Rondeau – Erie Coast Conservation Action Plan (CAP)

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&
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Background & Rationale

Carolinian Canada Coalition's Big Picture Vision

The Rondeau – Erie Coast Conservation Action Plan (CAP) area 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. Green, healthy landscapes are essential to human quality of life and economic prosperity. Conservation efforts in the past have focused on "islands of green" on landscapes where human uses and activities prevail. In 1984 Carolinian Canada Coalition identified 38 critical natural areas across the ecoregion needing urgent action. But our scientific understanding has evolved and we now know that these "islands of green" cannot exist on their own. To remain viable they must be connected one to another in a "natural heritage system". Natural heritage systems are critical for maintaining the quality of our water and air, for species movement, and for adapting to climate change. In 2000, Carolinian Canada's "Big Picture" analysis identified such a natural heritage system of core natural areas and connecting corridors.

The "Big Picture" continues to inform and complement the natural heritage planning being done by municipalities, conservation authorities, and provincial and federal departments. Carolinian Canada is working to update the Big Picture with new information, and find ways to monitor how well we are doing to achieve this vision.

Conservation Action Planning in Canada's Carolinian Life Zone

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, 67 percent of Canada's terrestrial reptiles, half of the nation's bird species, and equally impressive proportions of other taxonomic groups. At the same time, one quarter of Canada's population lives in the region, our country'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 the Municipality of Chatham-Kent at the low end of this spectrum at 4.4% (Lower Thames Valley Conservation Authority). 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 33 of them occur in the Rondeau – Erie Coast CAP area. 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 organizations, 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 organisations, 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 and Mansur 2008, Jalava *et al.*, 2009). 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.

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.

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 seven additional priority areas (Essex Forests and Wetlands; Ausable River – Pinery; Upper Thames River; Hamilton – Burlington; Short Hills; Niagara River Corridor; Elgin Greenway) 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 Chatham-Kent Shoreline Areas Community Sustainability Plan

The 2007 analysis demonstrated that three of the priority areas are in Chatham-Kent, including the Sydenham River corridor, the Walpole Island – Lake St. Clair coast, the Rondeau - Erieau area, and the lower Thames River. These areas correspond very closely with areas that the Municipality of Chatham-Kent has identified in the "Chatham-Kent Shoreline Areas Community Sustainability Plan" (http://www.chatham-kent.ca/SiteCollectionDocuments/planning_development_services/Chatham-Kent%20Shoreline%20Areas%20%28Community%20Sustainability%20Plan%20-%20April%2011,%202011%29.pdf).

As part of an informal partnership between Chatham-Kent and the Carolinian Canada Coalition, and with the collaboration of a broad cross-section of stakeholders and sectors, CAPs for these areas of common interest represent an effort to develop and implement a realistic, action-oriented strategy that will build:

- healthier ecosystems and soils
- resilient, diverse biological communities
- cleaner water and air
- rewarding outdoor recreational experiences
- economic prosperity
- stronger communities
- improved quality of life for the communities.

Erie Coastal Stewardship EcoTrail

Located in the most densely populated region of Canada, Lake Erie's north shore is home to some of the rarest and most unique wildlife and habitats in the country. Some of these are protected within national, provincial and municipal parks, and a UNESCO World Biosphere Reserve, while others have been protected through the dedication of private landowners and volunteers. The coast's astounding natural diversity is mirrored by its rich cultural history. From sandy beaches and sunny marshes to clay cliffs and ravines, the landscape tells stories of hunting, farming, fishing, migration and settlement that run like threads through the fabric of coastal communities to this day.

With many partners, Carolinian Canada Coalition (CCC) is creating the Erie Coastal Stewardship EcoTrail. Inspired by urgent threats to the landscape, CCC and its partners have set forth on an ambitious project to connect the coast and the cultural and natural threads that run through it. The Erie Coastal Stewardship Eco Trail will be a ~600 km network of trails that will invite citizens, governments and industry, young and old, resident and tourist, rural and urban, to connect with the nature and culture of the coast.

The Erie Coastal Stewardship EcoTrail runs through the Rondeau – Erie Coast CAP area and provides an important opportunity for local stakeholders to engage in stewardship of the high diversity coastal habitats in the CAP.

The Rondeau – Erie Coast Conservation Action Plan

Additional synergies emerged in discussions between the Municipality of Chatham-Kent and CCC, in which these parties concluded that a conservation action plan (CAP) would be the ideal complement to the Chatham-Kent Shoreline Areas Community Sustainability Plan, in that the CAP would identify and prioritize the conservation activities to be implemented within the Shoreline Areas Community Sustainability Plan context. In other words, the Chatham-Kent Shoreline Areas Community Sustainability Plan 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.

A steering committee was convened in June 2012, consisting of representatives from Community Strategic Planning Committee / Ridgetown Rejuvenation Association +, Friends of Rondeau, Ontario Parks, Shrewsbury Community Association, CCC, Municipality of Chatham-Kent, Chatham-Kent Wind Action Group, Lower Thames Valley Conservation Authority / National Wild Turkey Federation, Christian Farmers Federation - Chatham Kent, C-K United Farm Voice / Kent Federation of Agriculture, Stewardship Kent, St. Clair Foundation, Shrewsbury Association and Transition Town Chatham-Kent. The committee was introduced to the CAP methodology, discussed 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 major landowner and stewards of the area, needed to be actively engaged in the process.

This report represents the results of this 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 the Municipality of Chatham-Kent.

- 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 Rondeau – Erie Coast Conservation Action Plan essentially provides a workbook designed to help guide conservation activities and serve the community and stakeholder groups in the following ways:

- Stewardship, restoration and site securement by conservation authorities, Canada South Land Trust, Stewardship Kent and other agencies and groups, can be targeted on the areas where the greatest ecological benefits will be gained;
- Conservation and recovery activities prioritized are 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 the Municipality of Chatham-Kent. Recovery of the ecosystems will not only serve the needs of SAR and other imperilled 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 the Municipality of Chatham-Kent and across the deep south of Ontario.

Vision

The Steering Committee developed the following vision for the Rondeau – Erie Coast CAP.

The Rondeau – Erie Coast Conservation Action Plan (CAP) aims to enhance biodiversity, resilience, and adaptation to climate change, ecosystem services, productive soils and agriculture, and tourism and recreation opportunities. This will result in more prosperous communities, healthier citizens and quality of life in Chatham-Kent. The vision will be achieved through maintaining, enhancing and protecting the natural systems of the CAP area through engaged citizens working together toward a common, mutually-beneficial cause: a healthier environment for all.

Acknowledgements

Carolinian Canada and our Ecosystem Recovery Network partners would like to thank all the many organisations and individuals who have contributed many hours of time and expertise to the development of the Rondeau - Erie Coast Conservation Action Plan. Most of those organisations and individuals are listed in the Plan Authors section of this report. We particularly wish to thank Tom Beaton and the Municipality of Chatham-Kent for partnership on this project, provision of facilities for meetings, staff time and GIS support, and the interest in incorporating the objectives and strategies of this CAP into their municipal greening and sustainable planning initiatives. We also especially wish to thank the remarkable support of the international Conservation Coaches Network (CCNet) and The Nature Conservancy (U.S.) for their inspiration, expertise, training, information and practical support for CAP programs around the world. Finally, we wish to thank the principal funders of the development of this CAP: the Ontario Ministry of Natural Resources Species at Risk Stewardship Fund, and Environment Canada's Habitat Stewardship Program.

1. Conservation Context

i. Geographic Context

The Rondeau – Erie Coast Conservation Action Plan (CAP) area covers 67044 ha (670.44 km^2) of land along the north shore of western Lake Erie. The CAP area falls entirely within the Municipality of Chatham-Kent (Figure 1.1). The CAP area boundaries were developed through GIS analyses of natural areas undertaken by the Municipality of Chatham-Kent using methodology developed by Ontario Nature (see appendix A for methodology), with the input of the CAP team and other participating organisations listed above. The CAP area was further subdivided into three sections recognizing differences in ecology and land use history: West = portion of CAP west of Rondeau watershed, Rondeau = Rondeau watershed including Rondeau Provincial Park, East = portion of CAP east and north of Rondeau watershed (Figure 1.1). The CAP area is within Ontario's Ecodistrict 7E-1 and includes portions of the Thames River watershed, and part of the Lake Erie watershed.

ii. Historical, Cultural and Socioeconomic Context

The Municipality of Chatham-Kent lies within the traditional territory of several First Nations. In the late 1700's a group of Christian Delaware from Pennsylvania and a Moravian missionary (David Zeisberger) established Fairfield Village on the Thames (Museum of Ontario Archaeology 2013). The residents at Fairfield were mostly Delaware-speaking Munsee, Unami and Unalachtigo, but many other groups lived there as well, including Shawnee, western Iroquois, Metis, Nanticoke, Mahican, Muncey Delaware, Mingo, Ojibwa, and Miami. Diaries kept by some of the Moravians indicated that as many as 174 First Nations individuals lived at Fairfield but that there were also numerous European and First Nation visitors (Museum of Ontario Archaeology 2013). Around the same time, Walpole Island and other tracts of land were set aside as 'reserves' for First Nations, including Muncey and Delaware Nation at Moraviantown, by the British government.

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 88% of Ecodistrict 7E-1, in which the Rondeau – Erie Coast CAP is found, has been converted to agriculture (334,345 ha), with an additional 9,725 ha having been altered for residential, industrial and infrastructure uses (Henson and Brodribb 2005). Only about 8% of 7E-1 remains naturally-vegetated. Nearly half of that is marsh, with a mixture of forest systems and some prairie and savannah systems also present (Henson and Brodribb 2005).

Approximately 89.99% (2,212.07km^2) of the Municipality of Chatham-Kent (2,458.09km^2) was reported as farmland in 2011 (OMAFRA 2012). The rich soils are ideal for growing a wide variety of crops. These are primarily but not limited to, soybeans, greenhouse vegetables, floriculture nursery & sod, corn, field vegetables, fruit and wheat. The lake-moderated climate provides Canada's longest growing season, relatively mild winters, and, in most years, adequate rainfall. Extensive drainage of land has also allowed even the wettest of areas to be suitable for agriculture.

The population of the Municipality of Chatham-Kent in 2011 was 103,671, for a density of 42.2 /km^2. Of this total, 67% lived in urban centres and 33% were in rural households. Communities within the Rondeau – Erie Coast CAP area include the towns of Blenheim (4,563), Ridgetown (3,117) and Wheatley (2,925) (Table 1.1). There are also a number of smaller communities with populations of approximately 1,000 or less, including Erieau, Shrewsbury and Morpeth. Outside the few main centres the population density is low (<13/km^2) reflecting the largely rural nature of the CAP area.

Table 1.1 Summary of Population Information in the Rondeau – Erie Coast CAP. Only centres within the CAP area are included; all information is from the 2011 census (Statistics Canada 2012).

Name	Population	2006-2011 Population Change (%)	Population Density (persons/km^2)	% of Dwellings as Secondary Homes
Blenheim	4,563	+0.3	1,025.30	4.64
Ridgetown	3,117	-3.8	689.2	4.94
Erieau	397	-6.1	568.7	38.48
Wheatley	2,925	26	742.7	6.55
Highgate	379	-8.2	131.7	5.23

The main industry today in the Municipality of Chatham-Kent is manufacturing and construction (28.7%), concentrated in Chatham. Other major employers include wholesale and retail trade (15.3%), health and education (14.3%), business services (11.4%), agriculture and other resource based industries (10%) and "other services" (16.7%) (Chatham-Kent 2011).

The shores of Lake Erie are desirable locations for cottages, water activities, nature appreciation and camping. Several port towns (Erieau, Rondeau, Erie Beach, Port Glasgow) and two provincial parks (Rondeau, Wheatley) along Lake Erie offer recreational activities such as boating, fishing, bird watching, golfing, hiking, camping and beaches. The Municipality of Chatham-Kent also attracts many tourists to visit historical sites such as Chief Tecumseh's battlefield and Uncle Tom's cabin.

iii. Ecological Context

Carolinian Canada

The Rondeau – Erie Coast CAP area is located in the south-western 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 regions (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). The ecoregion 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-1

At the southwest end of Ecoregion 7E is Ecodistrict 7E-1 (Chatham), which is the southernmost ecodistrict in Ontario. It is largely composed of the Lake St. Clair clay plains with minor till moraines. The northern boundary borders the Bothwell sand plains and bevelled till plains (Chapman and Putnam 1984). Lake Erie sand spits occur at Point Pelee and Rondeau. Ecodistrict 7E-1 is one of the most threatened ecodistricts in Ontario, with < 8% natural cover remaining, nearly half of which is marsh (mainly at Point Pelee and in the St. Clair Delta). The majority of the remaining natural cover is a mixture of forested ecological systems comprised predominantly of small remnant patches of sand plain deciduous forest complexes (4,071 ha/10,059 ac), till plain deciduous forest complexes (3,714 ha/9,177 ac) and clay plain deciduous forest complexes (2,140 ha/5,287 ac) (Henson and Brodribb 2005).

Despite the widespread conversion of natural cover to urban and agricultural land, 7E-1 remains biologically diverse. Within the remaining portions of natural cover, the CAP area still supports among the highest concentrations of globally rare species and communities in Ontario, and over 60 species listed as nationally Endangered, Threatened or Special Concern by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). In a recent assessment of global biodiversity values (rare species and communities, endemic and disjunct species), 7E-1 was found to rank fourth in Ontario, behind Manitoulin Island (6E-17) and the Northern and Southern Bruce Peninsula (6E-14 and 6E-4). Despite its high conservation value, Ecodistrict 7E-1 has very few protected areas. Only about 1% of the region is protected in regulated parks, with an additional 2% in conservation lands [e.g. Conservation Authority lands, Areas of Natural and Scientific Interest (ANSI)]. This is the lowest proportion of protected areas and conservation lands of any region in Ontario (Henson and Brodribb 2005).

Rondeau – Erie Coast CAP

The Rondeau – Erie Coast CAP extends across the western part of Lake Erie's north coast (67044 ha, Figure 1.1). The CAP is fully within the Municipality of Chatham-Kent. Mapping includes an additional 10 km buffer to display landscape connectivity with adjacent natural features (e.g. watersheds, natural areas). The northern boundary of the CAP area in the east is the former Canada South Rail line that the Municipality of Chatham-Kent is restoring and converting to a natural heritage recreational trail. In the west the northern boundary is the Chatham-Kent Shoreline Areas Community Sustainability Plan – Lake Erie study area (Figure 1.1). Lake Erie forms its southern boundary. Wetlands are the dominant ecosystems in the Rondeau – Erie Coast CAP area, along with forest, savannah and prairie habitats of high conservation value.

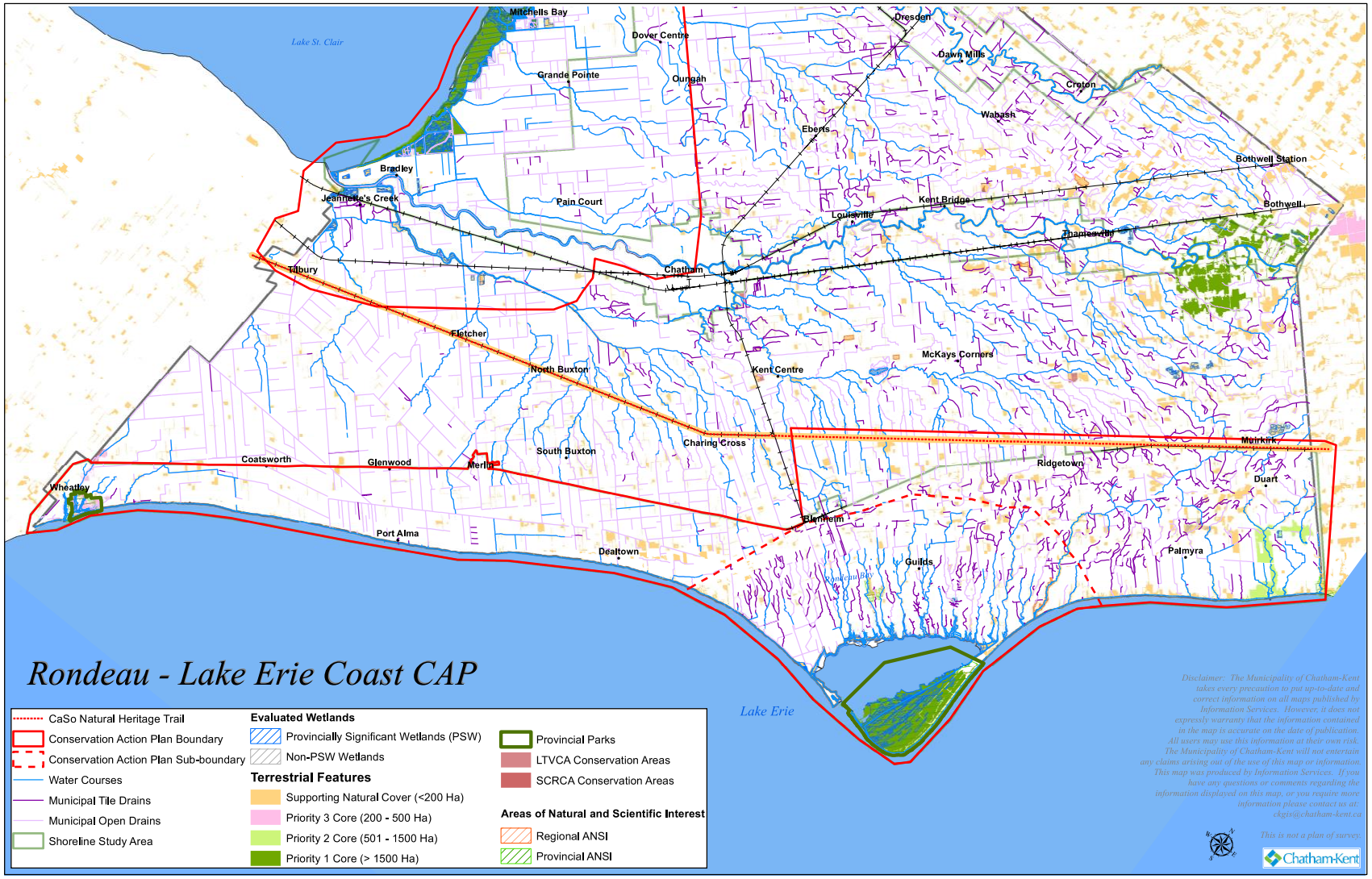
Physiography and Glacial History

The Rondeau – Erie Coast CAP overlaps with three physiographic regions of southern Ontario: the Erie Spits in the southern part of the CAP, the St. Clair Clay Plains in the north, and a small portion of the Bothwell Sand Plain in the east (Chapman and Putnam 1984). The relatively flat topography is interrupted by the rolling Blenheim Moraine in the western portion of the CAP. Most of the bedrock underlying the Rondeau – Erie Coast CAP dates to the upper Devonian, with a small portion dating to the middle Devonian. The bedrock consists 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 Rondeau – Erie Coast CAP area was under glacial lakes.

<u>Lake Erie Coast and Sand Spits</u>

This physiographic region has a history of erosion and deposition in Lake Erie. The Erie Spits are constantly changing shape and size, and are tending to gradually shift outwards into the lake using sand made available by erosion of the Lake Erie shoreline. The eastern shoreline of the CAP area is comprised of steep bluffs, with the western shoreline experiencing dynamic beach conditions. At the core of the CAP shoreline is Rondeau Provincial Park, an eight kilometre peninsula that extends into Lake Erie. A spit of land extends from the southern beach of the peninsula westward, almost meeting a spit of land extending eastward from the main shoreline, a feature called a cuspate foreland. Eroding sand, converging lake currents, and changing lake levels have resulted in a series of sloughs and parallel dry ridges that extend along the entire length of the peninsula (Cheskey and Wilson, 2001).

Figure 1.1 Rondeau – Erie Coast CAP area.



The Erie Spits have the most temperate climate in Ontario aside from Pelee Island and support a great array of southern flora and fauna. Within the physiographic region, Rondeau has exceptional breeding bird diversity and is a globally significant stopover site for a great diversity of migratory birds (IBA 2012 http://www.bsc-eoc.org:8086/site.jsp?siteID=ON007&seedet=N) .

St. Clair Clay Plains

The Rondeau – Erie Coast CAP is primarily located within the St. Clair Clay Plains physiographic region (Chapman and Putnam 1984). These extensive clay plains cover 363,200 ha (897,104 ac) in total, at an altitude of approximately 200 m above sea level with very little relief. There is a deep overburden covering the limestone and dolostone bedrock throughout the majority of the region. The region was once extensively covered by the glacial Lakes Whittlesey and Warren, which did not stratify the sediment and left the majority of the land covered in unconsolidated clay till, smoothed by shallow deposits of lacustrine clay. Overall, the area is characterized by poorly drained soils, and in some undrained areas, peat and muck has accumulated. Modern drainage and systematic tiling have made the region exceptionally productive in agriculturally with a wide variety of crops grown, including some tender fruits due to the warm climate. Throughout the CAP area extremely flat topography is broken only in small sections by low gravel ridges and old beach deposits (Chapman and Putnam 1984).

Blenheim Moraine

The Blenheim Moraine is a modest ridge of rolling clay land in the western half of the CAP. This moraine rises 50-100 feet above the plain and is mostly clay at the top of the ridge but surrounded by gravel terraces (Chapman and Putnam 1984).

Bothwell Sand Plain

The southern portion of the Bothwell Sand Plain, south of the Thames River, is found within the most eastern portion 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. The Bothwell Sand Plain has generally high agricultural value (Class 3 agricultural lands), with a high water table.

Biodiversity

The Rondeau – Erie Coast CAP 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 359 species of birds, 30 reptiles and amphibians, 35 mammals, 87 butterflies, 79 fish and more than 850 taxa of vascular plants have been recorded in Rondeau Provincial Park (NHIC; P.A. Woodliffe and E. Slavik, pers. comm.). The area provides habitat for at least 38 extant terrestrial and aquatic Species at Risk (SAR), with another 16 SAR having occurred historically. Several globally and provincially rare ecological communities also occur (e.g. Moist - Fresh Tallgrass Prairie Type, Moist - Fresh Black Oak - White Oak Tallgrass Woodland Type).

Southern vegetation types in the area include forests dominated by Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia*), Shagbark Hickory (*Carya ovata*), Black Walnut (*Juglans nigra*) and Eastern Cottonwood (*Populus deltoides*). Southern plant species include trees such as Sassafras (*Sassafras albidum*), Tulip Tree (*Liriodendron tulipifera*), 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. 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 Prothonotary Warbler (*Protonotaria citrea*), Acadian Flycatcher (*Empidonax virescens*), marsh birds such as King Rail (*Rallus elegans*) (Cheskey and Wilson, 2001), and mammals such as Virginia Opossum (*Didelphis virginiana*) and Southern Flying Squirrel (*Glaucomys volans*).

Marshes and Wetlands

Wetlands (mainly swamps) historically formed nearly 67% of the Municipality of Chatham-Kent but are now at only 3.7% (Stewardship Kent, 2013). The dominant wetland types in the area were swamps (wooded wetlands), marshes and wet prairie. Several Provincially Significant Wetlands and other wetlands are found in the CAP area, particularly at Rondeau Provincial Park and in the eastern portion of the CAP. 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 Foxsnake (*Pantherophis gloydi*, Endangered)].

Forests

Deciduous forests were historically much more widespread in the Rondeau – Erie Coast CAP area. A large proportion of the forests in Chatham-Kent were swamps. Only approximately 7.2% forest cover remains in the CAP area. Nonetheless, these forests maintain SAR such as the Acadian Flycatcher (*Empidonax virescens*, Endangered), Eastern Flowering Dogwood (*Cornus florida*, Endangered), Broad Beech Fern (*Phegopteris hexagonoptera*, Special Concern) and American Chestnut (*Castanea dentata*, Endangered).

Prairies and Savannahs

Prairies and savannahs are rare ecosystems in Southern Ontario and few natural remnants remain (Bakowsky and Riley 1994). The Rondeau – Erie Coast CAP area has several rare prairie and savannah ecosystems that support SAR such as Dense Blazing-star (*Liatris spicata*, Threatened, Figure 1.2) and Willowleaf Aster (*Symphyotrichum praealtus*, Threatened).

Figure 1.2 Hummingbird Clearwing visiting Dense Blazing-star (Threatened). © A. Woodliffe.

Lake Erie Shoreline and Sand Spits

The Rondeau Peninsula and Rondeau Bay area are a globally significant Important Bird Area, renowned for the diversity of migratory and breeding birds: at least 325 species have been recorded in the Rondeau Provincial Park alone (Cheskey and Wilson, 2001) with nearly 360 species in the greater Rondeau area (P.A. Woodliffe, pers. comm.). Over 850 taxa of vascular plants, 35 mammals, 30 reptiles and amphibians, 79 fish and 87 butterflies have been observed in the Rondeau Provincial Park area (NHIC; P.A. Woodliffe and E. Slavik, pers. comm.).

Natural Areas

Protected natural areas are essential for biodiversity conservation as they are often the only safe haven for many organisms that are sensitive to human influence. The Rondeau – Erie Coast CAP area contains many natural areas of various sizes and designations that support the remaining natural cover (Table 1.2, Appendix B). Only a very small proportion of the CAP area, however, has any strictly regulated protection criteria as set out by the International Union for Conservation of Nature (IUCN). Most protected areas are within Rondeau Provincial Park although there are other tracts of land with lower protection levels present, often associated with swamps or stream valleys that are unsuitable for agricultural purposes. In southwestern Ontario many natural areas are stewarded by conscientious landowners dedicated to biodiversity protection. Natural areas without strict protection, however, can be vulnerable to land use changes and impacts from human uses. For a complete list of the Natural Heritage sites in the Rondeau – Erie Coast CAP area, please see Appendix B.

Table 1.2 Natural Heritage Designations for the CAP area. Some sites can be included in more than one category (e.g. Rondeau Provincial Park is both a Provincial Park and an ANSI and part of the Important Bird Area). Additional natural areas exist which do not have any protection and are not included in this table. See Appendix B for full listing of natural areas.

Designation	IUCN Protected Area Management Category[1]	Area in hectares	Percentage of CAP area	Reference
Conservation Authority Area	V	129.05	0.19	Conservation Authority
Provincial Parks	II	3,254.00	4.85	Ontario Parks
Provincial Life Science Area of Natural and Scientific Interest	VI	2,017.26	3.01	NHIC 2011
Regional Life Science Area of Natural and Scientific Interest	N/A	210.69	0.31	NHIC 2011
Provincially Significant Wetland	VI	1,327.10	2.00	NHIC 2011
Carolinian Canada Site	N/A	18.61	0.03	CCC
Important Bird Areas	N/A	13,051.00	19.47	IBA Canada

[1] IUCN Categories (Dudley, 2008): Ia. Strict nature reserve *; Ib. Wilderness area*; II. National/provincial park*; III. Natural monument or feature; IV. Habitat/species management area, V. Protected landscape or seascape, VI. Protected area with sustainable use of natural resources. * Strictly regulated protected areas. Some areas may have more than one IUCN category because of internal zoning.

iv. Natural Cover / Ecosystem Types

Twenty coarse-resolution vegetation communities have been identified within ecodistrict 7E-1 (Henson and Brodribb 2005). Of these, four are forest types, three are wetlands (swamps or marshes), one is prairie, four are savannahs, three are grasslands, two are woodlands, two are shrublands and one is sand beach. Wetlands are the

dominant ecosystem within the CAP area. Pockets of deciduous forests, savannah woodlands, prairies and other types of communities are dispersed throughout the CAP area where conditions are appropriate.

Wetlands

Wetlands (mainly swamps) historically formed nearly 67% of the Municipality of Chatham-Kent but are now at only 3.7% (Stewardship Kent, 2013). The dominant wetland types in the area were swamps (wooded wetlands), marshes and wet prairie. Several Provincially Significant Wetlands and other wetlands are found in the CAP area, particularly at Rondeau Provincial Park and in the eastern portion of the CAP. These wetland types include marshes (e.g. Cattail Shallow Marsh) and swamps (e.g. Ash Mineral Deciduous Swamp, Buttonbush Thicket).

Lake Erie Sand Spit and Shoreline

A prominent feature of the Rondeau – Erie Coast CAP is the Lake Erie Shoreline running along the southern boundary of the CAP area. The associated wetland and forest habitats support many migratory birds and insects in addition to resident species. The shoreline consists of steep bluffs and areas of sandy coastline (e.g. Rondeau Provincial Park) that support rare dune, marsh and swamp ecosystems (Rondeau Provinical Park, 2001). One of these rare ecosystems is the Little Bluestem-Switchgrass-Beachgrass Open Dune found in Rondeau Provincial Park.

Forests

As noted, only about 7.2% forest cover remains in the Rondeau – Erie Coast CAP area (e.g. Figure 1.4). The different physiographic regions support slightly different assemblages of plants and hence different vegetation communities. Several different forest types occur in the CAP such as Dry-Fresh Oak-Hardwood Deciduous Forest and Fresh-Moist Shagbark Hickory Forest (Rondeau Provincial Park, 2001).

Figure 1.4 Clear Creek Forest in Rondeau – Erie Coast CAP. © A. Woodliffe.

Prairies and Savannahs

Only small remnant prairie habitats remain in Chatham-Kent 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. One globally and provincially rare grassland ecosystem occurs in the CAP area: Moist - Fresh Tallgrass Prairie Type (G2, S1).Three globally and provincially rare savannah ecosystem occurs in the CAP area: Dry Black Oak - White Oak Tallgrass

Woodland Type (G?S1), Dry Black Oak Tallgrass Savannah Type (G3S1), and Dry Black Oak-Pine Tallgrass Savannah Type (G?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 Lake Erie (Table 1.3).

Although these vegetation communities are deemed to be currently present at Rondeau, there have been a number of anthropogenic events over the last 100-150 years to change them from what they were to what they are now. The primary anthropogenic activities in these areas are the construction of more than 450 cottages as well as roads, campgrounds, picnic areas, parking areas for beach goers, etc. Most of the park's development has occurred in what is now known as Dry Black Oak-Pine Tallgrass Savannah Type which is mainly Pine/Oak forest just inland from beach, and Dry Black Oak Tallgrass Savannah Type which is the Pine/Oak forest just inland, but at north end where there is currently even less White Pine at present; also includes much of what in the park vegetation management plan is described as Dry Black Oak Savannah, at the north end. Historically White Pine was abundant all along the eastern shoreline just inland from the grassy beach dune community. The first explorers named Rondeau "Pointe Aux Pins", or Point of Pines and it still shows up on maps as that. However White Pine has declined considerably due to loss of space from facility development, the long-term use of lawnmowers, an abnormally high population of White-tailed Deer as well as, in the last couple of decades, the use of fire.

The youngest part of Rondeau is along the east beach, where the process of vegetation succession begins. The dry, sterile and well-drained sand cannot support much vegetation until nutrients are sufficient to go along with the moisture. Hardy grasses, albeit of low diversity, are the first plant species to become established, and as the sand becomes more fertile, a greater diversity of grasses, wildflowers and woody species gain a foothold. These sand prairies and savannas are under environmental stresses such as low nutrients and extremely dry, even xeric conditions that favour some of the hardier prairie plant species that also do well in dry prairies. Little Bluestem - Switchgrass - Beachgrass Dune Grassland Type is the dominant vegetation type all along the east beach grassy beach dunes. Going inland a little farther from this sand prairie is where Black Oak and White Pine are two of the tree species that are able to adapt to the more moderate environmental conditions, hence the Dry Black Oak-Pine Tallgrass Savannah Type. And it is here where the cottage community and many of the other park facilities have been established over the decades. This vegetation type is a relatively narrow band along the east shore, as the ongoing process of vegetation succession continues, eventually resulting in a hardwood forest dominated by American Beech and Sugar Maple.

There are small remnants of Moist - Fresh Tallgrass Prairie Type (G2, S1) at the Highgate Railway Prairie and other points along the railway corridor. There has been debate about whether these are naturally occurring or not. This railway line has pockets of tallgrass prairie from Windsor in the extreme west to at least Dutton Prairie in the east and include the Cofell Line Prairie, the aforementioned Highgate Railway Prairie, smaller unnamed prairie pockets or at least some prairie vegetation east to McPherson Line, as well as Taylor Meadow and the Dutton Prairie, both of which are in Elgin. There are species occurring here and there along this route that have not been considered native in the past, including Compass Plant (*Silphium laciniatum*) and Pale Purple Coneflower (*Echinacea pallida*) which do not occur anywhere in Ontario except along this railway.

The theory for those considering these prairie patches as anthropogenic is that early in the railroad's existence cattle, or at least hay, arrived from farther west, and the manure and/or hay fell off along the way, introducing seeds along the rail line. However very early last century, a map produced by Edgar Transeau of Ohio State University illustrated his interpretation of the extent of prairie, including the forest/prairie transition, in what has become commonly referred to as The Prairie Peninsula in the east, which depicted a distinct and sizeable area of prairie/forest transition in what is now Elgin County (Stuckey, 1981). On his map it is an area several times larger than what he documented for the north Essex and Windsor area. It is interesting to note that the map does not include anything in the former Dover Township of Chatham-Kent, which was mostly wet prairie at the time of settlement. Suffice to say that we don't know what Transeau was basing his information on exactly, and we don't know how accurate his maps were, but his maps have been the subject of discussion and refinement for several decades by prairie experts in the US to establish the extent of tallgrass prairie at its eastern edge.

Unfortunately those discussions seldom included Ontario. Regardless, Transeau's placement of the prairie vegetation in Elgin County is intriguing, and lends credence to the natural extent of the current Dutton Prairie. It is entirely possible that some species arrived after the installation of the railroad into the prairie like environment that already existed. Regardless, this series of moist-fresh tallgrass prairie remnants does occur today, and given the rarity of it throughout its range in both Canada and the US, should be a high priority for suitable management and restoration.

Table 1.3 Globally and Provincially Rare Vegetation Communities found in Rondeau – Erie Coast CAP.

Ontario Name*	Global Common Name*	Global & Provincial Rank*	Comments**
Dry Black Oak - White Oak Tallgrass Woodland Type	*Quercus velutina – (Quercus ellipsoidalis) – Quercus alba / Deschampsia flexuosa* Woodland	G?; S1	This oak woodland type is found in the upper midwestern United States and Canada, particularly in central Michigan and Ontario. Stands occur on excessively well-drained sands of outwash plains. Soil development is minimal, with a thin A horizon (5-10 cm). The canopy is open. Found in Rondeau Provincial Park.
Dry Black Oak Tallgrass Savannah Type	*Quercus velutina – (Quercus alba) – Quercus ellipsoidalis / Schizachyrium scoparium – Lupinus perennis* Wooded Herbaceous Vegetation	G3; S1	This black oak - mixed oak barrens community occurs in the central and lower Great Lakes region of the United States and adjacent Canada. Stands occur on sandy outwash or lakeplains. Soils are well-drained, coarse-textured, varying from almost pure sand to sandy loam. Canopy structure varies from a dominant herbaceous ground layer with sparse, scattered 'savanna' canopy (5-30%), through oak-dominated scrub, to a more closed 'woodland' canopy (30-80%). Found in Rondeau Provincial Park.
Dry Black Oak-Pine Tallgrass Savannah Type	*Pinus strobus – Quercus alba – (Quercus velutina) / Andropogon gerardii* Wooded Herbaceous Vegetation	G?; S1	This pine - oak barrens community is found in the Great Lakes region of the United States and Canada, in Michigan and Ontario, where it is found on sandy glacial lake plains. Historically the canopy was an open mixture of pines, particularly *Pinus strobus*, and oaks, including *Quercus alba, Quercus ellipsoidalis* and *Quercus velutina*. Current stands may be more heavily dominated by the oaks, with pine regenerating in the understory. A variety of prairie species may be expected. Found in Rondeau Provincial Park.
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 Rondeau 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 in both the U.S. and Canada on stabilized foredunes. Sand deposition and erosion, as well as tension with forest edges helps define this community type further. Found in Rondeau Provincial Park.

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. Found at the Highgate Railway Prairie.

* 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 Chatham-Kent, 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

Most of these tallgrass systems occurred on sand plains that experienced fires every 5-15 years in the drier mid-west, and likely more frequently in the more humid eastern part of its range such as southwestern Ontario. 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.

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).

In Rondeau's case, however, fire likely had very little to do with the establishment of prairie or savannah there. As described earlier, the low fertility of the coarse, well-drained sandy soils along the eastern and youngest edge of the peninsula is a harsh environment for many plant species, especially considering the sometimes xeric conditions. Some tallgrass prairie plant species are most suited for these conditions on this dynamic and expanding sandspit, especially grasses such as Little Bluestem, Big Bluestem and Switchgrass.

Due to the limited availability of nutrients in the developing dune system, the density of these prairie grasses is low, and natural fire would have difficulty spreading. The density of ground vegetation in the more well-developed oak/pine forest type is considerably greater, and fire, if it was present, would be able to spread more easily. However even since first explorers sailed by the Rondeau peninsula, it has been known as 'Pointe Aux Pins' due to the extensive and obvious White Pines that lined the eastern forest edge and was a navigational landmark. White Pines are very susceptible to fire, so if fire was a regular occurrence, these pines would never have become very well established. Even in the last couple of decades, where fire has been used by park managers to retain the openness and thus encourage prairie and savannah vegetation, many mature pines have succumbed.

If the prairie and savannah at Rondeau originated as a result of fire, there is the question of where natural fire might have originated from. In an extensive prairie and savannah ecosystem in the heart of its range, the drier mid-west, fire may have occurred from lightning strikes or from aboriginal people, and the flames would then be fanned by the prevailing winds across the landscape for many kilometres. At Rondeau, there is no place for fire to sweep in from since it is surrounded by water. The prevailing winds, and those that provide indices which are most likely to encourage fire, are from the west and southwest so if anything, fire along the east side would be blown towards the lake. Lightning is a possibility, but the period when most lightning strikes occur is during the summer months when humidity is highest, therefore limiting the spread of fire. It is possible that aboriginal people used fire from time to time, but not likely at Rondeau for clearing for agriculture as the sandy soils are not nearly as suitable for agriculture as are the soils inland from the peninsula. They may have used fire for driving game, but the regularity of sloughs would limit the effectiveness. The point is that natural fire was not likely the reason for the prairie and savannah to become established at Rondeau, but was more likely due to edaphic conditions and any occurrence of fire in the ensuing years was more incidental.

Fire is certainly recognized as a tool, however, to maintain some prairie and savannah vegetation. Park managers at Rondeau are responsible via the Vegetation Management Plan and adaptive management for deciding the appropriate balance for natural processes and the long term presence of significant ecosystems and their associated species.

For the tallgrass prairie remnants along the railway corridor, fire was more likely to occur naturally. During the Hypsithermal period, conditions in southern Ontario were much warmer and drier than they are now. Undoubtedly tallgrass prairie and savannah was able to expand considerably across the landscape during the Hypsithermal period, with fire driven by the prevailing westerly and southwesterly winds, forcing the retreat of the forest vegetation that was present. As the climate eventually cooled off again the deciduous hardwood forest regained some of the territory it had lost, and so the prairie retracted. Some of the remnants that were known at

the time of settlement and persist today may be a result of the much earlier expansion, but much more reduced from their peak extent during the Hypsithermal period. There were sizeable remnants farther west, in north Essex County where the corridor originated, and fire could have moved along the corridor. Of course early train engines used to pull cars were fueled by wood, and were known for releasing sparks and starting fires along the way, so undoubtedly regular fire was enabled from that source, thus encouraging the prairie vegetation adjacent to the rail corridor.

Hydrology

The Rondeau – Erie Coast CAP includes several watersheds whose streams drain into Lake Erie but most of the watersheds flow to the Thames River (Figure 1.1). The Thames 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.

The eastern shoreline of the CAP is comprised of steep bluffs with the western shoreline experiencing dynamic beach conditions. In the middle of the CAP shoreline is Rondeau Provincial Park, an eight kilometre peninsula that extends into Lake Erie. A spit of land extends from the southern beach of the peninsula westward, almost meeting a spit of land extending eastward from the main shoreline. This peninsula is a feature called a cuspate foreland, and it is thought to be one of the best examples of this type of feature in the world. Eroding sand, converging lake currents, and changing lake levels have resulted in a series of sloughs and parallel dry ridges that extend along the entire length of the peninsula (Cheskey and Wilson, 2001).

The eastern portion of the CAP area on the Bothwell Sand Plain has a high water table resulting in moist habitats such as wetlands. Although nearly 70% of wetlands in southern Ontario have been drained (Snell 1987) some swamp complexes still exist in Chatham-Kent (NHIC, 2012).

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 Chatham-Kent, 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.

Erosion

Erosion is a factor along the shoreline of Lake Erie. This is due to both natural erosive processes, but has also been accelerated by heavy shoreline and offshore water use by humans and lack of shoreline stabilization by natural plant communities (often cleared by cottagers and marinas). Human settlement along the Lake Erie coast and the subsequent hardening of the shoreline and construction of piers for harbours have disrupted natural erosion and deposition processes, especially the pier at Erieau. These changes have consequences for the peninsula at Rondeau and the Lake Erie shoreline in general.

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 38 extant terrestrial and aquatic Species at Risk (SAR), with another 16 SAR having occurred historically.

Unless otherwise indicated, data in Table 1.4 are from NHIC (November 2012) but the individual records are generally not current to 2012. Additional records of species provided by CAP team members have been added to the table. Only designated Species At Risk (SAR) (Endangered, Threatened or Special Concern) are included.

Many additional globally and provincially rare species (Table 1.5, Figure 1.4) and vegetation communities (Table 1.3) 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.

Figure 1.4 Rare species occurring in the Rondeau – Erie Coast CAP. Left: Giant Swallowtail (G5,S3). Right: Compass Plant (G5,S1). © A. Woodliffe.

Table 1.4 Significant Species found in the Rondeau – Erie Coast CAP Area. Data from NHIC plus additional observations of species by CAP team members in brackets.

Element	G-rank[1]	S-rank[1]	COSEWIC[2]	OMNR[2]	EO Rank[3]	Last Observed Date (DD/MM/YYYY)	Associated Conservation Target(s) (see Table 1.6 for key to codes)
Acadian Flycatcher	G5	S2S3B	END	END	C?	13/06/1998 (Rondeau PP 2013)	1. UF; 2. MF
American Badger	G5	S2	END	END	E	16/06/2005	3. PS; 4. TF; 5. AG
American Chestnut	G4	S2	END	END	C	2001-2002 (Wheatly PP 2012)	1. UF
American Ginseng	G3G4	S2	END	END	E	09/2007 (2013)	1. UF
American Water-willow	G5	S1	THR	THR	H	27/07/1984	6. CW; 7. LES; 8. IRW
Bald Eagle			NAR	SC	E	2012	1. UF; 2. MF; 3. PS; 4. TF; 5. AG; 6. CW; 7. LES; 8. IRW
Barn Owl	G5	S1	END	END	E	2004 (2007)	3. PS; 4. TF; 5. AG; 6. CW
Bent Spike-rush	G5	S1	END	END	BC	07/09/2007	6. CW; 7. LES; 8. IRW
Blanding's Turtle	G4	S3	THR	THR	E	23/07/1996 (2013)	6. CW; 7. LES; 8. IRW; 9. RA
Broad Beech Fern	G5	S3	SC	SC	BC	03/06/2003 (Rondeau PP 2013)	1. UF; 2. MF
Butternut	G4	S3?	END	END	E	1996 (Rondeau PP 2013)	1. UF; 2. MF; 4. TF
Cerulean Warbler	G4	S3B	END	SC	D	09/06/1990	1. UF
Climbing Prairie Rose	G5	S3	SC	SC	C	2002 (Wheatly PP 2012)	3. PS; 4. TF
Common Five-lined Skink (Carolinian population)	G5T2	S2	END	END	B	16/05/2004 (Rondeau PP 2013)	1. UF; 3. PS; 7. LES
Common Hoptree	G5	S3	THR	THR	C	07/09/2007 (Rondeau PP & Erieau 2013)	7. LES
Dense Blazing Star	G5	S2	THR	THR	A	19/08/2008 (CaSo Rail line 2012)	3. PS; 8. IRW

Element	G-rank[1]	S-rank[1]	COSEWIC[2]	OMNR[2]	EO Rank[3]	Last Observed Date (DD/MM/YYYY)	Associated Conservation Target(s) (see Table 1.6 for key to codes)
Eastern Flowering Dogwood	G5	S2?	END	END	E	2004 (Wheatly PP & CaSo Rail line 2012)	1. UF; 4. TF
Eastern Foxsnake	GNR	S2	END	END	E	15/05/2009 (2012)	1. UF; 2. MF; 3. PS; 4. TF; 5. AG; 6. CW; 7. LES; 8. IRW; 9. RA
Eastern Hog-nosed Snake	G5	S3	THR	THR	BC	23/07/1994 (Rondeau PP 2011)	1. UF; 3. PS; 4. TF; 5. AG; 7. LES; 8. IRW; 9. RA
Eastern Mole	G5	S2	SC	SC	E	1997	1. UF; 2. MF
Eastern Musk Turtle	G5	S3	THR	THR	H	1978-?	6. CW; 7. LES; 8. IRW; 9. RA
Eastern Pondmussel	G4	S1	END	END	H	16/05/1988	8. IRW
Eastern Ribbonsnake	G5	S3	SC	SC	E*	29/05/1986 (Rondeau PP 2012)	2. MF; 4. TF; 7. LES; 8. IRW; 9. RA
Eastern Sand Darter	G3G4	S2	THR	END	H	02/09/1975	6. CW; 7. LES; 8. IRW
Fowler's Toad	G5	S2	END	END	BC	19/07/1996 (Rondeau PP 2012)	6. CW; 7. LES; 8. IRW (near Lake Erie); 9. RA
Goldenseal	G4	S2	THR	THR	E	03/02/2010 (Rondeau PP 2013)	1. UF; 2. MF
Green Dragon	G5	S3	SC	SC	E	11/07/2001	2. MF; 8. IRW
Henslow's Sparrow	G4	SHB	END	END	E	07/07/2005	3. PS; 4. TF; 5. AG; 8. IRW (low-lying seasonally flooded areas)
Hooded Warbler	G5	S3B	THR	SC	E*	1983 (2001-2005 Ontario Breeding Bird Atlas)	1. UF
King Rail	G4	S2B	END	END	E	29/06/2005	6. CW
Lake Chubsucker	G5	S2	END	THR	H	07/07/1983	6. CW

Element	G-rank[1]	S-rank[1]	COSEWIC[2]	OMNR[2]	EO Rank[3]	Last Observed Date (DD/MM/YYYY)	Associated Conservation Target(s) (see Table 1.6 for key to codes)
Least Bittern	G5	S4B	THR	THR	CD	20/05/2000 (Rondeau PP 2012)	6. CW; 8. IRW
Louisiana Waterthrush	G5	S3B	SC	SC	H	06/1984 (Rondeau PP early 1990s)	2. MF; 7. LES
Massasauga	G3G4	S3	THR	THR	X	1881	All targets (extirpated)
Milksnake	G5	S3	SC	SC	H	01/07/1982	All targets, but primarily 3. PS; 4. TF; 9. RA
Nodding Pogonia	G3G4	S1	END	END	A	24/08/2005 (Rondeau PP 2012)	2. MF; 7. LES
Northern Bobwhite	G5	S1	END	END	H	1990	1. UF; 3. PS; 4. TF; 5. AG
Northern Map Turtle	G5	S3	SC	SC	E*	14/06/1986 (Rondeau PP 2013)	6. CW; 8. IRW; 9. RA
Piping Plover	G3	S1B	END	END	X	30/05/1947	7. LES
Prothonotary Warbler	G5	S1B	END	END	D	19/05/2003 (Rondeau PP 2013)	2. MF; 7. LES
Pugnose Shiner	G3	S2	END	END	H	16/06/1963	6. CW; 8. IRW
Pygmy Pocket Moss	G3G4	S1	SC	SC	E	2003	2. MF; 8. IRW
Red Mulberry	G5	S2	END	END	B	03/09/2009 (Rondeau PP 2013)	1. UF
Riddell's Goldenrod	G5	S3	SC	SC	X	03/10/1948	3. PS; 4. TF; 8. IRW (Wet prairies, roadside ditches)
Round Pigtoe	G4G5	S1	END	END	H	28/06/1988	6. CW; 8. IRW
Silver Chub	G5	S2	SC	SC	H	28/05/1921	6. CW; 7. LES
Snuffbox	G3	S1	END	END	H	12/08/1961	8. IRW

Element	G-rank[1]	S-rank[1]	COSEWIC[2]	OMNR[2]	EO Rank[3]	Last Observed Date (DD/MM/YYYY)	Associated Conservation Target(s) (see Table 1.6 for key to codes)
Spiny Softshell	G5	S3	THR	THR	A	20/06/2008 (Rondeau PP 2013)	6. CW; 7. LES; 8. IRW; 9. RA
Spotted Gar	G5	S1	THR	THR	E*	02/10/1986 (Rondeau PP 2012)	6. CW
Spotted Sucker	G5	S2	SC	SC	H	1977	8. IRW
Spotted Turtle	G5	S3	END	END	C	21/04/1990 (2013)	6. CW; 7. LES; 8. IRW
Warmouth	G5	S1	SC	SC	E	04/05/1999	6. CW; 7. LES; 8. IRW
Willowleaf Aster	G5	S2	THR	THR	B	26/09/1991	3. PS; 4. TF
Yellow-breasted Chat	G5	S2B	SC	SC	E*	05/07/1987 (probable breeding record Rondeau PP 2009)	3. PS; 4. TF

[1] Global and Subnational Ranks: Ranks indicate the conservation status of a species and are designated by a number from 1 (critically imperiled) to 5 (secure), preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global, and S = Subnational, in this case referring to Ontario).
[2] National and Provincial Status: Status of species listed nationally (COSEWIC) or provincially (OMNR): END = Endangered, THR = Threatened, SC = Special Concern.
[3] EO Rank indicates the viability of the population: A - Excellent predicted viability, B - Good predicted viability, C - Fair predicted viability, D - Probably not viable, E - Verified extant, F - Failed to find, H - Historical, X – Extirpated. An asterisk (*) indicates NHIC rank of H changed to E due to more current information provided by CAP team.

Table 1.5 Additional Globally and Provincially Significant Taxa found in the Rondeau – Erie Coast CAP Area. Data from NHIC and CAP team members. Codes as in Table 1.4.

Element	Scientific Name	Taxonomic Group	G-rank	S-rank	EO Rank
American Gromwell	*Lithospermum latifolium*	Vascular Plant	G4	S3	H
American Lotus	*Nelumbo lutea*	Vascular Plant	G4	S2	H

Element	Scientific Name	Taxonomic Group	G-rank	S-rank	EO Rank
Annual Yellow Flatsedge	*Cyperus flavescens*	Vascular Plant	G5	S2	H
Appendaged Waterleaf	*Hydrophyllum appendiculatum*	Vascular Plant	G5	S2	H* (2012)
Black Gum	*Nyssa sylvatica*	Vascular Plant	G5	S3	E
Black Tern	*Chlidonias niger*	Bird	G4	S3B	E
Brindled Madtom	*Noturus miurus*	Fish	G5	S2	H
Bristled Slitmouth	*Stenotrema barbatum*	Mollusc	G5	S2	E
Bristly Buttercup	*Ranunculus hispidus var. hispidus*	Vascular Plant	G5T5	S3	E
Canvasback	*Aythya valisineria*	Bird	G5	S1B,S4N	H
Carey's Sedge	*Carex careyana*	Vascular Plant	G4G5	S2	H
Carolina Whitlow-grass	*Draba reptans*	Vascular Plant	G5	S3	E
Cliff Conobea	*Leucospora multifida*	Vascular Plant	G5	S2	E
Coast Barnyard Grass	*Echinochloa walteri*	Vascular Plant	G5	S3	E
Cobra Clubtail	*Gomphus vastus*	Insect	G5	S1	H
Compass Plant	*Silphium laciniatum*	Vascular Plant	G5	S1	E
Crowned Beggarticks	*Bidens trichosperma*	Vascular Plant	G5	S2	H
Cyrano Darner	*Nasiaeschna pentacantha*	Insect	G5	S3	H
Double-striped Bluet	*Enallagma basidens*	Insect	G5	S3	E
Duke's Skipper	*Euphyes dukesi*	Insect	G3	S2	D
Eastern Narrow-leaved Sedge	*Carex amphibola*	Vascular Plant	G5	S2	E
Fall Crab Grass	*Digitaria cognata*	Vascular Plant	G5	S1	H
Fogg's Goosefoot	*Chenopodium foggii*	Vascular Plant	G2G3	S2	H
Forster's Tern	*Sterna forsteri*	Bird	G5	S2B	D
Fox Grape	*Vitis labrusca*	Vascular Plant	G5	S1	H

Element	Scientific Name	Taxonomic Group	G-rank	S-rank	EO Rank
Furrowed Glyph	*Glyphyalinia luticola*	Mollusc	G4G5	S1S2	E
Geniculate Three-awned Grass	*Aristida longespica var. geniculata*	Vascular Plant	G5T5?	S2	E
Giant Swallowtail	*Papilio cresphontes*	Insect	G5	S3	(2012)
Golden Puccoon	*Lithospermum caroliniense*	Vascular Plant	G4G5	S3	E
Great Blue Skimmer	*Libellula vibrans*	Insect	G5	S1	E
Great Lakes Sand Reed	*Calamovilfa longifolia var. magna*	Vascular Plant	G5T3T5	S3	H
Great Plains Ladies'-tresses	*Spiranthes magnicamporum*	Vascular Plant	G4	S3?	E
Green Cornet Milkweed	*Asclepias viridiflora*	Vascular Plant	G5	S2	E
Hairy Bedstraw	*Galium pilosum*	Vascular Plant	G5	S3	E
Hairy Green Sedge	*Carex hirsutella*	Vascular Plant	G5	S3	E
Hairy Mountain-mint	*Pycnanthemum verticillatum var. pilosum*	Vascular Plant	G5T5	S1	H*
Halberd-leaved Tearthumb	*Persicaria arifolia*	Vascular Plant	G5	S3	H
Hoary Puccoon	*Lithospermum canescens*	Vascular Plant	G5	S3	E
Hoary Tick-trefoil	*Desmodium canescens*	Vascular Plant	G5	S2	H
Large Round-leaved Orchid	*Platanthera macrophylla*	Vascular Plant	G4	S2	H
Large-seeded Forget-me-not	*Myosotis macrosperma*	Vascular Plant	G5	S1	H
Lilypad Clubtail	*Arigomphus furcifer*	Insect	G5	S3	E
Little Gull	*Larus minutus*	Bird	G5	S1B	H
Lizard's Tail	*Saururus cernuus*	Vascular Plant	G5	S3	E
Lowland Pillsnail	*Euchemotrema leai*	Mollusc	G5	S2S3	E
Missouri Ironweed	*Vernonia missurica*	Vascular Plant	G4G5	S3?	H* (2012)
Painted Skimmer	*Libellula semifasciata*	Insect	G5	S2	H

Element	Scientific Name	Taxonomic Group	G-rank	S-rank	EO Rank
Pallas' Bugseed	*Corispermum pallasii*	Vascular Plant	G4?	S1S3	E
Pawpaw	*Asimina triloba*	Vascular Plant	G5	S3	H* (2013)
Perfoliate Tinkersweed	*Triosteum perfoliatum*	Vascular Plant	G5	S1	E
Prairie Wedge Grass	*Sphenopholis obtusata*	Vascular Plant	G5	S1	H
Pumpkin Ash	*Fraxinus profunda*	Vascular Plant	G4	S2?	E
Purple Milkweed	*Asclepias purpurascens*	Vascular Plant	G5?	S2	H
Puttyroot	*Aplectrum hyemale*	Vascular Plant	G5	S2	X* (2013)
Rigid Sedge	*Carex tetanica*	Vascular Plant	G4G5	S3	E
Round-fruited Panic Grass	*Dichanthelium sphaerocarpon*	Vascular Plant	G5	S3	H
Scarlet Beebalm	*Monarda didyma*	Vascular Plant	G5	S3	H* (2012)
Sharp-winged Monkeyflower	*Mimulus alatus*	Vascular Plant	G5	S2	H* (2012)
Shellbark Hickory	*Carya laciniosa*	Vascular Plant	G5	S3	E
Shrubby St. John's-wort	*Hypericum prolificum*	Vascular Plant	G5	S2	E
Skunk Meadow-rue	*Thalictrum revolutum*	Vascular Plant	G5	S2	H
Slender Blazing Star	*Liatris cylindracea*	Vascular Plant	G5	S3	E
Slender Mountain-mint	*Pycnanthemum tenuifolium*	Vascular Plant	G5	S3	H
Slender Paspalum	*Paspalum setaceum*	Vascular Plant	G5	S2	E
Slim-flowered Muhly	*Muhlenbergia tenuiflora*	Vascular Plant	G5	S2	E
Smith's Bulrush	*Schoenoplectus smithii*	Vascular Plant	G5?	S3	H
Square-stemmed Spike-rush	*Eleocharis quadrangulata*	Vascular Plant	G4	S1	H
Squarrose Sedge	*Carex squarrosa*	Vascular Plant	G4G5	S2	E
Standley's Goosefoot	*Chenopodium standleyanum*	Vascular Plant	G5	S2	H
Stiff Yellow Flax	*Linum medium var. medium*	Vascular Plant	G5T3T4	S3?	H

Element	Scientific Name	Taxonomic Group	G-rank	S-rank	EO Rank
Striped Cream Violet	*Viola striata*	Vascular Plant	G5	S3	H
Swamp Darner	*Epiaeschna heros*	Insect	G5	S2S3	E
Tall Boneset	*Eupatorium altissimum*	Vascular Plant	G5	S1	E
Taper-leaved Bugleweed	*Lycopus rubellus*	Vascular Plant	G5	S3	H
Tulip Tree Silk Moth	*Callosamia angulifera*	Insect	G5	S1	H
Variegated Meadowhawk	*Sympetrum corruptum*	Insect	G5	S3	E
Velvet Wedge	*Xolotrema denotatum*	Mollusc	G5	S2S3	E
Virginia Bugleweed	*Lycopus virginicus*	Vascular Plant	G5	S3	H
Weak Blue Grass	*Poa saltuensis ssp. languida*	Vascular Plant	G5T3T4Q	S3	E
White-eyed Vireo	*Vireo griseus*	Bird	G5	S2B	H* (2010)
White-tinged Sedge	*Carex albicans var. albicans*	Vascular Plant	G5T4T5	S3	H
Whorled Mountain-mint	*Pycnanthemum verticillatum var. verticillatum*	Vascular Plant	G5T5	S1?	H
Winged Loosestrife	*Lythrum alatum*	Vascular Plant	G5	S3	E
Wingstem	*Verbesina alternifolia*	Vascular Plant	G5	S3	H*
Woodland Blue Grass	*Poa sylvestris*	Vascular Plant	G5	S1	H
Woodland Flax	*Linum virginianum*	Vascular Plant	G4G5	S2	H
Yellow Stargrass	*Hypoxis hirsuta*	Vascular Plant	G5	S3	H*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Bird	G5	S2B	H

2. Biodiversity Targets and Associated Threats

i. Conservation Targets

Table 1.6 Conservation Targets for the Rondeau – Erie Coast CAP Area.

Conservation Targets	Code	Nested Targets
1. Upland Forests (sand plain, clay plain, moraine)	UF	Acadian Flycatcher, American Chestnut, American Ginseng, Broad Beech Fern, Butternut, Cerulean Warbler, Eastern Flowering Dogwood, Eastern Foxsnake, Eastern Hog-nosed Snake, Eastern Mole, Common Five-lined Skink, Goldenseal, Hooded Warbler, Milksnake, Northern Bobwhite, Red Mulberry
2. Moist Forests and Swamps (includes headwaters)	MF	Acadian Flycatcher, Broad Beech Fern, Butternut, Eastern Foxsnake, Eastern Mole, Eastern Ribbonsnake, Goldenseal, Green Dragon, Louisiana Waterthrush, Milksnake, Nodding Pogonia, Prothonotary Warbler, Pygmy Pocket Moss, Warmouth
3. Native Prairies and Savannahs	PS	American Badger, Barn Owl, Climbing Prairie Rose, Common Five-lined Skink, Dense Blazing-star, Eastern Flowering Dogwood, Eastern Foxsnake, Eastern Hog-nosed Snake, Henslow's Sparrow, Milksnake, Northern Bobwhite, Riddell's Goldenrod
4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields	TF	American Badger, Barn Owl, Butternut, Climbing Prairie Rose, Eastern Foxsnake, Eastern Hog-nosed Snake, Henslow's Sparrow, Milksnake, Northern Bobwhite, Riddell's Goldenrod
5. Lake Erie Sand Spit and Shorelines (includes dune / slough complexes, sand beaches and bluffs)	LES	American Water-willow, Bent Spikerush, Blanding's Turtle, Eastern Foxsnake, Common Five-lined Skink, Common Hoptree, Eastern Hog-nosed Snake, Eastern Musk Turtle, Eastern Ribbonsnake, Fowler's Toad, Louisiana Waterthrush, Milksnake, Nodding Pogonia, Piping Plover, Prothonotary Warbler, Silver Chub, Spiny Softshell, Spotted Turtle, Warmouth
6. Coastal Wetlands	CW	American Water-willow, Barn Owl, Blanding's Turtle, Eastern Foxsnake, Eastern Musk Turtle, Fowler's Toad, King Rail, Lake Chubsucker, Least Bittern, Northern Map Turtle, Pugnose Shiner, Round Pigtoe, Silver Chub, Spiny Softshell, Spotted Gar, Spotted Turtle, Warmouth
7. Inland Riparian and Wetland (includes floodplains, drains, marshes, ponds, impoundments)	IRW	American Water-willow, Bent Spikerush, Blanding's Turtle, Dense Blazing-star, Eastern Foxsnake, Eastern Hog-nosed Snake, Eastern Musk Turtle, Eastern Pondmussel, Eastern Ribbonsnake, Fowler's Toad, Green Dragon, Henslow's Sparrow, Least Bittern, Milksnake, Northern Map Turtle, Pugnose Shiner, Pygmy Pocket Moss, Riddell's Goldenrod, Round Pigtoe, Snuffbox, Spiny Softshell, Spotted Sucker, Spotted Turtle, Warmouth
8. SAR Reptiles and Amphibians	RA	Blanding's Turtle, Eastern Hog-nosed Snake, Eastern Musk Turtle, Eastern Foxsnake, Eastern Ribbonsnake, Milksnake, Fowler's Toad, Northern Map Turtle, Spiny Softshell

Conservation Targets	Code	Nested Targets
9. Sustainable Agricultural Practices	AG	American Badger, Barn Owl, Eastern Foxsnake, Eastern Hog-nosed Snake, Henslow's Sparrow, Milksnake, Northern Bobwhite

Table 1.7 Conservation Target Viability for the Rondeau – Erie Coast CAP Area. Viability for each target was assessed separately for the three subsections of the CAP area (see Figure 1.1). W = western portion of the CAP, R = Rondeau watershed, E = eastern and northeastern portion of the CAP. Assessment ranking and colour codes are described below the table (P = poor, F = fair, G = Good, VG = Very good, NA = not applicable). Shading indicates the level of importance and suggested focus of strategy development assigned to the target by science committee (darker green received most votes, than lighter green, then no shading).

Conservation Target	Key Ecological Attribute(s)	Size	Condition	Landscape Context	Notes
1. Upland 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 (e.g., FQI; age class; structure). • Measure: no net loss of forest cover from 2012 levels; • Measure: x forest interior breeding bird species in x sites.	**W-P**	**W-P**	**W-P**	Size: R – Park area is good, remainder is fair Size: E-FP –SE is fair, rest is poor Condition: R – Park area is good, remainder is fair Condition/Landscape Context: W/E – because of size, integrity is poor, impacted by invasive species, high edge : interior ratio, fragmentation; some species have been/are able to adapt to highly fragmented landscape, but others (e.g., Fowler's Toad traveling to breeding ponds) seriously challenged W – Wheatley PP area ranked better (probably better considered in context of Essex CAP/NACP)
		R-GF	**R-GF**	**R-GF**	
		E-FP	**E-P**	**E-P**	
2. Moist Forests and Swamps	• Groundwater recharge; • Breeding Prothonotary Warblers; • Presence of nested target species;	**W-P**	**W-P**	**W-P**	R – sand spit excluded W – Two Creeks / Wheatley are the only exceptions (with some potential)
		R-FP	**R-FP**	**R-P**	

Conservation Target	Key Ecological Attribute(s)	Size	Condition	Landscape Context	Notes
	• Measure: overall extent and interior habitat; • Measure: x forest interior breeding bird species in x sites;	**E-PF**	**E - PF**	**E-FP**	E – better in east (e.g., Clear Creek), poorer in north
3. Native Prairies and Savannahs	• Species diversity – presence of key indicator species • Disturbance/Fire – need fire to maintain the species • Minimum size	**W- NA**	**W- NA**	**W- NA**	Rondeau – prairie/savannah probably not fire-dependent (e.g., historic White Pine populations) – Black Oak – White Pine savannah highly significant ("naturally" shrinking because peninsula itself is shrinking) West of Rondeau – native prairie probably not historically present East/North of Rondeau – the small fragments are in poor condition
		R-F	**R-F**	**R-F**	
		E-P	**E-P**	**E-P**	
4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields	• Species diversity – species should be represented in x amounts • Minimum width (e.g., 10 m, or height of trees) • Tree roots not being damaged. • Agricultural activities being limited to canopy dripline Linkages to other hedge rows, thickets • Presence of indicator species (e.g., pollinators, certain plants, herps) • Benign neglect	**W-P**	**W-P**	**W-P**	R- not applicable within park, values reflect outside park. Landscape Context - 5m buffer along lot lines would result in significant improvement (soil protection)
		R-FP	**R-FP**	**R-FP**	
		E-FP	**E-FP**	**E-P**	

Conservation Target	Key Ecological Attribute(s)	Size	Condition	Landscape Context	Notes
5. Lake Erie Sand Spit and Shorelines	• % natural cover within 2 km of Lake Erie • Presence of dynamic processes (rates of deposition, erosion) • Presence of undeveloped naturally-stabilized dune ecosystems (use ELC) • Extent of natural cover on beach ridge / swale systems (use GIS); overall extent of sand spit • Indicator species (Common Hoptree, Fowler's Toad, Five-lined Skink) • Extent of hardened shorelines / shoreline development • Naturally vegetated buffer along shoreline/bluff	**W-P**	**W-P**	**W-P**	R- south end is migrating north, east side is migrating east. Size – Water levels have major effect; R (good at Rondeau, expanding at Erieau but impacted) Condition – R good in the park, fair along interior of Bay, east of Park and Erieau, with some poor sections. E/W Shoreline areas (extends to include 2 km buffer from top of bluff)
		R-G	**R-F**	**R-FG**	
		E-PF	**E-F**	**E-F**	
6. Coastal Wetlands	• Marsh Monitoring Program (criteria; CWS/BSC) • Great Lakes Coastal Wetlands Consortium (health/stressors criteria) • Extent of Phragmites and other exotics (e.g., Frog-bit)	**W-F**	**W-PF**	**W-F**	R- Lake Erie Management Unit (Gilbert 2007?) health assessment; LC good within Park W – applies only to the Wheatley area
		R-F	**R-PF**	**R-FG**	
		E-NA	**E- NA**	**E- NA**	

Conservation Target	Key Ecological Attribute(s)	Size	Condition	Landscape Context	Notes
7. Inland Riparian and Wetland	• Water quality (benthic organism composition, temperature) • Extent of naturally-vegetated buffers (measured using GIS over time) (% of watercourse/wetland having 30m buffer; measures of surrounding land use measured by %) • Extent natural watercourse vs. altered watercourse • Connectivity to other wetlands • Structural and vegetation composition (diversity / native vs. invasive) • Intact hydrology	**W-P**	**W-P**	**W-P**	R- only upstream non-lake influenced riparian ecosystems included (wetlands all considered coastal) Management for tiles/drains– two-stage ditches, impoundments. With proper planning, creation of functional wetlands? Gravel/borrow pit rehab.
		R-P	**R-P**	**R-P**	
		E-P	**E-P**	**E-P**	
8. SAR Reptiles and Amphibians	• Habitat connectivity • Road mortality measures • Human persecution (at sites or along roads) • Quality of habitat in relation to invasive species (Phragmites, Eurasian milfoil, frogbit)	**W-P**	**W-P**	**W-P**	changes in fragmentation due to additional turbines and access roads/culverts; Recreation aspect of park has an impact on reptiles and amphibians; Within RPP the pressures on species is high with existing roads, fragmentation; Question: should this conservation target capture water quality as well?
		R-F	**R-PF**	**R-F**	
		E-PF	**E-PF**	**E-PF**	
9. 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				

Table 1.7 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

Species-specific threats to Rondeau – Erie Coast CAP SAR are available in Appendix C. Table 1.8 summarizes most relevant threats.

Table 1.8 Summary of Threats for the Rondeau – Erie Coast CAP. Threat ranking details can be found below the table (VH = very high, H = high, M = medium, L = low). Threats to sustainable agriculture were not addressed.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Non-Timber Crops (cash crops)	1. Erosion & soil compaction (UF) 2. Reduced extent of habitat & buffering, fragmentation (UF) 3. Loss of wetland size, function and connectivity (MF, CW, IRW) 4. Loss of organic matter (AG) 5. Sediment / nutrient loading (MF, CW, IRW) 6. Oxygen depletion (MF, CW, IRW). 7. Reduced biodiversity. (UF, MF, CW, IRW) 8. Water level fluctuations (CW, IRW) 9. Herbicide, pesticide run-off. (MF, CW, IRW) 10. Increased predator stress (MF, CW, IRW) 11. Water level fluctuations (MF, CW, IRW)	VH	VH	H	H	L	H	VH	M	VH	Highly variable situation; landowners using different practices across the CAP. Some good buffer strip practices (generally non-native grasses), grassed waterways and conservation/no tillage (but has been declining). Encroachment along road allowances. UF, MF - 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. Clearing of woodlots, hedgerows, fencerows, etc., to increase farmed area. PS - Existing remnants are being or have been converted to agriculture. Some small remnants remain (e.g., along CASO line). Visually can be reversed, but to recover actual functionality requires a very long term commitment (many decades, if not centuries). TF - E – being impacted by clearing. W – scope very high; R – medium; E – scope high; Farm consolidation; Requires changing attitudes LES - W – farmed to top of bluff. IRW, CW - Drain maintenance is a major impact. Spraying right into drains, materials falling into drains. RA – Mortality from farm equipment.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Invasive Non-Native/ Alien Species **(vascular plants)**	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 MF - Habitat degradation (out competing native species, loss of diversity) Often requires aggressive controls that add to impacts Increases the filling/succession of wetlands from the volume of biomass	VH	H	H	VH	H	VH	H	M?	VH	UF - Common Buckthorn, Multiflora Rose, Garlic Mustard, Common Periwinkle, Phragmites, Dame's Rocket, Dog Strangling Vine, Giant Hogweed… MF - White Mulberry, Garlic Mustard, Phragmites (esp. with opening of canopy due to EAB), Dame's Rocket, exotic earthworms. PS – Black Locust, White Sweet Clover… TF – Haven for invasives & their spread. Crack Willow, Phrag, Common Buckthorn, White Mulberry, Multiflora Rose, Garlic Mustard, etc. *- Some invasive plants provide cover, food and habitat for wildlife, but competition with native species is the major concern. LES – Phragmites, Garlic Mustard, White Sweet Clover, Tree of Heaven, White Poplar, White Mulberry, Japanese Barberry. IRW - Phragmites, Reed Canary Grass, and species from hedgerows (incl. cold season grasses). Irreversibility value varies depending on species and whether management is local or wide-scale.
Excess Energy	1. Erosion, slumping sedimentation 2. Damage to vegetation due to flooding & scouring 3. Excessive solar radiation, wind along forest edges 4. Other edge effects (invasives, disease, predators, nest parasites)	H	H			VH		H		H	UF, MF - Wind, solar radiation very high in small forest fragments. LES - Change in distribution of energy due to Erieau pier, with associated impacts at Rondeau and Erieau. See also: "Other Ecosystem Modifications" CW, IRW - See: Dams and Water Management Boat wakes (8-15kph), shoreline hardening and vegetation removal increase impact. Larger the wetland complex the better it can buffer an adverse event.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Dams & Water Management / Use **(includes tile drainage)**	1. Hydrological impacts (lower water table) (MF, IW) 2. Loss of headwaters & recharge areas (MF, IRW) 3. Increased water temperature (IRW) 4. Impeded fish movement (IRW) 5. Disrupted sediment transport (IRW) 6. Increased problematic native and non-native species (Canada Goose, Common Carp) (IRW) 7. Reduced water quality and quantity (IRW) 8. Increased energy – flash flooding, erosion (IRW) 9. Off-site impacts: erosion, hydrological impacts, eutrophication of wetlands and streams (UF)	H	H		L		L	H	M?	H	MF - Tile drains the main factor. Can be closed off fairly easily, but socioeconomic and legal/policy challenges are great. TF - If in riparian area, could have significant impact CW, IRW - Most channelization of natural streams has been done. Burying drain has occurred / is occurring, but is generally cost-prohibitive. Serious flash-flooding at Clear Creek (one of the few places with potential for return to cold water stream).
Agricultural & Forestry Effluents	1. Herbicides and insecticides (drift) (PS, TF) 2. Nutrient inputs (TF, IRW) (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. (AG)	L	L	M	H	L	H	H	M?	H	MF - Hog operations on adjacent lands. PS – Pesticide drift. TF - Mainly flowing into ditches. Some improvements being made in methods. Irreversibility high because difficult to change industrial agriculture attitudes IRW - Non-point source impacts are a huge problem and current BMPs may not be adequate or are not being practiced on wide enough scale. Priority project. CW - Pig farms. Nutrient run-off (management techniques have improved). EFP helpful. Mushroom farm – sterilized manure used. RA - Chemicals may be accumulating in reptiles.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Problematic Native Species	1. Increased nutrients, habitat destruction 2. Decreased biodiversity 3. Impede natural succession / regeneration RA - Predation (eggs, young and to a lesser degree adults)	M	L	H	L	H	L	L	H	H	PS – Cool season plant species. TF - Staghorn Sumac is not favoured by farmers and ends up being removed, with associated habitat loss. Other problematic "hyperabundant" native species include: Wild Turkey, White-tailed Deer, Raccoon, American Crow, etc., which have impact on other native species. LES - White-tailed Deer culls and exclosures have been effective at Rondeau. Double-crested Cormorants are increasing (nesting on small islands). Prickly Pear Cactus population is not naturally-occurring, but not considered a serious problem at this time. IRW - High coyote, beaver and other "problematic" native species populations can result in bad reaction towards conservation efforts. RA - Higher (albeit cyclical) predator populations (raccoon, skunks, Red Fox, opossum)
Invasive Non-Native/ Alien Species (invertebrate pests)	1. Reduced forest quality, health and diversity MF - Combination and cumulative effects of different stresses exacerbated; increased rate of infestations.	H	VH		H	L				H	UF - Emerald Ash Borer, Asian Long-horned Beetle, etc. MF - Emerald Ash Borer, Hickory Bark Beetle; Some beneficial impacts for some species (e.g., Red-headed Woodpecker); VH rank does not preclude efforts at prevention of future infestation. TF - Hedgerows may provide dispersal opportunities for forest insect pests and disease (e.g., Ash, elm)

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Other Ecosystem Modification : **(shoreline hardening, beach maintenance)**	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).					VH	H		?	H	LES - Erieau pier has had a huge impact longshore currents (effectively created Laverne Kelly Park, and dramatically altered Rondeau South Beach). See also "work and other activities". LES - Considerable disturbance along beach, particularly adjacent to cottages (mowing, clearing of vegetation, spraying, encroachment). Erieau area – some serious impacts by landowners and municipality. Terrace Beach (Morpeth) heavily managed. Generally not a great deal of impact along remainder of shoreline. Beach maintenance. Bulldozing of dunes. CW - Illegal vegetation destruction by local boaters to open channels: dumping chemicals (2-4D pucks), dragging chains. Control of vegetation mainly driven by activities such as boating, windsurfing, fishing, kiteboarding.
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 (AG) 7. Erosion, increased sand bedload; suspended sediment / turbidity; reduced groundwater recharge & discharge. (AG, IRW)	H	L	L	L	H	L	L	M	M	Mainly along coast in western part of CAP area. UF - Provincial level legislation required to protect upland forests (e.g., PPS). – e.g., "no net loss", or minimum of 30% per municipality LES - Within Rondeau PP: Septics, sandpoint wells, SAR habitat , encroachment. Very political issue. Outside Rondeau: some new housing at Erieau, increasing density and impacts; West - setbacks from shoreline bluffs greatly increased CW - Wheatley area.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Household Sewage & Urban Waste Water	1. Reduced resilience of species; more prone to disease. (TF) 2. Chemicals impact soil quality and water quality; smell (AG) 3. Diseases, pathogenic bacteria (e.g., ecoli), prions (AG) 4. Nutrient loading (IRW)		L			H*	H	M	M?	M	LES - Faulty sewage systems within Rondeau PP. *Affecting sand spit portion, not remainder of shoreline. IRW, CW- Septic systems (esp. Shrewsbury; also Two Creeks) RA - Pharmaceuticals and other substances in wastewater impacting turtles.
Renewable Energy (Wind Farms)	Death and damage to flying and migratory species. MF - *Possible impacts of lights, audio, vibration, stray voltage on wildlife; some cutting for access roads. RA – Mortality along access roads.	H	L	L	H			L	L	M	Displacement or alteration of routes of migratory species. UF - Service corridors are the threat to upland forests; some woodlots being cut to allow for development TF - Wind turbine development is mostly completed in West; still in progress elsewhere. Solar farm in East.. Need to refer to specific plans to determine future impacts. Existing legislation for the most part not helpful in protecting habitat. Currently restricted to class 3 & 4 agricultural lands RA – Increased snake mortality along access roads (especially while basking)
Invasive Non-native Species (diseases, pathogens)	1. Reduced forest quality, health and diversity	L	H		H				L?	M	MF - Major threat to elm, Blue-beech, Butternut. TF - Major threat to Black Knot (cherry), Elm, American Chestnut, Beech, Eastern Flowering Dogwood, walnut, butternut
Problematic Non-native Fauna		M	M	L	M	L	L	L	H	M	UF, RA – Feral cats (and dogs) RA - Red-eared Slider. Round Goby – possible increase in food source.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Roads	1. Habitat fragmentation and loss 2. Road mortality (TF) 3. Run-off (salt, chemicals) (MF)	M	L	L	M	L	L	L	H	M	Impacts of road salt requires better information; may require higher threat rank for some conservation targets. Upgrade of road surface (e.g., to asphalt) increases threat (higher potential for basking + higher speed traffic). UF – Culverts; road widening into forests TF - Road salt damaging vegetation and habitat. Suspended particulate impacts. Dust control (calcium chloride/carbonate, beet juice). Road mortality as species move from patch to patch. Construction of roads is "irreversible", but except for usual maintenance activities impacts are minor; no maor plans to expand road network. CW, IRW - Road salt (being used less, brine now), dust control (calcium chloride, nitrogen), culverts. RA - Mainly affecting Eastern Foxsnake, Snapping Turtle and possibly (locally) Blanding's Turtle. Other SAR herps found mainly away from roads.
Work & Other Activities **(drain maintenance – terrestrial; dredging – wetland / aquatic)**		L	L	L	L		L	H	M?	M	UF - Vegetation cleared along closed municipal drains, no regeneration (varies by municipality) (may benefit meadow and prairie spp.); TF - Soil compaction from equipment can be issue CW, IRW, RA - Drain maintenance, brushing and re-sloping along edges. CW - Dredging occurs periodically / sporadically.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Utility & Service Lines	1. Habitat fragmentation 2. Hydrological impacts	H	L		M	L		L		M	UF - 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. TF - Existing corridors, mainly just relatively minor maintenance disturbance. New transmission lines are damaging or destroying habitat in some areas (notably in the East).
Logging & Wood Harvesting	1. Habitat damage (UF, MF) 2. Loss of canopy cover (UF. MF) 3. Soil compaction & erosion (UF, MF) 4. Invasive species (UF, MF) 5. Reduced forest interior, extent (UF, MF) 6. Siltation (MF)	M	H		L				L	M	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 – Impacts vary depending on techniques used. TF - Hedgerow trees generally not suitable for logging; some landowners cut down large trees that are shading field
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). (AG)	H	L?	L?	L?	L?	L?	L?	L?	M	Climate change affecting ALL conservation targets. UF, MF –Drift from agricultural fields, industrial air pollution TF - Vehicle exhaust – impacts of roadsides higher than hedgerows and thickets
Fire & Fire Suppression	1. NATURAL SUCCESSION, LOSS OF ECOLOGICAL INTEGRITY 2. INVASIVE SPECIES (COOL-SEASON GRASSES AND OTHER SPP.)			H		L*	L		L?	M	PS, LES - Fire is part of the natural processes and can be a management tool for prairies where appropriate. CW - Fire would historically have occurred in wetlands and maintained more open conditions. Extent of suppression as a factor today is unclear.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Recreational Activities (motorized off-road vehicles, motor boats)	1. Disturbance to wildlife 2. Direct damage to habitat and vegetation 3. Soil erosion & compaction 4. Invasive species 5. Propeller damage (aquatic reptiles)	M	M	L	L	H	M	L	L?	L	MF – ATVs, ORVs LES – ATV traffic along beach CW – ATV traffic on Rondeau Bay with low water levels (Shrewsbury area); produces swaths of area where Phragmites can quickly invade (for this reason ranked "high"). RA - Boat traffic. Degree of impact uncertain. Constant boat traffic can greatly affect basking behavior.
Tourism & Recreational Development	1. Direct habitat loss 2. Household pets (predation) 3. Light pollution 4. Invasive species 5. Encroachment (habitat modification) 6. Direct persecution of snakes (RA)	L	L	L	L	L*	L	L	M	L	UF – Trailer parks, golf courses (pesticides) LES - Overlaps with Housing & Urban (i.e., cottages). * Potential exists for increased development.
Hunting & Collecting Terrestrial Animals	1. Population decline or loss (SAR turtles) (MF, IRW)	L	L		L	L	L	L	M	L	TF - Coyote and fox hunting widespread. Deliberate killing of snakes. RA - A couple of collectors apprehended annually; how many are not being caught?
Industrial & Military Effluents	1. Reduced resilience of species; more prone to disease. (TF) 2. Contaminants, toxins from industrial waste water (AG)		L		L		L	L	M?	L	RA - Chemicals may be accumulating in reptiles.
Garbage & Solid Waste	1. Bank destabilization (IRW) 2. Erosion (IRW) 3. Habitat loss (IRW) 4. Introduction of non-native species (IRW) 5. Leachate (IRW)	L	L	L	L	M	L	L	L	L	TF, RA - May provide snake habitat. LES – Dumping of appliances, vehicles, tires, containers, other solid waste and farm animals (e.g., near Kent-Elgin boundary) – locally increases erosion and siltation. CW - Tire reefs for fish habitat are still out in Rondeau Bay.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Livestock Farming & Ranching	1. Impaired regeneration of vegetation (MF) 2. Soil compaction & erosion (MF) 3. Invasive species (MF) 4. Reduced water quality (nutrient loading, sediment deposition) (MF, IRW) 5. Habitat destruction (trampling, over-grazing) (MF, IRW)	L	L	L	L	L	L	L	L	L	Some localized cattle ranching, with run-off, but overall impacts considered fairly low.
Oil & Gas Drilling		L	L	L	L	L	L	L	L	L	Potential for future "fracking".
Commercial & Industrial Development **(greenhouses)**	1. Loss of prime agricultural land (AG) 2. Erosion, increased sand bedload; suspended sediment / turbidity; reduced groundwater recharge & discharge. (AG, IRW)	L	L	L	L		M?	M?	L	L	UF – Needs to be considered in Official Plan updates CW, IRW - Potential impacts on water quality. Cedar Line greenhouse project example using DU model for operational wastewater and stormwater management (zero emissions, runoff).
Mining & Quarrying		L	L	L	L	L			L	L	MF - Pit near Clear Creek and southeast of Blenheim. IRW- Potential for wetland rehabilitation projects
Railroads	1. Habitat damage (by off-road vehicles)	L	L	L	L			L	L	L	TF – Result in more habitat.
Gathering Terrestrial Plants	1. Cumulative impact of losing individuals, seed sources, genes, food sources (MF, PS). 2. Damage to vegetation (trampling) (PS). 3. Habitat loss. (MF, IRW)	L	L	L*	L	L				L	PS - *As prairie sites become known to public, potential for collection (mainly of seed) increases. TF - Some collecting; no serious impacts noted. Pawpaw being harvested to some degree.
Introduced Genetic Material		L	L	L	L	L				L	White/Red Mulberry hybridization. Garden cultivars.

Threat	Associated Stress(es) Key: VERY HIGH; high; medium; low Stress applies to all conservation targets unless otherwise indicated (with acronym)	1. Upland Forests (UF)	2. Moist Forests & Swamps (MF)	3. Prairie & Savannah (PS)	4. Thickets, Hedgerows, Fencerows, Shelterbelts, Abandoned Fields (TF)	5. Lake Erie Sand Spit and Shorelines (LES)	6. Coastal Wetlands (CW)	7. Inland Riparian and Wetland (IRW)	8. SAR Reptiles and Amphibians (RA)	Overall	Notes
Fishing & Harvesting Aquatic Resources							L	L	L	L	
Wood & Pulp Plantations		L	L							L	Could actually create thickets by converting cropped land to growing willow or other shrubs for biofuel

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.

3. Conservation Objectives and Strategies

i. Conservation Objectives

Table 1.9 Conservation Objectives.

Objectives	Threats Addressed	Targets Addressed
1. Establish outreach program to communicate the reasons for the Conservation Action Plan, its goals and objectives, and get input from stakeholders and landowners on best approaches.	All	All
2. Support the development of natural heritage systems planning in Chatham-Kent.	All	All
3. Retain existing forest cover.	Habitat loss and fragmentation (cash crops, housing development, logging), excess sunlight, heating, wind burn, edge effects, invasive species, etc.	UF, MF, RA
4. Increase extent of healthy forest[1] in East section of Rondeau CAP area to 12% by 2033.	Habitat loss and fragmentation (cash crops, housing development, logging), excess sunlight, heating, wind burn, edge effects, invasive species, etc.	UF, MF, RA
5. Increase extent of healthy forest[1] in Rondeau Watershed section of CAP area to 12% by 2033.	Habitat loss and fragmentation (cash crops, housing development), invasive species, excess sunlight, heating, wind burn, edge effects, etc.	UF, MF, RA

[1] - with diversity of native species and age classes

Objectives	Threats Addressed	Targets Addressed
6. Plant strategic forest buffers covering 50 ha at priority sites in West section of Rondeau CAP by 2023.	Habitat loss and fragmentation (cash crops, housing development), invasive species, excess sunlight, heating, wind burn, edge effects, etc.	UF, MF, RA
7. Ten contiguous hectares of prairie (>10m wide) restored along municipally-owned lands (and/or adjacent lands) within next 5 years (0.5 ha in first year).	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA
8. One conspicuous demo site of prairie habitat (1 hectare minimum) initiated around public utility project site by 2015.	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA
9. One demonstration site of prairie habitat (1 hectare minimum) created or restored at a cemetery by 2015.	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA
10. One 20 ha block of prairie created or restored by 2015.	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA
11. 2 km of new (native-, multi-species, shrub dominated) hedgerows established in West by 2018.	Habitat loss and fragmentation (cash crops, wind turbine development), invasive species, soil erosion, excess wind burn	TF, RA, AG
12. 5 km of new (native-, multi-species, shrub dominated) hedgerows established East and Rondeau by 2018.	Habitat loss and fragmentation (cash crops, wind turbine development), invasive species, soil erosion, excess wind burn	TF, RA, AG
13. No new shoreline hardening structures or major alterations taking place along Lake Erie coast or Rondeau Bay by 2018.	Habitat loss (shoreline hardening)	LES, CW, RA
14. All faulty and obsolete septic systems on the Rondeau Peninsula and around Rondeau Bay upgraded by 2018.	Habitat degradation (household sewage)	LES, CW

Objectives	Threats Addressed	Targets Addressed
15. Beach grooming, landscaping, encroachment, littering and dumping impacts measurably reduced by 2015.	Habitat loss and degradation (beach grooming, landscaping, encroachment)	LES, CW, RA
16. Initiate Phragmites control projects of 50 acres per year at coastal wetland sites in Rondeau Bay and other affected sites.	Habitat loss and degradation, invasive species	CW, RA
17. Reduce and then maintain lower nutrient inputs to Rondeau Bay to acceptable concentrations.	Habitat degradation (effluents: agriculture, industrial greenhouses)	IRW, CW, RA, AG
18. Promote ecologically appropriate integrated vegetation management of drains by 2018.	Habitat loss, fragmentation and degradation (drain maintenance, crops to edge of watercourse), excess flooding energy	IRW, CW, RA, AG
19. Sediment (catchment) basins and 2-stage ditches included in all new engineers' reports, and in at least 2 drain maintenance bottom clean-up projects annually.	Habitat degradation (drain maintenance, erosion from agricultural fields, excess flooding energy)	IRW, CW, RA, AG
20. Reptile-friendly vegetation mats used in all drain maintenance projects and road/bridge upgrades.	Reptile mortality	IRW, RA
21. Turtle-friendlier drain maintenance practices being applied CAP-wide by 2015.	Reptile mortality	IRW, RA
22. Buffers of native vegetation of 3 m width on each side established along 50 km of open watercourses by 2020, and included in all new engineers reports.	Habitat loss, fragmentation and degradation (crops to edge of watercourse), agricultural effluents, excess flooding	IRW, CW, RA, AG

ii. Strategic Actions and Action Steps

Table 1.10 Strategic actions and action steps.

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
1. Establish outreach program to communicate the reasons for the Conservation Action Plan, its goals and objectives, and get input from stakeholders and landowners on best approaches.	1. Annual community workshop and bus tour to learn about natural features, land uses, ecological impacts and habitat stewardship demonstration sites. 2. Annual report/newsletter on CAP projects available to community. 3. Prepare and make best stewardship practices materials available to landowners via web site and publications. 4. Approach steering committee member groups to support project(s) a. Review all potential funding sources. b. Develop funding proposals in partnership with steering committee and implementation partners in order to support 1, 2, & 3.	2013 and beyond	All	All	Chatham-Kent, LTVCA, Farm organisations, Woodlot Associations, CCC, Ontario NativeScape	
2. Support the development of natural heritage systems planning in Chatham-Kent.	1. Update natural heritage inventory / features (Schedule C) of Official Plan by 2014. a. Explore opportunities to identify priority corridors and linkages by 2015.	2013-2015	All	All	C-K	
3. Retain existing forest cover.	1. Support tax relief, carbon credits, municipal policies, legislation, regulations, guidelines and incentives for private landowners that prevent the loss of existing forest cover. a. Support conservation by-law that promotes good, sustainable forest management practices. b. Support policy or programs that encourage retention of mature forests and long-term protection of forests (e.g. incentive programs, conservation easements). c. Support effective "ecological goods and services" incentive programs (such as ALUS). d. Support changes in taxation structure (federal and municipal) to reflect ecological services that forest cover provides to society and to reduce economic advantages of clear-cutting woodlots. 2. Promote good forest management practices and the social, economic and ecological values of forests through outreach materials, newsletters, letters to the editor, workshops and events.	2013 and beyond	Habitat loss and fragmentation (cash crops, housing development, logging), excess sunlight, heating, wind burn, edge effects, invasive species, etc.,	UF, MF, RA	C-K	

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
4. Increase extent of healthy forest in East section of Rondeau CAP to 12% by 2033.	1. Identify opportunities for forest restoration projects on municipal and private lands. Projects that increase extent of existing forest and make linkages among forest patches should be given priority. Projects should use ecologically appropriate species of native trees and shrubs. a. Approach partners such as the Greening Strategy, 50M Tree Program, Ontario Power Generation and CASO rail trail to secure resources for restoration projects. b. Recruit local landowners through CCC's Landowner Leaders program for forest restoration projects. c. Identify priority sites for restoration based on ecological values (e.g. increasing extent, connectivity) and opportunity. d. Include signage, demonstration sites and other communication tools as educational component for each restoration project. 2. Support "ecological goods and services" incentive programs (modeled on ALUS).	2033	Habitat loss and fragmentation (cash crops, housing development, logging), excess sunlight, heating, wind burn, edge effects, invasive species, etc.	UF, MF, RA	LTVCA, Chatham-Kent Stewardship Kent, CCC, Trees Ontario, Ontario Power Generation, Ducks Unlimited, Rondeau Bay Waterfowlers, OMNR Lake Erie Management Unit	
5. Increase extent of healthy forest in Rondeau Watershed section of CAP to 12% by 2033.	1. Identify opportunities for forest restoration projects on municipal and private lands. Projects that increase extent of existing forest and make linkages among forest patches should be given priority. Projects should use ecologically appropriate species of native trees and shrubs. a. Approach partners such as the Greening Strategy, 50M Tree Program, Ontario Power Generation and CASO rail trail to secure resources for restoration projects. b. Recruit local landowners through CCC's Landowner Leaders program for forest restoration projects. c. Identify priority sites for restoration based on ecological values (e.g. increasing extent, connectivity) and opportunity. d. Include signage, demonstration sites and other communication tools as educational component for each restoration project. 2. Support "ecological goods and services" incentive programs (modeled on ALUS).	2033	Habitat loss and fragmentation (cash crops, housing development), invasive species, excess sunlight, heating, wind burn, edge effects, etc.	UF, MF, RA	LTVCA, Chatham-Kent Stewardship Kent, CCC Trees Ontario, Ontario Power Generation, Ducks Unlimited, Rondeau Bay Waterfowlers, OMNR Lake Erie Management Unit	

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
6. Plant strategic forest buffers covering 50 ha at priority sites in West section of Rondeau CAP by 2023.	1. Identify opportunities for forest buffer planting projects on municipal and private lands. Projects should use ecologically appropriate species of native trees and shrubs. a. Approach partners such as the Greening Strategy, 50M Tree Program, Ontario Power Generation to secure resources forest buffer planting projects. b. Recruit local landowners through CCC's Landowner Leaders program for forest buffer planting projects. c. Identify priority sites for restoration based on ecological values (e.g. increasing extent, connectivity) and opportunity. d. Include signage, demonstration sites and other communication tools as educational component for each project. 2. Support "ecological goods and services" incentive programs (modeled on ALUS)	2023	Habitat loss and fragmentation (cash crops, housing development), invasive species, excess sunlight, heating, wind burn, edge effects, etc.	UF, MF, RA	LTVCA, Chatham-Kent Stewardship Kent, CCC, Trees Ontario, Ontario Power Generation, Ducks Unlimited, Rondeau Bay Waterfowlers, OMNR Lake Erie Management Unit	
7. Ten contiguous hectares of prairie (>10m wide) restored along municipally-owned lands (and/or adjacent lands) within next 5 years (0.5 ha in first year).	1. Implement prairie restoration[2] along CASO rail corridor.	2018	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA	Chatham-Kent, Ducks Unlimited, TGO, Stewardship Kent, LTVCA, Western University, & others	OPG, MNR SARSF, HSP, OMAFRA / COA
8. One conspicuous demo site of prairie habitat (1 ha minimum) initiated around public utility project site by 2015.	1. Recruit Landowner Leaders through CCC's programs to initiate projects on their lands. 2. Use projects as demonstration sites.	2015	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA	LTVCA, Ducks Unlimited, TGO, Stewardship Kent, Ontario NativeScape (wind turbine companies, DU)	OPG, MNR SARSF, HSP, Wind turbine companies, Samsung
9. One demonstration site of prairie habitat (1 ha minimum) created or restored at a cemetery by 2015.	1. Implement prairie restoration project at a C-K municipal cemetery or Pioneer cemetery within CAP. a. Identify suitable sites for prairie creation or restoration. b. Develop restoration plan and secure funding for project. c. Include signage and other communication tools as educational component for the project.	2015	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA	Chatham-Kent, TGO	

[2] Prairie restoration should occur away from shrub and tree communities to minimize predation on grassland birds.

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
10. One 20 ha block of prairie created or restored by 2015.	1. Identify opportunities for prairie restoration projects on municipal and private lands. a. Approach partners such as the Greening Strategy, Ducks Unlimited, Ontario Power Generation and CASO rail trail to secure resources for restoration projects. b. Recruit local landowners through CCC's Landowner Leaders program for prairie restoration project. c. Approach landfill sites as potential prairie restoration sites (e.g. Ridge Landfill) d. Include signage, demonstration sites and other communication tools as educational component for the restoration project.	2015	Habitat loss and fragmentation (cash crops, housing development, succession), invasive species, fire suppression	PS, RA	Ducks Unlimited, TGO, Stewardship Kent, Ontario NativeScape	
11. 2 km of new (native-, multi-species, shrub dominated) hedgerows established in West by 2018.	1. Identify opportunities for hedgerow planting projects on private lands. a. Approach partners such as the Greening Strategy, 50M Trees, and Ontario Power Generation to secure resources for planting projects. b. Recruit local landowners through CCC's Landowner Leaders program for hedgerow planting projects. c. Include signage, demonstration sites and other communication tools as educational component for the hedgerow planting projects. d. Identify priority sites for projects. 2. Develop programs to educate, bring awareness, and outreach regarding values and advantages of hedgerows. a. CCC's Landowner Leaders program. 3. Investigate possible criteria for zoned buffer along edges of farm properties. a. Investigate possible use of geophysical barriers to removal of new buffers. b. Support "ecological goods and services" incentive programs (modeled on ALUS) to engage farmers.	2018	Habitat loss and fragmentation (cash crops, wind turbine development), invasive species, excess energy	TF, RA, AG	LTVCA (CCC, C-K, OPG)	

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
12. 5 km of new (native-, multi-species, shrub dominated) hedgerows established East and Rondeau by 2018.	1. Identify opportunities for hedgerow planting projects on private lands. a. Approach partners such as the Greening Strategy, 50M Trees, and Ontario Power Generation to secure resources for planting projects. b. Recruit local landowners through CCC's Landowner Leaders program for hedgerow planting projects. c. Include signage, demonstration sites and other communication tools as educational component for the hedgerow planting projects. d. Identify priority sites for projects. 2. Develop programs to educate, bring awareness, and outreach regarding values and advantages of hedgerows. a. CCC's Landowner Leaders program. 3. Investigate possible criteria for zoned buffer along edges of farm properties. a. Investigate possible use of geophysical barriers to removal of new buffers. b. Support "ecological goods and services" incentive programs (modeled on ALUS) to engage farmers.	2018	Habitat loss and fragmentation (cash crops, wind turbine development), invasive species, excess energy	TF, RA, AG	LTVCA (CCC, C-K, OPG)	
13. No new shoreline hardening structures or major alterations taking place along Lake Erie coast or Rondeau Bay by 2018.	1. Enforce existing regulations. a. Lobby for adequate support for enforcement. 2. Investigate and support ecologically-friendly and landowner-friendly shoreline management approaches. a. Identify ecologically-friendly and landowner-friendly shoreline management by assembling small solution-focused groups to develop economical, community-generated solutions. b. Develop programs to educate, bring awareness, and outreach regarding values and advantages of ecologically-friendly and landowner-friendly shoreline management. c. Develop appropriate business strategy that involves local entrepreneurs. d. Develop recognition program for landowners following good shoreline management (modeled on Lake Huron Coastal Centre for Conservation). e. Recruit landowners with good shoreline management to join the Erie Coastal Stewardship EcoTrail as demonstration sites of coastal stewardship.	2018	Habitat loss (shoreline hardening)	LES, CW, RA	Local community groups (CCC)	

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
14. All faulty and obsolete septic systems on the Rondeau Peninsula and around Rondeau Bay upgraded by 2018.	1. Enforce existing regulations. a. Lobby for adequate support for enforcement. 2. Investigate and support ecologically-friendly and landowner-friendly upgrades to septic systems. a. Identify ecologically-friendly and landowner-friendly upgrades to septic systems by assembling small solution-focused groups to develop economical, community-generated solutions. b. Develop programs to educate, bring awareness, and outreach regarding values and advantages of ecologically-friendly and landowner-friendly shoreline management. c. Develop appropriate business strategy that involves local entrepreneurs.	2018	Habitat degradation (household sewage)	LES, CW	Local community groups, MoE, Chatham-Kent Public Health, Business	
15. Beach grooming, landscaping, encroachment, littering and dumping impacts measurably reduced by 2015.	1. Develop education and awareness program to promote ecological values of ungroomed beaches. a. CCC Landowner Leaders program. b. Develop recognition program for landowners following good beach practices (modeled on Lake Huron Coastal Centre for Conservation). c. Recruit landowners with good beach practices to join the Erie Coastal Stewardship EcoTrail as demonstration sites of coastal stewardship. d. Develop an Adopt-a-beach program. 2. Implement dune restoration projects such as raised boardwalks, rolling boardwalks. a. Identify priority sites for projects on municipal and private lands. b. Recruit private landowners for restoration projects through CCC's Landowner Leaders program. c. Approach potential partners. d. Include signage, demonstration sites and other communication tools as educational component for the restoration projects. 3. Clarify beach ownership.	2015	Habitat loss and degradation (beach grooming, landscaping, encroachment)	LES, CW, RA	Local community groups (CCC)	

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
16. Initiate Phragmites control projects of 50 acres per year at coastal wetland sites in Rondeau Bay and other affected sites.	1. Lobby federal government to permit use of safe herbicides to use over water for Phragmites control annually until achieved. 2. Identify highest priority wetland biodiversity hotspots by 2015 and prioritize invasive species control activities to take place at those locations. 3. Provide outreach to, and work with, plant nursery / garden centres to promote the sale of beneficial (ideally native) species (annually, starting in 2014). 4. Implement Phragmites control projects at priority sites starting in 2014. 5. Investigate new and creative methods of Phragmites control (e.g. biomass plant).	2015, and ongoing	Habitat loss and degradation, invasive species	CW, RA	Ontario Parks, OMNR, LTVCA, Ontario NativeScape, Rondeau Bay Working Group, Ducks Unlimited, Rondeau Bay Waterfowlers, CCC (outreach)	HSP, MNR SARSF, COA,
17. Reduce and then maintain lower nutrient inputs to Rondeau Bay to acceptable concentrations.	1. Determine "acceptable" levels by working with partners (e.g. Rondeau Bay Working Group). 2. Prioritize projects by level of degradation as determined by water quality testing. 3. Establish Landowner Leader demo sites to show good practices regarding run-off and nutrient management (e.g. McLean Property). a. Recruit private landowners through CCC's Landowner Leaders program. b. Include signage, demonstration sites and other communication tools as educational component for the projects. c. Develop programs to educate, bring awareness, and outreach regarding values and advantages of good nutrient management.	2013 and beyond	Habitat degradation (effluents: agriculture, industrial greenhouses)	CW, RA, AG	Rondeau Bay Working Group, OSCIA? OMAF? (CCC, LTVCA?)	

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
18. Promote ecologically appropriate integrated vegetation management of drains by 2018.	1. Provide outreach to responsible municipal staff and landowners regarding issue by 2015. a. Review, re-emphasize and, if necessary, prepare BMPs on riparian vegetation management. b. Hold drain maintenance "best practices" (e.g., reduced encroachment, grassed buffers, berms, other landscape features, row of shrubs at top, good utilization of sediment – e.g., biofuel) workshops with landowners, contractors and drainage superintendents / staff. c. Establish public/landowner outreach and education campaign by 2015. 2. Clarify responsibilities and communicate with responsible agencies re: monitoring and enforcement of violations (by 2015). 3. Promote ALUS-type incentives / support for ecological practices along drains.	2018	Habitat loss, fragmentation and degradation (drain maintenance, crops to edge of watercourse), excess flooding	IRW, CW, RA	Chatham-Kent, CCC (OMAF, LTVCA)	
19. Sediment (catchment) basins and 2-stage ditches included in all new engineers' reports, and in at least 2 drain maintenance bottom clean-up projects annually.	1. Present at annual meetings of drainage superintendents. 2. Provide BMP "newsletter" annually to drainage superintendents. 3. Conservation authorities make appropriate recommendations during report review. 4. Work with municipality to include recommendations in final drain reports. 5. Provide educational materials explaining cost savings and benefits of 2-stage ditches to target landowners. 6. Secure funding to initiate projects.	2013 and beyond	Habitat degradation (drain maintenance, erosion from agricultural fields, excess flooding energy)	IRW, RA	OMNR, C-K, LTVCA, CCC	Green energy funds, SAR funds
20. Reptile-friendly vegetation mats used in all drain maintenance projects and road/bridge upgrades.	1. Compile best management practices (BMPs) for reptile-friendly drain maintenance and road/bridge projects. 2. C-K roads department and drainage superintendent approached with information materials.	2013 and beyond	Reptile mortality	IRW, RA	CCC, C-K	

Objective	Strategic Actions	Timeline	Threats Addressed	Targets Addressed / Recovery Strategy links	Potential Leads (Collaborators)	Costs / Funding Sources
21. Turtle-friendlier drain maintenance practices being applied CAP-wide by 2015.	1. Compile best management practices (BMPs) for reptile-friendly drain maintenance practices. 2. Provide BMP "newsletter" annually to drainage superintendents. 3. Present at annual meetings of drainage superintendents. 4. Conservation authorities make appropriate recommendations during drain maintenance approvals process.	2013 and beyond	Reptile mortality	IRW, CW, RA, AG	OMNR, CCC, LTVCA	
22. Buffers of native vegetation of 3 m width on each side established along 50 km of open watercourses by 2020, and included in all new engineers reports.	1. Profile progressive practices and disseminate to high priority target audiences. 2. Advocate for strengthening of provincial guidelines (BMPs) to facilitate this objective. a. Work with OMAF and Chatham-Kent to lead process. b. Hold webinar or series of webinars to inform community on issue. c. New drainage reports include 3m buffer. 3. Advocate for increased support for Environmental Farm Plan program. a. Work with OMAF to facilitate process. 4. Hold on-site "best practices" demonstration events hosted by local landowners (one annually, work with local agricultural organizations). a. Tie-in to local OSCIA annual meetings. 5. Lobby for implementation of ALUS-type program province-wide.	2018	Habitat loss, fragmentation and degradation (crops to edge of watercourse), agricultural effluents, excess flooding energy		OMAF, OSCIA, LTVCA, C-K, OMNRLocal farm associations CCC – host webinar	

iii. Evaluation and Monitoring

An important component of the CAP process is monitoring. Are the CAP's strategic actions and action steps being implemented as planned? Are the strategic actions achieving the objectives they were designed to achieve? And are they resulting in the improved viability of the conservation targets and enhanced overall ecosystem health? Are target audiences receiving the appropriate information and educational materials? Is the community actively engaged and supportive of the CAP objectives and strategies? Are public policy changes occurring that support the vision and long term goals of the CAP?

Having answers to questions such as these during the ongoing implementation of the CAP will allow for 'adaptive management' in what is meant to be a flexible, long term program for positive change on the landscape. Objectives, quantitative targets, timelines, strategic actions and other aspects of the CAP may need adjustment based on unforeseen factors that either impede or prevent progress on a specific objective or target, or at least make it unrealistic to achieve that target within a given timeframe. The CAP is therefore a 'living document' that will be reviewed at least annually, and periodically revised as necessary, based on evaluation of monitoring results.

As long as adequate funding is available, Carolinian Canada Coalition (CC) is committed to monitoring the actual implementation of the CAP (i.e., are the strategic actions being undertaken as planned?). The Rondeau – Erie Coast CAP will be included in CC's annual CAP monitoring report, which is normally submitted to the key funders of the CAP program as well as to all local CAP implementation partners. CC is also exploring ways in which landscape-level monitoring can be undertaken on a regular basis in order to document changes and trends in land cover and land use in CAP areas as well as across the entire Carolinian life zone in Canada. Such high-level monitoring using remotely-sensed data will help determine if goals such as extent of forest cover, forest interior, prairie, wetland and natural connectivity are being achieved by the CAP. For finer-scale monitoring, such as would be required at individual sites and to determine how target species populations are faring, the support of CAP partner agencies and groups will be essential.

Table 1.7 includes a column that lists "key ecological attributes" or KEAs for each major conservation target. KEA are critical components of a target's life history, habitat, physical processes, or community interaction that, if degraded or lost would seriously jeopardize the target's integrity. Tracking change in the KEAs will thus be an excellent measure of the success of the CAP's strategic actions. In many cases, relatively straightforward, efficient, low-cost measures were identified by the CAP science team for each conservation target, and are included in the KEA column in Table 1.7. Wherever appropriate and feasible, CAP implementation partners should consider monitoring KEA in their project work plans. CC will strive to assist partners in developing methods to undertake such monitoring.

A comprehensive array of excellent conservation planning resource materials, including guidance on CAP monitoring methods, are also available on-line at The Nature Conservancy (U.S.) web site (www.conserveonline.org).

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Appendix A

Rondeau – Erie Coast CAP Mapping Methodology

Scope

The project area is a portion of the Municipality of Chatham-Kent centered around Rondeau Provincial Park. The area includes everything south of the Canada South Rail trail to Lake Erie, from the west boundary of Chatham-Kent all the way to the east boundary. A 10km buffer was used in order to avoid exclusion of natural features falling just outside of the CAP boundary. Any individual land use polygon with a centroid falling within the CAP area 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 Rondeau – Erie Coast 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.

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 Chatham-Kent.

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 Rondeau – Erie Coast CAP. 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 Chatham-Kent. 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 CAP 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

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 – Rondeau – Erie Coast CAP Area

Natural Area Name	Natural Heritage Designation*
SINCLAIR'S BUSH	Carolinian Canada Site
TWO CREEKS CONSERVATION AREA	Conservation Authority Area
SINCLAIR'S BUSH CONSERVATION AREA	Conservation Authority Area
McGEACHY POND CONSERVATION AREA	Conservation Authority Area
RONDEAU BAY MARSHES CONSERVATION AREA	Conservation Authority Area
LAND MANAGEMENT FARM CONSERVATION AREA	Conservation Authority Area
WALTER DEVEREAUX CONSERVATION AREA	Conservation Authority Area
GREATER RONDEAU AREA	Important Bird Area
PINEHURST SANDY-LOAM HILLS	International Biological Program site
VAN HORNE SUGAR MAPLE STAND	International Biological Program site
SHREWSBURY SANDY LOAMLAND	International Biological Program site
HIGHGATE ROLLING SANDLAND	International Biological Program site
WHEATLEY PROVINCIAL PARK	Life Science ANSI
PINEHURST SANDY LOAM HILLS	Life Science ANSI
VAN HORNE SUGAR MAPLE STAND	Life Science ANSI
RONDEAU BAY MARSHES	Life Science ANSI
RONDEAU PROVINCIAL PARK	Life Science ANSI
SINCLAIR'S BUSH	Life Science ANSI
MORPETH RAVINE	Life Science ANSI
CLEAR CREEK	Life Science ANSI
ELGIN AND KENT COUNTY SHORELINE	Life Science ANSI
WHEATLEY PROVINCIAL PARK	Life Science Site
PINEHURST SANDY LOAMLAND	Life Science Site
RONDEAU	Life Science Site
SINCLAIR'S BUSH 'ANSI'	Life Science Site
TROY WOODS	Life Science Site
MORPETH CREEK	Life Science Site
DUART ROLLING SANDLANDS	Life Science Site
HIGHGATE RAIL ROAD PRAIRIE WEST	Life Science Site

Natural Area Name	Natural Heritage Designation*
Shelden Property-Turin Paw Paw Woods Natural Area	Life Science Site
TURIN PAW-PAW SPECIAL AREA	Life Science Site
CLEAR CREEK & KENT-ELGIN SHORELINE 'ANSI'	Life Science Site
CLEAR CREEK WOODLOT	Life Science Site
KENT/ELGIN SHORELINE COMPLEX	Life Science Site

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

Appendix C

Species-specific Threats to Rondeau – Erie Coast CAP Species At Risk

O=Ontario-wide threats, OC=Ontario-wide threats also documented in Chatham-Kent.

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. UF; 2. MF	O C	O C	O C	O C		O?	O	O C					O C			Limited by availability of suitable habitat; Incompatible Forestry: diameter-limit harvesting, canopy opening; Brown-headed Cowbird nest parasitism; Predators?
American Badger	3. PS; 4. TF; 5. AG	O C	O C				O			O C?	O C?		O C	O C?			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		O C	O C	O		O C		O			O				O	Main threat is **Chestnut blight (*C. parasitica*)**; Limited by self-incompatible breeding system and low seed dispersal
American Ginseng	1. UF		O	O	O						O			C			Main threats are small population size, harvesting, and habitat loss and degradation from clearing and logging. Browsing from large populations of White-tailed Deer may be a problem locally.

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
American Water-willow	6. CW; 7. LES; 8. IRW		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).
Bald Eagle (STATUS REPORT NOT AVAILABLE)	1. UF; 2. MF; 3. PS; 4. TF; 5. AG; 6. CW; 7. LES; 8. IRW		O				O? C?		O C		O C	O C					Limited by availability of nest sites (large tall trees) and naturally low reproductive output; Pollution (mercury, lead, pesticides); disturbance during nesting; disease (botulism?)
Barn Owl	3. PS; 4. TF; 5. AG; 6. CW		O	O			O?		O				O	O			Main threats include loss of habitat, prey and nesting sites; predation; competition for prey and nest sites; disturbance to nests; road mortality. Limiting factors include cold climate, low population density making it difficult to locate mates, high sibling competition resulting in low recruitment.
Bent Spike-Rush	6. CW; 7. LES; 8. IRW		C	O C				O				O C			O C		Main threats include invasion of *Phragmites australis*, increased nitrogen inputs from agricultural runoff, changes in water levels, residential development. Limited by very specific habitat and limited geographic distribution.
Blanding's Turtle	6. CW; 7. LES; 8. IRW; 9. RA	O C	O C	O C			O? C?				O C	O C	O C	O C			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?

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
Broad Beech Fern (STATUS REPORT NOT AVAILABLE)	1. UF; 2. MF		O C		O			O C	O								Trampling during maple sugar operations; damage to plants and habitat during forestry operations; Limited by low tolerance to environmental changes.
Butternut	1. UF; 2. MF; 4. TF	O	O C		O C		O C				O			O C		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	1. UF	O C	O C		O C							O		O C?			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)
Climbing Prairie Rose	3. PS; 4. TF		O	O		O			O						O		Main threats include urban development, incompatible site management, succession, competition with non-native shrubs.
Common Five-Lined Skink	1. UF; 3. PS; 7. LES	O C	O C	O C		O C?			O C		O C		O C	O C?			Limited by availability of sandy substrates used for overwintering; vegetation succession; subsidized predators

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
Common Hoptree	7. LES		O			O?								O	O		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?.
Dense Blazing-star	3. PS; 8. IRW		O C			O C		O C	O			O C		O C?	O C	O C?	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
Eastern Flowering Dogwood	1. UF; 4. TF	O C	O C	O C	O C	O C	O C							O C			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
Eastern Foxsnake	1. UF; 2. MF; 3. PS; 4. TF; 5. AG; 6. CW; 7. LES; 8. IRW; 9. RA	O C	O C	O C					O C	O	O C	O C	O C	O C			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. UF; 3. PS; 4. TF; 5. AG; 7. LES; 8. IRW; 9. RA	O C	O C	O C							O C	O C	O C	C?			Limited by prey specialization, climate, low population densities; roads; pesticides (reduced fitness and reproductive success, prey abundance)

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
Eastern Mole	1. UF; 2. MF	O	O	O	O			O			O	O?					Limited by availability of suitable soil types, loss of potential habitat to agriculture and urban development, flooding of tunnels, limited ability to move to new suitable habitats, intentional killing/trapping, exposure to DDT?
Eastern Musk Turtle (Stinkpot)	6. CW; 7. LES; 8. IRW; 9. RA		O C					O		O C	O	O C					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 Pondmussel	8. IRW			O				O				O		O?	O		Main threats include invasive dreissenid mussels, decline in water quality, climate change, changes in hydrology. Possibly limited by excessive predation by muskrats, lack of host fish (unknown).
Eastern (Northern) Ribbonsnake	2. MF; 4. TF; 7. LES; 8. IRW; 9. RA		O C	O C				O C		OC?	O C		O C	O C			Limited by habitat (ponds/wetlands bordered by dense vegetation) and prey specialization (amphibians); declines in prey abundance; boat mortality?; subsidized predators
Eastern Sand Darter	6. CW; 7. LES; 8. IRW			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)

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
Fowler's Toad	6. CW; 7. LES; 8. IRW (near Lake Erie); 9. RA	O	O C	O C			O		O C	O C		O C	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
Goldenseal	1. UF; 2. MF	O	O	O		O		O	O	O	O						Main threats include habitat loss and degradation (logging, urban development, drainage/ditches), changes to natural disturbance regimes, harvesting. Limited by slow regeneration vegetatively and by seed, lack of natural disturbance (flood), lack of appropriate seed dispersing fauna.
Green Dragon	2. MF; 8. IRW		O C					O?			O				O C		Limited by climate; collection; changes in hydrological regime; garlic mustard
Henslow's Sparrow	3. PS; 4. TF; 5. AG; 8. IRW (low-lying seasonally flooded areas)	O C	O C	O C		O			O C	O				O C			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)

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Hooded Warbler	1. UF	O C	O C		O C		O	O	O C					O C			Limited by availability of habitat; Forestry (diameter-limit forest harvesting); Brown-headed Cowbird nest parasitism; disease
King Rail	6. CW		O	O				O		O	O?	O?	O				Main threats include wetland loss and degradation, changes in water levels, invasive species degrading habitat, collisions with artificial structures, toxic pollutants?, decreasing crayfish populations?, West Nile virus?, incidental trapping? and targeted hunting?
Lake Chubsucker	6. CW	O	O C	O C				O		O							Main threats include wetland habitat loss, siltation & turbidity, nutrient loading, channelization, exotic species degrading habitat, climate change, incidental harvest, changes to trophic dynamics, barriers to movement. Limited by cool water temperatures, habitat specificity, intolerance to turbidity and highly silted waters, limited dispersal ability.
Least Bittern	6. CW; 8. IRW	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	2. MF; 7. LES	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 (extirpated)	O	O								O		O				Low population numbers; isolation *Note: No known extant occurrences in Chatham-Kent*

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Milksnake	All targets, but primarily 3. PS; 4. TF; 9. RA		O	O							O		O	O			Persecution
Nodding Pogonia	2. MF; 7. LES			O C										O C	O C		Main threats include invasive species, habitat degradation by earthworms, excessive herbivory. Limited by small distribution (only 2 isolated sites in Ontario).
Northern Bobwhite	1. UF; 3. PS; 4. TF; 5. AG	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
Northern Map Turtle	6. CW; 8. IRW; 9. RA		O C					O C	O C	O C	O C	O C					Development, shoreline hardening; dams, control of water levels (submerge nest sites, alter habitat); Heavy metals and other toxins
Piping Plover	7. LES																Currently extirpated from historical range of the north shore of Lake Erie. Main threats in other parts of the range include excessive predation, habitat loss and degradation (including succession), human disturbance, livestock grazing (trampling, pollution), West Nile virus?, pollution?, threats on wintering grounds.

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Prothonotary Warbler	2. MF; 7. LES	O C	O C		O C			O C				O C?		O C			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
Pugnose Shiner	6. CW; 8. IRW	O C	O C	O C						O C		O C					Main threats include habitat modification, aquatic vegetation removal, sediment loading/turbidity, nutrient loading, exotic species degrading habitat, baitfish industry, changes in trophic dynamics, climate change. Limited by habitat specificity to quiet wetlands with clear water and dense vegetation.
Pygmy Pocket Moss	2. MF; 8. IRW	O	O	O					O	O		O					Main threats include air and water pollution; habitat loss, degradation and fragmentation; human disturbance. Limited by cool climate at northern range limit.
Red Mulberry	1. UF	O C	O C				O									O C	Main threats include hybridization with White Mulberry, habitat loss and fragmentation, impacts from nesting Double-crested Cormorants (not in Chatham-Kent), disease.
Riddell's Goldenrod	3. PS; 4. TF; 8. IRW (Wet prairies, roadside ditches)		O						O	O							Roadside and ditch maintenance (not in Chatham-Kent); small, isolated populations (susceptible to habitat disturbance)
Round Pigtoe	6. CW; 8. IRW		O	O C								O			O C		Main threats include siltation, nutrient loads, contaminants, increased water temperatures, exotic species especially dreissenid mussels. Limited by low dispersal ability.

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Silver Chub	6. CW; 7. LES			O C													Low dissolved oxygen levels; water temperature fluctuations; Eutrophication? (Lake Erie populations recovered after introduction of Zebra Mussel)
Snuffbox	8. IRW	O		O				O				O		O			Main threats include degradation of habitat (impoundments, siltation, channel modification, pollution), invasive dreissenid mussels, excessive predation.
Spiny Softshell	6. CW; 7. LES; 8. IRW; 9. RA	O	O C	O C			O C	O C?	O C	O C	O C	O C		O C			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
Spotted Gar	6. CW	O		O C						O		O C			O?	O?	Main threats include habitat modification, aquatic vegetation removal, sediment loadings, nutrient loadings, exotic species degrading habitat, climate change, barriers to movement, incidental harvest, competition and hybridization with exotic species?. Limited by cool water temperatures, availability of habitat, habitat fragmentation.
Spotted Sucker	8. IRW	O	O	O						O		O			O		Main threats include habitat loss and degradation (turbidity, siltation), nutrient loading, exotic species, altered coastal processes, barriers to movement, toxic compounds, climate change, incidental harvest. Limited by cool temperatures?

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Spotted Turtle	6. CW; 7. LES; 8. IRW		O C	O C		O C					O C		O C	O C			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; habitat degradation due to overgrazing by livestock
Warmouth	2. MF; 6. CW; 7. LES; 8. IRW	O	O	O								O			O		Main threats include habitat loss and degradation (turbidity, siltation), nutrient loading, exotic species, altered coastal processes, changes to trophic dynamics, climate change, barriers to movement, toxic compounds. Limited by cool temperatures.
Willowleaf Aster	3. PS; 4. TF	O C	O C			O		O	O						O		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)
Yellow-breasted Chat	3. PS; 4. TF		O			O								O C			Limited by lack of available suitable habitat; Brown-headed Cowbird nest parasitism (low)