

FEATURE ARTICLES

Considering potential *ex situ* conservation roles for Canadian snakes: an integrated approach to conservation planning

Stephanie Winton

Species Conservation Planning Assistant, Wildlife Preservation Canada, Penticton, BC
stephanie.winton@wildlifepreservation.ca

Jessica Steiner

Conservation Programs Director, Wildlife Preservation Canada, Guelph, ON
jessica@wildlifepreservation.ca

Amy Chabot

Research and Conservation Programs Coordinator, African Lion Safari, Cambridge, ON
achabot@lionsafari.com

Coined by the International Union for the Conservation of Nature (IUCN) Species Survival Commission (SSC) Conservation Planning Specialist Group (CPSG), the One Plan Approach to conservation involves development of integrated species conservation plans that consider all potential conservation tools and partners, both *in situ* (in the wild) and *ex situ* (in human care) (Traylor-Holzer et al. 2018). The One Plan Approach acknowledges that, when used strategically, *ex situ* conservation can be a key tool for species recovery that complements field conservation efforts (McGowan et al. 2017). Involving a diverse range of stakeholders in the planning process helps to ensure that the full complement of knowledge, skills, and strengths are brought together to identify the most effective and achievable conservation actions. Science-based, participatory, and inclusive species conservation planning processes have been proven to increase the conservation impact of the resulting plans (Lees et al. 2021).

Canadian snakes are an ideal group for integrated conservation planning. More than 60% of snake taxa in Canada are currently considered at some level of risk nationally (extirpated, endangered, threatened, or special concern; COSEWIC 2021) and face multiple combined threats including habitat loss and degradation, intentional persecution, disease, road mortality, and climate change, among others. While extensive *in situ* conservation activities are in place to help counteract known threats, and the potential use of

ex situ conservation actions is explicitly noted in the recovery strategies of four taxa (Blue Racer, Eastern Massasauga – Carolinian population, Gray Ratsnake – Carolinian population, and Queensnake), conservation planning in Canada has generally not considered the full complement of potential conservation roles that might be contributed by the *ex situ* community to achieve wild population recovery goals (Table 1). Given the potential for more integrated planning to advance snake conservation in Canada, in March 2021 CPSG and the Canadian Species Initiative (CSI) held an inclusive and participatory Integrated Collection Assessment and Planning (ICAP) workshop to evaluate *ex situ* roles for the 39 snake taxa native to Canada.

In the spirit of the One Plan Approach, an Integrated Collection Assessment and Planning (ICAP) process brings *in situ* and *ex situ* communities together to apply the five-step decision-making process of the IUCN SSC *Guidelines on the Use of Ex Situ Management for Species Conservation* to the task of regional or global collection planning (IUCN/SSC 2014; Traylor-Holzer et al. 2019). This process ensures that any recommended *ex situ* activities consider the conservation needs of the species as well as practical constraints of zoo collection planning, ensuring a net positive impact on the conservation of a species (Traylor-Holzer et al. 2018). The ICAP workshop for Canadian snakes took place virtually in nine sessions over three days (March 8-10, 2021). Over 60 *in situ* and *ex situ* regional experts participated including representatives of governments and First Nations communities, zoos and other *ex situ* facilities, academics, and other species experts from across Canada, the United States, and Mexico.

Prior to the workshop, information datasheets were prepared for each taxon, which included a summary of the *in situ* status and threats, *ex situ* status (globally and regionally), and previous recommendations for *ex situ* management for conservation as stated in existing recovery documents. During the ICAP workshop the participants assessed this information, considered additional knowledge brought forth by participants, and through a series of facilitated plenary discussions identified potential *ex situ* conservation roles for each taxon (IUCN/SSC 2014). Each potential role was rated with respect to its relative conservation benefit to the taxon, as well as the relative feasibility and risks of developing an *ex situ* program to meet the role. Based on a rapid analysis of the value versus feasibility and risks, workshop participants reached consensus on which of the potential *ex situ* roles identified (if any) were recommended for each taxon and formulated specific recommendations.

The ICAP workshop resulted in a variety of recommendations that were tailored to the conservation needs of the species. Recommendations were broadly grouped based on the conservation status and size of existing *ex situ* population (Table 2). Threatened taxa with established *ex situ* populations had the most recommendations for *ex situ* actions, while conservation-based research, training and education were recommended across taxa, including non-threatened species which can serve as models for other more threatened snakes.

While species-specific recommendations were made for each taxon, several general, overarching recommendations emerged from this process:

- *Ex situ* conservation activities have value in the conservation of Canadian snakes and should be used, when appropriate, to enhance recovery efforts, particularly for threatened taxa with an existing large *ex situ* population.
- Conservation-based education is important for changing negative perceptions and behaviours towards snakes which contribute to important threats to snakes in general.
- All *ex situ* roles that involve releases of animals must include research to evaluate success of these efforts and be integrated with *in situ* conservation efforts to address primary threats.
- In general, *ex situ* conservation-based research, training, and education should not proactively capture snakes from the wild, and should instead rely on opportunities from rescue, rehabilitation and/or confiscation. Where these opportunities are unlikely or unfeasible, wild collection may be necessary for specialized situations.
- There is a need to coordinate native snake collections and share husbandry knowledge on a national scale, to serve conservation-based research, training, and education priorities most effectively. Further, there is a need for improved and continuous communication between *in situ* and *ex situ* communities regarding evolving species conservation needs and priorities.
- Acquiring animals for potential *ex situ* roles should not be used as the justification for a salvage operation to occur for development mitigation; all options to avoid the impact should always be considered first.
- Rescued snakes should be returned to their original location as the priority; reinforcement, reintroduction and retention in captivity may be considered on a case-by-case basis, e.g., if the original habitat is no longer suitable.

Table 1. Most common potential direct roles that an *ex situ* programme might serve for the conservation of a species (note: this list is not exhaustive).

Direct Conservation Role	Definition
<i>Ark population</i>	Maintain a long-term <i>ex situ</i> population after extinction of all known wild populations and as a preparation for reintroduction or assisted colonization if and when feasible.
<i>Insurance population</i>	Maintain a long-term viable <i>ex situ</i> population of the species to prevent predicted local, regional, or global species extinction and preserve options for future conservation strategies (e.g., genetic and/or demographic supplementation or other conservation translocations).
<i>Rescue population</i>	Establish an <i>ex situ</i> population (temporary or long-term) for a species that is in imminent danger of extinction (locally or globally) and requires <i>ex situ</i> management, as part of an integrated program, to ensure its survival (e.g., in response to extreme weather, disease, oil spill).
<i>Demographic manipulation</i>	Improve a demographic rate (survival or reproduction) or status (e.g., skewed sex ratio) in the wild, often of a particular age, sex, or life stage (e.g., head-start program).
<i>Population restoration: Reintroduction</i>	Serve as a source of individuals for population restoration to re-establish the species to part of its former range from which it has been extirpated.
<i>Population restoration: Reinforcement</i>	Serve as a source of individuals for population restoration to supplement an existing population (e.g., for demographic, behavioral or genetic purposes).
<i>Conservation introduction: Ecological replacement</i>	Introduce the species outside of its indigenous range to re-establish a lost ecological function and/or modify habitats.
<i>Conservation introduction: Assisted Colonization</i>	Introduce the species outside of its indigenous range to avoid extinction of populations of the species.
<i>Conservation-based research</i>	Use an <i>ex situ</i> population (including non-threatened species serving as a model for threatened species) for research that will directly benefit conservation of the species, or a similar species, in the wild by addressing specific questions essential for success of the overall conservation strategy for the species (e.g., address key knowledge gaps, develop monitoring methods).
<i>Conservation-based training</i>	Use an <i>ex situ</i> population (including non-threatened model species) for training that will directly benefit conservation of the species, or a similar species, in the wild by addressing expertise essential for success of the overall conservation strategy for the species (e.g., train field biologists in handling and health assessment).
<i>Conservation education</i>	Forms the basis for an education and awareness program that addresses specific threats or constraints to the conservation of the species or its habitat, focusing on specific human behavioural changes that are essential for the success, and an integral part of, the overall conservation strategy for the species (e.g., persecution).

Table 2. Number of taxa recommended for each *ex situ* conservation role by size of *ex situ* population in Canada and US and by conservation status (threatened taxa = extirpated, endangered, threatened, and special concern as assessed by COSEWIC; non-threatened taxa = not at risk or not assessed by COSEWIC).

	Threatened taxa (26 total)		Non-threatened taxa (9 total; common gartersnake subspecies considered one taxon)	
	Large <i>ex situ</i> population: 26-130 (11 taxa)	Small <i>ex situ</i> population: 0-20 (15 taxa)	Large <i>ex situ</i> population: 74-179 (2 taxa)	Small <i>ex situ</i> population: 0-21 (7 taxa)
<i>Long-term breeding programs with intensive population management</i>				
Insurance	2	0	-	-
<i>Release programs with some level of population management</i>				
Rescue	2	3	0	0
Demographic Manipulation	2	0	-	-
Reintroduction	1	0	-	-
Reinforcement	2	0	-	-
<i>Programs with no specific population management</i>				
Research	7	11	2	2
Training	9	11	2	7
Conservation Education	9	10	2	6

The ICAP workshop identified the most appropriate roles that zoos can take to assist in the conservation of Canadian snakes, that are both achievable, and have high conservation value. ICAP recommendations broadened existing *ex situ* roles and published recommendations and helped to identify regional priorities for Canadian snakes. This process also increased knowledge and understanding amongst all participants of the full spectrum of possible *ex situ* roles and how they can contribute to conservation. The resultant ICAP report (Winton et al. 2021) provides a basis for *ex situ* actions to be developed that best contribute to conserving these species in the wild, based upon best available data and logical decision making and evaluation within a transparent, collaborative process involving both *in situ* and *ex situ* experts. Actions identified in the workshop complement *in situ* conservation efforts and enable the development of more detailed integrated conservation plans. The final workshop report with detailed results and recommendations is available for download on the CSI website (www.canadianspeciesinitiative.ca) or contact us directly to request a copy.

References

COSEWIC. 2021. Canadian Wildlife Species at Risk. Committee on the Status of Endangered Wildlife in Canada.

IUCN/SSC. 2014. Guidelines on the use of *ex situ* management for species conservation. Version 2.0. Gland, Switzerland: IUCN Species Survival Commission.

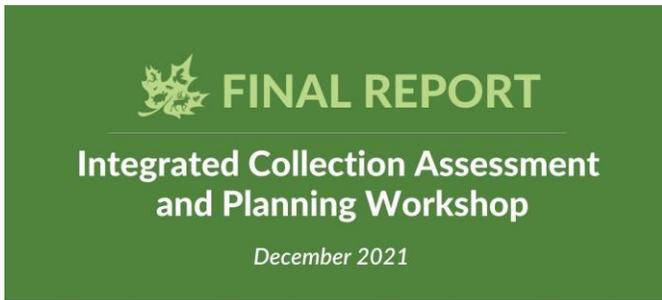
Lees, C.M., A. Rutschmann, A.W. Santure, and J.R. Beggs. 2021. Science-based, stakeholder-inclusive and participatory conservation planning helps reverse the decline of threatened species. *Biological Conservation* 260, 109194.

McGowan, P.J.K., K. Traylor-Holzer, and K. Leus. 2017. IUCN guidelines for determining when and how *ex situ* management should be used in species conservation. *Conservation Letters* 10(3): 361-366.

Traylor-Holzer, K., K. Leus, and O. Byers. 2018. Integrating *ex situ* management options as part of a one plan approach to species conservation. *The Ark and Beyond: The Evolution of Zoo and Aquarium Conservation* (ed. Minter BA, Maienschein J, Collins JP) pp. 129-141. Chicago: University of Chicago Press.

Traylor-Holzer, K., K. Leus, and K. Bauman. 2019. Integrated Collection Assessment and Planning

(ICAP) workshop: Helping zoos move toward the One Plan Approach. *Zoo Biology*. 38: 95–105. Winton, S., J. Steiner, A. Chabot, H. McCurdy-Adams, and K. Traylor-Holzer (Eds.). 2021. Integrated Collection Assessment and Planning Workshop for Canadian Snakes. Canadian Species Initiative, ON, Canada and IUCN SSC Conservation Planning Specialist Group, MN, USA.



Canadian Snakes



Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*). Photo by NACairms.