Ministry of the Environment, Conservation and Parks
2019

Blue Racer, Lake Erie Watersnake and Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population)

Ontario Government

Response Statement

Protecting and Recovering Species at Risk in Ontario

Species at risk recovery is a key part of protecting Ontario's biodiversity. *The Endangered Species Act, 2007* (ESA) is the Government of Ontario's legislative commitment to protecting and recovering species at risk and their habitats.

Under the ESA, the Government of Ontario must ensure that a recovery strategy is prepared for each species that is listed as endangered or threatened. A recovery strategy provides science-based advice to government on what is required to achieve recovery of a species.

Within nine months after a recovery strategy is prepared, the ESA requires the Ontario government to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy. The response statement is the government's policy response to the scientific advice provided in the recovery strategy. In addition to the strategy, the government response statement considered (where available) input from

Ontario

Indigenous communities and organizations, stakeholders, other jurisdictions, and members of the public. It reflects the best available local and scientific knowledge, including Traditional Ecological Knowledge where it has been shared by communities and Knowledge Holders, as appropriate and may be adapted if new information becomes available. In implementing the actions in the response statement, the ESA allows the government to determine what is feasible, taking into account social, cultural and economic factors.

The recovery strategies for the Blue Racer (*Coluber constrictor foxii*), the Lake Erie Watersnake (*Nerodia sipedon insularum*) and the Small-mouthed Salamander (*Ambystoma texanum*) in Ontario were completed on March 2, 2015. On May 30, 2018, an updated and expanded recovery strategy for Small-mouthed Salamander (*Ambystoma texanum*) and Unisexual Ambystoma (Small-mouthed Salamander dependent population) (*Ambystoma laterale – texanum*) was finalized. Unisexual Ambystoma (Small-mouthed Salamander dependent population) are also referred to as Small-mouthed Salamander dependent unisexuals in this document. Given their similar distribution and threats, the recovery efforts for the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander, and Small-mouthed Salamander dependent unisexuals are addressed collectively in a single government response statement, which has been updated following the completion of the updated recovery strategy noted above. The combined government response statement also recognizes the importance of collaborative implementation of recovery actions with partners on Pelee Island. This GRS does not aim to outline additional habitat protection for the four species; at this time, the general habitat protection under the ESA already in place will continue to apply.

Blue Racer habitat. Photo by Joe Crowley

The Blue Racer is a large, non-venomous snake that can grow up to 1.5 m in length. Adult Blue Racers are greyish-blue in colour with a white, cream or bluish-white belly and a characteristic black mask. Juveniles have dark blotches along their body that eventually fade completely.

Pelee Island

The Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander, and Small-mouthed Salamander dependent unisexuals are all found on Pelee Island. Within Canada, Blue Racer, Small-mouthed Salamander and Small-mouthed Salamander dependent unisexuals are known to occur exclusively on Pelee Island. Within Canada, the largest population of Lake Erie Watersnake occurs on Pelee Island. Pelee Island is located in the western basin of Lake Erie and has a vast amount of biodiversity and a rich cultural heritage. The community of Pelee Island celebrates its natural history. The Township of Pelee works with private landowners and partner organizations to create and expand nature reserves on the island and works to integrate other conservation-focused initiatives.

The Official Plan for the Township of Pelee outlines in the overall objectives the importance of understanding the value of the island's natural heritage, of fostering stewardship of the natural environment, and of protecting and enhancing the natural environment of the island. An environmental advisory committee for Pelee Island has also been formed to bring together representatives from the municipality, non-governmental organizations, the local conservation authority and provincial ministries to cooperate on issues of

The Lake Erie Watersnake is a non-venomous, highly-aquatic snake that is rarely found far from the shoreline. It averages between 59 and 88 cm and is pale grey to dark brown in colour, with ranging patterns of darker brown or reddish blotches on the back and sides that often connect to form a banding pattern.

Lake Erie Watersnake habitat. Photo by Joe Crowley

environmental importance. The Pelee Island community actively collaborated to support the Nature Conservancy of Canada (NCC) in purchasing over 10% of the island (435 ha) for the proactive preservation of priority conservation lands. Additional lands owned by a variety of land owners and managers are also in conservation ownership for a total of 18% of the island set aside for conservation purposes. The municipality, private landowners and NCC have also taken multiple additional steps to protect and support biodiversity on Pelee Island:

- In order to reduce road impacts to species, the municipality has significantly lowered speed limits on almost all roads on the island.
- Through the updating of waste disposal methods, the Township of Pelee has allowed for previous retaining ponds that were constructed to progress into functioning wetlands.
- All municipal infrastructure projects include site-specific collaboration with the local conservation authority, local Indigenous communities and organizations, and pertinent provincial and federal ministries.
- The municipality has intentionally created endangered species habitat such as snake hibernacula.
- To benefit both terrestrial and aquatic species, many stretches of shoreline habitat are being actively preserved and restored using native vegetation and materials.

The Small-mouthed Salamander is a medium-sized, heavy-bodied salamander that is dark brown to greyish-black with gray-blue patches that resemble lichen on its tail and sides. It can grow to a maximum length of about 18 cm and has a relatively small head and a short, narrow snout.

Small-mouthed Salamander and Unisexual Amybstoma (Small-mouthed Salamander dependent population) habitat. Photo by Joe Crowley

- Many private landowners continue to preserve natural habitat, construct and protect wetlands, plant native species, and use low impact farming practices on their individual properties to support biodiversity and the natural heritage of Pelee Island.
- With the support of the municipality, NCC has secured key natural areas including three alvars, critical shoreline and forested swamp areas. NCC also continues to restore agricultural lands to create habitat corridors and buffers and enhance connectivity for species.
- NCC has implemented a community-based conservation plan to protect key biodiversity features and functions, while supporting continuation of existing land uses and expansion of the island's ecotourism-based economy.
- The municipality, community members, NCC and other partners collaborate to exchange knowledge, promote the island's unique wildlife, interpret the natural surroundings for visitors and promote natural heritage events.

There are a variety of land uses on Pelee Island, including agriculture, hunting, recreation and tourism. Given the island formation, a finite amount of land is available to carry out all activities, which may result in competing land uses. The community's health, as well as prosperity, fundamentally rely on biodiversity and the ecosystem services it provides, such as food, clean water, fresh air and fertile soil. All of these factors highlight the importance of mobilizing partnerships and collectively working to conserve biodiversity while supporting local economic sustainability.

Protecting and Recovering the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population)

The Blue Racer, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) are listed as endangered species under the ESA, which protects both the animals and their habitat. The ESA prohibits harm or harassment of endangered and threatened species and damage or destruction of their habitat without authorization. Such authorization would require that conditions established by the government be met.

The Lake Erie Watersnake is listed as special concern under the ESA. The species was downlisted provincially from endangered to special concern on June 2, 2017, based on the Committee on the Status of Species at Risk in

The Unisexual Ambystoma (Small-mouthed Salamander dependent population), which co-exist with Small-mouthed Salamanders, are intermediate in appearance to other mole salamander species it co-exists with but cannot be readily distinguished from these species without genetic testing.

Ontario's (COSSARO) assessment. The species is included in this GRS to foster continued stewardship and in recognition of the value of collective efforts to conserve biodiversity.

A collaborative, stewardship first approach that partners the municipality, the provincial and federal governments, and local partners is intended to meet both the needs of the community and of the species that help contribute to the island's biodiversity, including Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Small-mouthed Salamander dependent unisexuals.

Blue Racer

The historical distribution of the Blue Racer in North America ranges from extreme southwestern Ontario, west to Minnesota, south to Illinois and east to Ohio. In the United States, the only states with current populations of the Blue Racer are Ohio, Indiana, Illinois, Michigan, Wisconsin and Iowa. In Canada, Blue Racers have disappeared from the mainland in southwestern Ontario and this species is now known to only occur on Pelee Island. Blue Racers inhabit forest edges and dry, open to semi-open habitat types such as alvars, savannahs, grasslands and thickets. They exhibit high fidelity to hibernation sites, which are usually underground cavities that are accessed through cracks and fissures in the bedrock.

The primary threat to the Blue Racer is habitat loss, largely due to succession of vegetation communities. Historically, clearing of land for agriculture and development posed a major threat but has been less significant in recent years. As woody plants succeed in the ecosystem, suitable habitat features for the species disappear, such as open canopies, dry open to semi-open areas, and edge habitat. As is the case with most snake species, road mortality and persecution are also significant threats to the Blue Racer. Working together to reduce negative perceptions of snakes is an important component of conserving biodiversity and addressing these threats for all snake species. It is possible that chemical contamination poses a threat to the species and that introduced Wild Turkeys (*Meleagris gallopavo*) may pose a threat as a potential new predator, though the extent of these potential threats is currently unknown. Continuing to increase the level of knowledge and understanding of interactions between introduced Wild Turkeys and Blue Racers will be of value.

Population estimates for the Blue Racer have not been completed since 2002, when the combined population size for three study sites on Pelee Island was estimated to be approximately 140 adult Blue Racers.

The possible population range identified through this study was 59 to 284. Hatchlings and juveniles have been observed as recently as 2015, suggesting that the population is successfully reproducing. However, anecdotal evidence from some research and site visits since 2002 suggest the Canadian population of the Blue Racer may have experienced further decline in recent years, and a decline in overall habitat quality and quantity has also been noted at several occupied sites on the island.

Given the small population size found in 2002, anecdotal evidence of potential decline since that time, and the threats to the Blue Racer and its habitat, approaches to recovery should focus on working together to increase the level of knowledge of the species, increase the amount of suitable habitat available for the Blue Racer and minimize threats to the species to enable natural increases in the species' population.

Government's Recovery Goal for the Blue Racer

The government's goal for the recovery of the Blue Racer in Ontario is to maintain the species' distribution and ensure a viable, self-sustaining population.

Lake Erie Watersnake

The Lake Erie Watersnake is a subspecies of the Northern Watersnake (*Nerodia sipedon*) and is endemic to the islands of Lake Erie and a small peninsula on the Ohio mainland. Previously listed as endangered in Ontario, the species was downlisted to special concern in June 2017 based on updated information that informed COSSARO's assessment. In Ontario, Lake Erie Watersnakes are known to occur on Pelee, East Sister, and Middle Islands. This species was previously known to also occur on Hen, North Harbour and Middle Sister Islands. Recent data suggest that it is likely extirpated from North Harbour and Middle Sister Islands. However, surveys have not occurred on Hen Island, which is privately owned, since the early 1990s. As a result, the 2016 Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status report identifies that the species' status on Hen Island is currently unknown. Hen, East Sister, North Harbour, and Middle Sister Islands all lie northwest of Pelee Island in Lake Erie, while Middle Island lies south of the southwest corner of Pelee Island.

Lake Erie Watersnakes are highly aquatic and rarely travel inland more than 50 m from the shoreline during the active season, although they will travel greater distances inland to hibernation sites. Adult snakes may hibernate singly or communally, using underground cavities, burrows, or human-made structures such as old wells or building foundations.

As indicated in scientific literature, significant threats to snakes such as the Lake Erie Watersnake are road mortality and persecution. The colouration of Lake Erie Watersnakes can make them difficult to see against unpaved or dust covered roads. Additionally, fear or dislike of snakes can foster negative human behaviours that may result in harm to individual snakes. Habitat loss due to shoreline development, vegetation clearing, increased presence of shoreline invasive species such as Phragmites (European Common Reed) (*Phragmites australis* ssp. *australis*), and removal of winter hibernation habitat is also a significant threat to the species. Other possible threats to the Lake Erie Watersnake include environmental contaminants and adverse effects of high-density nesting or roosting areas of waterbirds, such as Double-crested Cormorants (*Phalacrocorax auritus*), on habitat.

Populations of the Lake Erie Watersnake experienced historical declines, but may have stabilized in recent years; there is insufficient data to document population trends of Lake Erie Watersnake in Canada. An increase in the abundance of the invasive Round Goby (*Neogobius melanostomus*), which has become an important food source for the Lake Erie Watersnake, has shown to have increased populations in the United States. It is unknown whether there has been a similar effect in Canada due to potential differences in the magnitude of threats that are faced by the species. In 2016, the Committee on the Status of Endangered Wildlife in Canada estimated the number of mature individuals on Pelee Island to be 3,286, and estimated approximately another 200 individuals inhabiting the other islands. Approaches to recovering the Lake Erie Watersnake will focus on minimizing the threats of accidental and intentional human-caused mortality by increasing public awareness and understanding on managing its habitat to support the current abundance and distribution of the species in Ontario.

Government's Recovery Goal for the Lake Erie Watersnake

The government's goal for the recovery of the Lake Erie Watersnake is to maintain the current abundance and distribution of the species in Ontario.

Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population)

The Small-mouthed Salamander ranges from eastern Texas to western Alabama and across the central United States, reaching its northern range in Michigan, northern Ohio and Pelee Island in Ontario. The global population is thought to exceed 100,000 but is unknown. In Canada, the species is only known to occur on Pelee Island. Small-mouthed Salamander dependent unisexuals have been found in Michigan, Indiana and Ohio, and several Lake Erie islands. The full global distribution and population are uncertain because

genetic testing is required to identify these animals and this has not occurred for many populations. In Canada, the Small-mouthed Salamander dependent unisexuals are only known to occur on Pelee Island.

Small-mouthed Salamanders, Unisexual Ambystoma (Small-mouthed Salamander dependent population) and Blue-spotted Salamanders (*Ambystoma laterale*) (not at risk) all co-occur on Pelee Island. Unisexual Ambystoma (Small-mouthed Salamander dependent population) is a genetically distinct, all-female salamander lineage that depends on the other two salamander species to carry out reproduction.

Small-mouthed Salamander and Small-mouthed Salamander dependent unisexuals in Ontario are known historically to occur at five breeding sites on Pelee Island, but the most recent survey efforts (2015-2017) found Small-mouthed Salamanders and Small-mouthed Salamander dependent unisexuals at only three of those five breeding sites. These surveys did, however, identify three additional breeding sites in use by the two species on Pelee Island for a total of six confirmed sites. The status of one additional breeding site, and the current population abundance, are unknown.

The Small-mouthed Salamander and Small-mouthed Salamander dependent unisexuals are members of the Mole Salamander family (*Ambystomatidae*), a family name that refers to the biological characteristic of spending most of their time underground or beneath cover except when breeding.

All Unisexual Ambystoma (Small-mouthed Salamander dependent population) salamanders are females and have a unique reproductive strategy whereby the sperm from male Small-mouthed Salamanders or Blue-spotted Salamanders is needed to initiate egg development. Their offspring are unique in that they are also all females and are all considered Unisexual Ambystoma (Small-mouthed Salamander dependent) regardless of what species' sperm initiated egg development. While the sperm may or may not be incorporated into the Small-mouthed Salamander dependent unisexual egg, the species does not appear to be able to reproduce in the absence of a Small-mouthed Salamander or Blue-spotted Salamander. Therefore, the persistence of the Unisexual species is dependent on the presence of the other salamander species.

It is thought that these three species that make up the salamander complex on Pelee Island were isolated together in the area roughly 4000 years ago. Small-mouthed Salamander dependent unisexuals vastly outnumber both Small-mouthed and Blue-spotted Salamanders, making up over 80 percent

of all the Ambystoma salamanders on the island. Recent survey efforts examined more than 830 samples (adults and larvae) on Pelee Island collected from 2015 to 2017 and found that unisexuals made up over 95 percent of the sample (Hossie and Murray 2017).

The habitat needs of both species include: fish-free, shallow water bodies that retain water from March through July, used for breeding, and adjacent suitable terrestrial areas that are shaded and provide soft moist soils, logs, rocks and leaf litter that are used for cover, shelter and overwintering.

The main threats to the species are habitat degradation, loss and fragmentation. This includes the temporary or permanent loss of water from breeding sites during critical periods, and the loss of forest canopy cover, rotting logs and other ground cover. Small-mouthed Salamanders and Small-mouthed Salamander dependent unisexuals rely on wetlands site and ephemeral pools of water (i.e., temporary pools that form in the spring and typically dry up in the summer) for breeding; therefore, activities and climate conditions that affect the hydrology of the habitat and surrounding areas also pose a threat. Threats from invasive species, such as Phragmites, can also reduce suitable habitat conditions for the species. While environmental contaminants (e.g., pesticides, de-icing salt) are known to affect amphibians, the local impacts of environmental contaminants on Small-mouthed Salamander and Small-mouthed Salamander dependent unisexuals are unknown. Additional potential threats to the species include disease (e.g., ranaviruses, chytrid fungi) and predation and habitat alteration caused by Wild Turkeys. As the relative impacts of many of these potential and known threats on local populations are currently unknown, further research is necessary to support recovery actions for the species.

The Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent) populations on Pelee Island are small and the salamanders themselves are difficult to distinguish from other salamander species without the assistance of genetic testing. Continuing to manage the salamander complex will support recovery for all associated salamander species at risk. Given the lack of population estimates, there is a need to focus on conducting inventories of recent breeding sites and monitoring population trends and habitat usage. Approaches to recovery will focus on working in collaboration with the local community to monitor current populations, manage current habitat effectively, increase the amount of suitable habitat available for Small-mouthed Salamander and dependent unisexuals, and increase our knowledge of potential threats to the species.

Government's Recovery Goal for the Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population)

The government's goal for the recovery of the Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) is to ensure long-term viability and persistence of the Ontario populations by managing threats and increasing population abundance, distribution and connectivity.

Actions

Protecting and recovering species at risk is a shared responsibility. No single agency or organization has the knowledge, authority or financial resources to protect and recover all of Ontario's species at risk. Successful recovery requires inter-governmental co-operation and the involvement of many individuals, organizations and communities. In developing the government response statement, the government considered what actions are feasible for the government to lead directly and what actions are feasible for the government to support its conservation partners to undertake.

Government-led Actions

To help protect and recover the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) the government will directly undertake the following actions:

- Explore opportunities to work collectively with the Township of Pelee, including the Pelee Island Environmental Advisory Committee, the federal government and local partners to develop an integrated (landscape/place-based) approach to managing species at risk with consideration of ecosystem values and sustainable resources on Pelee Island. This may include:
  - developing a strategic plan for species at risk and their habitats on Pelee Island;
  - continuing to implement the Ontario Invasive Species Strategic Plan to address the invasive species (e.g., Phragmites) that threaten Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population);
  - continuing to implement Ontario's *Invasive Species Act* to address the invasive species identified in the Act (e.g., Phragmites) that threaten Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population);

- supporting the coordination of provincial and federal species at risk legislation (i.e., ESA and *Species at Risk Act* (SARA)), in order to collaboratively continue to protect Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) and their habitats; and,
- educating other agencies and authorities involved in planning and environmental assessment processes on the ESA.

- Explore opportunities to work collectively with the Township of Pelee, including the Pelee Island Environmental Advisory Committee, the federal government and local partners to integrate approaches to stewardship and implementation of recovery activities including:
  - encouraging collaboration, and establishing and communicating annual priority actions for government support in order to reduce duplication of stewardship efforts;
  - supporting conservation, agency, municipal and industry partners, and Indigenous communities and organizations to undertake activities to protect and recover Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population). Support will be provided where appropriate through funding, agreements, permits (including conditions) and advisory services;
  - undertaking communication and outreach to increase public awareness of species at risk in Ontario; and,
  - encouraging the submission of Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) data to the Ontario's central repository through the citizen science projects that they receive data from (e.g., the Ontario Reptile and Amphibian Atlas) and directly through the Natural Heritage Information Centre.
- Continue to monitor, protect and manage habitat for the four species in protected areas on Pelee Island (e.g., Lighthouse Point and Fish Point Provincial Nature Reserves). Continue to work collaboratively with local partners to enhance and restore habitat for species at risk within these protected areas.

Government-supported Actions

The government endorses the following actions as being necessary for the protection and recovery of the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population). Actions identified as "high" may be given priority consideration for funding under the Species at Risk Stewardship Program. Where reasonable, the government will also consider the priority assigned to these actions when reviewing and issuing authorizations under the ESA. Other organizations are encouraged to consider these priorities when developing projects or mitigation plans related to species at risk.

Focus Area: **Habitat Management**
Objective: Work collaboratively to increase habitat quality for the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population).

Habitat loss and degradation is a significant threat to all four species. A landscape level approach to habitat management for the species recognizes the finite amount of land available on Pelee Island. Collectively working to develop and implement best management practices will support habitat management and restoration for the four species, particularly for the Blue Racer, Small-mouthed Salamander and Small-mouthed Salamander dependent unisexauls as habitat is very limited. Without active management of Blue Racer habitat, the open to semi-open habitat succeeds (e.g., shrubs and trees grow in) over time and becomes unsuitable for the species. In the case of Small-mouthed Salamander and the Small-mouthed Salamander dependent unisexuals, the species rely on ephemeral pools and wetlands and suitable adjacent terrestrial areas. As a result, activities impacting the hydrology or tree canopy of these areas could have substantial consequences for these species. Cooperative, preventative efforts to manage habitat for suitability over the long-term will greatly assist in reducing these impacts.

Actions:

1. **(High)** Using community knowledge and species expertise, develop, promote and implement best management practices to manage existing habitat for the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) including:
   - prescribed burns to prevent woody succession in Blue Racer habitat, with consideration for the safety of neighbouring properties, snakes and other rare species present on-site;

- targeted removal of native or invasive woody vegetation in Blue Racer habitat, with consideration for other species at risk, using appropriate and approved methods;
- removal of invasive species such as Phragmites along shoreline habitat for Lake Erie Watersnake and at known breeding sites for Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population);
- managing vegetation to support suitable habitat conditions and maintaining appropriate wetland and forested habitat features such as cover objects and forest cover for Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population);
- buffering against potential site-level effects of environmental contaminants on water quality in Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) breeding habitat; and,
- managing existing and new infrastructure, such as drainage works, in a way that reduces the negative effects on Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) habitat, with additional consideration for neighbouring properties.

2. Collaborate with community members and organizations to strategically increase the amount of suitable habitat available for Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) by:

Blue Racer (High)

- identifying and assessing existing habitat and identifying candidate areas for habitat enhancement, restoration and creation where there are willing partners;
- creating a mosaic of suitable habitat types such as grassland, savannah and edge habitat, with a focus on increasing connectivity between suitable habitat patches;
- creating hibernation, nesting and shelter habitats and monitoring and documenting their effectiveness;

Lake Erie Watersnake

- identifying and assessing existing habitat and identifying candidate areas for habitat enhancement, restoration and creation where there are willing partners;
- restoring shoreline habitat and increasing structural heterogeneity, and increasing connectivity between areas of habitat;
- creating suitable hibernation and shelter habitats and monitoring and documenting their effectiveness;

Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) (High)

- identifying and assessing existing habitat and identifying sites adjacent to or between known locations for potential habitat enhancement, restoration and creation where there are willing partners; and,
- enhancing, restoring and creating suitable habitat such as ephemeral pools and surrounding forested areas in appropriate areas.

3. **(High)** Work with local partners to maintain adequate water levels and quality, and hydrology that sustain the breeding sites and migratory routes for Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population). This may include buffering for the potential effects of climate change on water levels in the future and exploring opportunities to support hydrology at a watershed scale (e.g., restoring riparian habitat).

Focus Area: **Awareness and Threat Management**
Objective: Work in partnership with the Pelee Island community to reduce threats to the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) through increasing public awareness, promoting local stewardship of the species and their habitats, and implementing threat mitigation techniques.

Landowners, local residents and visitors to Pelee Island have an important role to play in the protection and recovery of the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population). Increasing public awareness and promoting local stewardship are critical to addressing key threats such

as road mortality and persecution. Efforts to increase awareness should build off of work completed to date by conservation partners and other jurisdictions, such as the resources and programs developed in the U.S. to support Lake Erie Watersnake recovery. Steps taken in the future to mitigate threats to the species and their habitat can build on research conducted in the coming years. A continued collaborative approach that focuses on stewardship of the species and their habitat will support the effective implementation of protection and recovery actions.

Actions:

4. **(High)** Collaborate with local organizations and initiatives to reduce threats to the species, including road mortality and persecution. For example:
   - developing programs to reduce road mortality, which may include installing signs and publicizing the need for cautious driving, particularly in areas of high mortality for these species;
   - producing educational materials to increase public awareness, such as promoting the need to share the shoreline with Lake Erie Watersnakes; and,
   - implementing techniques to reduce rates of road mortality (e.g., ecopassages, barrier fencing, traffic calming measures), particularly in areas of high mortality for these species.
5. Promote local stewardship of the Blue Racer and the Lake Erie Watersnake that includes:
   - developing social marketing strategies to help influence public perceptions and behaviours that negatively affect snake populations;
   - producing stewardship publications to highlight success stories and engage the public in snake conservation; and,
   - increasing awareness of incentive programs and how landowners can benefit from protecting and restoring Blue Racer and Lake Erie Watersnake habitat.

Focus Area: **Inventory and Monitoring**
Objective: Improve knowledge of species' population trends, habitat usage and distribution.

Little is known about the current abundance, local distribution, habitat usage, and population trends of Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population). A greater understanding of the four

species' current population abundance is essential to support the ability to monitor progress and effectiveness of recovery actions and population trends over time. Further information on these topics, as well as additional surveying for potential presence at historical and potential locations would contribute to greater understanding of the status of the four species.

Actions:

6. Collaborate with local partners and community members to develop and implement survey and monitoring programs to:

Blue Racer (High) and Lake Erie Watersnake

- estimate the population abundance and distribution of the Blue Racer and the Lake Erie Watersnake and monitor trends over time;
- monitor changes in Blue Racer and Lake Erie Watersnake use and suitability of habitat;
- identify areas with high rates of road mortality between occupied habitats;
- survey for the Lake Erie Watersnake on other Lake Erie islands (e.g., Hen, Middle Sister and North Harbour Islands), where feasible, in order to determine if the species is still present in these areas;

Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) (High)

- estimate the population abundance and distribution of both salamander species at known sites;
- estimate the proportion of each species relative to the salamander complex;
- monitor suitability of habitat including terrestrial (e.g., canopy cover, soil moisture and cover object availability) and aquatic (e.g., water level, pH, pollutants and fish presence) features;
- monitor population trends and monitor changes in genetic composition and recruitment of the salamander complex over time;
- identify areas with high rates of road mortality between occupied habitats; and,
- survey for the two species at potential sites with suitable habitat in order to identify additional populations and refine knowledge on the distribution of the salamander species.

Focus Area: **Research and Population Management**
Objective: Increase knowledge of threats to the species, species-specific habitat requirements and ecological limitations.

Knowledge gaps related to specific habitat requirements and the significance of threats currently exist for all four species. Investigating and filling these knowledge gaps will help to better inform the implementation of recovery actions for these species, such as habitat management efforts and road mortality reduction techniques. Improving our knowledge of the salamander complex on Pelee Island, including genetic composition and any associated limitations, will support future recovery efforts. Increasing our understanding of potential emerging threats, such as disease and climate change, will also support effective mitigation if needed in the future. For both Blue Racer and the two salamander species, impacts of potential diseases could lead to significant impacts given their small population sizes.

Actions:

7. Investigate the structural, thermal and chemical properties of hibernation and nest/gestation sites to inform the creation and maintenance of these sites for the Blue Racer and the Lake Erie Watersnake. Assess the effectiveness of created hibernation habitats.
8. Research Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) habitat use (e.g., breeding sites, migration routes and overwintering sites) and habitat connectivity (including dispersal barriers).
9. Investigate the effectiveness of techniques to create breeding ponds for the two salamander species, including the factors that influence the quality of created breeding habitats.
10. Investigate the effects and severity of known and potential threats to Blue Racer and Lake Erie Watersnake, and identify potential mitigation measures as appropriate, including:
    - examining the potential effects of Double-crested Cormorants and Wild Turkeys on the species and/or their habitat; and,
    - investigating the potential effects of disease (e.g., Snake Fungal Disease) and other identified threats to the species and their habitat.

11. Investigate the effects and severity of known and potential threats to Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population), and identify potential mitigation measures as appropriate, including:
    - investigating the extent that environmental contaminants are directly or indirectly affecting the productivity and/or survival rates of the two salamander species;
    - examining the potential effects on the salamander complex of predation by Wild Turkeys and habitat alteration caused by the turkeys;
    - investigating the potential effects of climate change on the species and their habitat, and the relationship between habitat suitability and hydrology; and,
    - investigating the potential effects of disease (e.g., ranaviruses, chytrid fungi), and parasites (e.g., trematode) on Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population).
12. Conduct assessments to determine population targets for achieving self-sustaining and genetically viable Blue Racer, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent) populations in Ontario.
13. Investigate the ecological relationships in the Ambystoma salamander complex on Pelee Island to assess potential demographic constraints to species' recovery (e.g., related to reproductive output, recruitment, and survival in the larval and adult life stages).
14. Investigate the potential need for, and feasibility of, assisted recruitment techniques to support the recovery goal for Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population). If found to be feasible and necessary, implement, evaluate, adapt and improve recruitment techniques with consideration for the species' ecology and the salamander complex as a whole. An example of a priority recruitment technique is:
    - exploring the potential benefits and need for a cost-effective head-starting protocol/program (e.g., reproductive monitoring, artificial incubation of eggs, and release of juveniles).

Implementing Actions

Financial support for the implementation of actions may be available through the Species at Risk Stewardship Program. Conservation partners are encouraged to discuss project proposals related to the actions in this response statement with program staff. The Ontario government can also advise if any authorizations under the ESA or other legislation may be required to undertake the project.

Implementation of the actions may be subject to changing priorities across the multitude of species at risk, available resources and the capacity of partners to undertake recovery activities. Where appropriate, the implementation of actions for multiple species will be co-ordinated across government response statements.

Reviewing Progress

The ESA requires the Ontario government to conduct a review of progress towards protecting and recovering a species not later than five years from the publication of this response statement. The review will help identify if adjustments are needed to achieve the protection and recovery of the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population).

Acknowledgement

We would like to thank all those who participated in the development of the recovery strategies for the Blue Racer, Lake Erie Watersnake, Small-mouthed Salamander and Unisexual Ambystoma (Small-mouthed Salamander dependent population) for their dedication to protecting and recovering species at risk.

For additional information:
Visit the species at risk website at ontario.ca/speciesatrisk
Contact the Natural Resources Information Centre
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