

Ontario Species at Risk Evaluation Report for
English Northern Oak Hairstreak
Thècle méridionale d'Ontario
(*Satyrium favonius ontario*)

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

Assessed by COSSARO as Threatened

November 2022

Final

Executive summary

Northern Oak Hairstreak is a small brownish-grey butterfly with 'tails' on its hindwings. The undersides of its wings are brownish grey with prominent orange patches near the hindwing margins and it has a blue patch below the lower tail. There is a series of white and black dashed lines on the hindwing undersides and the white median line forms a "W" marking above the blue patch. Larvae are yellowish and slug-like with green and yellow stripes. Pupae are dark brown with fine hairs.

There are only a few occurrences of Northern Oak Hairstreak within a small range of southwestern Ontario, although there are likely a few undocumented occurrences for this difficult-to-survey species. It appears to be locally extirpated from some locations, although a new location has recently been discovered.

Northern Oak Hairstreak ranges from southern Ontario and Massachusetts south to Georgia, and west to Michigan, Kansas, Colorado, and Arizona. This species is widespread but very local and becomes increasingly scarce towards the northern edge of its range. Northern Oak Hairstreak live in oak forests with a closed canopy. Larval food plants are unconfirmed in Canada, although suspected to be White Oak.

Northern Oak Hairstreak is classified as Threatened in Ontario based on meeting criterion B1ab(iii)+2ab(iii). This species has a very small range in Ontario, with only a few locations and there is an observed, inferred, and projected decline in habitat quality by the application of broad-spectrum biological insecticides to control outbreaks of the non-native Spongy Moth.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Northern Oak Hairstreak is one of four subspecies of Oak Hairstreak (*Satyrium favonius*) (J. E. Smith 1797) that are recognized: *S. f. favonius* (J. E. Smith 1797), *S. f. autolytus* (W. H. Edwards 1871), *S. f. violae* (D. Stallings and Turner 1947) and *S. f. ontario* (W. H. Edwards 1868). Only subspecies *S. f. ontario* occurs in Ontario.

The type specimen for Ontario, as listed in various sources, was found in July 1868 at Port Stanley, Elgin.

1.1.2. Designatable units

Northern Oak Hairstreak has one designatable unit in Ontario and Canada; only one of the three (or four) described subspecies (i.e., *S. f. ontario*) occurs in Canada.

1.1.3. Native status

Northern Oak Hairstreak is native to Ontario. It was first collected in 1868 and there are over 150 records.

1.1.4. Occurrence

Northern Oak Hairstreak is extant. There are recent records from Ontario in 2021 and 2022 in iNaturalist.

1.2. Eligibility results

Northern Oak Hairstreak (*Satyrium favonius ontario*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G4G5T4 (NatureServe 2022) (status last reviewed in 2015)
- IUCN: Not assessed
- NRANK Canada: N1
- COSEWIC: Threatened (May 2022)
- SARA: None
- ESA 2007: None
- SRANK: S1 (ranked in 2009)

2.2. Distribution in Ontario

The Canadian range of Northern Oak Hairstreak is restricted to southwestern Ontario. It is currently known from Lambton, Essex, and Middlesex regions. Northern Oak Hairstreak was historically known from Port Stanley and Grimsby. Suitable habitat occurs outside of these regions, but it has not been found despite targeted searches.

There are three confirmed subpopulations (plus one unconfirmed in Ontario) and 3-8 locations. The range in locations is because some sites are unconfirmed and are based on the spraying of *Bacillus thuringiensis* var. *kurstaki* (Btk) (a key threat to the Northern Oak Hairstreak) to control the non-native Spongy Moth. Element Occurrences have not been processed for this species.

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

Northern Oak Hairstreak ranges from southern Ontario and Massachusetts south to Georgia, and west to Michigan, Kansas, Colorado, and Arizona. The subspecies found in Ontario is widespread and globally secure but very local and becomes increasingly scarce towards the northern edge of its range. See Table 1.

The broader biologically relevant range includes the Mixedwood Plains ecozone (8.1). Northern Oak Hairstreak is imperiled in other jurisdictions within this range including Michigan, the most proximate part of the broader biologically relevant range. Outside of this range, this species may feed on other species of oak (e.g., live [evergreen] oak species). Its condition within the broader biologically relevant range is similar to Ontario. This includes land use, threats, and the status of the species.

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	n/a	-	-
Manitoba	n/a	-	-
Michigan	S1		
Minnesota	n/a	-	-
Nunavut	n/a	-	-
New York	S2S4		More common along Atlantic coastal plain
Ohio	SNR		Rank for parent species
Pennsylvania	SNR		Absent from most of Pennsylvania, most of Ohio and the Appalachians
Wisconsin	n/a	-	-

2.4. Ontario conservation responsibility

Ontario's conservation responsibility is estimated to be <1% for the range and population of this species.

2.5. Direct threats

A threats calculator was completed on December 17, 2020. The overall threat impact is Very High – High (COSEWIC 2022).

Threats (in order of highest threat):

- 9.3 Agricultural and forestry effluents. High impact.
- 8.1 Invasive non-native/alien species/diseases. High-low impact.
- 7.1 Fire and fire suppression. Low impact.

The primary threat is the spraying of *Bacillus thuringiensis* var. *kurstaki* (Btk) to control Spongy Moth. The application period may overlap with the larval period of Northern Oak Hairstreak and in these instances would be lethal.

2.6. Specialized life history or habitat use characteristics

Northern Oak Hairstreak live in oak forests with a closed canopy. Oak forest communities are generally ranked as secure in Ontario (S4 or S5). Northern populations are thought to preferentially use white oaks (Gagliardi and Wagner 2016). Larval food plants are unconfirmed in Canada, although suspected to be White Oak (*Quercus alba*).

2.7. Existing Conservation and Recovery Actions

There is no recovery planning for this species.

Many of the known locations for this species are owned and managed for conservation:

- An extant subpopulation in Lambton County is within habitat owned and managed by St. Clair Region Conservation Authority.
- The Town of LaSalle owns Brunet Park which is also protected.
- One site is suspected to be in Walpole First Nation.
- Northern Oak Hairstreak was observed in Skunk's Misery on a tract owned and managed by the Lower Thames Valley Conservation Authority. Other habitat that forms this natural area is owned and managed privately, by Middlesex County, and by the Thames Talbot Land Trust.

However, the main threat of Btk spraying could still occur within lands managed for conservation.

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. Population trends are unknown.

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

Threatened based on B1ab(iii)+2ab(iii)

EOO (1183 km²) and IAO (24 km²) meet the threshold for Threatened (and Endangered), and (a) number of locations is 6-8 (based on different land management practices), and there is evidence for (b) continuing decline of (iii) area, extent and/or quality of habitat.

This includes the reduction of habitat quality by the application of broad-spectrum lepidopteran insecticides to control outbreaks of the non-native Spongy Moth.

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

Insufficient information. Population size and trends are unknown.

3.1.4. Criterion D – Very small or restricted total population

Does not apply.

3.1.5. Criterion E – Quantitative analysis

Does not apply.

3.2. Application of Special Concern in Ontario

Does not apply. There are only a few, isolated subpopulations within a small range of southwestern Ontario, although this species can be difficult to survey (Gagliardi & Wagner 2016; Gagliardi et al. 2017) and there may be undocumented occurrences in Ontario (COSEWIC 2022).

While there are several occurrences on conservation lands, this does not mitigate the primary threat.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Not applicable. Only a very small portion of the global range and population is found in Ontario.

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

Northern Oak Hairstreak is globally secure. This species is however rare in the northern portion of its range including jurisdictions adjacent to Ontario and it faces similar threats.

3.3.3. Rescue Effect

The potential for rescue from subpopulations in the United States is possible however the Northern Oak Hairstreak distribution in the adjacent states is not fully known and appears patchy. Rescue may be possible at Windsor. The closest record to LaSalle is near Ann Arbor, Michigan, which is 55 km away,

There is potential intervening habitat (i.e., oak forests) but Northern Oak Hairstreak appears local. Dispersal events are likely uncommon but may be facilitated by weather conditions (i.e., wind) which are known to assist dispersal in other hairstreak species (COSEWIC 2022).

3.4. Other status categories

3.4.1. Data deficient

Does not apply.

3.4.2. Extinct or extirpated

Does not apply.

3.4.3. Not at risk

Does not apply.

4. Summary of Ontario status

Northern Oak Hairstreak (*Satyrrium favonius ontario*) is classified as Threatened in Ontario based on meeting criterion B1ab(iii)+2ab(iii). This species has a very small range in Ontario, with only a few locations and there is an observed, inferred, and projected decline in habitat quality by the application of broad-spectrum biological insecticides to control outbreaks of the non-native Spongy Moth.

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

5. Information sources

COSEWIC. (2022). IN PRESS. COSEWIC assessment and status report on the Northern Oak Hairstreak *Satyrrium favonius ontario* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 41 pp. (

Gagliardi, B. L., & Wagner, D. L. (2016). 'Northern' Oak Hairstreak (*Satyrrium favonius ontario*)(Lepidoptera: Lycaenidae): Status Survey in Massachusetts, False Rarity, and Its Use of Non-nectar Sugar Resources. *Annals of the Entomological Society of America*, 109(4), 503-512.

Gagliardi, B. L., Wagner, D. L., & Allen, J. M. (2017). Species distribution model for the 'Northern' Oak hairstreak (*Satyrrium favonius ontario*) with comments on its conservation status in the northeastern United States. *Journal of Insect Conservation*, 21(5), 781-790.

Appendix 1: Technical summary for Ontario

Species: Northern Oak Hairstreak (*Satyrrium favonius ontario*)

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.	1 year
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Unknown
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
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 (no in COSEWIC) b. Yes c. No
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>	1183 km ² (extant subpopulations only) 12,853 km ² (all subpopulations)
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>	24 km ² ; includes extant (#4a, 4b, 6a, 6b, 7) and unconfirmed (#5) subpopulations only 32 km ² ; includes historical (#1, 2), extant (#4a, 4b, 6a,

Extent and occupancy attributes	Value
	6b, 7) and unconfirmed (#5) subpopulations
<p>Is the total population severely fragmented? 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?</p>	<p>a. No b. No</p>
<p>Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.</i></p>	<p>Insert number or range of numbers.</p>
<p>Number of NHIC Element Occurrences <i>Request data from MNRF.</i></p>	<p>Insert if available</p>
<p>Is there an observed, inferred, or projected continuing decline in extent of occurrence?</p>	<p>Yes, observed, inferred, and projected decline in EOO based on threat 7.3 (other ecosystem modifications)</p>
<p>Is there an observed, inferred, or projected continuing decline in index of area of occupancy?</p>	<p>Yes, observed, inferred, and projected decline in IAO based on threat 7.3 (other ecosystem modifications) and the potential pesticide spray to control Spongey Moth over multiple years (9.3) in the ten-year assessment timeframe</p>
<p>Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?</p>	<p>Yes, observed, inferred, and projected decline in subpopulations based on threat 7.3 (other ecosystem modifications) and the potential pesticide spray to control Spongey Moth over multiple years (9.3) in the ten-year assessment timeframe</p>
<p>Is there an observed, inferred, or projected continuing decline in number of locations?</p>	<p>Yes, inferred, and projected decline based on the potential pesticide spray to control Spongey</p>

Extent and occupancy attributes	Value
	Moth (9.3) over multiple years in the ten-year assessment timeframe
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes, inferred, and projected decline in quality of habitat based on threats from other ecosystem modifications (7.3) that includes invasive native plant growth (due to fire suppression) and the spread and competition from non-native plants; and habitat fragmentation.
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
#1 Port Stanley (historical)	<i>Unknown</i>
#2 Grimsby (historical)	
#3 Point Pelee (vagrant)	
#4a Reid Conservation Area (extant)	
#4b Moore Wildlife Management Area (extant)	
#5 Walpole Island (unconfirmed)	
#6a Brunet Park (extant)	
#6b Lasalle (extant)	
#7 Middlesex (extant)	

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats teleconference call was completed on December 17, 2020. Threat impact Very High – High (COSEWIC 2022).

Threats (in order of highest threat):

- 9.3 Agricultural and forestry effluents. High impact.
- 8.1 Invasive non-native/alien species/diseases. High-low impact.
- 7.1 Fire and fires suppression. Low impact.
- 7.3 Other ecosystem modifications. Unknown impact.
- 1.1 Housing and urban areas. Unknown impact.
- 5.3 Logging and wood harvesting. Unknown impact.
- 6.1 Recreational activities. Unknown impact.
- 6.3 Work and other activities. Unknown impact.
- 8.2 Problematic native species/diseases. Unknown impact.
- 11.1 Habitat alteration and shifting. Unknown impact.
- 11.2 Droughts. Unknown impact.
- 11.3 Temperature extremes. Unknown impact.

What additional limiting factors are relevant?

- Small population size and fragmented subpopulations (note: severely fragmented not considered under Criterion B)
- Abundance and health of larval host plant(s)
- Poorly understood relationship with cynipid wasps

Rescue effect

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes/No/Unknown/Probably/Possibly
Status of outside population(s) most likely to provide immigrants to Ontario	Michigan (S1)
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possibly
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Probably
Are conditions deteriorating in Ontario?	Probably (spraying for Spongy Moth)
Is the species of conservation concern in bordering jurisdictions?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Possibly (No in COSEWIC)

Sensitive species

No