Ausable River – Kettle Point to Pinery Conservation Action Plan
Executive Summary

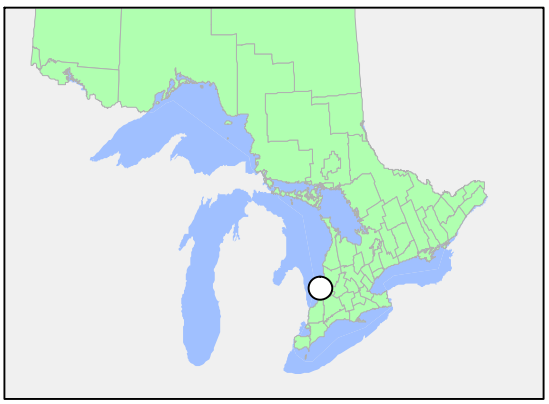
Vision Statement

The Ausable River – Kettle Point to Pinery natural area supports a variety of terrestrial and aquatic habitats, including characteristic Carolinian forests, pine – oak woodlands, dune ecosystems, prairies and savannahs, deciduous swamps, marshes, fens and other rich wetland communities. Species at Risk thrive in a variety of secure habitats, which contribute to the overall connected matrix of natural cover. Natural cover is restored, particularly in areas of the Huron Slope, in order to connect fragmented natural areas and river and stream corridors. Stewardship and site management focuses on further conserving and enhancing the biodiversity value of the area. The local community takes pride in the area and members from all sectors and heritage participate in stewardship and conservation. Relationships between conservation partners are strong and reciprocal, allowing for maximum success in conservation efforts across the interconnected, 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 ecological functions and values of the 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 Natural Area.

Conservation Context and Rationale



The Ausable River – Kettle Point to Pinery (ARKPP) Natural Area (NA) (Figure 1) covers approximately 60,000 ha (600 km^2) of land along the southeastern shore of Lake Huron between Kettle Point and Grand Bend, and extends inland to include the lower sections of the Ausable River and Parkhill Creek valleys, as well as several other subwatersheds. 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 ARKPP area within the past 30 years, with another dozen or so having occurred historically. The ARKPP NA has among the highest percentages of forest cover in Ecoregion 7E. Although portions of the shoreline are intensively developed with cottages, the ARKPP contains the largest forested area south of

the Bruce Peninsula on the eastern shore of Lake Huron. The globally rare dune ecosystem that extends across the breadth of the area just inland from the Lake Huron shore is one of the largest in the ecoregion, and provides the best example of dunes on the Ontario side of southern Lake Huron. The backdune areas support some of the best examples of Black Oak dominated tallgrass savannah in Ontario and North America. The Ausable River supports a diversity of fish and mussel SAR, and the valley slopes and tableland forests sustain a number of imperilled flora and fauna. Within the Natural Area (NA) are a number of Provincially Significant Wetlands and Areas of Natural and Scientific Interest and a large Provincial Park. One of the most ecologically significant areas within the NA is within the territory of the Chippewas of Kettle and Stony Point First Nation.

With the support of the Ontario Ministry of Natural Resources Species At Risk Stewardship Fund and Environtment Canada's Habitat Stewardship Program, this collaborative effort between the Carolinian Canada Coalition, Ausable Bayfield Conservation Authority, St. Clair Region Conservation Authority, Chippewas of Kettle and Stony Point First Nation, Ontario Parks, Rural Lambton Stewardship Network, Municipality of Lambton Shores, Lambton Wildlife Incorporated and the Lambton Federation of Agriculture, as well as other groups, will aim to achieve community outreach, landowner contacts, field research, and conservation and restoration successes over the long term.

The Old Ausable Channel, Pinery Provincial Park (Photo: K. Jean, ABCA, 2006)

Biodiversity Targets

1. Riparian Systems (including Old Ausable Channel) (RS)
2. Open Dunes and Sand Beaches (ODSB)
3. Dry Oak – Pine Woodlands (DOPW)
4. Prairies and Savannahs (PS)
5. Coastal Marshes (CM)
6. Meadow Marshes and Fens (MMF)
7. Swamps (SW)
8. Forests (FOR)
9. Heart-leaved Plantain / False Rue-anemone (HLP / FRA)

Impacts[1]

	Impacts – Huron Fringe	Overall Impact Rank
1	Air-Borne Pollutants	Very High
2	Invasive Non-Native/Alien Species	Very High
3	Tourism & Recreation Areas	Very High
4	Housing & Urban Areas	Very High
5	Problematic Native Species	High
6	Commercial & Industrial Areas	High
7	Recreational Activities	Medium
8	Roads & Railroads	Medium
9	Hunting & Collecting Terrestrial Animals	Medium
10	Logging & Wood Harvesting	Medium
11	Fishing & Harvesting Aquatic Resources	Medium
12	Other Ecosystem Modifications	Medium
13	Agricultural & Forestry Effluents	Medium
14	Renewable Energy	Medium
15	Introduced Genetic Material	Medium
16	Gathering Terrestrial Plants	Medium
17	Fire & Fire Suppression	Medium
18	Livestock Farming & Ranching	Medium
19	Utility & Service Lines	Medium
20	Mining & Quarrying	Medium
21	Industrial & Military Effluents	Medium
22	Dams & Water Management/Use	Low
23	Wood & Pulp Plantations	Low
24	Tile Drainage	Low
25	Annual & Perennial Non-Timber Crops	Low
26	Garbage & Solid Waste	Low
27	Household Sewage & Urban Waste Water	Low
28	Flight Paths	Low

	Impacts – Huron Slope	Overall Impact Rank
1	Air-Borne Pollutants	Very High
2	Invasive Non-Native/Alien Species	Very High
3	Housing & Urban Areas	High
4	Tourism & Recreation Areas	High
5	Commercial & Industrial Areas	Medium
6	Logging & Wood Harvesting	Medium
7	Other Ecosystem Modifications	Medium
8	Agricultural & Forestry Effluents	Medium
9	Roads & Railroads	Medium
10	Gathering Terrestrial Plants	Medium
11	Problematic Native Species	Medium
12	Livestock Farming & Ranching	Medium
13	Fire & Fire Suppression	Medium
14	Utility & Service Lines	Medium
15	Mining & Quarrying	Medium
16	Recreational Activities	Low
17	Hunting & Collecting Terrestrial Animals	Low
18	Fishing & Harvesting Aquatic Resources	Low
19	Industrial & Military Effluents	Low
20	Tile Drainage	Low
21	Annual & Perennial Non-Timber Crops	Low
22	Dams & Water Management/Use	Low
23	Garbage & Solid Waste	Low
24	Renewable Energy	Low
25	Household Sewage & Urban Waste Water	Low
26	Wood & Pulp Plantations	Low

[1] - Human activities with a potentially deleterious effect on biodiversity are often deemed "threats." The term "impacts" has been used in this plan to reflect the diversity of community interests in the landscape.

Conservation Objectives

Conservation Objectives	Targets Addressed
1. Create natural heritage plan for Lambton / Lambton Shores that is incorporated into next Official Plan.	All
2. Engage key rural landowners with (particularly terrestrial) SAR habitat in good stewardship practices.	All
3. Reduce invasive species impacts on sand dunes by 50% by 2020.	ODSB
4. Restore 50% of degraded sand dunes and beaches in the CAP shoreline by 2015.	ODSB
5. Reduce vehicle impacts on dune and beach ecosystems by 100% by 2020.	ODSB
6. No net increase in invasive species cover in logged woodlands over next five years.	DOPW, FOR
7. Provide 100% of private woodlot owners and registered forestry practitioners with information materials on SAR within two years.	DOPW, FOR
8. Fill knowledge gaps re: Heart-leaved Plantain.	HLP
9. Build capacity of stakeholders and 100% of landowners of seven priority terrestrial SAR occurrences to undertake appropriate management for SAR by 2012.	FOR, ODSB, DOPW, PS
10. Establish partnership initiatives 50% of landowners with existing Environmental Farm Plans to facilitate implementation of specific stewardship activities identified in Best Management Practices by 2015.	FOR, SW, RS, CW, HLP, FRA
11. Build relationships with Chippewas of Kettle and Stony Point First Nation (KSPFN) with regard to SAR protection, conservation and recovery.	ODSB, DOPW, FOR, SW, RS, CM, HLP
12. Implement prairie and savannah restoration at ecologically appropriate sites.	PS
13. Include seasonal concentration sites (e.g., hibernacula, gestation sites, staging areas) in Official Plans.	Nested reptile SAR within ODSB, MMF, CM, ODSB, DOPW, FOR, SW, RS
14. Significantly reduce recreational impacts on sand dunes at Pinery Provincial Park by 2015.	ODSB
15. Ensure that high potential invasive species do not colonize dune ecosystems.	ODSB

Conservation Actions

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed
URG F&S	1	Assist Municipality of Lambton Shores identify critical natural heritage sites for next O.P. (by April / May 2009)	1. Confirm timelines for O.P. (immediate) 2. Bring together conservation plans and initiatives that already exist or are in progress Recovery Strategies, Ausable Management Plans, etc. (immediate) 3. Identify priority natural heritage features (including SAR locations, ANSIs, PSW's) for CAP area (by April / May 2009). 4. Produce mapping that identifies and prioritizes natural heritage features in the CAP area within (by April / May 2009). 5. Identify significant woodlands based on provincial criteria and provide to Lambton Shores (by December 2010)	All
URG F & S	1	Assist Municipality of Lambton Shores identify critical natural heritage sites for next O.P. (by April / May 2009)	Provide standard criteria for identifying significant natural heritage features to Lambton Shores (by April / May 2009).	All
URG F & S	1	Develop criteria and terms of reference for Environmental Impact Assessments for next Lambton Shores O.P.	1. Provide standardized EIA criteria to Lambton Shores (April / May 2009) 2. Include recommendations for compact form, walkways, cycle lanes, public transport etc. into municipal and park plans in next Lambton Shores O.P. (April / May 2009). 3. Encourage "energy friendly" technology in new developments and renovations in next Lambton Shores O.P. (April / May 2009).	All
URG F & S	2	Secure permanent or long-term funding for Community Liaison position (by 2010).	1. Identify appropriate agencies, sponsors and fund-raising method(s), acquire funding and hire staff. 2. Identify, map and prioritize key properties for landowner stewardship education and outreach. 3. Work closely with landowners to protect and enhance SAR habitat and other important ecological functions.	All
URG F	3	Raise public awareness re: notification and reporting of invasive aliens.	1. Support LHCCC applications for funding to conduct invasive species control on dunes. 2. Undertake invasive species management on beaches and dunes.	All
URG F	4	Increase public awareness and engagement relating to good dune stewardship practices.	1. Develop beach and dune stewardship guides for 3 additional communities (Huron Woods, Southcott Pines, Beach O' Pines). [Public meeting for whole CAP area, with breakout committees for local communities.] 2. Identify target areas for improvement by 2011. 3. Implement Beach and Dunes Stewardship Guide.	ODSB
URG F	5	Mitigate vehicle impacts on dune and beach ecosystems by 100% by 2020.	1. Incorporate off-road vehicle by-law into Lambton Shores Official Plan. 2. Ensure appropriate regulations in Pinery management plans. 3. Ensure appropriate enforcement of by-laws and regulations.	ODSB

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed
URG F & S	6	Participate in forest management plans. Implement hygienic practices for logging equipment, machinery. Ensure logging is undertaken at appropriate seasons. Lobby, assist municipalities with by-law amendments. Educate foresters regarding invasive species and practices, prepare educational materials, hold workshops, etc.	1. Audit sites prior to, immediately after, and 3 years after, logging to establish baseline information on extent of invasive species cover (include in management plans). 2. Create buffers around existing invasive species patches to prevent their spread. 3. Restrict logging roads and skidder trails (ensure that skidder trails do not cross invasive species patches). 4. Set up demonstration plots to showcase good forest management practices. 5. Prepare SAR information packages and surveys for woodlot owners and forestry practitioners. 6. Mail information package and survey for stakeholder interest in protecting SAR. 7. Give presentation on SAR to woodlot owners at workshop.	F
URG F & S	8	Determine extent of canopy closure required for reproduction, survival, etc. Identify appropriate means to undertake study (literature search, academic research and/or consultant)	1. Develop project plan. 2. Acquire support and funding. 3. Undertake research and publish results.	HLP
URG F & S	9	Provide stakeholders, landowners and medicinal users with Best Management Practices (BMPs) document by April 2011.	1. Develop priority species list. 2. Conduct research for existing BMP materials and relevant information. 3. Write and publish BMPs. 4. Distribute BMPs to First Nation, stakeholders and landowners.	HLP, FRA + 5 SAR
NEC S	10	Engage agricultural community in Conservation Action Planning and implementation.	*Ongoing:* 1. Develop mail-outs and newspaper ads to advertise funding initiatives that already exist. 2. Find ways to provide financial incentives to small operators. 3. Involve local Federation of Agriculture members in the CAP implementation process. 4. Sponsor and/or organize an Environmental Farm Plan workshop. 5. Provide support to existing agricultural organizations. 6. Education – pick specific items to target for funding incentives (*e.g.,* other land uses).	All

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed
NEC S	11	Share knowledge relating to conservation and SAR with the KSPFN community. Assist KSPFN in acquiring funding for SAR and conservation projects.	1. Meet with KSPFN to determine appropriate strategies, actions and timelines (by January 2010).	All KSPFN SAR
NEC F & S	12	Raise public awareness regarding historic prairie and savannah ecosystems and fire management techniques.	1. Identify historic prairie and savannah sites and assess restoration potential. 2. Conduct prescribed burns at key degraded prairie sites.	PS
NEC F & S	13	Conduct research of existing knowledge and inventory to identify concentration sites.	1. Secure funding by April 2010. 2. Conduct research and inventory and produce report and mapping by January 2011. 3. Provide mapping to appropriate agencies (municipalities, CA's) by January 2011.	Faunal SAR
NEC F	14	Turn Pinery Parking lots 90 degrees to reduce trampling on dunes.	1. Meet with Ontario Parks staff to discuss feasibility and methods. 2. Identify leads, staffing and funding to undertake the actions NEC. 3. Implement changes.	ODSB
BEN F & S	15	Assess likelihood of potential invasions based on other Great Lakes dune systems.	1. Research means to prevent invasion.	ODSB

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Ausable River – Kettle Point to Pinery Conservation Action Plan (CAP)

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1. CONSERVATION CONTEXT AND RATIONALE

A. CONTEXT

This Conservation Action Plan (CAP) for the Ausable River – Kettle Point to Pinery area is intended to complement and enhance 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 Ausable River – Kettle Point to Pinery (ARKPP) Natural Area (NA) (Figure 1) covers approximately 60,000 ha (600 km^2) of land along the southeastern shore of Lake Huron between Kettle Point and Grand Bend, and extends inland to include the lower sections of the Ausable River and Parkhill Creek valleys, as well as several other subwatersheds. The Natural Area is part of Ontario's Ecological Site District (Ecodistrict) 7E-2 (see maps at end of this document). The boundary was initially interpolated from Carolinian Canada's hotspot analysis (Kraus *et al.* 2007), which determined that the boundary loosely followed quaternary watersheds. It was subsequently modified by the CAP team to follow municipal, road and property boundaries in order to address practicalities relating to stewardship and implementation (Figure 1).

Communities within the Huron Fringe portion of the ARKPP NA include Grand Bend, Port Franks, Ipperwash Beach, and the Chippewas of Kettle and Stony Point First Nation, Ravenswood, Lake Valley Grove, Cedar Point and Northville. Grand Bend (population 1,027) is a well-known recreation and resort community whose population during the summer grows to tens of thousands with cottagers and tourists. The Grand Bend beaches are a major attraction, offering swimming, sunbathing, recreational boating, biking, golf and sport fishing. [Wilson and Cheskey 2001] Lands in the Huron Slope portion of the NA are predominantly agricultural, with scattered small communities such as Parkhill, Sylvan, Thedford and Arkona.

ii. ECOLOGICAL CONTEXT

Carolinian Canada

The ARKPP NA is located at the northwest limit of Ecoregion 7E, colloquially known as the Carolinian life zone of Canada, which falls south of a line running between Grand Bend and Toronto. This life zone encompasses the northernmost edge of the deciduous forest region of eastern North America, and though smaller than other Canadian vegetation zones (1% of Canadian land area), it has greater numbers of species of flora and fauna than any other ecosystem in Canada (Norfolk Environmental Advisory Committee 2006). This zone is characterized by mainly deciduous-dominated forests including some conifer species [*e.g.*, Eastern Red-cedar (*Juniperus virginiana*), White Pine (*Pinus strobus*)], as well as many southern trees at their northern range limits such as Tuliptree (*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 can be found (Solymár *et al.* 2008).

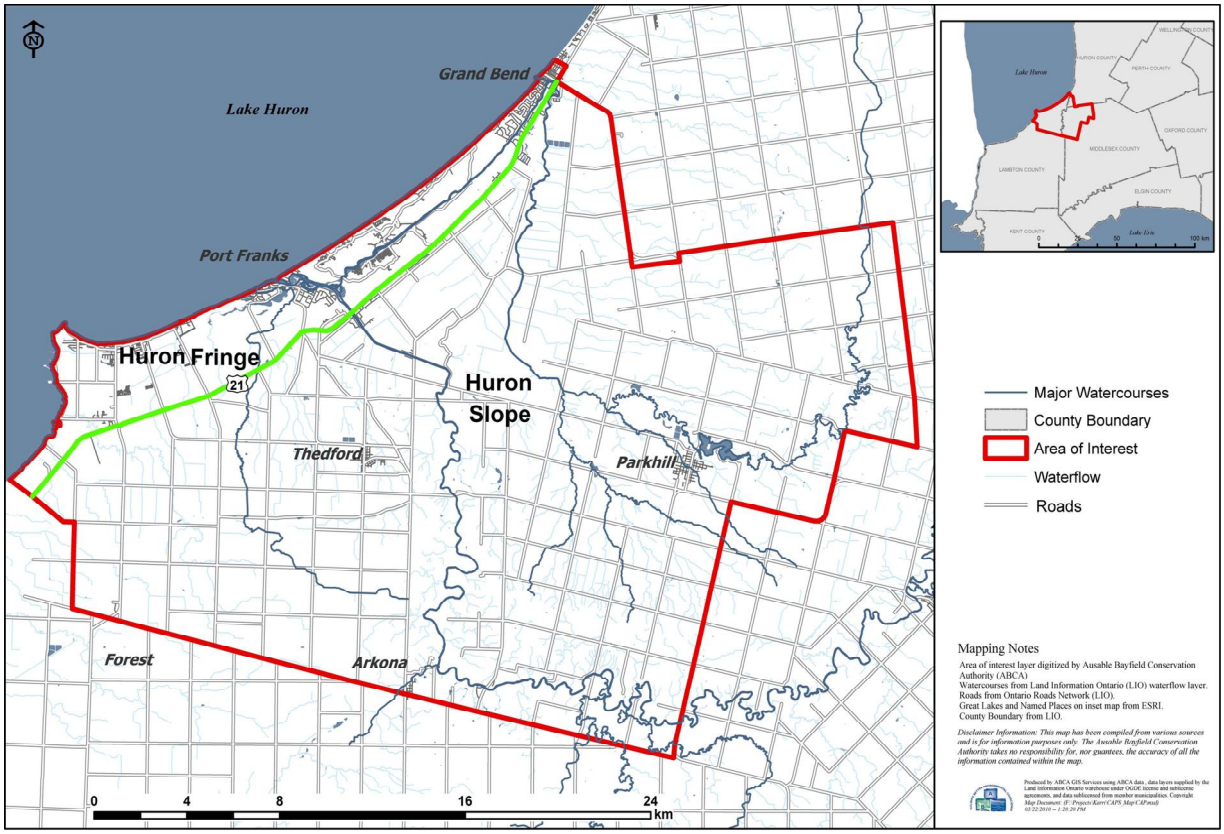

Figure 1. CAP boundary (in red) and division between Huron Fringe and Huron Slope (green)

Ecoregion 7E-2

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

Despite the widespread conversion of natural cover, Ecodistrict 7E-2 remains biologically diverse, with among the highest numbers of globally rare species and communities in Ontario. More than 60 COSEWIC Species At Risk (SAR) are found in the ecodistrict. Despite its high conservation importance, conservation lands make up only approximately 4% of the total area of the Ecodistrict 7E-2 (39,875 ha). Provincially significant life science ANSIs account for nearly half of this, with a total of 18,517 hectares (2% of the ecodistrict). Forty-three percent of all documented occurrences of species and vegetation

community targets in 7E-2 are within identified conservation lands; more than half of these are within provincially significant life science ANSIs. Six of the 27 significant vegetation communities identified within 7E-2 are globally rare (dunes, savannahs and tallgrass prairie), 14 are provincially rare, and 12 are considered to be high-quality representative vegetation communities that are important to conservation. [Henson and Brodribb 2005]

Lower Ausable River – Kettle Point to Pinery Natural Area

The ARKPP NA occurs at the northwestern extremity of Ecodistrict 7E-2. It is both unique and highly significant from a conservation perspective for several reasons. At least 34 COSEWIC Species At Risk (SAR) have been recorded in the ARKPP area within the past 30 years, with another dozen or so having occurred historically.

Huron Fringe

In contrast to the Huron Slope portion of the NA to the south and east, which have largely been converted to agriculture, the Huron Fringe has among the highest percentages of forest cover in Ecoregion 7E. Although portions of the shoreline are intensively developed with cottages, the ARKPP contains the largest forested area south of the Bruce Peninsula on the eastern shore of Lake Huron (Wilson and Cheskey 2001).

The globally rare dune ecosystem that extends across the breadth of the area just inland from the Lake Huron shore is one of the largest in the ecoregion, and provides the best example of dunes on the Ontario side of southern Lake Huron (Jalava 2006). The backdune areas support some of the best examples of Black Oak dominated tallgrass savannah in Ontario and North America. A high concentration of SAR and other rare taxa occur in the dune habitats, including the endangered Pitcher's Thistle (Jalava 2006).

The lower Ausable River and Old Ausable Channel sustain a high concentration of aquatic and wetland SAR. The 14 km long, 20-80m wide and 0.5-4.5m deep Old Ausable Channel is a disconnected portion of what was formerly the route of the Ausable River. It was cut off from the river through human intervention in the late 1800s and is now fed by groundwater, with a small amount of outflow at the south end. Its current state is quite pond-like, with still, clear water and dense aquatic vegetation (Killins 2008). However, the Old Ausable Channel does outlet into the Ausable River Cut. The majority of the Old Ausable Channel lies within Pinery Provincial Park, with its extreme northeastern section being in the village of Grand Bend.

Port Franks Forested Wetlands and Dunes is a provincially significant Life Science ANSI that includes the former Ipperwash Provincial Park and the former Camp Ipperwash military base, both of which have been returned to the Chippewas of Kettle and Stony Point First Nation, as well as the Lambton County Forest, Nature Conservancy of Canada properties, and extensive areas of private land in both developed and naturally-vegetated conditions. The area contains a rich assemblage of wetlands, including shallow ponds, marshes, wet meadows, shrub thickets, treed swamps and bog elements. In the southern portion, forested dunes occur, as well as an area of floodplain along Mud Creek, where Carolinian, prairie and northern flora occur. A rather broad and long lowland holding rich assemblage of wetland habitats lies south of the cottage area along the Lake Huron shoredunes, extending west to link with L, Moon and Bio Lakes. A succession of wooded dunes (dominated by oak and pine) separated by interdunal wetlands continues south almost to Hwy 21. Mud Creek traverses the low areas between these ridges, exiting into Lake Huron at Port Franks. [Lindsay 1984, NHIC 2008]

South of Ipperwash Beach, a series of low, linear sand ridges separated by wet depressions remains largely undeveloped. The ridges run parallel to Lake Huron. Red Pine, Eastern White Cedar, Red Cedar

and White Pine grow on the dry ridges creating dune parklands and woods. Mixed coniferous-deciduous forests, willow-dogwood swales and ponds with bog influences occupy the wetter sites. An area of high, wooded, dunes broken by the meandering course of Duffus Creek lies along the east edge of this 400 ha site. A concession road divides the area in two. [Lindsay 1984]

At the extreme southwest end of the area, the Shashawanda Creek – Lakeshore Marsh Complex consists primarily of a wooded-ravine system containing a permanently flowing creek over bedrock and cobble. The woods are upland mature hardwoods. Extensive areas of lowland forest occur closer to Lake Huron, presenting a fine example of remnant Great Lakes shoreline forest. Situated primarily within the Kettle Point First Nation, a high-quality provincially significant 90 ha coastal marsh extends from just north of Gustin Grove to the tip of Kettle Point, an important waterfowl migration stopover site. This complex is extremely diverse biologically as well as topographically, and includes the only Lake Huron coastal marsh in Ecoregion 7E. However, wetland drainage, selective cutting, and a network of roads and trails have affected the vegetation to some degree. [Lindsay 1984, Hoffman *et al.* 1979, NHIC 2008]

Huron Slope

Within the ARKPP NA, south and east of Highway 21 only small relict forests and wetlands remain. Some of these sustain significant flora and fauna. The most extensive natural area within the Huron Slope portion of the ARKPP NA is the Ausable River valley, with diverse riparian landforms in gently rolling moraine, supporting upland and valley slope deciduous forests, with valley basin and riparian lowland forests, thickets and meadow marshes (NHIC 2008). This extensive forested corridor follows the winding river valley for about 15 km, and is one of the largest river valley corridors left in a natural condition in Ecodistrict 7E-2. Its vegetation includes deciduous woods on valley slopes and adjacent tablelands (associations of Sugar Maple, White Ash, Beech, oak, Basswood, mixed with other species), hawthorn scrub and young successional woods (aspen, Black Walnut, ash), coniferous reforestation, floodplain forests of Black Maple - Black Walnut - oak - Basswood, ash - Silver Maple bottomlands, shrub thickets (dogwood - ninebark), marsh, tall riverbank meadows, and prairie associations (Lindsay 1984). The small prairie remnants are found along rim crests and valley slopes, with Big Bluestem, Indian Grass and sunflowers. Riparian prairie communities are also present, characterized by Big Bluestem, mosses, willows, Sneezeweed and Riddell's Goldenrod (Bakowsky 1993).

Other significant natural areas in the Huron Slope portion of the ARKPP NA include the Thedford Bog, a relatively large marsh and bog community. The McGill 4 wetland is a provincially significant wetland with four vegetation types. The McGillivray Township Lowland Forest is one of the last large forests left on the clay and muck plain that was once occupied by Thedford Marsh. Several other higher quality swamp forests and upland woodlots also occur in the area, such as the Parkhill Woods (including the Wright Tract of the Ausable Bayfield Conservation Authority), West Parkhill Woods, MacGillivray Township Lowland Forest, Sylvan Creek Woods, South of Greenway Woodlot, Parkhill Conservation Area and the South Moray Woodlot. [NHIC 2008]

Climate

The area is situated within the southernmost portion of the Lake Huron - Georgian Bay Climatic Region of southern 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 temperature of this region is 8° C, with summer and winter means of 19° and -5° C, respectively. There are 205 growing season days, and 3400 growing degree days.

The annual precipitation averages 856 mm, which is the heaviest of any area in southern Ontario. However, southwestern Ontario is also the most prone to dry periods, and in this area, there is an annual average of 20 days of drought (Brown *et al.* 1980). [Sutherland *et al.* 1994]

Physiography and Glacial History

The ARKPP NA occurs within the Huron Fringe and Huron Slope physiographic regions of southern Ontario. The Huron Fringe consists of a narrow strip of land along Lake Huron from the central Bruce Peninsula south to Sarnia. It is comprised of wave-cut terraces of glacial Lake Algonquin, which in this area are poorly defined, since they are mostly covered by a belt of sand dunes <= 2.5 km in width along the beach, and flat clay plains further inland (Chapman and Putnam 1984).

The ARKPP area is underlain by Paleozoic grey shale and limestone of the Middle Devonian Hamilton Formation (Hamilton & Dundee Group). The Kettle Point area contains the best exposure in the region for the Late Devonian, Kettle Point Formation shale (NHIC 2008). This bedrock is approximately 1200 m in depth, and thickens toward the southwest. The bedrock itself slopes gently downward from northeast to southwest. The uppermost unit of the Hamilton Formation consists of the Ipperwash Member, a 28.7 m thick band of grey limestone which outcrops at Stony Point, the Ipperwash Provincial Park area adjacent to the former military base. Limestone concretions (kettles) are characteristic of this formation and are varied in morphology and abundance at this site (NHIC 2008).

This underlying rock formed the wave-cut terraces of glacial lakes Algonquin and Nipissing which covered the area thousands of years ago. The shorelines of these glacial lakes are virtually indistinguishable today, except for a large ridge of material between Thedford and Grand Bend. This ridge of material is responsible for the formation of the dunes between Kettle Point and Grand Bend after the retreat of the post-glacial Lake Nipissing. The youngest dunes, which have formed closest to the lake, are unstable and subject to shifting sands and blowouts, and are formed as prevailing winds blow coarse sand inland (Jalava 2006). This process has resulted in some of the tallest dunes in southern Ontario, some of them being over 25 m tall (Wilson and Cheskey 2001). Walking the 3 km distance from the shoreline to the oldest dunes near Lakeshore Boulevard is equivalent to walking through 6,000 years of sand dune succession, from sand beach to oak backdune forest (Wilson and Cheskey 2001). As long as natural processes, such as long shore water currents in Lake Huron and the availability of wind-borne sand, are permitted to supply the sands necessary for dune formation, Pinery-Port Franks-Ipperwash dune complex will continue to develop and evolve.

Elsewhere in the ARKPP, the bedrock is overlain by Pleistocene deposits of St. Joseph Till, which consists of a grey to yellowish brown clayey silt till. It has a moderate number of grits, and few pebbles. This till is approximately 30 m deep in the Ipperwash - Pinery area (Fisher *et al*. 1987, cited in NHIC 2008). The sands along near-shore areas are of aeolian origin, and are known as Plainfield sand (Mathews *et al.* 1957, cited in NHIC 2008). These soils develop on dune or hummocky landscapes, and also on upper and crest slope positions in gently undulating landscapes. Due to the low levels of organic matter and fine soil particles, they are rapidly drained, and susceptible to wind erosion. The upper A-horizons range from strongly acid to neutral (Schut 1992, cited in NHIC 2008). At Pinery Provincial Park, Plainfield sands have A-horizons which are alkaline in the wet meadows, open dunes and swamps, changing to slightly acid in the oak - pine woodlands and mixed forests, likely as a consequence of acid input from oak and pine leaf litter. The underlying B-horizon soils are generally alkaline to neutral in all communities (Bakowsky 1990, cited in NHIC 2008).

Inland from the Lake Huron shore, bordering Highway 21, soils consist of Brookston clay (Mathews *et al.* 1957, cited in NHIC 2008). These are developed on silty clay and clay parent materials on poorly drained sites. The A-horizon is slightly acid in soil reaction, while the B-horizon is slightly alkaline. Brookston

clay has a relatively high amount of organic matter in the A-horizon, which overlies a B-horizon composed largely of strongly mottled clay, which in turn overlies a gleyed C-horizon (Mathews *et al.* 1957, cited in NHIC 2008). In developed or disturbed areas of the former Ipperwash military base, however, these profiles may differ due to the many engineered drains which have altered portions of the surface hydrology.

South and east of Highway 21 is an extensive area of clay plain and ancient peat deposits at the southern end of the Huron Slope physiographic region (Chapman and Putnam 1984). The Huron Slope is a large clay plain modified by a strip of sand, and by the twin beaches of glacial Lake Warren which flank the moraine. Within this area, the Thedford Marsh area was a shallow bay of both post-glacial Lakes Algonquin and Nipissing; extensive marl was deposited in this area, evidenced by peat beds found there today (Chapman and Putnam 1984).

According to Brownell (1984), the regional soil type is mainly grey-brown podsolic, formed from limey soil materials in hardwood forests. Clay loam predominates, however large areas with sandy soils are found mainly in the northern sections of the valley. Fox sandy loams are present in the ridges of the relict shorelines of glacial Lake Warren. Sand deposits around Sylvan are a former delta where the Ausable River historically drained into Lake Warren (Chapman and Putman 1984). Good drainage on steeper slopes results in dry-mesic conditions on both clay and sand substrates. Floodplain along the Ausable River conditions are highly variable. With high water levels in spring, the river overflows its banks, exposing the clay and removing much of the organic material. Forested clay levees result, as do riparian thickets. Organic muck soils occur where levees impede drainage and in seepage areas on valley slopes. (ABCA 2009)

Biodiversity

The Lower Ausable River – Kettle Point to Pinery Natural Area is situated in an area of relatively mild climate moderated by prevailing winds off Lake Huron. Its location at the northern edge of the Carolinian life zone and the unique combination of forests, savannahs, open dune systems and wetlands provides for an exceptional diversity of plants and animals, many of them with dune, prairie, southern and northern affinities.

Fire-adapted prairie and savannah vegetation occupy drier upland sites. Oaks are the predominant deciduous trees in the savannah and upland forests. A late successional stage on some sites is open pine-oak forest. However, many of the pine were planted as a management strategy beginning in the late 1950s. Interspersed between the dunes are low-lying areas that support a rich variety of wetland communities, including meadow marshes, ponds, small lakes, creeks, bogs, fens, shrub thickets and treed swamps. These ecosystems provide habitat for at least 800 species of vascular plants, 124 species of breeding birds, 32 species of mammals and 28 species of amphibians and reptiles, and a high diversity of fish taxa. A significant proportion of these species are considered nationally, provincially or regionally rare or endangered. (Wilson and Cheskey 2001)

Natural Areas

The ARKPP area consists of a combination of relatively intact and extensive natural areas near the Lake Huron shore from Kettle Point to Pinery Provincial Park, and much more fragmented small patches of forest and wetland in inland areas to the south and east of Highway 21. The natural areas include patches of sand beach, open dunes, dune savannahs, deciduous, mixed and coniferous forests and woodlands, treed swamps, thicket swamps, fens, bogs, coastal marshes and riparian meadows and open aquatic communities. There are several types of Natural Heritage designations that apply to these natural areas,

as summarized in Table 1.1. For a more complete list of the Natural Heritage sites in the NA, please see Appendix B.

Table 1.1: Natural Heritage Designations – Ausable River – Kettle Point to Pinery

Designation	IUCN Protected Area Management Category	Hectares	% of Natural Area (19,154 ha total)	Source
Nature Conservancy of Canada Projects[2]	Ia	99.0 (244.5)	0.5%	NCC
Provincial Park - Nature Reserve Zone	Ia	371.5 (917.6)	2.0%	NHIC 2008
Wilderness Area	Ib	172.7 (426.6)	0.9%	NHIC 2008
Conservation Authority Area	II	1,467.2 (3,624.0)	0.02%	NHIC 2008
Provincial Park – Natural Environment	II	2,532.2 (6,254.5)	13.2%	NHIC 2008
Provincial Park - Recreation	II	55.8 (137.8)	0.3%	NHIC 2008
First Nations Reserve	V	400.0 (988.0)	2.1%	NHIC 2008
Area of Natural and Scientific Interest (Earth Science)	VI	1.0 (2.5)	0.005%	NHIC 2008
Area of Natural and Scientific Interest (Life Science)	VI	4,174.4 (10,310.7)	14.4%	NHIC 2008
Provincially Significant Wetland	VI	526.6 (1,300.6)	0.7%	NHIC 2008
Carolinian Canada Site	None	638.1 (1,576.1)	3.3%	NHIC 2008
Important Bird Areas	None	7,200.0 (17,784.0)	37.6%	IBA Canada 2004
International Biological Program Site	None	496.1 (1,225.4)	2.6%	NHIC 2008

[1] IUCN Categories: Ia. Nature Reserve or wilderness area nature reserve*; Ib. Wilderness area*; II. National/provincial park*; III. Natural monument; IV. Habitat/species management areas, V. Protected landscape or seascape, VI. Managed resource protected areas; * Strictly regulated protected areas. Some areas may have more than one IUCN category because of internal zoning.
2: Two properties remain in NCC ownership (Van Valkenburg and Watson) while third property is now owned/managed by our partner (Maylard)

iii. NATURAL COVER / ECOSYSTEM TYPES

Huron Fringe

The natural cover from Pinery Provincial Park (PP) to Kettle Point is composed of six ecologically similar and contiguous areas extending along Lake Huron shoreline from Pinery PP in the northeast, to marshes south of Kettle Point in the southwest. A series of sand ridges run parallel to Lake Huron, with forested and open dunes, river floodplain, interdunal wet meadows, dune prairie and dune savannah present. The microclimate created by sandy soils, high dune ridges and the proximity to Lake Huron favours plant communities characteristic to Great Lakes shores, including many with prairie affinities. Within the dune complex, vegetation is sparse on the sand beach, foredune and first dune ridge, covering less than 33% of the overall surface area. Inland, between the first two dunes, interdunal wet meadow communities occur, with the best remnant examples located in Burley campground at Pinery PP. Open to semi-closed oak forests, mixed forests, red cedar dune savannah, dry oak savannah and floodplain forest are each well represented in this area. [from NHIC 2008, original source not indicated]

To the southwest of Pinery PP, on the southwest side of Ausable River Cut, is the Port Franks Wetlands and Forested Dunes complex, which is composed of two distinct physiographic sections. Nearest to Lake Huron is a coastal dune ridge and swale sequence featuring dunes as well as assemblages of various wetland types; these include bulrush marsh merging to cattail marsh, wet meadow, thicket swamps and treed swamp along a shallow, linear shaped pond and small stream. This complex extends west into the

former Ipperwash military site and links with L, Moon and Bio Lakes. Inland from Lake Huron is a forested dune complex that includes the floodplain along Mud Creek. The former Ipperwash Military Reserve, now part of Kettle and Stony Point First Nation, supports a relatively undisturbed spectrum of sand dune and sand plain habitats ranging from open shore dunes to large expanses of forested low dune ridges and wet swales inland. Deciduous woods with vernal streams are found in low-lying areas, providing habitat for the endangered Heart-leaved Plantain and other SAR. The community of Port Franks is at one end of an interdunal wet meadow that extends 2.5 km west through the former Military Reserve, almost to the former Ipperwash Provincial Park (PP) site. At Ipperwash, three small interdunal meadows, surrounded by dune ridges are found. [from NHIC 2008, original source not indicated]

Within this large and diverse area is the Lambton County Heritage Forest, which includes the floodplain of Mud Creek (with the nationally and provincially rare Swamp White Oak). An upland complex composed of an oak-pine forest runs parallel to Lake Huron, within which an open-canopy area along the dune ridge supports Wild Lupine (important to the now-extirpated Karner Blue Butterfly), and the nationally and provincially rare Prairie Junegrass (*Koeleria macrantha*) and Needle-and-thread Grass (*Stipa comata*). A more disturbed upland interdunal complex within the County Forest sustains oak-pine forests, evergreen-deciduous forests, interdunal meadow, as well as oak savannah and pine barrens. [Craig 2008]

Limestone bedrock shoreline occurs at Stony Point, and is flanked by sand beach. Representative examples of ash - oak swamp forests with high concentrations of Tulip-tree are found inland from here. Further west, the Ipperwash Dunes and Woodlot Complex supports a series of largely undeveloped, low, linear sand ridges, separated by wet depressions. As elsewhere along the strip west of Highway 21, the vegetation in this area consists of dune savannahs and open woodlands on dry ridges, and undulating sandy mixed forests, swales and ponds, with bog influences on wetter sites. Artificial and natural streams and ponds, both temporary and permanent occur here. Small interdunal wet meadows persist as remnants in a once larger swale that was infilled for beach day-use parking lots when the area was a provincial park. [from NHIC 2008, original source not indicated]

Most of shoreline in the Kettle Point area has been developed with cottages. Naturally-vegetated patches include shoreline and inland marsh, pond and large exent of lowland forests on a flat to undulating sand plain. Shoreline shale outcrop with Kettle concretions major feature of the west shore as well as one of few eastern Lake Huron lakeshore marshes that extends south to Gustin Grove. [from NHIC 2008, original source not indicated]

Huron Slope

The Huron Slope portion of the CAP area supports deciduous forests of Sugar Maple and Beech, with Red Maple, Red Oak, White Oak, Bur Oak, Basswood and hickories as frequent associates on upland sites. Black Walnut is a major component of the Ausable River Valley floodplain forests, along with Green Ash, White Elm and Black Maple. On slopes and table lands Black Walnut is less common. Other Carolinian tree species found scattered throughout the area include Sycamore, Swamp White Oak, Chinquapin Oak, Shagbark Hickory, Hackberry, Tulip-tree, Sassafras and Eastern Flowering Dogwood. Conifers, such as Eastern Hemlock, White Cedar and White Pine are uncommon but occur naturally on steep slopes with a northerly aspect. White Cedar and Tamarack are occasional associates in treed swamps. Along the riverbanks, islands and eroded valley slopes of the Ausable River open prairie and wet meadow communities occur. (ABCA 2009)

Table 1.2: Ecological Systems – Lower Ausable River – Kettle Point to Pinery Natural Area
(Globally Rare ecotypes are **bolded)**

Global Habitat Type[1]	North American Ecological System[2]	Some Example(s) from Natural Area
Forest – Temperate	North-Central Interior Beech-Maple Forest North-Central Interior Wet Flatwoods	Dry - Fresh White Pine - Oak Mixed Forest Type **Dry Black Oak – White Oak Tallgrass Woodland Type (G? S1)** Moist - Fresh Hemlock - Sugar Maple Mixed Forest Type Red Oak Forest Type Mixed Oak - Pine Forest Type Red Oak - White Oak Forest Type White Oak Forest Type Black Oak Forest Type Floodplain Forest Hemlock Coniferous Forest Type Cedar - Tamarack Coniferous Forest Type Cedar Oak Mixed Forest Type Lowland deciduous Forest Type Red Pine Mixed Forest Type
Savannah – Dry	North-Central Oak Barrens	**Dry Black Oak – Pine Tallgrass Savannah Type (G? S1)**
Rivers, Streams, Creeks – Permanent	None, hydrological feature	
Riparian Areas	None, associated with hydrological features	
Wetlands – Shrub dominated	North-Central Interior Wet Meadow-Shrub Swamp	
Wetlands – Bogs, Marshes, Swamps, Fens, Peatlands	North-Central Interior Freshwater Marsh Great Lakes Wet-Mesic Lakeplain Prairie North-Central Interior and Appalachian Rich Swamp	White Cedar - Tamarack Coniferous Organic Swamp Type Red / Green Ash Mineral Deciduous Swamp Type Silver / Red Maple Mineral Deciduous Swamp Type **Graminoid Coastal Meadow Marsh Type (G2? S2S4)**
Wetlands – Permanent Freshwater Marshes/Pools	None	**Common Reed Grass Organic Shallow Marsh Type (G3G4)**
Sand dunes	American Beachgrass Herbaceous Alliance	**Little Bluestem - Long-leaved Reed Grass – Great Lakes Wheat Grass dune grassland (G? S2)**
Littoral – Sandy Shorelines and/or Beaches	None	

1: General habitat types based on NCC categores
2: Ecological systems from NatureServe (NatureServe 2008), crosswalked with NCC categories

* Ontario Name from NHIC (2008)
** Global Common Name from NatureServe 2008
*** Global Rank from NatureServe 2008

iv. DOMINANT ENVIRONMENTAL PROCESSES

Much of the ARKPP NA was historically dominated by eastern deciduous forests, particularly forests on clay plain south and east of Highway 21. These forests once formed the dominant matrix community throughout southern Ontario, were relatively stable, and supported wide-ranging species (Davis 1996,

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

Minimum Dynamic Area

Minimum dynamic area (MDA) is often used to determine the minimum area needed to maintain natural ecological processes and to ensure that examples of all successional stages will exist within a given habitat type under all disturbance regimes (e.g. wind, fire, insects) (Pickett and Thompson 1978). Most forests in southern Ontario experienced average disturbances of less than 2 hectares (4 acres), and early successional stages were limited to gaps created in the canopy by windstorms, downbursts and ice-storms (Riley and Mohr 1994, Larson *et al.* 1999). It has been estimated that protected landscapes must be 50 to 100 times larger than average disturbance patches in order to maintain a relative equilibrium of habitats (Shugart and West 1981). In such landscapes, the proportions of different successional stages (e.g. young forest, old growth forest) would be relatively constant over time, even though the sites occupied by different stand types would change. On this basis, minimum recommended area for core forests in southern Ontario would be between 100 and 200 hectares (~250 and 500 acres). Given projections for larger, more frequent storms due to climate change, a conservative strategy would recommend cores of at least 200 hectares (~500 acres) in size. No forest patches in the ARCPP NA south and east of Highway 21 (Lakeshore Road) comes close to meeting this minimum requirement, at just under 200 ha. Otherwise the large patches tend to be under 100 ha, and they are not frequent throughout the NA. Restoration of fragmented areas and creation of connected networks and corridors could increase the MDA of the forests in the NA, and these objectives will be discussed further in this document.

On the other hand, most patches of forested dunes north and west of Highway 21 are considerably larger than 200 ha. However, much of this drier oak – pine dominated forest would naturally experience larger disturbance events due to wildfire, and would have a substantially larger MDA (see below) [data pending on MDA for these ecosystems].

Fire

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

Savannahs exist as a delicate balance between scattered woody species and grassland species, and grow specifically in areas wet enough to support trees but dry enough to be subject to fire. They rely on frequent fire events to prevent forested oak woodland cover from becoming dominant.

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 the oak – pine savannahs and open woodlands on the dune systems in the Port Franks – Pinery area.

Wind, Long-shore Currents, Erosion and Lake Huron Lake Levels

The creation of the modern Great Lakes began during the retreat of the most recent glaciers, 14,000 to 10,000 years ago. Lake Huron coastal dunes largely formed during the past 5,000 years at the heads of small coves, as well as large arching bays, or on the tops of low forelands, baymouth bars and tombolo bars (Davidson 1990). Dune systems are inherently dynamic. Sand dunes build, shift their positions and break down as a result of wind, water currents and cyclically changing lake-levels. Sand is carried by long-shore water currents and deposited on-shore, where it is carried by wind to higher ground, usually behind existing beach ridges or other natural windbreaks. Many of Ontario's coastal dune systems consist of a single or a few beach ridges that are relatively low in height. But some are complex and extensive, having developed at the heads of large shallow bays on top of barriers and plains abandoned by the postglacial Nipissing Lake stage near modern Lake Huron (Davidson 1990). These systems include an active transverse foredune and one or more higher secondary dune ridges separated by low interdune areas. Such dunes may reach heights of 30m. High water levels may cause foredunes to erode, and violent windstorms can cause blowouts. Vegetation naturally stabilizes dunes with pioneering graminoids, followed by shrub species and ultimately by trees. [Jalava *et al.* 2003]

Natural disturbance is characteristic of dune systems and important for a host of endemic species. However, the intensity and forms of disturbance caused by human activities often exceed the natural resilience of dune systems. Cottage and resort development on or near dune sites, as well as heavy recreational use of associated sand beaches, often results in loss of dune habitat. Erosion and trampling by all terrain vehicles (ATVs) and foot traffic is often severe and can occur rapidly, even with relatively low levels of human activity. Shoreline and dune stabilization structures such as jetties, docks, piers and boardwalks affect the natural dynamics of dune systems. [Jalava *et al.* 2003]

Lake Huron levels rise and fall seasonally, with an annual low in February and a peak in July. Records show longer cycles of change of about 1.5m (records exist for only about the last 150 years), again reflecting weather changes (Karrow 2000). An 11-year sunspot cycle affects precipitation. The record high water levels of 1986 were followed by the next high in 1997, consistent with the sunspot schedule. Some projections for the future based on expected warming indicate dropping water levels from increased evaporation (Karrow 2000). High lake levels may cause rapid erosion of foredunes, and fatal inundation of plants and seed banks. At the same time, high water levels may open up new early-successional habitats by exposing inland dunes. High lake levels also result in sand deposition closer to dune complexes by long shore currents, making greater quantities of sand available for wind deposition when lake levels recede. [Jalava *et al.* 2003]

Low water levels may also facilitate dune building, as greater expanses of beach sand are available for wind deposition on the dunes. Conversely, extended low lake levels may result in complete loss of suitable habitat as later-successional vegetation overtakes open dunes (Jones 2001). Also, the resulting extensive open beach conditions may facilitate shoreline recreational travel, providing easier access to dunes and making them more vulnerable to human disturbance. [Jalava *et al.* 2003]

All of the above factors are involved in the development and maintenance of the dune ecosystems in the Pinery – Port Franks area.

Hydrology

The central portion of the ARKPP NA contain the Mud Creek (Huron Slope and Fringe), Lower Ausable (Huron Slope only) and Dunes (Huron Fringe only) subwatersheds (Figure 2). Portions of the Lower Parkhill, Upper Parkhill subwatersheds cover the northeastern portion of the Huron Fringe section. According to ABCA (2007): "Both shallow (former glacial Lakes Warren, Algonquin and Nippissing Shoreline aquifers) and bedrock aquifers are found in this watershed. The bedrock aquifer is the most common source of drinking water and is part of a large aquifer system in southwestern Ontario." The shallow aquifers are a source of the flow of both Parkhill Creek and the Ausable River.

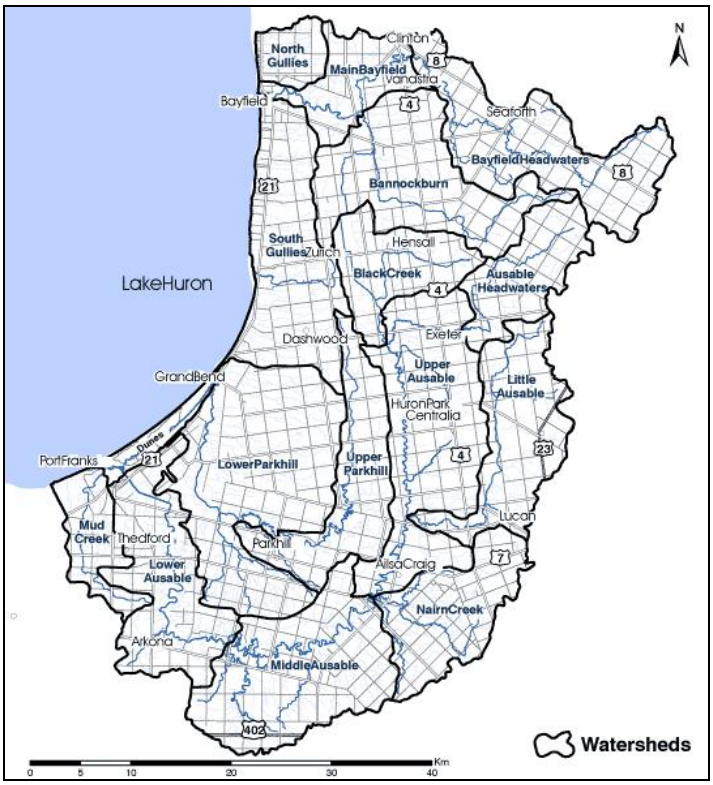

Figure 2. Subwatersheds of the Ausable – Bayfield Conservation Authority (source: http://www.abca.websmart.ca/reportcard_map.php)

The Lambton Shores area subwatershed (not shown in Figure 2, as it is in the St. Clair Region Conservation Authority area) occupies the remaining southwestern portion of the ARKPP NA. It includes Duffus Creek, Shashawandah Creek, James Creek and Woods Creek. 34% of the 15 metre area on both sides of the open streams is vegetated. According to SCRCA (2007): "There is a shallow sand aquifer from Kettle Point to Ipperwash which has high levels of iron and manganese and is vulnerable to surface land use influences. The deep aquifer at the interface between the overburden and the bedrock is known as the Fresh Water Aquifer, has high sodium and chloride and is of limited quantity."

v. SIGNIFICANT SPECIES

Unless otherwise indicated, data in the tables below are from NHIC (2008) but are generally not current to 2008. Only designated Species At Risk (SAR) (Endangered, Threatened or Special Concern) are

included. Many additional globally and provincially rare species and vegetation communities occur in these areas, and some of them may be considered as focal conservation targets during the CAP process.

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

Table 1.4 Significant Species – Lower Ausable River – Kettle Point to Pinery Area

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability[2] at known sites	Most recent records	Notes (data source: NHIC 2008 unless otherwise indicated)
Acadian Flycatcher *Empidonax virescens*	END	END	G5 S2B	E?; E	2001-2005	Lambton County Forest (LCF): >1 pair; Mature deciduous woodlands. Part of IBA Action Plan. KPFN: confirmed breeding in 1999. (Wilson & Cheskey 2001) Confirmed breeder during second OBBA (Cadman *et al.* 2007).
American Ginseng *Panax quinquefolius*	END	END	G3G4 S2	H; X; C	1895; 1980; 1989	Location information very sensitive because of potential for commercial exploitation.
Bald Eagle *Haliaeetus leucocephalus*	NAR	END-R	G4 S4B	E	2002	Pinery Provincial Park (PPP): Nested in large tree to at least 2002, forages widely. Confirmed breeding during OBBA (Cadman *et al*. 2007).
Blanding's Turtle *Emydoidea blandingii*	THR	THR	S3		1990	Ipperwash, PPP: Various records from wetlands, lakes, ponds, rivers
Bluehearts *Buchneria americana*	END	END	G5?S1	A; D; A?; D	2001; 2000; 1993; 1994	Various locations in interdunal swale meadows
Broad Beech Fern *Phegopteris hexagonoptera*	SC	SC	G5S3	D	1993	Ipperwash: Rare and local in rich moist woods; not found in 2004.
Butler's Gartersnake *Thamnophis butleri*	THR	THR	G5S3	D	1992	3.8km NNW of Parkhill: 1 individual observed
Cerulean Warbler *Dendroica cerulea*	SC	SC	G4 S3B	E; E	2001-2005	3 pairs at PPP; mature deciduous woodlands. Part of IBA Action Plan. PPWFD: Larger numbers (up to 26 singing males) recorded in early 1900s; general decline over the years. Probable breeder during second OBBA (Cadman *et al*. 2007).
Chimney Swift *Chaetura pelagica*	THR		G5 S4B SZN		2001-2005	Probable breeder during second OBBA (Cadman *et al*. 2007).
Common Nighthawk *Chordeiles minor*	THR		G5 S4B SZN		2001-2005	Confirmed as breeding during second OBBA (Cadman *et al.* 2007).
Dense Blazing Star *Liatris spicata*	THR	THR	G5S2	B; B; E	1983; 2000; 1993	Port Franks Wetlands and Forested Dunes (PFWFD Port Franks Wetlands and Forested Dunes (PFWFD): About 100 plants in wet meadows; PPP: In July 2000, >661 stalks at the Burley campground (NHIC 2008). Crabe counted 1,110 stems in an area just west of the Burley campground in August 2000. Extensively browsed by deer.
Dwarf Hackberry *Celtis tenuifolia*	THR	THR	G5S2	B	2004	PPP: Locally fairly common in various open habitats, including woodlands

[2] - Refer to Appendix A, "Viability" section for explanation of viability codes

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability[2] at known sites	Most recent records	Notes (data source: NHIC 2008 unless otherwise indicated)
Eastern Flowering Dogwood *Cornus florida*	END		G5S2	H	1983	Wet floodplain oak forest
Eastern Foxsnake *Elaphe glyodi*	THR	THR	G3S3	D	1991	Kettle and Stony Point First Nation (KSPFN): Single report
Eastern Hog-nosed Snake *Heterodon platirhinos*	THR	THR	G5S3	C; E	2002; 1990	PPP, KSPFN, Ipperwash: Occasional individuals found every summer to at least 2002. Rock Glen: Last NHIC record 1989
Eastern Ribbonsnake *Thamnophis sauritus*	SC	SC	G5S3		1990	Wetlands, Ausable River Valley
Five-lined Skink *Eumeces fasciatus*	END	SC	G5S3	C	2000	PPP: 7 records from 2000
False Rue-anemone *Enemion biternatum*	THR	THR	G5S2	A	1997	Ausable River: 20-30 patches of 50-100 plants each.
Forster's Tern *Sterna forsteri*	DD	DD	S2S3B	D	1991	KSPFN: Part of IBA Action Plan (3 pairs); deep water marsh (Wilson & Cheskey 2001).
Green Dragon *Arisaema dracontium*	SC	SC	G5S3	D	2000 2002	PPP: Not found in 2002; population size unknown, found in moist-fresh deciduous woodland. Rock Glen C.A.: 37 plants.
Heart-leaved Plantain *Plantago cordata*	**END**	**END-R**	**G5S1**	**A**	**2007 (?)**	**Maximum of 3,700 plants counted in wet woodland meadows at Ipperwash in 1989. Canada's only other population (~1,600 mature plants + ~1,500 seedlings in 2008) in woodlot north of Parkhill.**
Hooded Warbler *Wilsonia citrina*	THR	THR	G5 S3B	E; E	2001-2005	Ipperwash: (9 pairs) Oak woodlands, clearings. Part of IBA Action Plan. PFWFD: Four singing males on territory in 2000. (Wilson & Cheskey 2001). Confirmed or probable breeder in all overlapping atlas squares during second OBBA (Cadman *et al.* 2007).
Lake Chubsucker *Erimyzon sucetta*	END	END	G5	H	1982	Old Ausable Channel (OAC); L Lake
Louisiana Waterthrush *Seiurus motacilla*	SC	SC	G5 S3B	H; E	1984; 2001-2005?	PFWFD: 1 pair; deciduous swamps, ravines. Part of IBA Action Plan. (Wilson & Cheskey 2001). Mystery Falls: 1 pair.
Milksnake *Lampropeltis triangulum*	SC	SC	G5S3		1988	Variety of habitats including Ausable River Valley, farmland, edges, woodlands
Grass Pickerel *Esox americanus vermiculatus*	SC		G5T5 SU		2009	OAC, L Lake
Northern Bobwhite *Colinus virginianus*	END	END	G5 S1S2	H	1900	PPWFD: Almost certainly extirpated.
Northern Map Turtle *Graptemys geographica*	SC	SC	G5S3		1985	Large water bodies (including Ausable River), wetlands
Kidneyshell *Ptychobranchus fasciolaris*	END	END	G4G5 S1			Lower Ausable River
Wavy-rayed Lampmussel *Lampsilis fasciola*	END	END	G4 S1			Lower Ausable River
Snuffbox *Epioblasma triquetra*	END	END	G3 S1			Lower Ausable River
Mapleleaf Mussel *Quadrula quadrula*	THR	THR	G5 S2			Ausable River (AR)
Northern Riffleshell *Epioblasma torulosa rangiana*	END	END	G2T2 S1	E	1998	Recently found live at Rock Glen C.A. and Highway 7 at Sylvan bridge

ELEMENT	COSEWIC	OMNR	G/S Rank	Viability[2] at known sites	Most recent records	Notes (data source: NHIC 2008 unless otherwise indicated)
Pitcher's Thistle *Cirsium pitcheri*	END	END	G3S2	D	2008	PPP: Two populations on open dune systems; historic records also for Kettle Point and Port Franks areas
Prothonotary Warbler *Protonotaria citrea*	END	END	G5 S1S2B	F; F	1985; 1983	PPP: bred to 1985, probably extirpated; PFWFD: nested 1983, not found since. (Wilson & Cheskey 2001) Not recorded during second OBBA (Cadman *et al.* 2007).
Pugnose Shiner *Notropis anogenus*	END	END	G3S2	C	1997	OAC
Queen Snake Regina septemvittata	THR	THR	G5S2	B	1988	Ausable River
Red-headed Woodpecker *Melanerpes erythrocephalus*	THR	SC	G5 S3B		2007	PPP: ~10 pairs. Part of IBA Action Plan. (Wilson & Cheskey 2001). Open deciduous woodlands. Confirmed breeder during second OBBA (Cadman *et al.* 2007).
Red-shouldered Hawk *Buteo lineatus*	NAR	SC	G4 S4B	?	1997-2005	2 pairs. Deciduous / mixed woodlands, swamps. Part of IBA Action Plan (Wilson & Cheskey 2001). Possible breeding during OBBA (Cadman *et al.* 2007).
Riddell's Goldenrod *Solidago riddellii*	SC	SC	G5S3	B	1993	AR: three documented populations Abandoned railway line near Parkhill: 1 population
River Redhorse *Moxostoma carinatum*	SC	SC	G4S2	H	1936	AR
Snuffbox *Epioblasma triquetra*	END	END	G3 S1	E	1999	Rock Glen C.A.: 1 fresh shell, several weathered shells; found live @ Ausable River near Joany's woods in 2009.
Spiny Softshell *Apalone spinifera*	THR	THR	G5S2	D	1997	AR: 5 hatchlings; 2 live adults in Ausable River Cut in 2009
Spotted Turtle *Clemmys guttata*	END	END		D; C; D; H	1988; 1990; 1980; 1979	Location information sensitive due to potential for commercial exploitation.
Stinkpot *Sternotherus odoratus*	THR	THR	G5S3	E	1990	Typically found in rich aquatic habitats.
Tuberous Indian-plantain *Arnoglossum plantagineum*	SC	SC	G4S3	C	1987	AR: 3 subpopulations, up to 100 plants
Woodland Vole *Microtus pinetorum*	SC	SC	G5S3?	E	1992	PPP: Single specimen collected
American Badger *Taxidea taxus*	END	END	G5S2	X	1895	Extirpated from Grand Bend area.
Blue Racer *Coluber constrictor foxi*	END	END-R	G5T5 S1	H or X	1969	Ipperwash, PPP: Almost certainly extirpated. AR: 1983 sighting, unconfirmed
Cucumber Tree *Magnolia acuminata*	END	END-R	G5S2	X	1964	Dunes near Lost Lake: Rich deciduous woodlands
Drooping Trillium *Trillium flexipes*	END	END-R	G5S1	X	1894	Mud Creek near Parkhill: not found in >100 years
Karner Blue *Lycaeides melissa samuelis*	EXP	END-R	G5T2 SX	X	1987	PPP: Extirpated from dry sandy oak/pine woodlands; semi-open dunes; last known Ontario population.
Piping Plover Caladrius melodius	END	END-R	G2 S1B	X	1953	Extirpated, but could conceivably return to nest in sand beach/dune systems.

TABLE 1.5. GLOBALLY AND PROVINCIALLY RARE TAXA OF LAKE HURON COASTAL DUNE SYSTEMS FOUND IN THE PINERY – PORT FRANKS AREA

Scientific Name	Common Name	Global Rank*	Ontario Rank*	Lake Huron Site(s)	Habitat	Conservation Importance
Calamovilfa longifolia var. magna	Long-leaved Sand Reed	G5TU	S3	Scattered dune sites on Lake Huron shore; this variety is endemic to the Great Lakes	active sand dunes, dune savannahs, open sand plains; occasionally adventive along railways and roadsides	CRITICAL (all Ontario occurrences are at Lake Huron dune grasslands)
Cirsium pitcheri	**Pitcher's Thistle**	G3	S2	See main text of report and Jalava et al. (2003)	See main text of report and Jalava *et al.* (2003)	CRITICAL
Philaenarcys killa	**Sand Prairie Spittlebug**	G?	S1	Globally known only from Pinery Provincial Park - Port Franks area and several other locations in Lambton County	Habitats associated with the dynamic dune-building processes	CRITICAL (Pinery is type locality and only known occurrence)
Cicindela patruela	a tiger beetle	G3	S1	Restricted to the Pinery – Port Franks area; there are historic records for the Constance Bay 1965 Ottawa area.	Backshore dunes and scrubby sand barrens and openings in oak woodlands	CRITICAL (only extant Ontario populations are in Pinery area; formerly at Wasaga Beach)
Cobubatha dividua	a noctuid moth	G?	S1	Port Franks vicinity	backdunes and scrubby sand barrens; oak woodlands	CRITICAL? (Pinery has only known Canadian record)
Ammophila breviligulata	American Beachgrass	G4	S3	scattered Lake Huron distribution (widespread on Great Lakes)	Great Lakes sandy shores and dunes.	HIGH
Cicindela hirticollis	Beach Dune Tiger Beetle	G5	S2?	Wasaga Beach, Giant's Tomb and Manitoulin District; at least formerly at Grand Bend	undisturbed gently sloping sand beaches	HIGH
Acronicta albarufa	Barrens Dagger Moth	G3G4	S1	Grand Bend – Pinery – Port Franks	sand barrens, including sand dunes	HIGH?
Atrytonopsis hianna	Dusted Skipper	G4G5	S1	Pinery – Port Franks – Ipperwash	interdunal meadows	HIGH? (Pinery is one of only two known areas in Ontario)
Chaetaglaea tremula	Trembling Sallow	G5	S1	Grand Bend – Pinery – Port Franks	backdunes, sand barrens and openings in oak woodlands	HIGH?
Cicindela lepida	Little White Tiger Beetle	G4	S1	Common at St. Williams near Long Point, Lake Erie; occurs at Wasaga Beach; formerly at Hepworth, Bruce Peninsula, and Grand Bend	white sand dunes, inland dunes and sand patches in oak savannah, sand barrens	HIGH to MODERATE (possibly no longer extant on Lake Huron dunes)
Erynnis martialis	Mottled Duskywing	G3G4	S2	Grand Bend – Pinery – Port Franks	scrubby, open, sandy areas on backdunes, sand barrens, and limestone pavements having the host plant (Ceanothus)	HIGH?
Clastoptera hyperici	a spittlebug	G?	S1	Grand Bend – Pinery – Port Franks	sandy areas with Hypericum prolificum / H. kalmamium	HIGH?
Fitchiella robertsoni	a spittlebug	G?	S1	Grand Bend – Pinery – Port Franks	primarily a tallgrass prairie species; also in backdunes	HIGH?

Scientific Name	Common Name	Global Rank*	Ontario Rank*	Lake Huron Site(s)	Habitat	Conservation Importance
Idaea violacearia	a geometer moth	G4	S1	Grand Bend – Pinery – Port Franks	backdunes and scrubby sand barrens; oak woodlands	HIGH? (only known Canadian populations in Pinery area)
Lepyronia gibbosa	Hill Prairie Spittlebug	G1G2	S1	Grand Bend – Pinery – Port Franks	backdunes and scrubby sand barrens; open oak woodlands	HIGH?
Meropleon ambifusca	Newman's Brocade	G1G2	S1?	Grand Bend – Pinery – Port Franks	?	HIGH?
Papaipema aweme	Aweme Borer Moth	GH	SH	Grand Bend – Pinery – Port Franks	sand dunes and barrens; host plant possibly Little Bluestem	HIGH?
Proctacanthela cacopiloga	a robberfly	G?	S1	Pinery – Port Franks area; also found inland at St. Williams in Haldimand – Norfolk	backdunes and scrubby sand barrens; oak woodlands	HIGH?
Prosapia ignipectis	Black Spittlebug	G?	S1	Grand Bend – Pinery – Port Franks	?	HIGH?
Schinia sanguinea	Bleeding Flower Moth	G4	S1	Grand Bend – Pinery – Port Franks area	Interdunal meadows supporting host plant (Liatris spicata)	HIGH?
Asclepias viridiflora	Green Milkweed	G5	S3	Grand Bend – Pinery – Port Franks, Sarnia, La Cloche	open sandy woods, dunes, alvars	MODERATE
Celtis tenuifolia	Dwarf Hackberry	G5	S2	Grand Bend – Pinery – Port Franks	open sandy woods, alvars	MODERATE (Pinery has most viable population in Canada)
Corispermum pallassii	Bugseed	G?	S1S3	Lambton County	sandy shores and dunes; occasionally adventive on roadsides and railways	MODERATE taxonomic questions
Liatris aspera	Rough Blazing-star	G4G5	S2	Grand Bend – Pinery – Port Franks, Sarnia (historic)	open sandy woodlands, sandy prairies	MODERATE
Liatris cylindracea	Cylindrical Blazing-star	G5	S3	Grand Bend – Pinery – Port Franks, Scott Point, and alvars on Manitoulin Island	dry sand, low dunes, open Red Pine woodlands, dry oak savannahs and woods, alvars	MODERATE
Quercus prinoides	Dwarf Chinquapin Oak	G5	S2	Grand Bend area	open dry sandy woodlands, dunes, sandy prairie remnants	MODERATE (Pinery has most viable population in Canada)
Charadrius melodus	Piping Plover	G3	S1	extirpated from Lake Huron, last known breeding near Oliphant 1972, Carter Bay 1970, Ipperwash 1953	gently sloping sand beaches with scattered cobbles and herbaceous plants	MODERATE historic records only
*Corispermum hookeri**	Bugseed	G?	S1S3	Lambton County (historic)	sandy shores and dunes; occasionally adventive on roadsides and railways	MODERATE to LOW no recent records; taxonomic questions
Koeleria macrantha	June Grass	G5	S2	Grand Bend – Pinery – Port Franks, Sarnia	prairies, stabilized dunes, openings in sandy woodlands, rocky Bur Oak stands	MODERATE to LOW

Scientific Name	Common Name	Global Rank*	Ontario Rank*	Lake Huron Site(s)	Habitat	Conservation Importance
Lithospermum incisum	Fringed Puccoon	G5	S1	Sarnia and Grand Bend (historic)	dune savannah, sandy woodlands, open dry habitats	MODERATE to LOW historic Lake Huron dune records only
Stipa spartea	Porcupine Grass	G5	S3	Sarnia, Grand Bend – Pinery – Port Franks, Wasaga Beach, and southern Georgian Bay (Bruce Co., St. Edmunds Twp.), Missisagi Island	dry prairies, open stabilized dunes, sandy openings in dune woodlands; prairie remnants along railways	MODERATE to LOW [Pinery has most viable population in Ontario]
Heterodon platirhinos	Eastern Hognose Snake	G5	S3	Grand Bend – Pinery – Port Franks, Wasaga Beach, southern and central Georgian Bay (widespread in southern Ontario)	sandy areas	MODERATE to LOW
Lithospermum caroliniense	Plains Puccoon	G5	S3	Lambton, Bruce, Simcoe and Manitoulin	dunes, open sandy woodlands	LOW
Pterospera andromedea	Pinedrops	G5	S2	Wasaga Beach, Giant's Tomb, Manitoulin; extirpated from Grand Bend – Pinery – Port Franks, Sarnia, and Bruce Peninsula	humus-rich soil in pine forests; occasionally in open dune savannahs, pine savannahs; alvar woodland	LOW
Pycnanthemum tenuifolium	Slender Mountain-mint	G5	S3	Lambton, Bruce (Schmidt Lake only)	prairie remnants, open sandy woods, old fields	LOW
Salix myricoides	Blue-leaf Willow	G3G5	S2S3	Grand Bend – Pinery – Port Franks area (extirpated?); Bruce County; Manitoulin	sand dunes, sandy shores	LOW
Senecio plattensis	Prairie Ragwort	G5	S2S3	Grand Bend - Pinery – Port Franks	open sandy woods and dunes, prairies, alvars	LOW

* - considered 'probably introduced' in Ontario (Morton, pers. comm. 2003)

The above list is based primarily on a preliminary list of dune-associated taxa in Ontario (Oldham et al. 2001), as well as an evaluation of Natural Heritage Information Centre (NHIC) databases (including the NHIC Element Occurrence database, the NHIC Natural Areas database, the Atlas of Rare Vascular Plants of Ontario database, a database of herbarium collections, and databases of the personal plant collections of Michael J. Oldham and Wasyl D. Bakowsky). The following web site was used to supplement invertebrate information, particularly for the Pinery area, http://www.pinerypark.on.ca/news/checklists/icheck.pdf. The list is sorted first by Conservation Importance, then by major taxonomic group (*e.g.*, vascular plants, invertebrates, vertebrates), then alphabetically by genus.

Legend: Taxa endemic to the Great Lakes basin are in **bold**. See Appendix II for Global and Ontario rank definitions; Conservation Importance (of Lake Huron dune systems to taxon): CRITICAL = 90-100%, HIGH = 50-90%, MODERATE = 20-50%, LOW = <20% of Ontario species occurrences are believed to be in Lake Huron – Georgian Bay dune ecosystems, based on best available information.

vi. SOCIO-ECONOMIC / CULTURAL CONTEXT

Both the terrestrial ecosystems and hydrology of the ARKPP area have been greatly influenced by human activities over the past two centuries. Neither the hunting and gathering aboriginal peoples nor the farming-oriented European settlers found the sand dunes and limestone outcrops along the Lake Huron shoreline in this area particularly favourable for settlement. Further inland, soils were more fertile and conditions were more suitable. For aboriginal people, the primary interest lay in the flint deposits found in the shale outcroppings at Stoney Point as well as sites within the forest. These deposits were mined for centuries to make tools and weapons. European settlers also ventured into these forests for hunting, fishing, and selective cutting of trees. [Wilson and Cheskey 2001]

Huron Fringe

Following the War of 1812, the British government undertook the signing of treaties and establishment of reserves for native peoples, many of whom served with British forces during the war. Both the Kettle and Stoney Point Reserves were established at that time, each about 900 hectares in size.

In the late 1920s, a part of the waterfront of the Kettle Point Reserve, now known as West Ipperwash, and most of the Stoney Point Reserve were sold to private interests. In time, these sites became developed with cottages and permanent homes. In 1929, the remainder of the Stoney Point Reserve was expropriated by the Province of Ontario to create the fourth provincial park in Ontario, Ipperwash Provincial Park. The return of these lands to the First Nation is currently underway [Wilson and Cheskey 2001, Ontario Ministry of Aboriginal Affairs 2007]

Under the War Measures Act in 1942, the Government of Canada expropriated the remainder of the Stoney Point Reserve to create an Advanced Infantry Training Centre. When no longer required for war-training exercises, Camp Ipperwash became Ipperwash Army Cadet Camp. For over fifty years the Chief and the Band Council of the Chippewas of Kettle and Stoney Point First Nation petitioned the federal government to return the appropriated lands. This period of time has been marked by negotiation and frustration, confrontation and tragedy. A process of complete transfer of these lands back to the First Nation is now underway. [Wilson and Cheskey 2001]

In 1929, a proposed million-dollar resort by an American entrepreneur to develop a golf course and yacht harbour in the Pinery area failed to generate financial support. In 1957, the Ontario government purchased the land and established Pinery Provincial Park, which opened to the public in 1959. In the 1960s, the sand dune ecosystem was not well understood by park managers who perceived it as a degraded oak forest rather than a healthy oak savannah ecosystem. Over half a million pine trees were planted among the oaks, often into openings or savannah areas. Management efforts to restore this ecosystem began in the 1980s. [Wilson and Cheskey 2001]

In the 1930s, Lambton County purchased Lambton County Heritage Forest, a site within the IBA, from the Canada Company. Over 50 hectares of trees were planted between 1930 and the 1960s. Since that time land use has included selective cutting and passive recreational activities. In 1987, as a part of a federal government job creation program, a portion of the forest was logged and firewood extracted. As a result of this cutting, the county placed a moratorium on cutting on the site and undertook a comprehensive management planning process (completed in 1994) and initiated restoration activities for the site. [Wilson and Cheskey 2001]

In 2008, Lambton County signed a ten-year Management Agreement with the St. Clair Region Conservation Authority (SCRCA), for SCRCA to undertake resource management, recreation and education on the lands, including the 586 acre Lambton County Heritage Forest. A management and concept plan for the site has been prepared for County review and will proceed to public review.

Currently, Pinery Provincial Park, owned and operated by Ontario Parks, offers an extensive interpretive program during the summer, including naturalist-led hikes, evening programs, and children's programs. In winter, the park offers a limited interpretive program, groomed cross-country ski trails, and tobogganing hills. Over 500,000 people visit the park annually. Within the park there are ten nature trails, many self-guiding, for nature viewing and hiking as well as nine picnic areas for day use and a 10-kilometre beach for swimmers and sunbathers. For campers, there are 1000 campsites, a store, and washroom and shower facilities. [Wilson and Cheskey 2001]

Lambton County Heritage Forest consists of two portions of land, a 230-ha portion and a 7.5-ha portion. The 1994 Lambton County Heritage Forest Management Plan lays out the goals for managing this significant forested tract. These goals include restoration of open oak forest and oak savannah habitat for Lupine (*Lupinus perennis*) and Karner Blue Butterfly. Traditional use of the property continues in the smaller portion. Use of the larger portion is limited to activities that will not compromise its ecological integrity. A limited trail system is maintained. [Wilson and Cheskey 2001] A new Management Plan for Lambton County Heritage Forest is being developed by the St. Clair Region Conservation Authority, on behalf of Lambton County, with completion anticipated in 2009.

The hydrological history of the area is also complex. Historically, the Ausable River flowed northwest to Grand Bend, where it made an abrupt southward turn, for which the town was named. The river flowed south to Port Franks where it emptied into Lake Huron through an erosional break in the dune system. In 1873, the Canada Company, in an effort to reduce flooding, began construction of what is known today as the Ausable River Cut east from Port Franks towards Parkhill, redirecting much the river's waters directly westward into Lake Huron instead of taking the long route via Grand Bend. In 1892, the residents of Grand Bend cut a second outlet to Lake Huron near the "grand bend", resulting in the waters of Parkhill Creek draining directly into the lake there rather than flowing south to Port Franks along the former path of the original Ausable River. The section of isolated river channel adjacent to the Lake, now known as the Old Ausable Channel, no longer had inflow from upstream sources. It effectively became a long, narrow, isolated pond, with some outflow into the Ausable Cut and occasional back flushing of water from the Cut into the channel. [Killins 2008]

Huron Slope

Most of the land south and east of Highway 21 (Lakeshore Road) was cleared for agriculture in the 1800s. Today it consists mainly of a combination of agricultural and residential development. Besides clearing for agriculture, the largest influence on the biota of the Ausable River Valley has been timber removal for lumber and fuelwood. Almost all of the forest stands show signs of previous selective or clear-cut logging within the last 100 years. Excessive clearing throughout the 1800s led to severe erosion problems along the river valley due to excessive, unrestrained run-off. Many farmers have attempted to prevent erosion from their cultivated fields into the river valley, often by piling refuse and dead lumber at the heads of the gullies on steep slopes. Today, only 18% of the Lower Ausable Watershed is forested. Air photos from 1947 show significant deforestation in portions of the valley. Slopes appear to have been pastured with some flatter tablelands row-cropped. Since the 1950s and 1960s, the ABCA has acquired large tracts of land along the valley and most of the formerly open areas within the study area have been reforested or naturally regenerated since then. White Pine, spruce and White Pine – Black Walnut plantations were established on much of the cleared land in the 1960s. Some of pure pine and spruce plantations were

mechanically row thinned in the late 1990's, with fourth row thinning the most common treatment technique. (ABCA 2009)

The Huron Slope portion of the CAP area is found within a highly productive agricultural landscape in Middlesex and Lambton counties characterized by large cash crop and intensive livestock operations. Corn, beans and wheat form the standard crop rotation in the area, with forage crops mixed in to the rotation on poorer soils. Some vegetable, berry, and orchard crops are grown on sandy soils. In the past, the land has been disturbed for garbage dumps, sand and gravel pits, and clay pits. Evidence of these historical uses can be seen sporadically throughout the study area. At Rock Glen Conservation Area a system of hiking trails, picnic pavilion, parking areas and small Fossil Museum are maintained by ABCA. At Sadler Tract a local ATV riding club leases an area from ABCA, and the club maintains riding trails for club members. (ABCA 2009)

Table 1.6. Population Statistics for Ausable River – Kettle Point to Pinery CAP Area*

Name	Population	2001-2006 Population Growth	Population Density (persons/km^2)	% of Dwellings as Secondary Homes
Arkona	591	–1.2	236.9	3% (8 of 254 dwellings)
Chippewas of Kettle Point and Stony Point First Nation	1,020	+822 (24%)	110.8	50% (384 of 774 dwellings)
Lambton Shores (Grand Bend, Kettle Point, Port Franks, Ravenswood, Northville, Ipperwash Beach)	11,150	+5.5%	33.7	29% (1,983 of 6,773 dwellings)
Municipality of North Middlesex (Parkhill)	6,740	–2.3%	11.3	5% (114 of 2,421 dwellings)
Thedford	822	+8.9	363.9	6% (21 of 344 dwellings

* all information from Statistics Canada 2006

B. BIODIVERSITY TARGETS AND ASSOCIATED IMPACTS

The issue of one CAP or two sub-CAPs (Huron Fringe and Huron Slope) was discussed by the CAP team. It was decided that there will be one broad CAP with sub-CAPs embedded within, as opposed to two separate sub-CAPs. The revised targets with additional sub-targets that the team decided on were as follows, and are to incorporate both areas as appropriate – Huron Fringe (lakeshore) and Huron Slope (inland):

1. Riparian Systems (includes bottomlands and flood plains) (f,s)
2. Open Dunes and Sand Beaches (f)
3. Wetlands (a. coastal wetlands, b. marshes and fens, c. wetlands) (f,s)
4. Dry oak – pine woodlands (f,s)
5. Prairies and savannahs (f)
6. Forests (f,s)
7. Sustainable traditional uses (f,s)
8. Heart-leaved Plantain / False Rue-anemone (f,s)
9. Sustainable Land Use (a. agricultural, b. development, c. recreation) (f,s)

f - Relates to Huron Fringe
s- Relates to Huron Slope

The team also discussed extending the CAP boundaries to include the Parkhill area and further upstream areas of the Ausable River. By extending the boundaries of the CAP, additional significant species will be included, and the new boundaries would capture the entire ANSI (Area of Natural and Scientific Interest) that exists along the lower Ausable River.

The CAP team agreed that the CAP's boundaries should be extended, and should fit with an existing boundary (e.g., property or municipal boundaries). The current boundary delineation is displayed in Figure 1.

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 two project areas (Huron Fringe – Table 2.2, and Huron Slope – Table 2.3).

Table 2.1. Overall biodiversity targets and nested targets.

Conservation Targets	CAP Area Distribution	Nested Targets (confirmed and potential)
1. Riparian Systems (including Old Ausable Channel)	Huron Fringe; Huron Slope	**False Rue-anemone,** Riddell's Goldenrod, Tuberous Indian-plantain, Louisiana Waterthrush, Northern Riffleshell,Mapleleaf Mussel, Snuffbox, Kidneyshell, Pugnose Shiner, Lake Chubsucker, Grass Pickerel, River Redhorse, Blanding's Turtle, Queen Snake, Eastern Ribbonsnake, Butler's Garternsnake, Spiny Softshell, Spotted Turtle, Stinkpot, Northern Map Turtle, Drooping Trillium - X
2. Open Dunes and Sand Beaches	Huron Fringe	Pitcher's Thistle, Dense Blazing Star, Bluehearts, Five-lined Skink, Eastern Hog-nosed Snake, Blue Racer – X, Piping Plover – X
3. Dry Oak – Pine Woodlands	Huron Fringe; Huron Slope	Dwarf Hackberry, Milksnake, Red-headed Woodpecker, Common Nighthawk, Eastern Hog-nosed Snake, Woodland Vole, American Badger – X, Eastern Foxsnake, Five-lined Skink, Northern Bobwhite – X, Karner Blue – X,
4. Prairies and savannahs	Huron Fringe	Dwarf Hackberry, Riddell's Goldenrod, Milksnake, Common Nighthawk, Eastern Hog-nosed Snake, Eastern Foxsnake, Five-lined Skink, American Badger – X, Northern Bobwhite – X, Karner Blue – X,
5. Coastal Marshes	Huron Fringe	Forster's Tern
6. Meadow Marshes and Fens	Huron Fringe	Dense Blazing Star, Eastern Ribbonsnake
7. Swamps	Huron Slope	**Heart-leaved Plantain**, Green Dragon, Eastern Flowering Dogwood, Prothonotary Warbler, Louisiana Waterthrush, Red-shouldered Hawk
8. Forests	Huron Fringe; Huron Slope	**Heart-leaved Plantain,** Acadian Flycatcher, Hooded Warbler, American Ginseng, Green Dragon, Broad Beech Fern, Cucumber Tree, Eastern Flowering Dogwood, Cerulean Warbler, Woodland Vole, Red-headed Woodpecker, Bald Eagle (?)
9. Heart-leaved Plantain / False Rue-anemone	Huron Fringe; Huron Slope	Heart-leaved Plantain, False Rue-anemone

Table 2.2. Viability Summary: Huron Fringe Ecosystems

Biodiversity Targets		Landscape Context		Condition		Size		Viability Rank
		Grade	Weight	Grade	Weight	Grade	Weight	
1	Riparian Systems	Poor	1	Good	1	-	1	**Fair**
2	Open Dunes and Sand Beaches	Good	1	Fair	1	Good	1	**Good**
3	Great Lakes Meadow Marshes and Fens	Good	1	Good	1	Fair	1	**Good**
4	Dry Oak - Pine Woodlands	Fair	1	Poor	1	Good	1	**Fair**
5	Prairies and Savannahs	Poor	1	Poor	1	Poor	1	**Poor**
6	Coastal Marshes	Fair	1	Good	1	Good	1	**Good**
7	Forests - Forested Dunes	Poor	1	Fair	1	Fair	1	**Fair**
8	Sustainable Traditional Uses	Fair	1	Fair	1	Fair	1	**Fair**
9	Heart-leaved Plantain / False Rue-anemone	Poor	1	Fair	1	Good	1	**Fair**
Huron Fringe Biodiversity Health Rank								**Fair**

Table 2.3. Viability Summary: Huron Slope Ecosystems

Biodiveristy Targets		Landscape Context		Condition		Size		Viability Rank
		Grade	Weight	Grade	Weight	Grade	Weight	
1	Riparian Systems (Ausable and Parkhill Rivers)	Poor	1	Good	1	-	1	**Fair**
2	Dry Oak - Pine Woodlands	Fair	1	Poor	1	Good	1	**Fair**
3	Forests	Poor	1	Fair	1	Fair	1	**Fair**
4	Sustainable Traditional Uses	Fair	1	Fair	1	Fair	1	**Fair**
5	Heart-leaved Plantain	Poor	1	Good	1	Fair	1	**Fair**
8	Wetlands – Swamps	-		-		-		**-**
Huron Slope Biodiversity Health Rank								**Fair**

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

ii. IMPACTS

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

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

Table 2.4. Summary of Impacts: Lower Ausable - Kettle Point - Pinery Huron Fringe Ecosystems

Impacts Across Targets		Riparian Systems	Open Dunes & Sand Beaches	Meadow Marshes[3] & Fens	Dry Oak - Pine Woodlands	Prairies and Savannahs	Coastal Marshes	Forested Dunes	Sustainable Traditional Uses	Overall Impact Rank	Notes
Project-specific impacts		1	2	3	4	5	6	7	8		
1	Air-Borne Pollutants	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	CO2 , CH4, NO – global warming, flash floods, droughts, N deposition
2	Invasive Non-Native/Alien Species	High	Low	Low	Very High	High	Very High	Very High	Medium	Very High	Phragmites, Garlic Mustard, White Sweet Clover, knapweed, Elodea, zebra & quagga mussels, etc.
3	Tourism & Recreation Areas	High	High	Medium	High	Very High	Low	High	-	Very High	Docks, beach access trails, comfort stations, campsites
4	Housing & Urban Areas	High	High	Medium	High	High	Medium	High	-	Very High	Gated subdivision south of Grand Bend; Port Franks area
5	Problematic Native Species	Medium	-	-	Low	High	Very High	Low	Low	High	Canada Geese, raccoons (Pinery), White-tailed Deer
6	Commercial & Industrial Areas	Medium	-	-	Medium	High	-	Medium	-	High	

[3] - Includes Heart-leaved Plantain (which is also potentially impacted by threats to Riparian Systems and Forested Dunes targets)

Impacts Across Targets		Riparian Systems	Open Dunes & Sand Beaches	Meadow Marshes[3] & Fens	Dry Oak - Pine Woodlands	Prairies and Savannahs	Coastal Marshes	Forested Dunes	Sustainable Traditional Uses	Overall Impact Rank	Notes
Project-specific impacts		1	2	3	4	5	6	7	8		
7	Recreational Activities	Low	High	Low	Low	Medium	Low	Low	Low	Medium	ATVs, boat, dredging of channels for boat access, trampling of dunes and other habitats
8	Roads & Railroads	Medium	Medium	Medium	Medium	Medium	Low	Medium	-	Medium	Road allowance at Port Franks; beach road; roadkill of reptiles, mammals, birds
9	Hunting & Collecting Terrestrial Animals	Low	-	-	Low	Low	High	Low	Medium	Medium	Over-harvesting, gathering for commercial use (e.g., snakes); accidental trampling of SAR plants
10	Logging & Wood Harvesting	Low	-	-	Low	-	-	Low	Low	Medium	Incompatible forestry practices; logging upstream and in swamps affecting water quality
11	Fishing & Harvesting Aquatic Resources	Low	-	Low	-	-	High	-	Medium	Medium	Turtle collecting; over-harvesting for commercial use
12	Other Ecosystem Modifications	-	-	Medium	-	-	-	-	-	Medium	Tile drainage; woody succession due to unknown causes (e.g., in fens)
13	Agricultural & Forestry Effluents	High	-	-	-	-	Low	-	-	Medium	Agricultural run-ff
14	Renewable Energy	-	-	-	Low	-	High	-	-	Medium	Wind farms
15	Introduced Genetic Material	-	-	-	-	-	High	-	-	Medium	
16	Gathering Terrestrial Plants	-	Low	Medium	Low	Low	Low	Low	Medium	Medium	Picking Blue-hearts, Cylindric Blazing Star; over-harvesting of Heart-leaved Plantain, American Ginseng (for medical uses)
17	Fire & Fire Suppression	-	-	-	Medium	Medium	-	Medium	Low	Medium	Affects prairies and savannahs

Impacts Across Targets		Riparian Systems	Open Dunes & Sand Beaches	Meadow Marshes[3] & Fens	Dry Oak - Pine Woodlands	Prairies and Savannahs	Coastal Marshes	Forested Dunes	Sustainable Traditional Uses	Overall Impact Rank	Notes
Project-specific impacts		1	2	3	4	5	6	7	8		
18	Livestock Farming & Ranching	Low	-	-	Low	-	Low	-	-	Medium	Livestock grazing in natural areas
19	Utility & Service Lines	Low	-	-	Medium	Low	Low	Medium	-	Medium	
20	Mining & Quarrying	Low	Low	-	Medium	-	-	-	-	Medium	Sand mining
21	Industrial & Military Effluents	Low	-	Medium	-	-	-	-	-	Medium	Ordinance clearing at Ipperwash;
22	Dams & Water Management/Use	Low	-	Low	-	-	Medium	-	-	Low	One dam is an asset to maintaining upstream system.
23	Wood & Pulp Plantations	Low	-	-	-	Medium	-	-	-	Low	
24	Tile Drainage	Medium	-	-	-	-	-	-	-	Low	
25	Annual & Perennial Non-Timber Crops	-	-	-	Low	-	Low	Low	-	Low	
26	Garbage & Solid Waste	Low	-	-	-	-	-	-	-	Low	
27	Household Sewage & Urban Waste Water	Low	-	Low	-	-	-	-	-	Low	
28	Flight Paths	-	-	-	-	-	Low	-	-	Low	
Impact Status for Targets and Huron Fringe		Very High	Very High	High	Very High	Very High	Very High	Very High	High	Very High	

Table 2.5. Summary of Impacts: Lower Ausable - Kettle Point - Pinery Huron Slope Ecosystems

Impacts Across Targets		Riparian Systems -	Dry Oak - Pine Woodlands	Upland and Slope Forests	Sustainable Traditional Uses	Heart-leaved Plantain	Sustainable Land Uses - Forestry	Sustainable Land Uses - Recreation	Wetlands - Swamps	Overall Impact Rank	Notes
Project-specific impacts		1	2	3	4	5	6	7	8		
1	Air-Borne Pollutants	Very High	Very High	Very High	Very High	Very High	Very High	-	High	Very High	Global warming, flash floods, droughts, nitrogen deposition
2	Invasive Non-Native/Alien Species	High	Very High	Very High	Medium	Medium	Very High	-	High	Very High	Garlic Mustard, knapweed, etc.
3	Housing & Urban Areas	Medium	High	High	-	Medium	High	High	-	High	
4	Tourism & Recreation Areas	Medium	High	High	-	Medium	High	-	-	High	
5	Commercial & Industrial Areas	Medium	Medium	Medium	-	Medium	-	High	-	Medium	
6	Logging & Wood Harvesting	Low	Low	Low	Low	Medium	High	Low	-	Medium	Incompatible forestry practices
7	Other Ecosystem Modifications	-	-	-	-	High	-	-	-	Medium	Woody succession in wetlands & swamps
8	Agricultural & Forestry Effluents	High	-	-	-	-	-	-	Low	Medium	Agricultural run-off
9	Roads & Railroads	Medium	Medium	Medium	-	-	Medium	-	-	Medium	
10	Gathering Terrestrial Plants	Low	Low	Low	Medium	Medium	-	-	-	Medium	Over-harvesting of medicinal plants
11	Problematic Native Species	Medium	Low	Low	Low	Low	Medium	-	-	Medium	White-tailed Deer, Wild Turkey
12	Livestock Farming & Ranching	Low	Low	-	-	Medium	Medium	Low	-	Medium	Grazing in forests and other natural areas
13	Fire & Fire Suppression	-	Medium	Medium	Low	-	Low	-	-	Medium	
14	Utility & Service Lines	Low	Medium	Medium	-	-	Low	-	-	Medium	
15	Mining & Quarrying	-	Medium	-	-	-	Medium	-	-	Medium	
16	Recreational Activities	Low	Low	Low	Low	-	Medium	-	Low	Low	ATVs, snowmobiles at shoulder seasons
17	Hunting & Collecting Terrestrial Animals	Low	Low	Low	Medium	Low	-	-	-	Low	Collecting snakes
18	Fishing & Harvesting Aquatic Resources	Low	-	-	Medium	-	-	-	-	Low	

Impacts Across Targets		Riparian Systems -	Dry Oak - Pine Woodlands	Upland and Slope Forests	Sustainable Traditional Uses	Heart-leaved Plantain	Sustainable Land Uses - Forestry	Sustainable Land Uses - Recreation	Wetlands - Swamps	Overall Impact Rank	Notes
Project-specific impacts		1	2	3	4	5	6	7	8		
19	Industrial & Military Effluents	Low	-	-	-	Medium	-	-	-	Low	
20	Tile Drainage	Medium	-	-	-	-	-	-	-	Low	
21	Annual & Perennial Non-Timber Crops	Low	Low	Low	-	Low	-	-	-	Low	
22	Dams & Water Management/Use	Low	-	-	-	Low	-	-	-	Low	
23	Garbage & Solid Waste	Low	-	-	-	-	Low	-	-	Low	
24	Renewable Energy	Low	Low	-	-	-	-	-	-	Low	Wind farms
25	Household Sewage & Urban Waste Water	Low	-	-	-	-	-	-	-	Low	
26	Wood & Pulp Plantations	Low	-	-	-	-	-	-	-	Low	
Impact Status for Huron Slope		Very High	Very High	Very High	High	High	Very High	High	High	Very High	

Air-borne Pollutants

Air-borne pollutants in this context refer to carbon dioxide and other greenhouse gases associated with climate change. The actual impact which we wish to highlight is climate change itself. Climate change 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 targets 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 disturbed coastal communities. Both the loss of at risk biodiversity targets, and the arrival of new invasive species, is 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 targets, and the response of ecosystems to changing abundance or function of their components, means 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 are therefore possibly a threat to the mycorrhizal associations required by many plant species.

Invasive Non-Native/Alien Species

The impacts on ecosystems of invasive, non-native plant species (such as Common Reed, Garlic Mustard, Common Buckthorn), insects (such as Emerald Ash Borer), other invertebrates (such as Zebra Mussels), fungal diseases (such as Butternut Canker) are widely known. Common Reed in particular is of great concern both from biodiversity conservation and human use perspectives. Additionally, domestic cats are predators that efficiently prey on both adult and nestling birds, reptiles and native small mammals.

Housing & Urban Areas
Tourism & Recreation Areas
Commercial & Industrial Areas

Residential, commercial (primarily tourism) and cottage development has had a substantial impact on the portions of the CAP area still in natural cover. In their preliminary Environmentally Sensitive Area surveys in the early 1980s, Eagles and Beechey (1985) suggested that the portion of the forest complex in the vicinity of Port Franks "appears to be threatened by development." During this time a new road was constructed along the eastern edge of the then Ipperwash Military Reserve and across the northern edge of the wetlands. The paved road between Northville and Port Franks bisects the entire forest complex in this area. Housing development within the forest ecosystem fragments the forest and introduces a range of impacts and issues. [Wilson and Cheskey 2001]

Septic-bed and filter-bed sands, and their subsequent seeding, often bring in alien plants. Many residents deliberately plant non-native ornamental plants without considering their potential introduction into adjacent natural areas. Evidence of cultivars invading surrounding natural habitats has been observed at many locations near cottages throughout the CAP area. Other impacts associated with residential and resort developments include the planting of lawns on natural habitats, and the effects of associated applications of pesticides and fertilisers

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

Agricultural & Forestry Effluents
Annual & Perennial Non-Timber Crops
Livestock Farming & Ranching
Tile Drainage

The majority of the Huron Slope portion of the CAP area is under agricultural land use, and thus land stewardship by agricultural community is critical to the health of ecosystems. The continued presence of a high diversity of Species At Risk in the area is evidence that farmers and other rural landowners have helped maintain the ecological integrity of forests, river systems and wetlands. Nevertheless, agriculture has impacted and continues to affect the ecosystems in many ways including:

- Forest clearing, habitat fragmentation and reduction of forest interior habitat;
- Drainage of swamps, marshes and other wetlands;
- Re-routing of watercourses through channelization, drains, ponds and dams;
- Introduction of non-native and invasive plants and animals;
- Creating habitat for generalist species that out-compete, predate or parasitize more specialized native species;
- Soil erosion and reduction in soil quality;
- Increased nutrient loads in lakes, rivers and wetlands from agricultural run-off;
- Air and water pollution from pesticides and fertilizes;
- Grazing impacts in forests, wetlands and other natural habitats;
- Effects of genetically modified crops on native flora and fauna;
- Reduction in overall biological diversity and ecological resilience;
- Contributions to climate change through CO_2 outputs and local microclimatic effects.

Other Ecosystem Modifications

Along riparian corridors, beaches and other land/water interfaces in the NA, impervious surfaces (*e.g.,* pavement, hardened shorelines, rip-rap) may be a significant problem. Hardening of shorelines can reduce natural erosion and deposition of sand by long shore currents and wind, impacting negatively on natural dune ecosystem processes and resulting in succession of open dunes to woodland. 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. Areas of dense cottage development may be avoided altogether by species that are sensitive to human activity. Hydrological changes due to unknown causes appear to be resulting in woody succession in some fen communities in the CAP area.

Plantations

Forest plantations exist at a significant scale in the NA. Forest plantations can be especially problematic in areas which were historically represented by open habitats, including prairie and savannah areas. Coniferous plantations also generally have much lower biological diversity than naturally regenerating habitats.

Recreation

Recreation is a significant land use in the Natural Area. Bosanquet Township provides year-round recreational opportunities for hundreds of thousands of visitors as well as residents. Tourism is a major economic contributor to this community. The Lambton County Heritage Forest Management Plan (1994) examines the impact of nine recreational activities upon the county forest. These include passive activities such as hiking and nature observation, and more active pursuits such as mountain biking and snowmobiling. [Wilson and Cheskey 2001]

Logging & Wood Harvesting

Timber harvesting occurs in woodlots throughout the CAP area. 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;
- 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.

Roads and Railroads

Roads reduce the amount of interior habitat, 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.

Dams & Water Management/Use

A municipal drain runs through the Lambton County Heritage Forest along the Mud Creek floodplain. The Drainage Act permits the cleaning of the drain at any time by the Municipality

(Lambton County Heritage Forest Management Plan 1994). Lambton Wildlife, Inc. has expressed concern that the dredging and opening up of Mud Creek could have consequences for IBA bird species (Elliott 2000), imperilled turtle and Grass Pickerel populations. The floodplain along this creek may be prime habitat for Acadian Flycatcher and Red-shouldered Hawk. [Wilson and Cheskey 2001]

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.

Plantations

Forest plantations exist at a significant scale in the NA. Forest plantations can be especially problematic in areas which were historically represented by open habitats, including prairie and savannah areas. Coniferous plantations also generally have much lower biological diversity than naturally regenerating habitats.

Problematic Native Species (Increased Predation and Parasitism)

Excessively high deer populations in the Kettle Point to Pinery area have been controlled over the past decade to reduce impacts by browsing on native vegetation. In relation to native species imbalances that affect bird populations, Wilson and Cheskey (2001) wrote, "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). Such was the case of the Prairie Warbler and Karner Blue Butterfly populations at Pinery Provincial Park. 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, 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 (Terborgh, 1989, Cheskey 1991, Friesen *et al,* 1998)."

Human Intrusions and Disturbances
Recreational Activities

From Jalava (2006): "Threats to Lake Huron dune grassland communities…can be divided into human- and natural-sources….Because of high recreational pressures at provincial parks, threats to populations at some "protected" areas may be greater than on private lands (Oldham and Line 1999)….The main human-source threats to dune habitats [in Ontario] include:

i. Damage to plants and habitat from foot traffic and vehicles, and associated construction of access roads and trails;
ii. Habitat fragmentation and alteration by shoreline development;
iii. Alteration of long-shore currents by piers, berms, jetties, and infilling;

iv. Dune stabilization by walkways, plantings, snow fences, etc.;
v. Invasion by exotic taxa, especially those used in dune stabilization projects.

From Wilson and Cheskey (2001): "The dune located directly behind MacPherson's Restaurant is a classic example of human-induced erosion (Lambton County Heritage Forest Management Plan 1994). Within Pinery Provincial Park, unauthorized trails across dunes are closed and people discouraged from using them by signage. Boardwalks have been constructed across dunes to direct foot traffic and Marram Grass planted to reduce erosion."

All terrain vehicles (ATVs) and other off-road vehicles are a serious threat to most habitat types, but particularly sand dunes, wetlands and forests. 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 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. 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).

Gathering Terrestrial Plants

A number of medicinal plants, some of them SAR, occur within the CAP area. Their traditional harvest has been practiced sustainably for many centuries. However, many of these species occur in very low numbers and the populations within the CAP area are some of the last that remain in Canada. Many of these populations are undoubtedly at-risk from over-harvesting for commercial purposes, increased demand or uninformed harvesters.

Some native plant 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.

Fire & Fire Suppression

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 in pine-oak woodlands. This succession may be due to suppression of natural wildfire.

Utility & Service Lines

Major impacts of utility and service lines include habitat fragmentation, increased edge effects, introduction of invasive species, and pesticide impacts if herbicides are used during maintenance.

Sand Mining

The extensive sand deposits are exploited on a relatively small scale in Huron Fringe area. This activity causes extreme habitat modification, and potentially increases erosion, invasion by introduced species and impacts on hydrology.

Hunting & Collecting Terrestrial Animals

Collecting of snakes and turtles (many of them being Species At Risk) for the pet trade is potentially a serious problem in the area, but the extent to which it is occurring is not known.

Fishing & Harvesting Aquatic Resources

Collecting of SAR turtles for the pet trade is potentially a serious problem in the CAP area, but the extent to which it is occurring is not known. The need to control the use of exotic baitfish and potential collection of baitfish from OAC (e.g. pugnose shiners) is noted in the Ausable River recovery strategy (ARRT 2004).

Industrial & Military Effluents

Unexploded munitions and other military debris of the former Ipperwash Military Base are still present in natural areas of the Huron Fringe within the Kettle Point First Nation. There have been ongoing plans to remove these items, but removal activities may cause more habitat damage than leaving them in place. Highly sensitive SAR habitat is found in some of these areas.

Renewable Energy

Many areas near the Lake Huron coast are currently eliciting interest by the wind turbine power generation industry. Construction of wind turbines causes direct localized habitat damage, as well as potential long term impacts on movements and behaviour of wildlife, including bats and migratory birds. The benefits of clean energy should be weighed against local environmental impacts.

Garbage & Solid Waste
Household Sewage & Urban Waste Water

Impacts of household wastes, littering and land-filling within the area need to be determined. The installation of sewers vs. septic systems is a major public issue in the Grand Bend/Port Franks areas presently.

C. OPPORTUNITIES

Ongoing Conservation Initiatives: Ausable River Recovery Strategy and Other Local Initiatives

Ausable River Recovery Strategy

Background

The Ausable River, located on the northern fringe of the Carolinian Zone is a nationally significant watershed for the preservation of aquatic biodiversity within Canada. At least 26 species of freshwater mussels, 83 species of fishes, and 21 species of reptiles have been found. Many species are rare; 16 aquatic species have been designated by COSEWIC (Committee On the Status of Endangered Wildlife In Canada), including six mussels, six fishes and four reptiles.

The Ausable River Recovery Team (ARRT) came together in 2002, and is made up of representatives from universities and provincial and federal agencies. It is co-chaired by the Ausable Bayfield Conservation Authority and Fisheries and Oceans Canada. In 2003, the ARRT compiled background information on the Ausable River watershed and a draft recovery strategy was produced in 2005. The draft Ausable River Recovery Strategy (ARRS) recommended approaches to recovery through: management; stewardship/habitat improvement; research and monitoring; and public awareness. The draft ARRS provides a working guide for recovery initiatives.

Implementation

Research and Monitoring

Research and monitoring projects of aquatic species at risk (SAR) have occurred since 2004 in the Ausable River watershed. The following projects have been completed:

2004 – Distribution and habitat characteristics of species at risk fishes in the Ausable River
2004 – A survey of herptile communities in the Ausable River
2005 – Ausable River aquatic habitat assessment
2006 – A monitoring program to track the recovery of freshwater mussels in the Ausable River
2007 – Targeted surveys for threatened and endangered fishes of the Ausable River
2008 - An ecosystem approach to the identification of critical habitat for aquatic species at risk in the Ausable River

Research and monitoring of aquatic SAR continued in 2009 with the following two projects:

Impact of geomorphological processes on mussel species at risk distributions in the Lower Ausable River. Through surveys of geomorphological conditions and mussel and related fish communities in the lower Ausable River, the project would provided further insight into the habitat requirements of freshwater mussels that will inform recovery actions in the Ausable River and other watersheds.

Species at Risk Fishes in the northern Old Ausable Channel - Conducted standardized fish surveys and habitat assessments throughout the northern portion of the Old Ausable Channel

(OAC). This area of the OAC has never been sampled to determine if pugnose shiner, lake chubsucker and grass pickerel are found in this section of the channel.

Ultimately the project will lead to establishing a long-term fish habitat improvement process in the northern region of the OAC.

Stewardship and Public Awareness

Stewardship and habitat improvement as well as public awareness have also been important components of the ARRS. The ABCA has worked with landowners since 2003 with the help of various grants to fund on the ground stewardship initiatives such as: tree planting; livestock fencing; manure storage; and conservation tillage equipment modifications. All of these activities help to reduce sediment and nutrients to the Ausable River – the biggest threats to aquatic SAR, which are included in the Riparian Systems conservation target.

Currently, only two per cent of the Ausable River landscape is in wetlands. In 2007 ABCA and partners initiated a wetland restoration outreach program in the Lower Ausable River. It is thought that wetland enhancement will help to reduce nutrient and sediment concentrations in the downstream river system. Interested landowners, local municipal councillors and the Ministry of the Natural Resources are advising the ABCA on this broad wetland restoration project. The process began with a mapping exercise that identified potential wetland areas and continues with an ongoing public outreach component. All landowners in the Ausable River watershed between Alisa Craig and Arkona received a letter to ask if they had wet areas that could be enhanced. The response to this letter resulted in tree planting projects, a land donation, and three wetland restoration projects in 2008.

In 2008, the Ontario Trillium Foundation provided a grant to continue the wetland restoration process and expand the outreach to include all of Middlesex and Huron Counties for three years. Partners from the ABCA, Middlesex Stewardship Council, Huron Stewardship Council and Ducks Unlimited have partnered to initiate what is known as the Healthy Headwaters Wetlands Initiative. This group provides technical advice and assistance in completing wetland projects. This initiative continued into 2009.

The Species At Risk Incentive Program for Best Management Practices provides incentives to farmers with an appropriate Environmental Farm Plan.

Land stewardship activities are ongoing at various sites through the efforts of conservation group such as the ABCA, the St. Clair Region Conservation Authority, the St. Clair Region Conservation Foundation, the Thames Talbot Land Trust, Lambton Wildlife Incorporated and the Nature Conservancy of Canada.

Healthy Watershed funding is available for best management practices in the Middlesex County portion of the CAP area.

A Community Based Management Plan for the Old Ausable Channel Watershed

In 2006, the Grand Bend community and the Ausable Bayfield Conservation Authority embarked on a planning process to develop a long-term management strategy for the Old Ausable Channel (OAC). In an effort to involve the local community and all stakeholders, two large public meetings were held in 2006 and 2007 for the community to voice their management concerns for the OAC. A stakeholder steering committee was formed as a result of these meetings. The

steering committee consisted of representatives from the Ausable Bayfield Conservation Authority, Pinery Provincial Park, the Municipality of Lambton Shores, the Universities of Western Ontario and Waterloo, Fisheries and Oceans Canada and volunteers from five Grand Bend residential communities that border the OAC including: Southcott Pines; Pinedale; Beach O' Pines; Wee Lake; and Huron Woods as well as representatives from the village of Port Franks. The community based steering committee provided direction and guidance into the design of the management plan.

In spring 2008 the OAC Management Plan was completed and presented to the public. Recommendations from the plan included: approaches for landowner stewardship; monitoring and future studies; and education and public awareness opportunities. Projects completed to-date, based on recommendations from the plan include: a native plant guide for area residents; enhancement of a wetland area in the OAC; OAC angler information and education; eight workshops regarding local ecology; and water quality monitoring within the OAC. Work continues into 2009 with a native plant day; natural heritage mapping; water quality monitoring, a sucession management project in conjuction with the University of Waterloo and establishing a long-term fish habitat improvement process in the northern region of the OAC.

The knowledge that local residents bring to resource management is critical to successful planning. Long-term implementation of projects recommended in the plan is more achievable through the commitment of local people. Engagement and support of local residents through outreach and education is also important to the success of local projects.

Next Steps – A Port Franks Area Management Plan

The approach taken to develop the OAC Management Plan will be implemented in development of a Management Plan for the Port Franks area south of Pinery Provincial Park. The Port Franks area is home to many species at risk and a community that is also interested in protecting its natural environment.

The initial steps in the development of a management strategy for Port Franks include: a background report summarizing our current understanding about species at risk habitat and potential threats, holding a public meeting and two stakeholder steering committee meetings. It is hoped that the report and meetings will occur in 2009. The public meeting was held in September 2009 – biodiversity education was provided to local residents. They were invited to become engaged in the biodiversity strategy for the Port Franks area.

Initiatives in the Ausable Bayfield Watershed Potentially Applicable in the CAP Area

People are becoming more and more active in local planning and environmental initiatives. Area communities have shown active leadership in recent local watershed planning efforts in Zurich, Bayfield and Grand Bend. Neighbours in these communities are not only developing individual action plans to address environmental issues on their own properties, but they are also forming groups to manage the watershed in which they live.

The Zurich Drain Watershed Water Quality Improvement Project is an example of a community improving its watershed through actions by individuals. Community volunteers visited watershed landowners and connected individuals interested in undertaking environmental improvement projects with agencies that provide funding and technical support.

Since 2006, landowners in the Zurich area have completed or initiated 19 projects. Five of these projects were implemented in 2008 with funding from the Bluewater Shoreline Residents' Association, Huron County's Clean Water Project, and Environment Canada's EcoAction Community Funding Program. The projects included eaves trough installation, tree planting, a water well upgrade, and a wash water filtration system installation.

The community north of Bayfield has taken a committee approach to watershed management. The community has generally communicated that it is keen to enhance natural areas (including water quality in Lake Huron), but recognizes that this must be balanced with the development that the natural areas attract. The plan they helped create will describe the natural and human geography of the area north of Bayfield and will recommend approaches and actions to help ensure that natural features are protected and the watershed is enhanced. A draft of the plan will be presented to the community during the summer of 2009. In the meantime, at least 24 area landowners are undertaking projects on their own properties to enhance the local environment.

Port Franks Beach and Dune Stewardship Guide

With the support of Environment Canada's Habitat Stewardship Program, The Lake Huron Centre for Coastal Conservation has developed a user-friendly guide for ecologically-appropriate beach and down stewardship specific to the Port Franks area (Peach 2008). The guide provides general beach and dune conservation approaches as well as specific approaches for local beaches. The guide also discusses and provides stewardship methods for dealing with invasive species and enhancing near shore water quality. The stewardship guide also presents the various rules and regulations applicable to shoreline areas in the Port Franks area. The Port Franks Beach and Dune Stewardship Guide is a valuable tool for community-based conservation activities in the Huron Fringe portion of the CAP area.

2. CONSERVATION VISION AND GOALS

Vision Statement

The Ausable River – Kettle Point to Pinery natural area supports a variety of terrestrial and aquatic habitats, including characteristic Carolinian forests, pine – oak woodlands, dune ecosystems, prairies and savannahs, deciduous swamps, marshes, fens and other rich wetland communities. Species at Risk thrive in a variety secure habitats, which contribute to the overall connected matrix of natural cover. Natural cover is restored, particularly in areas of the Huron Slope, in order to connect fragmented natural areas and river and stream corridors. Stewardship and site management focuses on further conserving and enhancing the biodiversity value of the area. The local community takes pride in the area and members from all sectors and heritage participate in stewardship and conservation. Relationships between conservation partners are strong and reciprocal, allowing for maximum success in conservation efforts across the interconnected, 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 Ausable River – Kettle Point to Pinery Natural 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 Natural Area.

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

Table 3.1 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.

Conservation Objectives	**Targets Addressed**[4]
1. Create natural heritage plan for Lambton / Lambton Shores that is incorporated into next Official Plan.	All
2. Engage key rural landowners with (particularly terrestrial) SAR habitat in good stewardship practices.	All
3. Reduce invasive species impacts on sand dunes by 50% by 2020.	ODSB
4. Restore 50% of degraded sand dunes and beaches in the CAP shoreline by 2015.	ODSB
5. Reduce vehicle impacts on dune and beach ecosystems by 100% by 2020.	ODSB
6. No net increase in invasive species cover in logged woodlands over next five years.	DOPW, FOR
7. Provide 100% of private woodlot owners and registered forestry practitioners with information materials on SAR within two years.	DOPW, FOR
8. Fill knowledge gaps re: Heart-leaved Plantain.	HLP
9. Build capacity of stakeholders and 100% of landowners of seven priority terrestrial SAR occurrences to undertake appropriate management for SAR by 2012.	FOR, ODSB, DOPW, PS
10. Establish partnership initiatives 50% of landowners with existing Environmental Farm Plans to facilitate implementation of specific stewardship activities identified in Best Management Practices by 2015.	FOR, SW, RS, CW, HLP, FRA
11. Build relationships with Chippewas of Kettle and Stony Point First Nation (KSPFN) with regard to SAR protection, conservation and recovery.	ODSB, DOPW, FOR, SW, RS, CM, HLP
12. Implement prairie and savannah restoration at ecologically appropriate sites.	PS

[4] 1. Riparian Systems (including Old Ausable Channel) (RS)
2. Open Dunes and Sand Beaches (ODSB)
3. Dry Oak – Pine Woodlands (DOPW)
4. Prairies and Savannahs (PS)
5. Coastal Marshes (CM)
6. Meadow Marshes and Fens (MMF)
7. Swamps (SW)
8. Forests (FOR)
9. Heart-leaved Plantain / False Rue-anemone (HLP / FRA)

Conservation Objectives	Targets Addressed [4]
13. Include seasonal concentration sites (e.g., hibernacula, gestation sites, staging areas) in Official Plans.	Nested reptile SAR within ODSB, MMF, CM, ODSB, DOPW, FOR, SW, RS
14. Significantly reduce recreational impacts on sand dunes at Pinery Provincial Park by 2015.	ODSB
15. Ensure that high potential invasive species do not colonize dune ecosystems.	ODSB

Based on the urgency of need, the lead agency of this CAP, the Ausable Bayfield Conservation Authority (ABCA), has identified the following priorities for action:

1. Ensure delivery of all relevant natural heritage information to Municipality of Lambton Shores for incorporation into new Official Plan.
2. Accurate, up-to-date mapping of SAR occurrences to prioritize sites and landowners for action.
3. Identification of species-specific management needs for Best Management Practices (BMPs).
4. Adequate funding and long term human resources to build relationships with the rural landowner community (i.e., a permanent Community Liaison position).

Based on existing opportunities and community support, the ABCA has also prioritised the focal project areas for action within the CAP boundary as follows:

1. Port Franks (Huron Fringe)
2. Old Ausable Channel (Huron Fringe)
3. Kettle and Stony Point First Nation (Huron Fringe)
4. Ausable River Valley (Huron Slope)
5. Woodlots (Huron Slope)

Table 3.1 Summary of Conservation Objectives, Strategic Actions, Action Steps and Timelines

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed	Recovery Strategy Links	Lead	Action Steps Completed (Description & Date)	Site / Species Monitoring (Description & Date)	Recovery Teams Notified (List & Date)
URG F&S	1	Assist Municipality of Lambton Shores identify critical natural heritage sites for next O.P. (by April / May 2009)	1. Confirm timelines for O.P. (immediate) 2. Bring together conservation plans and initiatives that already exist or are in progress Recovery Strategies, Ausable Management Plans, etc. (immediate) 3. Identify priority natural heritage features (including SAR locations, ANSIs, PSW's) for CAP area (by April / May 2009). 4. Produce mapping that identifies and prioritizes natural heritage features in the CAP area within (by April / May 2009). 5. Identify significant woodlands based on provincial criteria and provide to Lambton Shores (by December 2010)	All	CWRS; Ausable River; Eastern Hognose; Pitcher's Thistle - Lake Huron Dune Grasslands; Acadian Flycatcher - Hooded Warbler; Prothonotary Warbler	ABCA	Terrestrial SAR inventory surveys completed on ABCA lands in summer 2009. ABCA continuing to work in the OAC: completed a SAR fish survey in summer 2009. Draft Natural Heritage mapping to inform Lambton Shores OP completed in summer 2009 and provided to municipality. ON SCHEDULE	Water quality monitoring conducted in summer 2009 and is ongoing.	CWRT (Feb 2010)
URG F & S	1	Assist Municipality of Lambton Shores identify critical natural heritage sites for next O.P. (by April / May 2009)	Provide standard criteria for identifying significant natural heritage features to Lambton Shores (by April / May 2009).	All	CWRS; Ausable River; Eastern Hognose; Pitcher's Thistle - Lake Huron Dune Grasslands; Acadian Flycatcher - Hooded Warbler; Prothonotary Warbler	ABCA & other CAP partners	As part of the NH mapping standard, criteria for identifying NH features was established by CAP team (primarily ABCA) with municipality. ON SCHEDULE (completed)	n/a	CWRT (Feb 2010)

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed	Recovery Strategy Links	Lead	Action Steps Completed (Description & Date)	Site / Species Monitoring (Description & Date)	Recovery Teams Notified (List & Date)
URG F & S	1	Develop criteria and terms of reference for Environmental Impact Assessments for next Lambton Shores O.P.	1. Provide standardized EIA criteria to Lambton Shores (April / May 2009) 2. Include recommendations for compact form, walkways, cycle lanes, public transport etc. into municipal and park plans in next Lambton Shores O.P. (April / May 2009). 3. Encourage "energy friendly" technology in new developments and renovations in next Lambton Shores O.P. (April / May 2009).	All	CWRS; Ausable River; Eastern Hognose; Pitcher's Thistle - Lake Huron Dune Grasslands; Acadian Flycatcher - Hooded Warbler; Prothonotary Warbler	Jane Bowles	NOT STARTED	n/a	n/a
URG F & S	2	Secure permanent or long-term funding for Community Liaison position (by 2010).	1. Identify appropriate agencies, sponsors and fund-raising method(s), acquire funding and hire staff. 2. Identify, map and prioritize key properties for landowner stewardship education and outreach. 3. Work closely with landowners to protect and enhance SAR habitat and other important ecological functions.	All	All	CAP Team	NOT STARTED	n/a	n/a

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed	Recovery Strategy Links	Lead	Action Steps Completed (Description & Date)	Site / Species Monitoring (Description & Date)	Recovery Teams Notified (List & Date)
URG F	3	Raise public awareness re: notification and reporting of invasive aliens.	1. Support LHCCC applications for funding to conduct invasive species control on dunes. 2. Undertake invasive species management on beaches and dunes.	All	CWRS; Ausable River; Pitchers Thistle - Lake Huron Dune Grasslands	Lake Huron Centre for Coastal Conservation	Removal of terrestrial invasive species completed in summer 2009 on ABCA lands. ABCA has applied for funding to work with the local Port Franks garden club to establish 3 native plant gardens, as well as provide info on native plants in 2010. ON SCHEDULE	Unkn.	CWRT (Feb 2010)
URG F	4	Increase public awareness and engagement relating to good dune stewardship practices.	1. Develop beach and dune stewardship guides for 3 additional communities (Huron Woods, Southcott Pines, Beach O' Pines). [Public meeting for whole CAP area, with breakout committees for local communities.] 2. Identify target areas for improvement by 2011. 3. Implement Beach and Dunes Stewardship Guide.	OD SB	Pitchers Thistle - Lake Huron Dune Grasslands	ABCA / Lake Huron Centre for Coastal Conservation	Technical advisory meeting held in August 2009 and public meeting held in September 2009 to start the process of gathering information and developing a community based biodiversity strategy for the Port Franks area Background info document is being developed for the Port Franks strategy A neighborhood steering committee to assist with the strategy was assembled and met in December 2009 to address biodiversity issues. This group will meet again in 2010. ABCA has applied for funding to work with the local Port Franks garden club to establish 3 native plant gardens, as well as provide info on native plants in 2010. ON SCHEDULE	Unkn.	CWRT (Feb 2010)

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed	Recovery Strategy Links	Lead	Action Steps Completed (Description & Date)	Site / Species Monitoring (Description & Date)	Recovery Teams Notified (List & Date)
URG F	5	Mitigate vehicle impacts on dune and beach ecosystems by 100% by 2020.	1. Incorporate off-road vehicle by-law into Lambton Shores Official Plan. 2. Ensure appropriate regulations in Pinery management plans. 3. Ensure appropriate enforcement of by-laws and regulations.	OD SB	Pitchers Thistle - Lake Huron Dune Grasslands	Ontario Parks / LHCCC	Draft Official Plan (2009) calls for elimination of off-road vehicles from dunes. Effective enforcement measures need to be addressed. Need for vehicle access to beach by Ontario Parks staff at Pinery also needs to be addressed. AHEAD OF SCHEDULE	Unkn.	CWRT
URG F & S	6	Participate in forest management plans. Implement hygienic practices for logging equipment, machinery. Ensure logging is undertaken at appropriate seasons. Lobby, assist municipalities with by-law amendments. Educate foresters regarding invasive species and practices, prepare educational materials, hold workshops, etc.	1. Audit sites prior to, immediately after, and 3 years after, logging to establish baseline information on extent of invasive species cover (include in management plans). 2. Create buffers around existing invasive species patches to prevent their spread. 3. Restrict logging roads and skidder trails (ensure that skidder trails do not cross invasive species patches). 4. Set up demonstration plots to showcase good forest management practices. 5. Prepare SAR information packages and surveys for woodlot owners and forestry practitioners. 6. Mail information package and survey for stakeholder interest in protecting SAR. 7. Give presentation on SAR to woodlot owners at workshop.	F	CWRS; Ausable River; Acadian Flycatcher - Hooded Warbler; Prothonotary Warbler	t.b.d.	NOT STARTED	n/a	n/a

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed	Recovery Strategy Links	Lead	Action Steps Completed (Description & Date)	Site / Species Monitoring (Description & Date)	Recovery Teams Notified (List & Date)
URG F & S	8	Determine extent of canopy closure required for reproduction, survival, etc. Identify appropriate means to undertake study (literature search, academic research and/or consultant)	1. Develop project plan. 2. Acquire support and funding. 3. Undertake research and publish results.	HLP	CWRS; Heart-leaved Plantain	t.b.d.	In 2009, ABCA completed a succession study with the U of Waterloo.	n/a	CWRT (February 2010)
URG F & S	9	Provide stakeholders, landowners and medicinal users with Best Management Practices (BMPs) document by April 2011.	1. Develop priority species list. 2. Conduct research for existing BMP materials and relevant information. 3. Write and publish BMPs. 4. Distribute BMPs to First Nation, stakeholders and landowners.	HLP, FRA + 5 SAR	CWRS + others	CCC, ABCA, OMNR	NOT STARTED; SLIGHTLY BEHIND SCHEDULE	n/a	CWRT (February 2010)

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed	Recovery Strategy Links	Lead	Action Steps Completed (Description & Date)	Site / Species Monitoring (Description & Date)	Recovery Teams Notified (List & Date)
NEC S	10	Engage agricultural community in Conservation Action Planning and implementation.	*Ongoing:* 1. Develop mail-outs and newspaper ads to advertise funding initiatives that already exist. 2. Find ways to provide financial incentives to small operators. 3. Involve local Federation of Agriculture members in the CAP implementation process. 4. Sponsor and/or organize an Environmental Farm Plan workshop. 5. Provide support to existing agricultural organizations. 6. Education – pick specific items to target for funding incentives (*e.g.,* other land uses).	All	CWRS; Ausable River; Eastern Hognose; Pitcher's Thistle - Lake Huron Dune Grasslands; Acadian Flycatcher - Hooded Warbler; Prothonotary Warbler; Queen Snake	ABCA / Ausable River Aquatic SAR Recovery Team	ABCA has applied for funding from the federal Habitat Stewardship Program and MNR SAR stewardship program to provide education and information regarding SAR for 2010-2011 ON SCHEDULE	n/a	CWRT (February 2010)
NEC S	11	Share knowledge relating to conservation and SAR with the KSPFN community. Assist KSPFN in acquiring funding for SAR and conservation projects.	1. Meet with KSPFN to determine appropriate strategies, actions and timelines (by January 2010).	All KSPFN SAR	CWRS, Pitcher's Thistle – Lake Huron Dune Grasslands	CCC, ABCA	ABCA has made initial contact with FN community and hope to meet and share knowledge (winter 2010) and possibly work on a collaborative funding proposal for 2011. RT member participated in SW Ontario First Nations SAR Working Group meetings hosted by Chippewas of Kettle and Stony Point. ON SCHEDULE	n/a	CWRT (February 2010)

Importance: Fringe / Slope	Objective(s)	Strategic Action(s)	Action Steps / Timelines	Target(s) Addressed	Recovery Strategy Links	Lead	Action Steps Completed (Description & Date)	Site / Species Monitoring (Description & Date)	Recovery Teams Notified (List & Date)
NEC F & S	12	Raise public awareness regarding historic prairie and savannah ecosystems and fire management techniques.	1. Identify historic prairie and savannah sites and assess restoration potential. 2. Conduct prescribed burns at key degraded prairie sites.	PS	Tallgrass	Rural Lambton Stewardship Network / +?	ABCA completed a succession study with the U of Waterloo ON SCHEDULE	Yes; succession study may provide baseline information for future restoration sites.	CWRT (February 2010)
NEC F & S	13	Conduct research of existing knowledge and inventory to identify concentration sites.	1. Secure funding by April 2010. 2. Conduct research and inventory and produce report and mapping by January 2011. 3. Provide mapping to appropriate agencies (municipalities, CA's) by January 2011.	Faunal SAR	Eastern Hognose; Multi-species Turtles		For 2010: ABCA has applied for funding to conduct SAR turtle presence absence surveys, and to provide SAR education in Port Franks in hopes of engaging residents in a turtle monitoring network ON SCHEDULE	Will be addressed through planned survey work, if funded.	CWRT (February 2010)
NEC F	14	Turn Pinery Parking lots 90 degrees to reduce trampling on dunes.	1. Meet with Ontario Parks staff to discuss feasibility and methods. 2. Identify leads, staffing and funding to undertake the actions NEC. 3. Implement changes.	ODSB	Pitchers Thistle - Lake Huron Dune Grasslands	Ontario Parks	NOT STARTED	n/a	n/a
BEN F & S	15	Assess likelihood of potential invasions based on other Great Lakes dune systems.	1. Research means to prevent invasion.	ODSB	Pitcher's Thistle – Lake Huron Dune Grasslands		NOT STARTED	n/a	n/a

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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
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 (e.g., 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 (e.g., 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 (e.g., G2?) to express minor uncertainty, or a range rank (e.g., G2G3) may be used to delineate the limits (range) of uncertainty.
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.

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

Rank	Definition
T#	**Infraspecific Taxon** (trinomial)—The status of infraspecific 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 infraspecific 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 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 **SX**	**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.
NH **SH**	**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.
N1 **S1**	**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.
N2 **S2**	**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.
N3 **S3**	**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.
N4 **S4**	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
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
SU	conflicting information about status or trends.
NNA	**Not Applicable** —A conservation status rank is not applicable because the species is not a
SNA	suitable target for conservation activities.
N#N#	**Range Rank** —A numeric range rank (e.g., S2S3) is used to indicate any range of
S#S#	uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
Not	Species is known to occur in this nation or state/province. Contact the relevant natural
Provided	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.

		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: Natural Heritage Designations in the Ausable River – Kettle Point to Pinery Natural Area

Natural Area Name	Fringe / Slope	Natural Heritage Designation	Size (ha)
Parkhill Conservation Area	Slope	CAA	461.0
Port Franks Conservation Area	Fringe	CAA	3.0
Thedford Conservation Area	Slope	CAA	0.0
Port Franks Wetlands and Forested Dunes	Fringe	CCS	638.05
Ausable River Valley	Slope	CCS	1721.6
Kettle Point	Fringe	ES-ANSI	1.0
Thedford Brickyard	Slope	ES-ANSI	10.0
Kettle Point First Nation	Fringe	FNR	ca 400.0
Port Franks Forested Dunes	Fringe	IBA	6,200.0
Thedford Flats	Slope	IBA	1,000.0
Pinery Provincial Park- Burley Property and Adjacent Areas	Fringe	IBP	95.1
Ausable River Valley Complex – North Section	Slope	IBP	662.4
Parkhill Mud Creek Swamp	Slope	IBP	62.7
Pinery Provincial Park – Castilleja Meadow	Fringe	IBP	34.0
Pinery Provincial Park – Hickory Nature Trail	Fringe	IBP	39.7
Pinery Provincial Park – Wilderness Area No. 1	Fringe	IBP	95.5
Pinery Provincial Park – Wilderness Area No. 2	Fringe	IBP	47.3
Pinery Provincial Park – Wilderness Area No. 3	Fringe	IBP	8.5
Pinery Provincial Park – Wilderness Area No. 4	Fringe	IBP	115.3
Thedford Marsh Forest	Slope	IBP	60.7
Ipperwash Beach Ridges and Swales	Fringe	FORMER LS-ANSI	400.0
FORMER Ipperwash Provincial Park	Fringe	FORMER LS-ANSI	4.0
FORMER Ipperwash Military Reserve	Fringe	FORMER LS-ANSI	0.0
FORMER Ipperwash Provincial Park	Fringe	FORMER PP-R	55.8
Ausable River	Slope	LS-ANSI	1780.0
McGillivary Township Lowland Forest	Slope	LS-ANSI	280.0
Pinery Provincial Park	Fringe	LS-ANSI	1200.0
Port Franks Wetlands and Forested Dunes	Fringe	LS-ANSI	480.0
Maylard (partner owned)	Fringe	NCC Property	15.5
Watson	Fringe	NCC Property	59.5
Van Valkenburg-Warnez	Fringe	NCC Property	24.0
Mud/Jericho Creek Woodlot	Slope	LS site	130.0
Pinery Provincial Park	Fringe	PP-NE	2532.19
Pinery Provincial Park – Nature Reserve Zone 1	Fringe	PPZ-NR	370.0
Pinery Provincial Park – Nature Reserve Zone 5	Fringe	PPZ-NR	1.5
Port Franks Wetland	Fringe	PSW	123.0
Thedford Swamp	Slope	PSW	19.0
McGill 4 – Wetland	Slope`	Wetland	52.0
McGill 24 – Wetland	Slope	Wetland	77.5
Ausable River North	Slope	LS Site	200.0
Parkhill Woods	Slope	LS Site	?
South Greenway Woodlot	Slope	LS Site	160.0
South Moray Woodlot	Slope	LS Site	160.0
South Parkhill Creek Woods	Slope	LS Site	64.0
Sylvan Creek Woods	Slope	LS Site	80.0
Thedford Bog	Slope	LS Site	198.0
West Parkhill Creek Woods	Slope	LS Site	200.0

The Pinery Provincial Park Dune Forest	Fringe	WA	52.43
The Pinery Provincial Park Floodplain	Fringe	WA	10.12
The Pinery Provincial Park Forest	Fringe	WA	79.76
The Pinery Provincial Park Shore	Fringe	WA	30.36

APPENDIX C. RECOMMENDED ACTIVITIES IN AVAILABLE RECOVERY STRATEGIES FOR SAR OF THE AUSABLE – KETTLE POINT – PINERY AREA

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	**Carolinian Woodlands**	**Heart-leaved Plantain**	**Butternut**	**Acadian Flycatcher / Hooded Warbler**	**Prothonotary Warbler**	**Eastern Hog-nosed Snake**	**Pitcher's Thistle**	**Tallgrass**	**Eastern Foxsnake**	**Ausable River Aquatic**	**Ausable River Aquatic - Fishes**	**Ausable River Aquatic - Mussels**	**Black Redhorse**	**Lake Chubsucker**	**Pugnose Shiner**	**Spiny Softshell**
Recovery Strategy Status (A=available; AP=part of ecosystem strategy; D=Draft)	**D**	**D**	**A**	**A**	**A**	**A**	**D**	**D**	**D**	**A**	**A**	**A**	**AP**	**AP**	**AP**	**AP**
Habitat Type	**FW**	**FW**	**FW**	**FW**	**SW**	**FW, SD, TE**	**SD**	**PS**	**FW, WA**	**WA**	**WA**	**WA**	**WA**	**WA**	**WA**	**WA**
Habitat Threats / Viablity Assessment	H	H				H	H		M	H	H	H				H
Update NHIC & central databases			H			H	M	X	H	M						
Inventory		H	H			H	H	X	H			M	H	H	H	H
Standardized habitat classification & mapping			M		H	H	H			H	H	H	H			H
Identify priority sites & landowners	H				H		H	X	H							
Review geomorphological data							M			M						
Ecosystem modeling										H						
PVA / MVP		M	M				M		H							
Investigate Road Impacts									H	L						
Investigate recreational impacts	H															
Investigate shoreline modification impacts / coastal processes							M									
Investigate Invasive plant Impacts	H		L		H											

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	Carolinian Woodlands	Heart-leaved Plantain	Butternut	Acadian Flycatcher / Hooded Warbler	Prothonotary Warbler	Eastern Hog-nosed Snake	Pitcher's Thistle	Tallgrass	Eastern Foxsnake	Ausable River Aquatic	Ausable River Aquatic - Fishes	Ausable River Aquatic - Mussels	Black Redhorse	Lake Chubsucker	Pugnose Shiner	Spiny Softshell
Investigate invasive aquatic spp. Impacts																
Locate & monitor disease-resistant plants			H													
Research mechanisms to control disease			M													
Investigate deer impacts	H						H									
Investigate invasive insect impacts	H				H		M									
Investigate baitfish harvest impacts																
Investigate impacts of alterations to drainage	H									M						
Survey with other SAR						H										
Gather TEK / ATK			M													
Investigate commercial Supply & Demand						L										
Demographic, genetic studies, dispersal, pop`n modeling		M	M			H	H		L			H				L
Investigate impacts of contaminants					L	L			M	H		M				
Investigate base flows, precip. Levels, water taking										H						
Investigate climate change impacts					M											
Conduct dam inventory										L						
Crayfish surveys																L
Investigate Common Carp control														H	H	

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	Carolinian Woodlands	Heart-leaved Plantain	Butternut	Acadian Flycatcher / Hooded Warbler	Prothonotary Warbler	Eastern Hog-nosed Snake	Pitcher's Thistle	Tallgrass	Eastern Foxsnake	Ausable River Aquatic	Ausable River Aquatic - Fishes	Ausable River Aquatic - Mussels	Black Redhorse	Lake Chubsucker	Pugnose Shiner	Spiny Softshell
Investigate conservation tillage, sustainable agriculture, soil restoration								X								
Investigate wintering habitat trends					H											
Investigate reintroduction opportunities		L					M					M				
Investigate Best Management Techniques	H							X								
Monitor Management Techniques				X												
Ensure confidentiality of EO data					L				H							
Initiate Public Reporting Program			H			H			M							
Develop & Apply Monitoring protocol	H	M	H		H	H	M	X	H	H				H	H	H
Monitor slumping impacts																
Develop & Distribute BMPs	H	H		X		H		X	M							
Input into Official Plans, etc.	H					H	M	X	H							
Develop appropriate EIS guidelines	H								M							
Identify key restoration sites	H	M			H			X	M							
Restore sites using appropriate techniques	H	M		X	H			X	M							
Restore historic sites		M						X								
Restore Habitat linkages	H							X	M							
Create vegetated buffers along waterways										H						
Establish windbreaks										M						
Encourage cover crops	M									M						

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	**Carolinian Woodlands**	**Heart-leaved Plantain**	**Butternut**	**Acadian Flycatcher / Hooded Warbler**	**Prothonotary Warbler**	**Eastern Hog-nosed Snake**	**Pitcher's Thistle**	**Tallgrass**	**Eastern Foxsnake**	**Ausable River Aquatic**	**Ausable River Aquatic - Fishes**	**Ausable River Aquatic - Mussels**	**Black Redhorse**	**Lake Chubsucker**	**Pugnose Shiner**	**Spiny Softshell**
Retire fragile farmland										M						
Restrict livestock access	M									H						
Encourage green manure crops										L						
Encourage low tillage	M									L						
Support informed wetland creation projects										H						
Support habitat improvement projects								X		L						
Support development of EFPs	M									M						
Nest box program					H											
Expand / Enhance Forest Interior	H			X												
Identify / Increase Older Growth Forests	M			X												
Develop & Distribute Appropriate Forest / Woodlot Management Guidelines	H		H	X	H											
Reduce Forestry Impacts	H			X												
Develop Guidelines for Managing Succession in Conifer Plantations				X												
Develop & implement management plans	H				H		M	X								
Restrict Development on public lands																
Signage						H	M		H							
(Temporary) road closures							H		H							
Discourage use of mesh silt fences									H							
Reduce invasive species impacts	H				H											

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	Carolinian Woodlands	Heart-leaved Plantain	Butternut	Acadian Flycatcher / Hooded Warbler	Prothonotary Warbler	Eastern Hog-nosed Snake	Pitcher's Thistle	Tallgrass	Eastern Foxsnake	Ausable River Aquatic	Ausable River Aquatic - Fishes	Ausable River Aquatic - Mussels	Black Redhorse	Lake Chubsucker	Pugnose Shiner	Spiny Softshell
Discourage use of exotic bait species										H				M	M	
Reduce trail / off-trail impacts	H				L		H									
Encourage natural shoreline processes							L									
Ensure natural water supply and flow regimes										H?						
Collect seed and propagate plants			H													
(Re-)introduce to enhance populations							L									
Liaise with First Nations		H				X		X								
Collaborate with other conservation initiatives (e.g. CWRS)	H	M					M	X		H						M
Integrate SAR communications	H				M	X		X	H	H						
Integrate SAR enforcement			H			X	M									
Apply / Promote Property Tax Incentives	H			X	H		M	X								
"Soft" Incentives to Protect Forest Habitat				X	H											
Secure Key Sites through Easements and Acquisition		L		X		X		X	H							
Use Carbon Offset Programs to Increase Habitat				X												
Forest Certification				X												
Prepare landowner rights & trespass materials										M						

Habitat Key: FW = Forests & Woodlands SW = Swamp Forests PS = Prairies & Savannahs TE = Thickets & Edges SD = Sand Dunes & Beaches WA = Open Wetland & Aquatic	Carolinian Woodlands	Heart-leaved Plantain	Butternut	Acadian Flycatcher / Hooded Warbler	Prothonotary Warbler	Eastern Hog-nosed Snake	Pitcher's Thistle	Tallgrass	Eastern Foxsnake	Ausable River Aquatic	Ausable River Aquatic - Fishes	Ausable River Aquatic - Mussels	Black Redhorse	Lake Chubsucker	Pugnose Shiner	Spiny Softshell
Prepare & Distribute Educational Materials	H	H	H	X	H		H	X	H	M						
Educate Commercial interests (pet trade, nurseries, horticulturalists, landscapers)	H					X										
Conduct Information Sessions	H			X			M			M						
Deer population control	H						M									
Canada Goose / Wild Turkey Management							M									
Support development of protective legislation	H							X	H							
Support CO's in prosecution									H							
Support permitting requirements for research in SAR habitat									L							
Recognize good stewards							M	X								
Develop communications strategey			H	?				X	?	M						
Rank / evaluate conservation methods	H															
Develop / improve protective policies (e.g., Drainage Act)	H	H	M													
Restrict movement of plants	M															
Wastewater treatment upgrades										M						
Require spring fish surveys on proposals to impact intermittent watercourses										M						

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Nutrient & manure management plans										H						
Pursue long term funding sources for recovery										H						
Disease diagnosis of roadkills										L						
Establish Tallgrass Institute, maintain Tallgrass Ontario								X								
Partnerships with academia	H															
Training program for conservation practioners	H															
Update Big Picture / NH mapping	H															
Determine effective invasive spp. Controls	H															
Community-based CAPs	H															
Evaluate & improve protected area management activities	M															
Promote better controls at border crossings	M															
Support environmental lobbying	M															