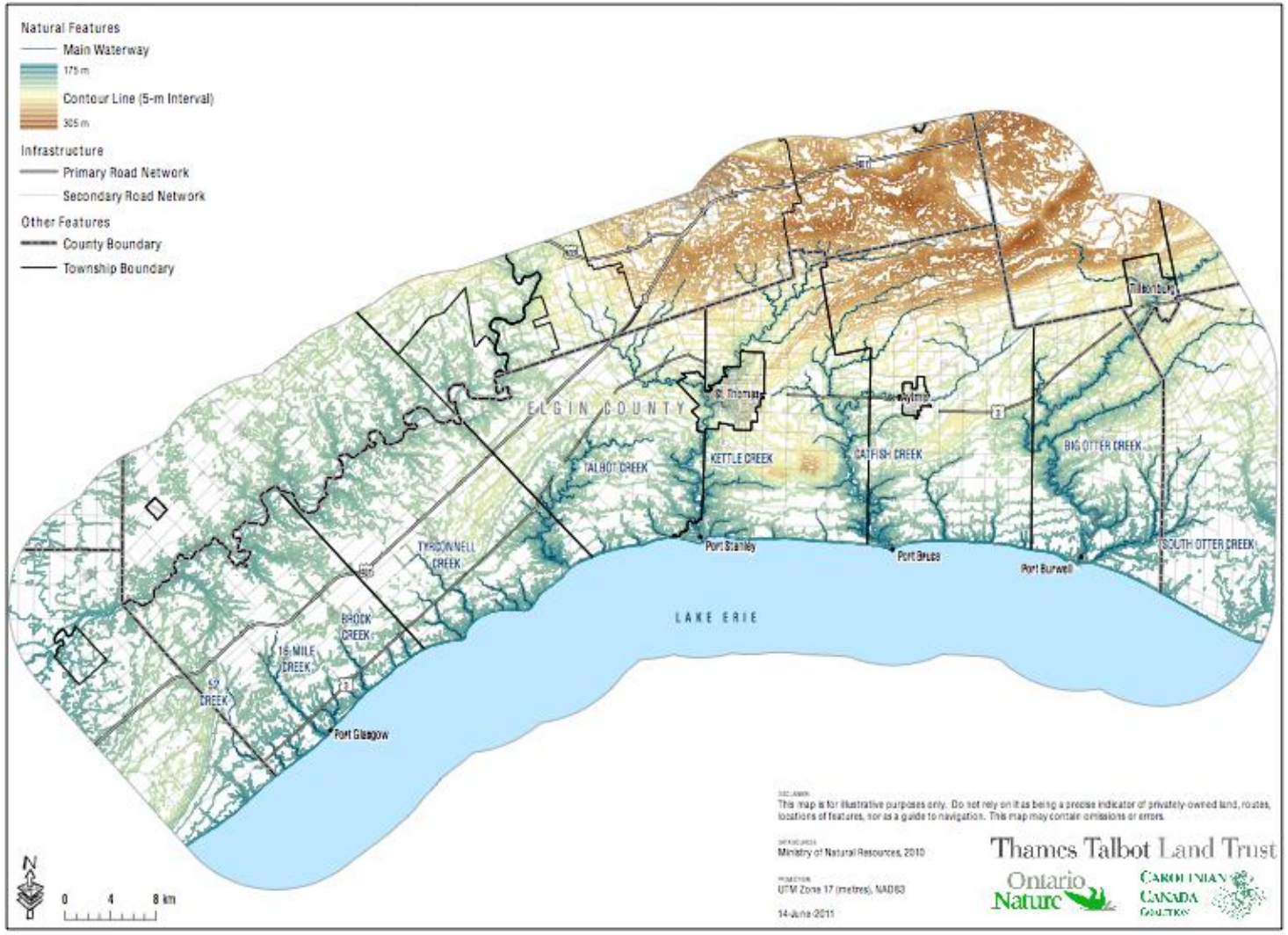
Figure 1.6. Creek mouth at Lake Erie shoreline

The Thames River bisects the northwest corner of the CAP and associated watersheds are included in the CAP. The river originates northeast of London and flows 273 km through the agricultural heartland of southwestern Ontario to Lake St. Clair, which drains into Lake Erie.

Portions of the CAP area on the Bothwell Sand Plain have a high water table resulting in moist habitats such as wetlands. Although nearly 70% of wetlands in southern Ontario have been drained (Snell 1987) many swamp complexes still exist in Elgin County (Kanter et al.1993).

Changes in land cover, drainage and damming of streams greatly affect the ecological integrity of river ecosystems (Allan 2004). In much of Southern Ontario, including Elgin County, large amounts of forest cover have been removed (Larson et al. 1999) and a large proportion of wetlands have been drained (Snell 1987). In addition, streams and rivers in the area are dammed and channelized to control water flow, modifying the natural flooding cycles and floodplain ecosystems.

Figure 1.7. Topography and major streams in the Elgin Greenway CAP area.



vi. SIGNIFICANT SPECIES

Despite the fact that much of the area has undergone conversion to agricultural and urban land uses, it provides habitat for at least 50 extant terrestrial and aquatic Species at Risk (SAR) (Figure 1.8), with another 17 SAR having occurred historically.

1.8. The threatened False Rue-anemone, one of at least 50 species at risk found in Elgin County

Unless otherwise indicated, data in table 1.4 are from NHIC (2008) but are generally not current to 2008. Only designated Species At Risk (SAR) (Endangered, Threatened or Special Concern) are included. Many additional globally and provincially rare species and vegetation communities occur in these areas, and some of them may be considered as focal conservation targets during the CAP process. Records have in some cases not been included for locally extirpated species (indicated with X) occurring at sites considered so modified that they are not recoverable, although records of many historic (indicated with H) and extirpated taxa are presented since these could conceivably recolonize (or be reintroduced) as habitats are restored.

Table 1.4. Significant Species – Elgin Greenway CAP Area
Bold = Carolinian Woodland Recovery Team priority species [see also appendices C, D]

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability at known sites	Most Recent Records	Associated Conservation Target(s) (see Table 1.5 for key to codes)
Acadian Flycatcher	END	END	G5 S2B S3B SZN		2000	1. VF; 2. UF; 3. MF
American Badger	END	END	G5 S2		2001	1. PS; 2. TF; 3. AG; 4. VF
American Chestnut	END	END	G4 N3 S2		2004	1. UF; 2. VRVF; 3. AG

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability at known sites	Most Recent Records	Associated Conservation Target(s) (see Table 1.5 for key to codes)
American Water-willow	THR	THR	G5 S1		1989	1. RS; 2. IW; 3. LES?
Bald Eagle (Status Report not available)	NAR	SC	G5 S2N, S4B		2008	1. MF; 2. UF; 3. LES; 4. RS; 5. IW
Black Redhorse	THR	THR	G5 S2		1938	4. RS
Blanding's Turtle	THR	THR	G4 S3		1992	1. IW; 2. RS; 3. LES; 4. UF 5. TF? 6. VF?
Blue Ash	SC	SC	G5 S3		2007	1. Rich floodplain forests (VF? RS? MF?); 2. PS (alvars); 3. TF [From SARA Registry: Blue Ash inhabits three types of habitat: rich floodplain forests, shallow soil over dry limestone and well-drained sand.]
Bobolink	THR	THR			2012	
Broad Beech Fern	SC	SC	G5 S3		2004	1. MF
Butternut	END	END	G4 S1		2011	1. RS; 2. UF?; 3. VF?; 4. TF? occasionally found along roads through forests, along on forest edges, and in clearings (wherever enough sunlight to support seed regeneration)
Cerulean Warbler	SC	SC	G4 S3B		1991	2. UF
Chimney Swift	THR	THR	G5 S4B, S4N		2012	Food: IW, RS, LES natural nest sites: VF, MF, UF
Colicroot	THR	THR	G5 S2		1993	6. PS; 7. TF
Common Five-Lined Skink	END	END	G5T2 S2		1970	1. UF; 2. PS; 3. LES
Common Hoptree	THR	THR	G5 S3		2002	1. LES

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability at known sites	Most Recent Records	Associated Conservation Target(s) (see Table 1.5 for key to codes)
Common Snapping Turtle	SC	SC	G5 S3			1. IW; 2. RS; 3. LES
Crooked-stem Aster	THR	THR	G4G5 S2		2010	1. RS; 2. VF (edge); 3. TF (forest edge and roadsides)
Dense Blazing-star	THR	THR	G5 S2		1998	1. PS; 2. IW
Drooping Trillium	END	END	G5 S1	BC	2007	1. VF; 2. MF
Eastern Flowering Dogwood	END	END	G5 S2?		2011	1. UF; fencerows and roadsides
Eastern Foxsnake	END	END	G5T1 S1		2010	1. IW; 2. PS; 3. TF; 4. MF; 5. RS; 6. LES; 7. VF; 8. UF; 9. AG? (anthropogenic features, not cropland)
Eastern Hog-nosed Snake	THR	THR	G5 S3		2001	1. LES; 2. RS; IW; TF; UF; PS
Eastern Meadowlark	THR	THR			2012	
Eastern Musk Turtle (Stinkpot)	THR	THR	G5 S3		Pre 1984	1. IW, 2. RS
Eastern Prickly Pear Cactus	END	END	G5 S1		1922	1. LES, 2. PS, 3. TF
Eastern (Northern) Ribbonsnake	SC	SC	G5 S3		1988	1. IW; 2. RS; 3. LES: 4. VF; Nesting: TF, PS, UF
Eastern Sand Darter	THR	THR	G3G4 S2		1997	1. RS; 2. LES; 3. IW (lakes); 4. AG?
False Hop Sedge	END	END	G4 S1		2005	1. UF; 2. MF;
False Rue-anemone	**THR**	**THR**	**G5 S2**		**1993**	1. VF; 2. MF; 3. TF (hedgerows)
Fowler's Toad	THR	THR	G5 S2		1987	1. LES; 2. IW and RS near lake
Gray Ratsnake	END	END	G5T1 S1		1996	1. UF; 2. TF & PS; 3. IW
Green Dragon	SC	SC	G5 S3		2011	1. VF; 2. RS (forest and thicket)

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability at known sites	Most Recent Records	Associated Conservation Target(s) (see Table 1.5 for key to codes)
Jefferson Salamander	END	END	G4 S2?		2011	1. UF, MF. 2. IW
Henslow's Sparrow	END	END	G4 SHB		1975	1. PS; 2. TF; 3. RS (low-lying seasonally flooded areas); 4. AG
Hill's Pondweed	SC	SC	G3 S2		1951	1. IW
Hooded Warbler	THR	SC	G5 S3B		2010	1. UF; 2. VF
Kentucky Coffee-tree	**THR**	**THR**	**G5 S2**	+	**1948**	**1. RS; 2. IW; 3. TF (hedgerows, edge)**
Large Whorled Pogonia	**END**	**END**	**G5 S1**	**D**	**1993**	**1. UF**
Laura's Clubtail	END	END	G4 S1		2008	1. RS; 2. VF; 3. AG?
Least Bittern	THR	THR	G5 S4B		1950	1. IW
Louisiana Waterthrush	SC	SC	G5 S3B, SZN		1991	1. VF; 2. MF
Massasauga	THR	THR	G3G4 S3		1965	All targets
Milksnake	SC	SC	G5 S3		1995	All targets
Monarch	SC	SC	G5 S2N, S4B		Not tracked by NHIC	1. TF; 2. PS (any open areas with milkweed and nectar sources)
Northern Bobwhite	END	END	G5 S1		1954	Mix of PS, TF, AG, UF
Northern Madtom	END	END	G3 S1		1997	1. RS
Northern Map Turtle	SC	SC	G5 S3		1995	1. LES; 2. RS
Prothonotary Warbler	END	END	G5 S1B		2009	1. MF
Purple Twayblade	END	END	G5 S2		1986	1. PS; 2. UF

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability at known sites	Most Recent Records	Associated Conservation Target(s) (see Table 1.5 for key to codes)
Red-headed Woodpecker	THR	SC	G5 S4B		2010	1. TF; 2. UF; 3. PS; 4. VF; 5. RS; 6. MF? 7. AG? Open areas with a high density of dead or unhealthy trees Winter: open, mature woodlands with abundance of acorns and beechnuts
Riddell's Goldenrod	SC	SC	G5 S3		1993	Wet prairie-like sites and roadside ditches 1. PS; 2. RS; 3. TF
Shumard Oak	SC	SC	G5 S3		1993	1. MF; 2. TF
Silver Chub	SC	SC	G5 S2		1960	1. LES; 2. RS
Small White Lady's-slipper	END	END	G4 S1		1924	1. MF (Elgin); 2. IW; 3. TF; 4. PS Historic: PS
Small Whorled Pogonia	END	END	G2 S1		1990	1. MF; 2. UF
Southern Flying-squirrel	NAR	NAR	G5 S4		Not tracked by NHIC	1. UF
Spiny Softshell	THR	THR	G5 S3		2008	1. LES; 2. RS (in Elgin County. In rest of range, order would be reversed)
Spoon-leaved Moss	END	END	G5 S1		2002	1. VF; 2. MF
Spotted Turtle	END	END	G5 S3		2010	1. IW; 2. RS; 3. TF; woodland streams
Swamp Rose Mallow	SC	SC	G5 S3		2002	1. LES (coastal marshes); 2. IW; 3. RS; 4. TF hydro corridor

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability at known sites	Most Recent Records	Associated Conservation Target(s) (see Table 1.5 for key to codes)
Western Chorus Frog (Carolinian population)	NAR	NAR	G5TNR S4		Not tracked by NHIC	All types of terrestrial habitat near breeding ponds (IW, TF, PS, AG, UF, MF) Breeding ponds: temporary ponds and wetlands that become dry in summer (TF, IW, MF)
Willowleaf Aster	THR	THR	G5 S2		1991	1. PS; 2. TF; 3. RS?
Woodland Vole	SC	SC	G5 S3?		1986	1. UF
Yellow-breasted Chat	SC	SC	G5 S2B SZN		2010	1. TF; 2. RS

2. BIODIVESITY TARGETS AND ASSOCIATED THREATS

i. CONSERVATION TARGETS

Table 1.5. Conservation Targets

Conservation Targets	Code	Nested Targets
1. Valley and Ravine Forests	VF	Acadian Flycatcher, American Badger, Chimney Swift, Crooked-stem Aster, Drooping Trillium, Eastern Foxsnake, Hooded Warbler, False Rue-anemone, Green Dragon, American Chestnut, Laura's Clubtail, Louisiana Waterthrush, Milksnake, Northern Ribbonsnake, Red-headed Woodpecker, Spoon-leaved Moss, Butternut, Southern Flying-squirrel, Blanding's Turtle(?), Blue Ash(?) (Historic / Extirpated: Massasauga – 1965)
2. Upland Forests (sand plain, clay plain, moraine)	UF	Acadian Flycatcher, Bald Eagle, Blanding's Turtle, Chimney Swift, Eastern Foxsnake, Eastern Hog-nosed Snake, Ratsnake, Hooded Warbler, Large Whorled Pogonia, Cerulean Warbler, American Chestnut, Milksnake, Southern Flying-squirrel, Small Whorled Pogonia, Eastern Flowering Dogwood, False Hop Sedge, Red-headed Woodpecker, Northern Ribbonsnake (nesting), Western Chorus Frog, Butternut, Jefferson Salamander (Historic / Extirpated: Woodland Vole – 1986, Northern Bobwhite – 1954; Common Five-lined Skink – pre-1984; Massasauga – 1965; Purple Twayblade – 1986)
3. Moist Forests and Swamps (inc. headwaters)	MF	Acadian Flycatcher, Bald Eagle, Blue Ash, Chimney Swift, False Hop Sedge, Broad Beech Fern, Drooping Trillium, Eastern Foxsnake, False Rue-anemone, Louisiana Waterthrush, Milksnake, Spoon-leaved Moss, Prothonotary Warbler, Small Whorled Pogonia, Shumard Oak, Western Chorus Frog, Spotted Turtle, Red-headed Woodpecker, Southern Flying-squirrel, Jefferson Salamander (Historic / Extirpated: Massasauga – 1965; Small White Lady's-slipper – 1924)
4. Native Prairies and Savannahs	PS	American Badger, Blue Ash, Colicroot, Dense Blazing-star, Eastern Foxsnake, Eastern Hog-nosed Snake, Milksnake, Ratsnake, Riddell's Goldenrod, Red-headed Woodpecker, Northern Ribbonsnake (nesting), Western Chorus Frog, Willowleaf Aster, Bobolink (Historic/Extirpated: Massasauga – 1965; Common Five-lined Skink – pre-1984; Eastern Prickly Pear Cactus – 1922; Henslow's Sparrow – 1975; Northern Bobwhite – 1954; Purple Twayblade – 1986, Small White Lady's-slipper – 1924)

Conservation Targets	Code	Nested Targets
5. Thickets, hedgerows, fencerows, shelterbelts, abandoned fields	TF	American Badger, Blue Ash, Colicroot, Crooked-stem Aster, Eastern Flowering Dogwood, Monarch, Eastern Foxsnake, Milksnake, Eastern Hog-nosed Snake, False Rue-anemone, Shumard Oak, Spotted Turtle, Western Chorus Frog, Swamp Rose Mallow, Willowleaf Aster, Riddell's Goldenrod, Ratsnake, Red-headed Woodpecker, Yellow-breasted Chat, Bobolink, Northern Ribbonsnake (nesting), Blanding's Turtle? Butternut? (Historic / Extirpated: Massasauga – 1965; Eastern Prickly Pear Cactus – 1922; Henslow's Sparrow – 1975, Northern Bobwhite – 1954 - H, Small White Lady's-slipper – 1924) (Planted / Introduced: Kentucky Coffee-Tree)
6. Sustainable Agricultural Practices	AG	Healthy soils, clean water, clean air;
7. Rivers, streams, and associated open floodplain habitats (incl. headwaters)	RS	Bald Eagle, Blanding's Turtle, Blue Ash, Butternut, Chimney Swift, Crooked-stem Aster, Eastern Foxsnake, Eastern Hog-nosed Snake, Eastern Sand Darter, Green Dragon, Laura's Clubtail, Milksnake, Northern Madtom, Red-headed Woodpecker, Riddell's Goldenrod, Swamp Rose Mallow, Common Snapping Turtle, Spotted Turtle, Northern Map Turtle, Northern Ribbonsnake, Spiny Softshell, Willowleaf Aster? (Historic / Extirpated: American Water-willow – 1989, Massasauga – 1965; Black Redhorse – 1938; Silver Chub – 1960 L. Erie; Fowler's Toad – 1987 (near Lake Erie); Henslow's Sparrow – 1975; Eastern Musk Turtle – pre-1984 SM) (Planted / Introduced: Kentucky Coffee-Tree)
8. Marshes, ponds, impoundments and constructed wetlands.	IW	Bald Eagle, Blanding's Turtle, Chimney Swift, Common Snapping Turtle, Dense Blazing-star, Eastern Foxsnake, Eastern Hog-nosed Snake, Eastern Sand Darter, Ratsnake, Least Bittern, Milksnake, Northern Ribbonsnake, Spotted Turtle, Western Chorus Frog, Swamp Rose Mallow, Yellow-breasted Chat, (Historic / Extirpated: American Water-willow – 1989, Massasauga – 1965; Jefferson Salamander – 1986; Eastern Musk Turtle – pre-1984, Fowler's Toad – 1987; Hill's Pondweed – 1951; Small White Lady's-slipper – 1924) (Planted / Introduced: Kentucky Coffee-Tree)
9. Lake Erie Shoreline	LES	Migratory birds and insects; Bald Eagle, Blanding's Turtle, Chimney Swift, Common Snapping Turtle, Eastern Hog-nosed Snake, Eastern Sand Darter, Milksnake, Northern Map Turtle, Common Hoptree, Silver Chub, Eastern Foxsnake, Northern Ribbonsnake, Spiny Softshell, Swamp Rose Mallow (Historic / Extirpated: Massasauga – 1965; Common Five-lined Skink – pre-1984; Eastern Prickly Pear Cactus – 1922; Fowler's Toad – 1987(near Lk Erie); Silver Chub – 1960 L. Erie; American Water-willow – 1989)
10. SAR Snakes	SS	Eastern Hog-nosed Snake, Gray Ratsnake, Eastern Foxsnake, Northern Ribbonsnake, Milksnake

Table 1.6. Conservation Target Viability

Conservation Target	Key Ecological Attribute(s)	Size	Condition	Landscape Context	Overall
1. Valley & Ravine Forests	Presence of reproducing populations of characteristic forest interior bird species (specific indicators to be determined); Extent of forest cover and interior habitat; Quality of forest communities. Measure: no net loss of forest cover from 2010 levels; Measure: x forest interior breeding bird species in x sites.	**Fair**	**Good**	**Fair**	**Fair**
2. Upland Forests	Same as #1	**Fair**	**Fair**	**Poor**	**Fair**
3. Moist Forests and Swamps	Groundwater recharge; Presence of: Prothonotary Warbler breeding; Tupelo / Black-gum / heron rookeries. Measures: overall extent, interior habitat	**Poor**	**Poor**	**Poor**	**Poor**
4. Prairies & Savannahs	Species diversity – presence of key indicator species; Disturbance/ Fire – need fire to maintain the species; minimum size	**Poor**	**Poor**	**Poor**	**Poor**
5. Thickets, Hedgerows, Shelterbelts, Fencerows, Abandoned Fields	Species diversity – species should be represented in x amounts; Minimum width of 10 m (30 ft); Need to maintain tree roots. Agricultural activities must be limited to canopy dripline; Links to other hedge rows, thickets; Provide shelter to wildlife – refuge for beneficial insects; Benign neglect	**Fair** (Hedge rows – poor; Thickets – fair to good; Fields – fair)	**Fair** (Hedge rows – poor; Thickets – fair to good; Fields – fair)	**Fair** (Hedge rows – poor; Thickets – fair to good; Fields – fair)	**Fair**
6. Sustainable Agriculture	Healthy soils – should have organic matter, bacteria, earthworms, fungus; Minimal compaction; Agriculture Should not depend on synthetic inputs; Healthy water - Not nutrient rich, free of toxins, buffered hydrology.	**Poor**	**Fair**	**Fair**	**Fair**
7. Rivers, Streams & Floodplains	Water quality (benthic organism composition, temperature); extent of naturally-vegetated buffers (measured using GIS over time) (% of watercourse having 30m buffer; measures of surrounding land use measured by %); extent natural watercourse vs. altered watercourse.	**Fair**	**Fair**	**Fair**	**Fair**
8. Inland Wetlands (marshes, ponds)	Water quality (benthic organism composition, temperature); extent of naturally-vegetated buffers (measured using GIS over time) (% of wetland having 100m buffer; measures of surrounding land use measured by %); connectivity to other wetlands; structural and vegetation composition (diversity / native vs. invasive); intact hydrology (quality of incoming watercourses, based on measures for #7).	**Poor**	**Fair**	**Poor**	**Poor**

Conservation Target	Key Ecological Attribute(s)	Size	Condition	Landscape Context	Overall
9. Lake Erie shoreline (1 km inland)	% natural cover, % hardened shoreline,	**Very Good**	**Good**	**Good**	**Good**
10. SAR Reptiles	Habitat connectivity				
OVERALL		**Fair**	**Fair**	**Poor**	**Fair**

Table 1.6 is based on The Nature Conservancy's Conservation Action Planning (CAP) viability summary table. The Nature Conservancy's (CAP) Excel Workbook version 5a can be used to calculate the overall viability ranks. The CAP Workbook is found on NCC's Training and Resources Website under the Reference Materials / Conservation / Campaign / Natural Area Conservation Planning (NACP) / NACP Resource Materials / TNC CAP Process folder. Consider placing nested targets and/or viability rationale in a separate appendix if their content is too overwhelming for the table. Carolinian Woodland Recovery Team mandated species are bolded.

Very Good	**Optimal Health**: The biodiversity target is functioning at an ecologically desirable status, and requires little management.
Good	**Minimum Health**: The biodiversity target is functioning within its range of acceptable variation; it may require some management.
Fair	**Likely Degradation**: The biodiversity target lies outside of its range of acceptable variation and requires management. If unchecked, the biodiversity target will be vulnerable to serious degradation.
Poor	**Imminent Loss**: Allowing the biodiversity target to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible.
Unknown	**Research Need**: The biodiversity target is known to occur, but information on this viability criterion is currently is unknown.
NA	**Not Applicable**: This criterion is not significant for assessing the health of this biodiversity target.

ii. THREATS

Detailed information on threats to Elgin County SAR is presented in Appendix D. Tables 1.7 and 1.8 summarize the most relevant threats (Figure 1.9).

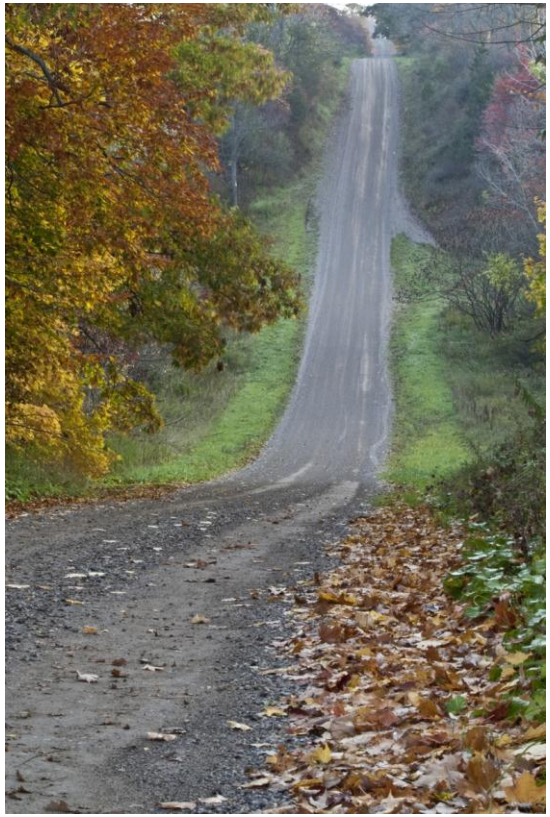


Photo: John St. Pierre

Figure 1.9. Although important to economic prosperity, roads fragment habitat and cause animal mortality

Table 1.7. Summary of Threats – Elgin Greenway CAP

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	Valley Forests (VF)	Upland Forests (UF)	Moist Forests & Swamps (SF)	Prairie & Savannah (PS)	Thickets, Hedgerows, Abandoned Fields (TF)	Sustainable Agriculture (SA)	Rivers, Streams & Floodplains (RS)	Inland Wetlands (IW)	Lake Erie Shoreline (LES)	Overall
Invasive Non-Native/ Alien Species a) Vascular plants, vertebrates	1. Competition for resources 2. Allelopathic spp. have broader ecosystem impacts 3. DISPLACE NATIVE PLANTS (PS) 4. Reduced food and habitat quality for wildlife (TF) 5. Control measures add to impacts 6. Filling, succession of wetlands from volume of the biomass	HIGH	HIGH	HIGH	HIGH	VERY HIGH		MED	HIGH	MED	VERY HIGH
Housing & Urban Development	1. Habitat loss & fragmentation 2. Predation by household pets 3. Light pollution 4. Invasive / non-native species. 5. Encroachment (habitat modification) 6. Loss of prime agricultural land (SA) 7. Erosion, increased sand bedload; suspended sediment / turbidity; reduced groundwater recharge & discharge. (SA, RS)	HIGH	HIGH	MED	LOW	HIGH	VERY HIGH	MED	LOW	HIGH	VERY HIGH
Other Ecosystem Modification: **Tile Drainage**	1. Erosion, bank stability 2. Hydrological impacts 3. Direct habitat loss 4. Loss of biodiversity & changes to species composition (MF) 5. Impact of mowing at wrong time or season (PS).	HIGH	HIGH	HIGH	MED			HIGH	HIGH	MED	VERY HIGH

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	Valley Forests (VF)	Upland Forests (UF)	Moist Forests & Swamps (SF)	Prairie & Savannah (PS)	Thickets, Hedgerows, Abandoned Fields (TF)	Sustainable Agriculture (SA)	Rivers, Streams & Floodplains (RS)	Inland Wetlands (IW)	Lake Erie Shoreline (LES)	Overall
Air-Borne Pollutants	1. Forest plant health 2. Climate change 3. Impacts of increased severe weather events 4. Burning of plastic releases carcinogens (dioxins, furans). (SA)	HIGH	HIGH	HIGH	LOW	LOW	VERY HIGH		LOW	LOW	VERY HIGH
Invasive Non-Native/ Alien Species b) Diseases, pathogens	1. Reduced forest quality, health and diversity	HIGH	HIGH	HIGH		HIGH					VERY HIGH
Invasive Non-Native/ Alien Species c) Invertebrate pests	1. Reduced forest quality, health and diversity	HIGH	HIGH	HIGH		HIGH					VERY HIGH
Roads	1. Habitat fragmentation and loss 2. Road mortality 3. Run-off (salt, chemicals) (MF)	HIGH	HIGH	HIGH	MED	LOW			LOW	MED	VERY HIGH
Non-Timber Crops	1. Erosion & soil compaction 2. Reduced extent of habitat & buffering 3. Habitat loss & fragmentation (PS, RS) (see also Agricultural Effluents, below) 4. Loss of organic matter (SA) 5. Sediment and nutrient loading (RS) 6. Oxygen depletion (RS) 7. Reduced habitat quality. (RS) 8. Reduced biodiversity. (RS) 9. Water level fluctuations (IW) 10. Herbicide & pesticide run-off. (IW) 11. Increased predator stress (IW)	LOW	MED	LOW	HIGH	HIGH		MED	MED	MED	HIGH

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	Valley Forests (VF)	Upland Forests (UF)	Moist Forests & Swamps (SF)	Prairie & Savannah (PS)	Thickets, Hedgerows, Abandoned Fields (TF)	Sustainable Agriculture (SA)	Rivers, Streams & Floodplains (RS)	Inland Wetlands (IW)	Lake Erie Shoreline (LES)	Overall
Agricultural & Forestry Effluents	1. Herbicides and insecticides (drift) (PS) 2. Nutrient inputs (RS) (contribute to succession if fertilizer gets into groundwater runoff - PS) 3. Reduced resilience of species; more prone to disease. (TF) 4. EXCESS NITROGEN IN SOIL. (SA)	LOW	LOW	LOW	MED	HIGH	VERY HIGH	MED	MED	MED	HIGH
Logging & Wood Harvesting	1. Habitat damage 2. Loss of canopy cover 3. Soil compaction & erosion 4. Invasive species 5. Reduced forest interior & extent 6. Siltation (RS)	MED	HIGH	HIGH	LOW	HIGH		LOW		MED	HIGH
Commercial & Industrial Development	1. Loss of prime agricultural land (SA) 2. Erosion, increased sand bedload; suspended sediment / turbidity; reduced groundwater recharge & discharge. (SA, RS)	LOW	MED	MED	LOW	HIGH	HIGH	MED	LOW	MED	HIGH
Recreational Activities a) Motorized off-road vehicles	1. Disturbance to wildlife 2. Direct damage to habitat and vegetation 3. Soil erosion & compaction 4. Invasive species	MED	MED	MED	MED	MED		LOW	LOW	LOW	HIGH
Problematic Native Species (White-tailed Deer, Wild Turkey, Canada Goose)	1. Increased nutrients, habitat destruction 2. Decreased biodiversity 3. Impede natural succession / regeneration	MED	MED	MED	MED	LOW		MED	MED	LOW	HIGH

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	Valley Forests (VF)	Upland Forests (UF)	Moist Forests & Swamps (SF)	Prairie & Savannah (PS)	Thickets, Hedgerows, Abandoned Fields (TF)	Sustainable Agriculture (SA)	Rivers, Streams & Floodplains (RS)	Inland Wetlands (IW)	Lake Erie Shoreline (LES)	Overall
Tourism & Recreational Development	1. Direct habitat loss 2. Household pets (predation) 3. Light pollution 4. Invasive species 5. Encroachment (habitat modification)	MED	MED	MED	LOW	MED	LOW	LOW	LOW	MED	MED
Livestock Farming & Ranching	1. Impaired regeneration of vegetation 2. Soil compaction & erosion 3. Invasive species 4. Reduced water quality (nutrient loading, sediment deposition) (IW) 5. Habitat destruction (trampling, over-grazing) (IW)	LOW	LOW	LOW	LOW	MED	MED	LOW	MED	LOW	MED
Renewable Energy	1. Death and damage to flying and migratory species.	LOW	LOW	LOW	LOW	MED			LOW	MED	MED
Utility & Service Lines	1. Habitat fragmentation 2. Hydrological impacts	MED	MED	MED	LOW	LOW			LOW	LOW	MED
Hunting & Collecting Terrestrial Animals	1. Population decline or loss (SAR turtles) (MF, IW)	LOW	LOW	MED	MED	MED		LOW	LOW	LOW	MED
Gathering Terrestrial Plants	1. Cumulative impact of losing individuals, seed sources, genes, food sources. 2. Damage to vegetation (trampling). 3. Habitat loss. (IW)	LOW	LOW	LOW	MED	MED		LOW		LOW	MED
Introduced Genetic Material		LOW	LOW	LOW	VERY HIGH	MED			LOW	LOW	MED

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	Valley Forests (VF)	Upland Forests (UF)	Moist Forests & Swamps (SF)	Prairie & Savannah (PS)	Thickets, Hedgerows, Abandoned Fields (TF)	Sustainable Agriculture (SA)	Rivers, Streams & Floodplains (RS)	Inland Wetlands (IW)	Lake Erie Shoreline (LES)	Overall
Household Sewage & Urban Waste Water	1. Reduced resilience of species; more prone to disease. (TF) 2. Chemicals impact soil quality and water quality; smell (SA) 3. Diseases, pathogenic bacteria (e.g., ecoli), prions (SA) 4. Nutrient loading (RS)	LOW	LOW	LOW	LOW	LOW	VERY HIGH	MED	LOW	LOW	MED
Industrial & Military Effluents	1. Reduced resilience of species; more prone to disease. (TF) 2. Contaminants, toxins from industrial waste water (SA)	LOW	LOW	LOW	LOW	MED	HIGH		LOW	LOW	MED
Dams & Water management/ Use	1. Hydrological impacts (lower water table) (MF) 2. Loss of headwaters & recharge areas (MF) 3. Increased water temperature (RS) 4. Impeded fish movement (RS) 5. Disrupted sediment transport (RS) 6. Increased problematic native and non-native species (Canada Goose, Common Carp) (RS) 7. Reduced water quality and quantity (RS)	LOW	LOW	MED	LOW	LOW		MED	LOW	LOW	MED
Garbage & Solid Waste	1. Bank destabilization (RS) 2. Erosion (RS) 3. Habitat loss (RS) 4. Introduction of non-native species (RS) 5. Leachate (RS)	LOW	LOW	LOW	LOW	MED		MED	LOW	LOW	MED
Excess Energy	1. Erosion, slumping sedimentation 2. Damage to vegetation due to flooding & scouring	HIGH	LOW	LOW		LOW		LOW	LOW	LOW	LOW
Oil & Gas Drilling		LOW	LOW	LOW	MED	LOW			LOW	LOW	LOW

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	Valley Forests (VF)	Upland Forests (UF)	Moist Forests & Swamps (SF)	Prairie & Savannah (PS)	Thickets, Hedgerows, Abandoned Fields (TF)	Sustainable Agriculture (SA)	Rivers, Streams & Floodplains (RS)	Inland Wetlands (IW)	Lake Erie Shoreline (LES)	Overall
Fire & Fire Suppression	1. NATURAL SUCCESSION, LOSS OF ECOLOGICAL INTEGRITY 2. INVASIVE SPECIES				MED					LOW	LOW
Wood & Pulp Plantations		LOW	LOW	LOW	LOW	LOW			LOW	LOW	LOW
Mining & Quarrying		LOW	LOW	LOW	LOW	LOW			LOW	LOW	LOW
Railroads	1. Habitat damage (by off-road vehicles)	LOW	LOW	LOW	LOW	LOW			LOW	LOW	LOW
Recreational Activities b) Horses, Mountain Bikes, Hiking & Other "Passive" Activities		LOW	LOW	LOW	LOW			LOW		LOW	LOW
Fishing & Harvesting Aquatic Resources								LOW	LOW	LOW	LOW

Threats are based on the IUCN classification of direct threats (IUCN-CMP 2006a).

Very High	The threat is likely to *destroy or eliminate* the biodiversity target.
High	The threat is likely to *seriously degrade* the biodiversity target.
Medium	The threat is likely to *moderately degrade* the biodiversity target.
Low	The threat is likely to *only slightly impair* the biodiversity target.

Table 1.8. Additional Comments on Sources of Threats

Source of Threat	Notes (i.d.: key impacted sites, specific activities, contributing factors, possible solutions, etc.)
Residential & Commercial Development	**LES: Even though threat may currently be low, plan should ensure that this does not become an issue (e.g., Port Glasgow, Duttona Beach, west of Port Bruce)**
Housing & Urban	VF: Cats (in particular) predating birds (migratory & breeding); Landscaping (Norway Maple, barberry); Trails, alteration of habitat, dumping UF: Provincial level legislation required to protect upland forests (e.g., PPS). – e.g., "no net loss", or minimum of 30% per municipality. Rural estate housing & rural development generally is not recommended, but where it takes place it should be situated outside of upland forests (with restored buffer zones incorporated into development plans); Cats (in particular) predating birds (migratory & breeding); Landscaping (Norway Maple, barberry); Trails, alteration of habitat, dumping. SF: Status of wetland evaluations in Elgin is good (Gould pers. comm. 2010) & mapping submitted to OP process. Small unevaluated swamp forests might still be at risk. TF: Hedgerows, fallow fields may be included in subdivision plans. SA: Linear sprawl along paved roads, easy to get zoning change; # of building starts is the main economic indicator; subdividing land amongst children may contribute. RS: Impacted sites – The Mighty Big Otter Creek, Catfish Creek, Kettle Creek, Thames River, Bradley Creek. Specific activities – Stormwater management systems and increases in impervious surfaces is affecting temperature and base flow in watercourses. Human activities (vegetation removal, trails etc..) landscaping of rural non-farm Contributing factors – increase in human population. Possible solutions – strengthen land use polices to address setbacks, groundwater recharge, education, better municipal planning IW: Grants/incentives to rural non-farmers to create enhance wetlands
Commercial & Industrial	UF: Needs to be considered in OP updates RS: Increase in impervious surfaces
Tourism & Recreational	VF, UF: Trailer parks, golf courses (pesticides)
Agriculture & Aquaculture	

Source of Threat	Notes (i.d.: key impacted sites, specific activities, contributing factors, possible solutions, etc.)
Non-Timber Crops	VF: Farming to ravine edge, gully formation UF: Farming to forest edge; squaring forest and loss of edge buffer; incentives are being used to utilize inappropriate equipment to clear forests to reclaim former agricultural lands. PS: Threat is high when railroads sell right-of-way to neighbouring farms and right-of-way is converted to crops TF: Farm consolidation Requires changing attitudes most tree rows planted at same time, will all be maturing in next 20 – 30 years, were given those trees and may not replace them when they die. RS: Extreme problem in eastern half of County: Big Otter, Kettle River and Catfish. Specific activities – cultivation of flood plains, Herbicide/pesticide applications, introduction of non-native species. Contributing factors – changes in ownership, changes in crop prices, size of machinery. Possible solutions – Buffer strips, incentives, BMPs, Legislation, education, IW: Dependent on the wetland in question – variable. Contributing factors – increased farming intensity (larger fields, larger equipment, push for increased productivity). Possible solutions – recognize habitat valuable provide tax incentives (similar to CLTIP). Education and outreach, encourage participation in the environmental farm plan. Legislation – to protect the remaining wetlands/wetland buffers LES: Widespread. Cropping to the edge of the bluff, maintaining manicured lawn right to the edge of the bluff, tile outlets. Natural toe erosion, maintaining crop land. Lawns – to maintain view. Education, BMP's, incentives
Wood & Pulp Plantations	TF: Could actually create thickets by converting cropped land to growing willow or other shrubs for biofuel
Livestock Farming & Ranching	VF, UF: Improving, but many valley sites need fencing. RS: Very specific locations. Legislation, BMP's, incentives. IW: Dependent on the wetland in question – variable. Specific activities - Livestock access to wetland and riparian habitat, manure runoff (direct, feed lot, fields, storage). Possible Solutions – Grants to improve storage/application, Legislation to prevent manure spreading on frozen ground. Education – BMP's.
Marine & Freshwater Aquaculture	
Energy Production & Mining	
Oil & Gas Drilling	VF, UF: West Elgin and East Elgin affected PS: May affect some prairie sites TF: Footprint is usually small.
Mining & Quarrying	TF: Opportunity to create habitat when rehabilitating quarry. IW: Formerly an issue, not now.

Source of Threat	Notes (i.d.: key impacted sites, specific activities, contributing factors, possible solutions, etc.)
Renewable Energy	VF, UF, SF: Possible future threat PS: Potential for wind farms along abandoned rail lines (mitigation / restoration elsewhere would be a potential solution) TF: Currently restricted to Class 3 & 4 agricultural lands LES: Not sure about the range/location of wind farms—still proposed, so impact will depend on location and number.
Transportation & Service Corridors	
Roads	VF, UF: Road drainage (culverts); road widening into forests)
Railroads	
Utility & Service Lines	VF: New utility (wind & solar farm) service lines may result in hydrological changes due to location of underground cables; utility lines and service roads may fragment forests
Shipping Lanes	
Flight Paths	
Biological Resource Use	
Hunting & Collecting Terrestrial Animals	MF: Collecting of SAR turtles. TF: Deliberate killing of snakes. IW: Key impacted sites – Calton swamp, Yarmouth natural heritage area, CSX right of way, Dunwich swamp. Public education/awareness – reporting incidents to enforcement. LES: Pet collection may occur more frequently in Rondeau and Long Point
Gathering Terrestrial Plants	VF: Poaching of medicinal plants (SAR) PS: Extent to which collecting is occurring locally is not known. IW: Depending on where it is located. Key impact sites - Calton swamp, Yarmouth natural heritage area, CSX right of way, Dunwich swamp. Public education/awareness – reporting incidents to enforcement.
Logging & Wood Harvesting	UF: Current logging practices (e.g., high-grading) resulting in degradation of habitat, reduced biodiversity, loss of seed trees, and habitat quality; no old growth and associated species and processes. MF: Logging in swamp forests can be very destructive if undertaken at wrong season and using inappropriate methods. TF: Hedgerow trees not suitable for logging due to metal, however landowner attitudes towards trees may be factor (cut down large trees that are shading field) RS: Widespread. Specific activities – aggressive skidding, wrong time of year, removing to much canopy, not washing equipment prior to entering sites, not marking woodlot properly. Contributing factors – economy/market, knowledge/ethics, LES: Tree cutting bylaw.
Fishing & Harvesting Aquatic Resources	

Source of Threat	Notes (i.d.: key impacted sites, specific activities, contributing factors, possible solutions, etc.)
Human Intrusions & Disturbances	
Recreational Activities	
a) Motorized vehicles	VF, UF, TF: Issue is not organized clubs, but indiscriminate and illegal ATV use at inappropriate times of year. PS: Creation of new trails and off-trail use are the biggest problems. RS: Establish associations and policed trails
b) Horses	PS: Equestrians tend to stay on trails (not a major issue locally)
c) Mountain Bikes	
d) Hiking & other "passive"	
Work & Other Activities	TF: Soil compaction from equipment may be a factor
Natural System Modifications	
Fire & Fire Suppression	
Dams & Water management/ Use	MF: Ditching, channelization
Other Ecosystem Modification (tile drainage)	VF: Impacts on bank stability, erosion, hydrological impacts, eutrophication of wetlands and streams UF: Vegetation cleared along closed municipal drains, no regeneration (varies by municipality) (may benefit meadow and prairie spp.); Off-site impacts: erosion, hydrological impacts, eutrophication of wetlands and streams. MF: Loss of ephemeral ponds and breeding habitat (for SAR and other spp.) PS: Mowing at wrong time of year; challenges of suppressing natural succession.
Invasive & Other Problematic Species & Genes	
Invasive Non-Native/ Alien Species	VF, UF: Common Buckthorn, Multiflora Rose, Garlic Mustard, Common Periwinkle, Phragmites, Dame's Rocket, Dog Strangling Vine, Giant Hogwood, etc. (Look to prevent future infestations, etc.); management actions may need to be species-specific MF: Phragmites of particular concern PS: Introduction of garden plants, Dog-strangling Vine TF: Buckthorn, Russian Olive, honeysuckle, Common Lilac, Multi-flora Rose, barberry RS: Common Carp, Phragmites, etc. IW: Ex: Phragmites is a key factor impacting many of the wetlands in Elgin. Other species include garlic mustard, celandine. Possible solutions – more science/research into controls. Identify problem sites/species and control faster. Increased controls on imports. Biological controls that impact native species. LES: Expectation that more may come in the future. Presence of invasives but none are particularly aggressive

Source of Threat	Notes (i.d.: key impacted sites, specific activities, contributing factors, possible solutions, etc.)
Problematic Native Species	VF: Habitat generalists (increasing forest interior) PS: Goldenrods can be problematic; ragweed creates negative public perception. TF: Succession; raspberries. RS: Canada Goose IW: Canadian Geese overpopulated. Constructed on-line impoundments that provide open water habitat in the winter. No-till farming. Possible solutions – remove on-line impoundments on cold water streams, plant/maintain tall vegetation adjacent to wetlands, harvest Canada Geese
a) White-tailed Deer, Wild Turkey	VF: Population control needed
b) Diseases, pathogens	VF, UF, TF: Butternut Canker, Beech Bark Disease, Dutch Elm Disease, Red Oak Wilt, Dogwood Anthracnose, etc.
c) Pests	VF, TF: Emerald Ash Borer, Dutch Elm Disease etc. TF: Common Hoptree affected
Introduced Genetic Material	
Pollution	
Household Sewage & Urban Waste Water	PS: Sewage sludge is spread in many areas for 30 years; high in toxins SA: Road salt and other associated run-off. Sewage sludge contains mix of industrial, medical and household effluent; Land application permitted by legislation, provided as a free fertilizer; difficult to monitor and enforce. Certified organic farmers can't apply sewage sludge. Prions – protein (cause spongiform encephalitis), persistent (don't die during treatment), gets into soil; people are getting diseases from soil due to medical waste. RS: Big Otter, Catfish Creek, Kettle Creek. Sewage treatment plants. Capacity. Sewage treatment plant upgrades, including the separation of storm and sanitary sewers LES: Problem solved in Otter Valley catchment due to new treatment plant. Flood could cause water treatment plant in St. Thomas to overflow. Not a lot of houses on shoreline still on septic.
Industrial & Military Effluents	SA: Ford and other industrial waste water lagoons – what's in them?; tend to be built in wet areas because not suitable for building.

Source of Threat	Notes (i.d.: key impacted sites, specific activities, contributing factors, possible solutions, etc.)
Agricultural & Forestry Effluents	PS: Prairie doesn't like good soil; “improving” the soil is not good for prairie; however, most soils in the area are degraded and the only way to maintain them is through fertilizer TF: Includes pesticides, herbicides, and fertilizer; Irreversibility high because difficult to change industrial agriculture attitudes; latest research on glyphosates (e.g. Round-up) found they change nutrient uptake in following years, affect ability to take up minerals and micronutrients in soils; possible that chemicals from 1950s/60s still in soil; these habitats are adapted to this type of stress. SA: Effluents include insecticides, herbicides, livestock medications, manure, and fertilizer. Irreversibility high because difficult to change industrial agriculture practices and attitudes (need different word). Unused nitrogen becomes nitrates which is a groundwater pollutant; stopped testing water for it because they have never not found it! Liquid manure not as good for soil as solid composted manure; more likely to run off, not as long lived in soil. Nutrients in composted manure are more accessible to plants (tends to stay put). Paper sludge spread as a soil conditioner (not allowed on certified organic); used to build berms at East Elgin Sportsman Association Club; was stored in Port Stanley and later spread on fields in Elgin (possibly just west Elgin)
Garbage & Solid Waste	TF: Becomes eyesore because captures windblown trash; landfill irreversibility is very high. SA: Green Lane (Southwold) – has been used for a long time, now taking Toronto garbage. RS: Most ravines. Unauthorized dumping in ravines. Garbage bag tags, disposal restrictions. Education, more opportunities to dispose of materials, roll tipping fees into general taxes.
Air-Borne Pollutants	TF: Vehicle exhaust – impacts of roadsides higher than hedgerows and thickets. SA: Burning plastic (feed bags and containers) – release dioxins and furans (carcinogenic)
Excess Energy	VF, UF, TF: Storm and spring flooding – relates to clearing of forests higher in watersheds and tile drainage; could be addressed through retention ponds. Stormwater runoff would be addressed through enhanced requirements for settling ponds. Planting of buffers along forest edge would improve forest health and reduce stresses. IW: Larger the wetland complex the better it can buffer an adverse event

3. Objectives and Strategies

i. Conservation Objectives:

Objectives	Threats Addressed	Targets Addressed
1. At least two projects per year address peak flows, nutrient inputs and gully erosion at priority drain outlets.	Tile drainage	VF, UF, SF, RS, IW, LES
2. Increase natural cover of all conservation target types through **restoration** by [realistic quantifiable target based on GIS analysis] by 2020, using existing Elgin Greenway and Landscape Strategy mapping, including utility and riparian corridors.	Housing and urban development / habitat fragmentation / encroachment / climate change	All
3. Protect and enhance functional ecological linkages between and within existing core natural areas by 2020 through **securement** using existing Elgin Greenway and Landscape Strategy mapping.	Housing and urban development / habitat fragmentation / encroachment / climate change	All
4. Establish and manage functional ecological linkages between and within existing core natural areas by 2020 through **stewardship** at 80 project sites using existing Elgin Greenway and Landscape Strategy mapping.	Housing and urban development / habitat fragmentation / encroachment / climate change	All
5. Develop outreach strategy by end of 2013 to communicate CAP themes and objectives to Elgin residents.	All	All
6. Complete a natural heritage inventory by 2016 in order to update and fill gaps in relation to Species At Risk, significant habitats, invasive species and other important natural heritage features.	All	All
7. Prevent and control the spread of new populations of high priority terrestrial invasive plant species at critical sites in Elgin County.	Invasive Non-Native/ Alien Species: Terrestrial invasive plant species	SF, RS, IW, VF, UF, PS, TF, LES

Objectives	Threats Addressed	Targets Addressed
8. Reduce road mortality of small animals at key sites.	Road mortality	SAR reptiles, amphibians, birds & mammals
9. Improve roadside habitat for pollinating insects	Declining pollinator populations, herbicides and insecticides (road maintenance impacts)	VF, UF, SF, PS, IW, LES
10. Improve forest habitat quality and reduce threats to priority species and community types.	Habitat loss and degradation due to incompatible forestry	UF, SF, TF, VF, PS, RS, LES, SAR forest interior birds
11. Manage problematic native species (e.g., White-tailed Deer, Wild Turkey, Canada Goose) populations.	Problematic native species	VF, UF, SF, PS, TF, RS, IW, LES
12. By 2015, develop a complementary strategy to promote sustainable agricultural practices in Elgin County.	Loss of prime agricultural land; Excess nitrogen in soil	Sustainable Agriculture; SA, TF, PS, RS, IW, LES, VF, UF, SF
13. By 2015, develop a complementary strategy to promote eco-tourism in Elgin County.		

ii. Strategic Actions and Action Steps

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
1. Objective	**Reduce peak flows, nutrient inputs at point sources and gully erosion at priority drain outlets.**	**2012-2020 & beyond**	**Tile Drainage**	VF, UF, SF, RS, IW, LES	Water quality; extent of naturally-vegetated buffers (measured using GIS over time) (% of wetland having 100m buffer; measures of surrounding land use measured by %); connectivity to other wetlands; structural and vegetation composition (diversity / native vs. invasive); intact hydrology.	**CA's, Elgin Stewardship Council (Elgin County Stewardship Initiative)**	**t.b.d.**
1.1. Strategic Action	***Undertake study to identify priority sites and landowners to contact.***	***2012 - 2013***	**Tile Drainage**	VF, UF, SF, RS, IW, LES	*Priority sites and landowners identified*	***CA's***	***t.b.d.***
1.1.1. Action Step	Acquire funding to undertake study and projects (e.g., Environmental Farm Plans; HSP; MNR SARSF; CA extension services; SAR FIP).	2012	**Tile Drainage**	VF, UF, SF, RS, IW, LES	Priority landowners identified	CA's, Elgin Stewardship Council (ESC), CCC, Ontario Nature	***Elgin Soil and Crop Imp. Assoc. (Margaret May); unused gov't funding***
1.1.2. Action Step	Develop and provide information packages to landowners.	2012 & beyond	**Tile Drainage**	VF, UF, SF, RS, IW, LES	All priority landowners have received info packages	CCC with CA input; Elgin Federation of Agriculture (EFA)	t.b.d.
1.1.3. Action Step	Implement at least two projects per year [based on 1.1.1] by 2020.	2020	**Tile Drainage**	VF, UF, SF, RS, IW, LES	18 projects successfully implemented by 2020	CA's, ESC	t.b.d.

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
1.1.4. Action Step	Lobby for increased funding for EFP's and other farm stewardship incentive programs (refer to Biodiversity Strategy).	2013 & beyond	**Tile Drainage**	VF, UF, SF, RS, IW, LES	Documented increases in funding for EFP and similar programs	Ontario Nature, Stewardship Network of Ontario	t.b.d.
2. Objective	**Increase natural cover of all conservation target types through restoration by [realistic quantifiable target based on GIS analysis] by 2020, using existing Elgin Landscape Strategy and Elgin Greenway mapping (including rail, utility and riparian corridors).**	**ongoing**	**All**	**All**	Trend in extent of natural cover (by ecotype) measured by GIS relative to (2010 SOLRIS) baseline	**Elgin Stewardship Council, CA's, Tallgrass Ontario**	***t.b.d.***
2.1. Strategic Action	***Identify opportunities for restoration along abandoned rail lines.***	***December 2012***	***Habitat fragmentation, invasive species, fire suppression***	***PS, TF (primarily, although other ecotypes may be restored)***	*Demonstrated increases in natural cover and connectivity along rail lands relative to* 2010 SOLRIS *baseline*	***CCC***	***t.b.d***
2.1.1. Action Step	Determine where abandoned rail lands: a) are municipally-owned; b) are being turned over to landowners; c) where plans exist for other land uses (e.g., utility corridor).	December 2012	as above	***PS, TF***	as above	***CCC***	t.b.d.
2.1.2. Action Step	Prioritize sites for restoration based on opportunities (based on 2.3.1) and ecological values.	December 2012	as above	***PS, TF***	as above	***CCC***	t.b.d.
2.1.3. Action Step	Secure funding to undertake restoration projects at priority sites.	2013 & onwards	as above	***PS, TF***	as above	Elgin Stewardship Council, CA's	t.b.d.
2.1.4 Action Step	Implement restoration at priority sites.	2013 & onwards	*as above*	***PS, TF***	as above	Elgin Stewardship Council, CA's	t.b.d.
2.1.5. Action Step	Include signage, demonstration sites and other communication tools as educational component for each restoration project.	2013	as above	***PS, TF***	as above	Elgin Stewardship Council, CA's	t.b.d.
2.2. Strategic Action	***Identify opportunities for restoration on other lands (e.g., along Lake Erie coast, marginal agricultural lands, small fields, riparian corridors, ravines, gullies, wetlands, etc.).***	***2013***	***all***	***all***	*Documented increases in natural cover and SAR populations. (toward 30% natural cover target?)*	***CCC, CAP Team, Elgin Stewardship Council***	t.b.d.

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
2.2.1. Action Step	Review and update Elgin Landscape Strategy.	2012	***all***	***all***	as above	Elgin Stewardship Council, CA's	t.b.d.
2.2.2. Action Step	Prioritize sites for restoration based on opportunities based on ecological values.	2013	***all***	***all***	as above	Elgin Stewardship Council, CA	t.b.d.
2.2.3. Action Step	Implement restoration at priority sites	2013 & onward	***all***	***all***	as above	Elgin Stewardship Council, CA's	t.b.d.
2.2.4. Action Step	Include signage, demonstration sites and other communication tools as educational component for each restoration project.	2013 & onward	***all***	***all***	as above	Elgin Stewardship Council, CA's	t.b.d.
3. Objective	**Protect and enhance functional ecological linkages between and within existing core natural areas (measured using appropriate GIS methods and tools) by 2020 through securement using existing eco-linkage and natural heritage system mapping.**	**2020**	**Housing development / Habitat loss and fragmentation**	**VF, UF, SF, PS, TF, RS, IW, LES / Acadian Flycatcher, Crooked-stem Aster, Drooping Trillium, Eastern Foxsnake, Hooded Warbler, False Rue-anemone, American Chestnut**	Trend in extent of natural cover connectivity measured by GIS relative to 2010 SOLRIS baseline and Greenway mapping	**Thames Talbot Land Trust (TTLT), conservation authorities**	***conservation foundations, general public, federal and provincial agencies***
3.1. Strategic action	***Identify priority sites along Lake Erie shoreline and coastal riparian corridors (to within 5 km of coast) for securement (e.g., ANSIs, PSWs).***	***2012***	***Housing development***	***as above***	*GIS measure of lands under permanent protection; GIS measure of trend in natural cover over time.*	***TTLT***	***t.b.d. (TTLT)***
3.1.1. Action Step	Develop a set of defensible scientific criteria to help select priority securement areas along the Lake Erie coastline	2012	***Housing development***	as above	*as above*	TTLT, CCC, NCC	t.b.d. (TTLT)
3.1.2. Action step	Complete priority parcel mapping.	2012	***Housing development***	as above	*as above*	TTLT	CCC (Trillium Fund), NCC
3.1.3. Action step	Refine criteria to identify specific parcels of land for potential securement	2012 & beyond	***Housing development***	as above	*as above*	TTLT (confidential)	t.b.d. (TTLT)

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
3.2. Strategic action	***Coastal Ravines Area: Develop a multi-year program for land securement:***	***2011***	***Housing development***	***VF, UF, TS, RS, LES /* Acadian Flycatcher, Crooked-stem Aster, Drooping Trillium, Eastern Foxsnake, Hooded Warbler, False Rue-anemone, American Chestnut**	*GIS measure of lands under permanent protection; GIS measure of trend in natural cover over time.*	***TTLT***	***t.b.d. (TTLT)***
3.2.1. Action step	Integrate with TTLT's Strategic Plan 2010 goals for land securement.	2012	***Housing development***	as above	*as above*	TTLT	TTLT
3.2.2. Action step	Establish target for land securement (hectares)	2012	***Housing development***	as above	*as above*	TTLT	TTLT
3.2.3. Action step	Establish securement budget for 3.2.2	2012	***Housing development***	as above	*as above*	TTLT	TTLT
3.2.4. Action step	Establish fund-raising campaign for for 3.2.3	2012	***Housing development***	as above	*as above*	TTLT	TTLT
3.2.5. Action step	Undertake cost-benefit analysis of conservation parcel purchases.	2012	***Housing development***	as above	*as above*	TTLT	TTLT
3.2.6. Action step	Begin site securement.	2016	***Housing development***	as above	*as above*	TTLT / CA's	TTLT fund-raising (potential future Greenlands $?)
3.2.7.. Action step	Develop capacity to acquire and manage new lands through fund-raising and partnerships.	immediate & ongoing	***Housing development***	as above	*as above*	TTLT / CA's / Elgin Stewardship Council	t.b.d.

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
3.3. Strategic action	***Identify priority sites beyond 5 km of coast for securement (based primarily on Elgin Greenway mapping).***	***ongoing***	**Housing development / Habitat loss and fragmentation**	as above	*as above*		t.b.d.
3.3.1. Action step	Secure priority sites as opportunities arise.	ongoing		as above	*as above*	CA's, TTLT, Ontario Nature, NCC	CA, TTLT, Ontario Nature, NCC
3.4 Strategic Action	***Integrate TTLT's Coastal Ravines campaign with CCC's proposed Lake Erie Coastal Stewardship Trail***	***2012-***	**Housing development / Habitat loss and fragmentation**	***primarily VF, UF, TF, RS, LES***	*Action steps completed within timelines*	***CCC, TTLT***	t.b.d.
3.4.1. Action step	Map privately-owned natural areas along the coastal trail in Elgin County	2012-	as above	as above	*Mapping completed.*	*CCC, TTLT*	t.b.d.
3.4.2. Action step	Identify natural sites, if and when secured, might be suitable for visits by travellers along the coastal trail	2012-	as above	as above	*Sites identified.*	*CCC, TTLT*	t.b.d.
3.4.3. Action step	Develop vegetation management strategy along lakeshore roads	2012-	as above	as above	*Management strategy completed.*	*CCC, TTLT, municipalities*	t.b.d.
4. Objective	**Establish and manage functional ecological linkages between and within existing core natural areas by 2020 through stewardship at 60 project sites using Elgin Greenway CAP and existing natural heritage system mapping (CA's, Elgin Stewardship Council).**	**2020**	**Housing development / Habitat loss and fragmentation**	VF, UF, SF, PS, TF, RS, IW, LES	Trend in extent of natural cover connectivity measured by GIS relative to 2010 SOLRIS baseline and Greenway mapping	***CA's, Elgin Stewardship Council***	t.b.d.
4.1 Strategic action	***Identify priority sites along shoreline and coastal riparian corridors for stewardship (i.e., restoration, sustainable and ecologically-appropriate forest management and agricultural practices).***	***2012***	**Housing development / Habitat loss and fragmentation**	***VF, UF, TF, RS, LES, SF, PS, IW***	*as above*	***CA's, Elgin Stewardship Council, CCC Lake Erie Coastal Trail Initiative***	t.b.d.
4.1.1. Action step	Integrate mapping from CCC (Big Picture), CA's and Elgin Stewardship Council	2012	as above	as above	*as above*	CCC	t.b.d.
4.1.2. Action step	Implement stewardship projects at 80 sites.	2012-2018	as above	as above	*as above*	CA's, Elgin Stewardship Council	t.b.d.

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
5. Objective	**Develop an integrated communications and outreach strategy to inform Elgin residents and stakeholders regarding CAP themes and objectives, Lake Erie Coastal Trail and TTLT's Lake Erie Coastal Ravines Initiative. Will include education component re: shoreline erosion.**	**2013**	**All**	**All**	Measures: number of communications products produced; stakeholders and landowners reached; positive/negative responses; tangible actions and projects initiated as a result	**CCC, TTLT**	t.b.d.
5.1. Strategic action	***Design an education and outreach strategy for landscape-level and priority site stewardship.***	***2013***	**All**	**All**	*Outreach strategy developed.*	***CCC***	t.b.d.
5.1.1. Action step	Acquire funding to develop Elgin outreach and marketing strategy (e.g., collaborate with ALUS Bayham Township, theme-based sessions, township by township, "Communities in Bloom" - type program, bus tour, demonstration sites, agricultural fairs, targeting rural non-farm landowners).	2014	**All**	**All**	Funding acquired and strategy developed.	CCC (Coastal Program). CA's, Elgin Stewardship Council, OSCA, EFA, ALUS	t.b.d.
5.1.3. Action step	Identify and collaborate with existing relevant outreach programs (ESC, CA's, Environmental Farm Plan).	2013 and onward	**All**	**All**	Partnerships established.	CA's	t.b.d.
5.2. Strategic Action	***Reach 200 landowners with relevant site-specific information (re: stewardship) and opportunities for support.***	***2013 - 2018***	**All**	**All**	*200 landowners provided with relevant materials.*	CCC, CA's, Elgin Stewardship Council, OSCA, EFA	t.b.d.
5.2.1. Action step	Hold open houses and workshops as directed by Outreach Strategy (above) (focused – e.g., eroded ravines, connecting woodlots, SAR habitat).	2013 and onward	**All**	**All**	Open houses and workshops held (as quantified by Outreach Strategy)	CCC (Coastal Program), TTLT, CA's, Stewardship Council, OSCA, EFA)	$20K per township
5.2.2. Action step	Communicate via neighbour to neighbour / naturalist clubs / youth focus & clubs & stewardship rangers, Environment Leadership Program / interpretive nature hikes for local schools	2012 and onward	**All**	**All**		Local naturalists, TTLT, CCC, Elgin Stewardship Council	t.b.d.
5.3. Strategic action	***Lobbying, policy and legislation***	***2013-***	*All*	*as above*		***EFA, Ontario Nature***	t.b.d.

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
5.3.1.	CAP team to keep abreast of progress of ALUS program for Elgin.	***2013-***	*All*	*as above*			t.b.d.
6.0	***Undertake natural heritage inventory in order to update and fill gaps in relation to Species At Risk, significant habitats, invasive species and other important natural heritage features.***	**completed by 2016**	Addresses information gaps, contributes to strategic implementation of CAP	**All**	CCC, naturalist clubs, OMNR, ON	**OMNR, Naturalist clubs, Elgin County, CCC, BSC, TTLT, CA's, Ontario Nature, citizen science programs, universities and colleges**	**County? OMNR Species At Risk Research Fund / Species At Risk Stewardship Fund**
6.1. Strategic action	***Convene all potential partners to scope the project, identify roles, capacity and sources of support.***	***2012***	***as above***	***All***	*as above*	*as above*	*as above*
6.1.1. Action step	Secure funding, identify volunteer coordinators, etc.	2013	as above	all	*as above*	*as above*	*as above*
6.1.2. Action Step	Compile existing literature and data sources.	2013	as above	all	*as above*	*as above*	*as above*
6.1.3. Action Step	Develop survey protocols, methodologies, survey needs, etc.	2013	as above	all	*as above*	*as above*	*as above*
6.1.4. Action Step	Undertake land owner contact.	2013-2015	as above	all	*as above*	*as above*	*as above*
6.1.5. Action Step	Undertake inventory.	2013-2016	as above	all	*as above*	*as above*	*as above*
7. Objective	**Prevent and control the spread of new populations of high priority terrestrial invasive plant species at critical sites in Elgin County.**	**2012 & onward**	**Dog-strangling Vine, Giant Hogweed, Garlic Mustard, Autumn Olive, Common Reed (*Phragmites australis*)**	**VF, UF, PS, TF, RS, LES**	Trend shows improved FQA's undertaken at priority sites (e.g., SAR habitat) by consultants or volunteers	**Ontario Invasive Plant Council, County weed inspector, Ontario Phragmites Working Group, OMNR**	***t.b.d.***

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
7.1.Strategic Action	***Assemble existing information about extent and control methods of high priority invasive plant species***	***2012 & onward***	as above	as above	*as above*	as above	***t.b.d.***
7.1.1. Action Step	***Meet and coordinate with provincial and other groups/agencies***	2012 & onward	as above	as above	*as above*	as above	t.b.d.
7.1.2. Action Step	Compile existing literature and data sources.	2012	as above	all	*as above*	*as above*	t.b.d.
7.1.3. Action Step	Build knowledge base regarding Elgin occurrences of these species (e.g., through Natural Heritage Inventory and citizen science).	2012 & onward	as above	as above	*as above*	as above	t.b.d.
7.2.Strategic Action	***Provide educational materials re: problematic invasive species to local nurseries and the general public.***	***2012 & onward***	as above	as above	*as above*	as above	t.b.d.
7.3	***Implement invasive species control at high priority sites.***	***2013 & onward***	As above	As above	*As above*	As above	t.b.d.
8. Objective	**Reduce road mortality of small animals at key sites.**	**2013-2016 and onward**	**Road mortality**	**SAR birds, mammals, amphibians and reptiles**	Monitoring by volunteers demonstrates declines in roadkill numbers (reflecting increases or stabilization of living populations); methodology t.b.d.	**Leads and roles to be delegated through Natural Heritage Inventory group (naturalist clubs, OMNR, Ontario Road Ecology Working Group, Ontario Nature, Metro Zoo, Ontario Road Superintendents Association)**	t.b.d.
8.1. Action Step	***Map important road crossing sites for reptiles, amphibians and other terrestrial SAR in Elgin County.***	***ongoing & as part of NHI***	***as above***	***as above***	***as above***	***as above***	t.b.d.
8.1.1. ***Action Step***	Compile any existing roadkill databases pertaining to Elgin County.	2013	as above	as above	as above	as above	t.b.d.
8.1.2. ***Action Step***	Include roadkill reporting as part of Natural Heritage Inventory.	2013-2015	as above	as above	as above	as above	t.b.d.

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
8.1.3. ***Action Step***	Educate through meeting/presentation to Ontario Road Superintendents Association and municipal road authority (and involve them in gathering data).	2012	as above	as above	as above	CCC Social Marketing Program	t.b.d.
8.1.4. ***Action Step***	Educate general public and students (i.e., relevant school programs) regarding: 1) scale and impact of road mortality on at risk populations; 2) how to prevent road mortality; 3) building hibernacula and artificial nesting sites away from roads; 4) assisting movement of turtles across the road; 5) reporting roadkill and other sightings to Ontario Nature, NHIC, local conservation authority, etc.	2013-2014	as above	as above	as above	CCC? Stewardship Council, CA's, Ontario Nature	t.b.d.
8.1.5. ***Action Step***	Educate municipal officials re: road mortality issues, science, species identification and options for reducing impacts (e.g., signage, underpasses, seasonal road closures, reduced speed limits, etc.)	2015	as above	as above	as above	OMNR, CCC, CAP Team	t.b.d.
8.1.6. ***Action Step***	Encourage local naturalist clubs to include reptile, amphibian and SAR roadkill reports (and locations) as part of their regular reporting.	2012	as above	as above	as above	TTLT, naturalist clubs	t.b.d.
8.1.7. Action Step	Explore opportunities for road closures (seasonal or permanent) based on ecological criteria (e.g., from NHI) and levels of use.	2012-2016	as above	as above	as above	CAP Team	t.b.d.
9. Objective	**Improve roadside habitat for pollinating insects**	**2012**	**Declining pollinator populations, herbicides and insecticides (road maintenance impacts)**	**VF, UF, SF, PS, IW, LES**	Documented changes in roadside maintenance practices.	**CCC, Ontario Road Ecology Working Group, Elgin Stewardship Council, local partners**	t.b.d.
9.1.Strategic Action	***Encourage municipalities not to spray herbicides or mow roadsides until late autumn.***	***2012***	***as above***	***as above***	***as above***	***as above***	t.b.d.

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
9.1.1. Action Step	Explain cost-savings and that roadside maintenance goals can be achieved with fewer resources and expenditures.	2012	as above	as above	as above	CCC	t.b.d.
9.1.2. Action Step	Educate public regarding 9.1.1.	2012	as above	as above	as above	CCC	t.b.d.
10. Objective	**Improve forest habitat quality and reduce threats to priority species and community types.**	2012-2016	**Habitat loss and degradation due to incompatible forestry**	**UF, SF, TF, VF, PS, RS, LES, SAR forest interior birds**	FQA used by volunteers or consultants to monitor priority sites; documented changes/improvements to local forestry practices.	**Tree Commissioner, OMNR (MFTIP, CLTIP), Ontario Forestry Association,** Ontario Woodlot Owners Association, Elgin-Middlesex Woodlot Owners Association	
10.1.Strategic Action	***Promote best management practices (selective logging) for woodlot owners having priority species and communities on their lands.***	2012-2016	***as above***	***as above***	***as above***	***County tree commissioner, CA's, CCC, OMNR (MFTIP)***	***OMNR SAR Stewardship Fund, federal Habitat Stewardship Program***
10.1.1. Action Step	Identify key forest parcels based on NHIC, Elgin Landscape Strategy and other SAR datasets, as well as new information gathered during Natural Heritage Inventory.	2012-2015	as above	as above	as above	CAP Team	As above
10.1.2. Action Step	Provide appropriate educational materials to these landowners, and encourage them to participate in relevant forest management programs (e.g., MFTIP) and to join woodlot association(s).	ongoing	as above	as above	as above	CA's, Elgin Stewardship Council, Ontario Woodlot Owners Association, Elgin-Middlesex Woodlot Owners Association	As above

#	Objectives and Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	KEA / Monitoring	Potential Leads (Collaborators)	Costs / Funding Sources
11. Objective	**Manage problematic native species populations.** (specific actions to be prioritized based on Natural Heritage Inventory results)	**ongoing**	**Problematic native species (e.g., White-tailed Deer, Wild Turkey, Canada Goose)**	**VF, UF, SF, PS, TF, RS, IW, LES**	FQA used by volunteers or consultants to monitor priority sites; documented reductions in populations of problematic species.	**OFAH, OMNR, municipalities, "Elgin County stakeholders / hunters group", CAP Team**	***t.b.d***
12. Objective	**By 2015, develop a complementary strategy to promote sustainable agricultural practices in Elgin County.**	**2015-**	**Loss of prime agricultural land; Excess nitrogen in soil**	**Sustainable Agriculture; SA, TF, PS, RS, IW, LES, VF, UF, SF**	Trend in number of farmers participating in Environmental Farm Plans (EFPs), Alternative Land Use System (ALUS) and other stewardship initiatives.	**ALUS program; Elgin Federation of Agriculture (EFA); National Farmers Union**	***ALUS, EFP***
5.6. Strategic action	*Promote the expansion of ALUS-type program for Elgin County.*	*2013?*	*All*	*VF, UF, SF, PS, TF, SA, RS, IW*	*Number of landowners participating in ALUS-type program; trend in overall area (# of ha) benefitting from program*	*EFA, ALUS*	*t.b.d.*
13. Objective	***Develop a complementary strategy to promote eco-tourism in Elgin County.***	***2013***	***Tourism & recreational development***	***all***	*Ecotourism strategy developed*	***CCC (Coastal Trail Program), Elgin County***	***t.b.d.***
13.1.1. Action Step	*Contact tourism-related agencies and organizations about EGCAP/LECRI*	*2012*	*as above*	*as above*	*as above*	*Elgin County (tourism staff)*	*t.b.d.*
13.1.2. Strategic Action	Identify birding hotspots along coast	2012	as above	as above	as above	Bird Studies Canada, naturalist clubs	t.b.d.

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Appendix A
Elgin County Greenway Mapping Methodology

Scope

The project area is the County of Elgin. A 10km buffer was used in order to avoid exclusion of natural features falling just outside of the county, such as Clear Creek, Skunk's Misery, Dereham Wetland, First Nations' lands and South Dorchester Swamp. Any individual land use polygon with a centroid falling within Elgin County or its 10km buffer was included in the mapping analysis. Using this approach, entire polygons were either included or excluded; none were divided.

Data Layers

The data layer SOLRIS v1.2 was the primary component used to create the Elgin County Greenway Mapping. The Southern Ontario Land Resource Information System, or SOLRIS, was developed by the Ontario Ministry on Natural Resources (see document entitled Southern Ontario Land Resource Information System (SOLRIS) - Phase 2 - Data Specifications, Version 1.2, April, 2008) for details about this data layer.

Elgin County Greenway Mapping consists of two maps: 1) Priorities for Conservation and Restoration; and 2) Land Use Policy. Both are described in more detail below.

Map 1: Priorities for Conservation and Restoration

Goal of Map

The goal of the Priorities for Conservation and Restoration map is to provide a tool to guide restoration, stewardship and land securement in Elgin County.

Identification of Core Habitats

Areas of natural cover shown on the Greenway maps have been placed into one of the following categories: Priority 1 Core, Priority 2 Core, Priority 3 Core, or Supporting Natural Cover. The category indicates that area's ecological importance as part of the Elgin County Greenway. Areas categorized as Priority 1 Core are greater than 1500 hectares in size and represent the largest and most intact areas of natural cover in Elgin County. Areas categorized as Priority 2 Core are between 501 and 1500 hectares in size. Areas categorized as Priority 3 Core are between 200 and 500 hectares and, although smaller than Priority 1 and 2 Cores, nonetheless are an important part of the Greenway system, especially when they are located in areas without much overall natural cover. Areas categorized as Supporting Natural Cover are important as stepping stones between core areas.

The categorization of areas of natural cover was based on the overall size of each area. The assessment ignored all fragmenting features with a width of 25 metres or less (e.g., minor roads, trails, power lines). In other words, two or more areas of natural cover separated by a road 25 metres or less in width were considered to be one area. Also, adjacent areas of natural cover (e.g., an area of forest adjacent to an area of marsh) were treated as one area. The criteria are shown in Table A1.

Table A1: Criteria for Identification of Core Habitats

Category	Size (ha)	Fragmenting features
Priority 1	Core >1500	<25m
Priority 2	Core 501 - 1500	<25m
Priority 3	Core 200 - 500	<25m
Supporting Nature Cover	< 200	<25m

Stewardship Focus Areas

Stewardship Focus Areas were created by placing a 750 metre[1] buffer around all areas identified as Priority 1, Priority 2 and Priority 3 Cores. The intention of the Stewardship Focus Areas is to recognize the value of Cores that are in close proximity to one another, and to highlight areas between and surrounding core areas where opportunities to enlarge or connect core areas through restoration may exist.

Shoreline Buffer

The Shoreline Buffer is intended to emphasize the importance of the Lake Erie shoreline as an important corridor for migrating birds and other animals. The Shoreline Buffer was created by identifying all areas of natural cover within 0.6 km of the Lake Erie shoreline, then buffering these areas with a 1 km buffer[2].

Priority Headwater Streams

Watercourses designated as Priority Headwater Streams represent areas identified by the group as priorities for restoration.

Map 2: Land Use Policy

Goal of Map

The goal of the Land Use Policy map is to provide a tool to highlight priorities for land use policy in Elgin County.

Identification of Natural Heritage Features

The map indicates the locations of evaluated wetlands (PSW and non-PSW), Areas of Natural and Scientific Interest (Life Science and Earth Science ANSIs) and freshwater streams.

In addition, an analysis was conducted using the SOLRIS data layer to identify areas of forest and other natural cover that are likely to meet the suggested criteria for the identification of Significant Woodlands[3] in planning areas with 15-30% natural cover. All areas of natural cover > 20ha in size were identified, as were areas > 10ha in size that occur within 50 metres of a watercourse.

Footnotes and References

1. We used the definition of a wetland complex from the Ontario Wetland Evaluation System Manual

(May 1994 revised).
2. Evaluation by The Nature Conservancy of stopover sites for migratory birds in the western Lake Erie basin ranked undeveloped cover within 1.6km of the Lake Erie shoreline as high or very high for landbirds and raptors (Ewert, et al., 2006).
3. We used the size and water protection criteria from the Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 – second edition (March 2010).

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Appendix B:
Natural Heritage Designations – Elgin Greenway CAP Area

Natural Area Name	Natural Heritage Designation*	Size (ha)
Crane CA	Conservation Authority Area	3
Dutton-Dunwich CA	Conservation Authority Area	0.92
Feasby CA	Conservation Authority Area	7.8
E.M. Warwick CA	Conservation Authority Area	14
Dan Patterson CA	Conservation Authority Area	73.7
Dalewood CA	Conservation Authority Area	242
Union Pond CA	Conservation Authority Area	11.3
Confederation Park (Belmont CA)	Conservation Authority Area	8.5
Lake Whittaker CA	Conservation Authority Area	166.3
Kirk Cousins Management Area	Conservation Authority Area	46.1
Springwater CA	Conservation Authority Area	150
Archie Coulter CA	Conservation Authority Area	55
Yarmouth Natural Heritage Area	Conservation Authority Area	84
Port Bruce Provincial Park	Provincial Park	231
Port Burwell Provincial Park	Provincial Park	2
John E. Pearce Nature Reserve	Provincial Park	68
Elgin Crossroads Unconformity	Provincial Earth Science ANSI	0.18
Catfish Creek Till	Provincial Earth Science ANSI	640.13
Lake Erie Shorecliff (Malahide Formation / Bradtville / Boy Scout Camp)	Provincial Earth Science ANSI	61.76
Sparta Raised Beaches	Provincial Earth Science ANSI	77.48
Port Stanley Till	Provincial Earth Science ANSI	915.67
Elgin and Kent County Shoreline	Provincial Life Science ANSI	520 (124.11 in Elgin Co.)
Thames River Floodplain	Provincial Life Science ANSI	386.16 (within Elgin)
Talbot Creek	Provincial Life Science ANSI	461.58
Springwater Forest	Provincial Life Science ANSI	236.35
Big Otter Creek Valley	Provincial Life Science ANSI	411.33
Lakeview South	Regional Life Science ANSI	80
Mount Salem Forest	Regional Life Science ANSI	240
Big Otter Creek South of Bayham	Regional Life Science ANSI	~300
Catfish Creek Slope and Floodplain	Regional Life Science ANSI	170
West Lorne Woods	Life Science Site	380
West Lorne Woods Railway Prairie	Life Science Site	~1
Dutton-Dunwich Prairie	Life Science Site	10
Dunwich Prairie and Swamp	Life Science Site	250
Thames River Floodplain	Life Science Site	425
Allan Craig Woods?	Life Science Site	258
Talbot Creek	Life Science Site	551

Natural Area Name	Natural Heritage Designation*	Size (ha)
Kettle Creek Oxbow Marsh	Life Science Site	14.89
Catfish Creek Slope and Floodplain Forest	Life Science Site	942
Summers Corners Swamp Forest	Life Science Site	182
Bayham Townline Woods	Life Science Site	424
Little Otter Creek Valley	Life Science Site	338
Little Otter Creek Valley Complex	Life Science Site	1105
Little Jerry Creek	Locally Significant Life Science Site (proposed Bayham OP)	130
Iroquois Beach (within Port Burwell P.P.)	Locally Significant Life Science Site (proposed Bayham OP)	135
Thames River Floodplain – Wetland	PS Wetland	30
Talbot Rivermouth Swamp	PS Wetland	43.7
Kettle Creek Woods – Wetland	PS Wetland	60.77
Beaver Creek Wetland	PS Wetland	89.93
East Belmont Wetland	PS Wetland	1.6
Glenworth Wetland Complex	PS Wetland	35.57
Hawk Cliff Wetland	PS Wetland	21.56
Springwater Conservation Area (Central Elgin)	PS Wetland	3.14
Springwater Conservation Area (Malahide)	PS Wetland	45.37
Yarmouth Natural Heritage Area Wetland	PS Wetland	26.03
King/Smith Swamp	PS Wetland	32.23
West Dutton Woodlot	PS Wetland	186.3
Aylmer Wildlife Management Area	PS Wetland	22.05
East Belmont Wetland	PS Wetland	25.38
Allen White Wetland	PS Wetland	2.69
Southwold Woods Swamp	PS Wetland	11.49
A2 Tait's Bush	PS Wetland	7.09
Brock Creek Wetland	PS Wetland	32.55
Buttinger Swamp	PS Wetland	61.06
Eagle Woodlot	PS Wetland	158.16
Ferndell Complex	PS Wetland	68.76
Heron Woods Complex	PS Wetland	72.04
New Glasgow Woodlot	PS Wetland	32.84
North Rodney Woodlot	PS Wetland	150.37
Reive Bog	PS Wetland	42.72
South Rodney Woodlot	PS Wetland	36.06
Taylor Pond Complex	PS Wetland	89.69
West Lorne Woodlot	PS Wetland	179.05
Elgin Nature Reserve Wetland Complex	PS Wetland	67.76
Silver Creek Wetland Complex	PS Wetland	122.06
Calton Swamp Wetland Complex	PS Wetland	62
Dexter Woodlot	Other Wetland	11.08
EY1	Other Wetland	6.93

Natural Area Name	Natural Heritage Designation*	Size (ha)
EY10	Other Wetland	4.27
EY15	Other Wetland	2.36
EY24	Other Wetland	1.25
EY6	Other Wetland	19.06
EY9	Other Wetland	2.15
Avon Wetland	Other Wetland	27.87
EM11/EM18	Other Wetland	28.78
EM19/EM6	Other Wetland	11.11
EM7	Other Wetland	15.84
EM8	Other Wetland	3
ESD5	Other Wetland	1.6
EY6	Other Wetland	1.02
MN4	Other Wetland	3.27
Van Roeseted Swamp	Other Wetland	8.71
DeDeckere-Lindsay Swamp	Other Wetland	4.87
ES1 Wetland	Other Wetland	13.59
ES2	Other Wetland	3.49
Port Stanly Poison Sumac Swamp	Other Wetland	6.86
Sloan's Wetland	Other Wetland	15.64
Thomas Swamp	Other Wetland	12.33
A5	Other Wetland	5.80
AL17	Other Wetland	17.36
Howse Buttonbush Swamp	Other Wetland	18.7
Port Glasgow Woodlot	Other Wetland	9.11
Simpson's Bush	Other Wetland	5.39
Talbot River – Wetland	Other Wetland	480
Catfish Creek Slope and Floodplain Forest	Carolinian Canada Site	204.3
Little Otter Creek Valley Forest	International Biological Program	97.1
Thames River Floodplain	International Biological Program	20.2
Catfish Creek Sand Slope and Flood Plain	International Biological Program	20.2
Southwest Elgin Forest Complex	Important Bird Area	13,595
Ekfrid Forest CA (outside CAP, within 10km buffer)	Conservation Authority Area	41
Big Bend CA (outside CAP, within 10km buffer)	Conservation Authority Area	16
Hawkins Tract (outside CAP, within 10km buffer)	Conservation Authority Area	40

*ANSI = Area of Natural and Scientific Interest, PS = Provincially Significant

APPENDIX C. RECOMMENDED ACTIVITIES IN SELECTED SPECIES AT RISK (SAR) RECOVERY STRATEGIES RELEVANT TO ELGIN GREENWAY CAP

Bolded activities are part of the CAP

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	**Carolinian Woodlands**	**Acadian Flycatcher / Hooded Warbler**	**American Chestnut**	**Butternut**	**Hooded Warbler**	**Red Mulberry**	**Eastern Hog-nosed Snake**	**Tallgrass**
Recovery Strategy Status (A=available; AP=part of ecosystem strategy; D=Draft)	**D**	**A**	**A**	**A**	**A**	**A**	**A**	**D**
Habitat	**FW**	**FW**	**FW**	**FW**	**FW**	**FW**	**FW, PS, TE**	**PS**
Habitat Threats / Viablity Assessment	H					H	H	
Update NHIC & central databases				H			H	X
Inventory			H	H		M	H	X
Standardized habitat classification & mapping				M		H	H	
Identify priority sites & landowners	**H**							**X**
Review land uses								
Ecosystem modeling								
PVA / MVP				M		M		
Investigate recreational impacts	H							
Investigate Invasive plant Impacts	H			L				
Investigate invasive aquatic spp. Impacts								
Locate & monitor disease-resistant plants			L	H				
Research mechanisms to control disease			H	M				
Investigate deer impacts	H							
Investigate Wild Turkey Impacts								
Investigate invasive insect impacts	H							
Investigate baitfish harvest impacts								
Investigate impacts of alterations to drainage	H							
Survey with other SAR							H	
Gather TEK / ATK				M				
Investigate commercial Supply & Demand							L	
Demographic, genetic studies, dispersal, pop`n modeling				M		M	H	
Investigate impacts of contaminants							L	
Investigate climate change impacts								
Crayfish surveys								
Investigate conservation tillage, sustainable agriculture, soil restoration								X

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	**Carolinian Woodlands**	**Acadian Flycatcher / Hooded Warbler**	**American Chestnut**	**Butternut**	**Hooded Warbler**	**Red Mulberry**	**Eastern Hog-nosed Snake**	**Tallgrass**
Investigate reintroduction opportunities						M		
Investigate Best Management Techniques	H							X
Investigate existing management at sites								
Monitor Management Techniques		X						
Ensure confidentiality of EO data								
Initiate Public Reporting Program				H			H	
Manage for habitat mosaics								
Develop & Apply Monitoring protocol	H		H	H		M	H	X
Monitor slumping impacts								
Develop & Distribute BMPs	H	X	M				H	X
Input into Official Plans, etc.	**H**					**H**	**H**	**X**
Develop appropriate EIS guidelines	H							
Identify key restoration sites	**H**					**M**		**X**
Restore sites using appropriate techniques	H	X						X
Restore historic sites								X
Restore / maintain habitat linkages	**H**					**M**		**X**
Encourage cover crops	M							
Restrict livestock access	M							
Encourage low tillage	M							
Support habitat improvement projects								X
Support development of EFPs	M							
Expand / Enhance Forest Interior	H	X						
Identify / Increase Older Growth Forests	M	X						
Develop & Distribute Appropriate Forest / Woodlot Management Guidelines	H	X		H				
Reduce Forestry Impacts	H	X						
Develop Guidelines for Managing Succession in Conifer Plantations		X						
Develop & implement management plans	**H**					**H**		**X**
Signage							H	
Reduce invasive species impacts	H					H		
Reduce trail / off-trail impacts	H							
Encourage natural shoreline processes								
Ensure natural water supply and flow regimes								
Collect seed and propagate plants			M	H		M		
(Re-)introduce to enhance populations			L			M		
Liaise with First Nations							X	X
Collaborate with other conservation initiatives	H					M		X

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	**Carolinian Woodlands**	**Acadian Flycatcher / Hooded Warbler**	**American Chestnut**	**Butternut**	**Hooded Warbler**	**Red Mulberry**	**Eastern Hog-nosed Snake**	**Tallgrass**
Integrate SAR communications	H					H	X	X
Integrate SAR enforcement				H			X	
Apply / Promote Property Tax Incentives	H	X						X
"Soft" Incentives to Protect Forest Habitat		X						
Secure Key Sites through Easements and Acquisition		X					X	X
Use Carbon Offset Programs to Increase Habitat		X						
Forest Certification		X						
Prepare landowner rights & trespass materials								
Prepare & Distribute Educational Materials	H	X	L	H				X
Educate Commercial interests (pet trade, nurseries, horticulturalists, landscapers)	H					H	X	
Conduct Information Sessions	H	X						
Deer population control	H							
Support development of protective legislation	**H**							**X**
Develop / improve protective policies	**H**			**M**				
Recognize good stewards								X
Develop communications strategey		**?**		**H**		**H**		**X**
Rank / evaluate conservation methods	**H**							
Restrict movement of plants	M		L					
Establish Tallgrass Institute, maintain Tallgrass Ontario								X
Partnerships with academia	H							
Training program for conservation practioners	H							
Update Big Picture / NH mapping	H							
Determine effective invasive spp. Controls	H							
Community-based CAPs	H							
Evaluate & improve protected area management	M							
Promote better controls at border crossings	M							
Support environmental lobbying	**M**							

APPENDIX D. SPECIES-SPECIFIC THREATS TO ELGIN GREENWAY SAR.
O=Ontario-wide threats, OE=Ontario-wide threats also documented in Elgin County.

ELEMENT	Associated Conservation Target(s) (see Table 1.5 for key to codes)	Habitat Fragmentation	Habitat Loss	Degradation of Habitat	Incompatible Forest Management	Changes to natural succession	Disease	Changes to Hydrology	Disturbance (Recreation, Construction or Maintenance)	Accidental Mortality	Discriminate Killing, Collection, Harvesting	Pollution	Road Mortality	Excessive Predation, Parasitism or Herbivory	Competition with Introduced Species	Hybridization with Introduced Species	Comments
Acadian Flycatcher	1. VF; 2. UF; 3. MF	O E	O E	O E	O E		O?	O	O E					O E			Limited by availability of suitable habitat; Incompatible Forestry: diameter-limit harvesting, canopy opening; Brown-headed Cowbird nest parasitism; Predators?
American Badger	1. PS; 2. TF; 3. AG; 4. VF	O E	O E				O			O E?	O E?		O E	O E?			Limited by low population density and large home ranges, low reproductive capacity, presence of deep sandy soils suitable for dens; reduced prey availability; predation by coyotes and domestic dogs; incidental trapping; canine distemper and tularemia
American Chestnut	1.UF; 2. VF; 3. AG		O E	O E	O		O E		O			O				O	Main threat is **Chestnut blight (*C. parasitica*)**; Limited by self-incompatible breeding system and low seed dispersal
American Water-willow	1. RS; 2. IW; 3. LES?		O	O				O	O			O		O	O		Limited by specialized habitat requirements, climate, and dynamic population fluctuations; invasive species (*Phragmites*, hybrid cattail, Reed Canary Grass); erosion (boat traffic); changes to shorelines, rivers, or lake beds; lowering pH to less than 5.5; industrial pollution; changes to nutrient levels; dams; herbivory (white-tailed deer) *Note: Only known population is protected at Port Burwell PP.*
Bald Eagle (STATUS REPORT NOT AVAILABLE)	1. MF; 2. UF; 3. LES; 4. RS; 5. IW		O E				O? E?		O E		O E	O E					Limited by availability of nest sites (large tall trees) and naturally low reproductive output; Pollution (mercury, lead, pesticides); disturbance during nesting; disease (botulism?)

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Black Redhorse	4. RS			O				O		O	O	O		O	O		Limited by specialized habitat requirements; bank alteration; run-off; drainage pattern/rate changes; sewage disposal; chemicals/pollution; dams and impoundments (may not use fishways); incidental harvest; introduction of sport fish (predators or competitors) *Note: No recent records in Elgin County, however it is difficult to identify this species; creel surveys often do not identify redhorses to species.*
Blanding's Turtle	1. IW; 2. RS; 3. LES; 4. UF 5. TF? 6. VF?	O E	O E	O E			O? E?				O E	O E	O E	O E			Limited by naturally low recruitment, low dispersal, long generation time; road mortality (female-biased); availability of nesting habitat; unusually high levels of predation (esp. nests); fragmentation and isolation of populations (roads/urbanization)?; sarcophagid fly infestation of nests?
Blue Ash (STATUS REPORT NOT AVAILABLE)	1.Rich floodplain forests (VF? RS?MF?); 2.PS (alvars); 3.TF		O		O E			O?						O			Indiscriminate forestry; livestock grazing prevents seedling establishment; low reproduction at some sites (cause not identified)
Broad Beech Fern (STATUS REPORT NOT AVAILABLE)	1. MF		O E		O E			O E	O								Trampling during maple sugar operations; damage to plants and habitat during forestry operations; Limited by low tolerance to environmental changes.

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Butternut	1. RS; 2. UF?; 3. VF?; 4. TF? occasionally found along roads through forests, along forest edges, in clearings (wherever enough sunlight to support seed regeneration)	O	O E		O E		O E				O			O E		O	Main threat is **butternut canker**; Limited by short life-span, short dispersal distance, low genetic diversity, specific conditions for regeneration; incompatible forest management: intentional harvesting (in anticipation of disease), indiscriminate removal of trees that have canker (prevents natural development of resistance), indiscriminate silvicultural practices; diseases and pests; excessive seed predation; hybridization with exotic Juglans species
Cerulean Warbler	2. UF	O E	O E		O E							O		O E?			Limited by high breeding site fidelity and threats in wintering grounds; acid rain; stream pollution, Forestry practices: remove most mature trees and open canopy (diameter-limit /diameter-cut, maintaining young, even-aged stands through short rotations); brown-headed cowbird brood-parasitism; light pollution, Forest pests? (emerald ash borer? Tent caterpillar? Gypsy moth?) disease? (oak wilt)
Chimney Swift	Food: IW, RS, LES natural nest sites: VF, MF, UF		O	O			O?		O	O		O	O	O	O		Loss or degradation of nesting and roosting sites (changes to chimneys, loss of large-diameter hollow trees); reduced abundance and quality of prey; bioaccumulation of pesticides; disturbance during breeding period (nest removal, chimney sweeping); competition with European Starlings for nest sites; accidental mortality (asphyxiation or burns in chimney); road mortality; predation; West Nile Virus (tested positive in US) *Note: NHIC does not have any records from Elgin County. Threats likely similar to rest of province.*

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Colicroot	6. PS; 7. TF		O E	O E		O E			O	O	O?				O E		Limited by availability of suitable habitat, low dispersal ability, does not survive transplantation (possible obligate symbiotic relationship with mycorrhizal fungus); absence of natural or prescribed fire; garbage/fill dumping; mowing (accidental mortality); harvesting (in US)
Common Five-Lined Skink	1. UF; 2. PS; 3. LES'	O E	O E	O E		O E?			O E		O E		O E	O E?			Limited by availability of sandy substrates used for overwintering; vegetation succession (suppression of fire/other disturbances?); subsidized predators
Common Hoptree	1. LES;		O			O?								O	O E		Dioecious, requires cross-pollination, sex ratio skewed towards males; cottage development; beach grooming; deer browsing; Double Crested Cormorant nesting colonies (may also benefit hoptree by opening canopy to create more habitat); twig boring beetle; fire suppression or beach stabilization? *Note: Documented populations all protected in provincial parks.*
Common Snapping Turtle	1. IW; 2. RS; 3. LES;	O E	O E	O E			OE?			O	O E	O E	O E	O E			Limited by life history characteristics (late maturity, long lifespan, low recruitment, reliance on low adult mortality) and climate; road mortality (female-biased); fragmentation (roads); high nest predation rates; harvesting for food or fish bait; incidental mortality (angling activities, boats); damage or destruction of nests (gravelling, grading); sarcophagid fly infestation of nests?

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Crooked-stem Aster	1. RS; 2. VF (edge); 3. TF (forest edge and roadsides)		O E	O E	O E			O E	O E						O E		Limited by semi-obligate out-breeding system (requires genetically different individuals to produce seed); Forestry: clear-cutting, heavy selective timber harvesting, damage; erosion due to tile drainage or other agricultural activities; garlic mustard; trampling by off-road vehicles *Note: 19 of 22 known populations in 1999 Status Report found in Elgin County*
Dense Blazing-star	1. PS; 2. IW		O E			O E		O E	O			O E		O E?	O E	O E?	Limited by climate and lack of disturbance (e.g. fire); over-grazing; hybridization and genetic erosion (cultivated varieties available at garden centres); herbicide application; mowing
Drooping Trillium	1. VF; 2. MF	O E	O E	O E				O	O E?		O? E?			O? E?	O E		Limited by low dispersal ability, low seed production, climate; excessive opening of canopy; dumping; decreased soil moisture; exotic earthworms; herbivory/browsing/grazing?; garlic mustard; honeysuckles *Note: selective logging at one Elgin site*
Eastern Flowering Dogwood	1. UF; fencerows and roadsides	O E	O E	O E	O E	O E	O E							O E			Main threat is **dogwood anthracnose fungus**; fire suppression and forest succession (closed canopy results in reduced EFD vigour and encourages fungal growth); reduced probability of seed dispersal; restricted gene flow (possibly reducing ability to develop natural resistance to anthracnose); insects and pests

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Eastern Foxsnake	1. IW; 2. PS; 3. TF; 4. MF; 5. RS; 6. LES; 7. VF; 8. UF; 9. AG? (anthropogenic features, not cropland)	O E	O E	O E					O E	O	O E	O E	O E	O E			Limited by fidelity to hibernacula, communal use of hibernacula, number of suitable hibernacula available; alteration of distribution of wetland/forest/field mosaics; roads and other barriers; disturbance of hibernacula or nests; accidental mortality from human activities; loss of suitable microhabitats (shedding sites) and replacement with less suitable anthropogenic features; limited availability of natural oviposition sites (reliance on compost piles leads to mortality)
Eastern Hog-nosed Snake	1. LES; 2. RS; IW; TF; UF; PS	O E	O E	O E							O E	O E	O E	E?			Limited by prey specialization, climate, low population densities; roads; pesticides (reduced fitness and reproductive success, prey abundance)
Eastern Musk Turtle (Stinkpot)	1. IW, 2. RS,		O E					O		O E	O	O E					Egg and hatchling survival vulnerable to weather extremes and flooding; shoreline development and wetland drainage; accidental mortality (angling activities, boats); killing by anglers when caught
Eastern (Northern) Ribbonsnake	1. IW; 2. RS; 3. LES: 4. VF; Nesting: TF, PS, UF		O E	O E				O E		OE?	O E		O E	O E			Limited by habitat (ponds/wetlands bordered by dense vegetation) and prey specialization (amphibians); declines in prey abundance; boat mortality?; subsidized predators; Lack of suitable habitat in Elgin?
Eastern Prickly Pear Cactus	1. LES, 2. PS, 3. TF		O			O					O						*Note: No known extant native occurrences in Elgin County. Literature report from 1922 (1924?): Area is now under intensive agriculture. The only known native occurrences in Ontario are in Essex County (Point Pelee National Park) and Pelee Island. Cultivated varieties available from some garden centres.*

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Eastern Sand Darter	1. RS; 2. LES; 3. IW (lakes); 4. AG?			O				O		O		O			O		Limited by strong preference for sandy substrates (not silt or cobble); increased siltation; impoundments; stream channel and flow modifications; excessive nutrient enrichment and turbidity; round goby; incidental harvest in commercial bait fisheries; aquatic insecticides (reduce prey abundance) *Note: Not observed in Catfish Creek or Big Otter Creek in more than 50 years despite repeated sampling efforts; presumed extirpated. Nearest extant populations Grand River, Big Creek, Long Point Bay, and Rondeau Bay. Extant populations in the Thames River are part of the Lake Huron drainage.*
False Hop Sedge	1. UF; 2. MF;		O E	O E	O E			O E				O E					Limited by availability of sunlight and climate; drains; dams; agricultural runoff *Note: Habitat loss and degradation in Elgin – logging at 2 sites, agriculture, and residential development at 3 sites*
False Rue-anemone	1. VF; 2. MF; 3. TF (hedgerows)		O E	O E	O E				O E			O E			O E		Soil compaction; pesticides; herbicides; road salt; garlic mustard; goutweed

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Fowler's Toad	1. LES; 2. IW and RS near lake	O	O	O			O		O	O		O	O	O?	O		Limited by amount of available suitable habitat, naturally high mortality, short life span, low genetic variability; artificial shoreline stabilization; removal of beach sand (fill); beach compaction; invasive plant species (Common Reed, Silver Poplar, Crown Vetch, Kentucky Bluegrass); accumulation of Zebra mussel shells; draining or filling of wetlands; mortality due to beach cleaning activities; botulism; pesticides and industrial contaminants; subsidized predators; potential hybridization with American Toad *Note: No known extant populations in Elgin County. Nearest extant populations are on Long Point an d at Rondeau Provincial Park.*
Gray Ratsnake	1. UF; 2. TF & PS; 3. IW	O E	O E	O E						O E	O E		O E	E?			Limited by fidelity to hibernacula, communal use of hibernacula, number of suitable hibernacula available, life history features; loss and change in configuration of habitat mosaic; road density; accidental mortality (due to agricultural and construction machinery, lawnmowers, off-road vehicles, boats); disturbance or destruction of hibernacula (aggregate extraction, road construction, high density residential development); collection for pet trade *Note: insufficient suitable habitat remaining in Elgin to support viable population?*
Green Dragon	1. VF; 2. RS (forest and thicket)		O					E			O				E		Limited by climate; collection; changes in hydrological regime (1 site in Elgin noted as too dry to support females); garlic mustard

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Henslow's Sparrow	1. PS; 2. TF; 3. RS (low-lying seasonally flooded areas); 4. AG	O E	O E	O E		O			O E	O				O E			Area-sensitive species (min 50ha; prefer >100ha); changes in agricultural practices (continuous use of fields without fallow years; earlier and more frequent hay cutting); over grazing or mowing; fire suppression and vegetation succession; habitat disturbance early in breeding season; nest and fledgling mortality from mowing during breeding season (late in summer may be acceptable); susceptible to catastrophic disturbance due to small population size, clumped distribution, and semi-colonial breeding behaviour; subsidized predator populations; Brown-headed Cowbird nest parasitism (low threat); competition for breeding habitat (other sparrows, Bobolink, Red-winged Blackbird)
Hill's Pondweed	1. IW		O	O				O				O			O		*Note: Only known population from Elgin believed to be extirpated (COSEWIC Status Report).*
Jefferson Salamander	1. UF, MF. 2. IW	O E	O E	O E				O	O	O	O	O E	O E	O			Limited by availability of vernal pools or fishless wetlands in woodlands and loose, moist soils in woodlands for burrowing; disruption, alteration, or diminishment of surface water hydrology and groundwater; barriers to migration; desiccation of migrating adults on roads; road salt; introducing carnivorous fish to breeding ponds *Note: Only one confirmed occurrence in Elgin County (2 larvae from eggs)*
Hooded Warbler	1. UF; 2. VF	O E	O E		O E		O	O	O E					O E			Limited by availability of habitat; Forestry (diameter-limit forest harvesting); Brown-headed Cowbird nest parasitism; disease

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Kentucky Coffee-tree	**1. RS; 2. IW; 3. TF (hedgerows, edge)**	O	O	O	O			O		O				O		O	Limited by climate, lack of suitable habitat, low genetic diversity (only 2 sites in Canada produce seed, most sites are single-sex clones); livestock grazing; Double Crested Cormorant colonies; introgression of non-native cultivars; dams and water flow regulation (may affect seed dispersal); roadside maintenance activities *Note: No known native occurrences in Elgin County (but recorded from all neighbouring counties). Introduced at Fingal Wildlife Management Area.*
Large Whorled Pogonia	**1. UF**	O	O	O	O				O		O	O			O		Limited by lack of suitable habitat (forests with soil pH between 4.2 and 5.1) and highly specialized reproductive biology; change to soil processes from introduced species (earthworms, garlic mustard) and air pollution; herbivory by white-tailed deer *Note: No known sites for Elgin County. Records from Skunks Misery (Middlesex), Fowlers Ponds (Oxford) and Backus Woods (Norfolk); 1984, 1987, 1989, 1993.*
Laura's Clubtail	1. RS; 2. VF; 3. AG?		O	O								O	O	O	O		Water quality degradation: agricultural (non-point source), industrial, and municipal pollution; siltation; decrease in dissolved oxygen content; water level regulation; channelization; loss/removal of riparian vegetation; water removal for irrigation and other uses; invasive aquatic species (Round Goby, carp, rainbow trout); road mortality; inbreeding *Note: Only 2 known extant occurrences in Canada, 1 of which is in Elgin County (Big Otter Creek, between Calton and Tillsonburg). The other occurrence is in Norfolk County (Big Creek).*

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Least Bittern	1. IW	O	O	O		O	O	O	O	O		O	O	O			Draining/filling of wetlands; Biomagnifications of agricultural and industrial chemicals (eggshell thinning); invasive species replace cattails (used as nesting material); succession to drier habitat; natural succession from wetland to upland; disease, parasites (semi-colonial); vehicular collisions; wake from boats floods nests, degrades foraging habitat
Louisiana Waterthrush	1. VF; 2. MF	O	O					O				O		O			Limited by availability of suitable habitat; Swamp drainage; Reservoir development; Fluctuating water levels; Siltation; Brown-headed Cowbird nest parasitism
Massasauga	All targets	O	O								O		O				Low population numbers; isolation *Note: No known extant occurrences in Elgin County*
Milksnake	All targets		O	O							O		O	O			Persecution
Monarch	1. TF; 2. PS (any open areas with milkweed and nectar sources)		O									O	O?				Limited by degradation and loss of wintering grounds; disturbance during migration; herbicides reduce/eliminate larval foodsource (milkweed) and adult foodsources (wildflowers); Bt?; Road mortality?
Northern Bobwhite	Mix of PS, TF, AG, UF	O	O	O							O			O		O	Alteration of relative proportions and/or distribution of grassland/forest/field mosaics; roads and other barriers; severe winters with heavy snow cover (buries food); predation by cats; hunting; interbreeding with imported/domestic NOBO *Note: Once considered abundant in parts of Elgin County. No known extant native occurrences.*

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Northern Madtom	1. RS			O								O			O		Sensitive to poor water quality; Competition from exotic fish species
Northern Map Turtle	1. LES; 2. RS		O E					O E	O E	O E	O E	O E					Development, shoreline hardening; dams, control of water levels (submerge nest sites, alter habitat); Heavy metals and other toxins
Prothonotary Warbler	1. MF	O E	O E		O E			O E				O E?		O E			Pesticides, agricultural runoff, water pollution (mainly in wintering areas); drainage of swamp forests; Brown-headed cowbird nest parasitism; competition for nest sites with wrens and other species
Purple Twayblade	1. PS; 2. UF		O E			O					O E	O E?					Will grow in partial shade but not full shade; habitat loss due to vegetative succession; pesticides *Note: only 2 records for Elgin County. One was in a pine plantation.*

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Red-headed Woodpecker	1. TF; 2. UF; 3. PS; 4. VF; 5. RS; 6. MF? 7. AG? Open areas with a high density of dead or unhealthy trees Winter: open, mature woodlands with abundance of acorns and beechnuts		O E		O E							O E	O E				Limited by availability of preferred habitat (mature, open oak and beech forests); loss of nesting and roosting sites (dead trees); Beech-bark disease (reduces food supply); Pesticides and industrial chemicals; lack of suitable habitat in Elgin?
Riddell's Goldenrod	Wet prairie-like sites and roadside ditches 1. PS; 2. RS; 3. TF		O						O	O							Roadside and ditch maintenance; small, isolated populations (susceptible to habitat disturbance) *Note: Only 1 record for Elgin County*
Shumard Oak	1. MF; 2. TF		O E		O? E?	O E						O E					Limited by requirement of full sunlight for seedling establishment; clearing of hedgerows/ fencerows to accommodate larger agricultural equipment; herbicides; mowing; canopy closure *Note: Only 2 records for Elgin County*
Silver Chub	1. LES; 2. RS			O E													Low dissolved oxygen levels; water temperature fluctuations; Eutrophication? (Lake Erie populations recovered after introduction of Zebra Mussel) *Note: Only 1 record for Elgin County*

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Small White Lady's-slipper	1. MF (Elgin); 2. IW; 3. TF; 4. PS Historic: PS		O E			O E					O E				O E		Limited by lack of optimal habitat; collecting; invasive species (leafy spurge, St. John's wort); low genetic diversity, isolation of populations; fire suppression and discontinuance of grazing *Note: Only 1 record for Elgin County*
Small Whorled Pogonia	1. MF; 2. UF			O E					O E		O? E?			O? E?			Limited by lack of available suitable habitat?, low reproductive rates, sensitivity to habitat disturbance, complex life history and extended dormancy; increased light reaching forest floor; competition from herbaceous layer; loss of genetic diversity; herbivory by white-tailed deer and molluscs (in US); collecting and associated trampling (in US) *Note: Calton Swamp has the only known occurrence of Small Whorled Pogonia in Canada*
Southern Flying-squirrel	1. UF	O	O											O			Area sensitive – will not use small, isolated woodlots; competition with Grey Squirrel *Note: Known to be extant in Norfolk County*
Spiny Softshell	1. LES; 2. RS (in Elgin County. In rest of range, order would be reversed)	O E	O E	O E			O E	O E?	O E	O E	O E	O E		O E			Limited by prey specialization (crayfish and molluscs); main threat is habitat degradation (alteration of nest sites by/for human recreation, shoreline hardening, disturbance from construction projects; disturbance during nesting; fragmentation by dams; decline in crayfish and mollusc (mussel?) populations; subsidized predators; sarcophagid fly infestation of nests; environment contamination; high numbers of infertile eggs at some Ontario sites; accidental mortality (angling and hunting activities, collisions with watercraft); egg poaching

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Spoon-leaved Moss	1. VF; 2. MF	E	O E	E		O						O? E?			O? E?		Limited by low diaspore production, low dispersal, habitat specificity, may benefit from a milder climate due to climate change; pesticides? road salt? air pollution? garlic mustard?
Spotted Turtle	1. IW; 2. RS; 3. TF; woodland streams		O E	O E		O E					O E		O E	O E			Limited by slow growth rates, delayed maturity, naturally low nest and juvenile survivorship, relatively small clutch sizes; Hibernate communally (susceptible to collection and mortality of large # of individuals); natural succession; Phragmites; overgrazing by livestock
Swamp Rose Mallow	1. LES (coastal marshes); 2. IW; 3. RS; 4. TF hydro corridor		O E					O E	O E						O E		Drainage and development of wetlands; roadside and utility corridor maintenance; invasive species (*Phragmites*, Black Alder), strangling by grapevines
Western Chorus Frog (Carolinian population)	All types of terrestrial habitat near breeding ponds (IW, TF, PS, AG, UF, MF) Breeding ponds: temporary ponds and wetlands that become dry in summer (TF, IW, MF)	O	O E	O E	O E	O E		O E				O E		O? E?			Limited by low dispersal ability, high site-fidelity to natal ponds, large, natural, annual fluctuations in population size; draining and filling of breeding ponds; nitrates and pesticides; reforestation and vegetative successions; introduction of fish to breeding ponds?

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Willowleaf Aster	1. PS; 2. TF; 3. RS?	O E	O E			O E		O	O E						O E		Requires cross-pollination (semi-obligate outbreeding); loss of genetic diversity; reduced seed production; changes in species community and increased competition; fire suppression; mowing; herbicides; dredging; invasive species (Black Locust, Common Buckthorn, Phragmites, White Sweet Clover) *Note: Only 1 record for Elgin County; in railway corridor, noted as being common at that site.*
Woodland Vole	1. UF	O	O										O?	O			Limited by climate and short life span; low population densities; road mortality? (fossorial, may not be a significant threat)
Yellow-breasted Chat	1. TF; 2. RS		O E			O E								O E			Limited by lack of available suitable habitat; Brown-headed Cowbird nest parasitism (low)