Ontario Species at Risk Evaluation Report for American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*)

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

Assessed by COSSARO as Special Concern

May 2017

Final

Scolopendre d’Amérique (*Asplenium scolopendrium* var. *americanum*)

La scolopendre d’Amérique (*Asplenium scolopendrium* var. *americanum*) est une fougère vivace et persistante qui pousse en touffes de frondes liguliformes. Le spécifique *americanum* fait référence à la variété caractéristique de l’Amérique du Nord. Au Canada, elle se trouve exclusivement dans le Sud de l’Ontario, où elle pousse à l’ombre de caducifoliés, sur la roche calcaire et la dolomie couvertes de mousse. Son habitat se limite principalement aux microclimats ombragés et très humides de l’escarpement du Niagara. On recense environ 109 sous-populations en Ontario, collectivement constituées d’environ 110 000 individus. Comme la province compte environ 80 % de toutes les sous-populations de scolopendre d’Amérique et 94 % des individus, elle assume en grande partie la responsabilité de la conservation de l’espèce. En Ontario, la plus grande menace est la perte et l’altération de l’habitat de l’espèce attribuables à la coupe forestière et à l’exploitation des carrières. L’immigration de source externe des populations frontalières étatsuniennes est peu probable, vu le nombre très restreint d’individus et la distance à parcourir; l’espèce est d’ailleurs considérée comme menacée aux États-Unis. Si la scolopendre d’Amérique ne répond à aucun des critères d’une espèce menacée ou en voie de disparition – étant donné le nombre relativement élevé d’individus et de sous-populations en Ontario –, elle demeure toutefois confinée à une aire géographique restreinte et vit dans des microhabitats très spécifiques, sans compter que le nombre d’individus de certaines sous-populations est très faible. L’essentiel de la population mondiale se trouve en Ontario, et son statut risque de changer si les menaces à son habitat persistent (coupe forestière, exploitation des carrières, etc.). C’est pourquoi la scolopendre d’Amérique est désignée comme une espèce préoccupante.

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Executive summary

American Hart's-tongue Fern (*Asplenium scolopendrium*) is a perennial, evergreen fern that grows as a cluster of strap-shaped fronds (leaves). The variety that grows in North America is *americanum,* referred to as American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*)*.* The Canadian range of American Hart's-tongue Fern is limited to southern Ontario, where it typically grows on moss-covered limestone and dolostone under deciduous trees. Its distribution is primarily limited to shady and moist microclimates with relatively high humidity on the Niagara Escarpment. There is a total of ~109 subpopulations in Ontario, which collectively harbour up to ~110,000 individuals. Ontario is home to ~80% of all American Hart's-tongue Fern subpopulations and ~ 94% of individuals, and therefore has a high conservation responsibility for this species. In Ontario, habitat loss and modification through logging and quarrying provide the greatest threats to American Hart's-tongue Fern. Rescue from adjacent states in the USA is unlikely because of the very small population sizes and the considerable distance that would need to be traversed; furthermore, American Hart's-tongue Fern is threatened in the USA. Although American Hart's-tongue Fern does not meet any criterion for designation as either endangered or threatened owing to the relatively high numbers of individuals and subpopulations in Ontario, it is restricted to a small geographic area and has very specific microhabitat requirements; in addition, some subpopulations are very small. Most of the global population occurs in Ontario and on-going threats, such as logging and quarrying, may cause American Hart's-tongue Fern to become threatened if habitat destruction/modification continues. American Hart's-tongue Fern has therefore been designated Special Concern.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Asplenium scolopendrium L. var. *americanum* (Fernald) Kartesz and Gandhi is the North American variety of Hart's-tongue Fern. There is also a European variety: *A. scolopendrium* var. *scolopendrium*. The North American var. *americanum* was separated from the European var. *scolopendrium* by Fernald (1935) based on morphological differences: smaller leaves, narrower scales, distal location on blades in var. *americanum;* see also Kartesz and Gandhi, (1991). There are also differences in ploidy levels between the two varieties (tetraploidy in var. *Americanum* versus diploidy in var. *scolopendrium;* Britton, 1953), and differences in perispore morphology (Arreguin-Sanchez and Aguirre-Claveran 1986).

1.1.2. Designatable units

The Canadian population of American Hart's-tongue Fern is considered one designatable unit. The European variety is excluded from the assessment.

1.1.3. Native status

The type specimen of American Hart's-tongue Fern was collected by Fernald, Thompson, and Wright in 1934 from Inglis Falls, Grey County (near Owen Sound), Ontario. It is in the Gray Herbarium (Fernald 1935). It is unknown how long American Hart's-tongue Fern has been present in Ontario, although there are records that pre-date 1934 in both Ontario (Ransier, 1913) and neighbouring New York (Maxon, 1900).

1.1.4. Occurrence

American Hart's-tongue Fern grows at more than 100 locations around the Niagara Escarpment in Ontario.

1.2. Eligibility results

American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G4T3 (NatureServe accessed April, 2017)
- NRANK Canada: N2
- COSEWIC: Special Concern (November, 2016)

- SARA: Special Concern (Schedule 1)
- ESA 2007: Special Concern (June, 2008)
- SRANK: S3 (ranked in 2011)

2.2. Distribution in Ontario

The Canadian range of American Hart's-tongue Fern is limited to Ontario where it can be found in exposed limestone and dolostone of the Niagara Escarpment. American Hart's-tongue Fern has been found in five counties/regions: Bruce, Grey, Simcoe, Dufferin, and Halton (Figure 1). Between 104 (NHIC, 2017) and 109 (COSEWIC, 2016) element occurrences or subpopulations are presumed extant in Ontario; the difference between these two numbers depends on how populations are lumped or split based on the distributions of plants within sites. Of the 109 subpopulations, 81 are located in Grey County, 17 in Bruce County, six in Simcoe County, three in Dufferin County, and two in Halton Region (Table 1). Over the last 16 years there has been an increase in the number of recognized subpopulations based on the discovery of 28 new subpopulations, plus the splitting of several subpopulations that were previously combined but which comprise patches that are separated by >1 km. Additionally, six subpopulations that had previously been considered historical (COSEWIC, 2000) have been confirmed as extant (COSEWIC, 2016). Ten subpopulations have been extirpated at some point within the last few decades (at a time unknown, owing to infrequent surveys), and an additional seven have not been confirmed in approximately 40 years and are ranked either "historical" or "extirpated" (COSEWIC, 2016).

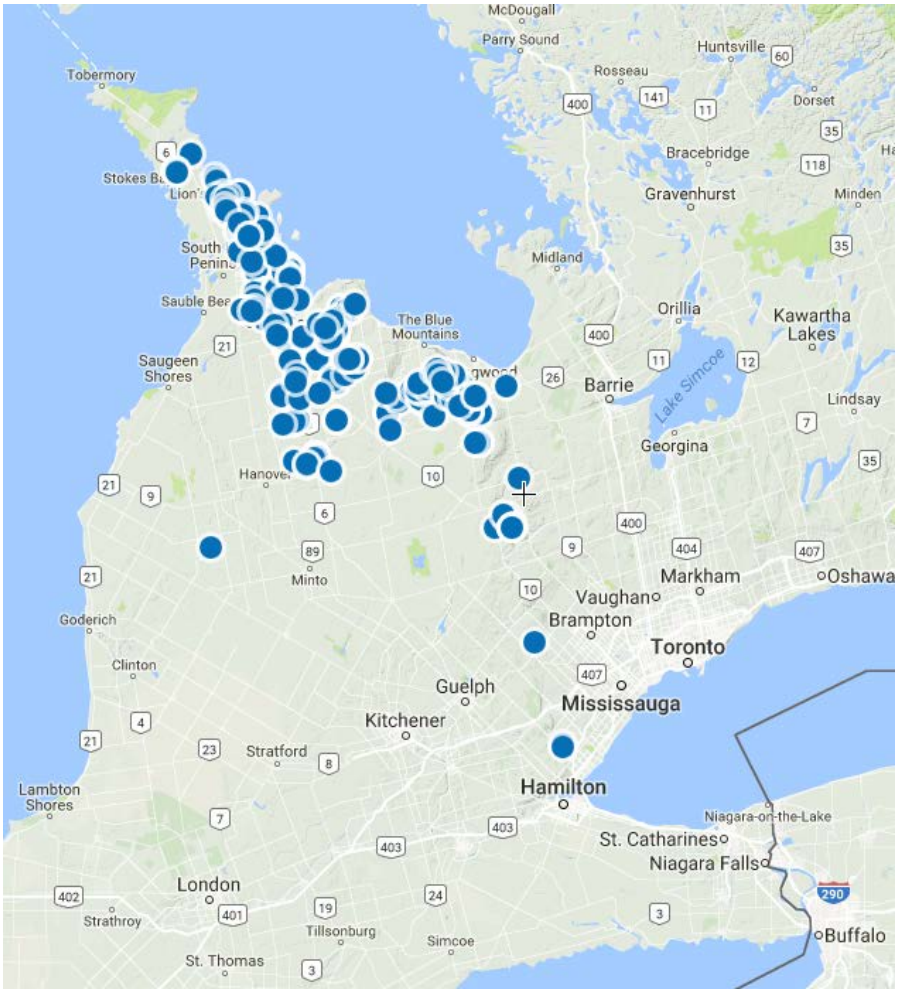

Figure 1. American Hart's Tongue Fern observation records from NHIC (April, 2017), excluding sites reported as historical or extirpated (COSEWIC, 2016). Map created for this report using GeoCAT [website accessed April 20th, 2017].

Table 1. Elemental occurrences as described by NHIC (April, 2017).

EO_ID	First Observation Date	Last Observation Date	Location Name	Element Occurrence Quality Rank	Latitude	Longitude
3584	1933-09-04	1998-12-09	HOPE BAY AREA	A - Excellent	44.9	-81.1
6189	1975-08-21	1992	SKINNER'S BLUFF	A - Excellent	44.8	-81.0
6190	1932-08-25	1960-06-21	PURPLE VALLEY	H - Historical	44.8	-81.1
6191	1976-07-17	1998-12-09	CAPE CROKER	B - Good	44.9	-81.1
21592	1980	2002-05-23	NOTTAWASAGA LOOKOUT	D - Poor	44.4	-80.2
21597	1940-10-10	1993-09-21	DEVIL'S GLEN PROVINCIAL PARK AND VICINITY	BC - Good or fair	44.3	-80.2
21598	1978	1981-05-31	NOISY RIVER PROVINCIAL NATURE RESERVE	H - Historical	44.3	-80.2
21599	1953-10-04	1999-07-20	MOUNT NEMO	D - Poor	43.4	-79.8
21600	1951-06-29	2001-10-06	COL. CLARK'S CORNER	C - Fair	45.0	-81.3

EO_ID	First Observation Date	Last Observation Date	Location Name	Element Occurrence Quality Rank	Latitude	Longitude
21601	1993-08-05	2001-08-15	LION'S HEAD PENINSULA	D - Poor	44.9	-81.2
21602	1934-06-21	1993-08-23	BARROW BAY SOUTH	B? - Possibly Good	44.9	-81.1
21607	1953	1971	CAPE DUNDAS	H - Historical	44.9	-81.1
21608	1962-09-07	2001-08-22	EAST WIARTON UPLAND WOODS	C - Fair	44.7	-81.0
21609	1938-08-01	2001-11-02	MOUNTAIN LAKE FEN	A - Excellent	44.6	-81.0
21610	1986	2001-12-03	SHOULDICE FOREST	AB - Excellent or Good	44.6	-81.0
21616	1992	2001-09-28	MUD CREEK ESCARPMENT	BC - Good or fair	44.6	-80.9
21617	1952-06-06	1993-10-07	BASS LAKE ESCARPMENT	B? - Possibly Good	44.7	-80.9
21618	1905-08-01	2001-09-28	KEMBLE FOREST	A - Excellent	44.7	-80.9
21619	1975	1984-05-14	SLOUGH OF DESPOND	H - Historical	44.7	-80.9
21620	1905-08-01	1998-11-26	INGLIS FALLS	A - Excellent	44.5	-80.9
21621	1975-09-08	1984	MCGILL LAKE	H - Historical	44.5	-80.8
21622	1958-08-11	2001-08-02	ROCKY SAUGEEN RIVER	B - Good	44.2	-80.8
21623	1916-06-28	2004-08-05	BOGNOR MARSH AND ESCARPMENT	A - Excellent	44.5	-80.7
21624	1965-08-30	1998	ROBSON LAKES	B? - Possibly Good	44.4	-80.7
21625	1955-08-01	2002-10-18	BAYVIEW ESCARPMENT	A - Excellent	44.6	-80.7
21626	1983	1984	WALTER'S CREEK HEADWATER AREA	H - Historical	44.4	-80.7
21627	1987	1994	ROCKLYN CREEK VALLEY	BC - Good or fair	44.5	-80.6
21628	1957-08-01	1993-07-17	BEAVER VALLEY WEST SLOPE	C? - Possibly Fair	44.3	-80.5
21629	1985-07	1993-06-17	UPPER BEAVER VALLEY	C? - Possibly Fair	44.3	-80.5
21630	1993-09-16	1993-09-16	KIMBERLEY CREEK	AB - Excellent or Good	44.3	-80.5
21632	1993-06-16	1993-06-16	MITCHELL CREEK VALLEYS	C? - Possibly Fair	44.4	-80.4
21633	1975-08-26	2001-10-30	KOLAPORE SOUTHWEST	B? - Possibly Good	44.3	-80.4
21634	1953-08-16	2001-10-30	KOLAPORE ESCARPMENT	A - Excellent	44.3	-80.3
21635	1957-08-02	2001-10-30	KOLAPORE SWAMP	B - Good	44.4	-80.4
21636	1972?	1999-06	FEVERSHAM GORGE	BC - Good or fair	44.3	-80.3
21637	1971-11-06	1993-06-26	PRETTY RIVER VALLEY ANNEX	BC - Good or fair	44.4	-80.3
21639	1993-10-12	2002-06-05	PRETTY RIVER VALLEY SOUTH	C? - Possibly Fair	44.4	-80.3
21640	1976-PRE	2003-11-26	DUNTROON WEST ESCARPMENT FOREST	C? - Possibly Fair	44.4	-80.2
21641	1933-10-03	1999-06	MONO CLIFFS	BC - Good or fair	44.0	-80.0
21643	1955-10-01	1976-pre	CREDIT FORKS	H - Historical	43.8	-79.9
21646	1991-00-00	1993-00-00	CALEDON MOUNTAIN SLOPE FOREST	D - Poor	43.7	-79.9
21649	1951-06-02	1952-08-24	E STOKES BAY	H - Historical	45.0	-81.3
21651	1907-07-23	1919-09	WIARTON AREA	X - Extirpated	44.7	-81.2
21653	1932-08-26	2004-08-30	SW MCIVER	BC - Good or fair	44.8	-81.1
21654	1920-09-10	1998-09-13	OWEN SOUND, RIFLE RANGE	C - Fair	44.6	-80.9

EO_ID	First Observation Date	Last Observation Date	Location Name	Element Occurrence Quality Rank	Latitude	Longitude
21655	1923-08-30	1994	NE CRUIKSHANK	E - Extant viability unknown	44.6	-81.0
21657	1965-08-30	2001-10-03	KLONDIKE EAST OF DESBORO	C - Fair	44.4	-80.9
21658	1901-09-02	2001-08-27	POTTAWATOMI CONSERVATION AREA	E - Extant viability unknown	44.5	-80.9
21659	1966-07-18	1966-07-18	S MULOCK	H - Historical	44.2	-80.9
21660	1965-08-18	2001-10-04	HARRISON LAKE/KINGHURST FOREST AREA	C - Fair	44.3	-80.9
21661	1933-09-08	1962-09-08	HAYWARD FALLS, ROCKY SAUGEEN RIVER	H - Historical	44.2	-80.7
21662	1960-05-27	1960-05-27	SAUGEEN RIVER	X - Extirpated	44.1	-80.8
21663	1898-09-22	1942-06-30	NNW WOODFORD	H - Historical	44.5	-80.7
21664	1954-09-14	1971-08-07	WALTER'S FALLS	H - Historical	44.5	-80.7
21665	1957-07-25	1984	W GORING/LILY OAK FOREST	H - Historical	44.4	-80.7
21666	1933-08-23	1950-09-29	CANADIAN FORCES TRAINING AREA	X - Extirpated	44.6	-80.6
21667	1937-08-23	1937-08-23	NEAR SCENIC CAVES, E BANKS	H - Historical	44.3	-80.7
21668	1961-08-10	1976-05-18	E EUGENIA	H - Historical	44.3	-80.5
21669	1976-05-26	1976-05-26	E EUGENIA	H - Historical	44.3	-80.5
21671	1952-10-11	1958-08-08	OSLER BLUFF	H - Historical	44.4	-80.2
21672	1937-08-21	1937-08-21	NNE MCINTYRE	H - Historical	44.3	-80.2
21673	1952-10-26	1974-11-02	W DUNTROON	H - Historical	44.4	-80.2
21674	1952-10-26	1983	MCKINNEY'S HILL	H - Historical	44.2	-80.2
21676	1951-04-28	1958-08-18	INGLEWOOD VICINITY	H - Historical	43.7	-79.9
21683	1970-09-19	1970-09-19	STAYNER	H - Historical	44.4	-80.0
22657	1983	2001-10-23	ABERDEEN, ROCKY SAUGEEN RIVER	AB - Excellent or Good	44.2	-80.8
22658	1981	1981	TRAVERSTON CREEK FOREST	X - Extirpated	44.2	-80.6
22659	1970s	1996?	BETWEEN BOAT AND SPRY LAKE	C - Fair	44.7	-81.2
22660	1980	1980	NE HEPWORTH	H - Historical	44.6	-81.0
22661	1980	2001-08-22	N SHALLOW LAKE	C - Fair	44.6	-81.0
22662	1980	2002-10-08	E HEPWORTH	E - Extant viability unknown	44.6	-81.1
22663	1975	1975	S BARROW BAY VILLAGE	X - Extirpated	44.9	-81.2
22664	1970	2001-10-24	RUSH COVE AREA	A - Excellent	44.9	-81.1
22665	1996	1996	ENE PURPLE VALLEY	C - Fair	44.8	-81.0
22666	1970	2001-11-13	N MALCOLM BLUFF, CAPE CROKER INDIAN RESERVE	C - Fair	44.8	-81.0
22667	1975	2001-08-04	SYDNEY BAY BLUFF, CAPE CROKER INDIAN RESERVE	B - Good	44.9	-81.1
22668	1997	1997	N COLPOY'S BAY	CD - Fair or Poor	44.8	-81.1
22669	1980	1989-10-24	NW OWEN SOUND P.O.	BC - Good or fair	44.5	-80.9
22670	Unknown	1990	NW WILLIAMSFORD BRIDGE	BC - Good or fair	44.3	-80.8

EO_ID	First Observation Date	Last Observation Date	Location Name	Element Occurrence Quality Rank	Latitude	Longitude
22671	1966-05-23	2006-05-19	GIBRALTER FOREST - DUNCAN LAKE SOUTH	BC - Good or fair	44.4	-80.3
22672	1983	1983	E WILLIAMS LAKE	H - Historical	44.4	-80.8
22673	1994-06-11	1994-06-11	SE TEESWATER, ALONG TEESWATER RIVER	E - Extant viability unknown	43.9	-81.2
22674	Unknown	1998-12-10	SE LINDENWOOD	A - Excellent	44.6	-80.9
22675	1998-11-23	1998-11-23	BLACK'S PARK CONSERVATION AREA	B - Good	44.5	-80.9
22676	Unknown	2001-09-10	ENE DURHAM	C - Fair	44.1	-80.7
22678	Unknown	1998-05	W KINGHURST	C - Fair	44.3	-80.9
22679	Unknown	1999-10	E OWEN SOUND, E OF TELFER CREEK	B - Good	44.5	-80.8
22680	Unknown	1998-10-25	SW ROCKFORD	C - Fair	44.5	-80.9
22681	Unknown	1999-10	SE ANNAN	B - Good	44.6	-80.8
22682	Unknown	2001-10-18	WOODFORD DEN TANDT PROPERTY	B - Good	44.5	-80.7
22683	Unknown	1999-10	NE OXENDEN	B - Good	44.7	-81.0
22684	Unknown	1999-10-15	POTTAWATOMI CONSERVATION AREA	B - Good	44.5	-80.9
23008	1977	1977	MILTON HEIGHTS	H - Historical	43.5	-79.9
23150	1999-10	2001-08-22	MCNAB LAKE	B - Good	44.6	-81.0
23281	1994	1994	NE GREENOCK	E - Extant viability unknown	44.1	-81.2
34305	2001-06-19	2001-06-20	NEAR HWY 26 AND IRISH BLOCK ROAD/TOWNSHIP ROAD NO. 4	E - Extant viability unknown	44.5	-80.7
34317	2001-06-11	2001-06-15	WILDWOOD MANOR RANCH	E - Extant viability unknown	43.7	-79.9
34319	2000-04-28	2000-07-25	CHATSWORTH TOWNSHIP, LOT 9, CONCESSION 2	E - Extant viability unknown	44.4	-80.9
35618	1984	2001-10-24	CATHEDRAL WOODS	A - Excellent	44.9	-81.1
63557	Unknown	1997-05-23	Hope Bay Provincial Nature Reserve	E - Extant viability unknown	44.9	-81.1
64085	Unknown	1997-05-23	ADAMSVILLE AREA	E - Extant viability unknown	44.8	-81.1
64086	Unknown	1997-05-23	Not applicable	E - Extant viability unknown	44.8	-81.0
67527	2000-07-25	2000-07-25	CHATSWORTH	E - Extant viability unknown	44.4	-80.9
67528	2002-08-17	2002-08-17	BRUCE TRAIL NEAR KIMBERLEY	E - Extant viability unknown	44.4	-80.5

2.3. Distribution and status outside Ontario

Northern populations of American Hart's-tongue Fern (*A. scolopendrium* var. *americanum*) occur in two counties in Michigan (upper peninsula) and three counties in northern New York (Michigan Natural Features Inventory, 2013; New York Department of Environmental Conservation, 2013). A population was introduced in New Jersey from New York as a rescue attempt in 1936, but the current status of this population is unknown and it was not found during a 2012 search (Snyder pers. comm., cited in COSEWIC, 2016). Disjunct southerly populations are found in two counties in Alabama, and one county in Tennessee where they inhabit sinkholes and limestone caves in

which microclimates mimic conditions at the more northerly sites (USFWS 1989; NatureServe 2017). American Hart's-tongue Fern in the US is overall listed as Threatened. In Michigan, Alabama and Tennessee it has a rank of S1, and in New York is S2.

The European variety of Hart's-tongue Fern (*A. scolopendrium* var. *scolopendrium*) has a large distribution ranging in the west from Iceland and the British Isles, through Scandinavia to central Asia, and south to the northern part of the Mediterranean (Birks 1976). *Asplenium scolopendrium var. scolopendrium* has also been reported from New Brunswick where it is considered exotic, most likely following a deliberate introduction (Hinds, 1986).

2.4. Ontario conservation responsibility

Most of the global population of American Hart's-tongue Fern is found in Canada. There are only 28 subpopulations in the U.S (USFWS 2012) compared to 109 in Canada, and the species is threatened (and in some areas critically imperiled) in the USA. There are approximately 6500 American Hart's-tongue Fern individuals in the U.S.A. (USFWS 2012) compared to the approximately 110,000 present in Canada. The Canadian population therefore comprises approximately 80% of North American occurrences and 94% of North American individuals of American Hart's-tongue Fern, and therefore Ontario has substantial conservation responsibility for this species.

2.5. Direct threats

As a result of specific microhabitat requirements, American Hart's-tongue Fern is extremely sensitive to changes such as canopy openings that can lead to increased light, heat, or air movement and thus a reduction in humidity (Cinquemani Kuehn and Leopold 1993; COSEWIC, 2016). Logging is therefore a serious and current threat to American Hart's-tongue Fern because it opens the forest canopy and reduces microhabitat humidity. Another threat comes from quarrying, which either completely removes suitable habitat, or modifies suitable habitat if adjacent quarries alter hydrology, introduce dust, and potentially alter microclimates. A threats calculator application determined that the overall threat impact to American Hart's-tongue Fern is high. Logging and quarrying are each medium impact threats, and habitat loss/modification or damage to plants from residential development, recreational activities, invasive species, and problematic native species have each been identified as low impact threats (COSEWIC, 2016).

2.6. Specialized life history or habitat use characteristics

American Hart's-tongue Fern has very specific microhabitat requirements. It is restricted to forests with exposed limestone and dolostone that include deep shade, moisture, and relatively high humidity. Plants cannot tolerate drying, therefore their habitat must retain sufficient moisture to allow them to withstand periods of no precipitation.

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

Does not apply. Inferences of decline are somewhat limited by the paucity of sites for which there are data representing more than one time point, partly because there were no estimates of abundance in the report by Austen (2000). In addition, there has been a small net gain in number of known subpopulations since 2000 due to new discoveries. Since these have likely existed for some decades but no information on their status over this period is available, their discovery underscores the limitations on tracking population trajectories. These limitations are further increased by the fact that the subdivision of some sites into subpopulations has been inconsistent (COSEWIC, 2017). However, both Austen (2000) and COSEWIC (2016) determined the overall viability and status of subpopulations (Table 2), which reveal no strong evidence of decline in total number of mature individuals.

Table 2. Comparison of viability rank and status of populations based on data that were published by Austen (2000) and COSEWIC (2016). Percent of total is based on the numbers of subpopulations presumed extant: 109 in 2013 and 74 in 2000. Note: 7 subpopulations ranked H (historical) in 2013 are thought highly likely to be extant.

Viability rank	Number in 2013	Number in 2000	% of 2013 total	% of 2000 total
A	18	9	17	12
AB	13	6	12	8
B	24	15	22	20
BC	8	10	7	9
C	15	25	14	19
CD	3	1	3	4
D	6	2	5	7
E	15	6	14	19
H	17	23		
X	13	4		
Total	132	101		
Presumed extant	109	74		

Viability Rank: A: Excellent Viability, B: Good Viability, C: Fair Viability, D: Poor Viability, E: Extant (no other information), H: Historical, X: Extirpated

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

Does not apply. With an EOO ~10,375 km2 and IAO ~520 km2, meets Threatened B1 and nearly meets Endangered B2 for size of EOO and IAO, respectively. Observed and projected declines are evident in IAO, number of subpopulations, and area, extent and quality of habitat. However, there are more than 10 locations, the distribution is not severely fragmented, and populations do not exhibit extreme fluctuations.

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

Does not apply. Estimated total number of individuals is > 110,000, there is no strong evidence of decline, larger subpopulations contain > 1000 mature individuals, and there is no evidence of fluctuations.

3.1.4. Criterion D – Very small or restricted total population

Does not apply. There are > 1000 mature individuals and the IAO is > 20 km2 with more than five subpopulations.

3.1.5. Criterion E ‑ Quantitative analysis

A quantitative analysis has not been done (population data lacking).

3.2. Application of Special Concern in Ontario

American Hart's-tongue Fern occurs in deeply shaded Sugar Maple woods on limestone and dolostone habitats of the Niagara Escarpment of southern Ontario. There are many individuals located within many subpopulations; however, they are restricted to a small geographic area, and some subpopulations are very small. Most of the global population occurs in Canada and on-going threats, such as logging and quarrying, may cause American Hart's-tongue Fern to become threatened if habitat destruction/modification continues. Furthermore, although the species did not meet threatened under Criterion B, it partially met the requirements owing to its relatively small EOO and IAO. American Hart's-tongue Fern therefore qualifies as Special Concern in Ontario.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

The Ontario population of American Hart's-tongue Fern has ~80% of all North American occurrences and ~94% of all North American individuals; therefore Ontario's conservation responsibility is significant.

3.3.2. Rescue effect

A rescue effect from the Michigan or New York populations is exceedingly unlikely because of the very small sizes of the populations plus the fact that propagules would have to travel hundreds of kilometres – including over water and urban developments - before reaching the nearest suitable habitat in Ontario. Furthermore, population genetic data on American Hart's-tongue Fern populations from New York and Michigan suggest that long-distance dispersal is very rare (Fernando *et al*. 2015). This species is listed as Threatened under the U.S. *Endangered Species Act*.

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

American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*) is classified as Special Concern in Ontario because of Ontario's conservation responsibility combined with its small geographic area, specific microhabitat requirements, the small size of some subpopulations, and ongoing threats such as logging and quarrying. The ongoing threats could conceivably lead to the species becoming threatened in the future.

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Appendix 1: Technical summary for Ontario

Species: American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*)

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.	Unknown but plants may be very long-lived and some very old plants are present
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Unknown but inferred small net loss; projected on-going, long-term loss from logging and other threats.
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. Some, but not all (climate change) b. Partially, yes c. No
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO).	10,375 km^2 (COSEWIC, 2016)
Index of area of occupancy (IAO).	520 km^2 (COSEWIC, 2016)
Is the total population severely fragmented?	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?	a. No b. probably yes
Number of locations. *--109 subpopulations with many different types of ownership and a highly patchy, discontinuous distribution. Number of locations potentially could be very high*.	109 subpopulations, although there may be more if subpopulations can be further divided
Number of NHIC Element Occurrences	104
Is there an observed, inferred, or projected continuing decline in extent of occurrence? *--observed decline since 1970s but little change since 2000;--projected decline if two subpopulations on west side of range (not visited since 1990s) are not extant or if small southern-most subpopulation is lost. Projected loss could be ~38% or greater.--some suitable habitat still apparently present at western subpopulation sites; southern-most site still extant.*	Unknown
Is there an observed, inferred, or projected continuing decline in index of area of occupancy? *--observed decline of 32 sq. km or ~6% since mid-1990s;--inferred loss is greater because some of the 17 sites ranked historical are probably no longer extant;--loss projected to continue due to increased demand for development and aggregate extraction.*	Yes-observed, inferred, and projected
Is there an observed, inferred, or projected continuing decline in number of populations? *--8 lost since mid-1990s and of those 2 lost since 2000.-- other recent losses of portions but not entire subpopulations--7 subpopulations have <20 plants; projected that some of these could be lost in the next 10 years*	Yes, observed and projected
Is there an observed, inferred, or projected continuing decline in number of locations? *--projected if each subpopulation or patch constitutes a location--projected if southern-most subpopulations are lost.*	Yes, projected (locations not defined but number may be high)
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat? *--decline in quality observed at some sites due to logging;--projected decline due to threats;--declines observed even in some protected areas.*	Yes, observed and projected
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)

Table 3. List of all known Canadian subpopulations of American Hart's-tongue Fern with most recent dates of observation, and abundance where known. EO_ID = element occurrence as identified by NHIC, data summary from NHIC and COSEWIC (2016).

Legend: /--separate observations; &--two observers together or two types of ownership; *--new discovery since 2000; CA--conservation authority; PP--provincial park.

EO_ID	SUBPOPULATION NAME	Last observation	Abundance
22657	Aberdeen	2001	330
new	Adamsville NNW*	2004	350-500
22681	Annan SE	1999	300
21602	Barrow Bay South ANSI	1993	no info
21617	Bass Lake Escarpment	1993	"abundant"
21625	Bayview Escarpment	2013	>15,000
21629	Beaver Valley - Upper	2013	250-300
21628	Beaver Valley West Slope	1993	no info
needs #-not 21623	Bognor NE	2012	>5000
21623	Bognor SW	2010	>8000
new	Boundary Bluffs Bruce Trail*	2009	no info
22666	Cape Croker - Malcolm Bluff	2011	>100 (2011: "scattered clumps")
22667 & 6191	Cape Croker - Sydney Bluff	2013	>300
21607	Cape Dundas	1996	"common"
new	Castle Glen	2006	300
new	Castle Glen SE*	2012	"several clumps"
new	Chatsworth South*	2007	~10
34319	Chatsworth L9 Con2	2000	30
21600	Clark's Corner	2013	500
22668	Colpoys Bay	1997	"very small population"
21655	Cruikshank NE	1994	no info
21597	Devil's Glen	2013	~300
21632	Duncan Escarpment PNR	1993	300

EO_ID	SUBPOPULATION NAME	Last observation	Abundance
needs #-not 22671	Duncan Lake South	1985	local but abundant/ ~150
21640	Duntroon W Escarpment	2003	30
22676	Durham ENE	2001	20
new	Durham SE*	2002	384
new	E of Desboro*	2012	<100
21657	E of Desboro - Klondike	2013	46
21608	East Wiarton Upland Woods	2001	442/100's - 1000's
21636	Feversham Gorge	1999	100
21671	Gibraltar	1983	no info
23281	Greenock SW	1994	no info
new	Griersville SE*	2012	no info
22662	Hepworth NE	2001	200
new	Hope Bay SW*	2010	~100
35618	Hope Bay Cathedral Woods	2001	2020
63557	Hope Bay PNR/ANSI	2008	>15,000
22674	Indian Creek Mgt Area SE Lindenwood	1998	700
21620	Inglis Falls	2011	100's/915
34305	Irish Block*	2001	20
new	Irish Block NW*	2012	<50
21618	Kemble Mountain	2010	4143
67528	Kimberley Bruce Trail*	2002	"3 colonies"
21630	Kimberley Creek	1993	100's
22678	Kinghurst (should be EAST of	2013	1978/~100
21635 & 21634	Kolapore Escarpment	2010	>1600
new	Kolapore Swamp East	2010	no info

EO_ID	SUBPOPULATION NAME	Last observation	Abundance
21633	Kolapore Uplands Mgt Area (SE)	2010	>111
new	Lady Bank WSW*	2008	no info
new	Lake Charles S*	2012	"upland bush full of HTF" (100s?)
new	Lake Charles E*	2008-2011	no info
needs #-not 21655	Lily Oak Forest	2013	600-800
new	Lindenwood SW	2011	50-100
21601	Lion's Head North	2001	7
new	Lion's Head South*	2013	16
new	Little Germany Management Area*	2010	100s
21621	Massie Hills Management Area	1984	various locations
21653 & 64085 & 64086	McIver Side Road	2004	200
23150	McNab Lake	2001	807
new	Minniehill SSE*	2012	<50
21641	Mono Cliffs PP	2013	18,000
21609	Mountain Lake Fen	2001	3460
21599	Mt. Nemo	2013	13
needs #-not 21616	Mud Creek East	2010	no info
needs #-not 21616	Mud Creek North	2002	200
21616	Mud Creek South/Shouldice ANSI	2006	500 - 1000
21598	Noisy River PP	2013	1500
21592	Nottawasaga Lookout	2010	164/41
new	Nottawasaga South*	2008-2011	no info
21671	Osler Bluff	2012	~500
22669	Owen Sound NW	1980s	no info
21654	Owen Sound Rifle Range	1998	~500

EO_ID	SUBPOPULATION NAME	Last observation	Abundance
new	Owen Sound South*	2010	no info
new	Owen Sound Southeast*	2003	10 to 20
new	Park Head*	2012	750
22684	Pottawatomi CA	2013	147
21639	Pretty River PP*	2002	25
6190	Purple Valley	2013	700-1000
21637	Rob Roy Management Area	1993	"considerable populations" (100s?)
needs #-not 21637	Rob Roy NE	1993	no info
21624	Robson Lakes	1993	no info
22680	Rockford SW	1998	25-50
21627	Rocklyn Creek Valley East	2001	"lush and healthy pop" + 215
needs #-not 21627	Rocklyn Creek Valley West	1993	no info
needs #-not 21622	Rocky Saugeen East	2001	116
21622	Rocky Saugeen South	2001	282
22664	Rush Cove Corner	2001	1100
new	Scotsdale Farm*	2010?	no info
23281	SE Greenock	1994	no info
22661	Shallow Lake NNW	2001	62
21610	Shouldice Forest/The Glen	2002	1488
6189	Skinner's Bluff	2013	~1000
21619	Slough of Despond	2010	~200
new	Talisman Ski Area W of Kimberley*	2007	30-50
22673	Teeswater SE on Teeswater River	1994	no info
22679	Telfer Creek	1999	>200
new	Vandeleur*	2011	>100

EO_ID	SUBPOPULATION NAME	Last observation	Abundance
Austen EO 214	Violet Hill – Mono Cliffs North	2013	~300
new	Walker Quarry SW of Duntroon*	2013	10,500
21626	Walter's Creek Headwaters Area NE	1984	no info
needs separate #	Walter's Creek Headwaters Area SW	1984	no info
21664	Walter's Falls ESE	2008-2012	no info
22675	West Rocks Management Area	2004	275
34317	Wildwood Manor Ranch*	2001	~12
22672	Williams Lake E	1983	no info
22670	Williamsford Bridge	1990	no info
22682 & 22663	Woodford NNW	2010	>3000
new	Woodford W Bruce Trail*	2012	100's - 1000's

Quantitative analysis (population viability analysis conducted)

A population viability analysis has not been conducted.

Threats

A threats calculation was done in April 2015 (reported in COSEWIC, 2016). Overall, the threat assessment was high. Specifics:

5.3 Logging & Wood Harvesting medium impact
3.2 Mining & Quarrying medium impact
1.1 Residential low impact
6.1 Recreational activities low impact
8.1 Invasive species low impact
8.2 Problematic native species low impact
5.2 Collection of terrestrial plants negligible impact
1.3 Development of tourism and recreational areas negligible impact
11.1 Habitat shifting and alteration due to climate change negligible impact
What additional limiting factors are relevant?
Recent studies show genetic isolation and increased temperatures from climate change may be affecting U.S. populations; effects in Canada are unknown at this time

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Small, declining, or extirpated
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	No
Would immigrants be adapted to survive in Ontario?	Unknown
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	Yes in some places
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?	No

Sensitive species

Not applicable.

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for American Hart's-tongue Fern (*Asplenium scolopendrium* var. *americanum*)

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S3	Declining	COSEWIC (2016)
Quebec	Not present	N/A	N/A
Manitoba	Not present	N/A	N/A
Michigan	S1	stable	Michigan Natural Features Inventory, 2013
Minnesota	Not present	N/A	N/A
Nunavut	Not present	N/A	N/A
New York	S2	Within these populations there may be a slight decrease in numbers of individuals due to competition from invasives. At this time, this decrease appears to be negligible, but as these invasive species continue to spread, their impact is likely to be more evident.	New York Department of Environmental Conservation, 2013
Ohio	Not present	N/A	N/A
Pennsylvania	Not present	N/A	N/A
Wisconsin	Not present	N/A	N/A

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
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
S3: Vulnerable
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