

Hamilton – Burlington 7E-3 Conservation Action Plan Executive Summary (February 2010)

Vision Statement

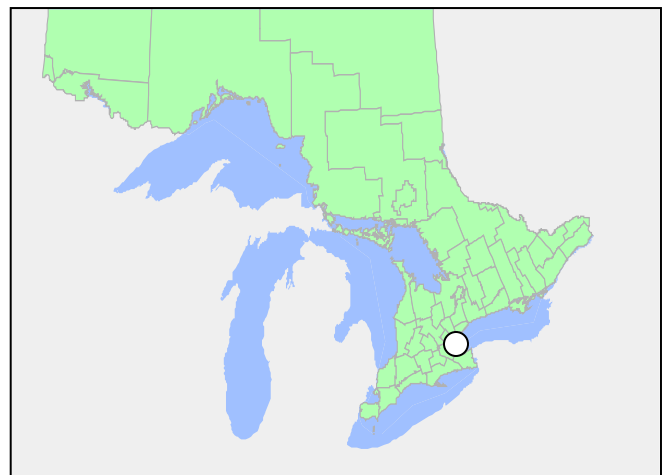
The Hamilton – Burlington area supports a full range of healthy terrestrial and aquatic habitats, including characteristic Carolinian deciduous forests, Niagara Escarpment ecosystems, dry oak woodlands, prairies and savannahs, successional thickets and fields and sand dunes, as well as coastal and inland wetland and aquatic ecosystems. Species at Risk thrive in a variety of secure habitats, which contribute to the overall connected matrix of natural cover. Natural heritage systems are restored in order to connect fragmented natural areas, and river and stream corridors. Stewardship and site management focuses on further conserving and enhancing the biodiversity values of the area. The local community takes pride in the natural beauty and health of the area, and members from all sectors and backgrounds participate in stewardship and conservation. Relationships between conservation partners are strong and reciprocal, allowing for maximum success in conservation efforts across the interconnected, ecologically functional landscape.

Goals

1. To maintain existing and establish new functional ecological linkages between core natural areas.
2. To complete securement of core natural areas.
3. To maintain and recover viable populations of Species at Risk and restore their habitats.
4. To improve water quality and aquatic habitats.
5. To manage invasive species populations so no net increase in their extent occurs.
6. To strategically increase natural cover through restoration to reconnect fragmented woodlands, wetlands and riparian corridors.
7. To direct incompatible development and land uses away from natural areas.
8. To enhance community support and understanding of the ecosystems of the Hamilton – Burlington area.
9. To encourage and support local policies that promote conservation.
10. To enhance information and monitoring of biodiversity values, natural processes and threats.
11. To support and enhance conservation partnerships across the Hamilton – Burlington region.

Conservation Context and Rationale

The Hamilton – Burlington 7E-3 Conservation Action Plan area (Figures 1 and 2) covers approximately 21,000 ha (210 km²) of lands at the western tip of Lake Ontario. It includes the waters and wetlands of Hamilton Harbour, Cootes Paradise, as well as the portions of the cities of Hamilton and Burlington found within Ecodistrict 7E-3. The area supports plants and animals characteristic of the Carolinian Life Zone, many of which are provincially, nationally and globally rare. At least 34 federally- and provincially-designated Species



at Risk (SAR) have been recorded in the CAP area within the past 30 years, with several others having occurred historically. The area has among the highest percentages of forest cover in Ecoregion 7E, and includes one of the largest coastal wetlands on Lake Ontario. Although the region has undergone intensive urban and industrial development, the Hamilton – Burlington CAP area contains some of the most extensive, diverse and highest quality natural areas in the Golden Horseshoe, Canada’s most densely-populated region. The area includes a number of Provincially Significant Wetlands and Areas of Natural and Scientific Interest, several conservation areas, and is bisected by an extensive corridor of protected lands along the Niagara Escarpment.

This CAP was made possible through the support of Environment Canada’s Habitat Stewardship Program and the provincial Species at Risk Stewardship Fund. It is intended to complement, support and enhance the many past and ongoing conservation initiatives in the area. It is a collaborative effort between the Carolinian Canada Coalition, Ontario Ministry of Natural Resources, Hamilton – Halton Watershed Stewardship Program of Hamilton Conservation Authority and Conservation Halton, Royal Botanical Gardens, Hamilton Wentworth Stewardship Council, local and regional municipalities, as well as other groups and organisations. This plan aims to achieve community outreach, landowner contacts, field research, and conservation and restoration successes over the long term.

Conservation Targets	Nested Targets (confirmed and potential)
Coastal Wetlands	Spiny Softshell, Blanding’s Turtle, Stinkpot, Northern Map Turtle, Common Snapping Turtle, Bald Eagle, Least Bittern, Black Tern (X), Eastern Ribbonsnake, Prothonotary Warbler
Niagara Escarpment & Deciduous Forests – North of Harbour	Niagara Escarpment bedrock plain, rim, cliff, talus, karst and seepage zones; Acadian Flycatcher, Hooded Warbler, Cerulean Warbler, Kentucky Warbler, American Columbo, American Ginseng, White Wood Aster, Jefferson Salamander, Woodland Vole, Southern Flying-squirrel, American Chestnut, Butternut, Eastern Flowering Dogwood, Red Mulberry, Few-flowered Club-rush
Deciduous Forests – South of Harbour	Eastern Flowering Dogwood, Butternut
Inland Wetland and Aquatic Communities	Louisiana Waterthrush, Redside Dace, Black Redhorse, Common Snapping Turtle, Western Chorus Frog, Eastern Ribbonsnake
Prairies, Savannahs, Dry Oak Woodlands	Hoary Mountain Mint, Few-flowered Club-rush, Henslow’s Sparrow (X), Northern Bobwhite (X), Eastern Hog-nosed Snake (X), Spotted Wintergreen (X), Massasauga (X), Forked Three-awn Grass (X)
Successional Thickets & Fields	American Chestnut, Butternut, Eastern Flowering Dogwood, Common Hoptree, Barn Owl, Yellow-breasted Chat, Milksnake, Short Eared Owl, Western Chorus Frog, Henslow’s Sparrow (X), Northern Bobwhite (X), Loggerhead Shrike (X)
Sand Dunes	Common Hoptree (?), Short-eared Owl (X), Piping Plover (X), American Beachgrass (introduced, but did it occur historically?), Schweinitz’s Cyperus, Common Sootywing

Threats to Conservation Targets¹

Threats Across Targets		Coastal Wetlands	Niagara Escarpment / Deciduous Forests - N	Deciduous Forests - South of Harbour	Inland Aquatic and Wetland Communities	Successional Thickets and Fields	Prairies, Savannahs & Dry Oak Woodlands	Sand Dunes	Overall Threat Rank
Project-specific threats		1	2	3	4	5	6	7	
1	Perception, Values, Lack of awareness	-	-	-	-	Very High	High	High	High
2	Residential and commercial development	-	High	High	-	Very High	Medium	-	High
3	Trails	-	High	High	-	High	High	High	High
4	Invasive Non-Native/Alien Species	-	High	High	Medium	Medium	High	High	High
5	Roads & Railroads	-	Medium	Medium	High	High	Low	High	High
6	St. Lawrence Seaway water level regulation	High	-	-	-	-	-	High	High
7	Shoreline alteration (on- and off-site)	-	-	-	-	-	-	Very High	High
8	Municipal Waste-water	Very High	-	-	-	-	-	-	High
9	Household and feral pets	-	Medium	Medium	-	High	Medium	-	Medium
10	Residential encroachment on buffer / transition zone	-	Medium	Medium	Medium	-	High	-	Medium
11	Common Carp, Round Goby, Phragmites, Zebra Mussels	High	-	-	-	-	-	-	Medium
12	Fire suppression & natural succession	-	-	-	-	Medium	High	-	Medium
13	Impervious surfaces	-	-	-	High	-	-	-	Medium
14	Artificial light	Medium	Medium	Medium	Medium	-	-	-	Medium
15	Filling and drainage alterations	-	-	-	Medium	-	-	-	Low
16	Persecution of snakes, commercial collecting of reptiles and medicinal plants	Medium	Low ²	Low	-	Medium	-	-	Low
Threat Status for Targets and Project		High	High	High	High	Very High	High	Very High	Very High

¹ - Human activities and natural processes with a potentially deleterious effect on biodiversity are often deemed “threats.”

² - Species-specific strategic actions required in some cases

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Hamilton – Burlington 7E-3 Conservation Action Plan (CAP)

PROJECT TEAM AND KEY PARTNERS

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1. CONSERVATION CONTEXT AND RATIONALE

A. CONTEXT

This Conservation Action Plan (CAP) for the Hamilton – Burlington 7E-3 area is intended to complement, support and enhance the many past and ongoing conservation initiatives in the area. This section summarizes those efforts, and provides the geographic, ecological and socioeconomic context for the CAP.

i. GEOGRAPHIC CONTEXT

The Hamilton – Burlington 7E-3 Conservation Action Plan area (Figures 1, 2, 3, and 4) covers approximately 21,000 ha (210 km²) of lands at the western tip of Lake Ontario. It includes the waters and wetlands of Hamilton Harbour, Cootes Paradise, as well as the portions of the cities of Hamilton and Burlington found within Ecodistrict 7E-3. The area supports plants and animals characteristic of the Carolinian Life Zone, many of which are provincially, nationally and globally rare. At least 34 federally- and provincially-designated Species at Risk (SAR) have been recorded in the CAP area within the past 30 years, with several others having occurred historically. The area has among the highest percentages of forest cover in Ecoregion 7E, and includes the largest coastal wetland on Lake Ontario at Cootes Paradise. Although the area has undergone intensive urban and industrial development, it contains some of the most extensive, diverse and highest quality natural areas in the Golden Horseshoe, Canada's most densely-populated region. The area includes a number of Provincially Significant Wetlands (PSWs) and Areas of Natural and Scientific Interest (ANSIs), several conservation areas, and is bisected by an extensive corridor of protected lands along the Niagara Escarpment.

The CAP area boundary was initially interpolated from Carolinian Canada's hotspot analysis (Kraus *et al.* 2007). The boundary was subsequently adjusted to include all areas within the City of Hamilton found in Ecodistrict 7E-3, as well as the southwestern portion of the City of Burlington, which contains several important natural areas (Figure 1). The project boundary encompasses the following complementary plans: Dundas Valley 50-Year Vision & Strategy 2008 – 2058, the Cootes to Escarpment Park System (CEPS) Conservation and Land Management Strategy, several watershed and subwatershed plans, and the Niagara Escarpment Plan Area.

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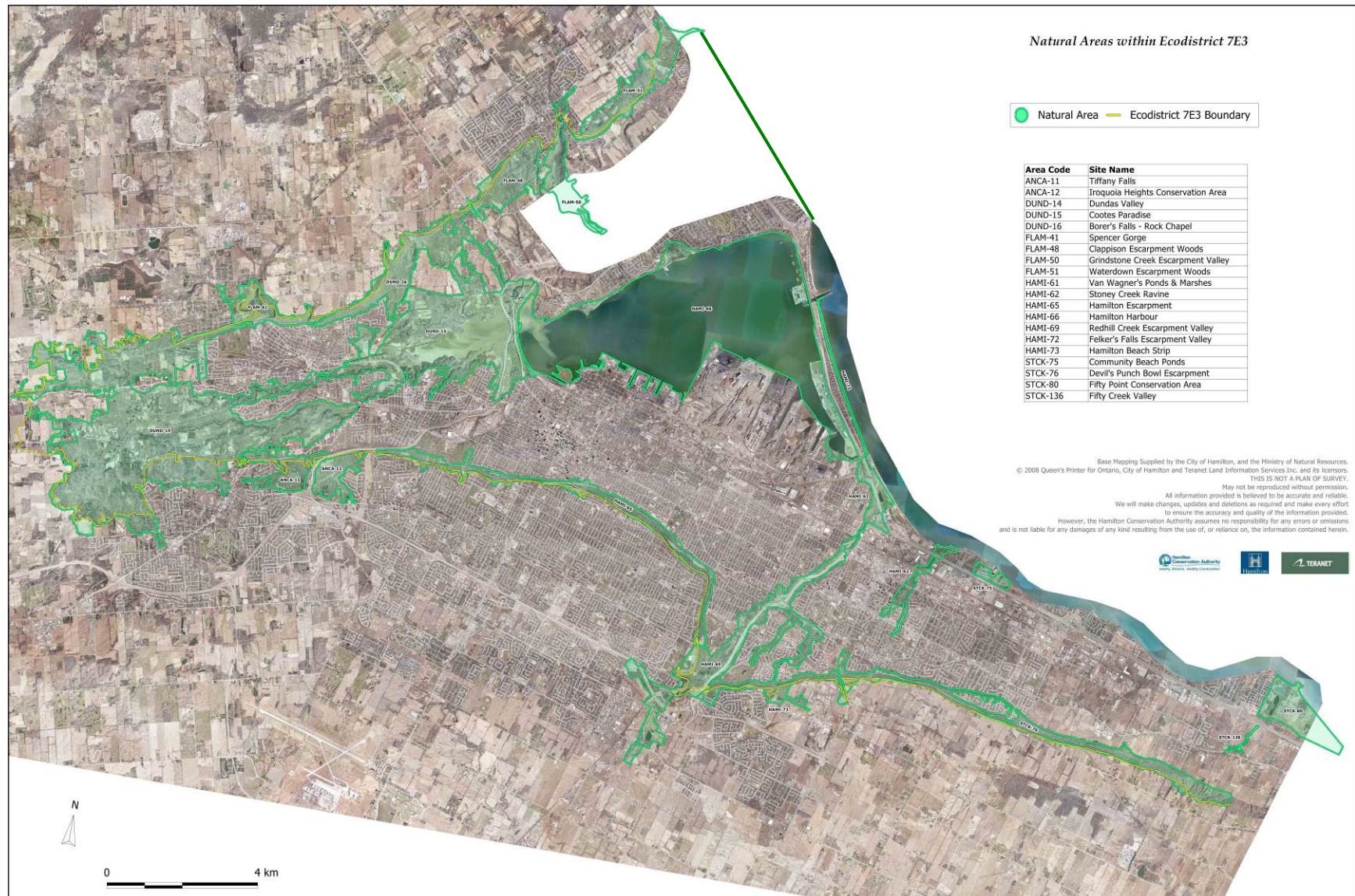


Figure 1. Hamilton – Burlington 7E-3 CAP area

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HAMILTON-BURLINGTON: Priorities for Conservation and Restoration

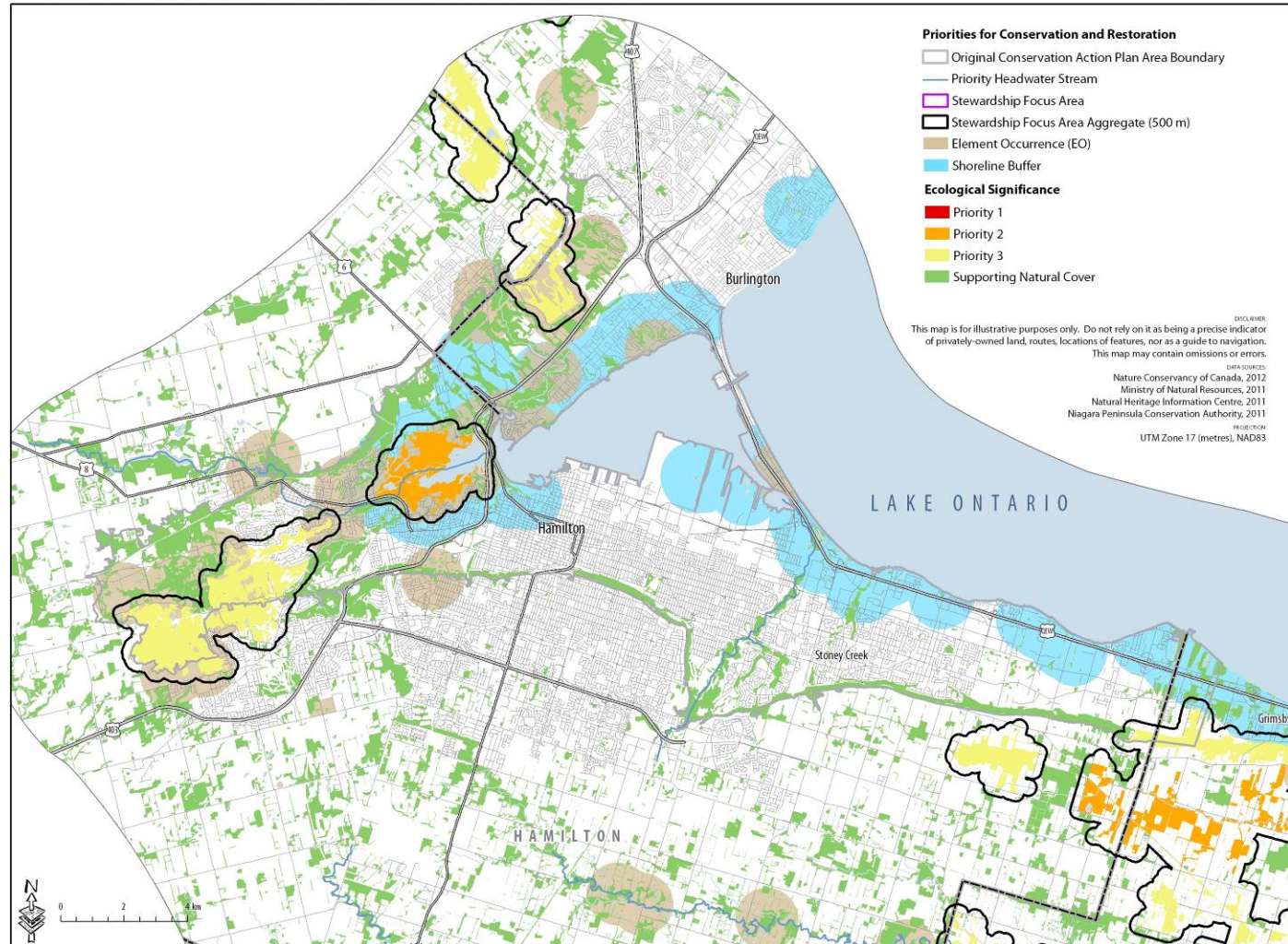


Figure 2. Priority areas in Hamilton – Burlington Region for conservation and restoration based on GIS analysis of natural features and existing/potential connectivity.

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HAMILTON-BURLINGTON: Natural Features

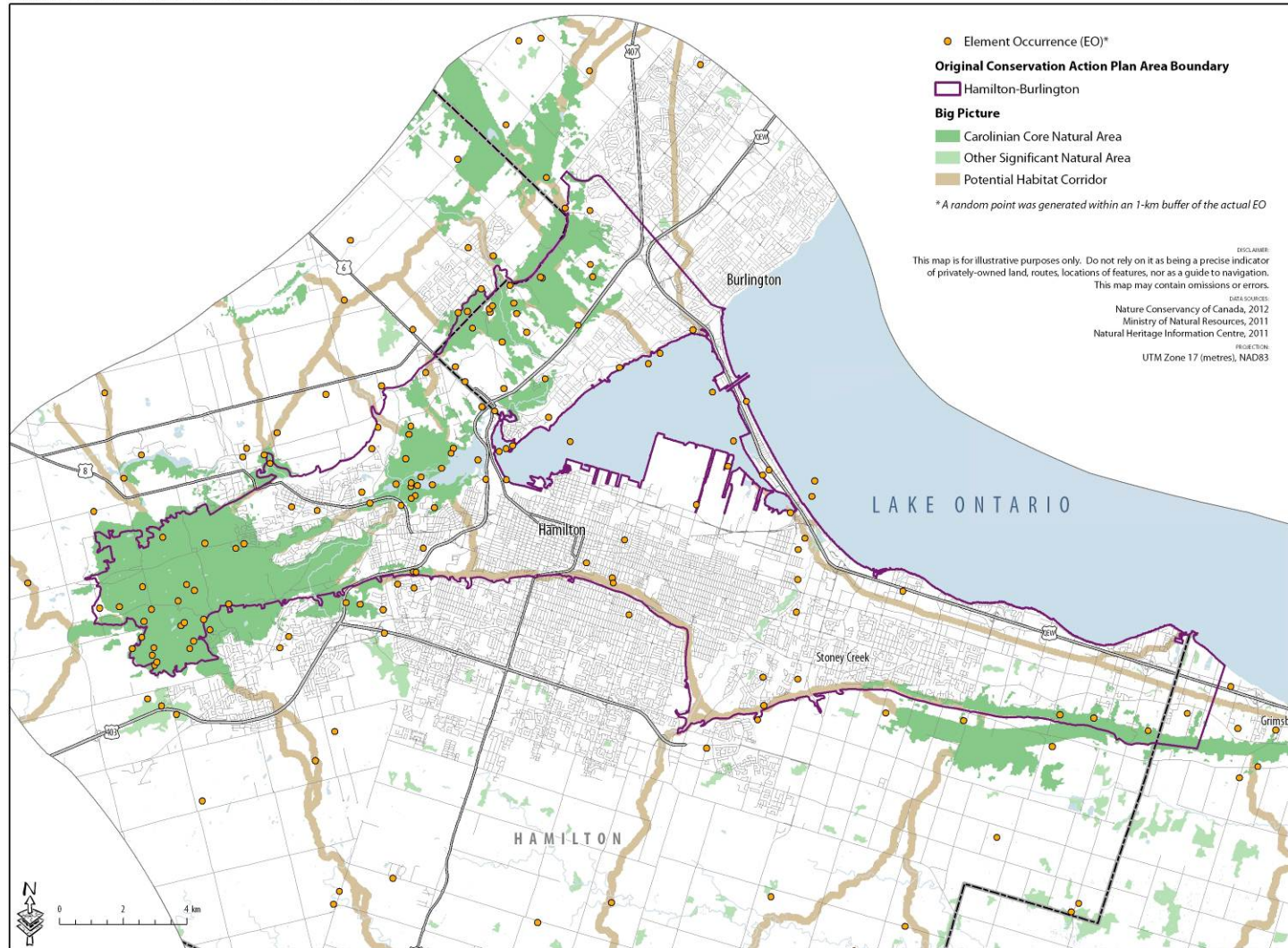


Figure 3. Hamilton – Burlington 7E3 CAP with Element Occurrences and Big Picture Cores and Corridors.

ii. ECOLOGICAL CONTEXT

Carolinian Canada

The Hamilton – Burlington CAP area is located near the southeast limit of Ecoregion 7E, the ecoregion that contains extreme southern Ontario 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 although it is smaller than other Canadian vegetation zones, it has more species of flora and fauna than any other ecoregion in Canada. In fact, the Carolinian life zone occupies less than 0.25% of Canada's landmass, yet it provides habitat for over 40% of Canada's vascular plant species and an equally large proportion of vertebrate and invertebrate fauna (Jalava *et al.* 2009).

However, one quarter of Canada's human population lives in this area and, as a result, extensive conversion to human land uses has occurred. In southern Ontario, 94% of upland forest has been cleared over the past two centuries, while more than 70% of all pre-settlement wetlands have been converted, and more than 99% of prairies and savannahs have been lost (Bakowsky 1993). On a heavily-modified working landscape such as this, fragmentation has reduced most natural cover to patch sizes much smaller than the "landscape scale". Overall, natural cover across the Carolinian life zone now ranges from less than 7% in some areas, to just under 18% in others. These high levels of land conversion mean that many of the essential ecological processes and functions have been severely compromised. Because of this, combined with the fact that many of its species are near the northern limits of their distribution, the ecoregion has the greatest number and concentration of Species at Risk in Canada. (Jalava *et al.* 2009)

The zone is characterized by mainly deciduous-dominated forests including some conifer species [*e.g.*, Eastern Red-cedar (*Juniperus virginiana*), White Pine (*Pinus strobus*)], as well as many southern trees at their northern range limits such as Tulip-tree (*Liriodendron tulipifera*), along with shrubs and herbaceous species not found in other parts of Canada (Lindsay 1984). In Carolinian Canada, over 70 native tree species, 2,200 plant species and more than half of all Canadian bird species are found (Solymár *et al.* 2008).

Ecoregion 7E-3

The Hamilton – Burlington 7E-3 CAP area occurs at the southwest end (and in the most urbanized portion) of Ecodistrict 7E-3 (formerly, Ecological Site District) 7E-3 (Grimsby), which extends from the Niagara River west to Hamilton and north into southern Halton Region. This ecodistrict includes the southernmost portion of the Niagara Escarpment in Canada, and the adjacent shallow till moraines along the escarpment rim. The ecoregion also includes the Iroquois Plain and Lake Ontario shorelines below the escarpment. The western edge of the ecodistrict includes the escarpment influences of till moraines and spillways, and Norfolk sand plains as they reach the transition to the Flamborough Limestone Plains of Ecodistrict 6E-1. (Henson and Brodribb 2005)

Approximately 19% of Ecodistrict 7E-3 remains naturally-vegetated, primarily as forest. Niagara Escarpment forest makes up ~25% of this, with sand plain forest complexes comprising 15%, and till moraine forest complexes comprising 14%. These forest complexes are predominantly deciduous. Ten percent of the remaining natural cover is wetlands, with 75% being swamp. (Henson and Brodribb 2005)

Sixty percent of the ecodistrict has been converted to agricultural uses, with nearly half being developed agricultural lands (40,524 ha), and another 9,066 hectares being pastures and abandoned fields. Approximately 20% of the ecodistrict, nearly 16,500 hectares has been developed for residential, commercial and industrial uses, and these include the larger urban centres of Hamilton and St. Catharines. (Henson and Brodribb 2005)

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Approximately 8% (6,735 ha) of Ecodistrict 7E-3 is protected in conservation lands. Conservation Authority properties account for nearly half of this total (3,005 ha). Another 4,000 hectares have been designated as provincially significant life science ANSIs, of which 83 hectares coincide with provincial parks. Seventy percent of all extant rare species and vegetation community occurrences in this ecodistrict have been recorded in identified conservation lands, mostly within provincially significant life science ANSIs. (Henson and Brodribb 2005)

Hamilton – Burlington 7E-3 CAP Area

The Hamilton – Burlington CAP area is both unique and highly significant from a conservation perspective for several reasons. While the majority of the area has been heavily modified for urban residential, commercial and industrial uses, a remarkable diversity and extent of high-quality natural areas remains. The area includes a 10 km stretch of the Niagara Escarpment, the extensive wetlands and upland habitats of Cootes Paradise, as well as the Dundas Valley kame, and Lake Iroquois plain features. These features support the largest coastal wetland on Lake Ontario, a broad diversity of Niagara Escarpment associated forests, cliff and talus communities, various inland wetlands and riparian habitats, patches of prairie, oak savannah and dry oak woodlands, regenerating fields and thickets, and, along the Lake Ontario shoreline, a small area of naturally-occurring sand dunes. Spencer Creek and Grindstone Creek comprise the main watersheds of the CAP area. At least 34 COSEWIC Species at Risk have been recorded in the area within the past 30 years, with several others having occurred historically.

Climate

The Hamilton – Burlington CAP area is situated within the Niagara Fruit Belt Climatic Region, one the warmest regions in Ontario (Brown *et al.* 1980). As with much of Southern Ontario, this region experiences a continental climate, which is modified by the Great Lakes. Continental climates are characterized by seasonal extremes of temperature, typically with hot summers and cold winters. The huge inland lakes which surround southern Ontario on three sides tend to ameliorate these fluctuations, allowing for warm summers, relatively mild winters, and resulting in a fairly long growing season with generally reliable rainfall (Brown *et al.* 1980). The mean annual frost-free period ranges from 157 to 191 days, comparable to those encountered in extreme southwestern Ontario. The region has warm winters, with mean daily minimum January temperatures ranging from -7.2°C to -9.8°C. Minimum temperatures are an important limiting factor for many southern plant species. Topography greatly influences the area's climate. Comparisons of sites below and above the Niagara Escarpment indicate shorter frost-free periods and lower July and January temperatures above the escarpment. Escarpment slope aspect also modifies microclimates. For example, the Sassafras-Waterdown Woods area, situated on a south-facing slope, has a warmer microclimate than the north-facing slopes of the Niagara Escarpment in the southeastern part of the CAP area. North-facing slopes experience less intense solar radiation and cold air drainage off the escarpment plateau. Cooler air temperatures also reduce soil temperature and evaporation, resulting in increased soil moisture (Riley *et al.* 1996).

Geology, Physiography and Glacial History

The Hamilton – Burlington 7E-3 CAP area is characterized by the linear Niagara Escarpment, which is bisected by numerous incised gorges and the Dundas Valley, one of two major re-entrant valleys near the south end of the Niagara Escarpment (Chapman and Putnam 1984). The Niagara Escarpment is southern Ontario's most prominent geological and ecological feature. It winds for 725 km north from Niagara Falls to Tobermory on the Bruce Peninsula, where it becomes submerged under Lake Huron only to resurface on Manitoulin Island, extending west across to northern Michigan and into Wisconsin. The Niagara Escarpment is recognized internationally by the United Nations Educational, Scientific and

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Cultural Organization (UNESCO) Man and Biosphere Program as a World Biosphere Reserve. It is a glacial rebound feature formed by deposition on the bed of an Ordovician tropical sea some 500 million years ago. Several glacial advances, erosion and weathering have shaped the escarpment into its current form.

Within the CAP area, prominent cliffs occur in the Sassafras – Waterdown Woods area, Rock Chapel – Borer’s Falls, and along the north-facing escarpment in the east end of the study area. Eroded rubble has formed talus slopes below the cliffs, with extensive examples in these same areas. Above the cliffs, the dolostone caprock of the Niagara Escarpment, known as the Lockport Formation, forms an extensive bedrock-based plain. In the Sassafras – Waterdown Woods area prominent fissures dissect this dolostone pavement, while in other areas the plain consists of series of parallel ridges near the cliff rim derived from ancient tropical coral reefs. Several incised gorges, often with attractive waterfalls, were carved into the Niagara Escarpment by stream action during deglaciation, with much of the erosion having been caused by glacial meltwaters. Notable such gorges are found at Spencer Gorge (with Webster’s Falls and Tews Falls), Borer’s Falls, Tiffany Falls and Devil’s Punchbowl. (Riley *et al.* 1996)

Back from the escarpment rim, much of the escarpment plain is mantled with glacial till, with good examples found at Sassafras – Waterdown Woods. North of the Dundas Valley, a moraine known as the Waterdown Moraine extends to the escarpment rim at Spencer Gorge and Rock Chapel, with glacial sediments more than 5 m deep forming steep slopes at the edge of the cliffs. (Riley *et al.* 1996)

As noted above, the Dundas Valley is one of the major re-entrant valleys along the Niagara Escarpment. While the east end of the valley has prominent exposed cliffs, the western end is buried in the rolling topography of glacial kame deposits, with isolated depressions or “kettles”. The largest of these kettles is found at Summit Bog, a 27 ha bowl filled with peat up to 7 m deep. Sulphur Creek and its tributaries have carved valleys with frequent seepage zones into the kame hills. (Riley *et al.* 1996)

The lower slopes of the Niagara Escarpment consist of shales of the Queenston Formation, the basal unit of the escarpment. These slopes are often mantled by glacial till, but near the mouth of the Dundas Valley the tills are very thin, and south-facing shale slopes extend for up to 2.5 km from the cliffs, making them among the most extensive shale slopes along the entire Niagara Escarpment. Outstanding examples occur at Sassafras-Waterdown Woods and Clappison Woods. These easily eroded shales have been dissected by various stream valleys, such as along Grindstone Creek. (Riley *et al.* 1996)

Narrow escarpment terraces also occur on the Queenston Formation shale, particularly in the east end of the CAP area. Also in the east end of the study area, along Lake Ontario, an extensive lake plain formed between 12,000 and 11,000 years ago by the smoothing of wave action and lacustrine deposition of sand and clay at the edge of glacial Lake Iroquois. The glacial lake subsequently receded and was at one time several kilometres offshore from its current position, but has been rising gradually for the past 6,000 years, flooding the rivermouth portions of the incised stream valleys, thereby forming several coastal marshes and ponds, including the extensive wetlands of Cootes Paradise – Dundas Marsh in the Hamilton Harbour area (Riley *et al.* 1996)

Biodiversity

The Hamilton – Burlington 7E-3 CAP area is situated in one of the southernmost portions of Canada and is home to a remarkable diversity of southern vegetation, flora and fauna, many of them at the northern limits of their ranges. Further enhancing the southern character of the CAP area is the fact that the Cootes Paradise area contains one of the few south-facing sections of the Niagara Escarpment. These warm, protected microclimates provide conditions suitable for southern Carolinian forest zone plant species to exist at their northern limits. The natural areas contain some of the most botanically rich lands in Canada,

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and provide habitat for many important bird, reptile, amphibian, fish and insect species. Cootes Paradise Marsh and Grindstone Estuary connect this ecological unit to Lake Ontario via Hamilton Harbour (CEPS 2009). Southern vegetation types in the area include forests dominated by Chinquapin Oak, Sugar Maple – Red Elm, Shagbark Hickory, Black Walnut and Eastern Cottonwood. Southern plant species include trees such as Sassafras, Chinquapin Oak, Black Oak, American Chestnut, Eastern Flowering Dogwood and Red Mulberry. Many southern herbaceous plants, sedges and grasses also reach their northern limits in this area. Characteristic southern fauna of the area include breeding birds such as Black-crowned Night-Heron, Least Bittern, Common Barn Owl, Red-bellied Woodpecker, Tufted Titmouse, Carolina Wren, Northern Mockingbird, Hooded Warbler, Yellow-breasted Chat and Orchard Oriole, and mammals such as Virginia Opossum, Southern Flying Squirrel and Woodland Vole. (Riley *et al.* 1996)

A number of plant species with prairie and western affinities occur within the Hamilton – Burlington 7E-3 CAP area. The combination of southern and western species, combined with the many taxa whose ranges are centred on southern Ontario, and the varied Niagara Escarpment, kame moraine and lake plain topography with their associated habitat types, results in outstanding diversity of species at many of the key sites within the CAP area. Indeed, at least 827 vascular plant species have been recorded at the Cootes Paradise Area of Natural and Scientific Interest (ANSI), the greatest botanical diversity of any site along the Niagara Escarpment. A significant number of these taxa have been extirpated, but an outstanding flora is nevertheless still extant. Other diverse sites include the Dundas Valley ANSI (at least 406 taxa), Spencer Gorge ANSI (531 taxa), Sassafras – Waterdown Woods ANSI (527 taxa) and Clappison Woods ANSI (415 taxa) (Riley *et al.* 1996). Within the Cootes to Escarpment Park System area, which does not include the Dundas Valley nor areas within the CAP south of Hamilton Harbour, 1,582 species of flora and fauna have been documented (CEPS 2009).

The combination of relatively large natural areas and great habitat diversity also makes the CAP area suitable for a number of fauna with more northern affinities including Ruffed Grouse, Northern Goshawk, Alder Flycatcher, Red-breasted Nuthatch, Brown Creeper, Winter Wren, Black-throated Green Warbler, Blackburnian Warbler and Northern Waterthrush. Most of these species are associated with Hemlock and White Cedar stands, as well as conifer plantations, while Winter Wren prefers block talus slopes of the Niagara Escarpment. (Riley *et al.* 1996)

The Dundas Valley contains a nationally significant community of forest birds. The largest forest tracts provide suitable habitat for area-sensitive and forest interior breeding birds such as Sharp-shinned Hawk, Ruby-throated Hummingbird, Eastern Wood-Pewee, Great Crested Flycatcher, Wood Thrush, Red-eyed Vireo, Scarlet Tanager and Rose-breasted Grosbeak (Riley *et al.* 1996). Breeding evidence for at least five nationally vulnerable, threatened or endangered species has been recorded. Two of these threatened species are regularly present in nationally significant numbers (i.e., greater than 1% of their national population). These species are the Hooded Warbler (two to four pairs annually), and Louisiana Waterthrush (two to four pairs annually). Cerulean Warbler (Special Concern) is also present within the valley, but not in nationally significant numbers. Yellow-breasted Chat (Special Concern) and Acadian Flycatcher (Endangered) have also been recorded within the valley, but only on an irregular basis. (IBA 2010, GC 2009, Cadman *et al.* 2007)

During recent years, about 100 species of breeding birds have been recorded within the valley, making it one of the more species rich areas in southern Ontario. A significant proportion of these are neotropical migrants, of which the more abundant species are Red-eyed Vireo, Wood Thrush, Eastern Wood-Pewee, Ovenbird, and Scarlet Tanager. Also of interest is the presence of both hybrids of Blue-winged and Golden-winged Warblers. (IBA 2010)

Dundas Marsh is an important area for migrating waterfowl, shorebirds, herons, raptors, gulls, terns, and songbirds. The extensive wetlands, particularly the rivermouth marshes and ponds along Lake Ontario,

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provide habitat for Great Blue Heron, Green Heron, Canada Goose, Wood Duck, Mallard, Common Moorhen, American Coot, Virginia Rail and Sora, as well as migrating waterfowl and shorebirds. The wetlands also provide important habitat for reptiles and amphibians, including SAR turtles such as Spiny Softshell, Blanding's Turtle, Northern Map Turtle and Common Snapping Turtle, and Western Chorus Frog (Riley *et al.* 1996). There is confirmed breeding evidence for three bird SAR in Canada: Least Bittern (vulnerable), Cerulean Warbler (vulnerable) and Prothonotary Warbler (endangered), the latter having nested here regularly, but not annually, since at least the 1950s. In addition, Yellow-breasted Chat (vulnerable) possibly bred in 1974, as might a pair of King Rails (endangered) in the 1960s. Other breeding species include Double-crested Cormorant, Blue-winged Teal, Yellow-billed Cuckoo, Whip-poor-will (recently designated Threatened), Eastern Bluebird, Tufted Titmouse, Carolina Wren, Black-throated Green Warbler and Orchard Oriole (IBA 2010).

Natural Areas

Despite the high degree of urbanization, the Hamilton – Burlington 7E-3 CAP area sustains a number of exceptional, ecologically important natural areas. Most are associated with the Niagara Escarpment corridor and the Dundas Valley – Cootes Paradise complex, and most receive some degree of protection, either as public lands managed for conservation, as nature reserves of the Royal Botanical Gardens or private land trusts, or through the land use planning process as provincially-designated Areas of Natural and Scientific Interest (ANSIs) or Provincially Significant Wetlands (PSWs), as municipally-designated Environmentally Significant Areas (ESAs) or under protective zoning of the Niagara Escarpment Plan (NEP). ANSIs are recognized and protected in the City of Hamilton's Official Plan. Any development proposals (legal change in land use or zoning), within or adjacent to an ANSI are subject to review by the Ontario Ministry of Natural Resources. The types of Natural Heritage designations that apply to the natural areas of the CAP area are summarized in Table 1.1. It should be noted that many of these designations overlap (e.g., a portion of a Conservation Authority Area may also be designated provincially significant ANSI, PSW, municipal ESA and Escarpment Natural Area).

Within the Cootes to Escarpment Park System area, "the former quarries within Clappison Escarpment Woods and Waterdown Escarpment Woods are listed as Provincial Earth Science Areas of Natural and Scientific Interest. Cootes Paradise Marsh is a 250-hectare (approximate) Provincially Significant Wetland (PSW) that is also identified as an Important Bird Area of national significance by Bird Life International. RBG-Hendrie Valley-Lambs Hollow Wetland on lower Grindstone Creek is also a PSW. In addition, Royal Botanical Gardens' Cootes Paradise, Carroll's Bay and Grindstone Valley nature sanctuaries were recently designated as an Important Amphibian and Reptile Area (IMPARA) by the Canadian Amphibian and Reptile Conservation Network. This is only the fourth area in Canada to receive such a designation." (CEPS 2009)

Both Dundas Valley and Sassafras Woods are recognized as a Carolinian Canada Sites (Eagles and Beechey 1985), and many other environmentally significant areas (ESAs) have been designated by the City of Hamilton and the City of Burlington.

From CEPS (2009): "The existing natural areas and watercourses within the study area are part of provincial and local greenlands systems in recognition that the natural, physical and hydrological features are interrelated and collectively support biodiversity, which must be protected. Looking beyond what exists to consider what could or should exist, moves habitat protection towards longer term biophysical systems that function with ecological integrity. Protection and rehabilitation of impaired habitats and habitats in diminishing supply, such as meadow, are integral to a fully functional greenlands system. The identification of future areas for rehabilitation and restoration will be completed through future land management planning...

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“There are seven main natural areas associated with the Niagara Escarpment and Cootes Paradise that have been inventoried as environmentally significant / sensitive areas at the local level : Cootes Paradise Marsh, Borer’s Falls-Rock Chapel, Clappison Escarpment Woods, Grindstone Creek Escarpment Valley, Waterdown Escarpment Woods, Sassafras Woods and Bridgeview Valley. All, except for Bridgeview Valley, are classified by the province as Life Science Areas of Natural and Scientific Interest . Small parts of Hamilton Harbour, Dundas Valley and Nelson Escarpment Woods environmentally significant areas extend into the study area. As well, a species inventory was completed in the Former National Sewer Pipe Lands to the east of Sassafras Woods in Halton Region and the property was identified as a candidate environmentally sensitive area.” (CEPS 2009)

Dundas Valley – Dundas Marsh Important Bird Area (IBA)

According to IBA (2010), the Dundas Valley IBA includes the Dundas Marsh (also called Cootes Paradise), and the Spring Creek valley forms a narrow, natural corridor joining Dundas Valley to Dundas Marsh. Most of the Dundas Valley area is comprised of relatively undisturbed deciduous and mixed upland forest, bordered on the north and south sides primarily by residential areas. The topography is quite varied, being comprised of rolling hills, deeply incised stream courses, and steep valley walls, with local relief up to 30 m or more. Dundas Marsh is situated at the western end of Hamilton Harbour. It is a shallow flooded basin of open water and marsh joined to Hamilton Harbour by the Desjardins Canal. Also included in the IBA are Spencer Creek Gorge and Tiffany Falls.

Three Provincial Areas of Natural and Scientific Interest (ANSI) lie within or adjacent to the Dundas Valley (Summit Muskeg Preserve near Copetown, the Sulphur Creek Forest, and Mineral Springs Forest in the Dundas Valley). Muskeg Preserve is also accorded Nature Reserve status within the NEP. Portions of the Dundas Valley Conservation Area are designated as a Carolinian Canada site due to their Carolinian (southern) characteristics for Ontario, and the quality of the habitats. Carolinian Canada undertook landowner contacts to raise the level of awareness of the area’s natural values and enhance conservation stewardship.”

Niagara Escarpment Plan Area

[Source: <http://www.escarpment.org/landplanning/index.php>]

Development in the area of the Niagara Escarpment is guided by the Niagara Escarpment Plan, Canada’s first large-scale environmental land use plan. A significant portion of the Hamilton – Burlington 7E-3 CAP area is offered by the Niagara Escarpment Plan. The seven land use designations outlined in the Niagara Escarpment Plan (NEP) are as follows, in order of the degree of protection offered by the designation: 1. Escarpment Natural Area (Biosphere Reserve Core area); 2. Escarpment Protection Area (Biosphere Reserve Buffer area); Escarpment Rural Area (Biosphere Reserve Buffer area); Urban Area & Minor Urban Centre (Biosphere Reserve Transition area); Escarpment Recreation Area (Biosphere Reserve Transition area); Mineral Resource Extraction Area (Biosphere Reserve Transition area). Following the land use designation system, the NEP Area is especially well suited for UNESCO World Biosphere Reserve designation. The biosphere reserve is anchored by a backbone of heavily protected lands at and near the Escarpment cliff face. For each of its land use designations, the Niagara Escarpment Plan outlines the objectives, permitted uses and policies. The Escarpment Natural Area has the most restrictive policies, the Urban Areas the least restrictive. For example, no new building lots are permitted in either the Escarpment Natural Area or the Escarpment Protection Area, and only one new lot per original 40-hectare parcel is permitted in the Escarpment Rural Area.

The overall objectives embodied in the Plan are stated in the legislation: (a) to protect unique ecologic and historic areas; (b) to maintain and enhance the quality and character of natural streams and water supplies; (c) to provide adequate opportunities for outdoor recreation; (d) to maintain and enhance the

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open landscape character of the Niagara Escarpment in so far as possible, by such means as compatible farming or forestry and by preserving the natural scenery; (e) to ensure that all new development is compatible with the purpose of this Act; (f) to provide for adequate public access to the Niagara Escarpment; and (g) to support municipalities within the Niagara Escarpment Planning Area in their exercise of the planning functions conferred upon them by the Planning Act. (Section 8, Niagara Escarpment Planning and Development Act, Revised Statutes of Ontario)

A separate section of the Plan includes development criteria to be applied throughout the Plan Area. These criteria cover matters such as protection of water quality, management of forest resources, restrictions on developing on steep slopes and criteria for approving small-scale commercial uses accessory to agriculture (such as wineries in conjunction with vineyards). They also permit municipalities the flexibility to apply their own planning standards, provided that those standards do not conflict with the Niagara Escarpment Plan.

The third component of the Plan is the Niagara Escarpment Parks and Open Space System. It sets out policies for the parks system as a framework for the establishment and co-ordination of a network of publicly owned lands within the Plan Area. There are 131 existing and proposed public parks and open space areas, linked by the Bruce Trail. This trail is a continuous footpath running the entire length of the Plan Area, largely in the core Escarpment Natural Area. It is administered and maintained by the Bruce Trail Conservancy, a non-government organization composed largely of volunteers.

The land use legislation generally in force in Ontario -- the Planning Act -- authorizes each municipality to plan within its own boundaries. By contrast, the Niagara Escarpment Planning and Development Act deliberately directs the Niagara Escarpment Commission to plan at the provincial level for Niagara Escarpment ecosystems which transcend municipal boundaries.

Given the purpose of the Act, the onus is on those who wish to develop to prove that their proposals are compatible with the Escarpment environment. When commenting on, or making decisions on proposed development, the Commission is guided by the purpose and objectives of the Niagara Escarpment Planning and Development Act and the policies and criteria of the Niagara Escarpment Plan.

Within a geographical "development control" area set out provincial regulation, all proposals defined as "development" require a development permit from the Niagara Escarpment Commission. Examples of such developments include new single dwellings, road construction, sand and gravel pits, installation of irrigation or recreational ponds, altering the grade of the land, and changes in the use of existing structures.

Niagara Escarpment UNESCO World Biosphere Reserve

In 1990, the United Nations Educational Scientific and Cultural Organization (UNESCO) named the Niagara Escarpment a World Biosphere Reserve. While this designation does not carry any specific regulations, it does bring added awareness to the overall significance and value of the Niagara Escarpment. However, the Niagara Escarpment Plan provides regulatory control over development and activities permitted within the Biosphere Reserve (see above).

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Table 1.1: Natural Heritage Designations – Hamilton – Burlington 7E-3 CAP Area

Designation	IUCN Protected Area Management Category ¹	Hectares	Source
Conservation Authority Areas			NHIC (2009); HCA web site
Dundas Valley		2,430.0	
Tiffany Falls		?	
Iroquoia Heights		120.0	
Felker's Falls		74.0	
Devil's Punch Bowl		?	
Vinemount		?	
Winona		?	
Fifty Point		80.0	
Spencer Gorge / Webster's Falls		56.7	
Waterdown Woods RMA			
Clappison Woods RMA			
Grindstone Creek RMA			
Little RMA			
Kerncliff RMA			
Burlington Beach RMA			
TOTAL			
Municipal Parks		~1,250.0	City of Hamilton web site
Royal Botanical Gardens (includes Cootes Paradise, Hendrie Valley and Rock Chapel – Berry Tract)		1,005.0	RBG web site
Head of the Lake Land Trust sites		18.6	HOTL web site
Bruce Trail Conservancy sites		?	
Provincial ANSI (Earth Science)			NHIC (2009)
Old Nelson Quarry		1.0	
Old Dundas Quarry		?	
Spencer Gorge		43.0	
Dundas Valley		418.0	
King City Quarry		3.0	
Devil's Punchbowl		4.2	
TOTAL		~470.0	
Provincial ANSI (Life Science)			NHIC (2009)
Sassafras – Waterdown Woods		243.0	
Spencer Gorge		57.0	
Summit Bog		14.0	
Dundas Valley Forests		401.0	
Sulphur Creek Valley		224.0	
Cootes Paradise Drowned Valley		423.0	
Grindstone Creek Valley		102.0	
TOTAL		1,464.0	
Provincially Significant Wetlands			NHIC (2009)
Cootes Paradise		121.7 ²	
Vinemount Swamp		95.3	
RBG/Hendrie Valley/Lamb's Hollow		23.0	
Tiffany Creek Headwaters		30.1	
Copetown Bog		12.0	
Van Wagner's Marsh		13.3	
TOTAL		295.1	
Carolinian Canada Sites			NHIC (2009)
Sassafras Woods		132.3	
Dundas Valley		2,698.1	
TOTAL		2,830.4	
Important Bird Areas		~2,000.0	Falls <i>et al.</i> (1990)
Dundas Valley / Dundas Marsh			

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International Biological Program Sites			NHIC (2009)
RBG – Cootes Paradise		518.0	
Sulphur Creek Forest		134.0	
Spencer Creek CA		45.3	

¹ IUCN (2006b) Categories: Ia. Nature Reserve or wilderness area nature reserve*; Ib. Wilderness area*; II. National/provincial park*; III. Natural monument; IV. Habitat/species management areas, V. Protected landscape or seascape, VI. Managed resource protected areas; * Strictly regulated protected areas. Some areas may have more than one IUCN category due to internal zoning.

² Cootes Paradise PSW size is given as 121.7 ha by NHIC (2009), 175 ha by Greenbelt Foundation, ~250 ha by RBG, on their respective web sites.

iii. NATURAL COVER / ECOSYSTEM TYPES

The following descriptions of predominant natural cover and ecosystem types in the Hamilton – Burlington 7E-3 CAP area are based primarily on Riley *et al.* (1996). The three predominant physiographic features in the area, the Niagara Escarpment, the kame moraine in the Dundas Valley, and the Iroquois lake plain, each support distinctive ecosystems and associated vegetation.

Niagara Escarpment Ecosystems

The extremely shallow-soiled exposed sites along the Niagara Escarpment rim in some areas support distinct vegetation communities dominated by Ironwood and Red Oak mixed with Sugar Maple. At Sassafras – Waterdown Woods and Rock Chapel, unique White Cedar – Red Oak stands occur on the dry escarpment rims, while the cliff rim at Spencer Gorge supports a fire-successional White Cedar forest. The cliffs themselves tend to be shaded, relatively moist, and dominated by Bulblet Fern, particularly along the north-facing escarpment in the eastern part of the CAP area. Drier, more exposed cliffs occur along the south-facing escarpment, such as at Sassafras – Waterdown Woods and Spencer Gorge, and are typically very sparsely vegetated by Smooth Cliff Brake or Poison Ivy. Groves of stunted White Cedar trees occur in a few locations on the open cliffs. Beneath the cliffs, talus and till-mantled slopes typically support rich extensive Sugar Maple forests, often with Black Maple and/or Red Elm as co-dominants, or even as dominants. Basswood stands, usually with White Ash and Butternut co-dominant and with rich understoreys, also occur on the upper talus slopes, notably at Sassafras – Waterdown Woods, and also at Rock Chapel. A mixed talus forest of Basswood – Butternut – White Cedar, more typical of sites farther north on the escarpment, is found at Waterdown Woods, whereas Spencer Gorge sustains the northernmost example of Chinquapin Oak talus woodland in Canada. Rich mixed Hemlock stands occur on both the talus and till-mantled escarpment slopes in the CAP area, and mixed successional talus stands of White Cedar, Hemlock and White Birch are found at Spencer Gorge. Openings in the upper talus may be dominated by Mountain Maple, Bladdernut, Riverbank Grape, Red-berried Elder and Staghorn Sumac. (Riley *et al.* 1996)

Extensive shale slopes, thinly mantled with glacial till, occur on the south-facing escarpment slopes of the Dundas Valley east to Burlington. They are dissected by numerous deep and narrow valleys that are largely covered in deciduous forests of Sugar Maple, as well as drier Red Oak, White Oak and Shagbark Hickory stands. Cooler, north-facing shale slopes, such as at Grindstone Creek Valley, have mixed forests of Hemlock. The steepest slopes have occasional White Cedar stands, mixed with Sugar Maple and Hemlock, while valley bottomlands sustain Sugar Maple shale terrace forests, moist-fresh Manitoba Maple, White Ash and Crack Willow groves, and a variety of wetlands. The wetlands include Common Cattail and Narrow-leaved Cattail marshes, thicket swamps of Grey Dogwood, as well as meadow marshes dominated by Rice Cut Grass, Reed Canary Grass, Spotted Jewelweed and Spotted Joe-Pye-weed. Ephemeral streambeds on the upland shale slopes also support moist-fresh stands of Shagbark Hickory and White Ash, as well as Spotted Jewelweed meadow marshes. The shale slopes also have occasional successional forests of Large-toothed Aspen, White Ash, White Elm, White Birch and

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Trembling Aspen, as well as thickets of Grey Dogwood, various hawthorn species and, to a lesser extent, Staghorn Sumac and European Buckthorn. (Riley *et al.* 1996)

Kame Moraine

The extensive kame deposits in the Dundas Valley are characterized by uplands and steep-sided valleys covered in both moist and drier forests. Moist stands are dominated by Sugar Maple, Beech and Red Maple. Drier stands are dominated by Red Oak, White Oak, Black Oak and occasionally Shagbark Hickory. White Pine is a common associate. Hemlock often dominates, along with Sugar Maple, on valley slopes with a northerly aspect. Where natural or anthropogenic disturbance has created openings, successional stands dominated by combinations of White Ash, Black Walnut, White Birch, Red Cedar, White Elm, Butternut, Sassafras, Bitternut Hickory, Trembling Aspen and Large-toothed Aspen occur. Early-successional thickets of Grey Dogwood, hawthorns and Staghorn Sumac also are found, as are small openings of Summer Grape and Common Blackberry. (Riley *et al.* 1996)

Seepage zones are abundant on the kame valley slopes, resulting in a diversity of wetlands, with admixtures of Yellow Birch, Red Maple, White Elm and Blue-beech occurring in deciduous swamps, and with occasional mixed swamps having Hemlock and White Pine in association with Yellow Birch or Red Maple. Thicket swamps also occur, with Spicebush, Speckled Alder, Red-osier Dogwood, Nannyberry, Grey Dogwood, Silky Dogwood or Bebb's Willow as dominants. Skunk Cabbage can be abundant throughout the swamps and thicket swamps, as well as in open meadow marshes in the valley bottomlands, often in association with Spotted Jewelweed, Spotted Joe-Pye-weed, Rice Cut Grass, Fowl Manna Grass, Reed Canary Grass, Sensitive Fern and Narrow-leaved Cattail. Small marshes of Common Cattail are also found on the kame bottomlands. (Riley *et al.* 1996)

Dundas Valley sustains a number of kettle wetlands underlain by peat deposits. The largest of these is the Copetown Bog, which supports a Leatherleaf shrub bog, a graminoid bog of Beaked Sedge and Tawny Cottongrass, and a treed bog of Black Spruce and Tamarack reminiscent of areas far to the north on the Canadian Shield. Other wetland types found in the kettles include open water aquatic communities of watermeal and Common Duckweed, marshes of Common Cattail, Rice Cut-grass – Water Arum and Tussock Sedge, meadow marshes of Reed Canary Grass, thicket swamps of Buttonbush, Highbush Blueberry, Winterberry, Autumn Willow, Slender Willow and Red-osier Dogwood, as well as treed swamps dominated by Red Maple, Crack Willow, Trembling Aspen and Balsam Poplar. Also highly significant on the Dundas Valley kame is relict prairie habitat, which once was much more extensive in the area. One small example remains at the Ancaster Prairie site, and it is dominated by Indian Grass and Little Bluestem. (Riley *et al.* 1996)

Lake Plain

Most of the Iroquois lake plain on the Niagara Peninsula - Hamilton area has been converted to agriculture and urban land uses. Within the Hamilton – Burlington 7E-3 CAP area, lake plain is found in the eastern part of the Ancaster Creek valley, south of Hamilton Harbour, and includes all of the Cootes Paradise area. Where patches of forest remain, relatively dry deciduous forests of Red Oak, White Oak, Black Oak, Red Maple and hickories predominate on the uplands. Sugar Maple, Beech and Red Maple forests are also characteristic on the lake plain, particularly on cooler sites with a more northerly aspect. Successional stands of Large-toothed Aspen and Black Walnut, and thickets of Staghorn Sumac and various hawthorns also occur. Valley bottomlands have Crack Willow, Manitoba Maple and White Ash as dominant trees, and meadow marshes of Skunk Cabbage, Spotted Jewelweed and Spotted Joe-Pye-weed also occur. The large expanses of shallow open water in Cootes Paradise support aquatic communities of Eurasian Water-milfoil, Fragrant Water-lily, Bullhead Lily, Common Duckweed and Sago Pondweed. Common Cattail marshes occur along the fringes, along with Canada Blue-joint

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meadow marshes. Smaller bays in the Cootes Paradise wetland have accumulations of peat that sustain Water-willow marshes and Speckled Alder – Red-osier Dogwood thicket swamps. (Riley *et al.* 1996)

iv. DOMINANT ENVIRONMENTAL PROCESSES

Much of the Hamilton – Burlington 7E-3 CAP area was historically dominated by eastern deciduous forests on the kame moraine, Niagara Escarpment and lake plain physiographic features. These deciduous forests once formed the dominant matrix community throughout southern Ontario, were relatively stable, and supported wide-ranging species such as Black Bear, Moose and probably Eastern Cougar (Davis 1996, Anderson and Bernstein 2003). Nested within these large forests were large and small patch habitat types (Anderson and Bernstein 2003), occurring in response to 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. Only the forests of the Dundas Valley in the CAP area meet this minimum requirement. Otherwise the large patches tend to be under 100 ha, or are long, linear bands along the Niagara Escarpment corridor with high edge to interior ratios. Restoration of fragmented areas and creation of connected networks and corridors could increase the MDA of the forests in the CAP area, and these objectives will be discussed further in this document.

Fire

Primary disturbance regimes in the prairies and savannahs of southern Ontario were largely driven by drought and fire cycles. Most of these tallgrass systems occurred on sand plains (limited primarily to the Ancaster Prairie and south-facing slopes in the Cootes Paradise area in the CAP area), which would have experienced fires every 5-15 years. Fire is a significant process in the functioning and maintenance of Ontario's remaining prairies (areas which historically supported grasses and herbs with few trees), grasslands (anthropogenic communities of grasses which occur as a result of abandoned cultural use such as farming) and savannahs [grasslands with 25-35% cover of woody species (Lee *et al.* 1998)], as well as drier oak woodland communities, which are found to some extent in the CAP area. 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 the naturally-occurring establishment of woody species, usually shrubs and saplings, followed by trees, into open habitats, eventually resulting in woodland or forest. As succession advances, prairie and grassland species usually die out due to shading or competition from these plants.

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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 extremely important to maintaining grasslands, prairies and savannahs. Burning tallgrass prairies has been shown to stimulate growth of prairie plants and the mycorrhizae that aid plants in nutrient acquisition (Bentivenga and Hetrick 1991). Periodic fires would historically have maintained drier open oak-dominated woodlands, as well as the patches of prairie and savannah found in the CAP area.

Hydrology and Watersheds

The Hamilton – Burlington 7E-3 CAP area includes major portions of the Grindstone Creek, Spencer Creek, Lower Rambo Creek, Red Hill Creek, Fifty Creek, Stoney and Battlefield Creeks watersheds, and the entire North Shore, Lower Hager Creek, SC Numbered Watercourses, Urban Hamilton and Hamilton Harbour watersheds (Figure 4). The following description of watersheds is from CEPS (2009):

“The two main watersheds within the study area are Grindstone Creek (approximate watershed area of 9,000 hectares) and Spencer Creek (approximate watershed area of 27,900 hectares). The mouth of Spencer Creek is a 250-hectare shallow marsh and open water area known as Cootes Paradise Marsh. Cootes Paradise Marsh used to outlet to the estuary of Grindstone Creek, until the current outlet directly into Hamilton Harbour was created in the 1850s. The estuary is now separated from Cootes Paradise Marsh by fill connecting Burlington Heights, a glacial bay-mouth sandbar, with the north shore of Hamilton Harbour (also referred to as Burlington Bay).” Several smaller watersheds drain directly into Cootes Paradise Marsh or Hamilton Harbour from the Escarpment, including Chedoke, Borer’s, Falcon, Indian, Hager and Rambo creeks, which start just above the Escarpment. (CEPS 2009)



Figure 4. Watersheds of the Hamilton – Burlington Area (source: HHWSP)

v. SIGNIFICANT SPECIES

Unless otherwise indicated, data in the tables below are from NHIC (2009) but are generally not current to 2008. Only designated Species at Risk (SAR) (Endangered, Threatened or Special Concern) are included. Many additional globally and provincially rare species and vegetation communities occur in these areas, and some of them may be considered as focal conservation targets during the CAP process.

Records have in some cases not been included for locally extirpated species (indicated with X) occurring at sites considered so modified that they are not recoverable, although records of many historic (indicated with H) and extirpated taxa are presented since these could conceivably recolonise (or be reintroduced) as habitats are restored.

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Table 1.4 Federally and Provincially Designated SAR in the Hamilton – Burlington 7E-3 CAP Area

Species	Habitat	C	OMNR	G ³ / S Ranks	RS Status	Status / Threats / Issues & Recommended Recovery Actions Relevant to CAP	Relevant Projects (contacts)	Actions Underway
Acadian Flycatcher	Deciduous forest (older growth / gaps & edges)	END	END	G5 S2B	A	HCA – Dundas Valley (2009) “Dundas Valley considered among the top six forested areas for Acadian Flycatcher (ACFL) / Hooded Warbler (HOWA) and worthy of additional recovery efforts & CAP focus.” – Jon McCracken, BSC Develop conservation agreement to conserve critical habitat at unprotected sites. Work with Environment Canada to contact landowners of important forests (whether containing CH or not) and provide BMPs for ACFL / HOWA and older-growth forests. Encourage conservation easements on old-growth tracts or protect them through other stewardship mechanisms. Produce a “BMP Fact Sheet” and distribute to planning authorities to ensure knowledge of impacts of moisture regime alteration, residential development, recreational activities, and forest management in and adjacent to habitat; include silvicultural tech guidelines and old-growth recommendation. Encourage incorporation of ACFL /HOWA habitat into long-term management planning on all public lands. Survey forests every 5 years to determine changes in population, distribution, and availability of habitat. Monitor CH to ensure populations are not declining due to overlooked threats. Develop a management strategy for invasive insects and pathogens that includes: monitoring the spread of tree-killing invasive insects and/or diseases; assessing impacts of insects and disease on habitat; encouraging land managers to undertake site-specific measures to stop or reduce impacts. Develop a management strategy for invasive plants that includes: assessing the extent CH is being altered by invasive plants; assessing the extent to which the species is affected; recommendations on control of invasive plants.	Dundas Valley IBA (Jon McCracken, Debbie Badzinski) FBMP monitoring undertaken by HCA (Shari Faulkenham) Sheila O’Neal, HHWSP	In early 2000s HCA apparently had no plans significant timber extraction in Dundas Valley holdings, making it one of the most secure and viable sites. (JM) Not a lot of recent activities. 5-year monitoring blitz in 2007. ACFL surveys in 2009 were all in Norfolk County. Very little collaboration / communication from local groups with RT. Groups operating independently. (DB) Noted during annual FBMP monitoring. (SF) HHWSP responsible for implementing private land stewardship programs.

³ 4 – Based on NatureServe 2009

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Species	Habitat	C	OMNR	G ³ / S Ranks	RS Status	Status / Threats / Issues & Recommended Recovery Actions Relevant to CAP	Relevant Projects (contacts)	Actions Underway
Hooded Warbler	Oak and other deciduous woodlands, clearings in large tracts of deciduous forest	THR	SC	G5 S3B	A	HCA – Dundas Valley (2002); Cootes Paradise (2005); Rock Chapel (2009) See Acadian Flycatcher (above)	Dundas Valley IBA (Jon McCracken, Debbie Badzinski) Sheila O'Neal, HHWSP	In early 2000s HCA apparently had no plans significant timber extraction in Dundas Valley holdings, making it one of the most secure and viable sites. (JM) Not a lot of recent activities. 5-year monitoring blitz in 2007. Less emphasis now on HOWA because of downlisting. CH draft for HOWA was provided to EC. Very little collaboration / communication from local groups with RT. Groups operating independently. (DB) HHWSP responsible for implementing private land stewardship programs.
Cerulean Warbler	Mature deciduous forests	SC	SC	G4 S3B	N	HCA – Waterdown Escarpment Woods (1990); Dundas Valley "rare (1990); Cootes Paradise (1990) C- E (1990) – Waterdown Woods RMA, Woodland Cemetery n/a	Protecting SAR at HNC Nature Sanctuaries CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal HHWSP	HNC: Conducting detailed SAR surveys HHWSP responsible for implementing private land stewardship programs.

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Species	Habitat	C	OMNR	G ³ / S Ranks	RS Status	Status / Threats / Issues & Recommended Recovery Actions Relevant to CAP	Relevant Projects (contacts)	Actions Underway
American Columbo	Deciduous forests	END	END	G5 S2	20 12*	HCA - Grindstone Creek Escarpment Valley (<1977); Borer's Falls – Rock Chapel (2005) CEPS - Sassafras Woods – 250 stems 2003; Cartwright – 220 stems,(47 flowering) (2009); Clappison Escarpment etc – 1420 stems (68 flowering) 2009 Threats: Cartwright – habitat succession, proposed development; Clappison – invasives (Dog Strangling Vine), Hydro One maintenance RS not available	MNR SAR Program (Donald Kirk,) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Protecting SAR at HNC Sanctuaries Sheila O'Neal HHWSP	Inventory and occurrence updates for past 2 years, at CA properties and private land (when invited). New populations being found, information base improving. (DK) Population monitoring in 2009. Efforts to control Garlic Mustard, European Buckthorn and other invasive species are ongoing at Cartwright NS. The HNC and Conservation Halton have prepared a management plan for the sanctuary. HHWSP responsible for implementing private land stewardship programs
American Ginseng	Rich deciduous forest	END	END	G3G4 S2	DN	Occurs within CAP area; site data extremely sensitive due to threat of poaching. Threats: Poaching has occurred recently. RS not available.	MNR SAR Program CEPS Sheila O'Neal, HHWSP	One population poached, one extant at HCA property. HHWSP responsible for implementing private land stewardship programs
White Wood Aster	Deciduous forests	THR	THR	G5 S2	D?	HCA – Cootes Paradise (1955) CEPS – Cootes Paradise RS not available.	MNR SAR Program (Donald Kirk) CEPS Sheila O'Neal, HHWSP	Issues: management (logging), new populations being found. (DK) HHWSP responsible for implementing private land stewardship programs
Woodland Vole	Mature deciduous forests.	SC	SC	G5 S3	N	HCA – Cootes Paradise (2005) n/a	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs

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Jefferson Salamander	Moist deciduous forests	THR	THR	G4 S2	A	HCA – Dundas Valley (2001); Cootes Paradise (2005); Felker's Falls Escarpment (1991); Devil's Punchbowl Escarpment (1989) CEPS Waterdown Escarpment Woods; viable population Threats: habitat fragmentation, roads/roadkill, potential development pressure Verify and document extant, historic and potential element occurrences. Develop and implement a standardized monitoring protocol and a 5-year monitoring schedule to focus on: Presence/absence (of salamanders); site specific and cumulative impacts; range expansion/retraction. Select at least one long-term control site and conduct annual monitoring. Prioritize monitoring frequency of locations based on current and potential threats. Describe and identify aquatic and terrestrial habitat for extant populations. Identify and describe recovery habitat. Work with planning authorities to encourage integration of habitat regulation into Official Plans and other relevant planning processes. Identify communication needs and products that will provide information and resources to landowners, property managers, aggregate industry, local stewardship councils, local conservation authorities and other stakeholders to assist in the recovery effort and promote land stewardship Support monitoring by stakeholders. Identify factors at historic sites that were probable factors that caused the loss of the population (e.g., water level fluctuations, addition of fishes, loss of egg attachment sites etc.). Prioritize potential sites for restoration. Evaluate restoration and mitigation techniques. Continue research on species ecology, juvenile dispersal, population biology and parameters consistent with conservation biology planning. Control sites will provide benchmark data for comparison with other locations. Investigate the species' tolerance to environmental and cultural stressors (e.g., contaminants, agricultural activities, urban development, and resource extraction). Conduct research on the hydrology of breeding habitat	CEPS CH SAR Program (Nigel Finney, Kim Barrett) HCA (Shari Faulkenham) Sheila O'Neal, HHWSP	CH and MNR jointly conducted a substantial telemetry study on Waterdown Woods population in 2007 and 2008. Additional population may be located in Grindstone Creek RMA, to be confirmed (Contact: Brenda Van Ryswyk) HCA assisted with removal of Goldfish from JESA breeding pond in 2009. (SF) HHWSP responsible for implementing private land stewardship programs
Southern Flying-squirrel	Mature deciduous forests	SC	SC	G5 S3	N	HCA – Spencer Gorge (1991); Red Hill Creek Escarpment Valley (1999) n/a	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs

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American Chestnut	Deciduous forests and edges	END	END	G4 S2	A	HCA – Clappison Escarpment Woods 1987-88; Spencer Gorge 1994; Dundas Valley (2001); Cootes Paradise (2007); Iroquois Heights CA (1986) “~13 occurrences [in CEPS area]...Majority of records are from late 1980's. Updated surveys needed.” – HCA Major threat is chestnut blight. Assess status of populations every 5-10 years using methods outlined in RS. From existing information, and information collected from status assessments, identify and promote conservation of at least 15 core populations. A management strategy will be initiated in ten of the 15 populations. The remaining five populations will initially be unmanaged and will serve as controls for comparison. The management strategy could include: 1) removing dead, sporulating chestnut tissue from the site to reduce inoculum; 2) suppressing canker development using selected treatments; 3) encouraging recruitment of new individuals through pollination; 4) transplanting uninfected individuals from other sites; and 5) thinning or other microhabitat management to improve survival and growth of seedlings. Work cooperatively with planning agencies, conservation authorities, forestry consultants and municipal by-law officers to protect known populations and their habitats within their jurisdictions, following the Provincial Policy Statement under the Planning Act for the protection of habitat of endangered and threatened species. Information and status of regional populations from the inventory should be made available to these agencies. Undertake landowner contact and encourage stewardship. Involve the Nature Conservancy of Canada, local land trusts, and regional stewardship networks to bring about land securement through such mechanisms as landowner contact and stewardship, conservation easements, or acquisition. Promote awareness of the status of American chestnut to the general public through communication with farm, forestry, naturalist, and, planning organizations.	CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Butternut	Deciduous forests and edges	END	END	G5 S3	A	HCA – Spencer Gorge (2002); Grindstone Creek Escarpment Valley (1987-88); Hamilton Harbour (1991); Dundas Valley (2005); Cootes Paradise (2009); Borer's Falls – Rock Chapel (2008); Tiffany Falls (2004); Iroquois Heights CA (2001); Van Wagner's Ponds (2001); Hamilton Escarpment (2002); Red Hill Creek Escarpment Valley (2002); Felker's Falls Escarpment (1991); Community Beach Ponds (2008); Devil's Punchbowl Escarpment (1991); Fifty Creek Valley (2000), Hendrie Valley (2009) CEPS - Waterdown Escarpment Woods & other sites; pop'n status unknown, surveys required. Threats: Butternut canker Conduct inventories following a standardized protocol and a statistically valid method for population estimation and tracking. Educate landowners on butternut identification, and identification and assessment of canker in the field. Encourage landowners to assess extent of disease and abstain from harvesting putatively resistant individuals and trees predicted to survive ≥15 years based on health assessment. Engage landowners, stakeholders and others in recovery implementation and actions, including maintaining populations on the landscape. Locate and monitor putatively resistant trees.	MNR SAR Program Protecting SAR at HNC Nature Sanctuaries (?) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	RBG undertaking seed collection and propagation. HHWSP responsible for implementing private land stewardship programs

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Eastern Flowering Dogwood	Deciduous woodland edge, clearings, wet floodplain oak forests	END	END	G5 S2	N	HCA – Clappison Escarpment Woods (1987-88); Grindstone Creek Escarpment Valley (1987-88); Dundas Valley (2001); Cootes Paradise (pre-1969); Tiffany Falls (2001); Stoney Creek Ravine (2002); Red Hill Creek Escarpment Valley (1976); Community Beach Ponds (1991); Devil's Punchbowl Escarpment (1991) CEPS – Bridgeview Valley, Sassafras Woods, pop'n size unknown (1 possibly found during inventory for new interchange). Threats: disease, canopy closure, development (new interchange) RS in prep., not available.	MNR SAR Program (Donald Kirk) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	CH – Inventory for new interchange at Sassafras Woods. (KB) OMNR has produced ID cards, stickers; reusable grocery bags and signage; also inventory and occurrence updates for past 2 years. HHWSP responsible for implementing private land stewardship programs
Red Mulberry	Deciduous forests	END	END	G4 S2	A	HCA – Clappison Escarpment Woods, Waterdown Escarpment Woods (1987-88); Grindstone Creek Escarpment Valley (<1990); Spencer Gorge (2000); Cootes Paradise (1977); Borer's Falls – Rock Chapel (2009) (identified as core site for protection in RS; possibly planted at this site) CEPS - Cootes Paradise, Clappison Escarpment RMA & ESA, Waterdown Escarpment RMR & ESA – 11 trees Threats – hybridization, habitat loss Initiate targeted searches for RM in potential habitat such as Niagara Escarpment, Brock University Grounds. Communicate the negative effects and discourage planting of White Mulberry. Complete ELC surveys of all extant populations of Red Mulberry. Contact private landowners and encourage habitat stewardship. Work with municipalities and other planning agencies to protect significant habitats and populations by providing generalized maps and advice on official plans for municipal land use and other planning processes such as the PPS. Develop site-specific management plans for core populations; retain one site as a control. Initially eradicate White Mulberry within habitats of core populations, then within pollination range, while minimizing the impacts of these activities on other associated species, vegetation communities and ecological processes; assess effects of eradicating hybrids on retention of Red Mulberry alleles. Examine habitats for other threats and develop approaches within site management plans. Cooperate with other initiatives to connect and expand forest fragments to create potential future habitat. Monitor populations and threats. Guelph District MNR provided SAR funding to University of Guelph from 2001-03: Hire summer student at Royal Botanical Gardens: continue health ranking protocols for indiv. trees, collect samples, survey of sexes, establish culling experiment. Hire summer student at U of Guelph: fruit molecular analysis, enter/analyze sex data, molecular analysis from culling, assist culling RBG. Investigate impact of disease, establish gender distribution, gain insight into culling. Tree health protocols, collect samples, establish culling experiment with Guelph University. Summer student to assist Ken Burgess: research on ecological impacts of hybridization (cross pollination of trees at Point Pelee and Rondeau).	OMNR SAR Program CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs

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Broad Beech Fern	Moist deciduous forests	SC	SC	G5 S3	N	HCA – Dundas Valley (1972-1991); Cootes Paradise (pre-1969) CEPS – Cootes Paradise n/a	Protecting SAR at HNC Nature Sanctuaries Sheila O'Neal, HHWSP	HNC: Conducting detailed SAR surveys (2009) HHWSP responsible for implementing private land stewardship programs
Louisiana Waterthrush	Along clear, clean streams in mature forests and swamps	SC	SC	G5 S3B	N	HCA – Spencer Gorge (1991); Hamilton Harbour (1998); Dundas Valley (1993); Borer's Falls – Rock Chapel (1992); Tiffany Falls (1995); Red Hill Creek Escarpment Valley (1997) n/a	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Redside Dace	Clean clear streams rubble and gravel bottom and a mixture of pool and riffle habitats	SC	END	G5 S3	A	Spencer Creek (Shawn Staton) Westdale Creek (1950s) Encourage planning authorities to protect RD habitat in OPs. Encourage the incorporation of RD protection goals in NH plans and growth management plans. Conduct fieldwork to refine and map distribution. Work with baitfish harvesters and the Bait Association of Ontario to protect and monitor RD. Ensure that potential impacts on populations are considered when introductions are proposed. Ensure that potential invasion by exotic species is considered when removal of barriers is planned. Evaluate health of RD populations and habitats to identify degraded sites and investigate feasibility of restoration. Encourage BMPs in rural streams to restore a healthy riparian zone, reduce livestock access, establish manure storage and runoff collection systems, encourage conservation tillage and reduce tile drain impacts. Offer financial incentives as part of a stewardship program. Focus riparian rehabilitation re-establishment of grasses and shrubs. Identify candidate streams for RD re-introduction. Encourage development of EFPs and Nutrient Management Plans. Conduct rapid fluvial geomorphological assessments of select RD habitats. Identify critical habitats required for spawning, incubation and larval development. Investigate seasonal use of habitat, particularly over- wintering areas. Investigate movements and physiological tolerances. Conduct inventory of riparian buffer areas and their health. Identify key factors associated with urban development and agricultural practices that may contribute to population declines. Foster public support and awareness by developing appropriate materials and programs identified in the strategy.	DFO SAR (Shawn Staton) Sheila O'Neal, HHWSP	Some survey work done; Staton did surveys ~10 years ago, ROM & others went back and had hard time finding HCA – built bypass around around dam (SS) HHWSP responsible for implementing private land stewardship programs
Black Redhorse	Riffle areas in clear large streams and rivers	THR	THR	G5 S2	N	Spencer Creek (Shawn Staton)	DFO SAR (Shawn Staton) Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs.

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Few-flowered Club-rush	Well-drained open-canopy deciduous and mixed forest; tallgrass	END	END	G5G5 S1	A	HCA – Cootes Paradise (2009) Determine what level/type of disturbance benefits / threatens populations. Determine fire ecology of this species and necessity of prescribed burns. Assess role of other potential threats: human disturbance; changing abiotic conditions (due to canopy closure or habitat fragmentation or disturbance); predators/pathogens; competition (including non-native species); potential loss of genetic variability; etc. Perform a PVA for the Canadian populations. Determine biotic/abiotic characteristics of critical habitat. Elucidate key aspects of the species' ecology: sexual system; recruitment (seed vs. clonal); dispersal; survivorship; longevity; ecological relationships; population dynamics; competitive ability; etc., within both the Canadian and the core (U.S.) populations in order to assess Canadian populations. Assess the genetic variability within the Canadian populations, and between the Canadian and core populations, and perform subsequent research with genetic components (evaluate degree of local adaptation; determine degree of gene flow; determine role of clonal vs. sexual reproduction; etc.). Explore the need for a seed bank to conserve local genetic diversity. Develop site-specific management plans for extant populations. Establish & implement monitoring protocols to assess populations and their responses to management techniques. Survey suitable habitat for new populations and sites of potential recovery habitat. Educate field staff from various agencies on identification of this species. Promote the restoration recovery habitat independently, or in conjunction with other groups / RS;s. Revisit this strategy regularly upon the availability of new data.	RBG SAR program (Natalie Iwanycki, Karla Spence-Diermair) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	RBG undertaking propagation, habitat restoration, monitoring. (KSD, NI) HHWSP responsible for implementing private land stewardship programs
Hoary Mountain-mint	Dry, open, sandy-clay habitats in open-canopied deciduous woods	END	END	G5 S1	A	All pop'ns within ~1km of one another (1 on cemetery, other owned by City of Burlington); Slumping, succession, invasive spp. are the major threats. No major anthropogenic influences, except for littering, esp. from cemetery (but threats mainly natural). Getting people to care more about plants; invasive spp. education would help. RT hasn't tackled and could use help, and would be very supportive; all plant SAR need invasives control. Otherwise, program doesn't need additional support; well-managed populations with interested landowners (MT). Monitor population annually and maintain database of the data collected. Monitor effects of slumping on populations. Educate landowners and municipalities about species presence, threats, and management options. Map current and potential habitat with ELC standards. Remove invasive species at existing sites. Identify life history attributes, germination requirements, ecological niche, studies of genetic variation. Collect seed and propagate plant material. Increase population size at selected areas through planting (reintroduction) or site maintenance. Investigate effects of prescribed burns on Hoary Mountain-mint. Investigate possibilities for reintroduction.	MNR SAR Program (Melinda Thompson-Black) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	Preliminary test burn attempted 3 years in a row, overall numbers increased substantially, but number of populations have been reduced (prob. due to slumping); invasive spp. Removal (problem due to RBG introductions); burns done, more pop'ns, but issue is loss of smaller pop'ns (e.g., of 2 or 3 plants in "the hanging prairie" – very steep slope); possibility of augmenting pop'ns discussed, but no standard method (esp. w/new ESA); Annual work not recorded in publicly available documents (only people on RT are within MNR) HHWSP responsible for implementing private land stewardship programs

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Prothonotary Warbler	Deciduous swamp forests	END	END	G5 S1B	A	HCA – Cootes Paradise (1999); single female in 2009. Nest box program in Dundas Marsh (6-12 boxes /yr, now more like 6). Monitoring being done. Single female present in 2009. Single pair is maximum ever recorded at the site. Population has history of blinking out and reappearing from year to year. (J. McCracken) Identify and, where appropriate, map critical habitat. Prioritize sites that are in most urgent need of protection. Identify landowners at high priority sites. Determine ideal protection strategies for each high-priority site (tax relief, easement, covenant, acquisition, stewardship). Develop guidelines/ information for allowable forestry activities at Prothonotary Warbler occupied sites. Identify relevant landowners and land managers, and support the development of appropriate outreach materials. Develop and implement protocol to monitor and mitigate threats to habitat in occupied sites. Develop criteria for the prioritization of sites that would most clearly benefit from strategic restoration activities. Develop appropriate restoration and management tools to restore breeding habitat at each site. Refine nest box provisioning program, and establish site-based criteria to screen sites that are being considered for box deployment. Minimize public disturbance of nest sites during the breeding season through outreach and extension. Do not disclose nesting locations to the general public? Quantify and map areas of occupied habitat that are vulnerable to forest insect infestations, and assess the potential impact of these insects for each site. Determine the present extent of invasive plant species within each area containing critical habitat. Research methods to control invasive species. Monitor annual population trend, productivity, and survivorship in Canada in relation to predation, brood parasitism, and nest competition. Assess/evaluate potential impacts of future catastrophic events on critical habitat. Investigate potential for mosquito control programs to directly or indirectly impact the species during the breeding season in Canada.	RT's Nest Box and Monitoring Program (Jon McCracken) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	Location info very sensitive, harassment by birders, canoeists and others a serious concern. Monitor is very protective of sites, provides good monitoring data and field notes. Collaboration with additional players would jeopardize relationship with current monitor, who is doing a good job. Better to focus on other SAR/RT work in the area. Increasing extent of treed swamp at the site (if this were possible) could benefit the species, but the population (locally, and provincially) is not considered viable. (JM) HHWSP responsible for implementing private land stewardship programs
Common Hoptree	Sandy clearings and shorelines.	THR	THR	G5 S3	D	Listed for "Hamilton Harbour" (2003) in HCA database. Research & Inventory: What management practices are being used at each site? Species and extent of invasion at each site (monitoring template) and impact. Standard protocol for inventory and monitoring work (to include monitoring template). Determine population size and health at: extant sites, historic sites, suitable sites. Research role of shoreline processes and fire. Management: Tie to provincial and federal strategies on cormorant control where they are a threat. Assess and monitor sites to determine where invasives threaten Common Hoptree. Remove invasives where they are found to be a problem. Identify sites where succession threatens Common Hoptree populations. Consider adding male or female trees where these are missing in small populations Develop BMP's. Develop information package and deliver to municipalities and conservation authorities and land managers, private landowners through stewardship networks. Encourage municipalities to protect their shorelines from private landowners cleaning up shorelines and road edges from lawn creation. Discourage use of hardened shorelines. Include invasive species (discourage planting), recreational use impacts (landowners, parks, conservation authorities and visitors). Keep public informed of reasons for Cormorant management.	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs

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Barn Owl	Native grasslands, marshes & agricultural areas	END	END	G5 S1	A*	Identify priority sites for conservation, restoration, and protection efforts; collaborate with grassland and grassland species recovery teams, conservation organizations, government, private sector, rural landowners, and farmers; promote land trusts and conservation easements to secure habitat; approach landowners of priority sites regarding the establishment of grassland reserves; provide information on Conservation Tax Incentive Program, Species at Risk Stewardship Fund and Species at Risk Farm Incentive Program to interested landowners; identify, demonstrate and promote sustainable grassland management practices and engage landowners and farmers in these practices; provide rural landowners and farmers with contact information for funding agencies, organizations with expertise in grassland conservation, and sources for grassland species and habitat information; promote awareness of legal protection of Barn Owls; continue to evaluate areas of potential Barn Owl habitat and promote erection of nest boxes in barns and silos in these areas; conduct periodic monitoring of nest boxes to study use by Barn Owls & potential competitors	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs.
Yellow-breasted Chat	Thickets and scrubby regenerating fields	SC	SC	G5 S2	N	HCA - Borer's Falls – Rock Chapel (1999); Iroquois Heights CA (1984); Red Hill Creek Escarpment Valley (1988)	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Milksnake	Woodlands, fields.	SC	SC	G5 S3		HCA – Waterdown Escarpment Woods (1989); Dundas Valley (2001); Cootes Paradise (2009); Borer's Falls – Rock Chapel (2009); Van Wagner's Ponds (1989); Red Hill Creek Escarpment Valley (2000); Felker's Falls Escarpment (2008); Devil's Punchbowl Escarpment (1989) CEPS - Hidden Valley, Grindstone Creek RMA, Kerns Rd, Aldershot, Cootes Paradise, Waterdown Woods RMA n/a	CEPS CH SAR Program (Nigel Finney, Kim Barrett)	HHWSP responsible for implementing private land stewardship programs
Short-eared Owl	Grasslands, shorelines, marshes and tundra.	SC	SC	G5 S3B	N	HCA - Red Hill Creek Escarpment Valley (1976)	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs

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Spiny Softshell	Mud and sand-bottomed large lakes and rivers.	END	END	G5 S4B	DP	HCA – Hamilton Harbour (2003); Cootes Paradise (2005) CEPS Cootes Paradise Threats: Poaching Conduct surveys for 1) populations lacking current information; 2) targeted locations of potential populations; 3) known populations to determine spatial extent and quality of available habitat. Solicit observations from public and from within protected areas. Ensure necropsies are performed when unusual deaths occur. Identify areas of significant traffic mortality; evaluate mortality reduction techniques at key sites. Conduct quantitative assessment of effect of boating on mortality. Determine effective techniques to reduce incidental mortality in fishing traps. Collected DNA samples from all turtles handled in any research program & identify population markers. Develop and disseminate guidelines for BMPs (for new roads, existing roads and off-road vehicles). Enforce restrictions of off-road vehicles in protected areas. Prioritize protection of privately owned sites based on urgency and conservation importance; identify and contact land owners; determine and implement appropriate protection approaches for selected sites. Create or enhance nesting sites where required; monitor use and nesting success. Develop recommended nest protection techniques. Encourage the permanent marking of all handled turtles so illegally collected turtles can be identified to source. Develop headstarting protocols for populations with little evidence of natural recruitment. Develop rehabilitation techniques and share with vets. Develop and deliver awareness program to enforcement officials.	OMNR SAR Program CEPS RBG (Tys Theysmeyer) CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	Part of Ontario Herpetofaunal Atlas surveys. HHWSP responsible for implementing private land stewardship programs
Blanding's Turtle	Lakes, ponds, rivers, wetlands	THR	THR	G4 S3	DP	HCA – Cootes Paradise (2009); Stoney Creek Ravine (1987) CEPS - Cootes Paradise, Hendrie Valley (2009) Threats: poaching, habitat loss and degradation See Spiny Softshell (above)	OMNR SAR Program (Suzanne Robinson – RT) RBG SAR program (Karla Spence-Diermair) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	Interest (research) in engaging commercial fishing industry to reduce off-catch of turtles (a significant problem for MATU STIN BLTU) – Carlton U. (SR) RBG undertaking radio telemetry, habitat improvement. HHWSP responsible for implementing private land stewardship programs

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Common Musk Turtle (Stinkpot)	Lakes, ponds, rivers	THR	THR	G5 S3	DP	HCA – Hamilton Harbour (1932); Cootes Paradise (2009); Stoney Creek Ravine (1978) CEPS: Cootes Paradise Threats: Poaching See Spiny Softshell (above)	OMNR SAR Program (Suzanne Robinson – RT) CEPS CH SAR Program (Nigel Finney, Kim Barrett) RBG (Tys Theysmeyer) Sheila O'Neal, HHWSP	Interest (research) in engaging commercial fishing industry to reduce off-catch of turtles (a significant problem for MATU STIN BLTU) – Carlton U. (SR) HHWSP responsible for implementing private land stewardship programs
Northern Map Turtle	Large lakes and rivers	SC	SC	G5 S3	DP	HCA – Cootes Paradise (2009) CEPS - Cootes Paradise, Hendrie Valley ESA Threats: Poaching See Spiny Softshell (above)	OMNR SAR Program (Suzanne Robinson – RT) RBG SAR program (Karla Spence-Diermair) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	Interest (research) in engaging commercial fishing industry to reduce off-catch of turtles (a significant problem for MATU STIN BLTU) – Carlton U. (SR) RBG undertaking radio telemetry, habitat improvement. HHWSP responsible for implementing private land stewardship programs

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Common Snapping Turtle	Lakes, rivers, wetlands	SC	SC	G5 S4	N	Grindstone Creek ESA, Cootes Paradise, Hendrie Valley ESA, Bridgeview Valley 2009 Threats: Poaching, roadkill See Spiny Softshell (above)	MNR SAR Program (Suzanne Robinson – RT) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	Part of Ontario Herpetofaunal Summary. HHWSP responsible for implementing private land stewardship programs
Bald Eagle	Coastal areas, wetlands	SC	SC	G5 S4B	N	CEPS – Cootes Paradise 2009 RBG erected a nesting platform a year or two ago and are monitoring use. Two adults appeared to be nesting last year but did not produce any young (KB). n/a	CEPS CH SAR Program (Nigel Finney, Kim Barrett) RBG (Tys Theysmeyer) Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Least Bittern	Marshes	THR	THR	G5 S4B	DN	HCA – Cootes Paradise (1999); Van Wagner's Ponds (1996) CEPS: Cootes Paradise 2009 RS not available	(SARA web site) CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	Coastal wetlands in Ontario are being monitored to evaluate use by marshbirds and a landscape-level analysis of wetland integrity is currently being developed in southern Ontario. (SARA) HHWSP responsible for implementing private land stewardship programs
Black Tern	Marshes	NAR	THR	G5 S3B	?	HCA – Hamilton Harbour “extirpated” (1991); Cootes Paradise “extirpated” (1969); Van Wagner's Ponds “extirpated” (1990); Stoney Creek Ravine “extirpated” 1979 n/a	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs

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Eastern Ribbonsnake	Wetlands	SC	SC	G5 S3	N	HCA – Dundas Valley (1987); Cootes Paradise (2005)	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Wood Turtle	Clean, sand- bottomed rivers, streams and adjacent woodlands	SC	END	G5 S2		Historic records only (1985)	CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Henslow's Sparrow	Moist fields, prairies.	END	END	G5 S1	DN	Historic records only.	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Northern Bobwhite	Scrubby fields, prairies, savannahs	END	END	G5 S1	DN	Historic records only.	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Loggerhead Shrike	Pasture with scattered trees & shrubs; alvars	END	END	G5T S1B	?	Historic records only (e.g., 1985, RBG Berry Tract, Borer's Falls – Rock Chapel)	CEPS CH SAR Program (Nigel Finney, Kim Barrett) Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs
Eastern Hog-nosed Snake	Sand plains (forests, savannahs, prairies)	THR	THR	G5 S3	?	Historic records only.	Sheila O'Neal, HHWSP	HHWSP responsible for implementing private land stewardship programs

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Species	Habitat	C	OMNR	G ³ / S Ranks	RS Status	Status / Threats / Issues & Recommended Recovery Actions Relevant to CAP	Relevant Projects (contacts)	Actions Underway
Spotted Wintergreen	Dry oak-pine woodland on sandy soils	END	END	G5 S1	A	Extirpated		
Massasauga	Tallgrass prairie, wetlands, woodlands	THR	THR	G5T4 S3	A	Extirpated		
Piping Plover	Sand dunes, sand beaches	END	END	G5 S1B	A	Extirpated; recovery within CAP area probably not feasible due to limited extent of, and high levels of human activity in, suitable habitat.		
Forked Three-awned Grass	Dry sandy fields, prairies and clearings	END	END	G5 S2	A	Extirpated (dubious historic collection from 1862)		

Key to codes and abbreviations:

COSEWIC / OMNR Status: EXP = Extirpated; END = Endangered; THR = Threatened; SC = Special Concern

Recovery Strategy Status (as of January 2009):

A = Completed Strategy Available; D = Draft prepared, available; DN = Draft prepared, not available; N = strategy not available; P = part of multi-species or ecosystem-based strategy; ? = status unknown.

CEPS – Cootes to Escarpment Park System

RS = Recovery Strategy

CH = Critical Habitat

EO = Element Occurrence (see Appendix)

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**Other Provincially Rare Species Documented in the Hamilton – Burlington 7E-3 CAP Area
(NHIC 2009)**

Common Name	Scientific Name	# of EO's (Cootes – Escarpment)	Last Observation
Bowman's-root	<i>Porteranthus trifolius</i>	1	1957
Downy Yellow False Foxglove	<i>Aureolaria virginica</i>	2	2009
Perfoliate Bellwort	<i>Uvularia perfoliata</i>	2	2001
Shiny Wedge Grass	<i>Sphenopholis nitida</i>	3	1981
Midland Sedge	<i>Carex mesochorea</i>	1	1979
Arrow-arum	<i>Peltandra virginica</i>	1	2001
Brainerd's Hawthorn	<i>Crataegus brainerdii</i>	1	1987
Cypress Witchgrass	<i>Dichanthelium dichotomum</i>	1	1989
Evening Primrose	<i>Oenothera pilosella</i>	1	1977
Green Violet	<i>Hybanthus concolor</i>	1	2008
Mottled Duskywing	<i>Erynnis martialis</i>	2	2001
Fern-leaved Yellow False Foxglove	<i>Aureolaria pedicularia</i>	1	2001
Yellow false-foxglove	<i>Aureolaria flava</i>	1	1989
Clinton's Leafless-bulrush	<i>Trichophorum clintonii</i>	1	1954
Schreber's Wood Aster	<i>Eurybia schreberi</i>	2	1988
White-tinged Sedge	<i>Carex albicans</i> var. <i>albicans</i>	1	1980
Sweet Pignut Hickory	<i>Carya glabra</i>	1	2008
Northern Hawthorn	<i>Crataegus dissona</i>	1	1981
Trailing Wild Bean	<i>Strophostyles helvula</i>	1	1999
Bristly Buttercup	<i>Ranunculus hispidus</i> var. <i>hispidus</i>	1	1999
Eastern Few-fruited Sedge	<i>Carex oligocarpa</i>	1	2001
Kentucky Warbler	<i>Oporornis formosus</i>		2001

vi. SOCIO-ECONOMIC / CULTURAL CONTEXT

Both the terrestrial ecosystems and hydrology of the Hamilton – Burlington 7E-3 CAP area have been greatly influenced by human activities over the past two centuries. The area now called Hamilton was first occupied by the Iroquois Confederacy of Five (later Six) Nations. It was during the period of the American Revolution and the War of 1812 that the first Europeans settled in the area, although there is some record of French explorers making transient visits. George Hamilton settled after the War of 1812, creating a town site in 1815. Hamilton was incorporated as a police village in 1833 and as a city in 1846.

In the second half of the 1800s, Hamilton became a city known for its heavy industry, a hotbed of working-class activism. In 1872 was the leading voice to urge the universal maximum nine-hour working day. Hamilton became an important iron- and steel-producing city because of its easy access to the necessary raw materials: limestone came from the Niagara Escarpment; coal was mined in Appalachia; and iron ore was delivered from the Canadian Shield. Diverse steel works combined to become the Steel Company of Canada in 1910 and the Dominion Steel Casting Company in 1912.

During the First World War heavy industry boomed as the Canadian and British governments increased demand for steel, arms, munitions and textiles. This resulted in a building boom, where schools, apartments and high-rise buildings were built. The Great Depression of the 1930s, however, had a

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devastating effect on the local economy. The Second World War resulted in a resurgence of economic demand for steel and other products manufactured in the Hamilton area.

Today, health care has outstripped heavy industry as the largest employer. Education, government, services and technology sectors have all dramatically developed as heavy industry has declined. The city's industrial waterfront is presently being restored. (www.hamiltonkiosk.ca/history.php)

Table 1.6. Population Statistics for the Hamilton – Burlington 7E-3 CAP Area*

Name	Population (2006)	2001-2006 Population Growth
City of Hamilton	504,559	14,291
City of Burlington	164,415	13,579

* all information from Statistics Canada 2006

B. BIODIVERSITY TARGETS AND ASSOCIATED IMPACTS

After considerable deliberation, the CAP team selected the following conservation targets as being representative of the full range of systems needing to be considered in order to maintain and recover native biodiversity in the Hamilton – Burlington 7E-3 CAP area:

1. Coastal Wetlands
2. Niagara Escarpment / Deciduous Forests – North
3. Deciduous Forests – South of Harbour
4. Inland Wetland and Aquatic Communities
5. Prairies, Savannahs, Dry Oak Woodlands
6. Successional Thickets and Fields
7. Sand Dunes

Each of these conservation targets represents an ecosystem type or types upon which several or many species at risk (SAR) depend (Table 2.1). If measures are taken to maintain and enhance the health of key ecological attributes of each of the systems targets, the viability the nested species will normally also be enhanced. The viability, key ecological attributes and indicators of health of each of the conservation targets was assessed by the CAP team (Tables 2.2), based on expert knowledge and experience within the team. The indicators were selected on the basis of elements of the ecosystem that could feasibly be monitored over the long term to determine the effectiveness of implementation of actions recommended in this plan.

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i. BIODIVERSITY TARGETS AND THEIR VIABILITY

The following tables present the overall CAP conservation targets (Table 2.1), an assessment of their viability in the Hamilton – Burlington 7E-3 CAP area.

Table 2.1. Overall biodiversity targets and nested targets.

Conservation Targets	CAP Area Distribution	Nested Targets (confirmed and potential)
1. Coastal Wetlands	7E-3 Hamilton Burlington	Spiny Softshell, Blanding's Turtle, Stinkpot, Northern Map Turtle, Common Snapping Turtle, Bald Eagle, Least Bittern, Black Tern (X), Eastern Ribbonsnake, Prothonotary Warbler
2. Niagara Escarpment & Deciduous Forests - North	7E-3 Hamilton Burlington	Niagara Escarpment bedrock plain, rim, cliff, talus, karst and seepage zones; Acadian Flycatcher, Hooded Warbler, Cerulean Warbler, Kentucky Warbler, American Columbo, American Ginseng, White Wood Aster, Jefferson Salamander, Woodland Vole, Southern Flying-squirrel, American Chestnut, Butternut, Eastern Flowering Dogwood, Red Mulberry, Few-flowered Club-rush
3. Deciduous Forests – South of Harbour	7E-3 Hamilton Burlington	Eastern Flowering Dogwood, Butternut
4. Inland Wetland and Aquatic Communities	7E-3 Hamilton Burlington	Louisiana Waterthrush, Redside Dace, Black Redhorse, Common Snapping Turtle, Western Chorus Frog, Eastern Ribbonsnake
5. Prairies, Savannahs, Dry Oak Woodlands	7E-3 Hamilton Burlington	Hoary Mountain Mint, Few-flowered Club-rush, Henslow's Sparrow (X), Northern Bobwhite (X), Eastern Hog-nosed Snake (X), Spotted Wintergreen (X), Massasauga (X), Forked Three-awn Grass (X)
6. Successional Thickets & Fields	7E-3 Hamilton Burlington	American Chestnut, Butternut, Eastern Flowering Dogwood, Common Hoptree, Barn Owl, Yellow-breasted Chat, Milksnake, Short Eared Owl, Western Chorus Frog, Henslow's Sparrow (X), Northern Bobwhite (X), Loggerhead Shrike (X)
7. Sand Dunes	7E-3 Hamilton Burlington	Common Hoptree (?), Short-eared Owl (X), Piping Plover (X), American Beachgrass (introduced, but did it occur historically?), Schweinitz's Cyperus, Common Sootywing

X – Extirpated or historically-occurring target; ? – Potential target

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Table 2.2. Viability Summary See Appendix B for criteria used by CAP team to assess viability of conservation targets.

Conservation Targets		Key Ecological Attribute	Size		Condition		Landscape Context		Viability Rank
			Grade	Weight	Grade	Weight	Grade	Weight	
1	Coastal Wetlands ³	Water level fluctuations; species composition / dominance; extent of characteristic communities	Very Good (see ranking criteria – Appendix B)	1	Fair ²	1	Fair	1	Good
2	Niagara Escarpment & Deciduous Forests - North	Connectivity among communities and ecosystems; species composition / dominance; extent of characteristic communities	Good	1	Fair	1	Good ⁴	1	Good
3	Deciduous Forests - South of Harbour		Poor ⁸	1	Poor ⁹	1	Poor ¹⁰	1	Poor
4	Inland Aquatic and Wetland Communities	Hydrologic regime (timing, duration, frequency, extent); species composition / dominance	Poor ⁵	1	Fair	1	Poor	1	Poor
5	Successional Thickets and Fields	Successional dynamics	Poor	1	Fair ⁶	1	Fair	1	Fair
6	Prairies, Savannahs and Dry Oak Woodlands	Fire regime (timing, frequency, intensity, extent)	Poor	1	Fair ⁷	1	Poor	1	Poor
7	Sand Dunes	Sand deposition	Poor ¹	1	Poor	1	Fair	1	Poor
Project Biodiversity Health Rank									Fair

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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.

Notes (cross-referenced to above table):

1. Dunes – not large enough to maintain dynamic processes; zero to few representative species
2. Cootes Paradise – vulnerable due to fluctuating / regulated Lake Ontario water levels. Regulated for navigation.
3. Lake Ontario Biodiversity Strategy – review and extract applicable components, relate them to this CAP
4. Team ranked this as “Fair to Good”; includes hydrological / hydrogeological features of Niagara Escarpment (Karst, groundwater movement) – note nesting of terrestrial and hydrological targets under Escarpment conservation target.
5. Team ranked this as “Poor to Fair”; note nesting of small and large systems, and the associated vulnerability to development impacts (impacting species assemblages)
6. Successional habitats are vulnerable to external threats / losses related to development and agriculture
7. Invasive species – currently there is little or no management
8. Size is good in west end, poor in east end of study area
9. Number of threats compounding condition – pests, climate change, invasives
10. HHWSP has buffer mapping

ii. IMPACTS

The Hamilton – Burlington 7E-3 CAP area is dominated by human land uses, predominantly extensive residential, industrial and commercial areas. Some agricultural lands are present, particularly on the lake plain in the extreme southeast end of the CAP area, as well as in the upper portions of the Dundas Valley. The high population densities and associated highly modified landscape and intensive land uses have had significant impacts on the natural areas and ecological functions of the CAP area, and the pressures and stresses continue. Despite this, many high quality natural areas remain, and stewardship, protection and restoration efforts are playing an important role in maintaining and in some cases enhancing the functionality of the area's ecosystems. The major impacts were evaluated by the CAP team and are listed in Table 2.3, followed by more detailed summaries of each of the threats. See Appendix B for criteria used by the CAP team to evaluate and rank each of the threats.

Perception, Values, Lack of Awareness (re: ecological significance)

One of the most significant threats to SAR and the biodiversity of the Hamilton – Burlington 7E-3 CAP area identified by the CAP team involves the public perception and valuing of SAR and the habitats that support them. There is a widespread perception that the area has already been modified to the point that there is little need to protect remaining natural habitats. There is a need to change this perception and demonstrate the importance of functional ecosystems. Most of the CAP area consists of private land, and some landowners are concerned about the implications of SAR habitat on property values and the permitted uses and activities on their lands. Successional thickets and fields are particularly susceptible to a widespread perception that they are wastelands of no value unless they are developed or farmed, and yet many of the region's (and the province's) most threatened SAR are grassland and shrubland species, notably birds (McCracken 2005). In such a heavily populated region, land use planners and land managers constantly are faced with having to balance the interests of development, recreation, resource extraction and conservation. The ecological needs of SAR and all native flora and fauna are often not fully understood or appreciated when land use decisions are made, although there has been much progress in this regard in recent decades (see Section C, "Opportunities", for a discussion of some of the many relevant programs and initiatives in the area). Some of the imbalances in perception and values may be alleviated through public education and the establishment in the community of a long term ethic of ecological health and sustainability as articulated in the "Vision Statement" of this Conservation Action Plan. This threat includes the need to establish policies to protect "under-valued" habitats such as prairies, savannahs, thickets and fields. "Weed by-laws" are an example of how such habitats are often considered "waste land" as opposed to essential habitat for a number of imperilled species.

Timber harvesting occurs in some woodlots of the CAP area, but because of the urban land uses, commercial logging is not a major activity. The Dundas Valley forests are largely protected by the Hamilton Conservation Authority and some sections are approaching older growth. Old growth conditions favour the Acadian Flycatcher, while selective logging seems to benefit the Hooded Warbler. Where forestry does occur, incompatible logging practices can impact SAR populations through:

- introduction of invasive species;
- opening of the canopy, reducing habitat needed by shade-requiring species;
- soil compaction and erosion;
- increased evaporation, reduced soil moisture;
- increased edge effects;
- increased competition from successional species;
- increased habitat for generalists, predators and nest-parasites;
- reduced extent of forest interior habitat required by certain sensitive species;

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Table 2.3. Summary of Impacts based on IUCN classification of direct threats (IUCN-CMP 2006a); see Appendix B for criteria used by the CAP team to rank threats/impacts.

Threats Across Targets		Coastal Wetlands	Niagara Escarpment / Deciduous Forests - N	Deciduous Forests - South of Harbour	Inland Aquatic and Wetland Communities	Successional Thickets and Fields	Prairies, Savannas & Dry Oak Woodlands	Sand Dunes	Overall Threat Rank
Project-specific threats		1	2	3	4	5	6	7	
1	Perception, Values, Lack of awareness	-	-	-	-	Very High	High	High	High
2	Residential and commercial development	-	High	High	-	Very High	-	-	High
3	Trails	-	High	High	-	High	High	High	High
4	Invasive Non-Native/Alien Species	-	High	High	Medium	Medium	High	High	High
5	Roads & Railroads	-	High	Medium	High	High	Low	High	High
6	St. Lawrence Seaway water level regulation	High	-	-	-	-	-	High	High
7	Shoreline alteration (on- and off-site)	-	-	-	-	-	-	Very High	High
8	Municipal Waste-water	Very High	-	-	-	-	-	-	High
9	Household and feral pets	-	Medium	Medium	-	High	Medium	-	Medium
10	Residential encroachment on buffer / transition zone	-	Medium	Medium	Medium	-	High	-	Medium
11	Common Carp, Round Goby, Phragmites, Zebra Mussels	High	-	-	-	-	-	-	Medium
12	Fire suppression & natural succession	-	-	-	-	Medium	High	-	Medium
13	Impervious surfaces	-	-	-	High	-	-	-	Medium
14	Artificial light	Medium	Medium	Medium	Medium	-	-	-	Medium
15	Filling and drainage alterations	-	-	-	Medium	-	-	-	Low
16	Persecution of snakes, commercial collecting of reptiles and medicinal plants	Medium	Low ⁴	Low	-	Medium	-	-	Low
Threat Status for Targets and Project		High	High	High	High	Very High	High	Very High	Very High

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

⁴ - Species-specific strategic actions required in some cases

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- damage to vegetation;
- reduction in older-growth habitat and associated processes;
- interruption in SAR life cycles and movement patterns;
- loss of biomass;
- other disturbance to SAR habitat and individual species.

Development (Housing & Urban; Tourism & Recreation; Commercial & Industrial)

Residential, commercial and industrial development have had a substantial impact on portions of the CAP area. The construction of buildings and associated infrastructure result in direct, irreversible loss of habitat for native species, including species at risk (SAR). Associated impacts include the planting of lawns on natural habitat, cultivars invading surrounding natural areas, and the effects of associated applications of pesticides and fertilizers. Residential development occurs throughout the area and such impacts are considered widespread and serious.

Trails

Given the proximity of urban centres and the extent of easily accessible natural areas, recreational trails have a significant impact on the quality of natural habitats in the Hamilton – Burlington 7E-3 CAP area. Some of the threats to habitats by recreational activities include: damage to plants and habitat from foot traffic and vehicles; soil compaction and erosion; direct habitat loss and fragmentation; and invasion by exotic taxa. Trail bike paths through important breeding bird and rare plant habitat can render key sites unsuitable for certain species. All terrain vehicles (ATVs) and other off-road vehicles are a serious threat to most habitat types. The trails increase edge effects, provide habitat for invasive plant species, damage and remove natural vegetation, and, if used during wet periods, result in soil compaction, erosion and potential siltation in the run-off to local waters. Some off-road vehicle users appear to enjoy exploring virgin terrain, creating new trails, and rutting and disturbing natural habitats. The noise created by vehicles using off-road trails disturbs wildlife, especially reptiles, birds and certain mammals that are sensitive to human activity (e.g., Brant and Brown 1988, Bowles 1995, Bury 1980, Parent and Weatherhead 1998, Schubert and Smith n.d.). Snowmobile and off-road vehicle trails are often routed through wilderness and their motors are generally less muffled than those of domestic vehicles. White-tailed Deer are known to flee approaching snowmobiles and off-road vehicles, and mortality due to such stress has been documented (Bollinger 1974, Dorrance *et al.* 1975).

Terrestrial Invasive Species

The impacts on ecosystems of invasive, non-native plant species (such as Garlic Mustard, Common Buckthorn, Common Reed), insects (such as Emerald Ash Borer), other invertebrates (such as Zebra Mussels) and fungal diseases (such as Butternut Canker) are widely known.

Shoreline Alteration

Shoreline alteration is considered a major threat to the strip of relict sand dunes at the mouth of Hamilton Harbour. The construction of piers, berms, jetties, groynes and other shoreline modifications disrupts the long shore lake currents that deposit the sand necessary for dune building and maintenance processes. Shoreline hardening along the waterbodies that supply eroded sand to the long shore currents can also reduce the amount of sand available for deposition. Without adequate quantities of beach sand for aeolian deposition (i.e., by wind), erosion exceeds dune-building processes and the dune systems eventually disappear.

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Roads

Infrastructural improvement such as the building of new roads and the expansion of existing ones is invariably associated with development. Roads reduce the amount of interior habitat, fragment habitat patches, and can isolate populations. Roads disrupt natural processes such as groundwater flow and the spread of wildfire; they affect plant dispersal and inhibit animal movements, and can drain aquifers and increase soil erosion (Forman and Alexander 1998, Forman *et al.* 1997, Jones *et al.* 2000). Road construction modifies soil density, topography, and surface and groundwater hydrology (Seiler 2001). Wetland and riparian habitats are especially sensitive to hydrological changes caused by roads (Findlay and Bourdages 2000). Roads also result in high faunal mortality, particularly for reptile species, which often use warmed pavement for thermoregulation and road embankments for egg-laying, and which cross roads during seasonal movements between feeding areas and hibernacula. Amphibians are also highly prone to roadkill, particularly in early spring when moving to and from breeding ponds, as well as during rainy nights when they are more mobile and often venture onto roads. Other road impacts include: run-off of salt, oil and grit; and road noise can affect faunal behaviour, resulting in lower reproductive rates and retreat from otherwise suitable habitat by some species. Roadside maintenance, utility and service lines have similar impacts of habitat fragmentation, increased edge effects, introduction of invasive species, and pesticide impacts if herbicides are used during maintenance. Such effects are particularly pronounced for prairie species, which may otherwise thrive in these surrogate habitats.

St. Lawrence Seaway Water Level Regulation

“Study results indicate that moderation of water-level fluctuations under water regulation has significantly restricted the long-term hydrologic environment important to the maintenance of coastal wetland meadow marsh communities. Moderation of long-term water-level fluctuations has also created hydrologic conditions that have supported the expansion of aggressive, dominant emergent and submergent plant species, resulting in a reduction of plant species richness and emergent marsh habitat quality. It is likely that the reduction in habitat quality has also been influenced and magnified in wetlands that have been impacted by increased nutrient and sediment inputs attributable to surrounding land uses. However, intensive surveys and historical aerial photo evaluations provide very similar results across all of the study sites, including sites with largely natural (forested) watersheds. The consistency in study results supports the conclusion that water-level moderation through water regulation is having a major impact on coastal wetland habitat quality.” (Atkinson 2006)

“Lower percentages of meadow marsh under some plans were due to insufficient low lake levels that could allow soils to dry and restrict invasion by cattails, as well as lack of periodic high lake levels that could kill invading upland plants. An assessment of seasonal lake-level characteristics demonstrated that Plan 2007 would reduce mean winter lake levels by 13 cm or more than Plan B+ and springtime lake levels by more than 10 cm. These seasonal differences could result in less winter habitat for muskrats and reduced access to spring spawning habitats for fish such as northern pike.” (Wilcox and Xie 2008)

Household and Feral Pets

Predation of birds, reptiles, amphibians and small mammals by domestic pets is a well-documented impact that occurs in natural areas near residential areas. In the United States, rural cats kill an estimated one billion small mammals and many hundreds of millions of birds each

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year (Coleman *et al.* 1997), and serious impacts on rare and endangered species, including reptiles, have been documented worldwide (ABC 2003, Coleman *et al.* 1997). This threat includes feral cats as well as “coy-dogs”, which are hybrids of coyotes and domestic dogs. Dogs also stress wildlife by their presence and barking, and can be vectors for the spread of invasive plant species.

Residential Encroachment on Buffer/Transition Zone

Proximity to residential areas is often inversely proportional to the quality of natural habitat, whether it be upland forest, savannah, prairie or wetland. Encroachment often results in the creation of informal paths and trails, trampling by pedestrians and trail bikes, increased impacts by domestic pets (as noted above), clearing of the understorey, removal of woody debris and other “aesthetic” alterations to habitat, invasion by introduced species, including cultivars, pesticides, horticultural collecting, noise and other disturbance to wildlife. Some species are directly affected by encroachment and proximity to developed areas. These include: Butternut (pathogens); Red Mulberry (hybridization with non-native variety, pathogens); reptiles, small mammals and amphibians (predation by pets). Many native plants (including SAR) have attractive flowers. Their populations, particularly those in high-traffic recreational areas, are potentially threatened by people picking them for decorative or horticultural purposes.

Invasive Species in Wetlands and Aquatic Communities: Manna Grass, Common Reed, Common Carp, Round Goby, Zebra Mussel

Invasion of wetlands by Reed Manna Grass (*Glyceria maxima*) and, currently to a lesser extent, Common Reed (*Phragmites australis*) is of great concern from biodiversity conservation and human use perspectives. Common Carp, and to a lesser extent Round Goby, also pose significant threats to wetland and aquatic ecosystems. The main issue is that the carp feed on invertebrates in the sediment. When they feed, they suck up a chunk of mud, fish out the food, and expel the sediment. This results in the uprooting of all the vegetation and causing the water to be constantly murky. Other marsh fauna are adapted to clear water conditions and/or need to lay eggs in the vegetation (often resulting in low breeding success). Also, murky water reduces the vigour and ability of plants to regenerate. In addition to carp control, there is also a need to control the use of exotic baitfish and potential collection of baitfish from streams and wetlands in the CAP area.

Fire Suppression and Natural Succession

Within the CAP area, natural succession in the form of increased cover by woody plants (shrubs and trees) has been noted in what may have been native prairies, savannahs, and pine-oak woodlands. This succession may be due to suppression of natural wildfire. Successional thickets and regenerating fields provide habitat for a suite of declining bird species and other taxa of open habitats. Unless site conditions are very dry and therefore naturally open, these communities will normally succeed into upland forest communities. In order to sustain viable populations of open-country species, the regional habitat mosaic must retain sufficient open areas. Where disturbances (whether natural or human-caused) are suppressed, open upland habitat will decline in extent.

Impervious Surfaces

Along riparian corridors, beaches and other land/water interfaces in the natural area, impervious surfaces (e.g., pavement, hardened shorelines, rip-rap) may be a significant problem. Such

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problems are particularly pronounced in the vicinity of larger urban areas such as Hamilton and Burlington, where a significant percentage of surface area is impermeable to rainwater, resulting in greatly decreased infiltration and increased surface run-off. Shoreline modification may also affect fish habitat, and can impede the traditional movement of species both along the shoreline and from the waters to terrestrial habitats. In the CAP area this threat is affecting creeks more than inland wetlands.

Municipal Wastewater

According to the Remedial Action Plan for Hamilton Harbour (www.hamiltonharbour.ca/rap/accomplishments.htm#water): “While monitoring shows levels of nutrients such as phosphorus steadily declining, excessive nutrients still enter the Hamilton Harbour from sewers, wastewater treatment plants and the watershed. These nutrients can cause algal blooms, a nuisance to boaters and swimmers, and in the case of some toxic algae, a danger to animals and people. When algae dies and decays, it uses up oxygen in the water that fish and other aquatic life need to survive.”

“Water clarity has shown a substantial improvement and normally meets initial water quality targets of 2 metres set for 2003. In 1997, high lake levels combined with a cool spring resulted in an unusually high population of algae-eating zooplankton providing water clarity, at times, up to 6 metres in depth.

“Bacterial levels of *E. coli* have dropped dramatically in the Harbour, but swimming beaches are often closed due to contamination by gulls and waterfowl. Chlorination and ultraviolet radiation of treated wastewater effluent during the summer months helps reduce bacteria levels in the Harbour.”

Municipal wastewater also introduces sediment, road salt, chemicals, pharmaceuticals and pathogens into the watershed.

Artificial Light

According to Saleh (2007): “The effects of ecological light pollution are widespread, and are particularly pronounced in urban areas. Exposure to artificial light can create problems for species adapted to using light- or the absence of light- to aid in orientation. In these cases, ecological light pollution may interrupt natural behaviors, expose individuals to higher predation levels, or disrupt navigational abilities. Nocturnal frogs are especially vulnerable to the effects of artificial lighting....Exposure to artificial light impedes the ability of nocturnal frogs to locate and capture prey. This is probably due to their inability to adjust their eyes to new light levels quickly, a process that can take anywhere from minutes to hours...Many predatory birds and reptiles, usually active only during the day, will forage at night under artificial lights....While this appears to be beneficial to these predators, prey species may suffer over time....Many species of wildlife operate specific internal cycles or rhythms that help them determine when to initiate foraging, migratory or reproductive behavior. The addition of artificial light to the nighttime environment disrupts the precision of these cycles, thus modifying behavior.”

Persecution of Snakes, Commercial Collecting of Reptiles and Medicinal plants

Collecting of SAR turtles and snakes for the pet trade is potentially a serious problem in the CAP area, but the extent to which it is occurring is not known. Collection of medicinal plant species at risk is known to have occurred recently within the CAP area.

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Filling and Drainage Alterations

Alterations impacting streams and wetlands include channelization, artificial ponds, filling, grading and hardening. Such activities may increase the turbidity of watercourses, create warmer thermal regimes and alter natural fluvial geomorphological processes.

Problematic Native Species (Increased Herbivory, Predation and Parasitism)

While not specifically identified as a threat by the CAP team, high White-tailed Deer populations are known to be present in the larger natural areas of the CAP area. Excessively high White-tailed Deer populations can lead to serious negative impacts on native vegetation due to heavy browsing. Deer culls have been used many areas where natural deer predators are absent, but these can be unpopular for ethical and practical reasons, particularly in the vicinity of heavily urbanized areas.

With respect to native species imbalances that affect bird populations, Wilson and Cheskey (2001) write, “A stable population is one where natality (birth rates) and mortality (death rates) balance. When the scale is tipped towards mortality, a population declines and eventually becomes extirpated (goes extinct in the area)...When increased mortality resulting in population declines or extirpation is a result of human behaviour, there is a strong ethical argument to stop or change the behaviour. There is strong evidence the complex consequences of people living near or in forests or natural areas includes damage to many species’ populations. Some of these activities result in increased numbers of natural nest predators including raccoons (which are a significant predator of turtle eggs), squirrels, chipmunks, Blue Jays, Common Grackles and Common Crows. The Brown-headed Cowbird is a nest parasite which lays its eggs in other bird’s nests, often at the expense of the host species. It also benefits from feedlots and certain types of bird feed.... Garbage and food wastes, waste grain, certain types of bird seed, and compost are all implicated in creating inflated populations of nest predators (and cowbirds). These species are consequently more abundant in our surrounding forests, and inflict a greater toll on forest birds, particularly those nesting in “open cup” type nests.”

Air-borne Pollutants

Although not listed by the CAP team as a target-specific threat, air-borne pollutants and associated climate change are a potentially serious threat to all targets and the overall biodiversity of the Hamilton – Burlington 7E-3 CAP area. There has been research out of McMaster University documenting heritable mutations in mice and herring gulls in proximity to steel mills (<http://www.science.mcmaster.ca/biology/faculty/quinn/Detecting%20Induced%20Heritable%20Mutations%20in%20situ3.htm> and <http://www.pnas.org/content/105/2/605.full>)

Air-borne pollutants also refer to carbon dioxide and other greenhouse gases associated with climate change, which is likely to be among the most significant threats to global biodiversity (Fischlin *et al.* 2007, Thomas *et al.* 2003). Habitat management and species protection in a changing climate is likely to be difficult, and it can be expected that biodiversity which are already at risk may be lost, especially from isolated patches of habitat or areas with limited connectivity to other natural cover. Climate change could also allow additional exotic species to become established and become invasive (Dukes and Mooney 1999). Climate change will be manifested in different ways in different regions. Although some regions may experience little change in temperature, they are likely to experience instead changes in weather patterns, with increasing frequency and severity of storms, or changing timing of storm events. In the Great Lakes region, this may have a dramatic effect on already naturally rare and anthropogenically

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disturbed coastal communities. Both the loss of at-risk biodiversity and the arrival of new invasive species are likely to have a disproportionate effect on ecosystem functions in a system already stressed by changing temperature regimes and storm patterns. The unpredictable nature of both climate change, its effects on biodiversity, and the response of ecosystems to changing abundance or function of their components, mean that the effects may be severe in ways we cannot predict (McFarlane pers. comm. 2009).

Air- and precipitation-borne nutrient loading (increases in available nitrogen) have been shown to impact on fungal diversity (Arnolds 1991), and may therefore be a threat to the mycorrhizal associations required by many plant species.

C. OPPORTUNITIES

Existing Programs and Activities

The Hamilton – Burlington 7E-3 CAP area is already benefitting from a broad range of conservation-oriented programs, projects and activities being undertaken by many different agencies, organisations and groups, often in partnership with one another. There are 32 environmental organizations within the City of Hamilton (HWSC 2008). These groups include: City of Hamilton, Ontario Ministry of Natural Resources, Conservation Halton, Royal Botanical Gardens, Earth Day Hamilton, Hamilton Conservation Authority, Hamilton Naturalists' Club, Hamilton Industrial Environmental Association, Clean Air Hamilton, Grand River Conservation Authority, and Environment Hamilton, along with technical expertise by Trees Ontario, University of Toronto, Ministry of Natural Resources, and the Forest Gene Conservation Association. Some of the key programs and activities of many of these organizations are summarized below, but it should be noted that this is only a partial summary of all the important conservation work being undertaken in the CAP area.

Hamilton – Halton Watershed Stewardship Program (HHWSP)

Partners: Hamilton Conservation Authority, Conservation Halton

Goals, Timelines, Activities: Since 1994, the HHWSP has been contacting urban and rural landowners of natural areas and watercourses in both Hamilton and Halton Conservation Authorities' watersheds sharing information with landowners about their individual roles in the protection and enhancement of wetlands, forests, prairies/meadows, riparian areas and streams. The HHWSP is an ongoing program that proactively encourages good land and water stewardship. The Hamilton – Burlington 7E-3 Conservation Action Plan (CAP) area falls within the jurisdiction of the HHWSP.

Over 320 landowners have made voluntary agreements to consider the effects of their land management practices on the health of the watershed. These landowners have been recognized individually and received the Watershed Steward Award. Across the watershed landowners proudly display their stewardship signs (awards). The Watershed Steward Award is given to landowners in exchange for their voluntary agreement to continue to protect the natural features on their land. Over 5,000 hectares of land, which includes over 260 kilometres of riparian habitat and over 2,700 hectares of natural area in the watersheds of Hamilton and Halton Conservation Authorities are protected by these voluntary agreements.

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By the end of 2009, well over 1,000 landowners have been provided educational information or involved in rehabilitation projects which include establishing riparian buffers, enhancing wetland and upland habitat, fencing cattle from watercourses, constructing manure storage facilities, invasive species control and controlling erosion. The planting of indigenous species of vegetation and bioengineering is promoted and implemented. Landowners receive technical advice and financial assistance to implement these projects, and must sign a 10-year management agreement in exchange for receiving financial assistance. Over 32 kilometres of riparian habitat, over 100 hectares of forest, wetland, prairie/meadow habitat have been created or rehabilitated. Some of these landowners own natural areas and/or watercourses where species at risk have been identified.

The HHWSP received national recognition by Wildlife Habitat Canada's Countryside Canada Stewardship Award Program in 2003. The HHWSP also received the Ontario Trillium Foundations Great Grant Award in 2007. The HHWSP was described as making great strides in protecting and restoring watersheds and the program continues to reach out to landowners, educating and encouraging them to make environmentally-wise choices for their land. For the past several years the program has been focusing on landowners of natural areas where species at risk had been identified in the Hamilton and Halton natural areas inventories.

“Within the Hamilton Harbour watershed, the Hamilton-Halton Watershed Stewardship Program (2006) proposed targets to provide direction for further restoration work. Using Environment Canada's How Much Habitat is Enough (2004) as a guide, targets have been developed based on historical conditions and realistic potential increases in habitat area....Since current conditions do not meet Environment Canada guidelines for habitat targets, it is imperative that existing habitat be protected. Riparian habitat as well as forest cover and interior forest cover are the primary habitats with potential for restoration within the study area. To meet the proposed targets, additional forest cover is needed in the approximate amounts of 100 hectares (18 per cent) in the North Shore Watershed, 490 hectares (30 per cent) in the Grindstone Watershed and 2,753 hectares (30 per cent) in the Spencer Creek Watershed.” (CEPS 2009)

With support from its funders, program partners and watershed landowners the HHWSP will continue to reach out to landowners and be a resource to them as they take steps to protect and restore the natural heritage features they own.

Hamilton Conservation Authority (HCA) Subwatershed Plans

Partners: HCA and various local stakeholders

Goals, Timelines, Activities: Overlapping with the CAP area Subwatershed Stewardship Action Plans have been created for the Ancaster Creek, Chedoke Creek and Tiffany Creek watershed (which are all part of the Spencer Creek watershed). These detailed action plans have been developed collaboratively with local partners and include: 1. characterizations of each watershed; 2. descriptions of environmental stresses and associated stewardship actions; 3. subwatershed maps depicting the specific locations of stresses; 4. maps of existing and potential ecological linkages and ecotourism opportunities; and 5. ecological and water quality monitoring data for each catchment. Stakeholder input and Geographic Information Systems (GIS) analysis yielded the identification of environmental stresses, both natural and human-induced, with 15 of them considered to be impacting the natural environment on a subwatershed scale. Another 215 stresses were identified at the site level, of which 75 are in the Ancaster Creek watershed, 82 in the Chedoke Creek watershed, and 58 in the Tiffany Creek watershed. Storm-sewer outfalls, terrestrial habitat fragmentation, urban development, erosion, stormwater management, eco-

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tourism, and detachment from nature were commonly ranked as the most prevalent stresses in all three subwatersheds. Seventy-six Stewardship Actions were identified to mitigate the impacts of these stresses, including education and outreach opportunities, special study opportunities, and ecological restoration. The stewardship program is working with local Implementation Team partners to implement these actions. This Implementation Team is coordinating the program's activities for the entire Spencer Creek watershed, as subwatershed action plans are completed, for a planned five-year period (2008-2013). (Berestecki 2008)

Hamilton Conservation Authority (HCA) SAR Monitoring and Recovery

Partners: HCA

Goals, Timelines, Activities: According to Faulkenham (pers. comm. 2009), very little SAR monitoring is currently being undertaken by HCA, particularly with terrestrial taxa (some aquatic monitoring is taking place). As it stands, recovery efforts for SAR are more reactive than proactive. The most "exciting" SAR-recovery related project this year has been removal of goldfish from Jefferson Salamander breeding ponds. Watershed rehabilitation is occurring in some areas on HCA land, and some prairie and oak savannah restoration is planned for the future. The HCA is working with the City of Hamilton to initiate a new Natural Areas Inventory (to begin in 2011), and the CAP may also assist in getting this going.

According to Cheskey and Curry (2003), all of the lands and waters within HCA's Dundas Valley Conservation Area lands fall under the management prescriptions and policies described in the 1997 Dundas Valley Conservation Area Master Management Plan. The Master Management Plan is consistent with policies of The Niagara Escarpment Plan, and Provincial Policy Statements as they apply to Provincially Significant Lands.

Conservation Halton

Partners: HHWSP, HNC, CEPS and various other local partners

Goals, Timelines, Activities: Some of the relevant projects that Conservation Halton has been involved in include natural heritage inventory work, Jefferson Salamander studies, assisting the Hamilton Naturalists Club with American Columbo work and monitoring of other SAR. A population increase of 15,000-25,000 people is anticipated in the Waterdown area, with new developments including an expanded interchange along the 403, road expansion and new subdivisions, and Conservation Halton is attempting to mitigate the impacts of such a population increase to the greatest extent possible.

Hamilton – Wentworth Stewardship Council / ReLeaf Hamilton (RH)

Partners: Hamilton – Wentworth Stewardship Council (HWSC), City of Hamilton, HCA, GRCA, CCC, RBG and many others

Goals, Timelines, Activities: According to McKay (pers. comm. 2009), ReLeaf Hamilton (RH) network is a group consisting of local and regional conservation organizations and conservation landholders, local Conservation Authorities, the Hamilton-Wentworth Stewardship Council, and the City of Hamilton. These organizations share a common goal of restoring and sustaining forest ecosystems within the City of Hamilton boundary. It is a new organization which is still in the development stages. It is an informal organization bringing together civil society organizations, governments, and landowners because sustaining forests is a complex and challenging task in the

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city, and the partners hope to capitalize on working collaboratively. The network is about helping each of its partner organizations do their job better through coordinating and sharing information, and also about creating shared resources they can all benefit from such as: collective funding proposals; a common brand which is recognized and valued by the public and local decision-makers; technical resources and guidance for planting “the right tree in the right place”; a common set of strategic priorities; tools for communicating with and engaging the general public and different landowner sectors. The CAP process helps to develop an important resource: key biodiversity information and priorities for conservation lands that fall in part within the city boundaries. As a collaborative, community-based process, the CAP process also contributes to wider discussions about RH’s targets and strategic priorities for forest stewardship in the city as a whole.

OMNR Species at Risk (SAR) Program

Partners: OMNR and various local stakeholders.

Goals, Timelines, Activities: OMNR’s SAR program is a broad provincial program with many facets, that includes: enforcement of the Endangered Species Act; development of SAR recovery strategies; SAR habitat regulation; funding SAR stewardship activities through the OMNR SAR Stewardship Fund; other SAR stewardship and research activities; and a broad range of educational, communications and outreach activities relating to Ontario SAR. Locally, OMNR is actively working with local partners on projects relating to high priority SAR such as Few-flowered Club-rush, Hoary Mountain-mint and Jefferson Salamander and others. These include prescribed burns in prairie (Hoary Mountain-mint) habitat in collaboration with RBG, the City of Hamilton and the City of Burlington (Thompson pers. comm. 2009).

Carolinian Woodlands Recovery Strategy

Partners: Carolinian Canada Coalition, OMNR, Environment Canada, and more than 30 other national, provincial, regional and local agencies, organisations and groups

Goals, Timelines, Activities: Conservation Action Plans (Hamilton – Burlington 7E-3) 2009 and onward. Refer to Jalava *et al.* (2008, 2009) for more detail.

Niagara Escarpment Commission (NEC) / Niagara Escarpment Plan Area (NEPA)

Partners: various provincial, regional and local stakeholders, including municipalities

Goals, Timelines, Activities: The Niagara Escarpment Plan (NEP) was established in 1985 by the province to give added planning protection to the 725 kilometre-long escarpment from development pressures, recreational activities, agricultural uses, and quarrying and aggregate extraction. The Dundas Valley is located within the Niagara Escarpment Planning area. Development within this area must have regard for the requirements of the NEP. The Dundas Valley Conservation Area is classified as a Natural Environment Park in the NEP’s Parks and Open Space System. Within this system, the valley is zoned as Escarpment “natural” and escarpment “protection”. These zonings take precedence over municipal plans, and basically permit existing building uses and modest expansions if they enhance the purpose of the nodal park. The Dundas Valley is also identified within the NEPA as a nodal park, one of nine along the escarpment that are intended to represent the major habitat types. Nodal parks are also designed to serve as focal points where the natural and cultural history of the escarpment is exhibited and interpreted.

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Hamilton Naturalists' Club (HNC) / Head of the Lake Land Trust

[source: www.hamiltonnature.org/aboutus/aboutus.htm, accessed: 15 January 2010]

Partners: HNC, RBG, City of Hamilton, OMNR SAR Stewardship Fund, HCA, Conservation Halton and other local partners

Goals, Timelines, Activities: The Hamilton Naturalists' Club is an active and respected advocate for wildlife, natural areas, and the protection of the environment. Their Conservation/Education Study Committee examines and comments on local land use planning and environmental issues affecting the community. It plays an active role in the cleanup of Hamilton Harbour and the protection and restoration of other local natural areas. The Committee also coordinates efforts to educate children and the general public about biodiversity and the protection and enhancement of wildlife habitat.

In 1962, the Club became the first volunteer organization in Ontario to purchase significant areas as nature sanctuaries. The Club currently owns several Nature Sanctuaries including two rare Carolinian forest habitats and has also contributed hundreds of thousands of dollars to assist Conservation Authorities and others to protect important natural areas in Ontario.

The HNC works with recovery teams and conservation partners to undertake stewardship activities on HNC nature sanctuaries to enhance the quality of SAR habitat, as well as to collect monitoring data about the health of some of these species (American Chestnut, Butternut, Flowering Dogwood) to aid recovery teams in the development of SAR recovery plans. In 2008, HNC conducted thorough vegetation inventories of two of its nature sanctuaries, resulting in accurate data on SAR locations, health and threats and recommendations to guide management activities. This included a comprehensive American Columbo survey at the HNC-owned Cartwright Nature Sanctuary within the CAP area. Proposed implementation of SAR recovery activities in 2009 included improving the quality of habitat for SAR by removing invasive species (garlic mustard, autumn olive, buckthorn, and black locust) in close proximity to SAR. The HNC has numerous volunteers who want to aid recovery teams by collecting monitoring data. HNC will develop and deliver curriculum-based educational activities to primary school students in Hamilton. Educational sessions will also be held with neighbouring landowners in response to their interest to learn more about local SAR. HNC is working with the American Chestnut Recovery Team to implement appropriate management activities.

Jointly with the Royal Botanical Gardens, the Club maintains a Junior Naturalists' Club for children aged 5 to 12. Their monthly program features hands-on nature activities.

The HNC has organized and led a number of studies of natural areas in Hamilton. Professional biologists documented the plants, animals, birds, butterflies, fish, and other species. These watershed summaries, reports, and databases are the authoritative guides to significant natural areas, providing direction to land-use decision-makers, scientists, and students of nature. In 2006, the HNC collaborated with other clubs, municipalities and agencies to complete the two volume Halton Natural Areas Inventory (NAI). An updated NAI is planned for the Hamilton area in the near future, to be undertaken in collaboration with the City of Hamilton and other local partners. The HNC has also published a broad range of outreach and educational materials on natural history and conservation, including publications on the birds and mammals of the Hamilton area.

A 1999 bequest from the Townson family allowed the Club to establish several endowment funds at the Hamilton Community Foundation.

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Royal Botanical Gardens (RBG)

Partners: RBG, and various local and regional partners.

Goals, Timelines, Activities: Karla Spence-Diermair, Royal Botanical Gardens (RBG), noted that the RBG has had a formal SAR program for the past three years, but that SAR work has been ongoing for specific taxa for a considerably longer time. Through its ongoing SAR monitoring and restoration programs, the RBG has compiled much updated information that will be useful for the Hamilton CAP. Focal species over the past three years have included Few-flowered Club-rush, Red Mulberry, Butternut, Least Bittern and the turtle species at risk. Work has included a combination of population assessments and habitat restoration projects. Additional surveys and restoration work has been completed for Prothonotary Warbler and Bald Eagle.

Project Paradise has been a long-term initiative working to improve the water quality and habitat of Cootes Paradise Marsh and the Grindstone Creek wetlands. Some projects associated with Project Paradise include the operation of the Fishway and other carp barriers, wetland plantings, water quality monitoring, etc. The terrestrial programme includes forest plot monitoring, invasive species removal, breeding bird surveys, etc.

Cootes to Escarpment Park System (CEPS)

Partners: RBG, City of Hamilton, Conservation Halton, Hamilton Conservation Authority, City of Burlington, Hamilton RAP, Ontario Greenbelt Foundation, Niagara Escarpment Commission, Region of Halton, Hamilton Naturalists' Club, Bruce Trail Conservancy, Hamilton Harbour Remedial Action Plan

Goals, Timelines, Activities: The mission of the Cootes to Escarpment Strategy is to collaboratively continue preserving and enhancing the natural lands using a sustainable approach that balances natural ecosystem health with responsible human appreciation and activities to achieve the vision. It is not a land use plan but a land management plan for public park lands that are primarily within the Greenbelt and are characterized by environmentally significant features. Since good land management practices are supported by many tools, the strategy identifies land use planning policies that can support the Cootes to Escarpment Park System as well as other tools such as stewardship.

More specifically, from CEPS (2009): "Implementation of this strategy will primarily rely on specific actions on park lands. However, it will also rely on the partners to work co-operatively to protect and promote the park system using existing legal and stewardship practices including their own strategic plans, recreation master plans and official plans.

"The foundation of the Cootes to Escarpment Park System is the unique ecological corridor from Cootes Paradise Marsh to a 10-kilometre section of the Niagara Escarpment. This area provides the only contiguous habitat connection from Lake Ontario to the Escarpment not broken by a 400 series highway. For the purposes of this Strategy, the Cootes to Escarpment Park System is divided into six core natural areas called Heritage Lands, which reflect the natural and cultural components of their respective area and are based on existing Environmentally Sensitive Areas.

"The six Cootes to Escarpment Heritage Lands include:

Cootes Paradise Heritage Lands

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Borers-Rock Chapel Heritage Lands
Clappison-Grindstone Heritage Lands
Waterdown-Sassafras Woods Heritage Lands
Lower Grindstone Heritage Lands
Burlington Heights Heritage Lands

“The province recognizes many parts of these natural lands as Areas of Natural and Scientific Interest or Provincially Significant Wetlands and has included them within a provincial natural heritage system. These natural areas contain some of the most botanically rich lands in Canada and provide habitat for many important bird, reptile, amphibian, fish and insect species as well as many species at risk.

“The Cootes to Escarpment Park System already contains 26 existing park lands owned by Royal Botanical Gardens, Conservation Halton, Hamilton Conservation Authority, City of Burlington, City of Hamilton and Bruce Trail Conservancy. These 1,560 hectares (3,855 acres) of land form the backbone of a recreational system where the public can experience and appreciate natural environments. However, the urban growth and intensification expected over the next 20 – 25 years in Hamilton and Burlington threatens the health of these natural areas. By 2031 the region is expected to grow to 1.4 million residents, which will result in a 37 per cent population increase. This increase will place greater demand on natural areas for respite, recreation and education. At the same time, ecological integrity will become even more tenuous without large connected habitat areas to protect the biodiversity of Ontario.

“In order to achieve the vision for the future park system, the strategy identifies that existing park lands and core natural systems need to be expanded. An additional 640 – 750 hectares (1,581 – 1,853 acres) of private and Ontario Realty Corporation property is considered important in protecting and connecting the natural areas in the current park system and will be considered in a land securement strategy to be developed outside of this strategy. Bringing additional lands into the public realm could occur mainly through voluntary agreement to sell or donate property, or through land dedication with a subdivision development. While the Cootes to Escarpment Park System focuses on protecting core environmentally significant areas, this strategy recognizes that there are other connected significant natural features and supports the protection of those features through land use planning, watershed planning and stewardship actions.

“In addition to acquiring new lands through land securement, the management of current park lands needs to be addressed. Therefore, the land management component of this strategy includes policies and actions to guide the collective management of the current park lands within the park system. These include policies and actions for natural and cultural heritage, recreation, education and facilities.

“Existing individual park properties are classified through the Niagara Escarpment Parks and Open Space System (NEPOSS) and most are required to conform to the Niagara Escarpment Plan. Park properties outside the Niagara Escarpment Plan Area and Greenbelt Plan are not classified. This classification structure identifies the main management objective the properties need to fulfill within the park system, and together with the policies and actions outlined in the strategy will guide future area-specific management plans. Together, the classification, policies and actions identify common directions the partners can implement through specific management plans to protect the natural system and provide a variety of recreational opportunities at a broad scale. It is envisaged that a Cootes to Escarpment Park System Management Network will be formed to implement this strategy. The management network would include not only the partners,

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but also provincial government, and institutional and local interest groups with a stake in seeing the park system managed for the long-term health of the community.

“The complete park system will include an inter-regional trail system that connects the park lands with the Bruce Trail and Lake Ontario Waterfront Trail. Through the Cootes to Escarpment Park System, those parts of the inter-regional trail that are not part of the Lake Ontario Waterfront Trail will be primarily designed for hiking. Main access and facilities for recreation and nature education will be centred on South Shore Cootes Paradise, North Shore Cootes Paradise, King City Quarry, City Park, Bayview Park and Kerncliff Park. Other park lands will provide primarily hiking and interpretive opportunities.

“The Cootes to Escarpment Park System Conservation and Land Management Strategy identifies a vision to protect local, provincial and national environmentally significant natural areas that shape our landscape. It provides guidance on co-operative actions to realize this vision that supports the interest of the partner organizations to secure permanent protection of significant natural lands and provide public recreation and education opportunities.”

According to Albanese (pers. comm. 2009), all of the CEPS partners will be developing master or management plans for their areas. These will answer questions such as: 1. what are the natural heritage values, and how are they best protected; 2. are trail systems desirable? 3. what kind of facilities are needed? A priority at present is to complete Ecological Land Classification (ELC) for the entire CEPS area, as natural heritage data have not been comprehensively or consistently collected for the area. The Cootes to Escarpment Strategy is being finalized, and funding for implementation is being acquired. A marketing plan and land securement strategy are also necessary.

City of Hamilton

[source:

www.hamilton.ca/CityDepartments/PlanningEcDev/Development/CommunityPlanning/NaturalHeritage/, accessed 15 January 2010]

Partners: HNC, HCA, Grand River Conservation Authority, CH, Niagara Peninsula Conservation Authority, RBG, OMNR, EC, and others.

Goals, Timelines, Activities: The City of Hamilton’s Natural Heritage Planning department develops strategies and programs for protecting, enhancing, and monitoring Hamilton’s natural areas and their ecological functions. Protection and enhancement are achieved through Official Plan policy, watershed and subwatershed plans, Secondary Plans, tree cutting and fill and grading by-laws, and development review. The Natural Heritage Planner works with local partners to conduct field studies on natural areas and maintain databases and mapping resources. This data is used in establishing boundaries for Environmentally Significant Areas (ESAs), development review, long range planning, and monitoring the condition of natural areas in Hamilton.

Natural areas in the City of Hamilton are protected locally through policies for Environmentally Significant Areas (ESAs) and the Regional Natural Heritage System (NHS). ESAs are natural areas that have been identified as unique because they serve important ecological functions, contain rare plant or animal species, contain rare or unique topography or geologic features, or have been designated as an Area of Natural or Scientific Interest or a Provincially Significant Wetland. There are currently 81 ESAs in Hamilton, which range from wetlands and swamps to prairie, alvar, and escarpment habitat. Proposed land use changes in or adjacent to ESAs are referred to the Environmentally Significant Areas Impact Evaluation Group (ESAIEG) for

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review. ESAIG is a voluntary group of local people with technical expertise that advises Community Planning staff on the impacts of land use changes in or adjacent to ESAs and provide recommendations based on the review of an Environmental Impact Statement (EIS).

The Natural Heritage System (NHS) developed by the former Region of Hamilton-Wentworth serves as a framework for conservation planning and management in Hamilton. The purpose of the NHS is to identify and conserve a system of interconnected, protected natural areas so that ecological functions (for example, improving air and water quality, controlling erosion and flooding, and providing habitat for plants and animals) are maintained and enhanced.

Maps of the ESAs in the City, and the Regional Greenlands Preliminary Concept Map, are available as part of the Regional Official Plan, which can be viewed at the offices of the Planning and Economic Development Department.

Urban Eco Park

[Source: www.russpowers.ca/Pages/Issues/EcoPark/Dundas%20Eco%20Park.pdf, accessed 15 January 2010]

Partners: Active local residents and Urban Strategies Incorporated

Goals, Timelines, Activities: The Urban Eco-Park is advancing the concept to protect and promote the natural and cultural heritage of a large swath of Dundas from the Niagara Escarpment to Cootes Paradise by preserving viewsheds, formalizing connections and linkages, and embracing the public use of this resource. What is needed for this entire area is a broader vision that can direct urban growth and development in ways that enhance its unique natural setting. While a good portion of the lands are in public hands, there is risk that those held privately may be the site of inappropriate urban development. The Pleasant View lands, are almost entirely surrounded by public natural areas and remain largely in a natural state. The majority of these areas are now afforded certain protection through the Niagara Escarpment and/or Greenbelt Plans of the Ontario Government and the broader area has the potential to become a larger Eco Park, which would complement the emerging eco-tourism industry in the Hamilton area. Past Ontario Municipal Board battles have been fought and won over the private holdings; however, the low-density residential permission applicable to the Pleasant View lands that have heretofore effectively prevented development because of market realities, is not as strong as actual legislated protection prohibiting urban development. A plan properly identifying essential natural features and connections and defining appropriate development areas is badly needed. Because of the site's exceptional potential to become an integral part of the Urban Eco Park within the larger Cootes Paradise-Desjardins Canal-Niagara Escarpment area, the following key recommendations have been proposed by the Urban Eco Park:

- Refusal of the application for 201 King Street E.
- Endorsement of the regional vision of the Urban Eco Park
- Endorsement of the local potential of the Urban Eco Park Gateway
- Development of a plan to design and implement the Urban Eco Park

Bird Studies Canada (BSC)

Partners: HCA and other local partners

Goals, Timelines, Activities: Prothonotary Warbler monitoring; Dundas Valley IBA.

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According to Cheskey and Curry (2003): The goal of the Dundas Valley Conservation Area Master Plan is the protection, conservation and rehabilitation of the valley's physical and natural features while permitting low intensity recreational uses in designated areas. This report includes six simple recommendations related to conservation and protection of species at risk and forest species in general in the Dundas Valley:

1. Monitor the valley to identify locations of breeding species at risk
2. Assess threats to individuals and pairs
3. Consider closing trails if SAR are threatened from disturbance by trail users
4. Consider developing a campaign to address threat of predators associated with humans including domestic pets such as cats, both pets and feral, dogs, and wildlife nest predators that benefit from humans such as raccoons, and squirrels.
5. Continue securing more land within and adjacent to the Dundas Valley
6. Maintain good relations with private landowners

Bruce Trail Conservancy (NCC)

[source: <http://brucetrail.org/>, accessed 15 January 2010]

Partners: BTC trail clubs and other local partners

Goals, Timelines, Activities: The Bruce Trail Conservancy is a charitable organization committed to establishing a conservation corridor containing a public footpath along the Niagara Escarpment, in order to protect its natural ecosystems and to promote environmentally responsible public access to this UNESCO World Biosphere Reserve. Environment Committee consists of a chair and at least five members with expertise in , ecology, environmental assessment, geography, geology, mapping, pesticides, community planning, site development, and other related fields, and is involved in the following main activities, all of which may have relevance to the Hamilton – Burlington 7E-3 CAP program:

- Developing initiatives that promote conservation and restoration of natural resources and wildlife of the BTC conservation corridor and the Niagara Escarpment., e.g. review of property management plans;
- Preparing material to educate trail users in the ecological, historical and cultural features of the Niagara Escarpment, e.g., leading interpretive hikes and preparation of interpretive signs for Bruce Trail properties;
- Submitting articles to the Bruce Trail Magazine;
- Supporting BTC clubs and other committees on environmental issues in their manuals, procedures and practices, e.g., Guide to Non-Native Trees and Shrubs;
- Monitoring government, ENGOs and private development that may impact the environment (e.g., quarry operations; roads such as the Redhill Parkway, Hamilton).
- Preparing policy documents (e.g., Position Paper on Wind Turbine Development, 2005; Pesticide Policy for BTC Managed Lands Leased for Agriculture, 2003; Mountain Bike Policy Background, 2002). Commenting on environmental aspects of BTC policies (e.g., Vegetation Policy, 1999; Non-Pedestrian Activities Policy, 1999). Commenting on trail optimum route strategy to avoid ecologically sensitive areas and rare plants.
- Implementing the Calypso Orchid Environmental Award

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Hamilton Harbour RAP

[source: <http://www.hamiltonharbour.ca/rap/about.htm>, accessed 15 January 2010]

Partners: The Hamilton Harbour RAP is a stakeholder group representing over 40 agencies from industry, environment and government developed the RAP Stage 1 and 2 reports. Implementation is mandated to the Bay Area Implementation Team (BAIT) representing 18 key government and industrial stakeholders, co-chaired by Environment Canada and the Ontario Ministry of the Environment. Overseeing public participation to both scrutinize and encourage remedial actions is the Bay Area Restoration Council (BARC) with its own elected president and board. A “who does what best approach” to implementation is used by the various RAP stakeholders (ArcelorMittal Dofasco, BARC, City of Burlington, City of Hamilton, CH, DFO, EC, HCA, Hamilton Halton Home Builders' Association, Hamilton Harbour RAP Office, Hamilton Port Authority, Hamilton Waterfront Trust, McMaster University, Ontario Ministry of the Environment, OMNR, Regional Municipality of Halton, RBG, U. S. Steel Canada).

Goals, Timelines, Activities: The Hamilton Harbour RAP is a community organization with the mandate to restore the aquatic habitats and water quality of Hamilton Harbour, the most polluted of Canadian Areas of Concern (AOC) on the Great Lakes. The focus is on the harbour and watershed, an area with a population of over 750,000. Partnerships are a key component of the program, which is not specifically focused on SAR, but in some ways it deals with them indirectly, because of the focus on invasive species (primarily carp and other aquatic species introduced through ballast water). The many programs and projects of the Hamilton RAP are summarized at: <http://www.hamiltonharbour.ca/rap/accomplishments.htm>.

Bay Area Restoration Council (BARC)

[source: www.hamiltonharbour.ca/programs-yfr.htm, accessed 15 January 2010]

Partners: Hamilton Harbour RAP and various local partners, including corporate sponsors and schools

Goals, Timelines, Activities: Formed in 1991, the Bay Area Restoration Council (BARC) leads community efforts to restore and protect Hamilton Harbour and its watershed. BARC works with its stakeholders to create a multi-use Harbour that balances vibrant and diverse ecosystems with opportunities for public recreation. BARC’s activities and programs include:

- Since 1994, BARC’s Monitoring Committee has authored “Toward Safe Harbours” reports, highlighting the Remedial Action Plan’s implementation, successes and setbacks. BARC works as a watchdog organization for Hamilton Harbour revitalization efforts and produces the reports as an objective appraisal of the status of various themes of remedial action. The report provides a different focus every year (e.g., in 2008 the focus was on beach closures) and is available to the public on-line (www.hamiltonharbour.ca). The program will be expanded in 2010 in six different languages.
- Adopt-a-Creek, presented in partnership with RBG, is an annual, one-day, two-part event hands-on program where community or corporate groups spend a day sampling a creek to assess its health. In the morning participants sample numerous parameters including temperature, pH, dissolved oxygen, macroinvertebrate diversity and phosphate levels. In the afternoon participants take part in a litter cleanup of the creek.
- Classroom Mini Marsh is a joint program between the BARC and RBG. Mini Marsh kits include instructions, different types of rooted marsh plants, a bowl, pea gravel and a snail.

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Just plant the shoots in the pea gravel, maintain the water level in the bowl and watch your Mini Marsh grow. At the end of the school year, the plants can be returned to the RBG Nature Centre for planting in Cootes Paradise marsh, connecting students with the restoration of this significant Hamilton Harbour ecosystem.

- ‘Don’t Feed the Birds’ is a BARC campaign to educate people on the health and environmental effects of feeding the geese and gulls along our waterfront.
- Each April, BARC, Sunoco and Earth Day Hamilton organize an Earth Day planting event in Hamilton. These successful days allow individuals to connect with and enhance the Hamilton Harbour ecosystem by planting native trees and shrubs. Earth Day tree planting and other activities began in 1997, and since then thousands of volunteers have enhanced the ecosystem by planting native trees and shrubs. The volunteers express tremendous satisfaction with their efforts to create improved habitat areas at Bayfront Park, the Waterfront Trail, Princess Point and Churchill Park.
- Marsh Volunteer Planting involves replanting many of the native species lost from the Hamilton Bay area over the years. Every year, groups of up to 15 volunteer planters wade through marshes and slog through mud to replace native shrubs, plants and trees in an effort to enhance and create new habitat areas.
- Stream of Dreams™ is BARC's newest educational program. It was created by the Stream of Dreams Murals Society in Burnaby, British Columbia when a chemical spill nearly destroyed a creek there. Stream of Dreams™ educates students and communities about Hamilton Harbour and its watershed, while dazzling them with the beauty of community art. It is a two-part workshop where students receive environmental education in one component and paint their own dream fish in the other component. All fish are hung together on a nearby fence as a large mural.
- Yellow Fish Road™ is a program that educates students and the public about the impacts of pollution entering urban storm drains. Yellow Fish Road™ volunteers paint yellow fish symbols beside storm drains and distribute fish-shaped brochures to nearby households. This program reminds people to properly use and safely dispose of hazardous household chemicals, rather than allowing them to enter curbside storm drains.

Ducks Unlimited Canada (DUC)

Partners: DU and local partners

Goals, Timelines, Activities: In March of 2010 the HHWSP will have completed delivering DUC's - Ontario Wetland Care Program to private landowners. The HHWSP looks forward to developing future partnerships with DUC to continue protecting and improving wetland habitat. According to Krete (pers. comm. (2009), DU has completed a conservation planning document for Southern Ontario that will guide implementation across the landscape. DUC is almost exclusively focused on waterfowl conservation and has undertaken numerous waterfowl studies. DUC has also assessed landowner attitudes and infrastructure, and has evaluated the landscape based on its potential for waterfowl production.

2. CONSERVATION VISION AND GOALS

Vision Statement

The Hamilton – Burlington area supports a full range of healthy terrestrial and aquatic habitats, including characteristic Carolinian deciduous forests, Niagara Escarpment ecosystems, dry oak woodlands, prairies and savannahs, successional thickets and fields and sand dunes, as well as coastal and inland wetland and aquatic ecosystems. Species at Risk thrive in a variety of secure habitats, which contribute to the overall connected matrix of natural cover. Natural heritage systems are restored in order to connect fragmented natural areas, and river and stream corridors. Stewardship and site management focuses on further conserving and enhancing the biodiversity values of the area. The local community takes pride in the natural beauty and health of the area, and members from all sectors and backgrounds participate in stewardship and conservation. Relationships between conservation partners are strong and reciprocal, allowing for maximum success in conservation efforts across the interconnected, ecologically functional landscape.

Goals

1. To maintain existing and establish new functional ecological linkages between core natural areas.
2. To complete securement of core natural areas.
3. To maintain and recover viable populations of Species at Risk and restore their habitats.
4. To improve water quality and aquatic habitats.
5. To manage invasive species populations so no net increase in their extent occurs.
6. To strategically increase natural cover through restoration to reconnect fragmented woodlands, wetlands and riparian corridors.
7. To direct incompatible development and land uses away from natural areas.
8. To enhance community support and understanding of the ecosystems of the Hamilton – Burlington area.
9. To encourage and support local policies that promote conservation.
10. To enhance information and monitoring of biodiversity values, natural processes and threats.
11. To support and enhance conservation partnerships across the Hamilton – Burlington region.

3. CONSERVATION OBJECTIVES, STRATEGIES, ACTIONS AND MEASURES OF SUCCESS

Table 3.2. lists the objectives were developed by the CAP team to address threats and enhance ecosystem recovery within the Hamilton – Burlington 7E-3 CAP area:

Objective	Conservation Target(s) Addressed
1. Increase natural cover of all conservation target types through restoration by [realistic quantifiable target based on 2010 RH analysis] by 2020, using existing eco-linkage and natural heritage system mapping, including utility and riparian corridors.	All
2. Establish functional ecological linkages between existing core natural areas (measured using appropriate GIS methods and tools) by 2020 through securement using existing eco-linkage and natural heritage system mapping (including utility and riparian corridors).	All
3. Reduce road mortality at important sites by [realistic XX%] based on baseline survey data, using methods supported by existing research.	All SAR fauna except fish.
4. Landowners within or adjacent to natural areas have received stewardship packages by 2013.	All
5. Adopt existing effective approaches to education and outreach with nurseries and garden centres regarding invasive and problematic species in 2010.	All
6. Ensure ongoing collaboration among CAP partners to implement identified strategies and actions.	All

Table 3.2. provides a summary of the priority conservation actions recommended by the CAP Team. These actions are linked to relevant biodiversity targets and impacts, objectives and associated actions. The actions are ranked based on their urgency:

- **Urgent:** Conservation actions that without implementation would clearly result in the reduction of viability of a biodiversity target or the increase in magnitude of a critical threat within the next 5-10 years. Also includes research information that is needed before key decisions can be made on the management of biodiversity targets.
- **Necessary:** Conservation actions that are needed to maintain or enhance the viability of biodiversity targets or reduce critical threats. Also research that will assist in decisions on management of biodiversity targets.
- **Beneficial:** Conservation actions that will assist in maintaining or enhancing viability of biodiversity targets and reducing threats.

Key to acronyms used in Table 3.2:

BTC = Bruce Trail Conservancy
CCC = Carolinian Canada Coalition
CEPS = Cootes to Escarpment Park System
CH = Conservation Halton
HCA = Hamilton Conservation Authority
HHWSP = Hamilton – Halton Watershed Stewardship Program
HNC = Hamilton Naturalists' Club

HSP = Habitat Stewardship Program (Environment Canada)
MTO = Ontario Ministry of Transportation
OMNR = Ontario Ministry of Natural Resources
OMNR SARS Fund = OMNR Species At Risk Stewardship Fund
RBG = Royal Botanical Gardens
RH = ReLeaf Hamilton

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Table 3.2. Summary of Conservation Objectives, Strategic Actions, Action Steps and Timelines

#	Objectives and Strategic Actions	Targets Addressed / Recovery Strategy links	Threats Addressed	Potential Leads (Collaborators)	Costs / Funding Sources
1. Objective	Increase natural cover of all conservation target types through restoration by [realistic quantifiable target based on 2010 RH analysis] by 2020, using existing eco-linkage and natural heritage system mapping, including utility and riparian corridors.	All	Residential and Commercial Development; Roads; Residential Encroachment on Buffer / Transition Zone		t.b.d.
1.1. Strategic Action	<i>Compile all relevant mapping and data sets to understand baseline and prioritize restoration sites and linkages by 2012.</i>	All	<i>As above</i>	<i>RH</i>	<i>t.b.d.</i>
1.1.1. Action Step	Prioritize public land and utility corridor sites for restoration and rehabilitation by 2011. (see detailed notes re: existing projects/programs)	As above	As above	HCA / CEPS	<i>t.b.d.</i>
1.1.2. Action Step	Prioritize private land sites for stewardship and restoration by 2012.	All	As above	HHWSP	<i>t.b.d.</i>
1.1.3. Action Step	Secure funding to undertake 1.1.	All	As above	RH	<i>t.b.d.</i>
1.2. Strategic Action	<i>Undertake restoration planting of 27 ha at Waterdown Woods on CH land and private land by 2011.</i>	2.	<i>As above</i>	<i>HHWSP/CH</i>	<i>Funding in place</i>
1.2.1. Action Step	Secure funding annually to negotiate and undertake additional priority restoration projects.	2.	As above	HHWSP / CEPS / RBG	Annual applications based on needs.
1.2.2.	Implement restoration at priority sites.	All	As above	HHWSP / CEPS / RBG & numerous additional local partners	As above

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#	Objectives and Strategic Actions	Targets Addressed / Recovery Strategy links	Threats Addressed	Potential Leads (Collaborators)	Costs / Funding Sources
1.3. Strategic Action	<i>Establish local seed bank for future restoration activities.</i>	6.	<i>Invasive Non-Native / Alien Species;</i>	<i>RBG / HCA / CH / private growers</i>	<i>Collecting in-kind; \$ for storage and propagation; planting in-kind</i>
2. Objective	Establish functional ecological linkages between existing core natural areas (measured using appropriate GIS methods and tools) by 2020 through securement using existing eco-linkage and natural heritage system mapping (including utility and riparian corridors).	All	Residential and Commercial Development; Roads; Residential Encroachment on Buffer / Transition Zone		<i>t.b.d.</i>
2.1. Strategic Action	<i>Compile data (see actions under Objective 1), create GIS mapping and publish a document that identifies all existing and relict prairie, savannah and dry oak woodland sites in study area by 2012 to support land securement plans.</i>	6.	<i>As above</i>	<i>Tallgrass Ontario / RH</i>	<i>t.b.d.</i>
2.1.1. Action Step	Apply for necessary funding through existing programs in 2010/11.	6.	<i>As above</i>	Tallgrass Ontario	<i>t.b.d.</i>
2.2. Strategic Action	<i>Develop and support land securement plans to be implemented by public agencies and land trusts by 2012.</i>⁵	All	<i>As above</i>	<i>City of Hamilton, CEPS, HNC, BTC, RBG, HCA, City of Burlington Region of Halton, CH)</i>	<i>Partners to secure funding</i>

⁵ - Securement strategies or drafts exist with City of Hamilton, HCA, HNC, BTC, planned for CEPS, and securement funding exists in Halton Region / CH (where there is basic mapping, but not a formal strategy).

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#	Objectives and Strategic Actions	Targets Addressed / Recovery Strategy links	Threats Addressed	Potential Leads (Collaborators)	Costs / Funding Sources
2.3. Strategic Action	<i>Secure 50% of the additional parklands/lands as identified by CEPS, the Dundas Valley 50 Year Vision, as well as other securement strategies of partners, by 2020 and the remainder by 2030; sufficient resources available through endowments to ensure long-term management and stewardship.</i>	<i>All</i>	<i>As above</i>	<i>CEPS / HCA</i>	<i>Costs t.b.d. / Federal, provincial and regional funding sources + endowment funds + land donations.</i>
2.3.1. Action Step	Dedicate consultants and/or staff to implement program(s) by 2012.	All	As above	CEPS / HCA	t.b.d.
2.3.2 Action Step	Implement active management measures.	All	As above	CEPS / HCA	t.b.d.
2.4. Strategic Action	<i>Incorporate SAR and habitat needs into master plans (management plans / stewardship plans) for protected areas as existing plans are updated, by 2015 as new plans are written, and as newly secured properties are acquired.</i>	<i>As above</i>	<i>Fire suppression; trails; invasive species; household and feral pets; persecution; harvesting and commercial collecting of plants/animals; encroachment; artificial light</i>	<i>OMNR SAR Program, Recovery Teams, HCA, CH, RBG, municipalities, naturalist club, BTC</i>	<i>In kind</i>
2.4.1. Action Step	Designate staff and/or hire consultants to write the master plans.	As above	As above	As above	t.b.d.
2.5. Strategic Action	<i>Develop management plans to address SAR recovery needs at priority sites south of Hamilton Harbour ("Urban Ecology Strategy").</i>	<i>3.</i>	<i>Fire suppression; trails; invasive species; household and feral pets; persecution; harvesting and commercial collecting of plants/animals; encroachment; artificial light</i>	<i>HCA, HNC, City of Hamilton, Environment Hamilton, CCC, Green Venture, consultants</i>	<i>t.b.d.</i>
2.5.1. Action step	Implement active management measures necessary to protect priority SAR and habitats according to recovery strategies, master plans and management plans (whichever is most current and site-specific).	All	As above	As above	t.b.d.

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#	Objectives and Strategic Actions	Targets Addressed / Recovery Strategy links	Threats Addressed	Potential Leads (Collaborators)	Costs / Funding Sources
3. Objective	Reduce road mortality at important sites by [realistic XX%] based on baseline survey data, using methods supported by existing research.	SAR fauna (except fish)	Roads		<i>t.b.d.</i>
3.1. Strategic action	<i>Complete inventory and mapping of road crossing and mortality hotspots for birds, mammals and herpetofauna by 2013.</i>	<i>SAR fauna (except fish)</i>	<i>Roads</i>	<i>CH, HCA, Ontario Road Ecology Group, Dundas Turtle Watch, RBG</i>	<i>Academia, Metro Zoo, Trillium?, Greenbelt?, CAA?, TD Canada Trust, MNR SARS Fund, HSP</i>
3.2. Strategic action	<i>Complete a decision-making, best management practices and technical specifications document relating to road development based on the best available research, technical information and case studies by 2012.</i>	<i>SAR fauna (except fish)</i>	<i>Roads</i>	<i>CH / HCA / Ontario Road Ecology Group, (RBG)</i>	<i>As above</i>
3.2.1. Action step	Apply for funding to hire contractor by 2011 to undertake strategic actions 3.1 and 3.2.	SAR fauna (except fish)	Roads	CH/ HCA/ Ontario Road Ecology Group,	As above
3.3. Strategic action	<i>Incorporate eco-passages into all new roads and road reconstruction projects, where ecologically appropriate.</i>	<i>SAR fauna (except fish)</i>	<i>Roads</i>	<i>Municipalities, CH, HCA, MTO</i>	
3.4. Strategic action	<i>Construct eco-passage over Highway 6 at the Niagara Escarpment in conjunction with future grade separation.</i>	<i>SAR fauna (except fish)</i>	<i>Roads</i>	<i>MTO, City of Hamilton, CEPS, CH</i>	<i>Highway interchange reconstruction</i>
3.5. Strategic action	<i>Construct eco-passage under Cootes Drive at Dundas by 2015.</i>	<i>SAR fauna (except fish)</i>	<i>Roads</i>	<i>City of Hamilton, CEPS</i>	<i>t.b.d.</i>
3.6. Strategic action	<i>Construct eco-passage(s) under Waterdown Road near upper hydro corridor during widening of the road.</i>	<i>SAR fauna (except fish)</i>	<i>Roads</i>	<i>City of Hamilton, City of Burlington, CH</i>	<i>Hamilton / Burlington</i>
3.6.1. Action step	During next official plan review incorporate policy to consider eco-passages as part of all road development plans.	SAR fauna (except fish)	Roads	HCA, CH, municipalities	In kind

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#	Objectives and Strategic Actions	Targets Addressed / Recovery Strategy links	Threats Addressed	Potential Leads (Collaborators)	Costs / Funding Sources
3.6.2. Action Step	Implement spring (phased to permanent) closure of King Road at Waterdown Woods by 2011 (to reduce breeding salamander mortality).	Jefferson Salamander	Roads	City of Burlington, CH	In kind
4. Objective	Landowners within or adjacent to natural areas have received stewardship packages by 2013.	1, 2, 3, 4, 5, 6	Perception / lack of awareness; household and feral pets; residential encroachment into buffers; persecution & collecting; artificial light; invasive species		<i>t.b.d.</i>
4.1.Strategic Action	<i>Develop and gather existing HCA/CH/RBG, landowner stewardship guides/documents that address key threats to habitats and species at risk.</i>	<i>All</i>	<i>As above</i>	<i>HCA/CH/RBG</i>	<i>t.b.d.</i>
4.1.1. Action Step	Undertake inventory of all stewardship documents relevant to CAP area SAR and habitats by June 2010 (and ongoing).	All	As above	OMNR, CCC	In kind
4.1.2. Action Step	Identify the products that can be reviewed and/or distributed immediately.	All	As above	OMNR, CCC	In kind
4.1.3. Action Step	Identify gaps in terms of species, geographic relevance and availability.	All	As above	OMNR, CCC	In kind
4.1.4. Action Step	Develop beneficial management practices document that addresses needs of target SAR (based on the above) by late 2011.	All	As above	HCA, CH, OMNR, CCC	HSP
4.1.4. Action Step	Distribute stewardship packages to priority landowners ⁶ in a coordinated way by 2012 (and ongoing).	All	As above	HHWSP, RBG	<i>t.b.d.</i>
4.1.5. Action Step	Hold X events and X workshops relating to SAR and habitat stewardship.	All	As above	HHWSP, CCC, HWSC, TGO, HPWWS	<i>t.b.d.</i>

⁶ - Content of packages will vary depending on whether SAR are present on private landowner property, or whether they live adjacent to natural area, etc.

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#	Objectives and Strategic Actions	Targets Addressed / Recovery Strategy links	Threats Addressed	Potential Leads (Collaborators)	Costs / Funding Sources
5. Objective	Adopt existing effective approaches to education and outreach with nurseries and garden centres regarding invasive and problematic species in 2010.	1, 2, 3, 4, 5, 6	Lack of Awareness; Invasive Non-Native / Alien Species		<i>t.b.d.</i>
5.1. Strategic Action	<i>Investigate which approaches (e.g., CVCA, TRCA, LEAF, SER Ontario) will be appropriate to implement in the CAP area.</i>	<i>All</i>	<i>As above</i>	<i>HHWSP, RBG, RH, Ontario Invasive Plant Council</i>	<i>t.b.d.</i>
5.1. Strategic Action	<i>Identify existing nurseries and garden centres in CAP area and its vicinity.</i>	<i>All</i>	<i>As above</i>	<i>HHWSP, RBG, RH, Ontario Invasive Plant Council</i>	<i>t.b.d.</i>
5.2. Action Step	Implement appropriate educational and outreach activities with nurseries and garden centres by 2011.	<i>All</i>	<i>As above</i>	<i>HHWSP, RBG, RH, Ontario Invasive Plant Council</i>	<i>t.b.d.</i>
6. Objective	Ensure ongoing collaboration among CAP partners to implement identified strategies and actions.	All	All	CCC / NCC + partners	<i>t.b.d.</i>
6.1 Strategic Action	<i>Hold annual meetings and workshops with all CAP teams, relevant recovery team representatives and other key conservation partners.</i>	<i>All</i>	<i>All</i>	<i>CCC + CAP partners</i>	<i>\$6K annually</i>
7. Objective	<i>[Realistic number of] ha of private lands owned by corporations within the CAP area have conservation or restoration programs in place by 2015.</i>	<i>All</i>	<i>All</i>	<i>CCC, OPG, Wildlife Habitat Canada, Wildlife Habitat Council, and other CAP partners</i>	<i>t.b.d.</i>
7.1 Strategic Action	<i>By 2011: Meet with Wildlife Habitat Council, Wildlife Habitat Canada and key corporate and conservation partners to develop strategies for engaging corporate partners in CAP implementation.</i>	<i>All</i>	<i>All</i>	<i>CCC, OPG, Wildlife Habitat Canada, Wildlife Habitat Council, Hamilton Industrial Environmental Organisation (HIEO), HHWSP, RH, and other CAP partners</i>	<i>t.b.d.</i>

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#	Objectives and Strategic Actions	Targets Addressed / Recovery Strategy links	Threats Addressed	Potential Leads (Collaborators)	Costs / Funding Sources
7.1.1. Action Step	<i>In 2010, prepare an assessment of: 1) existing corporate partners in conservation projects within the CAP area; 2) key corporate landowners based on extent, locations and ecological characteristics of their lands; 3) develop a prioritized list of potential corporate partners.</i>	<i>All</i>	<i>All</i>	<i>CCC, OPG, Wildlife Habitat Canada, Wildlife Habitat Council, HIEO, and other CAP and corporate partners</i>	<i>t.b.d.</i>
7.1.2.	<i>By 2012, begin implementation of appropriate conservation and recovery efforts on corporate lands.</i>	<i>All</i>	<i>All</i>	<i>As above</i>	<i>t.b.d.</i>

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APPENDICES

Appendix A

Glossary of Ontario Biodiversity and Conservation Terms

Area of Natural and Scientific Interest (ANSI): means areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education (Provincial Policy Statement 2005)

Biodiversity: Biological diversity - or biodiversity - is the term given to the variety of life on Earth and the natural patterns it forms. The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes and, increasingly, by the influence of humans. It forms the web of life of which we are an integral part and upon which we so fully depend (Convention on Biological Diversity).

Biodiversity Target: an element of biodiversity selected as a focus for conservation assessment, planning or action. Biodiversity targets most commonly include species, vegetation communities and ecological systems.

Committee on the Status of Endangered Wildlife in Canada (COEWIC): is a national committee of experts that assesses and designates which wild species are in danger of disappearing from Canada. COSEWIC assigns the following status to species:

Extinct (EXT)	A species that no longer exists
Extirpated (EXP)	A species no longer existing in the wild in Canada, but occurring elsewhere in the wild
Endangered (END)	A species facing imminent extirpation or extinction throughout its range
Threatened (THR)	A species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
Special Concern (SC)	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events, but does not include an extirpated, endangered or threatened species
Not At Risk (NAR)	A species that has been evaluated and found to be not at risk
Data Deficient (DD)	A species for which there is insufficient information to support a status designation

Committee on the Status of Species at Risk in Ontario (COSSARO): a provincial group of experts whose mandate is to evaluate and recommend a provincial status to candidate species and re-evaluate current species at risk for the Ontario Ministry of Natural Resources. COSSARO employs a uniform, scientifically-based, defensible approach to status evaluations. The committee evaluates species by considering factors such as population size, trends and distribution, habitat trends and known threats. Based on its evaluation, COSSARO recommends the appropriate provincial status category for each candidate species.

Conservation Lands: Lands that are managed or regulated for long-term conservation. The conservation lands identified in the Great Lakes Conservation Blueprint included regulated protected areas (e.g. Provincial Parks), policy areas (e.g. Provincially Significant Wetlands) and lands owned by conservation organizations.

Declining Species: exhibit significant, long-term declines in habitat and/or abundance, are subject to a high degree of threat, or may have unique habitat or behavioural requirements that expose them to a great risk.

Disjunct Species: have populations that are geographically isolated from each other by at least one ecoregion.

Ecodistrict: a subdivision of an ecoregion characterized by distinctive assemblages of relief, geology, landforms and soils, vegetation, water, fauna, and land use.

Ecological Functions: the natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions.

Ecological System: dynamic spatial assemblages of ecological communities characterized by both biotic and

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abiotic components that 1) occur together on the landscape; 2) are tied together by similar ecological processes (*e.g.*, fire, hydrology), underlying environmental features (*e.g.*, soils, geology) or environmental gradients (*e.g.*, elevation, hydrologically-related zones); and 3) form a robust, cohesive and distinguishable unit on the ground.

Element Occurrence (EO): an area of land and/or water in which a species or natural community is, or was, present. An EO should have practical conservation value for the element (species or vegetation community) as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. For species, the EO often corresponds with the local population, but when appropriate may be a portion of a population (*e.g.*, long-distance dispersers) or a group of nearby populations (*e.g.*, metapopulation). For vegetation communities, the EO may represent a stand or patch of a natural community or a cluster of stands or patches of a natural community. The Natural Heritage Information Centre is the central repository for Element Occurrence records.

Endemic: a species or ecological system that is restricted to a region, such as the Great Lakes ecoregion. Many endemic species and systems are generally considered more vulnerable to extinction due to their dependence on a single area for their survival.

Focal Species: have spatial, compositional, and functional requirements that may encompass those of other species in the region and may help address the functionality of ecological systems. Examples include keystone species, wide-ranging species, and cave-dwelling species.

Global Rank (GRANK): the overall status of a species or ecological community is regarded as its "global" status; this range-wide assessment of condition is referred to as its global conservation status rank. Global conservation status assessments are generally carried out by NatureServe scientists with input from relevant natural heritage member programs (such as the NHIC in Ontario) and experts on particular taxonomic groups, and are based on a combination of quantitative and qualitative information. The factors considered in assessing conservation status include the total number and condition of occurrences; population size; range extent and area of occupancy; short- and long-term trends in these previous factors; scope, severity, and immediacy of threats, number of protected and managed occurrences, intrinsic vulnerability and environmental specificity.

Rank	Definition
GX	Presumed Extinct (species): Not located despite intensive searches and virtually no likelihood of rediscovery. Eliminated (ecological communities): Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.
GH	Possibly Extinct (species): Missing; known from only historical occurrences but still some hope of rediscovery. Presumed Eliminated: Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut Forest.
G1	Critically Imperilled: At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperilled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	Secure: Common; widespread and abundant.

Variant Ranks

Rank	Definition
G#G#	Range Rank —A numeric range rank (<i>e.g.</i> , G2G3) is used to indicate the range of uncertainty in the status of a species or community. A G2G3 rank would indicate that there is a roughly equal chance of G2 or G3 and other ranks are much less likely. Ranges cannot skip more than one rank (<i>e.g.</i> , GU should be used rather than G1G4).
GU	Unrankable —Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Whenever possible, the most likely rank is assigned and a question mark qualifier may be added (<i>e.g.</i> , G2?) to express minor uncertainty, or a range rank (<i>e.g.</i> , G2G3) may be used to delineate the limits (range) of uncertainty.

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GNR	Unranked —Global rank not yet assessed.
GNA	Not Applicable —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

Rank Qualifiers

Rank	Definition
?	Inexact Numeric Rank —Denotes some uncertainty about the numeric rank (e.g. G3? - Believed most likely a G3, but some chance of either G2 or G4).
Q	Questionable taxonomy —Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority.
C	Captive or Cultivated Only —At present extant only in captivity or cultivation, or as a reintroduced population not yet established.

Intraspecific Taxon Conservation Status Ranks

Intraspecific taxa refer to subspecies, varieties and other designations below the level of the species. Intraspecific taxon status ranks (T-ranks) apply to plants and animal species only; these T-ranks do not apply to ecological communities.

Rank	Definition
T#	Intraspecific Taxon (trinomial)—The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperilled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an intraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status. At this time, the T rank is not used for ecological communities.

Limited Species: are nearly restricted to the Great Lakes ecoregion. These are species that are not "true" endemics because there may be populations outside the ecoregion. However, the core part of the species range is in the Great Lakes ecoregion.

Natural heritage system: means a system made up of natural heritage features and areas, linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state (Provincial Policy Statement).

Peripheral: species or ecological systems that are located closer to the outer boundaries of an ecoregion than to the centre and are not widespread throughout the ecoregion (e.g., where the Great Lakes ecoregion is the extreme edge of the species' range).

Protected Areas: natural area designation that is regulated under legislation such as the National Parks Act, Provincial Parks Act or the Public Lands Act. Protected areas identified in the Great Lakes Conservation Blueprint include National Parks, National Wildlife Areas, Migratory Bird Sanctuaries, Provincial Parks and Conservation Reserves.

Provincially Significant: in regard to wetlands, coastal wetlands and areas of natural and scientific interest, an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the Province, as amended from time to time (Provincial Policy Statement).

Species at Risk (SAR): species designated as Endangered, Threatened or Special Concern by either the Ontario Ministry of Natural Resources (OMNR) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Secondary Target: an element of biodiversity (species or vegetation community) that is of some conservation concern in the Ontario portion of the Great Lakes. Occurrences of secondary biodiversity targets were included in

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the Conservation Blueprint portfolio where their occurrence coincided with a primary target occurrence, a protected area or conservation land.

Sub-national (Provincial) Rank: provincial ranks are used by the Ontario Natural Heritage Information Centre to set conservation priorities for rare species and vegetation communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario. Comparison of global and provincial ranks, gives an indication of the status and rarity of an element in Ontario in relation to its overall conservation status, therefore providing insight into the urgency of conservation action for it in the province. The NHIC evaluates provincial ranks on a continuous basis and produces updated lists annually.

Subnational (S) and National (N) Conservation Status Ranks

Status	Definition
NX	Presumed Extirpated —Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SX	
NH	Possibly Extirpated (Historical) —Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
SH	
N1	Critically Imperilled —Critically imperilled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S1	
N2	Imperilled —Imperilled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S2	
N3	Vulnerable —Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S3	
N4	Apparently Secure —Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S4	
N5	Secure —Common, widespread, and abundant in the nation or state/province.
S5	
NNR	Unranked —Nation or state/province conservation status not yet assessed.
SNR	
NU	Unrankable —Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SU	
NNA	Not Applicable —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
SNA	
N#N#	Range Rank —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
S#S#	
Not Provided	Species is known to occur in this nation or state/province. Contact the relevant natural heritage program for assigned conservation status.

Threats Assessment: The threat ranking method assigns Severity, Scope, and Irreversibility directly to the sources of stress. The following two matrices show how Severity and Scope are combined to create a Threat Magnitude rank, which is then combined with the Irreversibility Rank to deliver an Overall Threat Rank.

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		Scope			
		4-Very High	3-High	2-Medium	1-Low
Severity	4-Very High	4-Very High	3-High	2-Medium	1-Low
	3-High	3-High	3-High	2-Medium	1-Low
	2-Medium	2-Medium	2-Medium	2-Medium	1-Low
	1-Low	1-Low	1-Low	1-Low	1-Low

The **Overall Threat Rank** is calculated by integrating **Threat Magnitude** and a third rating variable (in this case **Reversibility**):

		Irreversibility			
		4-Very High	3-High	2-Medium	1-Low
Magnitude	4-Very High	4-Very High	4-Very High	4-Very High	3-High
	3-High	4-Very High	3-High	3-High	2-Medium
	2-Medium	3-High	2-Medium	2-Medium	1-Low
	1-Low	2-Medium	1-Low	1-Low	1-Low

Viability: the status or health of a species population or vegetation community occurrence. Viability indicates the ability of the biodiversity target to withstand or recover from natural and anthropogenic disturbances and probability of persistence of long periods of time. The viability rank provides a measure on the quality of occurrence which can be useful in determining probability of conservation success (i.e. will the target likely persist) and restoration/management needs. The more viable a species or community is, the higher its EO rank and the higher its conservation value (see Table). Viability ranks are based solely on factors that reflect present quality. There are three viability rank factors, each reflecting what is currently known about a species or community:
Size + Condition + Landscape Context = Viability

Rank	Definition
A	Excellent estimated viability
B	Good estimated viability
C	Fair estimated viability
D	Poor estimated viability
E	Verified Extant (viability not assessed)
H	Historical
F	Failed to find
X	Extirpated

Wetlands: means lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic plants or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens.

Wide-ranging Species: are highly mobile species that require large tracts of habitat for their survival. These include top-level predators, migratory mammals, birds and insects. The design of fully functioning networks of conservation sites needs to take into account the habitat requirements of such species, including factors such as linkages, natural corridors, interior habitats and roadless areas.

Widespread: species or ecological systems occurring naturally throughout the Great Lakes ecoregion and considerably beyond the ecoregion.

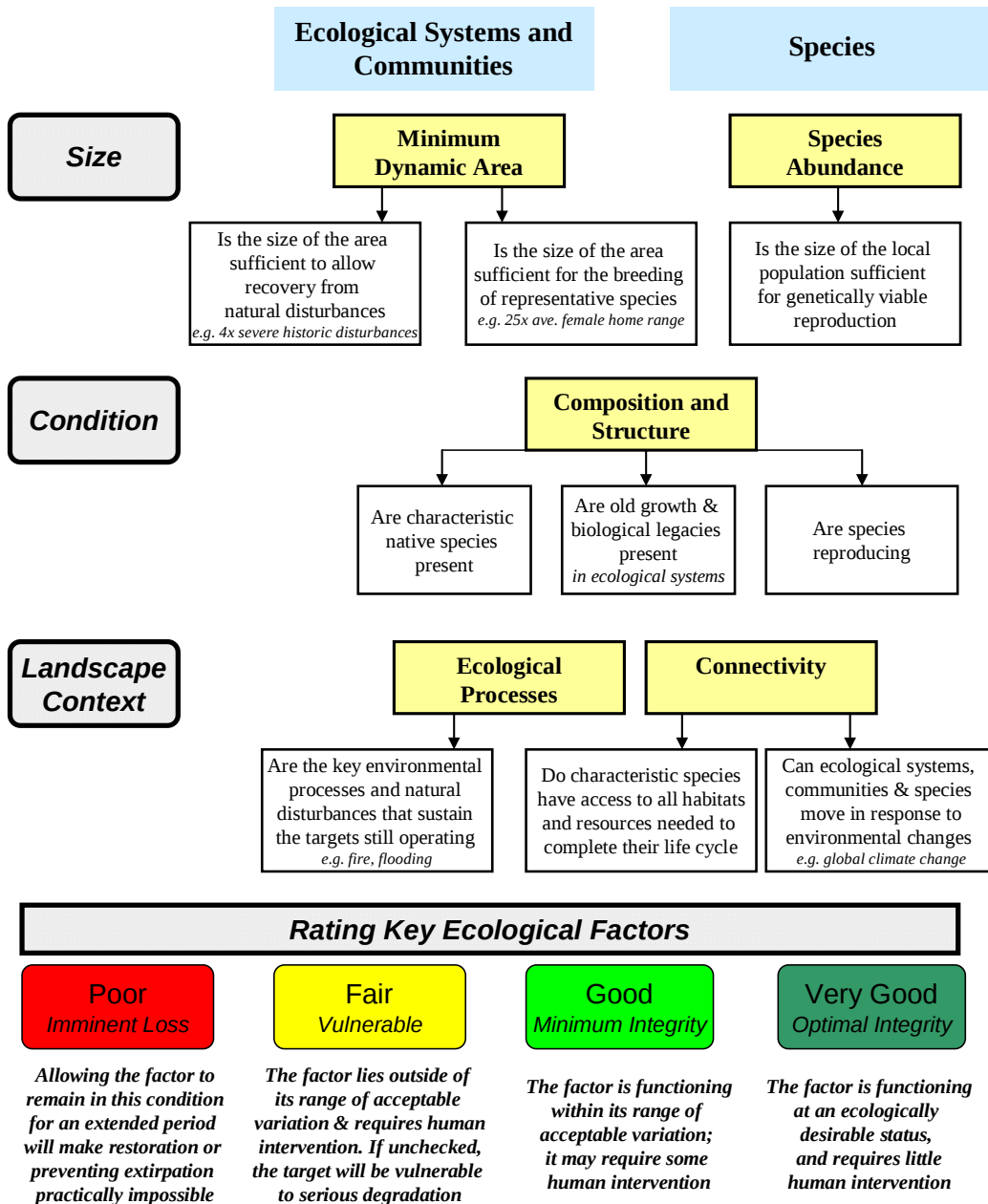
APPENDIX B.

CRITERIA USED TO EVALUATE CONSERVATION TARGET VIABILITY AND THREATS

[source: The Nature Conservancy, www.conservonline.org]

Viability Assessment Tool

Representative Key Ecological Attributes



Note: The ecological factors cited are common to many targets, but are not inclusive. Not all factors will apply to a given target.

Stress Ranking Guidelines

Severity of Damage -- *what level of damage can reasonably be expected within 10 years under current circumstances (given the continuation of the existing management/conservation situation)*

Very High	The stress is likely to <i>destroy or eliminate</i> the conservation target over some portion of the target's occurrence at the site
High	The stress is likely to <i>seriously degrade</i> the conservation target over some portion of the target's occurrence at the site
Medium	The stress is likely to <i>moderately degrade</i> the conservation target over some portion of the target's occurrence at the site
Low	The stress is likely to <i>only slightly impair</i> the conservation target over some portion of the target's occurrence at the site

Scope of Damage – *what is the geographic scope of impact on the conservation target at the site that can reasonably be expected within 10 years under current circumstances (given the continuation of the existing situation)*

Very High	The stress is likely to be <i>very widespread or pervasive in its scope</i> , and affect the conservation target <i>throughout the target's occurrences the site</i>
High	The stress is likely to be <i>widespread in its scope</i> , and affect the conservation target at <i>many of its locations</i> at the site
Medium	The stress is likely to be <i>localized in its scope</i> , and affect the conservation target at <i>some of the target's locations</i> at the site
Low	The stress is likely to be <i>very localized in its scope</i> , and affect the conservation target at a <i>limited portion of the target's location</i> at the site

Stress Ranking Chart

↓ Scope	----- Severity -----			
	Very High	High	Medium	Low
Very High	<i>Very High</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>
High	<i>High</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>
Medium	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>	<i>Low</i>
Low	<i>Low</i>	<i>Low</i>	<i>Low</i>	-

Source-of-Stress Ranking Guidelines

Contribution – Expected contribution of the source, acting alone, to the full expression of a stress (as determined in the stress assessment) under current circumstances (i.e., given the continuation of the existing management/conservation situation)

Very High	The source is a <i>very large</i> contributor of the particular stress
High	The source is a <i>large</i> contributor of the particular stress
Medium	The source is a <i>moderate</i> contributor of the particular stress
Low	The source is a <i>low</i> contributor of the particular stress

Irreversibility – Reversibility of the stress caused by the source of stress

Very High	The source produces a stress that is not reversible, for all intents and purposes (e.g. wetland converted to shopping center)
High	The source produces a stress that is reversible, but not practically affordable (e.g. wetland converted to agriculture)
Medium	The source produces a stress that is reversible with a reasonable commitment of additional resources (e.g. ditching and draining of wetland)
Low	The source produces a stress that is easily reversible at relatively low cost (e.g. ORVs trespassing in wetland)

Source Ranking Chart

↓ Irreversibility	----- Contribution -----			
	Very High	High	Medium	Low
Very High	<i>Very High</i>	<i>High</i>	<i>High</i>	<i>Medium</i>
High	<i>Very High</i>	<i>High</i>	<i>Medium</i>	<i>Medium</i>
Medium	<i>High</i>	<i>Medium</i>	<i>Medium</i>	<i>Low</i>
Low	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>Low</i>

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**APPENDIX C. RECOMMENDED ACTIVITIES IN AVAILABLE RECOVERY STRATEGIES (RS's)
FOR SELECTED SAR OF THE HAMILTON – BURLINGTON 7E-3 CAP AREA**

Priority of recommended strategies: H = High (urgent); M = Medium (necessary); L = Low (beneficial); X = no priority indicated in RS
Bolded strategies are addressed wholly or partly by this CAP.

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannas TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	Flvcatcher / Acadian	American Chestnut	Barn Owl	Butternut	Few-flowered Club-rush	Hoary Mountain	Hooded Warbler	Jefferson Salamander	Prothonotary Warbler	Red Mulberry	Redside Dace	Spiny Softshell	Common Houtree	Carolinian Woodlands	Tallgrass
Habitat	FW	FW	TE	FW	FW	PS	FW	FW	SW	FW	WA	WA	SD	FW	PS
Recovery Strategy Status (A=available / AP=part of available multi-species strategy / D = draft available)	A	A	A	A	A	A	A	A	A	A	A	AP	D	D	D
Habitat Threats / Viability Assessment			H		H			H		H		H		H	
Update NHIC & central databases				H											X
Inventory		H	H	H	L			H		M		H			X
Standardized habitat classification & mapping			H	M		H			H	H		H			
Identify priority sites & landowners			H						H					H	X
Minimum Viable Population Assessment				M	H					M					
Investigate recreational impacts													X	H	
Investigate role of fire						M							X		
Investigate shoreline modification impacts / coastal processes													X	H	
Investigate Invasive plant Impacts				L					H				X		
Locate & monitor disease-resistant plants		L		H											
Research mechanisms to control disease		H		M											
Investigate deer impacts													X	H	
Investigate invasive insect impacts									H					H	
Investigate impacts of alterations to drainage								M						H	
Investigate soil chemistry													X		
Gather TEK / ATK				M											
Demographic, genetic studies, dispersal, pop`n modeling				M	H	M		M		M		L			
Investigate impacts of contaminants									L						
Investigate climate change impacts									M						
Crayfish surveys												L			
Investigate conservation tillage, sustainable agriculture, soil restoration															X
Investigate wintering habitat trends									H						
Investigate reintroduction opportunities						L				M					

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Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	Tallgrass	Carolinian Woodlands	Common Hantree	Spiny Softshell	Redside Dace	Red Mulberry	Prothonotary Warbler	Jefferson Salamander	Hooded Warbler	Hoary Mountain	Few-flowered Club-rush	Butternut	Barn Owl	American Chestnut	Acadian Elvcatcher /
Investigate Best Management Techniques	X	H													
Investigate existing management at sites			X												
Ensure confidentiality of EO data							L								
Initiate Public Reporting Program			X									H			
Develop & Apply Monitoring protocol		H	X	H		M	H	H		H	H	H	H	H	
Monitor slumping impacts										M					
Develop & Distribute BMPs	X	M	X							H					
Input into Official Plans, etc.						H		H							
Develop appropriate EIS guidelines															
Identify key restoration sites						M	H	M							
Restore sites using appropriate techniques	X		X				H				L		H		
Restore historic sites			X												
Restore Habitat linkages					M										
Encourage cover crops															
Restrict livestock access															
Encourage low tillage															
Identify / demonstrate / promote sustainable grassland management													H		
Support habitat improvement projects								M					H		
Support development of EFPs													H		
Nest box program							H						L		
Expand / Enhance Forest Interior	X														
Identify / Increase Older Growth Forests	X														
Develop & Distribute Appropriate Forest / Woodlot Management Guidelines	X						H					H			
Reduce Forestry Impacts	X														
Develop Guidelines for Managing Succession in Conifer Plantations	X														
Develop & implement management plans							H	H			H				
Signage															
Reduce invasive species impacts			X				H	H		H					
Reduce trail / off-trail impacts							L								
Encourage natural shoreline processes			X												
Collect seed and propagate plants		M													
Introduce opposite gender plants			X												

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[illegible]

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