Canadian Herpetological Society
Société d'Herpétologie du Canada

Important Amphibian and Reptile Areas

ALGONQUIN PROVINCIAL PARK – WILDLIFE RESEARCH AREA, AROWHON, EASTERN LOWLANDS SITES

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 congregations of species

1. Species of Conservation Concern
A site that 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:

1. Globally designated as Critically Endangered, Endangered or Vulnerable by the International Union for the Conservation of Nature (IUCN).
2. Nationally designated as at-risk (Endangered, Threatened, and Species of Special Concern) by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
3. 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 congregate 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 congregation 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

Name: Patrick D. Moldowan; Jacqueline D. Litzgus
Organization/Affiliation: University of Toronto; Laurentian University
Address: 33 Willcocks Street; 935 Ramsey Lake Road
City/Town: Toronto; Sudbury
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Location

Three sites within Algonquin Provincial Park (Map 1, 2):

1) Wildlife Research Area (Algonquin Wildlife Research Station; Map 2, 4)
2) Arowhon (Wolf Howl Pond, West Rose Lake; Map 2, 3)
3) Eastern Lowlands (Achray; Map 2)

Province/Territory: County/Region/District(s): Ontario, Nipissing District
Closest City/Town: Dwight, Ontario (to west); Whitney, Ontario (to east).
UTM/Geographical Coordinates:

1) Wildlife Research Area: 45.591882, -78.522611 (Map 2, 4; Figure 1)
2) Arowhon: 45.578552, -78.689231 (Map 2, 3; Figure 2)
3) Eastern lowlands: 45.867106, -77.757299 (Map 2; Figure 3)

Directions to Sites:

1) Algonquin Wildlife Research Station is located north of Highway 60 between highway kilometre markers 30 and 31 (across from Mew Lake Campground entrance, just west of Bat Lake trailhead). Public access is discouraged but arrangements to visit can be made by contacting the AWRS Manager.
2) Arowhon is accessed from Mizzy Lake hiking trail, Highway 60 at kilometre marker 15.
3) Eastern Lowlands are accessed via Highway 28 to Barron Canyon Road, Achray Road.

Maps (see Appendix):

Map 1. Algonquin Provincial Park in a provincial and regional context. Map from Algonquin Provincial Park Management Plan (1998).

Map 2. Algonquin Provincial Park with delineation of the three sites (red boxes) that constitute the Algonquin Park IMPARA nomination: Arowhon (left), Algonquin Wildlife Research Area (centre), and Eastern Lowlands (right).

Map 3. Arowhon area, Algonquin Provincial Park (close-up from Map 2). Wolf Howl Pond and adjacent waterbodies have been subject to long-term turtle research by biologists based at the Algonquin Wildlife Research Station.

Map 4. Wildlife Research Area, Algonquin Provincial Park. The Algonquin Wildlife Research Station is located at the southern edge of the Wildlife Research Area at Lake Sasajewun.

Physical Description

Area:

1) 12,140 ha (Algonquin Wildlife Research Area; Maps 2, 4)
2) 1,600 ha (~4 km by ~4 km; Arowhon area; Map 2, 3)

3) 144,000 ha (~35 km by ~40 km; eastern lowlands; Map 2)

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

General Description. Algonquin Provincial Park (Map 1), the first provincial park in Ontario, was established in 1893. The park is situated on Precambrian Canadian Shield bedrock and is located at the border between southern deciduous hardwood forests and northern boreal forests (OMNR 1998). This transition zone boasts varied topography, climate and ecosystems, which affects resident floral and faunal communities. The western uplands (Algonquin Dome) reach 587 m in elevation and are characterized by a colder and wetter climate compared to the eastern lowlands (150 m above sea level). The soil of the rugged western uplands is primarily glacial till overlaid by hardwood forests of Sugar Maple (*Acer saccharum*), Yellow Birch (*Betula alleghaniensis*), and American Beech (*Fagus grandifolia*), interspersed with softwood conifers such as Eastern Hemlock (*Tsuga canadensis*) and White Pine (*Pinus strobus*; OMNR 1998). The warmer, drier east side of Algonquin Park features post-glacial outwash soils and demonstrates a history of fire on the landscape. These forests are dominated by Trembling Aspen (*Populus tremuloides*), White Birch (*Betula papyifera*), White Pine, Red Pine (*Pinus resinosa*), Red Maple (*Acer rubrum*; OMNR 1998). Found throughout the forests of the park are: Black Spruce (*Picea mariana*), Tamarack (*Larix laricina*), Eastern White Cedar (*Thuja occidentalis*), and Balsam Fir (*Abies balsamea*; OMNR 1998). Algonquin Park has over 1,500 lakes and 1,200 kilometres of streams (Crossman and Mandrak 2003) and protects significant, often headwater, portions of five major Ontario rivers (Oxtongue, Petawawa, Barron, Madawaska, and Bonnechere).

1. **Wildlife Research Area** (Figure 1; Maps 2, 4): Long-term herpetological research has and continues to take place within the Wildlife Research Area. The area features a mosaic of forest and wetland types that form an extended network of wildlife research locations. The Algonquin Wildlife Research Station (AWRS; established 1944), situated in the south of the Wildlife Research Area, is the centralized hub of wildlife studies and has an accomplished track record of herpetological research (see bibliography). As is true of many organismal groups, it can be said confidently that the AWRS is the field-based site of more herpetological research than any single place in Canada. Immediately adjacent to the Wildlife Research Area is Bat Lake and the associated public trail (5.8 km loop trail visiting hemlock stand, stream, lookout, and Bat Lake – located at km 30 on Highway 60; trailhead: 45.576927°N, -78.522514°W), which is home to long-term salamander research. Some research activities take place further afield within Algonquin Provincial Park, thus the inclusion of sites 2 and 3.

2. **Arowhon** (Figure 2; Maps 2, 3): Multiple sites along the Mizzy Lake Trail, a 10.8 km loop trail visiting nine ponds and small lakes (km 15.4 on Highway 60; trailhead: 45.542515°N, -78.695621°W) has been the location of more than 45 years of continuous turtle research.

3. **Eastern lowlands** (Figure 3; Map 2): On account of topography and habitat, this area demonstrates a more diverse and abundant herpetofaunal assemblage than the rest of the park, and several herpetofaunal species are geographically restricted to the eastern lowlands, such as Mudpuppy, Pickerel Frog, Eastern Milksnake, and Northern Watersnake. The Achray area (approximated by 45.86°N, -77.75°W) has been the centralized hub of herpetological activity in eastern Algonquin Provincial Park.

Land Ownership
Name: Ontario Parks
Organization/Affiliation: Ontario Ministry of Environment, Conservation and Parks
Address: East Gate Complex, Highway 60
City/Town: Whitney
Province/Territory: Ontario
Postal Code: K0J 2M0
Telephone and Fax: 613-637-2780 (phone)
E-mail: (No relevant general contact)

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

Are they aware of this site nomination, and if so did they participate in the process?
The Algonquin Zone Ecologist (Jennifer Hoare), Assistant Biologist (Alison Lake), Management Biologist (Lauren Trute), Zone Ecologist (Paul Gelok), Chief Park Naturalist (Rick Stronks), and Natural Heritage Education Specialist (David LeGros) have been made aware of the nomination.

We acknowledge and appreciate constructive review of this application by David LeGros, Paul Gelok, and Lauren Trute.

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.

Table 1. Amphibian and reptile species of Algonquin Provincial Park, Ontario, Canada.

Species	Status (COSEWIC; COSSARO)	No. of Individuals	References
Anura			
Lithobates catesbeianus	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Shirose et al. 1993, 1997; Shirose and Brooks 1995; Brooks et al. 2003
Lithobates clamitans	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Shirose and Brooks 1995; Brooks et al. 2003
Lithobates sylvaticus	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly	Brooks et al. 2003

		abundant (abundant)	
Lithobates septentrionalis	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Shirose and Brooks 1995; Brooks et al. 2003
Pseudacris crucifer	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Brooks et al. 2003
Lithobates pipiens	Not At Risk; Not At Risk	Unknown, found at low densities (uncommon)	Brooks et al. 2003
Lithobates palustris	Not At Risk; Not At Risk	Unknown, restricted to Algonquin's eastern lowlands (rare)	Brooks et al. 2003
Pseudacris triseriata	Threatened; Not At Risk	Single record (1985) (rare)	Brooks et al. 2003
Hyla versicolor	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Brooks et al. 2003
Anaxyrus americanus	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Brooks et al. 2003
<u>Caudates</u>			
Ambystoma maculatum	Not Assessed; Not Assessed	Unknown (abundant)	Brooks et al. 2003
Ambystoma laterale	Not Assessed; Not Assessed	Unknown (abundant)	JP Bogart and PD Moldowan (unpublished)
Ambystoma species complex (*A. laterale* and	Not Assessed; Not Assessed	Unknown	Lowcock et al. 1991, 1992; JP Bogart and PD

A. jeffersonianum, LLJ genotype)			Moldowan (unpublished)
Plethodon cinereus	Not Assessed; Not Assessed	Unknown (abundant)	Brooks et al. 2003
Eurycea bislineata	Not Assessed; Not Assessed	Unknown (abundant)	Brooks et al. 2003
Hemidactylium scutatum	Not At Risk; Not Assessed	Single record (1946) (rare)	Brooks et al. 2003
Notophthalmus viridescens	Not Assessed; Not Assessed	Unknown	Brooks et al. 2003
Necturus maculosus	Not At Risk; No Assessed	Single record (1945); 'rediscovered' in Algonquin's eastern lowlands (2015) (rare)	Brooks et al. 2003; Mills and Hill 2016
<u>Squamates</u>			
Thamnophis sirtalis	Not Assessed; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Brooks et al. 2003
Thamnophis sauritus	Special Concern; Special Concern	Three records (1962, 2005, 2006), restricted to Algonquin's eastern lowlands (rare)	Brooks et al. 2003; Algonquin Park Museum (unpublished)
Lampropeltis triangulum	Special Concern; Not Assessed	Unknown, restricted to Algonquin's eastern lowlands (uncommon)	Brooks et al. 2003
Nerodia sipedon	Not Assessed; Not Assessed	Unknown, restricted to Algonquin's eastern lowlands (common)	Brooks et al. 2003
Opheodrys vernalis	Not Assessed; Not Assessed	Unknown, found at very low densities (rare)	Brooks et al. 2003

Storeria dekayi	Not At Risk; Not Assessed	21 records (all pre-1990). (rare)	Brooks et al. 2003; Algonquin Park Museum (unpublished)
Storeria occipitomaculata	Not Assessed; Not Assessed	Unknown (uncommon)	Brooks et al. 2003
Diadophis punctatus	Not Assessed; Not Assessed	Unknown, found at low densities (uncommon)	Brooks et al. 2003
Heterodon platirhinos	Threatened; Threatened	Last seen in 1984 (extirpated)	Brooks et al. 2003
<u>Testudines</u>			
Chrysemys picta marginata	Special Concern; Not Assessed	Unknown, but locally widespread and seemingly abundant (abundant)	Brooks et al. 2003
Chelydra serpentina	Special Concern; Special Concern	Unknown, but locally widespread and seemingly abundant (abundant)	Brooks et al. 2003
Glyptemys insculpta	Endangered; Threatened	Unknown, locally restricted (uncommon)	Quinn and Tate 1991; Brooks et al. 1992, 2003; Smith 2002
Graptemys geographica	Special Concern; Special Concern	Two records (2010, 2014) (rare)	Algonquin Park Museum, J Inglis (unpublished); MG Keevil, PD Moldowan, and SJ Kell (unpublished)
Terrapene carolina	Extirpated; Not Protected	Single record (1960s) (extirpated, if ever present)	Brooks et al. 2003
Clemmys guttata	Endangered; Endangered	Two records (1967, 1970) (extirpated, if ever present)	Brooks et al. 2003
Emydoidea blandingii	Endangered; Threatened	Unknown, but locally widespread	Edge 2008; Paterson 2011

		at low densities (uncommon)	

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.

Table 2. Plant and animal species of note, Algonquin Provincial Park, Ontario, Canada.

Species	Status (COSEWIC; COSSARO)	Importance of Site	References
Canis lycaon	Threatened; Threatened	Algonquin Park represents population stronghold	COSSARO 2016; COSEWIC 2015
Salvelinus fontinalis	Not Assessed; Not Assessed	Highest density of Brook Trout lakes in the world; recreational fishery	Crossman and Mandrak 2003
Salvelinus namaycush	Not Assessed; Not Assessed	Recreational fishery	Crossman and Mandrak 2003
Pellaea atropurpurea	Not Assessed; Not Assessed	Very rare provincially	OMNR 1998
Listera australis	Not Assessed; Not Assessed	Very rare provincially	OMNR 1998
Platanthera blephariglottis	Not Assessed; Not Assessed	Very rare provincially	OMNR 1998
Botrychium lanceolatum	Not Assessed; Not Assessed	Very rare provincially	OMNR 1998
Danthonia compressa	Not Assessed; Not Assessed	Very rare provincially	OMNR 1998

Site Criteria
Under each category, please provide a description of how this site fulfills the Important Amphibian and Reptile Areas criteria (see Part 1).

1. **Species of Conservation Concern:** Algonquin Park is home to one amphibian species and nine reptile species of conservation concern (see Table 1). In particular, the park is one of the few strongholds for the internationally and provincially Endangered Wood Turtle (*Glyptemys insculpta*) in Ontario. Based on an estimate of 770-1161 adult Wood Turtles in Ontario, Algonquin-locale turtles (approx. 200 adults) represent 17~26% of the provincial population (COSEWIC 2019). When considering the Wood Turtle population across Canada (4985-11521 adults; COSEWIC 2019), the Algonquin Park population

represents 2~4% of the national population. Therefore, this site holds greater than 1% of the Wood Turtle's Canadian population, providing justification for IMPARA eligibility under criterion 1. Algonquin Park is home to the nationally and globally Endangered Blanding's Turtle. Population size estimates are not available for this species in Algonquin Park and therefore no relative regional context can be placed on the importance of the park's population; however, given the relatively low density, the Algonquin Park population likely constitutes less than 1% of the Canadian population.

2. **High Species Diversity:** Similar to much of south-central Ontario, Algonquin Park is home to greater than half of the biodiversity all amphibian and reptile species occurring in Ontario (Table 1): 10 species of anurans (of 13 in Ontario; 77% of provincial species represented), 8 salamanders (of 13; 62%), 9 extant snakes (of 17; 53%), and 6 extant turtle taxa (of 8; 75%). Despite this biodiversity, the Algonquin Park IMPARA nomination does not qualify for eligibility under criterion 2.

3. **Important Life History Requirements:** Multiple sites outlined within the Algonquin Park IMPARA recognize areas where the local abundance of amphibians and reptiles is unusually high and thus significant. As noted above (criteria 1), Algonquin Park is home to populations of provincially, federally, and internationally imperiled Wood and Blanding's Turtles. Wolf Howl Pond, within the Arowhon locale, has an abundant Painted Turtle population (97-109 turtles/ha; COSEWIC 2018) and has been subject to intensive population, ecological, and behavioural study since 1978. Similarly, Bat Lake, immediately adjacent to the Wildlife Research Area, boasts high Spotted and Blue-spotted Salamander populations that have been subject to study since the early 1990s. For their ongoing research and high species abundance, Wolf Howl Pond and Bat Lake are deemed significant with respect to fulfilling important life history requirements.

Regarding Eligibility Criteria: In addition to the abovementioned justifications, the nominated sites within Algonquin Park are the source of more herpetological research than any other single place in Canada. The sheer amount of peer-reviewed research (see bibliography) stemming from the AWRS and the Eastern Lowlands has significant conservation and policy implications for Canada's herpetofauna (e.g., contributing to COSEWIC status assessments, life history information demonstrating non-sustainability of Ontario Snapping Turtle hunt). Consequently, these long-term research sites are invaluable to Canadian (and North American) herpetology and herpetological conservation.

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):

Algonquin Park has the highest visitor rate of all parks in Ontario; recreational activities include camping, hiking, canoeing, and fishing. It is also the only provincial park in which commercial forestry (logging) occurs. Forest management plans under the Crown Forest Sustainability Act include a wide variety of conditions intended to minimize or avoid negative effects to wildlife species, including amphibians and reptiles. The extent to which these recreational and resource extraction activities impact the resident amphibians and reptiles have not been recently quantified (but see Enright 1998).

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

Highway 60 bisects the lower part of Algonquin Park and is a heavily-trafficked road. Amphibian and reptile road morality is a threat to local populations along this highway corridor, particularly during peak tourist periods. Air, water and noise pollution from vehicles may also be an issue. Aside from Highway 60, there are few publicly-accessible (paved) roads in Algonquin Park, a contrast to many other provincial parks in southern Ontario. Minimal public road access limits the extent of road mortality and likely affords some protection from poaching and the introduction of invasive species.

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

Some forestry practices and the construction of forestry roads present a potential threat to habitats and wildlife in Algonquin Park. Past or current habitat conservation or restoration efforts include:

Approximately 19% of park area is directly protected to preserve a “natural state” through zoning as nature reserve, wilderness, and natural environment (Table 3). Research by Enright (1998) investigated the relationship between forestry and amphibian populations. LeGros et al. (2014, 2017) has addressed the rehabilitation of forestry roads to improve habitat for amphibians. Wood Turtle research (Quinn and Tate 1991; Smith 2002; Paterson 2011; D. Mullin and J.D Litzgus, unpublished) has focussed particularly on habitat use patterns to identify critical habitat and mitigate forestry impacts.

Table 3. Zonation of land types in Algonquin Provincial Park. Table contents modified from OMNR (1998, 2003). The proportion of park area represented by each zone type is based on the best available information (OMNR 1998; OMNR 2013).

Zone type	Area (ha.)	% of park area	Description and allowable uses
Nature Reserve	51,462	6.8	Protected representative and significant earth and life science features; some facilities permitted (e.g., campsites, portages, and overnight trails) provided they do not impair natural values
Wilderness	104,792	13.7	Protected and managed to preserve natural state and provide recreational users with a semi-wilderness experience; zone with least evidence of anthropogenic influence (i.e., logging, railways, hydro lines, and buildings all absent), although some motorized vehicles allowed (e.g., ski-trail grooming, park maintenance, research)
Natural Environment	83,470	10.9	Low intensity recreational activity permitted (e.g., hiking, cross-country skiing, horseback riding, cycling, fishing, backpacking, canoeing, back-country camping) with minimal development required to support these activities

Historical	1,624	0.2	Includes any significant historical resources related to human history; low intensity uses permitted (e.g., trails, back-country campsites) but high intensity uses prohibited (e.g., logging, campground development)
Development	22,502	3.0	Provide main access to the park and facilities (e.g., operational, research, recreation, and interpretive) and services for day use and camping; high intensity uses permitted.
Access	824	0.1	Staging areas where minimum facilities are present to support use of other zone types (e.g., access roads, parking and washroom facilities, access point offices, boat launches, concessions, and research facilities); low to high intensity uses permitted
Recreation/Utilization	498,785	65.3	Permissible use for low intensity recreational activities (e.g., backing, canoeing, camping, horseback riding, dogsledding) and commercial forestry (forest management occurs in 73% of the recreation/utilization zone, or 57% of the while park area); between 1990-1996, for example, an average of 1% of park area was harvested annually
Total	763,459	100.0	

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

A large-scale long-term quantitative study on the impacts of forestry activities on the ecology of amphibians and reptiles (and other wildlife) in Algonquin Park would be beneficial to informing conservation actions and areas of concern within the park and beyond. The Algonquin Forestry Authority, who oversees logging in Algonquin Park, has shown an interest in collaborating with researchers and park biologists on such projects.

Other Concerned Organizations
Please provide contact information for organizations or individuals that are involved in protection/conservation of this site.

Algonquin Wildlife Research Station
P.O. Box 49
Whitney, Ontario K0J 2M0, Canada
705-633-5621
algonquinwildliferesearch@gmail.com

The Friends of Algonquin Park

P.O. Box 248
Whitney, Ontario K0J 2M0, Canada
613-637-2828

Algonquin Provincial Park (Ontario Parks)
East Gate Complex
Hwy 60
Whitney, ON
K0J 2M0
613-637-2780

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.

Canada's longest life history studies of turtles—Painted, Snapping, Blanding's, and Wood Turtles—occurs in Algonquin Provincial Park. This research began in 1972 at the AWRS when 20 Snapping Turtles nesting on the Lake Sasajewan dam were tagged. By 1976, 80 females had been tagged and it was decided to undertake a "long-term" study of reproductive output and movements. In 1981, it was realized that these turtles were relatively long-lived and offered a reliable way to measure key life-history and environmental variables in a long-lived species that would complement the long-term (1952-present) Algonquin Park study of short-lived small mammals in comparatively undisturbed aquatic and terrestrial ecosystems. In 1978 and 1980, Painted Turtles and Wood Turtles, respectively, were added to the study. Many of the turtles captured as adults in the first years of study are still alive and reproducing annually, and may be as old as 100 years. The study has investigated growth, reproductive output and success, recruitment, genetic variation, movements, diet, reproductive behaviour, (the lack of) density-dependent population changes, impacts of increased mortality, age-specific life-history changes, the role and effects of thermal constraints, and efficacies of conservation techniques (e.g., nest caging). We now have a unique set of data spanning nearly a half-century and tens of thousands of individual capture records, allowing us to assess responses to climate and demographic pressures. Long-term studies are essential to understand such phenomena, as well as for the formulation and testing of ecological theory. An enormous number of peer-reviewed publications and graduate theses have come from the turtle projects (see below).

Multiple amphibian studies have been conducted at the AWRS. Mink, Bull, and Green Frogs have been the subjects of population and life history studies (Shirose and Brooks 1995, Shirose et al. 1993, 1997). Enright (1998) investigated forestry and amphibian populations. LeGros et al. (2014, 2017) studied the response of an amphibian community to mitigation of unused logging roads. The Bat Lake Inventory of Spotted Salamanders (BLISS) research project was formalized in 2008 focussing on the biology of Spotted and Blue-spotted Salamanders. The ongoing focus of BLISS includes the efficacies and biases of different field sampling methods, life history, population biology, reproductive phenology, and spatial ecology of *Ambystoma* salamanders.

Algonquin Provincial Park, specifically research conducted at the Algonquin Wildlife Research Station, represents some of the most well-studied herpetological populations in Canada. The long-term studies have produced a large volume of peer-reviewed publications and graduate student projects (see bibliography).

Herpetological bibliography for Algonquin Provincial Park:

Peer-reviewed Papers

1. Armstrong D.P., Brooks R.J. 2013. Application of hierarchical biphasic growth models to long-term data for snapping turtles. Ecological Modelling 250: 119–125.

2. Armstrong D.P., Brooks R.J. 2014. Estimating ages of turtles from growth data. Chelonian Conservation and Biology 13: 9–15.

3. Armstrong D.P., Keevil M.G., Rollinson N., Brooks R.J. 2018. Subtle individual variation in indeterminate growth leads to major variation in survival and lifetime reproductive output in a long-lived reptile. Functional Ecology 32: 752–761.

4. Baxter L., Brain R.A., Hosmer A.J., Nema M., Muller K.M., Solomon K.R., Hanson M.L. 2015. Effects of atrazine on egg masses of the yellow-spotted salamander (*Ambystoma maculatum*) and its endosymbiotic alga (*Oophilia amblystomatis*). Environmental Pollution 206: 324–331.

5. Bianchini K., Tattersall G.J., Sashaw J., Prteus C.S., Wright P.A. 2012. Acid water interferes with salamander-green algae symbiosis during early embryonic development. Physiological and Biochemical Zoology 85: 470–480.

6. Bobyn M.L., Brooks R.J. 1994. Incubation conditions as potential factors limiting the northern distribution of Snapping Turtles, *Chelydra serpentina*. Canadian Journal of Zoology 72: 28–37.

7. Bobyn M.L., Brooks R.J. 1994. Interclutch and interpopulation variation in the effects of incubation conditions on sex, survival and growth of hatchling turtles (*Chelydra serpentina*). Canadian Journal of Zoology 233: 233–257.

8. Boyle S.P., Moldowan, P.D. 2013. *Ambystoma maculatum* (Spotted Salamander). Terrestrial oviposition. Herpetological Review 44: 113–114.

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Algonquin Provincial Park – Wildlife Research Area, Arowhon, Eastern Lowlands Sites, Ontario was designated as an IMPARA in December 2019.

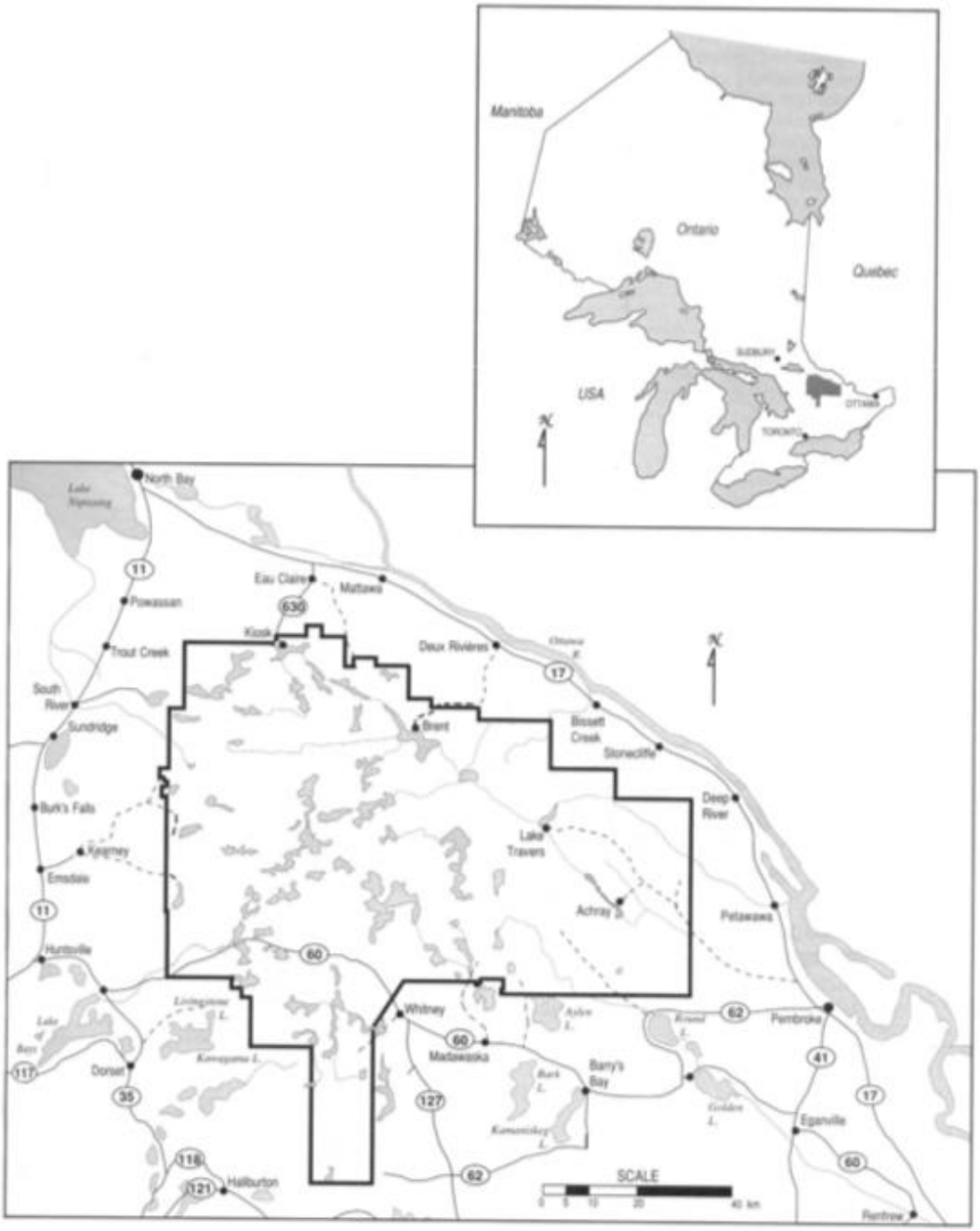
Figure 1. Wildlife Research Area and the Algonquin Wildlife Research Station (AWRS) of Algonquin Provincial Park, Ontario. a. Cookhouse of the AWRS, established 1944. The Wildlife Research Area is home to a mosaic of b. forest types, c. wetlands, and d. riparian habitats making it home to a diversity of amphibian and reptile species. Many long-term herpetological studies based at the AWRS, within and outside the Wildlife Research Area, have provided invaluable information for understanding the biology and conservation of species, such as the e. Snapping Turtle and f. Spotted Salamander. Photos: Patrick D. Moldowan.

Figure 2. Arowhon area of Algonquin Provincial Park, Ontario. a. Long-term research on Painted Turtle life history and ecology has been ongoing at multiple wetlands since 1978. b. West Rose Lake, a Painted Turtle study site. c. Aerial photo of Wolf Howl Pond and old railway embankment that forms a popular hiking trail (Mizzy Lake Trail) today. d. Educational signage at Wolf Howl Pond highlighting turtle research to thousands of visitors annually. Photos: a.–c. Patrick Moldowan; d. Pauk Cook.

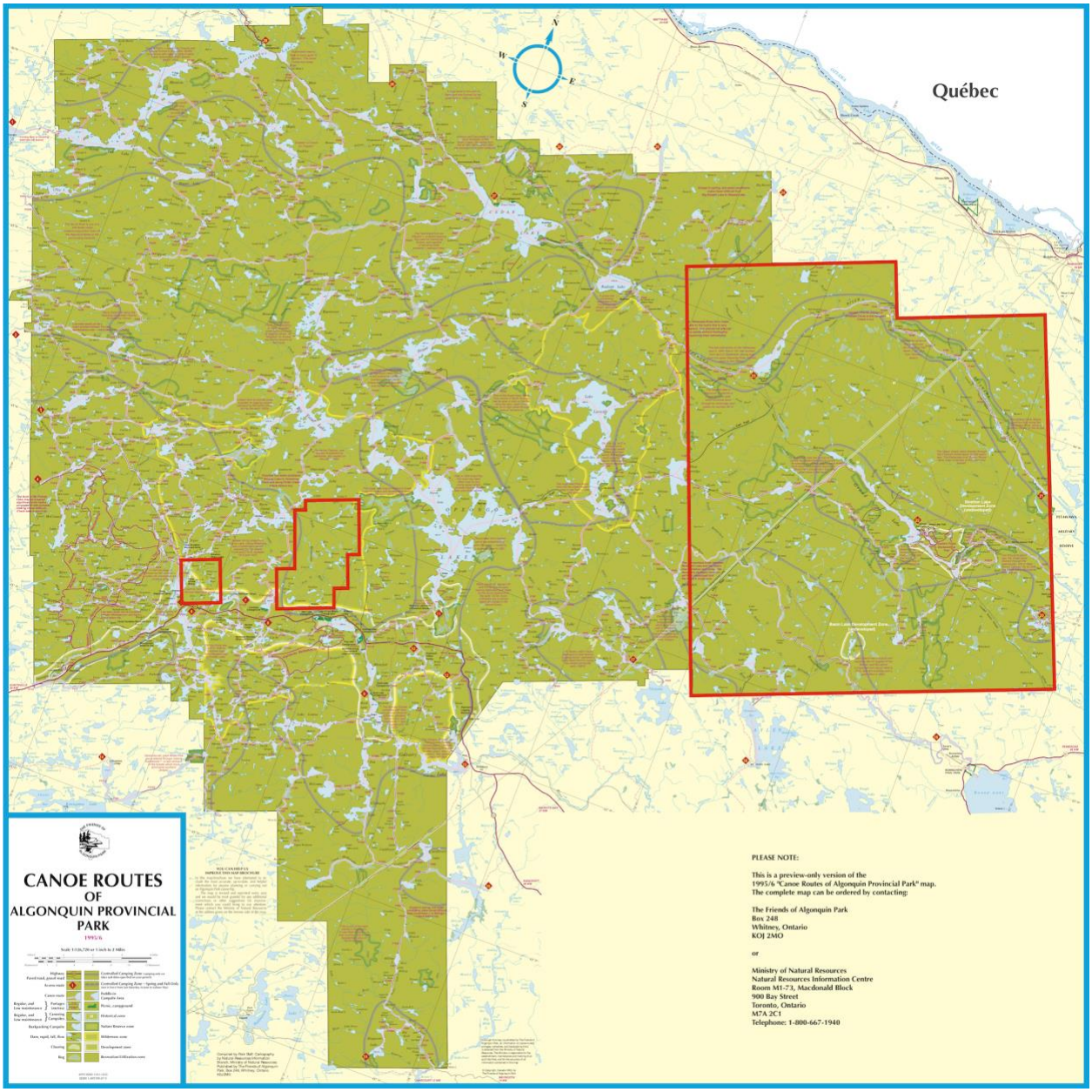
Figure 3. The eastern lowlands of Algonquin Provincial Park demonstrate a longer growing season, a. sand-bottomed lakes, b. higher productivity wetlands compared to the park's western uplands. c. The east side of the park is dominated by comparatively dry forests, which are subject to logging. On account of differences in topography, climate, and habitat, many amphibian and reptile species that are absent or at a low density in the western uplands are present or generally more common in the eastern lowlands, such as d. Blanding's Turtle, e. Northern Watersnake, f. Northern Ring-necked Snake, and g. Red-belled Snake. Photos: Patrick D. Moldowan.

Appendix I - Maps

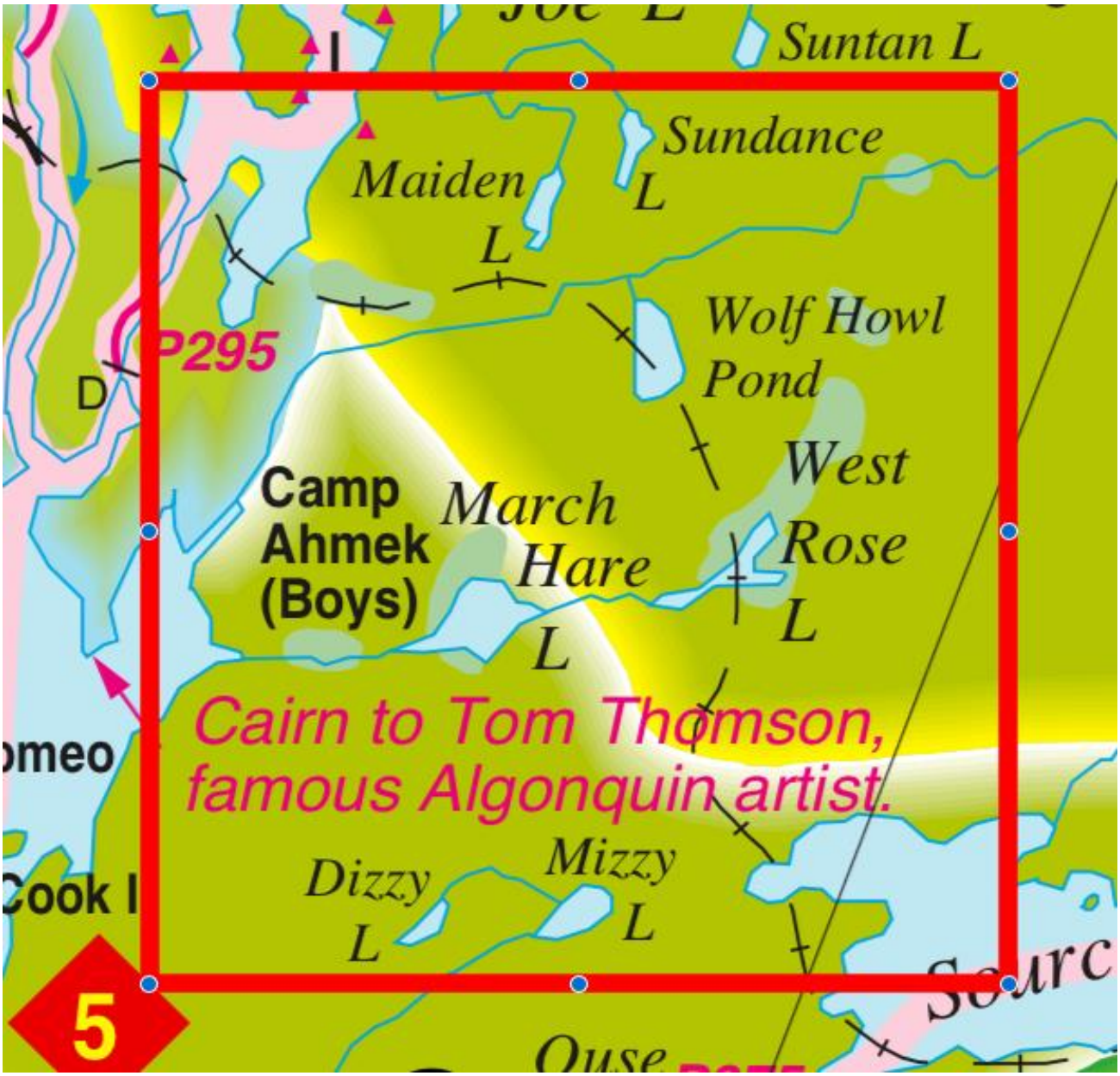
Important Amphibian and Reptile Area (IMPARA): Algonquin Provincial Park – Wildlife Research Area, Arowhon, Eastern Lowlands Sites, Ontario



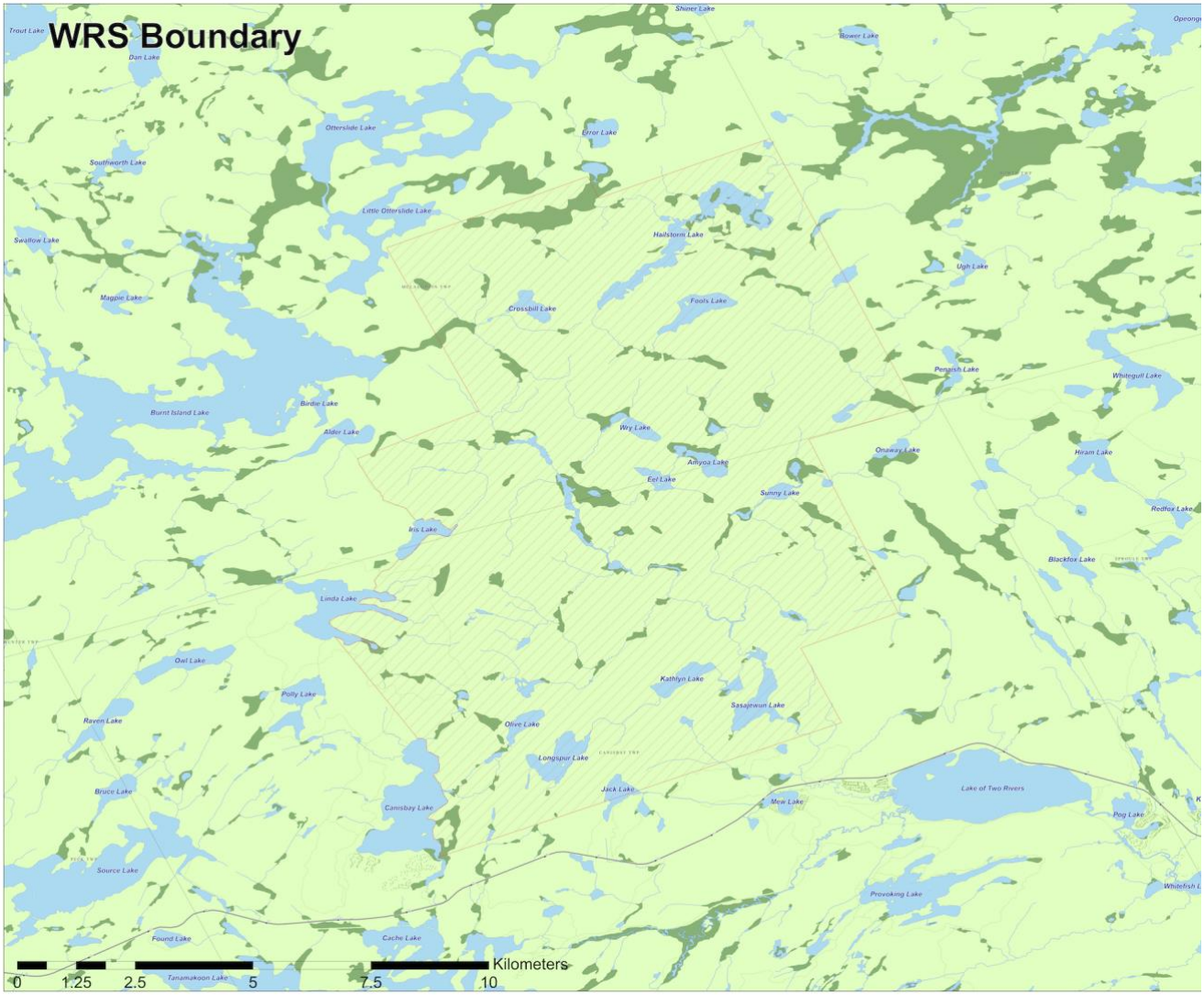
Map 1. Algonquin Provincial Park in a provincial and regional context. Map from Algonquin Provincial Park Management Plan (1998, p. 3, https://files.ontario.ca/environment-and-energy/parks-and-protected-areas/mnr_bpp0073.pdf)



Map 2. Algonquin Provincial Park with delineation of the three sites (red boxes) that constitute the Algonquin Park IMPARA nomination: Arowhon area (left), Algonquin Wildlife Research Area (centre), and Eastern Lowlands (right). Base map: The Friends of Algonquin Park.



Map 3. Arowhon area, Algonquin Provincial Park (close-up from Map 2). Wolf Howl Pond and adjacent waterbodies have been subject to long-term turtle research by biologists based at the Algonquin Wildlife Research Station. Base map: The Friends of Algonquin Park.



Map 4. Wildlife Research Area (red box), Algonquin Provincial Park. The Algonquin Wildlife Research Station (WRS) is located at the southern edge of the Wildlife Research Area at Lake Sasajewun. Map courtesy: Algonquin Park East Gate, Ontario Parks.