

**COSSARO Candidate Species at Risk Evaluation**

**for**

**Eastern Small-footed Myotis  
(formerly Eastern Small-footed Bat)  
(*Myotis leibii*)**

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

**Assessed by COSSARO as ENDANGERED**

**January 2013**

**Final**

## **Chauve-souris pygmée (*Myotis leibii*)**

La chauve-souris pygmée est la plus petite chauve-souris de l'est de l'Amérique du Nord. Son aire de répartition comprend le sud de l'Ontario et du Québec jusqu'au nord de l'Alabama et l'est de l'Oklahoma vers le sud; elle est apparemment rare partout où elle se trouve. On connaît peu de choses sur cette espèce en Ontario, mais son aire de répartition se prolonge de la rive est du lac Supérieur, vers l'est jusqu'à la frontière du Québec et vers le sud jusqu'au lac Érié. Tout comme les autres membres du genre *Myotis*, elle hiberne dans les cavernes et les mines. Bien que les tendances de population n'aient pas été documentées en Ontario, la chauve-souris pygmée est à risque élevé de contracter le syndrome du museau blanc, une maladie fongique qui a envahi l'Ontario depuis 2010, environ. Cette maladie fait en sorte que les chauves-souris perdent leur approvisionnement en gras au milieu de l'hiver pendant leur hibernation et comporte un taux de mortalité très élevé. Le syndrome est présent dans beaucoup de gîtes d'hibernation de la chauve-souris pygmée en Ontario et on a démontré que cette maladie a causé le déclin de l'espèce dans le nord-est des États-Unis. La chauve-souris pygmée est désignée comme étant **en voie de disparition** en raison du risque élevé de graves déclin de la population provoqués par le syndrome du museau blanc.

*Cette publication hautement spécialisée « Ontario Species at Risk evaluation report prepared under the Endangered Species Act, 2007 by the Committee on the Status of Species at Risk in Ontario », 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 des Richesses naturelles par courriel à [recovery.planning@ontario.ca](mailto:recovery.planning@ontario.ca).*

## **PART 1**

### **CURRENT STATUS AND DISTRIBUTION**

#### **Current Designations:**

**GRANK – G1G3** (16 July 2012) (NatureServe, accessed 13 Jan 2013)

**NRANK Canada – N2N3** (31 December 2011) (NatureServe, accessed 13 Jan 2013)

**COSEWIC – Not assessed**

**SARA – Not listed**

**ESA 2007 – Not listed**

**SRANK – S2S3** (NHIC, accessed 13 Jan 2013)

#### **Distribution in Ontario:**

Most Ontario records are from south of Georgian Bay east to the Pembroke area. Other records are from the Bruce Peninsula, the Espanola area, and Lake Superior Provincial Park (Dobbyn 1994, NHIC 2013). Most records are of individuals observed during hibernation in caves and abandoned mines.

#### **Distribution and Status Outside Ontario:**

The range extends from the east shore of Lake Superior east to Vermont and south to northern Georgia and southeastern Oklahoma. The species has occurred in 21 states plus Ontario and Quebec, but is apparently extirpated in Connecticut and Ohio (NatureServe 2013). The distribution is very spotty within this range, and most occurrences are in New York, Pennsylvania, West Virginia, and western Virginia.

## PART 2

### ELIGIBILITY FOR ONTARIO STATUS ASSESSMENT

#### 2.1 APPLICATION OF ELIGIBILITY CRITERIA

##### Taxonomic Distinctness

**Yes.** Originally treated as part of *Myotis subulatus* (*Myotis subulatus leibii*) and then as *Myotis leibii* distinct from *Myotis ciliolabrum*, the eastern and western small-footed bats, respectively (van Zyll de Jong 1984).

##### Designatable Units

One Designatable Unit in Ontario.

##### Native Status

**Yes.** No reason to believe it is non-native. Records from as early as the 1940s.

##### Presence/Absence

**Present**

#### 2.2 ELIGIBILITY RESULTS

1. The putative taxon or DU is valid. **Yes**
2. The taxon or DU is native to Ontario. **Yes**
3. The taxon or DU is present in Ontario, extirpated from Ontario or extinct? **Present**

## **PART 3**

### **ONTARIO STATUS BASED ON COSSARO EVALUATION CRITERIA**

#### **3.1 APPLICATION OF PRIMARY CRITERIA (Rarity and Declines)**

##### **1. Global Rank**

###### **Endangered**

Global rank is G1G3 (NatureServe 2013). Qualifies as Endangered using the median value of G2.

##### **2. Global Decline**

###### **Endangered**

NatureServe (2013) (citing Langwig *et al.* 2009, Hicks *et al.* 2008) indicates a short-term (since 2006) decline of 70 to 90% based on surveys at hibernacula, especially in New York, Massachusetts, and Vermont. Assessment of longer term population trends is difficult given the scarcity of historical data.

##### **3. Northeastern North America Ranks**

###### **Endangered**

S1, S2, SH or SX in 93% (14/15) of northeastern North America jurisdictions. In Connecticut the species was known only as a non-breeding vagrant or migrant and is now considered to be extirpated.

##### **4. Northeastern North America Decline**

###### **Not Applicable**

The Northeastern North American range is largely the same as its global range and most of the population occurs in New York, Pennsylvania, West Virginia, and Virginia. Therefore the Global Decline criterion was used instead of the Northeastern North America decline.

##### **5. Ontario Occurrences**

###### **Not in any category**

This is one of the most poorly known species of bats in Ontario. A 1966 record from Lake Superior Provincial Park, significantly extended the known range of the species at the time (Peterson 1966). Since then, Eastern Small-footed Myotis were found at hibernacula between Lake Superior Provincial Park and those along the Bonnechere River in southeastern Ontario. There are 29 Element Occurrences in Ontario (although the concept of "occurrence" is very loosely defined to include hibernacula, maternity colonies, bachelor colonies, and migratory or foraging individuals). Ten of these have been verified within the last 20 years and are presumed to be extant, the others are unknown (NHIC 2013).

## **6. Ontario Decline**

### **Insufficient information**

Population data are lacking in Ontario. Monitoring data have been collected at Ontario hibernacula since 2009, but do not distinguish this species from other *Myotis* species (Amy Cameron pers. comm.).

## **7. Ontario's Conservation Responsibility**

### **Not in any category**

Ontario represents about 8% of the global range. The percentage of the global population that exists in Ontario is unknown.

## **3.2 APPLICATION OF SECONDARY CRITERIA (Threats and Vulnerability)**

## **8. Population Sustainability**

### **Insufficient information**

Although population numbers and trends from Ontario are unavailable, White-nose Syndrome has spread quickly in Ontario and declines of Eastern Small-footed Myotis in New York and elsewhere have been attributed to this disease. This species may be less vulnerable to White-nose Syndrome (WNS) than Little Brown Myotis (see Direct Threats), but declines elsewhere are strong evidence of recruitment failure. However, no Population Viability Analysis has been completed and there is no written opinion from a recognized expert on the species.

## **9. Lack of Regulatory Protection for Exploited Wild Populations**

### **Not in any category**

Eastern Small-footed Myotis (Bat) is listed as a “specially protected mammal” under Schedule 6 of the Fish and Wildlife Conservation Act (FWCA). The FWCA prohibits bats from being hunted or trapped in Ontario. The FWCA does permit Small-footed Myotis to be harassed, captured or killed “if a person believes on reasonable grounds that wildlife is damaging or is about to damage the person’s property”. Eastern Small-footed Myotis sometimes roost in buildings during summer and could be subject to exploitation, but data are lacking.

## **10. Direct Threats**

### **Endangered**

White-nose Syndrome (WNS) threatens northeastern North American bats that overwinter in caves and mines. It is caused by a fungus (*Geomyces destructans*) that grows in humid cold environments (Blehert *et al.* 2009). WNS kills bats by disrupting the hibernation cycle and therefore exhausting supplies of body fat in midwinter, before the bats are able to forage (Warnecke *et al.* 2012). Physiological processes associated with dehydration, and damage to wings may also contribute to mortality (Cryan *et al.*

2010). WNS was first recorded in February 2006 in a cave near Albany, New York (Frick *et al.* 2010), and reached Ontario and Quebec in 2010, and New Brunswick and Nova Scotia in 2011. Several million bats have died in northeastern US and Canada since 2006 (USGS 2013). Eastern Small-footed Myotis may be less susceptible to WNS than Little Brown Bat given their propensity to hibernate in the cooler, drier part of the cave where WNS may be less virulent (Langwig *et al.* 2012, Craig Willis pers. comm.). Nevertheless, population declines of 78% of Eastern Small-footed Myotis in New York caves have been attributed to WNS (NatureServe 2013).

Mortality of Eastern Small-footed Myotis from wind turbines has recently been documented in Ontario (Environment Canada *et al.* 2011, OMNR unpublished data) and is a threat of unknown magnitude. Three Eastern Small-footed Myotis were among 454 bat kills (excluding the Hoary Bats (*Lasiurus cinereus*), Eastern Red Bats (*L. borealis*), and Silver-haired Bats (*Lasionycteris noctivagans*)) recorded during monitoring at 14 Ontario wind sites in the mid-2000s. Note that this number is uncorrected for searcher efficiency, percent of area searched, and scavengers and the actual number of bats killed is almost certainly higher.

Although declines in Eastern Small-footed Myotis due to WNS have not been demonstrated in Ontario, virtually all known Ontario hibernacula are infested or at high risk of infestation by WNS. This disease has been documented to have a devastating effect on Eastern Small-footed Myotis populations in the northeastern US. Therefore this criterion is ranked as Endangered because Eastern Small-footed Myotis is at risk of disappearance or severe decline at >75% of element occurrences. Wind turbine mortality represents an additional threat of unknown magnitude.

## **11. Specialized Life History or Habitat-use Characteristics**

### **Endangered**

Eastern Small-footed Myotis hibernates in caves or mines, and therefore has very specialized microhabitat requirements. The use of underground hibernation sites exposes the bats to White-nose Syndrome, and bat-bat contact during swarming ensures its spread. Like other species of *Myotis* that occur in Canada, female Small-footed Bats bear a single young. Females probably reproduce annually, but this is not supported by data. Like other small, temperate bats, mortality is concentrated in the first year, as most do not survive to reproduce. The few available band records suggest that, like other *Myotis*, Eastern Small-footed Myotis may live more than 10 years in the wild. Although Eastern Small-footed Myotis are small (adult mass 4-5 g) their life history is more like that of a large mammal (low reproductive output, considerable longevity beyond year 1). This low reproductive rate, combined with specialized hibernation habitat, and vulnerability to White-nose Syndrome put this species at a very high level of risk and qualify it for Endangered under this criterion.

### **3.3 COSSARO EVALUATION RESULTS**

#### **1. Criteria satisfied in each status category**

Number of primary and secondary criteria met in each status category:

ENDANGERED – [3/2]

THREATENED – [0/0]

SPECIAL CONCERN – [0/0]

Number of Ontario-specific criteria met in each status category:

ENDANGERED – [0]

THREATENED – [0]

SPECIAL CONCERN – [0]

#### **2. Data Deficiency**

**No.** The number of criteria assessed as “insufficient information” is 2. Although information on Ontario population declines are lacking, WNS is present in many of its known hibernacula, and this disease has been implicated in declines of US populations of this bat.

#### **3. Status Based on COSSARO Evaluation Criteria**

The application of COSSARO evaluation criteria suggests that **Eastern Small-footed Myotis** is **Endangered** in Ontario.

## PART 4

### ONTARIO STATUS BASED ON COSEWIC EVALUATION CRITERIA

#### 4.1 APPLICATION OF COSEWIC CRITERIA

##### Regional (Ontario) COSEWIC Criteria Assessment

###### Criterion A – Decline in Total Number of Mature Individuals

###### **Insufficient information**

No information on Ontario population trends.

###### Criterion B – Small Distribution Range and Decline or Fluctuation

###### **Insufficient information**

Extent of occurrence is approximately 162,000 km<sup>2</sup>. Area of occupancy and number of locations are unknown. Population trends are unknown.

###### Criterion C – Small and Declining Number of Mature Individuals

###### **Insufficient information**

Population size and trends are unknown.

###### Criterion D – Very Small or Restricted Total Population

###### **Insufficient information**

Population size and area of occupancy are unknown.

###### Criterion E – Quantitative Analysis

###### **Insufficient information**

No Population Viability Analyses have been conducted for the species in Ontario.

###### Rescue Effect

###### **No**

Populations throughout northeastern North America are declining. Therefore rescue effect does not apply.

###### Special Concern Status

###### **Yes**

Special Concerns applies because this species is susceptible to mortality from WNS, which has been demonstrated to cause precipitous declines in Eastern Small-footed Myotis numbers in the northeastern US.

## **4.2 COSEWIC EVALUATION RESULTS**

### **1. Criteria satisfied in each status category**

*Indicate whether or not a criterion is satisfied in each of the status categories.*

ENDANGERED – [No]

THREATENED – [No]

SPECIAL CONCERN – [Yes]

### **2. Data Deficiency**

**No**

Although population trend data are lacking from Ontario, there is strong evidence that WNS is present in many Eastern Small-footed Myotis hibernacula and this disease has been demonstrated to cause declines of this species in the northeastern US.

### **3. Status Based on COSEWIC Evaluation Criteria**

The application of COSEWIC evaluation criteria suggests that **Eastern Small-footed Myotis** is **Special Concern** in Ontario.

## PART 5

### ONTARIO STATUS DETERMINATION

#### 5.1 APPLICATION OF COSSARO AND COSEWIC CRITERIA

COSSARO and COSEWIC criteria give the same result. **No**

COSSARO criteria present a strong case for Endangered on the basis of the rare and declining status of Eastern Small-footed Myotis in northeastern North America and its vulnerability to WNS. The lack of Ontario population trend data means that there is insufficient information to apply COSEWIC criteria A to E. Applying a precautionary approach, a status of Endangered is recommended.

#### 5.2 SUMMARY OF STATUS EVALUATION

**Eastern Small-footed Myotis** is classified as **Endangered** in Ontario.

Eastern Small-footed Myotis is the smallest bat in eastern North America. It ranges from southern Ontario and Quebec, south to northern Alabama and eastern Oklahoma and is apparently rare wherever it occurs. Very little is known of this species in Ontario, but its range extends from the east shore of Lake Superior, east to the Quebec border and south to Lake Erie. Like other members of the genus *Myotis*, it hibernates in caves and mines. Although Ontario population trends have not been documented, Eastern Small-footed Myotis is at high risk from White-nose Syndrome (WNS), a fungal disease that has invaded Ontario since about 2010. This disease causes hibernating bats to exhaust their fat supplies in midwinter and has a very high mortality rate. WNS is present in many Eastern Small-footed Myotis hibernacula in Ontario and this disease has been demonstrated to cause declines of the species in the northeastern US. Eastern Small-footed Myotis is classified as Endangered due to the high risk of severe population declines caused by WNS.

## Information Sources

### 1. Literature Cited

Blehert, D., A. Hicks, M. Behr, C. Meteyer, B. Berlowski-Zire, E. Buckles, J. Coleman, S. Darling, A. Gargas, R. Niver, J. Okoniewski, R. Rudd, and W. Stone. 2009. Bat white-nose syndrome: An emerging fungal pathogen. *Science* 323:227.

Cryan P., C. Meteyer, J. Boyles and D. Blehert. 2010. Wing pathology of white-nosed syndrome in bats suggests life-threatening disruption of physiology. *BMC Biology* 2010, 8:135, <http://www.biomedcentral.com/1741-7007/8/135>.

Dobbyn, J. S. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists.

Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources. 2011. Wind Energy Bird and Bat Monitoring Database Summary of the findings from post-construction monitoring reports. Unpublished memo.

Frick, W., J. Pollock, A. Hicks, K. Langwig, S. Reynolds, G. Turner, C. Butchkoski and T. Kunz. 2010. An emerging disease causes regional population collapse of a common North American bat species. *Science* 329:679-682.

Hicks, A.C., C. J. Herzog, R. I. von Linden, S. R. Darling, and J.T.H Coleman. 2008. White-nose syndrome: field observations from the first two winters. White-nose Syndrome Workshop, Albany, New York, USA, June 9-11, 2008. 36 pp.

Langwig, K.E., W.F.Frick, J.T.Bried, A.C.Hicks, T.H.Kunz and A.M.Kilpatrick. 2012. Sociality, density-dependence and microclimates determine the persistence of populations suffering from a novel fungal disease, white-nose syndrome. *Ecology Letters* (2012): 1-8.

Langwig, K., A. Hicks, R. von Linden, C. Herzog, S. Darling, T. French, and J. Armstrong. 2009. White nose syndrome related declines of hibernating bat species in the Northeast. Presentation at 2009 North American Society for Bat Research Symposium, Portland, Oregon.

NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: January 4, 2013 ).

NHIC. 2013. Species Report for *Myotis leibii* (Eastern Small-footed Bat). Ontario Natural Heritage Information Centre website

<https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/speciesDetailReport.do?eIID=36004>. Accessed Jan. 4 2013.

Peterson, R.L. 1966. The Mammals of Eastern Canada. Oxford University Press. Toronto.

Turner, G., D. Reeder, and J. Coleman. 2011. A five-year assessment of mortality and geographic spread of white-nose syndrome in North American bats and a look to the future. *Bat Research News* 52:13-27.

USGS. 2013. National Wildlife Health Centre. White-Nose Syndrome (WNS). [http://www.nwhc.usgs.gov/disease\\_information/white-nose\\_syndrome/](http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/). Accessed January 2013.

van Zyll de Jong, C.G. 1984. Bats. Vol. 2. of Handbook of Canadian Mammals. National Museums of Canada. Ottawa.

Warnecke, L., J.M. Turner, T.K. Bollinger, J.M. Lorch, V. Misra, P.M. Cryan, G. Wibbelt, D.S. Blehert, and C.K.R. Willis. 2012. Inoculation of bats with European *Geomyces destructans* supports the novel pathogen hypothesis for the origin of white-nose syndrome. *PNAS* 109(18):6999-7003.

## 2. Community and Aboriginal Traditional Knowledge Sources

None received.

## 3. Acknowledgements

## APPENDIX 1

### NORTHEASTERN NORTH AMERICA STATUS RANK AND DECLINE

	Subnational Rank	Sources	Decline	Sources
CT	SHN	NatureServe 2013	Apparently extirpated	NatureServe 2013
DE	Not Present	"		
IL	Not Present	"		
IN	Not Present	"		
IA	Not Present	"		
LB	Not Present	"		
KY	S2	"		
MA	S1	"	78%	NatureServe 2013
MB	Not Present	"		
MD	S1	"		
ME	S1S2	"		
MI	Not Present	"		
MN	Not Present	"		
NB	Not Present	"		
NF	Not Present	"		
NH	S1	"		
NJ	S3	"		
NS	Not Present	"		
NY	S2	"	78%	NatureServe 2013
OH	SH	"	Apparently extirpated	NatureServe 2013
ON	S2S3	"		
PA	S1B, S1N	"	Yes, unquantified	NatureServe 2013
PE	Not Present	"		
QC	S1	"		
RI	Not Present	"		
VA	S2	"		
VT	S1	"	78%	NatureServe 2013
WI	Not Present	"		
WV	S1	"		

Occurs as a native species in 15 of 29 northeastern jurisdictions  
 Srank or equivalent information available for 15 of 15 jurisdictions = (100%)  
 S1, S2, SH, or SX in 14 of 15 = (93%)