

# Nine-spotted Lady Beetle

## Ontario Government Response Statement



Photo: Todd Uguine

### 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 Ministry 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 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 Strategy for the Nine-spotted Lady Beetle (*Coccinella novemnotata*) in Ontario was completed on May 30, 2018.

Nine-spotted Lady Beetle is a small (4.7-7.0 mm), pale orange to red insect in the lady beetle family. The adult beetle is round with a dark line between its wing covers and usually has nine spots. Adults can emit foul tasting chemicals when threatened and their bright colours discourage predators from eating them.

## Protecting and Recovering Nine-spotted Lady Beetle

Nine-spotted Lady Beetle is listed as an endangered species under the ESA, which protects both the insect and its habitat. The ESA prohibits harm or harassment of the species and damage or destruction of its habitat without authorization. Such authorization would require that conditions established by the Ontario government be met.

The Nine-spotted Lady Beetle's historical range in North America covered most of southern Canada and the continental United States to Mexico. The species was once widely distributed in Canada and was commonly found from Vancouver Island east to southern Québec. In recent years, the species has become increasingly rare with only 13 records in Canada in the last decade. The species was last recorded in Ontario in 1987. Recent Canadian observations of the species are concentrated in the western provinces, although there have been recent records in jurisdictions adjacent to Ontario in the last decade (i.e., Québec and the state of New York).

The latest species assessments and the provincial recovery strategy suggest that given the lack of current records in Ontario, it is possible the species may have become extirpated; however given its small size, the lack of targeted search effort, and records in neighbouring jurisdictions, it is possible that individuals or small populations remain that have not been detected. In addition, recent search efforts have been focused on agricultural systems or urban centres rather than the more naturalized habitats where the species is currently being located in other parts of its range.

Lady beetles are beneficial to ecosystems as they help to control agricultural and garden pests. Both adult and larval Nine-spotted Lady Beetle feed primarily on aphids, but can also consume other soft-bodied insects and mites as well as sap, pollen and nectar. Lady beetles are highly mobile and are able to move between habitat types to reach areas of high food abundance and concentrations of aphids. They are thought to be able to fly up to 18 km in a single flight and up to 120 km under the right conditions. In the past Nine-spotted Lady Beetle was found in a wide variety of habitat types including urban, agricultural and natural areas. While the species was historically common in agricultural crops including alfalfa, potatoes, corn, soybean and cotton as well as in gardens, grass, clovers and weeds, recent survey efforts in its North American range suggest the species may have become more specialized in its habitat use. It is now most often associated with naturally open areas and areas of shrubs or trees interspersed with open grassy areas.

Nine-spotted Lady Beetle are relatively short-lived and can have two generations per year. The species lays its eggs in clusters on plants near prey sources such as aphids in order to provide larvae with a food source upon hatching. They may also lay infertile eggs along with the fertile eggs as a food source. Larvae hatch after three to four days, form a pupa seven to nine days later, and emerge as adults after an additional five to six days. Mating begins shortly after adults emerge. Nine-spotted Lady Beetle is cold tolerant and the fall generation of adults congregate and overwinter in well-ventilated areas such as under stones, rock crevices, thick clumps of grass, leaf litter or in tree bark. The spring generation is also able to undergo a period of inactivity (aestivation) in order to avoid high summer temperatures. Unlike introduced non-native species of lady beetles, Nine-spotted Lady Beetles generally do not bite or invade homes to overwinter.

Declines in native lady beetle species have been identified by examining changes in insect collections over time. In recent decades, the abundance of several native lady beetle species (including Nine-spotted Lady Beetle) has decreased while collections of non-native lady beetle species have increased. Declines appear to have been more severe in Ontario and southern Québec than in other parts of the Canadian range. Most lady beetles observed in southern Canada are now non-native lady beetle species. While the direct causes of Nine-spotted Lady Beetle decline are not known, they are thought to include the introduction of non-native lady beetle species, pesticide use, and changes in land use and agricultural practices.

In North America, non-native species such as Seven-spotted Lady Beetle (*Coccinella septempunctata*) and Multi-coloured Asian Lady Beetle (*Harmonia axyridis*) have been introduced both unintentionally and intentionally for the biological control of agricultural pests. Although a direct link has not been identified, declines in Nine-spotted Lady Beetle generally coincide with the establishment of non-native lady beetles. It is thought that non-native lady beetles affect native lady beetles through competition for aphid food resources, predation and the introduction of pathogens and parasites. The presence of non-native beetles in areas formerly occupied by Nine-spotted Lady Beetle may also prevent the species from reoccupying those areas. A common native species of lady beetle, Convergent Lady Beetle (*Hippodamia convergens*), is widely available for purchase and shipment in North America for the purpose of garden and agricultural pest control and its movement and release may also spread parasites and pathogens.

The species may be affected by the use of pesticides (including neonicotinoids) which may reduce the abundance of their aphid prey as well as cause direct mortality and negatively impact reproduction. The use of

aphid control measures (e.g., introduction of predators, parasites, etc.) may also reduce food availability for native lady beetles. Although Nine-spotted Lady Beetle was once considered a habitat generalist, development of land and changes in farming practices (e.g., removal of hedgerows and buffer strips, abandonment of marginal farm land, changes in crop type) may also have resulted in changes in food availability and contributed to declining numbers.

Given uncertainty about the status of the species in Ontario as well as what caused its steep decline in abundance, it is difficult to determine whether Nine-spotted Lady Beetle can be expected to persist in the province. Similarly, it is unknown whether augmentation or reintroduction efforts might be successful if they were undertaken. For these reasons, the government supports protection and recovery efforts that will increase our knowledge of the species and inform future protection and recovery actions. The government also supports actions that minimize potential threats and improve habitat conditions, particularly those that benefit pollinators and other species at risk. As knowledge gaps are filled, the information can support implementation of protection and recovery activities, including determining whether reintroduction or augmentation is necessary and feasible.

### **Government's Recovery Goal**

**The government's goal for the recovery of Nine-spotted Lady Beetle is to support the persistence of the species in Ontario by filling knowledge gaps related to the species' current status and distribution, habitat use, and threats in order to better inform protection and recovery actions. The government supports investigating the necessity and feasibility of reintroduction and of augmenting existing populations.**

### **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 Nine-spotted Lady Beetle, the government will directly undertake the following actions:

- Work with partners and stakeholders to support pollinator health in Ontario through actions such as integrated pest management and education.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Nine-spotted Lady Beetle data to Ontario's central repository through the citizen science projects that they receive data from (e.g., iNaturalist) and directly through the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Continue to protect Nine-spotted Lady Beetle and its habitat through the ESA.
- Support conservation, agency, municipal and industry partners, and Indigenous communities and organizations to undertake activities to protect and recover Nine-spotted Lady Beetle. Support will be provided where appropriate through funding, agreements, permits (including conditions) and/or advisory services.
- Encourage collaboration, and establish and communicate annual priority actions for government support in order to reduce duplication of efforts.

## Government-supported Actions

The government endorses the following actions as being necessary for the protection and recovery of Nine-spotted Lady Beetle. 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 whether Nine-spotted Lady Beetle is present in Ontario and if located, monitor existing populations, their habitat and site-specific threats.

In order to better focus actions to support protection and recovery of Nine-spotted Lady Beetle in Ontario, it is important to understand whether the species is still present in the province, and if so, where it is found. The use of

standard survey methods and undertaking surveys in the types of habitat where the species has recently been found in other jurisdictions will help provide more certainty in the results. If populations are found to be present in Ontario, continued monitoring of their status, habitat conditions and site-specific threats will help monitor progress toward meeting the recovery goal and inform future recovery actions.

**Actions:**

1. **(High)** Develop, implement and promote a standardized survey protocol to confirm whether Nine-spotted Lady Beetle is present in Ontario. Surveys should:
  - include the identification of all lady beetle species observed; and,
  - prioritize efforts in naturally open areas and early successional habitats.
2. At locations where the species is found to be present, develop and implement a monitoring program that includes identification and monitoring of habitat conditions and site-specific threats.
3. Engage volunteers to participate in citizen science survey and monitoring efforts for native lady beetles, including Nine-spotted Lady Beetle (e.g. iNaturalist, the Lost Ladybug Project).

**Focus Area: Research**

**Objective:** Improve knowledge of the Nine-spotted Lady Beetle and its habitat, the threats impacting the species, and the feasibility of population management actions (i.e., augmentation or reintroduction).

Further information related to the decline of the species is needed to support effective protection and recovery efforts. If populations of Nine-spotted Lady Beetle are found to remain in Ontario, it is vital to understand what factors have allowed them to persist while other populations have been lost. As the species is found throughout North America and has experienced declines in all parts of its range, research and collaboration with other jurisdictions is likely to provide helpful insight into causes of decline as well as current threats and ways to mitigate them. In addition to improving knowledge of threats, identifying the minimum viable population size, and determining whether it is feasible to rear the species in captivity will support an assessment of whether augmentation or reintroduction efforts are appropriate.



**Actions:**

4. **(High)** Undertake collaborative research, including work with other jurisdictions, to better understand potential causes of decline and current threats, such as the effects of introduced non-native lady beetles, pathogens and parasites, and pesticides (e.g., neonicotinoids) on both the Nine-spotted Lady Beetle and its prey.
5. **(High)** At locations where the species is found to be present, investigate the specific habitat conditions and/or mechanisms that support the persistence of Nine-spotted Lady Beetle.
6. Investigate the necessity and feasibility of augmenting the species at confirmed locations or reintroducing the species in areas with suitable habitat. Actions may include:
  - assessing whether current threats can be sufficiently mitigated or reversed in order to enable successful augmentation or reintroduction;
  - undertaking population viability analysis for extant populations; and,
  - evaluating the feasibility of captive rearing and release, including identifying potential source populations.

**Focus Area: Stewardship and Awareness**

**Objective:** Increase public awareness of and engagement in actions to protect and recover Nine-spotted Lady Beetle.

The areas in which Nine-spotted Lady Beetle were historically found in Ontario are used for a variety of purposes including agriculture, recreation and gardening. As a result, a number of groups and organizations can contribute to implementing recovery actions and promoting awareness of species at risk. Although the current status of Nine-spotted Lady Beetle in Ontario is uncertain, habitat restoration and enhancement activities that result in suitable habitat for the species while addressing the needs of other species at risk are beneficial. These actions will help to ensure that sufficient habitat is available should the species increase in abundance while also benefitting other species at risk. If populations of Nine-spotted Lady Beetle are detected in Ontario, habitat restoration and enhancement activities should be undertaken where they are expected to benefit the existing population(s). Collaboration between organizations will support coordinated implementation of actions, improve efficiency and prevent duplication of efforts.

### **Actions:**

7. Undertake habitat restoration and/or enhancement to improve habitat quality and availability for Nine-spotted Lady Beetle in Ontario. Emphasis should be placed on:
  - suitable locations for Nine-Spotted Lady Beetle where activities result in improved habitat for multiple species at risk (e.g., pollinator habitat restoration, grassland stewardship initiatives); and,
  - locations where the species is found to be present and where habitat restoration or enhancement is deemed beneficial.
8. Collaborate with organizations, landowners, land managers, and Indigenous communities and organizations to promote awareness of native lady beetles, including Nine-spotted Lady Beetle, among people engaged in agricultural, gardening and stewardship activities in Ontario by sharing information on:
  - how to identify the species;
  - the species' habitat requirements;
  - the benefits of native lady beetles for pest control;
  - protection afforded to the species and its habitat under the ESA; and,
  - actions that can be taken to avoid or minimize impacts to the species and its habitat including reducing use of pesticides (e.g., neonicotinoids), implementing integrated pest management and maintaining habitat such as hedge rows and buffer strips.

## **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 Nine-spotted Lady Beetle.

## Acknowledgement

We would like to thank all those who participated in the development of the Recovery Strategy for the Nine-spotted Lady Beetle (*Coccinella novemnotata*) 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](http://ontario.ca/speciesatrisk)

Contact the Natural Resources Information Centre

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