

Photo: Rob Tervo



Common Five-lined Skink

(*Plestiodon fasciatus*) Carolinian and Southern Shield populations in Ontario

Ontario Recovery Strategy Series

Recovery strategy prepared under the *Endangered Species Act, 2007*

September 2010

Natural. Valued. Protected.

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the Endangered Species Act, 2007 (ESA, 2007) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

Under the ESA, 2007, a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA, 2007 outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA, 2007. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Natural Resources Species at Risk webpage at: www.ontario.ca/speciesatrisk

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DECLARATION

The Ontario Ministry of Natural Resources has led the development of this recovery strategy for the Common Five-lined Skink in accordance with the requirements of the *Endangered Species Act, 2007* (ESA 2007). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

The recovery strategy does not necessarily represent the views of all of the individuals who provided advice or contributed to its preparation, or the official positions of the organizations with which the individuals are associated.

The goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. Implementation of this strategy is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy.

RESPONSIBLE JURISDICTIONS

Ontario Ministry of Natural Resources
Environment Canada, Canadian Wildlife Service – Ontario
Parks Canada Agency

EXECUTIVE SUMMARY

The Common Five-lined Skink (*Plestiodon fasciatus*) is the only lizard native to Ontario. Juveniles and some adults have five stripes that run down the back. Juveniles have bright blue tails, but the colour fades with age. Females typically lay a clutch of 9-10 eggs under cover, such as logs or rocks. The young mature in just under two years and typically live less than five years.

The Common Five-lined Skink is widespread in eastern North America, being found from Florida and Texas in the south to Minnesota and Ontario in the north. Canadian populations are limited to Ontario, where they occur in two disjunct areas: a small area in southwestern Ontario along the shorelines of Lakes Erie, St Clair, and Huron (Carolinian population) and along the southern edge of the Canadian Shield (Southern Shield population). Under the *Endangered Species Act, 2007* (ESA 2007) the Southern Shield population is listed as special concern, while the Carolinian population, reduced to only a few sites, is now listed as endangered. There is little information on abundance or trends across Ontario. The only intensive study of the Common Five-lined Skink is at Point Pelee National Park, where abundance declined as a result of disturbance to cover objects. Approximately 36 percent and 76 percent of element occurrences for the Southern Shield population and the Carolinian population, respectively, are considered either historic or extirpated. The Carolinian population has been reduced to six element occurrences.

The Common Five-lined Skink is associated with openings in, or edges of, deciduous forests. Within this broad category there is a wide range of habitats used including rocky outcrops, stabilized sand dunes, riparian forests, open deciduous forests and forest clearings. The Common Five-lined Skink is generally found in sandy areas in the Carolinian population and rocky areas in the Southern Shield population.

The major threat to the species is habitat loss and degradation from development. Disturbance is also a significant threat in the form of destruction or removal of cover objects used by Common Five-lined Skinks. Illegal collecting, traffic mortality and increased predation are also important threats.

A significant knowledge gap is that the complete distribution of the Common Five-lined Skink is not fully known. Other knowledge gaps include a lack of information on movements (habitat use, home range and dispersal), accurate population estimates for most sites in Ontario, and an assessment of the threat that succession poses to sites in Ontario.

A recovery goal has been prepared for each population. The goal for the Carolinian population is to ensure the long term survival of all remaining sub-populations. This recovery goal recognizes that some extant sites may not currently have enough suitable habitat to support the species in the long term. Increasing the amount of suitable habitat and microhabitat should be a high priority to ensure recovery of the species.

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The goal for the Southern Shield population is to ensure the long term survival of representative sub-populations across the range.

The recovery objectives for both populations are to:

- 1) Determine the complete distribution of the Common Five-lined Skink in Ontario;
- 2) Improve understanding of population estimates, spatial ecology and clarify uncertain threats;
- 3) Develop and implement management measures to protect sites, reduce identified threats and increase available habitat.

It is recommended that any Ecological Land Classification unit containing a verified Common Five-lined Skink occurrence in the Carolinian population be prescribed as habitat in a habitat regulation. An exception to this approach is any observation outside of suitable habitat. Such an approach is recommended because it ensures all habitat elements required by the Common Five-lined Skinks (nesting, foraging, and hibernating sites) are regulated. Only sites with occurrences documented in the past 20 years should be prescribed as habitat in a habitat regulation for the population. This time period recognizes the cryptic nature of the Common Five-lined Skink and its ability to persist in even small pockets of suitable habitat. No area is recommended for habitat regulation for the Southern Shield population because as a special concern species the habitat protection provisions of the ESA 2007 do not apply.

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1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Common Five-lined Skink

SCIENTIFIC NAME: *Plestiodon fasciatus*

SARO List Classification:

Common Five-lined Skink (Carolinian population) - Endangered (2009)

Common Five-lined Skink (Southern Shield population) - Special Concern (2009)

SARO List History:

Common Five-lined Skink (Carolinian population) - Endangered (2009)

Common Five-lined Skink (Southern Shield population) - Special Concern (2009)

Five-lined Skink - Special Concern (2004)

COSEWIC Assessment History:

Five-lined Skink (Carolinian population) - Endangered (2007)

Five-lined Skink (Great Lakes/St Lawrence population) - Special Concern (2007)

Five-lined Skink - Special Concern (1998)

SARA Schedule 1:

Five-lined Skink (Carolinian population) - Endangered (March 18, 2009)

Five-lined Skink (Great Lakes/St Lawrence population) - Special Concern (March 18, 2009)

CONSERVATION STATUS RANKINGS:

GRANK: G5

NRANK: N3

SRANK: S3

The glossary provides definitions for the abbreviations above.

1.2 Species Description and Biology

Species Description

The Common Five-lined Skink is a small lizard that grows to approximately 86 mm in body (snout-vent) length (COSEWIC 2007). The tail can be longer than the body. Juveniles and some adults have five cream-coloured stripes running down the length of the back. Body colour becomes more bronze with age, although females tend to retain more of the juvenile pattern (COSEWIC 2007). Juveniles have bright blue tails, but the colour fades with age. Adult males have wide heads, compared with females, and develop orange colouration around the jaws and chin during the spring breeding season. The Common Five-lined Skink can shed all or part of the tail when attacked by a predator. The tail will re-grow but will usually look different. The Common Five-lined Skink is the only lizard native to the province of Ontario.

Until recently, the Common Five-lined Skink was placed in the genus *Eumeces*. The genus *Eumeces* included skinks from North America, Africa and Asia. Recent genetic work has indicated that the genus *Eumeces* consists of a number of genera and all North American skinks are now separated into the genus *Plestiodon* (Schmitz et al. 2004, Smith 2005).

A phylogeographic analysis across the range of the Common Five-lined Skink revealed six major mitochondrial lineages (Howes and Lougheed 2008). Both Ontario populations fall within the eastern lineage, the most geographically widespread unit. Ontario populations have less genetic diversity than other more central populations (Howes and Lougheed 2008). The Carolinian and Southern Shield populations demonstrate significant genetic isolation from each other (COSEWIC 2007).

Species Biology

Like all lizards, the Common Five-lined Skink is an ectotherm – it does not maintain a constant body temperature, but controls its body temperature through basking. As such, it is forced to hibernate for approximately half of the year in Ontario. Skinks emerge from hibernation from early April in the Carolinian population (Hecnar and M'Closkey 1998) to early May in the Southern Shield population (Wick 2004). Skinks can be active until late September or early October in Ontario (Hecnar and M'Closkey 1998, Wick 2004).

The Common Five-lined Skink feeds on a variety of invertebrates, primarily arachnids, insects, insect larvae and earthworms (Judd 1962, Hecnar et al. 2002, COSEWIC 2007). Crickets were the most common prey at Rondeau Provincial Park (Judd 1962) while arachnids were the most common prey at Point Pelee National Park (Hecnar et al. 2002) suggesting that the Common Five-lined Skink is not a dietary specialist. It is an active forager, locating prey by sight or chemical perception through tongue-flicking.

Breeding occurs in the spring. Females will mate with more than one male and multiple paternity for a clutch of eggs has been confirmed for Ontario (Wick 2004). Females typically lay 9-10 eggs and remain to brood and guard the eggs for four to six weeks until they hatch in late summer (Vitt and Cooper 1989, Hecnar 1994, COSEWIC 2007). More than one female commonly nests under the same cover object (Cagle 1940, Vitt and Cooper 1986a, Seburn 1990, Hecnar 1994). The offspring typically reach maturity by their second spring. Adults may live up to 10 years of age (Fitch 1956), although most individuals do not live past age five (COSEWIC 2007).

1.3 Distribution, Abundance and Population Trends

The range of the Common Five-lined Skink corresponds to the deciduous hardwood forests of eastern North America (Fitch 1954). It ranges from Florida and Texas in the south to Minnesota and Ontario in the north. Within Canada, it is limited to the province

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of Ontario. The Common Five-lined Skink is found in two widely separated areas of Ontario (COSEWIC 2007, Figure 1):

- 1) The Carolinian population is limited to a small area of southwestern Ontario, close to the shorelines of Lakes Erie, St Clair, and Huron.
- 2) The Southern Shield population occurs along the southern edge of the Canadian Shield, from Georgian Bay in the west, to Leeds and Grenville County in the east.

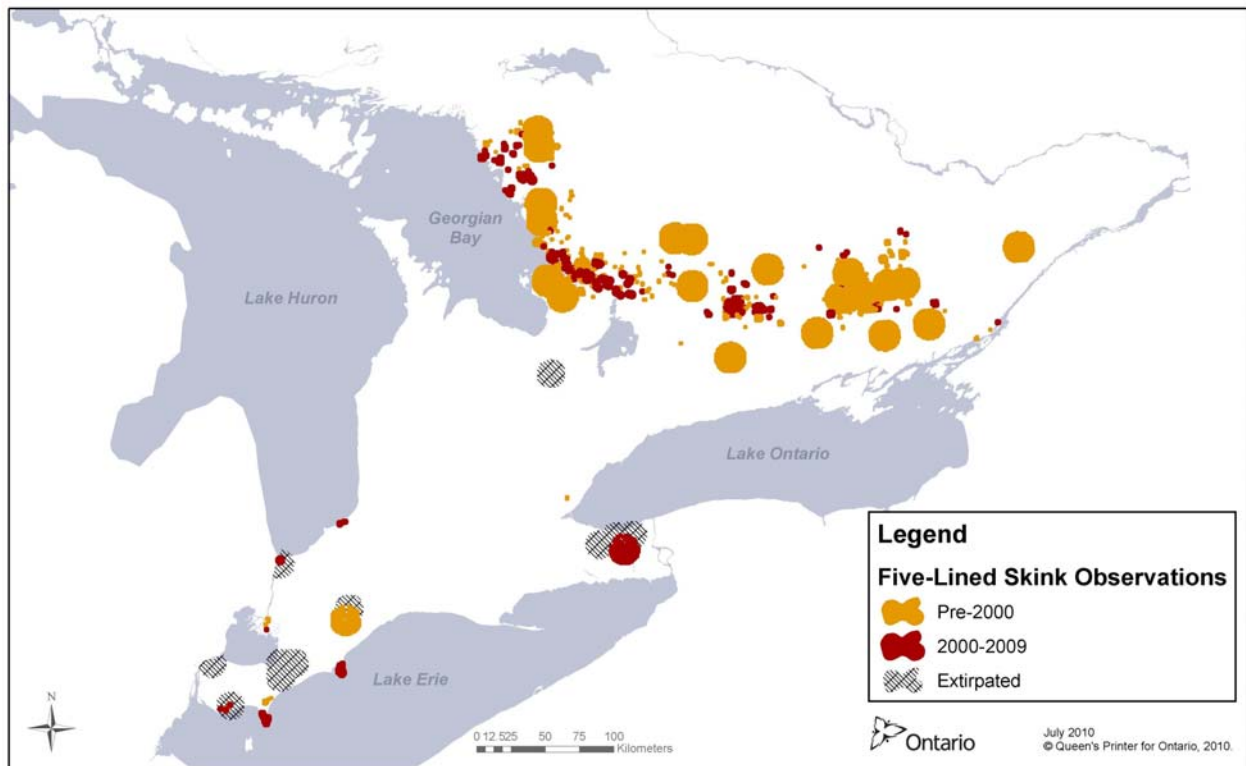


Figure 1. Extirpated and current distribution of the Common Five-lined Skink in Ontario

The Natural Heritage Information Centre of the Ontario Ministry of Natural Resources identifies 200 element occurrences (or sub-populations) of the Common Five-lined Skink in Ontario (NHIC 2010). There are 175 element occurrences for the Southern Shield population, of which 63 are ranked historic (not verified in the last 20 years) and one is ranked extirpated (NHIC 2010). There are 25 element occurrences for the Carolinian population, of which eight are ranked historic and 11 are ranked extirpated (NHIC 2010). Therefore 36 percent and 76 percent of element occurrences for the Southern Shield population and the Carolinian population, respectively, are considered either historic or extirpated. The Carolinian population has been reduced to six element occurrences (NHIC 2010).

There is little information on abundance of Common Five-lined Skinks at most Ontario locations. Skinks are semi-fossorial and spend much of their time concealed under or inside cover objects and are therefore difficult to survey. A total of 428 individuals were marked at Point Pelee National Park during one year (Seburn 1990). Adults made up

approximately 50 percent of the captures. No estimate for the entire park exists, but given that the whole park was not surveyed, the number of Common Five-lined Skinks would most likely have exceeded 1000 individuals in 1989 (personal observation). Surveys for activity density (number of individuals encountered within a defined area on a single survey), which is correlated with population size, have been conducted annually at Point Pelee National Park since 1990 (Hecnar and Hecnar 2009). Peak activity density was over 80 Common Five-lined Skinks at one site within the park (Hecnar and Hecnar 2009). Up to 98 nests have been found in a single year in the park (Hecnar and Hecnar 2009). The Common Five-lined Skink also appears to be relatively numerous at Rondeau Provincial Park, although no quantitative data exist (COSEWIC 2007). Effective population size has been estimated at 306 (95% confidence interval: 273-346) at Point Pelee National Park and 291 (95% confidence interval: 259-329) at Rondeau Provincial Park (COSEWIC 2007). Effective population size is typically significantly lower than population census size. The Common Five-lined Skink appears to be less abundant at other Carolinian sub-populations (Hecnar and Hecnar 2000). There are no population census estimates for any of the Southern Shield sub-populations, although effective population sizes have been calculated for seven sub-populations, varying from 177 to 328 Common Five-lined Skinks (COSEWIC 2007).

Similarly, there is little information on population trends. Populations can vary naturally as a result of the degree of reproductive success from one year to the next (Fitch 1954). Common Five-lined Skink abundance at Rondeau Provincial Park appears stable (COSEWIC 2007) although little quantitative data are available. The Common Five-lined Skink appears to have declined at Pinery Provincial Park, but again, no quantitative data are available (COSEWIC 2007). Research at Point Pelee National Park indicates that the Common Five-lined Skink declined significantly from 1990 to 1995 based on changes in activity density (Hecnar and M'Closkey 1998). The number of skinks increased until hitting a record peak in 2000 and then declined again (Hecnar and Hecnar 2009). When the data from 1990 to 2008 were examined, there was no significant trend over time (Hecnar and Hecnar 2009). Population modeling suggests that the Point Pelee National Park sub-population is at significant risk of extirpation given the inherent variability in population size (Hecnar and Hecnar 2009). It is likely that other Carolinian sub-populations are also at risk of localized extirpations. There are no population trend estimates for any of the Southern Shield sub-populations.

1.4 Habitat Needs

The Common Five-lined Skink is primarily associated with openings in, or edges of, deciduous forests. Within this broad category there is a range of habitats including rocky outcrops, stabilized sand dunes, riparian forests, open deciduous forests and forest clearings (COSEWIC 2007). The Common Five-lined Skink makes use of very different habitats in the two Ontario populations.

Habitat summary

Carolinian population

In southwestern Ontario, the Common Five-lined Skink is primarily limited to stabilized dune habitat and open woods or savanna with sandy substrate near the shorelines of Lakes Erie, St Clair and Huron (COSEWIC 2007). Within these habitats, the Common Five-lined Skink is usually found under cover. Cover objects are usually logs, boards or sheets of wood (Seburn 1990). In general, Common Five-lined Skinks appear to prefer cover objects which are larger than average (Seburn 1990). Larger objects tend to have increased soil moisture as a result of decreased evaporation.

Southern Shield population

The Common Five-lined Skink is largely limited to the southern edge of the Canadian Shield. Within this area, Common Five-lined Skinks are generally restricted to rocky outcrops in an area of mixed coniferous or deciduous forest (Howes and Loughheed 2004). The presence of loose cover rocks on the exposed bedrock was the most important variable in predicting the presence of Common Five-lined Skinks (Howes and Loughheed 2004). In general, Common Five-lined Skinks selected rocks that were longer than average (55.2 ± 2.1 cm) and in more open areas than randomly selected areas (Quirt et al. 2006). Additionally, rocks on a bedrock substrate were commonly used, likely because they provided more ideal thermal conditions. Common Five-lined Skink sites in Minnesota, where the habitat is similar to the Canadian Shield, tend to be associated with permanent or temporary sources of water, including ponds, streams or even temporary pools in rock outcrops (Lang 1982).

Nesting Habitat

Carolinian population

Nesting habitat was found to be a subset of cover objects used throughout the active season (Seburn 1990). Cover objects used for nesting had a significantly larger surface area than other cover objects (Seburn 1993). Nest locations were more commonly found under logs than boards (Hecnar 1994). Larger logs (>15 cm diameter and more than 44770 cm^3) in a moderate state of decay were more commonly used (Hecnar 1994).

Southern Shield population

Nest sites are typically under rocks on top of a thin layer of soil or moss and lichen (Seburn and Seburn 1989, Wick 2004). Nests were found under rocks that averaged 39.3 ± 3.1 cm long and 15.6 ± 1.0 cm thick at one site in Ontario (Wick 2004). Skink eggs have also been found in an abandoned fire pit constructed of rock slabs (Seburn and Seburn 1989). There was no soil in the fire pit, but a large amount of old ash was present.

Hibernation

Carolinian population

Habitat selection for hibernation has not been quantified within this population. Observations of holes in the substrate and the presence of skinks under woody debris on the first days of recorded seasonal activity suggest that skinks at Point Pelee

National Park hibernate within their summer home ranges (S. Hecnar pers. comm. 2010). Common Five-lined Skinks have also been observed overwintering within their summer home range in Kansas (Fitch and von Achen 1977), although it is unclear if this is common. A negative correlation between skink abundance at Point Pelee National Park and annual water levels in Lake Erie suggests that selection of hibernacula below the frost line and above the high water level is important for overwinter survivorship (Hecnar and Hecnar 2009).

Southern Shield population

Little is known about habitat selection for hibernation, although individuals have been found to hibernate in crevices in rock formations or building foundations outside of Ontario (Harding 1997). In a rocky landscape similar to the Canadian Shield, Common Five-lined Skinks have been found two to three metres below the surface in rock fissures during mid-winter at an active quarry in Minnesota (Lang 1982). Common Five-lined Skinks were observed hibernating within their summer home range in Kansas (Fitch and von Achen 1977), although it is unclear if this is common. Therefore it is likely, although unproven, that Common Five-lined Skinks hibernate near or within their summer home ranges.

1.5 Limiting Factors

The Common Five-lined Skink reaches its northern limit in Ontario. Although individuals in the Carolinian population are unlikely to be at their thermal limit, it is possible that the distribution of skinks in the Southern Shield population is limited to the warmest and sunniest areas. Over-wintering locations may also be a limiting factor. Common Five-lined Skinks must hibernate in areas above the water line and also below the frost line (Hecnar and Hecnar 2009).

Although the Common Five-lined Skink is found in diverse habitats in the core of its range in the US, within Ontario it could be considered a habitat specialist. Skinks in the Carolinian population appear to be largely limited to areas with a sandy substrate and individuals in the Southern Shield population are mainly restricted to rock outcrops with loose rock present. The eastern limit of the Common Five-lined Skink in Ontario appears to be set by the presence of moist lowlands (Ussher and Cook 1979).

1.6 Threats to Survival and Recovery

The Common Five-lined Skink faces a number of threats. The following list includes known or perceived threats in decreasing order of importance.

Habitat Loss

The loss, degradation and fragmentation of habitat has been a significant threat to the Common Five-lined Skink, particularly in the Carolinian population where habitat has been lost to urban development, agriculture and recreation (COSEWIC 2007). Loss of

habitat in the Southern Shield population does not appear to be as widespread, although there is less historic knowledge of the distribution of the species in this area. Habitat degradation and loss is likely a growing threat in the Southern Shield population as the human population grows.

It is unclear how significant or widespread succession is as a threat to the Common Five-lined Skink in Ontario. In Minnesota, where the Common Five-lined Skink also makes use of rock outcrops, open habitat declined by roughly two-thirds at known sites from approximately 1940 to 1980 possibly as a result of fire suppression (Lang 1982). Forest succession has almost eliminated the Common Five-lined Skink from the Fitch Natural History Reservation (formerly the University of Kansas Natural History Reservation; Fitch 2006a, b) and it is also believed to have reduced the number of Common Five-lined Skink sites in Connecticut (H. Gruner pers. comm. 2009). A survey of historic Common Five-lined Skink locations in southwestern Ontario commented on the lack of suitable habitat as a result of succession (Hecnar and Hecnar 2000).

Threat level: Widespread
Degree of certainty: High
Level of concern: High

Disturbance

There are a number of kinds of anthropogenic disturbance that threaten the Common Five-lined Skink. The removal of cover objects has been observed in the Southern Shield population (B.J. Howes pers. comm. 2009) and is a significant threat at Point Pelee National Park (Hecnar and M'Closkey 1998). In areas of high use by people, fewer skinks were found and there was less woody debris. Park visitors have used woody cover objects for firewood, removed driftwood for ornamental use, and salvaged boards for lumber. The removal of woody debris may force skinks to re-locate, but may also reduce nesting success if nesting cover objects are removed while females are brooding their eggs. The removal of woody debris is likely also a threat at other sites.

During surveys at Point Pelee National Park, mapped cover objects were commonly found moved (Hecnar and M'Closkey 1998). While much of the disturbance is likely by humans, some disturbance may be the result of predators seeking food. Logs were rolled out of place or broken apart. Up to 82 percent of cover boards set out for Common Five-lined Skink use were disturbed. In June of 1994 and August of 1995 nearly every mapped cover object had been disturbed. Frequent disturbance results in cover objects breaking down into smaller cover objects which are of lesser use to Common Five-lined Skinks (Hecnar and M'Closkey 1998). Disturbance may also cause brooding females to abandon their nests (Fitch 1954). Human activity can also lead to accidental mortality as Common Five-lined Skinks have been found crushed under cover objects that have been stepped on (Hecnar and M'Closkey 1998). There is also the risk of Common Five-lined Skinks being crushed by off road vehicles in the Southern Shield population.

Threat level: Widespread

Degree of certainty: High
Level of concern: High

Illegal Collecting

Several large scale disturbances of cover objects were observed at Point Pelee National Park from 1990 to 1995 (Hecnar and M'Closkey 1998). In June of 1994 and August 1995 virtually every cover object was disturbed (Hecnar and M'Closkey 1998). After these disturbances fewer gravid females and nests were found in the summer and few hatchlings were observed in the late summer and early fall, when they should have been abundant. The authors concluded that this widespread disturbance was likely the result of illegal collecting of Common Five-lined Skinks for the pet trade (Hecnar and M'Closkey 1998).

Threat level: Widespread
Degree of certainty: High
Level of concern: High

Traffic Mortality

A total of 16 Common Five-lined Skinks were found dead on roads in Point Pelee National Park during intensive surveys for vertebrate roadkill in 2005 (Farmer 2007). Similarly, 18 individuals were found dead on roads in Rondeau Provincial Park during surveys in 2005 (Farmer 2007). The threat of roads has also been identified for the Common Five-lined Skink in Florida (Aresco 2005) and Illinois (COSEWIC 2007).

Threat level: Widespread
Degree of certainty: High
Level of concern: Moderate

Increased Predation

Although predation is natural, elevated populations of predators can have a significant effect on prey populations. For example, Raccoon (*Procyon lotor*) population density at Point Pelee National Park is four times the average density for rural Ontario (Phillips and Murray 2005). Raccoons are confirmed predators of Common Five-lined Skinks (COSEWIC 2007) and research suggests that Raccoon predation is considerable at Point Pelee National Park (Hecnar and Hecnar 2005). It has also been observed that domestic cats will kill Common Five-lined Skinks (Lang 1982). The rapidly growing population of Wild Turkeys (*Meleagris gallopavo*) in areas such as Point Pelee National Park may also affect Common Five-lined Skinks (T. Dobbie pers. comm. 2009). In addition to direct predation, predation attempts can result in tail loss in Common Five-lined Skinks (e.g. Cooper and Vitt 1985, Vitt and Cooper 1986b), which in turn leads to reduced sprint speed for a few weeks (Goodman 2006), possibly increasing predation risk.

Threat level: Widespread
Degree of certainty: Moderate
Level of concern: Moderate

1.7 Knowledge Gaps

Although there have been several studies on the Common Five-lined Skink in Ontario there is limited information about various aspects of the species. Significant knowledge gaps include:

Distribution

The complete distribution of the Common Five-lined Skink may not be fully known even in the Carolinian population. A new location with Common Five-lined Skinks in the Carolinian zone was discovered in 2009 (J. Choquette pers. comm. 2009). Common Five-lined Skinks may still be present at some sites classified as historic or at previously unknown locations.

Movement

Habitat use, home range and dispersal of Common Five-lined Skinks have not been studied in any meaningful way. It is important to determine how far individuals typically move or can disperse to adequately inform a habitat regulation for the species.

Population sizes

Population estimates are lacking for all Ontario sites, with the exception of Point Pelee National Park. Some Carolinian sites are only known by the observation of a few Common Five-lined Skinks.

Succession

Although succession is known to cause loss of suitable habitat for Common Five-lined Skinks, it is unclear how significant or widespread succession is as a threat in Ontario.

Predator control

The threat of increased predator populations is an issue that affects many species at risk. While attempts to limit predator access to garbage have been largely successful, predator populations still have abundant food sources. While developing effective strategies to control predator populations is beyond the scope of this recovery strategy, it should be a priority in areas where predators pose a significant threat to many species at risk.

1.8 Recovery Actions Completed or Underway

The following recovery actions have been undertaken for the Common Five-lined Skink or its habitat in Ontario:

Recovery

- Enhancing habitat at the Oxley Poison Sumac Swamp by setting out artificial cover objects (COSEWIC 2007).
- Enhancing habitat at Point Pelee National Park by setting out artificial cover objects (Hecnar and M'Closkey 1998). Since 1996, Parks Canada staff have led Ontario Stewardship Rangers and volunteers in annual restoration of microhabitat for

Recovery Strategy for the Five-lined Skink (Carolinian and Southern Shield populations) in Ontario

Common Five-lined Skink as well as in tagging and monitoring woody debris as part of ongoing restoration efforts (T. Dobbie pers. comm. 2009).

- Control of invasive species affecting Common Five-lined Skink habitat began in 2010 at Rondeau Provincial Park (S. Dobbyn pers. comm. 2010). Additional cover objects are also being provided to increase availability of suitable microhabitat.
- Ontario provincial parks are making changes to reduce predator access to garbage in attempts to help control predator populations (e.g. raccoons).

Education

- Education efforts at Point Pelee National Park have been on-going since at least the early 1990's. Permanent displays about Common Five-lined Skink biology and protection are found at the Visitor Centre and at the children's youth camp in the park. The Common Five-lined Skink is also included in the park's introductory video. In 2009, Common Five-lined Skinks and their habitat were incorporated into the Grade four in-park school program. Live Common Five-lined Skinks are also used in park education programs (T. Dobbie pers. comm. 2009).
- The Common Five-lined Skink has been included in natural heritage programs at Rondeau Provincial Park for many years (S. Dobbyn pers. comm. 2010). Outreach activities also include cottage leaseholders.

Research

- Range-wide phylogeographic study to delineate evolutionary lineages of the species (Howes et al. 2006).
- Range-wide study on intra-population genetic diversity to determine how northern peripheral populations differ from other populations in the range (Howes and Loughheed 2008).
- Ongoing research and monitoring of the Common Five-lined Skink at Point Pelee National Park by Professor Hecnar and his lab (e.g. Baptista 2007, Hecnar and Hecnar 2009) with support of Parks Canada Agency.
- Monitoring of Common Five-lined Skinks within the inland portions of its habitat in Rondeau Provincial Park has been ongoing since 2003 (S. Dobbyn pers. com. 2010)
- Microhabitat study (Howes and Loughheed 2004) and thermoregulation study (Quirt et al. 2006) in the Southern Shield population
- Fine-scale genetic analysis of population structure in the Southern Shield population (Wick 2004).
- Quantitative assessments of Lake Erie Sand Spit Savanna habitat trends have been conducted on two occasions at Point Pelee National Park (Smith and Bishop 2002, Dougan & Associates 2007).

2.0 RECOVERY

2.1 Recovery Goal

The recovery goal for the Carolinian population of the Common Five-lined Skink is to ensure the long term survival of all remaining sub-populations. This recovery goal recognizes that some extant sites may not currently have enough suitable habitat to support the species in the long term. Increasing the amount of suitable habitat and microhabitat should be a high priority to ensure recovery of the species.

The recovery goal for the Southern Shield population of the Common Five-lined Skink is to ensure the long term survival of representative sub-populations across the range. The goal recognizes the widespread nature of the Common Five-lined Skink on the Canadian Shield.

2.2 Protection and Recovery Objectives

Table 1. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Determine the complete distribution of the Common Five-lined Skink in Ontario
2	Improve understanding of population estimates, spatial ecology and clarify uncertain threats
3	Develop and implement management measures to protect sites, reduce identified threats and increase available habitat

2.3 Approaches to Recovery

Table 2. Approaches to recovery of the Common Five-lined Skink in Ontario

Relative Priority (Carolinian population)	Relative Priority (Southern Shield population)	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Determine the complete distribution of the Common Five-lined Skink in Ontario					
Critical	Beneficial	Short-term	Inventory	1.1 Survey historic locations to determine if Common Five-lined Skinks are still present	<ul style="list-style-type: none"> • Distribution of the species is likely not fully known
Critical	Beneficial	Short-term	Inventory	1.2 Develop a prioritized list of sites where the species potentially occurs and survey for presence of Common Five-lined Skinks	<ul style="list-style-type: none"> • Distribution of the species is likely not fully known
Beneficial	Beneficial	Short-term	Inventory	1.3 Determine spatial limits of existing occupied sites	<ul style="list-style-type: none"> • Distribution of the species is likely not fully known
2. Improve understanding of population estimates, spatial ecology and clarify uncertain threats					
Critical	Beneficial	Short-term	Monitoring	2.1 Implement standardized survey protocol (e.g. method used at Point Pelee National Park) for estimating abundance of Common Five-lined Skinks at each Carolinian population site and representative Southern Shield population sites	<ul style="list-style-type: none"> • Population estimates lacking for most sites
Beneficial	Beneficial	Short-term	Research	2.2 Determine habitat use, typical movement and dispersal abilities	<ul style="list-style-type: none"> • Extent of habitat use and dispersal ability largely unknown
Beneficial	Beneficial	Short-term	Research	2.3 Determine if succession is a significant threat to occupied sites and which techniques are beneficial to maintaining or enhancing Common Five-lined Skink habitat	<ul style="list-style-type: none"> • Habitat loss

Recovery Strategy for the Five-lined Skink (Carolinian and Southern Shield populations) in Ontario

Relative Priority (Carolinian population)	Relative Priority (Southern Shield population)	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
3. Develop and implement management measures to protect sites, reduce identified threats and increase available habitat					
Critical	Beneficial	Long-term	Protection	3.1 Develop and implement habitat protection guidelines	• Habitat loss
Critical	Beneficial	Ongoing	Management	3.2 Increase or maintain amount of habitat and microhabitat available for Common Five-lined Skinks	• Habitat loss, Disturbance
Necessary	Beneficial	Ongoing	Protection	3.3 Promote compliance with existing legislation and increase surveillance of habitat during nesting season to discourage collecting of Common Five-lined Skinks	• Illegal collecting
Necessary	Beneficial	Ongoing	Education and Outreach	3.4 Educate target groups (e.g. land owners, pet trade, park visitors) regarding Common Five-lined Skinks and their habitat	• Disturbance, Illegal collecting
Beneficial	Beneficial	Long-term	Management	3.5 Identify and implement approaches to reduce traffic mortality (e.g. seasonal road closures within protected areas)	• Traffic mortality
Beneficial	Beneficial	Ongoing	Research	3.6 Develop and implement additional approaches to manage predator populations	• Increased predation; predator control

Narrative to Support Approaches to Recovery

The abundance of Common Five-lined Skinks appears to rebound quickly after declines if there is abundant habitat and microhabitat available (Hecnar and M’Closkey 1998, Hecnar and Hecnar 2009). Therefore the major requirements for maintaining the current distribution of the Common Five-lined Skink should focus on protecting existing habitat and maintaining, or increasing where possible, the amount of habitat and microhabitat (or cover objects) available. Providing cover objects for Common Five-lined Skinks is an ongoing requirement as cover objects degrade over time. At sites where Common Five-lined Skinks are limited to small areas, concerted efforts should be undertaken to increase the amount of suitable habitat available.

2.4 Performance Measures

Successful recovery, especially for the Carolinian population, will require an increase in the amount of suitable habitat and an increase in the abundance of Common Five-lined Skinks in areas with low abundance. Therefore major performance measures for the Carolinian population are:

- Suitable habitat will increase by at least 25 percent within 10 years. An increase can be the result of increased open areas or through the increase in microhabitat (i.e. cover objects) which improve the suitability of the habitat.
- Abundance estimates for Common Five-lined Skinks will remain stable or increase at all extant sites.

Table 3. Performance measures

Approach	Performance Measure
Objective 1: Determine the complete distribution of the Common Five-lined Skink in Ontario	
1.1 Survey historic locations to determine if skinks are still present	<ul style="list-style-type: none"> • Majority of historic locations surveyed for Common Five-lined Skinks
1.2 Develop a prioritized list of potential sites and survey for presence of skinks	<ul style="list-style-type: none"> • Majority of prioritized sites surveyed for Common Five-lined Skinks
1.3 Determine spatial limits of existing occupied sites	<ul style="list-style-type: none"> • Majority of sites in Carolinian population have habitat mapping completed
Objective 2: Improve understanding of population estimates, spatial ecology and clarify uncertain threats	
2.1 Implement standardized survey protocol (e.g. method used at Point Pelee National Park) for estimating abundance of Common Five-lined Skinks at each Carolinian population site and representative Southern Shield population sites	<ul style="list-style-type: none"> • Majority of sites in Carolinian population and at least 5 sites in Southern Shield population have abundance estimates using standardized protocol

Recovery Strategy for the Five-lined Skink (Carolinian and Southern Shield populations) in Ontario

Approach	Performance Measure
2.2 Determine habitat use, typical movement and dispersal abilities	<ul style="list-style-type: none"> • Completion of habitat use and movement study at one or more sites in Ontario
2.3 Determine if succession is a significant threat to occupied sites and which techniques are beneficial to maintaining or enhancing Common Five-lined Skink habitat	<ul style="list-style-type: none"> • At least 10 sites analyzed for loss of habitat as a result of succession
Objective 3: Develop and implement management measures to protect sites, to reduce identified threats and increase available habitat	
3.1 Increase amount of habitat protected	<ul style="list-style-type: none"> • Percentage of sites implementing habitat protection guidelines
3.2 Increase or maintain amount of habitat and microhabitat available for Common Five-lined Skinks	<ul style="list-style-type: none"> • Majority of Carolinian sites and at least 5 additional Southern Shield sites have increased or maintained habitat and microhabitat for Common Five-lined Skinks
3.3 Promote compliance with existing legislation and increase surveillance of habitat during nesting season to discourage collecting of Common Five-lined Skinks	<ul style="list-style-type: none"> • Target groups (e.g. pet stores, reptile keepers, park visitors) demonstrate improved awareness of legislation • Patrols of known nesting areas are carried out where appropriate
3.4 Educate target groups (e.g. land owners, pet trade, park visitors) regarding Common Five-lined Skinks and their habitat	<ul style="list-style-type: none"> • Target groups (e.g. pet stores, reptile keepers, park visitors) demonstrate improved awareness of threats and stewardship issues
3.5 Identify and implement approaches to reduce traffic mortality (e.g. seasonal road closures within protected areas)	<ul style="list-style-type: none"> • Traffic mortality reduction techniques have been implemented and tested at known areas of concern
3.6 Develop and implement additional approaches to control predator populations	<ul style="list-style-type: none"> • Predator control techniques have been tested in at least one area and successful techniques are adopted by protected areas with Common Five-lined Skinks

2.5 Area for Consideration in Developing a Habitat Regulation

Under the ESA 2007, a recovery strategy must include a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the author will be one of many sources considered by the Minister when developing the habitat regulation for this species.

A recommended area to be considered in developing a habitat regulation is only required for the Carolinian population of the Common Five-lined Skink. No area is recommended for the Southern Shield population because as a special concern species the habitat protection provisions of the ESA 2007 do not apply.

The extent of habitat occupied by Common Five-lined Skinks at each of the remaining Carolinian sites is highly variable. Sites range from just a few hundred meters to several kilometres in length. Most Common Five-lined Skink locations in the Carolinian population are within one kilometre of the lakeshore, however, Common Five-lined Skink are not restricted to areas close to lakes and can be found in open areas more than one kilometre from water. Common Five-lined Skink habitat also changes over time. It can be reduced as a result of succession resulting in closed canopied areas, or it can be increased as a result of openings. For example, Common Five-lined Skinks appear to be expanding their range into new areas of Point Pelee National Park (Hecnar and Hecnar 2009).

Nesting locations

Common Five-lined Skinks commonly nest under logs or artificial objects such as boards (Fitch 1954, Seburn 1990, Hecnar 1994). Such cover objects are critical to the long term persistence of Common Five-lined Skinks (Hecnar and M'Closkey 1998) and the amount and quality of cover objects needs to be maintained in areas with Common Five-lined Skinks.

Foraging locations

In general, individual skinks make use of only a small area, with movements typically less than 25 meters over the course of a year (Fitch 1954). However, individuals have been observed to move more than 100 meters in Ontario (Seburn 1993) and more than 200 meters in Kansas (Fitch 1954). Common Five-lined Skinks can shift their activity centre more than once during the active season, resulting in home ranges of more than 2000 square meters (Fitch and von Achen 1977). The size and shape of the habitat used by the Common Five-lined Skink will vary greatly from site to site, depending upon the available habitat.

Hibernation locations

Little is known about where Common Five-lined Skinks hibernate in the Carolinian region of Ontario. They may overwinter within their summer home range (Fitch and von Achen 1977), but this may not always be the case. Movements appear to be generally less than 200 meters (Fitch 1954) suggesting that most hibernation locations will be within or adjacent to summer habitat.

Recommendation

It is recommended that the entire Ecological Land Classification (Lee et al. 1998) unit containing each verified Common Five-lined Skink observation in the Carolinian population be prescribed as habitat in a habitat regulation. An exception to this approach is any observation outside of suitable habitat. Such an approach is recommended for a number of reasons including the following.

- Most observations of Common Five-lined Skinks are under cover objects, yet intervening habitat is also used.
- This approach increases the likelihood that all habitat elements required by the Common Five-lined Skinks are included.

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- Information on the spatial limits of habitat used by Common Five-lined Skinks is lacking for most sites.
- Common Five-lined Skink use of habitat may shift with time as a result of changes to habitat.

It is recommended that the development of a habitat regulation be considered at all Carolinian sites with observations of Common Five-lined Skinks in the past 20 years, where suitable habitat still persists. This time period recognizes the cryptic nature of the Common Five-lined Skink and its ability to persist in even small pockets of suitable habitat. The habitat regulation should be written such that it also immediately includes historic sites if the Common Five-lined Skink is reconfirmed and as well as any newly discovered occurrences.

GLOSSARY

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

- 1 = critically imperilled
- 2 = imperilled
- 3 = vulnerable
- 4 = apparently secure
- 5 = secure

Endangered Species Act, 2007 (ESA 2007): The provincial legislation that provides protection to species at risk in Ontario.

Species at Risk Act (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of species that at the time the act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

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