

**Ontario Species at Risk Evaluation Report for
Allegheny Mountain Dusky Salamander
Salamandre sombre des montagnes
(*Desmognathus ochrophaeus*)**

Committee on the Status of Species at Risk in Ontario
(COSSARO)

(Carolinian Population)

Assessed by COSSARO as Endangered

September 2021

Salamandre sombre des montagnes (*Desmognathus ochrophaeus*)

La salamandre sombre des montagnes (*Desmognathus ochrophaeus*) est classée dans la catégorie des espèces en voie de disparition en Ontario par le CDSEPO.

L'aire de répartition de la salamandre sombre des montagnes en Amérique du Nord se trouve dans le système de la chaîne de montagnes des Appalaches et le long des côtes sud des lacs Érié et Ontario et se prolonge jusqu'au sud du Québec. Sa petite répartition isolée se limite au Canada à deux populations, l'une au sud de l'Ontario et l'autre à l'extrême sud du Québec, situées l'une et l'autre à proximité de la frontière avec les États-Unis. La population de l'Ontario fut découverte pour la première fois en 1989, mais n'a pas été confirmée avant 2004. En 2010, il s'est avéré qu'un deuxième cours d'eau, situé également dans la gorge de la rivière Niagara, maintient cette espèce, mais à environ 350 m de distance du premier. La population totale de l'Ontario compte vraisemblablement moins de 100 adultes et sa zone d'occurrence couvre probablement moins de 4 km².

La salamandre sombre des montagnes se trouve généralement dans des milieux forestiers de haute altitude, dans ou directement à proximité de petites zones de suintement, de petites sources, de petits cours d'eau à faible débit, de suintements, d'affleurements rocheux humides aux eaux froides et bien oxygénées. Des pierres, de la mousse, de la matière ligneuse et de la litière de feuilles ou des refuges souterrains à proximité de l'eau constituent ses refuges naturels. Ils la protègent contre la prédation et la déshydratation et constituent des abris pour le repos, l'alimentation, la ponte et les aires de croissance des larves. L'hibernation a lieu dans des refuges souterrains constamment alimentés en eau.

La salamandre sombre des montagnes est membre de la famille des *Plethodontidae*, salamandres dépourvues de poumons. Le cycle vital de l'espèce est complexe et comprend un stade larvaire aquatique. La durée du stade larvaire varie de quelques jours à plusieurs mois, selon les conditions environnementales et la disponibilité de la nourriture. L'espérance de vie moyenne est d'approximativement 7 ans, mais peut atteindre 15 ans.

Les changements de l'approvisionnement en eau et de sa qualité dans les plans d'eau connus pour maintenir l'espèce constituent les menaces les plus importantes pesant directement sur l'espèce et son habitat. Les polluants qui ont une incidence sur l'eau souterraine et l'eau de surface peuvent être notamment les effluents des zones urbaines, des activités agricoles et industrielles ou les polluants atmosphériques. Des phénomènes stochastiques, comme des glissements de terrain dans la gorge du Niagara, pourraient nuire à son habitat restant limité ou le détruire. La capacité de dispersion limitée de l'espèce restreint considérablement les possibilités de migration vers de nouveaux sites.

Cette publication hautement spécialisée n'est disponible qu'en anglais conformément au Règlement 671/92, selon lequel il n'est pas obligatoire de la traduire en vertu de la

Loi sur les services en français. Pour obtenir des renseignements en français, veuillez communiquer avec le ministère l'Environnement, de la Protection de la nature et des Parcs au cossarosecretariat@ontario.ca.

Executive summary

Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) is in the family of lungless salamanders, Plethodontidae. Adults range in size between 70 and 110 mm in total length. Most adults have a light mid-dorsal stripe that extends from the head to the tail, often with a row of dark chevron-shaped markings.

The North American range of Allegheny Mountain Dusky Salamander occurs throughout the Appalachian Mountain system and along the southern shores of Lakes Erie and Ontario, extending to southern Quebec. The small and isolated Canadian distribution consists of two populations, one in southern Ontario, and one in extreme southern Quebec, both adjacent to the US border. The Ontario population was first discovered in 1989, but not confirmed until 2004. In 2010, a second nearby stream was found to maintain this species, both within the Niagara Gorge, but separated by approximately 350 m. The total population in Ontario is likely less than 100 adults and the extent of occurrence is less than 4 km².

Allegheny Mountain Dusky Salamander is generally found in high elevation forested areas, in or directly adjacent to small seeps, springs, slow-flowing streams, seepages and wet rock outcrops with cool, well-oxygenated water. Natural cover includes rocks, moss, woody debris and leaf litter or damp subterranean retreats close to water. Such retreats provide protection from dehydration and predation, and serve as foraging, nesting and nursery habitats. Hibernacula are comprised of wet subterranean refugia.

Allegheny Mountain Dusky Salamander has a complex life cycle, including an aquatic larval stage. The larval stage can range from days to months depending on environmental conditions and food availability. Sexual maturity is reached at 3 to 4 years, dependent upon size. Approximately 8 – 24 eggs are laid, of which are protected by the female until hatching in the fall or spring. Average lifespan is approximately 7 years, though 15 years is attainable.

Changes to the water supply and water quality within the waterbodies known to maintain the species represent the most important threat to the salamander directly, and to its habitat. Pollutants that impact groundwater and surface water can include effluents from urban areas, agriculture, industry, or air pollution. Stochastic events such as landslides within the Niagara Gorge could harm or destroy the limited remaining habitat. Additional threats include urban growth, logging, invasive plant species and impacts from climate change such as increasing drought conditions. The species has limited dispersal ability, so opportunities for migration to new sites are likely unavailable.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Allegheny Mountain Dusky Salamander is one of 23 species known in the genus *Desmognathus*, of these, only two species are known in Ontario, Northern Dusky Salamander (*Desmognathus fuscus*) and Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*). Allegheny Mountain Dusky Salamander is the only Canadian representative of the morphologically similar *D. ochrophaeus* complex of 7 salamander species, all of which share a similar appearance and habitat preferences in the US. (Tilley and Mahoney 1996; COSEWIC 2018).

1.1.2. Designatable units

Two Designatable Units exist for Canada, one for the Covey Hill, Quebec population (Appalachian Population) and one for the Niagara, Ontario population (Carolinian Population). The single Ontario Designatable Unit is distinct from that of Quebec due to significant geographic distance between units and including natural physical barriers. The limited dispersal capability of this species prevents exchange of individuals between provinces, making each a discrete unit. Genetic studies are lacking, though due to the distance between units, local isolation and different environmental and habitat conditions, local adaptations may have evolved. Additionally, each Designatable Unit is found within a different Amphibian and Reptile Faunal Province (COSEWIC 2018).

1.1.3. Native status

Allegheny Mountain Dusky Salamander is native to Ontario, and populations spend their entire life cycles within the province. This species has been repeatedly documented since 1989, including the discovery of a second subpopulation in 2010. Prior to this, the species was not likely located due to the difficulty of accessing the known sites, limited habitat availability and cryptic behavior within an often-subterranean or rock-covered environment.

1.1.4. Occurrence

Allegheny Mountain Dusky Salamander currently occurs along two streams within the Niagara Gorge in Ontario. These individuals spend their entire life cycles within the province of Ontario. Repeated observations have been recorded at these sites, and an ongoing study has confirmed the species as recently as 2018.

1.2. Eligibility results

Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G5 (NatureServe 2021)
- IUCN: Least Concern (August 25, 2015)
- NRANK Canada: N2N3
- COSEWIC: Endangered (April 2018)
- SARA: Endangered (Schedule 1)
- ESA 2007: Endangered (month and year of last assessment)
- SRANK: S1 (ranked in year)

2.2. Distribution in Ontario

The Ontario population was first documented in 1989, but not confirmed until 2004. In 2010, a second nearby stream was found to maintain this species, both within the Niagara Gorge, but separated by approximately 350 m (Figure 1). Despite multiple searches, no additional locations have been found to date (COSSARO 2018). There are a total of 2 COSEWIC-defined locations and a single NHIC defined EO for this species in Ontario. The two COSEWIC-defined locations are based on occupancy in two streams, each with a separate groundwater source.

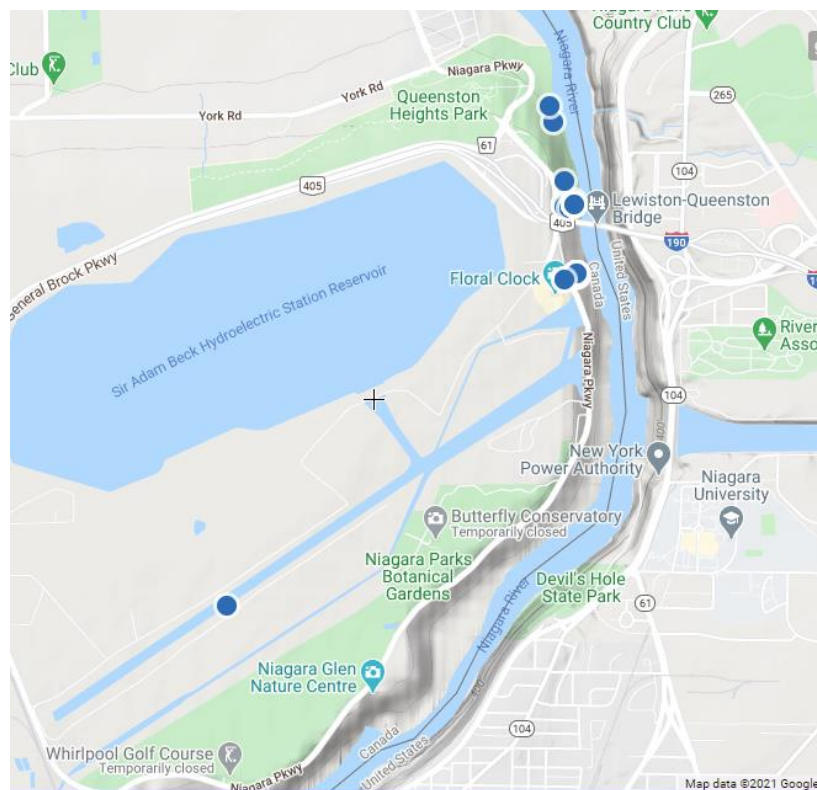


Figure 1. All Ontario Allegheny Mountain Dusky Salamander records from the NHIC database. Created for this report using [GeoCAT](#) [website accessed March 31, 2021].

2.3. Distribution, status and the broader biologically relevant geographic range outside Ontario

Known from 9 U.S. states: Kentucky (S4), Maryland (S5), New Jersey (SU), New York (S5), Ohio (SNR), Pennsylvania (S5), Tennessee (S5), Virginia (S4) and West Virginia (S4). This species is listed as Secure (S5) or Apparently Secure (S4) in 7 of the 9 states where it occurs. This species is not ranked in Ohio and possibly extirpated in New Jersey. Outside of Ontario in Canada, ranked as S1 in Quebec and declining (Nature Serve 2021).

Allegheny Mountain Dusky Salamander does not have a broader biologically relevant geographic range in Ontario beyond the single Designatable Unit. None of the populations within New York State are found within the Niagara Gorge or are found in similar habitats outside of Ontario. Additionally, this species is not known to make large distance movements and the Niagara River represents a barrier to movement for this species, suggesting that interactions between populations, regardless of jurisdiction, are unlikely. Results of genetic analysis of individuals from the Ontario and New York populations of Allegheny Mountain Dusky Salamander indicate that the two populations are not genetically distinct (Pers. Com. Anne Yagi, 2021). However, a review of the available records for New York State indicate that the closest individuals are found several kilometers from the Ontario population and are separated by areas that lack suitable habitat for this species. The New York population is not considered at risk.

Table 1. Condition of the Species in Adjacent Jurisdictions and Broader Biologically Relevant Geographic Range

Adjacent Jurisdictions	Biologically Relevant to Ontario (n/a, yes, no)	Condition	Notes & Sources
Quebec	No	SNR	NatureServe 2021
Manitoba	n/a		
Michigan	n/a		
Minnesota	n/a		
Nunavut	n/a		
New York	Yes	S5	NatureServe 2021
Ohio	No	SNR	NatureServe 2021
Pennsylvania	No	S5	NatureServe 2021
Wisconsin	n/a		
<i>Other Relevant Jurisdiction</i>			

2.4. Ontario conservation responsibility

Less than 1% of the global range of the species occurs in Ontario.

2.5. Direct threats

Based on the COSEWIC Threats Calculator completed July 18, 2017, the following are threats in likely order of importance: “(i) dams and water management and habitat modification by invasive Common Reed (Natural system modifications), (ii) industrial effluents and other sources of contamination (Pollution), and (iii) landslides (Geological events). Specific habitat requirements and dependency on very moist habitats; small population size, increasing vulnerability to threats and stochastic environmental fluctuations” (COSEWIC 2018). Additionally, one of the two streams was impacted by a grout spill in 2016. The long-term impacts of this event remain unclear (COSEWIC 2018). Monitoring data collected since 2016 show high variability in the number of individuals documented. With a generation time of approximately 5 years, the potential impacts of the grout spill in 2016 may yet be still not observable in the population.

2.6. Specialized life history or habitat use characteristics

Allegheny Mountain Dusky Salamander is generally found in high elevation forested areas, in or directly adjacent to small seeps, springs, slow-flowing streams, seepages and wet rock outcrops with cool, well-oxygenated water. Changes to the water table or thermal dynamics of the watercourse could result in declines. Natural cover includes rocks, moss, woody debris and leaf litter or damp subterranean retreats close to water. Such retreats provide protection from dehydration and predation, and serve as foraging, nesting and nursery habitats. Hibernacula are comprised of wet subterranean refugia. Changes to the local environment due to human use, landslides or tree removal could damage or destroy necessary habitat.

Allegheny Mountain Dusky Salamander has a complex life cycle, including an aquatic larval stage. The larval stage can range from days to months depending on environmental conditions and food availability. Sexual maturity is reached at 3 to 4 years, dependent upon size. Approximately 8 – 24 eggs are laid, of which are protected by the female until hatching in the fall or spring. Dispersal ability of Allegheny Mountain Dusky Salamander is limited as individuals require access to suitable moisture levels and are unable to traverse large waterways (e.g., Niagara River). Average lifespan is approximately 7 years, though 15 years is attainable. Due to the relatively long larval and juvenile stages, and due to the propensity of females to guard the eggs, any number of natural or anthropogenic threats could negatively impact this species during development (i.e., spills, landslides, extended drought, fire, human recreational use, etc.).

3. Ontario status assessment

3.1. Application of endangered/threatened status in Ontario

3.1.1. Criterion A – Decline in total number of mature individuals

Insufficient information is available. There is a projected decline, though the magnitude of this decline is unknown.

3.1.2. Criterion B – Small distribution range and decline or fluctuation

Meets **Endangered** under Criterion: B1ab(iii, v)+2ab(iii, v), because both the IAO and EOO are below the following thresholds: fewer than 5 known locations, both a projected and observed decline in habitat quality and a projected and inferred decline in the total number of mature animals.

3.1.3. Criterion C – Small and declining number of mature individuals

Meets **Endangered** under: C2a(i) because the known population size is below listed thresholds and there is a continuous projected and observed decline in population due to threats; neither of the known subpopulations has more than 250 mature animals.

3.1.4. Criterion D – Very small or restricted total population

Meets **Endangered** under D1 due to a population size that is likely less than 250 adults. Additionally, the species meets Threatened under D2, because of a small population that is at risk due to human activities and stochastic events, of which could lead the population to become critically endangered over a short period of time, if the ground water that feeds all occupied streams is compromised.

3.1.5. Criterion E – Quantitative analysis

Insufficient information is available to complete quantitative analysis.

3.2. Application of Special Concern in Ontario

Not applicable. Species meets criteria for Threatened and Endangered

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

The species is not globally at risk and less than 1% of the global range is found in Ontario. Ontario's conservation responsibility is low.

3.3.2. Status modification based on rescue effect or level of risk in broader biologically relevant geographic range

Rescue Effect Modification not applied: Small areas of suitable habitat remain, though rescue is unlikely due to anthropogenic changes along the Niagara Peninsula and isolation of any potential habitat. Individuals from the US are unlikely to re-establish populations naturally, and no indication of immigration has been documented.

Broader Biologically Relevant Range modification not applied: Allegheny Mountain Dusky Salamanders are typically associated with high elevation forested areas, in or directly adjacent to small seeps, springs, slow-flowing streams, seepages and wet rock

outcrops with cool, well-oxygenated water. The locations of this species in Ontario are somewhat novel as none of the New York populations are found within the Niagara Gorge. A review of records available for New York State indicates that observations of this species are several kilometers away from the Canadian border and generally associated with areas of higher elevation. Populations in Ontario and the United States are separated by large areas of unsuitable, unconnected habitat (iNaturalist 2021, New York State Amphibian Reptile Atlas 2021). The geographic isolation of the Ontario and New York populations and the differences in habitat occupancy does not warrant a Broader Biologically Relevant Range beyond the current range of the Ontario population.

3.4. Other status categories

3.4.1. Data deficient

Not applicable.

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

Not applicable.

4. Summary of Ontario status

Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) is classified as Endangered in Ontario based on meeting criterion B1ab(iii, v)+2ab(iii, v), C2a(i), and D1.

This status of this species is consistent with the definition of status under the Endangered Species Act, 2007.

5. Information sources

COSEWIC. 2018. COSEWIC assessment and status report on the Allegheny Mountain Dusky Salamander *Desmognathus ochrophaeus*, Appalachian population and Carolinian population in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 95 pp. (<http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>).

iNaturalist. 2021. Species observation data for Allegheny Mountain Dusky Salamander. Web site: <http://www.inaturalist.org>. [accessed August 2021].

NatureServe. 2021. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Web site: <http://explorer.natureserve.org>. [accessed August 2021].

New York State Reptile and Amphibian Atlas. 2021. Allegheny Dusky Salamander Distribution Map. New York State Department of Environmental Conservation. Web site: <https://www.dec.ny.gov/animals/44509.html>. [accessed August 2021].

Tilley, S.G., and M.J. Mahoney. 1996. Patterns of genetic differentiation in salamanders of the *Desmognathus ochrophaeus* complex (Amphibia: Plethodontidae). Herpetological Monographs 10:1-42.

Yagi, A., pers. comm. 2021. *Telephone exchange with G. Cunnington*. 2012. President, 8 Trees Inc., Fonthill, Ontario.

Appendix 1: Technical summary for Ontario

Species: Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*)

Demographic information

Demographic attribute	Value
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	~5 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Yes, inferred and projected
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Unknown
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown [There could be a 50% reduction in mature salamanders over the next 10 years if individuals impacted by a grout spill in 2016 fail to reproduce]
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.	Unknown
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. Unknown b. Yes c. Yes
Are there extreme fluctuations in number of mature individuals?	Unknown

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	4 km ²
Index of area of occupancy (IAO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	4 km ² (actual area of occupancy is 0.4 km ²)
Is the total population severely fragmented?	a. No

Extent and occupancy attributes	Value
i.e., is >50% of its total area of occupancy is in habitat patches that are: (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	b. Possibly. The streams occupied by the salamanders are separated by over 350 metres of inhospitable terrain
Number of locations.	There are a total of 2 COSEWIC-defined locations and a single NHIC defined EO for this species in Ontario. The two COSEWIC-defined locations are based on occupancy in two streams, each with a separate groundwater source.
Number of NHIC Element Occurrences	One
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	No, though a decline is possible due to a grout spill that occurred in 2016.
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	No
Is there an observed, inferred, or projected continuing decline in number of locations?	No
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Possibly, due to a grout spill that occurred in 2016.
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of mature individuals in each sub-population or total population (if known)

Sub-population (or total population)	Number of mature individuals
<i>Insert additional rows as necessary. If total population, do not use table</i>	Unknown, though likely less than 100; preliminary estimates suggests ~33 adults

format.

(COSEWIC 2018)

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats calculator was prepared on July 18, 2017 (COSEWIC 2018).

Threats follow in assumed of importance:

- (i) dams and water management and habitat modification by invasive Common Reed (Natural system modifications),
- (ii) industrial effluents and other sources of contamination (Pollution), and
- (iii) landslides (Geological events).

Additional limiting factors: Allegheny Mountain Dusky Salamander persist in low numbers in Ontario, are habitat specialists, requiring very moist habitat conditions, and are increasingly vulnerable to threats, including stochastic environmental fluctuations.

Rescue effect

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	No, the broader biologically relevant geographic range for this species does not extend beyond the province of Ontario
Status of outside population(s) most likely to provide immigrants to Ontario	New York (S5).
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	No. The Niagara River and geographic distance between populations prevent natural immigration
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	No
Are conditions deteriorating in Ontario?	Yes. One of only two locations was contaminated by a grout spill
Is the species of conservation concern in bordering jurisdictions?	No. New York (S5)
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	No

Sensitive species

Yes, this is a data sensitive species.

Acronyms

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

COSSARO: Committee on the Status of Species at Risk in Ontario

ESA: Endangered Species Act

EO: Element occurrence (as defined by NHIC)

EOO: extent of occurrence

GRANK: global conservation status assessments

IAO: index of area of occupancy

IUCN: International Union for Conservation of Nature and Natural Resources

MNRF: Ministry of Natural Resources and Forestry

NHIC: Natural Heritage Information Centre

NNR: Unranked

NRANK: National conservation status assessment

SARA: Species at Risk Act

SNR: unranked

SRANK: subnational conservation status assessment

S1: Critically Imperiled

S2: Imperiled

S3: Vulnerable

S4: Apparently Secure

S5: Secure

IUCN: International Union for Conservation of Nature and Natural Resources

CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario