

Shagreen and Toothed Globe

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 Ontario government's legislative commitment to protecting and recovering species at risk and their habitats.

Under the ESA, the government 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.

Generally, within nine months after a recovery strategy is prepared, the ESA requires the 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 considers (where available) input from Indigenous communities and organizations, stakeholders, other jurisdictions, and members of the public. It reflects the best available local and scientific knowledge, including Indigenous 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 Strategy for the Shagreen (*Inflectarius inflectus*) and Toothed Globe (*Mesodon zaletus*) in Ontario was completed on January 25, 2023. Given their similar distribution and threats, the recovery efforts for the Shagreen and Toothed Globe are addressed collectively in a single government response statement.



Photo: A. Nicolai



Photo: UMMZ Mollusk Division

Shagreen is a medium-sized terrestrial snail with a depressed, yellow to brown shell that has three tooth-like projections in the opening. Its body is dark grey in colour and rarely extends out of the shell.

Toothed Globe is a large terrestrial snail with a depressed, spherical, yellow shell that has a tooth-like projection in the opening. Its body is greyish-brown or black, and paler underneath.

Protecting and Recovering Shagreen and Toothed Globe

Shagreen and Toothed Globe are listed as endangered species under the ESA, which protects both the animals and their habitats. The ESA prohibits harm or harassment of these species and damage or destruction of their habitat without authorization or complying with the requirements of a regulatory exemption.

Shagreen occurs only in eastern North America. Its range extends north to Michigan and Ontario, east to New York, south to Florida and Texas and west to Texas, Kansas and Oklahoma. In Canada, the species is currently thought to be restricted to Pelee Island and Middle Island in Lake Erie. There are a total of 10 known extant locations across the two islands. The species is presumed extirpated from sites on Middle Sister Island, East Sister Island, and North Harbour Island in Lake Erie, as well as the southwestern Ontario mainland. Shagreen's Ontario distribution, measured by its index of area of occupancy (the total area occupied by the species when divided into 2 x 2 km grid cells) was 32 square kilometres as of 2019.

Toothed Globe has a similar global distribution, ranging north to Michigan and Ontario, east to New York, south to South Carolina and Texas, and west to Texas, Oklahoma and Iowa. In Canada, there are no currently known occurrences. However, the species is historically known from several Lake Erie islands and the southwestern Ontario mainland. It may still occur at historical locations on Hen Island in Lake Erie, and on the mainland in Essex and Middlesex counties, where intact habitat remains, but recent surveys have not been conducted due to lack of access.

In Ontario, Shagreen can be found in rocky or open woods and wooded alvar, and has only been found under logs. However, in parts of the species' U.S. range, it can be found under other natural objects such as rocks and leaf litter (the layer of decomposing leaves and debris found on top of the soil), or human-made objects such as railroad ties. Historically, Toothed Globe was common in deciduous forests and along river bluffs, ravines and on mountainsides, preferring slopes with thick leaf litter over a rich humus. Like other terrestrial snails, Shagreen and Toothed Globe likely have very specific microhabitat requirements, such as moist, temperature-buffered refuges that provide shelter against extreme weather. These microhabitat requirements likely vary based on lifecycle stage or season, but further investigation is required.

Little is known about the biology of Shagreen and Toothed Globe. Both snails are air-breathing, egg-laying terrestrial snails. These species are believed to reach sexual maturity within one to three years and each individual snail has both male and female reproductive organs. Both members of a mating pair may exchange sperm and produce eggs. The generation time (which is the approximate average age of parents in the generation) is estimated to be two years for Shagreen and five to six years for Toothed Globe. The hibernation period for both species likely occurs from early October until mid-April, depending on environmental conditions. Hibernation sites likely include shallow depressions in the forest floor covered with leaf litter, or in soil at depths of 5 to 10 cm. Like many other snail species that live in leaf litter, Shagreen and Toothed Globe may feed on decaying plants or microfungi on logs under which they are found, and may play an important role in the nutrient cycle in ecosystems where they occur. Dispersal ability of these species is not well understood, but is believed to be extremely limited (for example, the related Oregon Forestsnail was measured to travel no more than 32 m from where it was first found over a three-year period).

Additional research is required to gain a full understanding of the current threats to Shagreen and Toothed Globe. Habitat loss and degradation, primarily resulting from the impacts of hyperabundant and invasive species, is a threat to both species. Double-crested Cormorants (*Phalacrocorax auritus*) may be a key reason Shagreen and Toothed Globe have been extirpated from several Lake Erie islands. Double-crested Cormorant nesting colonies have increased in recent decades, and the guano of these birds is known to lead to changes in soil chemistry, tree dieback and changes in species communities. Habitat of these snails may also be degraded by invasive species such as various types of non-native plants (e.g. Japanese Chaff Flower [*Achyranthes japonica*], Garlic Mustard [*Alliaria petiolata*], European Common Reed, also known as invasive Phragmites [*Phragmites australis* ssp. *australis*]), and earthworms. Several invasive snails (e.g. Leopard Slug [*Limax maximus*]) may also threaten Shagreen and Toothed Globe through direct competition for food or shelter, but the interactions between the species are poorly understood. The introduction of Ring-necked Pheasant (*Phasianus colchicus*) for hunting, and restoration of Wild Turkey (*Meleagris gallopavo*) in Ontario may also impact Shagreen and Toothed Globe as both bird species are known to include snails in their diet. Other potential threats are described in the Recovery Strategy for the Shagreen (*Inflectarius inflectus*) and Toothed Globe (*Mesodon zaletus*) in Ontario.

Significant knowledge gaps remain about both Shagreen and Toothed Globe, including their distribution, subpopulation statuses, habitat requirements, ecological interactions and threats. Current and historical occurrences of these species are limited to small patches of highly fragmented habitat, and both species likely require specific microhabitat conditions and have limited dispersal ability. Recovery of Shagreen will require monitoring to confirm where the species is present, protection and maintenance of existing habitat to ensure the persistence of existing subpopulations and allow for natural expansion, and research to better understand threats to the species and appropriate mitigative actions. Targeted surveys are necessary to determine if and where Toothed Globe still occurs in the province. If it is found to be extant (still present) in Ontario, recovery actions for Toothed Globe will be similar to those required for Shagreen.

Government's Recovery Goal

The government's goal for the recovery of Shagreen is to maintain or increase its distribution in Ontario. The government's goal for the recovery of Toothed Globe is to determine whether the species is present in Ontario, and, if the species is found to occur in the province, maintain or increase its distribution. The government supports investigating the necessity and feasibility of augmenting existing populations of Shagreen and Toothed Globe.

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 Shagreen and Toothed Globe, the government will directly undertake the following actions:

- Continue to protect Shagreen and Toothed Globe and their habitat through the ESA.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Shagreen and Toothed Globe data to Ontario's central repository through the NHIC (Rare species of Ontario) project in iNaturalist or directly through the Natural Heritage Information Centre.
- Continue to support conservation, agency, municipal and industry partners, and Indigenous communities and organizations to undertake activities to protect and recover White-rimmed Shingle Lichen. Support will be provided where appropriate through funding, agreements, permits and/or advisory services.
- Work with all levels of government, communities and sectors to take action on climate change, and to report on progress in reducing greenhouse gas emissions.
- Continue to implement Ontario's *Invasive Species Act, 2015* to control the spread of invasive species (e.g. invasive Phragmites) that threaten Shagreen and Toothed Globe by restricting the importation, deposition, release, breeding/growing, buying, selling, leasing or trading of invasive Phragmites.
- Continue to implement the Ontario Invasive Species Strategic Plan (2012) to address the invasive species (e.g. Garlic Mustard [*Alliaria petiolata*]) that threaten Shagreen and Toothed Globe and their habitat.
- Conduct a review of progress toward the protection and recovery of Shagreen and Toothed Globe within five years of the publication of this document.

Government-supported Actions

The government endorses the following actions as being necessary for the protection and recovery of Shagreen and Toothed Globe. 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: Inventory and Monitoring

Objective: Investigate where Shagreen and Toothed Globe are present in Ontario, and, if located, monitor existing sites, their habitat, and site-specific threats.

In order to better focus actions to support protection and recovery of Shagreen and Toothed Globe in Ontario, it is important to understand if and where these species are present in the province. The use of standard survey methods and undertaking surveys in areas where the species have previously been found or where suitable habitat exists will help address knowledge gaps about the species' distributions. Continued monitoring of extant sites, habitat conditions

and site-specific threats will aid in understanding appropriate management actions required for each site.

Actions:

1. **(High)** Develop and implement a standardized survey and monitoring protocol for Shagreen and Toothed Glove in Ontario. Survey and monitoring protocols should document and monitor:
 - i. presence or absence at a site, including at sites that are currently considered occupied, sites that were historically occupied but still have suitable habitat, and potential new sites within the species' historical range that have not yet been surveyed but may be occupied based on the presence of suitable habitat
 - ii. habitat use and conditions, with emphasis on identifying habitat features that predict presence or absence of the target species, including suitable Ecological Land Classification ecosite types
 - iii. species abundance and population trends
 - iv. site-specific threats

Focus Area: Research

Objective: Conduct research that fills knowledge gaps related to biology, threats and habitat requirements.

Further information related to the decline of these species is need to support effective protection and recovery efforts. Investigating the species' response to various known and potential threats will help focus recovery efforts on actions that will have the most benefit for the species. In addition to improving knowledge of threats, further understanding of the species' biology, such as life history, food requirements and dispersal ability, is required to support management of the species and their habitats. Given the rarity of these species and their limited distribution, work is also required to determine whether active population management may be necessary, and, if so, the feasibility of implementing such measures.

Actions:

2. **(High)** Investigate the effects and severity of known and potential threats to Shagreen and Toothed Glove and their habitats, and identify potential mitigation measures as appropriate. Targeted threats may include:
 - i. impacts of Double-crested Cormorant, Wild Turkey, Ring-necked Pheasant, invasive plants, and non-native earthworms and gastropods
 - ii. climate change and severe weather, including short-term and long-term adaptive capacity, and snail performance (e.g. reproduction, feeding, and dispersal)
 - iii. impacts of prescribed burns
 - iv. pollution
3. Conduct research to improve knowledge on Shagreen and Toothed Glove biology and ecology, such as life history, genetic diversity between subpopulations, diet, dispersal ability and home range territory size.
4. Investigate the necessity and feasibility of augmenting the species at confirmed locations. Actions may include:
 - i. conducting population viability analyses to determine if augmentation is necessary

- ii. Investigating the possibility of captive breeding, assisted reproduction or head-starting
- iii. Developing an action plan to maintain the species' existing population based on research results

Focus Area: Habitat and Threat Management

Objective: Maintain or improve Shagreen and Toothed Globe habitat and mitigate threats to known extant subpopulations in Ontario.

Shagreen and Toothed Globe may be impacted by several threats, including invasive and hyperabundant native species, climate change, prescribed burns and pollution. As knowledge gaps are being filled on the effects and severity of these threats, management efforts should be focused on maintaining or enhancing habitat and minimizing threats to support the protection and recovery of these species where they are known to exist. Where appropriate to support natural expansion, efforts should also be taken to improve connectivity and enhance suitable habitat immediately surrounding existing occurrences.

Successful recovery depends on continued collaboration across multiple levels of government, landowners and other stakeholders. Much of Shagreen's known distribution and Toothed Globe's historical distribution is on land publicly or privately managed for conservation. Conservation organizations and local partners have been actively involved in the ongoing maintenance and restoration of these areas (e.g. prescribed burns) to support multiple species at risk. As certain management activities may impact Shagreen (and Toothed Globe, if it is present), working collaboratively on these efforts will enhance the protection and recovery of the species.

Actions:

5. **(High)** Work collaboratively with municipalities, conservation partners, landowners and land managers to undertake habitat restoration and/or enhancement to improve habitat quality and availability for Shagreen and Toothed Globe, including:
 - i. enhancing the connectivity between suitable habitats (e.g. planting hedgerows, wild grass stripes and poly-cultures [multiple plants species])
 - ii. creating refuge areas for snails to move into in times of extreme temperatures or droughts (e.g. ensuring an abundance and diversity of logs throughout the habitat)
 - iii. monitoring and evaluating habitat management activities and adjusting actions as needed
6. Develop and implement site-specific management plans that identify and mitigate threats to Shagreen, Toothed Globe and their habitats, or update existing management plans where appropriate. Plans should also consider impacts of ongoing management strategies for other species (e.g. pesticide application, prescribed burns). Best Management Practices (BMPs) should be considered whenever possible.

Focus Area: Awareness and Outreach

Objective: Increase the level of public awareness and engagement in protecting recovering the species.

Increasing public awareness of these species and encouraging participation in stewardship and monitoring will contribute towards recovery efforts by determining where Shagreen exists in the province, and if and where Toothed Globe exists, including where these species may occur on private lands. Improved knowledge of the species and their distribution is required to better manage threats and habitat. It is also important to improve awareness of conservation partners who may be interested in undertaking stewardship efforts or are involved in developing property management plans.

Actions:

7. Promote awareness of Shagreen and Toothed Globe among environmental professionals, naturalists, landowners, land users and land managers by sharing information regarding:
 - i. how to identify the species
 - ii. the species' distribution and habitat associations
 - iii. protection afforded to the species and their habitats under the ESA
 - iv. actions that can be taken to reduce threats to species and their habitats
8. Engage volunteers (e.g. naturalists, land managers, experts) to participate in surveys and monitoring efforts for Shagreen and Toothed Globe. Where appropriate, encourage the recording, sharing and transfer of Indigenous Knowledge relating to these snails.

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 Ministry of the Environment, Conservation and Parks staff. The Ontario government can also provide guidance about the requirements of the ESA, whether an authorization or regulatory exemption may be required for the project and, if so, the authorization types and/or conditional exemptions for which the activity may be eligible. 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 coordinated across government response statements.

Performance Measures

Progress towards achieving the government's goal for the recovery of Shagreen will be measured against the following performance measures:

- The index of area of occupancy (a measure of distribution based on occupied 2x2 km grid cells) is maintained or increased from 32 km² by 2033.

Progress towards achieving the government's goal for the recovery of Toothed Globe will be measured against the following performance measures:

- By 2028, targeted surveys have been conducted in Ontario to determine whether the species is present in the province.
- If one or more extent subpopulations are discovered, the distribution of Toothed Globe (as measured against the index of area of occupancy as of 2028) is maintained or increased by 2043.

Reviewing Progress

The ESA requires the Ontario government to conduct a review of progress towards protecting and recovering a species no later than the time specified in the species' government response statement, which has been identified as five years. The review will help identify if adjustments are needed to achieve the protection and recovery of Shagreen or Toothed Globe.

Acknowledgement

We would like to thank all those who participated in the development of the Recovery Strategies and Government Response Statement for the Shagreen (*Inflectarius inflectus*) and Toothed Globe (*Mesodon zaletus*) in Ontario 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 Ministry of the Environment, Conservation and Parks

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