



Canadian Herpetological Society
Société d'Herpétologie du Canada

Important Amphibian and Reptile Areas Nomination Form

THOUSAND ISLANDS ECOSYSTEM

Part 1: IMPARA Criteria:

The Important Amphibian and Reptile Areas Program (IMPARA) Site Criteria are intended to be guidelines for identifying the importance of a site, and are somewhat flexible, depending on the specifics of the site. These criteria are intended to be the first step in a dialogue between the nominator and CHS.

Sites may be nominated based on one or more of the following criteria:

1. Sites containing species of conservation concern
2. Sites containing a high diversity of species
3. Sites that fulfill important life history function for aggregations of species

1. Species of Conservation Concern

A site that is nominated under this criterion must contain a significant number of individuals of a species that is of conservation concern at one or more of the following levels:

- Globally designated as Critically Endangered, Endangered or Vulnerable by the International Union for the Conservation of Nature ([IUCN](#)).
- Nationally designated as at-risk (Endangered, Threatened, and Species of Special Concern) by the Committee on the Status of Endangered Wildlife in Canada ([COSEWIC](#))
- Provincially/territorially designated as at-risk by: COSEWIC, a provincial government or other designated group that assesses the status of species within a province, or a provincial/regional Conservation Data Centre.

Defining what is meant by a "significant" number of individuals of any species is difficult given the diversity of life histories, geographic distributions and abundances of amphibians and reptiles. Here are two methods to define a significant number of individuals:

- The site holds greater than or equal to 1% of a species' Canadian population.
- The site is one of 50 or fewer sites, or is one of the 50 most important sites supporting the Canadian population of a species.

These three methods require different qualities and quantities of information. They reflect the reality that a great deal is known about some species of amphibians and reptiles, and relatively little about the majority. Therefore, we encourage nominators to include as much information as they can in their nomination. For example, when it is possible to estimate the number of

individuals at a site as well as in all of Canada, then method 1 should apply. Otherwise, if the total number of sites at which the species occurs is known, method 2 should apply. Sites from which a species has been extirpated may also be nominated if habitat restoration and/or re-introductions are underway or planned.

CHS uses the broad definition of a species used by COSEWIC, which defines species as, "Any indigenous species, subspecies, variety or geographically defined population of wild fauna and flora."

2. High Diversity of Species

A site that is nominated under this criterion regularly holds a large proportion of the amphibian and/or reptile species known to be present within the nation, province/territory, region, or another spatial scale. The goal of this criterion is to identify sites that contain higher than average numbers of species. Species diversity varies significantly from region to region across Canada, and lower latitudes generally have more species than higher latitudes. This means that a significant proportion of the herpetofauna in one region may be relatively insignificant in another region, and vice versa. Therefore, it is up to the nominator to define the geographic scale (i.e. national, provincial/territorial, regional, or other) under consideration, and to demonstrate how the site's diversity is relatively high.

Nominators may also choose to make their case based on various taxonomic levels. For example, the site may hold a large proportion of the province's snake species.

3. Important Life History Requirements

A site that is nominated under this criterion is used by exceptionally large numbers of amphibians and/or reptiles that aggregate for the purpose of completing some life history activity such as reproduction, hibernation, or thermoregulation (e.g. communal hibernation sites, vernal breeding ponds). The nominator should define the geographic scale at which this site should be considered important. Nominators should also provide evidence supporting their claim that the aggregation of a species at the site is exceptionally large.

Other Considerations

Important Amphibian and Reptile Areas must have clear boundaries (geographical or political), and must be large enough to potentially support self-sustaining populations. However, they should also be small enough that they form units amenable to locally-oriented conservation and restoration. While areas that already protect amphibian and reptiles (i.e., parks and conservation areas) are obvious candidates for IMPARA designation, it is also important to nominate areas that are not currently protected.

Part 2: Nomination Form

Personal Information

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Name: Josh Van Wieren
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Location

Site names: Thousand Islands Ecosystem
Province/Territory: Ontario
County/Region/District(s): Frontenac Arch Biosphere Reserve, Frontenac County and Leeds and Grenville United Counties
Closest City/Town: Kingston and Gananoque (W), Athens (N), Brockville (E)
UTM/Geographical Coordinates: 44° 25' 45.46" N, 76° 06' 27.16" W
Directions to Site: These directions also define the boundary of the proposed area. From Brockville, take highway 29 northwest and turn southwest on 30. Regional road 30 connects to highway 42 leading to Athens. The proposed area stretches just north of Athens, but for purposes of this description will be used as the northern boundary. Carry along Hwy 42 until it merges with regional road 33 (alongside Little Brockville Lake). Merge onto highway 15, and travel south to Kingston. The suggested southern boundary line for this IMPARA is the Canadian portion of the St. Lawrence River from Kingston to Brockville.

Maps see Figure 1

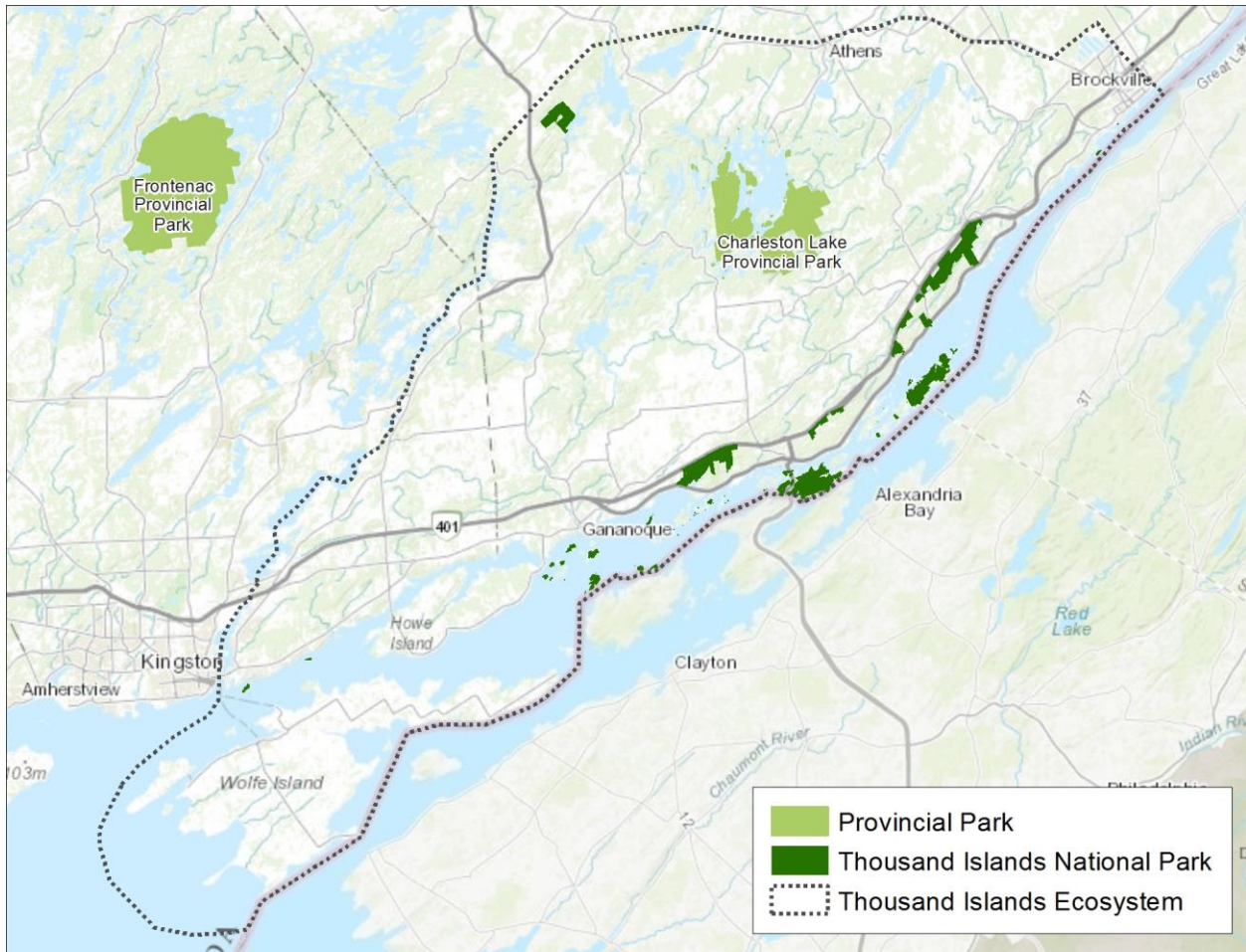


Figure 1 Location of the Thousands Islands Ecosystem (delimited by dotted line) along the north shore of the St. Lawrence River upstream of Kingston, Ontario. The area encompasses Charleston Lake Provincial Park and the Thousand Islands National Park.

Physical Description

Area (please specify units): Approximately 2,000 km²

Please describe the site, providing information of habitat type, vegetation type, presence and type of water bodies:

The Thousand Islands Ecosystem (TIE) IMPARA is a large parcel of land representing the intersection of the Frontenac Arch and the St. Lawrence River valley. The region is composed of 33% forest cover, 20% cropland, 14% pasture, 10% wetlands, 22% open water, and 1% urban development (Quesnelle *et al.* 2013). This area joins the boreal forest of the Canadian Shield to the forests of the Adirondack Mountains in the southeast (Quinby *et al.* 1999). The area includes two important migration corridors for flora and fauna. The first is the north/south corridor along the granite bridge between the Canadian Shield and the Adirondack Mountains that provides a close knit network of islands and intact tracts of conserved natural lands. The site also functions as an east/west corridor of habitat along the St. Lawrence River valley especially important for aquatic organisms. The region contains components of five forest zones: the Atlantic Coastal,

Appalachian, Northern Boreal, Great Lakes-Saint Lawrence Lowland and Carolinian fore (Andrews *et al.* 2012). This combination of features makes the Thousand Island Ecosystem a hotspot for biodiversity. As such the Frontenac Arch Biosphere, which overlaps much of the same land areas as the TIE, was created by UNESCO in 2002 because of its unique geographic features and high biodiversity.

The areas of granite rock have mainly podzolic soil however this IMPARA site also contains areas of limestone rock formations to the east and west that support less acidic luvisolic soils. Each of these soil types supports unique vegetation communities.

The land is marked by the passing of glaciers 10,000 years ago (Larson and Schaetzel 2001). The Thousand Islands experience a moderated climate due to their proximity to the Great Lakes and situation within the St. Lawrence River. Many species of plants and animals reach their northern range limits in this regional climatic zone (Parks Canada, 2009). The islands aid in plant and animal migration, dispersal, and intermingling as they represent biological stepping stones and help to form various metapopulations (Lomolino 1982, Parks Canada 2009).

The Thousand Islands Ecosystem and Thousand Islands National Park (TINP) supports three large water bodies: the St. Lawrence River, Charleston Lake and the Gananoque River. There are numerous smaller lakes and diverse wetland types found throughout the area. The wetlands, including marshes, bogs and fens, play a significant role in supporting the wide diversity of species that are found in this area, which are often the focus of conservation efforts.

Land Ownership

If there are five or fewer owners, please list them. Otherwise, an appropriate government representative, such as municipal council or regional district, is sufficient.

Name: Josh Van Wieren, Parks Canada Ecologist
Organization/Affiliation: Parks Canada
Address: 2 County Road 5, RR3
City/Town: Mallorytown
Province/Territory: Ontario
Postal Code: K0E 1R0
Telephone: 613-923-5261 ext. 113
E-mail: Josh.VanWieren@canada.ca

Are the land owners/managers aware of the importance of the site to amphibian and reptile conservation?

Thousand Islands National Park is aware of the importance of the region for amphibian and reptile conservation and are strong advocates for this IMPARA nomination. Parks Canada and its partners have made considerable efforts to communicate information about amphibian and reptile species found in the region, the problems they face, the importance of their conservation, and what landowners can do to protect them. If this site is successfully nominated, Parks Canada will promote its IMPARA status as part of their reptile and amphibian conservation efforts.

There are a variety of conservation groups partnered with Thousand Islands National Park working towards the conservation of this region. The Frontenac Arch Biosphere covers much of the area of the proposed IMPARA and has a variety of outreach and interpretive programs

focused generally on biodiversity, including conservation of amphibians and reptiles. They have conducted a summary of reptile and amphibian occurrences throughout the area with a particular focus on areas that contain species at risk (Andrews *et al.* 2012).

The majority of the land under the proposed TIE IMPARA is privately owned and incorporates some small towns, so it is unknown how aware all landowners are of amphibian and reptile conservation issues.

Are they aware of this site nomination, and if so did they participate in the process?

Parks Canada is one of the proponents of this nomination. However, the majority of landowners under the proposed IMPARA are privately owned lands. Here again, it was not possible to inform all landowners of the nomination process.

Amphibian and Reptile Species

In the table provided, please list all species of amphibians and reptiles recorded at the site, estimated numbers of individuals of each species (if known), and any citations from which information was obtained (include the name of an observer if information is not published). Provide a Literature Cited section at the end of the nomination.

Species	Status (SARA)	No. of Individuals	References
Snakes and Lizards			
Dekay's Brownsnake	Not assessed	Uncommon	ORAA
Gray Ratsnake	Threatened	Hundreds-based on extensive long term monitoring. May be the largest population of Gray Ratsnakes in Canada	Ontario NHIC
Eastern Gartersnake	Not assessed	Abundant	ORAA
Eastern Milksnake	Special Concern	Uncommon	Ontario NHIC
Common Five-lined Skink	Special Concern	Estimated that there is greater than 1% of the Canadian population here.	COSEWIC
Eastern Ribbonsnake	Special Concern	Common	Ontario NHIC
Northern Ring-necked Snake	Not assessed	Hundreds-based on limited surveys	ORAA
Northern Watersnake	Not at Risk	Common	Ontario NHIC
Red-bellied Snake	Not assessed	Dozens to hundreds based on limited	

		surveys	
Smooth Greensnake	Not assessed	Uncommon	ORAA
Turtles			
Blanding's Turtle	Threatened	Hundreds to thousands based on surveys	COSEWIC
Eastern Musk Turtle	Threatened	Uncommon	Ontario NHIC
Midland Painted Turtle	Special Concern	Abundant	COSEWIC
Northern Map Turtle	Special Concern	Common	Ontario NHIC
Common Snapping Turtle	Special Concern	Common	Ontario NHIC
Spotted Turtle	Endangered	Rare	Ontario NHIC
Frogs and Toads			
American Bullfrog	Not assessed	Common	ORAA
American Toad	Not assessed	Common	ORAA
Gray Treefrog	Not assessed	Common	ORAA
Green Frog	Not assessed	Abundant	ORAA
Mink Frog	Not assessed	Rare	COSEWIC
Northern Leopard Frog	Not assessed	Abundant	COSEWIC
Pickerel Frog	Not at risk	Rare	ORAA
Spring Peeper	Not assessed	Common	ORAA
Western Chorus Frog	Threatened	Uncommon	COSEWIC
Wood Frog	Not assessed	Common	ORAA
Salamanders			
Blue-spotted Salamander	Not assessed	Uncommon	ORAA
Common Mudpuppy	Not at risk	Rare	COSEWIC
Eastern Newt	Not assessed	Uncommon	ORAA
Eastern Red-backed Salamander	Not assessed	Common	ORAA
Four-toed Salamander	Not assessed	Rare	COSEWIC
Northern Two-lined Salamander	Not assessed	Rare	ORAA
Spotted Salamander	Not assessed	Common	ORAA

Other Species

Please list other significant non-amphibian and non-reptile species (e.g. rare or endemic) that are present at the site and describe the importance of the site to these species.

Species	Status	Importance of Site	References
Plants			
American Ginseng	Endangered	Found throughout the Thousand Island Region	COSEWIC 2010
Butternut	Endangered	Found throughout the Thousand Island Region	COSEWIC 2010

Blunt-lobed Woodsia	Threatened	Northern range limit, TIE contains some of the few populations in Canada	COSEWIC 2010
Eastern Prairie-Fringed Orchid	Endangered	Northern range limit;	COSEWIC 2010
Deerberry	Threatened	Northern most limit; holds three of the four natural populations and all but two individual plants in Canada. (Parks Canada, 2009)	COSEWIC 2010
Broad Beech Fern	Special Concern		COSEWIC 2010
Swamp Rose Mallow	Special Concern	Northern Extent	
American Water-willow	Threatened	Northern Extent	
Birds			
Eskimo Curlew	Endangered	Migration stop over site	
Eastern Loggerhead Shrike	Endangered	Summer breeding sites	COSEWIC 2010
Henslow's Sparrow	Endangered		COSEWIC 2010
King Rail	Endangered	Northern edge of range	COSEWIC 2010
Golden-Winged Warbler	Threatened	Summer breeding sites	COSEWIC 2010
Least Bittern	Threatened	Breeds in multiple large emergent marsh ecosystems in the area.	COSEWIC 2010
Peregrine Falcon	Special Concern	Uses cliff habitat found in a few undisturbed natural areas in the Thousand Islands Region	COSEWIC 2010
Cerulean Warbler	Endangered	Provides essential plots of S. Great Lakes forest for breeding	COSEWIC 2010
Red Headed Woodpecker	Threatened	Summer nesting and breeding ground and wintering habitat provided by mature forest stands.	COSEWIC 2010

Short-Eared Owl	Special Concern	Wintering ground in southern Ontario marshes and grasslands	COSEWIC 2010
Yellow Rail	Special Concern	Summering grounds; use of shallow marshes for breeding and nesting	COSEWIC 2010
Chimney Swift	Threatened	Found throughout the Thousand Islands Region	COSEWIC 2010
Common Nighthawk	Threatened	Found throughout the Thousand Islands Region	COSEWIC 2010
Whip-poor Will	Threatened	Found throughout the Thousand Islands Region	COSEWIC 2010
Barn Swallow	Threatened	Likely breeding and nesting within park, found throughout the thousand Islands and important migration corridor.	COSEWIC 2010
Horned Grebe	Special concern	Possible nesting, but more likely a migration stop over.	COSEWIC 2010
Bobolink	Threatened	Found throughout the Thousand Islands Region	
Canada Warbler	Threatened	Potential migration stopover	
Eastern Meadowlark	Threatened	Found throughout the Thousand Islands Region	
Eastern Wood Peewee	Special concern	Breeding and nesting within park is likely and found throughout the Thousand Islands Region	
Rusty Blackbird	Special concern	Possible nesting, but more likely a migration stop over	
Wood Thrush	Threatened	Breeding and nesting within park are likely and found throughout the Thousand Islands	

		Region	
Northern Bobwhite	Endangered	Potential refugia for migration and vagrant migration	
Louisiana Waterthrush	Special concern	Possible nesting, but more likely a migration stop over	
Olive-sided Flycatcher	Threatened	Potentially important migration stopover	
Fishes			
Pugnose Shiner	Threatened	This species is found throughout the Thousand Islands Region and may be the largest populations in the country.	COSEWIC 2010
American Eel	Threatened	Freshwater and estuaries used for growth from juvenile into adult form	COSEWIC 2010
Bridle Shiner	Special Concern	Prefers shallow marshes for spawning and locating prey	COSEWIC 2010
Grass Pickerel	Special Concern	Found throughout the Great Lakes – St. Lawrence water system focusing populations in shallow and warm wetlands	COSEWIC 2010
Lake Sturgeon	Threatened	St. Lawrence freshwater system provides essential year-round habitat	COSEWIC 2010
Silver Lamprey	Special Concern	Known to reside year round in the St. Lawrence River portion of the TIETINP	COSEWIC
Mammals			
Eastern Cougar	Data Deficient	Breeding and hunting grounds; present all year	COSEWIC 2010
Gray Fox	Threatened	Preferred habitat mixed deciduous forest and swamp	COSEWIC 2010

Little Brown Myotis	Endangered	Foraging and possible roosting ground.	COSEWIC 2010
Northern Myotis	Endangered	Foraging and possible roosting ground.	COSEWIC 2010
Tri-colored Bat	Endangered	Foraging and possible roosting ground.	COSEWIC 2010
Arthropods			
West Virginia White Butterfly	Not assessed	Spring and summer resident of moist deciduous woods	
Monarch Butterfly	Special Concern	Spring and summer site; uses old farm fields, gardens and similar grassy planes	COSEWIC 2010
Eastern Pondmussel	Special Concern	Found in a few streams in the region that have yet to be invaded by zebra mussels.	COSEWIC 2010

Site Criteria

Under each category, please provide a description of how this site fulfills the Important Amphibian and Reptile Areas criteria (see Part 1). If a category does not apply to this site then simply leave it blank (e.g. if there are no threatened species present then leave the Threatened Species category blank).

1. Species of Conservation Concern:

The Thousand Islands Ecosystem provides crucial habitat for a variety of amphibian and reptile species of conservation concern under SARA (Table 1), as well as a number of vascular plants, birds, fishes, mammals and arthropods fitting the same criteria (Table 2). The proposed IMPARA is inhabited by 10 reptile and amphibian species at risk including: one threatened amphibian, Western Chorus Frog; and 10 reptiles of concern: 3 turtles of special concern (Northern Map Turtle, Common Snapping Turtle, Midland Painted Turtle), 2 threatened turtles (Blanding's Turtle, Eastern Musk Turtle), 1 endangered turtle (Spotted Turtle), 1 lizard of special concern (Common Five-lined Skink), 2 snakes of special concern (Eastern Ribbon Snake and Eastern Milksnake) and 1 threatened snake (Gray Ratsnake).

The Five-lined Skink is Ontario's only species of lizard, and consists of two distinct populations (OMNR 2009, COSEWIC 2010). The Great Lakes – St. Lawrence population resides within the proposed IMPARA and is designated as Special Concern (OMNR 2009, COSEWIC 2010). It is believed, based on geographic range and known sightings, that the proposed site is considered significant, containing greater than 1% of the Canadian population of Five-lined Skink.

Like the Five-lined Skink, there are two Gray Ratsnake populations: Great Lakes-St. Lawrence and Carolinian. The population within this nominated IMPARA is threatened, while the second population is endangered. The granite corridor provides rock outcrops, thin soils and crevasse, creating favourable habitat for the Five-lined Skink and the many species of snakes found in this region. Numerous (>10) Gray Ratsnake hibernacula have been located within this region, underlining the importance of the Thousand Islands Ecosystem and Thousand Islands National Park for the fulfilment of this threatened snake's life history requirements. Based on the range for the Gray Ratsnake in the Great Lakes – St. Lawrence population, and the location of the proposed IMPARA within the range, it can be assumed that the number of hibernacula within it is significant to the population, with far greater than 1% of the Great Lakes – St. Lawrence population residing within the boundaries. The TIE population is arguably the most important population for the species' conservation in Canada.

A brief summary of species who may meet the requirements of this criteria are listed below:

Species	Criteria Met*	Confidence	Notes
Gray Ratsnake	1 and 2	Very confident	Possibly the most important population in the country.
Five-lined Skink	1	Likely	
Blanding's Turtle	1	Very confident	Based on estimated Canadian population of 10,000.
Eastern Musk Turtle	1	Likely	
Northern Map Turtle	1 and 2	Confident	Based on estimated Canadian population of 10,000.

*Criteria 1 = The site holds greater than or equal to 1% of a species' Canadian population; Criteria 2 = The site is one of 50 or fewer sites, or is one of the 50 most important sites supporting the Canadian population of a species.

The proposed Thousand Islands Ecosystem IMPARA encompasses habitat ranges for other species of conservation concern such as the 6 vascular plants (3 endangered, 2 threatened and 1 special concern), 15 birds (5 endangered, 4 threatened, 5 special concern and 1 provincially species concern), 6 fish species (1 endangered, 1 threatened and 4 of special concern), 2 mammals (1 threatened and 1 provincially endangered), and finally 2 arthropods (1 of special concern and 1 of provincial special concern) (Table 2 and Appendix 2). Deerberry is also a plant of national significance and approximately 95% of all individual plants occurring in 3 of its 5 national sites in this proposed IMPARA (Parks Canada 2009).

2. High Species Diversity

A total of 17 amphibian and 16 reptile species occur within the Thousand Islands Ecosystem. This proposed IMPARA is home to over half of Ontario's reptile and amphibian species. Nationally these numbers represent approximately 35% (17/48) of amphibians and 33% (16/48) of the reptiles in Canada (Canadian Herpetological Society, 2018). This is a significant percentage of the national total diversity as the TIE represents 0.0002% (area of TIE / 9093507km² land area of Canada) of the land in Canada (Natural Resources Canada 2009). The site's location on the southern Ontario border means that some southern species reach their northern limit in this region. Due to the unique geographic distribution, this makes the proposed site nationally, provincially and regionally significant in conserving and maintaining species diversity.

On a provincial scale, the Thousand Islands Ecosystem represents an area of exceptional amphibian and reptile diversity (Canadian Forest Service 2007). The majority of areas within the province have less than 10 amphibian and reptile species (Canadian Forest Service 2007).

All 27 species of reptile and amphibians found in the TIE are known to breed and hibernate there. Several species have exceptionally high numbers of critical habitat features such as hibernacula when compared to adjacent areas. In particular, the region is immensely important for Gray Ratsnake. That determination is based on detailed and ongoing monitoring of Gray Ratsnakes in the Thousand Islands National Park and historic monitoring by other conservation partners such as Murphy's Point Provincial Park, and Queen's University.

3. Important Life History Requirements

The granite corridor provides rock outcrops, thin soils and crevasse, creating favourable habitat for over wintering. Numerous (>10) Gray Ratsnake hibernacula have been located within this region, underlining the importance of the Thousand Islands Ecosystem and Thousand Islands National Park for the fulfilment of this threatened snake's life history requirements. Based on the range for the Gray Ratsnake in the Great Lakes – St. Lawrence population, and the location of the proposed IMPARA within the range, it can be assumed that the number of hibernacula within it is significant to the population, with far greater than 1% of the Great Lakes – St. Lawrence population residing within the boundaries. The TIE population is arguably the most important population for the species' conservation in Canada.

Human Impacts

Please describe how human activities are impacting the site and the immediately surrounding areas in the following ways:

- Current site usage (if any), e.g. industrial, residential, farming, logging, camping, recreation, etc. (please indicate relative importance):

This proposed IMPARA covers a large geographic area and consists primarily of privately owned land with a variety of land uses. The waters of the St. Lawrence River are used for both recreational boating and commercial shipping. There are small residential towns in the area. While the area is largely forested compared to other regions of Southern Ontario, there is also some agricultural land use. While only a small proportion of the land in this area is completely protected for conservation purposes the designation as an IMPARA may have a favourable impact on future development in favour of amphibian and reptile conservation.

- Pollution (air, water, light, noise):

This area is characterized by moderate exposure to pollution, particularly in the southern portion of the proposed IMPARA that contains the St. Lawrence River. Pollution stressors from the St. Lawrence River and other aquatic urban sources include the release of sewage and solid waste, boat discharges, acid rain, pesticides, heavy metals and petrochemicals (Parks Canada 2009). Mudpuppies and Snapping Turtles captured downstream of the Thousand Islands Ecosystem in the more contaminated St. Lawrence River east of Cornwall, Ontario have elevated concentrations of mercury and organic contaminants such as PCBs to which they are susceptible (Bonin *et al.* 1995). Mercury concentrations of northern pike in the St. Lawrence River at Thousand Islands have declined since the mid-

70s but are still equivalent to mercury concentrations in the St. Lawrence River at Lake St. Francis Area of Concern (Goulet *et al.* 2007). Twenty percent of the land use within the Thousand Islands ecosystem is agricultural crop production so there is likely some exposure to current use pesticides. Both amphibians and reptiles may be negatively impacted by exposure to current use agricultural pesticides (Lehman and Williams 2010, Pauli *et al.* 2010).

- Threats to habitat (e.g. development, habitat loss or degradation, succession, fire)

Southern Ontario has experienced a high degree of human disturbance with habitat loss due to urban sprawl, agriculture, road construction, and the conversion of land into recreational and trail sites (Quesnelle 2013, ROM and OMNR 2009). Roads pose a significant threat to wildlife in the Thousand Islands Ecosystem (Eberhardt 2009). In a study of road mortality on the 1000 Islands Parkway estimated that 16,700 vertebrates per year are killed along a 37 km stretch of the road between April and October. Most of these mortalities are amphibians, but also included many snakes and turtles, including six listed reptile species (Garrah *et al.* 2015). Road mortality can be particularly egregious on the survival of snake species and are a main contributor to the declines in the Gray Ratsnake and Eastern Milksnake (ROM and OMNR, 2009). Some research on mitigation of road kill in the park has been conducted (Garrah *et al.* 2015, Garrah 2012). Recreational use of sites is estimated to be the largest cause for decline in the Great Lakes-St. Lawrence population of the Five-lined Skink (OMNR, 2009). Threats to wetland integrity in the area include changes in the water level and invasive species, particularly non-native plants.

- Past or current habitat conservation or restoration efforts:

Land acquisition is currently the primary means of habitat conservation in the Thousand Island Ecosystem. Various conservation groups (TINP, Nature Conservancy of Canada, and various Land Trusts) continue to permanently protect land parcels in the nomination area. There is also a strong tradition of stewardship initiatives in the area as well as road mortality mitigations (Garrah 2012), public outreach programs, and interpretive programming. Additionally, some significant restoration projects have been completed / are ongoing in the area (e.g. White-tailed Deer reduction, shoreline restoration, building removals, field restoration and extensive invasive alien plant species removal)

Within TINP a significant number of research initiatives have been completed or undertaken with respect to issues such as hyperabundant wildlife, species at risk (Gray Ratsnakes, Eastern Musk Turtles, Northern Map Turtles, and Deerberry), landowners attitudes and beliefs, ecological land classification inventories, and species habitat modeling (Parks Canada 2010). These initiatives have helped shape the goals with respect to wildlife within the park.

Recommended conservation actions for this area

Please describe any conservation actions that are needed/recommended for this area:

Much of the area of the Thousand Islands Ecosystem has been impacted in the past by human activity. Numerous partners are working to promote the conservation of herpetofauna and other taxa, the primary action areas being land acquisition (TINP, Land Trusts, Nature Conservancy) and road mortality mitigations. TINP worked with various partners to complete a Multi-species Action Plan for all regularly occurring species at risk found in the

park (Parks Canada 2016). This plan outlines detailed restoration actions (>40) for various species at risk as well as detailed long-term monitoring for a number of reptile species.

- Continue to survey the region to gain a better understanding of where different species occur
- Continue to identify which are the most important areas for conservation efforts (restoration, protection, land acquisition etc)
- Continue to research not only what areas are important but also what landscape features are required to ensure species persist (habitat amount, habitat quality, landscape matrix, landscape fragmentation).
- Continue to identify important life stage features for the conservation of turtles and snakes, such as home ranges, hibernation sites and nesting / gestation sites
- Identify road mortality hot spots and implement mitigations
- Identify what mitigations are most appropriate for different species and in different situations
- Resolve turtle mortality fishing net issue by either identifying turtle friendly modification to fishing nets that are agreed upon by fishermen and conservation managers or eliminate commercial fishing from important turtle areas
- Continue public outreach to increase awareness and appreciation for a variety of species, especially in regards to road mortality and public dislike for snakes.
- Identify social science approaches that work to raise awareness / profile for species that live in the same areas they do
- Fill in the gap for a variety of unknowns for various species (e.g. Five-lined Skink habitat use / hibernation sites, juvenile Gray Rat Snake behaviour etc.)

Other Concerned Organizations

Please provide contact information for organizations or individuals that are involved in protection/conservation of this site, *i.e.* World Wildlife Fund Canada, Nature Conservancy Canada, Ducks Unlimited, Federation of Nova Scotia Naturalists.

Organization	Mailing Address	Phone Number	Fax Number	Website	E-mail
Thousand Islands National Park	2 County Road 5, RR 3 Mallorytown, ON Canada K0E 1R0	613-923-5261	613-923-1021	http://www.pc.gc.ca/en/pn-np/on/1000	information@pc.gc.ca
Cataraqui Region Conservation Authority	P.O. Box 160 Glenburnie, ON Canada K0H 1S0	613-546-4228	613-547-6474	http://www.crc.ca/	crca@cataraquieregion.on.ca
Frontenac Arch Biosphere Reserve	19 Reynolds Rd. RR1 Lansdowne, ON Canada K0E 1L0	613-659-4824	613-659-4827	http://www.fabr.ca/index.htm	info@fabr.ca
The Algonquin to	19 Reynolds Rd. Lansdowne, ON	613-659-4824	613-659-4827	http://www.a2alink.org/inde	president@a2alink.org

Adirondack Conservation Association	Canada K0E 1L0			x.html	
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Previous Work

Please list studies/documents/papers that have been derived from this site. If possible, include the documents with the submission or provide enough information so that the sources can be retrieved by CHS

Andrews E, de Guzman L, Keddy C, Schindler C. 2012. Biodiversity in the Frontenac Arch Biosphere. A report on species richness, distribution, and protection of species at risk. Queen's Environmental Science Honours Project.

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- Thousand Islands Ecosystem, Ontario was designated as an IMPARA in December 2019.



Rock Barren in Thousand Islands Region (Photo by Parks Canada)



Five-lined Skink (Photo by Parks Canada)



Gray Rat Snake (Photo by Parks Canada)



Gray Rat Snake Hibernaculum in Thousand Islands Region (Photo by Parks Canada)



Vernal Pool in Thousand Islands Region (Photo by Josh Van Wieren)



Spring Pepper (Photo by Jen Harvey)



Eastern Musk Turtle (Photo by Chris Helmeste)



Coastal Emergent Marsh in Jones Creek (Photo by Parks Canada)