COSSARO Candidate Species at Risk Evaluation

for

Northern Dusky Salamander (*Desmognathus fuscus*)

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

Assessed by COSSARO as ENDANGERED

May 2012

Final

La **Salamandre sombre du Nord** (*Desmognathus fuscus*) est un membre de taille moyenne de la famille des Pléthodontidés (salamandres dépourvues de poumons). Les adultes sont généralement de couleur brunâtre avec une mince bande dorsale foncée qui se prolonge sur le premier segment de la queue. Le corps est parsemé de taches foncées concentrées sur les flancs et de couleur blanche ou crème sur le ventre. Les individus âgés tendent à être uniformément brun foncé ou noirs. La Salamandre sombre du Nord habite les sources, les eaux d'infiltration, et les petits tributaires des eaux d'amont claires des habitats forestiers et dans l'ensemble des régions montagneuses de l'est de l'Amérique du Nord. L'aire de répartition en Ontario représente moins de 1 p. 100 de l'aire mondiale totale avec un seul petit ruisseau dans la gorge de la rivière Niagara. Il n'existe pas de données sur l'abondance ou les tendances de la population, mais le nombre total de sujets adultes est probablement très inférieur à 250. Les menaces comprennent les effets liés à la petite taille de la population, comme la consanguinité et la stochasticité environnementale et démographique, l'érosion causée par les inondations et le ruissellement, la dégradation de la qualité de l'eau par la contamination de surface et les perturbations causées par les randonneurs. En raison de son aire limitée, de sa faible population et des nombreuses menaces continues, la Salamandre sombre du Nord est considérée comme une espèce **en voie de disparition** en Ontario.

Cette publication hautement spécialisée, COSSARO Evaluation for Northern Dusky Salamander n'est disponible qu'en anglais en vertu du Règlement 671/92 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez contacter le secrétariat de COSSARO par courrier électronique à l'adresse COSSAROsecretariat@ontario.ca.

PART 1 - Current status and distribution

Current designations:

GRANK – G5 (Assessed 11/11/2003) (NatureServe, accessed 16/05/2012)
NRANK Canada – N3 N4 (Assessed 09/09/2012) (NatureServe, accessed 16/05/2012)
COSEWIC – Endangered (COSEWIC, 2012) Note there are 2 DU's, one in Ontario (Endangered), and one in QU/NB (Not At Risk)
SARA – 2 DU's Carolinian-Endangered; Quebec/New Brunswick-Not At Risk (Schedule X) (Environment Canada, 2012)
ESA 2007 – Endangered (Ministry of Natural Resources, 2008)
SRANK – S1 (NHIC/NatureServe, accessed 16/05/2012)

Distribution in Ontario:

In Ontario, the Northern Dusky Salamander is restricted to a single site in a stream arising from groundwater seepages in the Niagara Gorge, above the whirlpool downstream of Niagara Falls (Markle et al. 2010; COSEWIC 2012).

Distribution and status outside Ontario:

The Northern Dusky Salamander is primarily found in the Appalachian region from New Brunswick and Quebec south to Indiana and South Carolina. In Canada, it occurs in three areas of southern Quebec (the Adirondack Piedmont, the Appalachian Uplift, and the north shore of the St. Lawrence River), and in widely scattered areas in southern New Brunswick (COSEWIC 2012). In the USA, its range extends from the borders with Quebec and New Brunswick to southeastern Indiana, western Kentucky, eastern Tennessee, and northeastern Georgia with the exception of the eastern coastal plain (Frost 2010). The species is distributed at elevations between sea level and 1600 m, and is absent from the highest mountains of the Appalachians (Great Smoky, Unicoi and Great Balsam mountains), and the southwestern portion of the Blue Ridge Mountains (Bonin 1999, NatureServe 2012).The current global range of the Northern Dusky Salamander covers between 200 000 km^2 and 2 000 000 km^2 (NatureServe 2012) and is similar to previous range estimates (Conant and Collins 1991).

PART 2 - Eligibility for Ontario status assessment

2.1 Application of eligibility criteria

Taxonomic distinctness
Yes. The Northern Dusky Salamander (*Desmognathus fuscus*; Rafinesque 1820) is a member of the family Plethodontidae, also referred to as lungless salamanders (Gray 1850). The Northern Dusky Salamander (*Desmognathus fuscus*) was reported as occurring historically in the Niagara region of Ontario, but this was not verified until biologists found adults and larvae in a stream near Niagara Falls in 1989 (Kamstra 1990, 1991). There was some concern that this Ontario population might be the closely related Desmognathus ochrophaeus (Mountain Dusky Salamander) which occurs in two nearby streams in the Niagara Gorge. However, recent morphological and DNA examination has confirmed that the Northern Dusky Salamander does occur in a third stream (Markle and Green 2005, 2006; Markle et al. 2010; COSEWIC 2012; W. Weller pers. comm. April 2012).

Designatable Units
There is only a single DU in Ontario, as all individuals are confined to a single small stream. The population of Northern Dusky Salamanders inhabits a steep bank in the vicinity of the Whirlpool that is produced by eight or nine groundwater seeps that flow into the Niagara River. This population had long been known from a single historical record opposite Buffalo, New York (Bishop 1941), but was not precisely located until 1989 (Kamstra 1991). Surveys along the escarpment have failed to uncover any additional populations of Northern Dusky Salamanders, and the nearest populations of this species are over 30 km away in New York State (COSEWIC 1999; Markle and Green 2005; W. Weller pers. comm. April 2012).

Native status
Yes. It is native to the Niagara Gorge in the Niagara Peninsula.

Presence/absence
Present. The entire population is contained in a narrow area between the Niagara River at the bottom of the gorge, and the tableland along Niagara Parkway, both acting as dispersal barriers (Yagi and Tervo 2008).

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

PART 3 - Ontario status based on COSSARO evaluation criteria

3.1 Application of primary criteria (rarity and declines)

1. Global rank
Not in any category. G5

2. Global decline
Not in any category. Overall there appears to be stability in the species, although it is highly sensitive to disturbance particularly from logging, road building and anything that increases silt in its stream habitat or that alters the riparian habitat (Markle et al. 2010; COSEWIC 2012; NatureServe 2012).

3. Northeastern North America ranks
Not in any category. It is ranked S4 or S5 in all 15 USA jurisdictions in which it is ranked. It is not ranked in three others. In Canada, it is S3 in Quebec and New Brunswick, and S1 in Ontario. Thus it is ranked above S3 in only one of 18 jurisdictions = 5.5 %

4. Northeastern North America decline
Not in any category. It does not appear to be declining significantly in any jurisdiction, although it certainly must be declining to some extent because of past and current loss of its stream habitat (COSEWIC 2012; NatureServe 2012).

5. Ontario occurrences
Endangered. It is confined to a single Element Occurrence in Ontario with an Index of Area of Occupancy of 4 km^2 (COSEWIC 2012). Note: the authors cannot access the NHIC site owing to its requirement for Explorer 6.0, however, it is inconceivable that there could be more than one valid EO. The 1999 COSSARO report claimed 3 EO's and 2 locations, but this was likely based on taxonomic uncertainty and confusion between *D. fuscus* and the closely related *D. ochrophaeus* which occurs in two other streams in the Niagara Gorge (Markle et al. 2010; COSEWIC 2012).

6. Ontario decline
Not in any category. There is no evidence of any decline at the single Niagara site, but no systematic attempt has been made to quantify abundance or trends (Markle et al. 2010; COSEWIC 2012).

7. Ontario's conservation responsibility
Not in any category. The proportion of the global range in Ontario is << 5% (COSEWIC 2012).

3.2 Application of secondary criteria (threats and vulnerability)

8. Population sustainability
Endangered. Although the single stream occupied by the Northern Dusky Salamander is protected, the population faces some severe threats. A major threat to sustainability is small population size that exposes the population to demographic and genetic stochasticity. Considering the extremely limited extent of occupied habitat, these salamanders are undoubtedly few in number and genetically impoverished (Markle et al. 2010; COSEWIC 2012). Another current threat comes from erosion of the steep stream banks caused by flooding from the surrounding urban habitats after major rainfall events, and from trampling by tourists. The prospects of this population maintaining itself over a long period seem somewhat dim.

9. Lack of regulatory protection for exploited wild populations
Not in any category. This species is currently protected as an endangered species by a combination of the federal *Species at Risk Act (2002)*, and *Ontario Endangered Species Act (2007)*. Northern Dusky Salamander is not exploited in Ontario.

10. Direct threats
Endangered. Water quality of both the seeps themselves, and surface water which may drain into seeps feeding the stream occupied by the salamanders is important (Kamstra 1991; COSEWIC 1999; Yagi and Tervo 2008). Suitable streams are visually clear, contain adequate levels of oxygen, and remain cool due to forest cover (Kamstra 1991; COSEWIC 1999; Yagi and Tervo 2008). The major direct threat is declining habitat quality owing to erosion of the stream banks, contamination of groundwater and runoff from nearby urban areas, and damage to the riparian habitat from hikers and tourists (Yagi and Tervo 2008).

11. Specialized life history or habitat-use characteristics
Endangered. Although movements of Northern Dusky Salamanders in this population are not well understood, the average home range and extent of dispersal for Northern Dusky Salamanders is estimated to remain within 15 m of a stream (Petranka 1994, 1998). Therefore, the maximum dispersal limit within suitable habitat and under optimal conditions may be estimated as 30 m on either side of an inhabited stream (Yagi and Tervo 2008b). This species needs clean, high order streams and intact forest canopy to maintain a damp riparian area. It is problematic for these conditions to persist given the location surrounded by urban development and with the above–mentioned threats from erosion, flooding and disturbance (COSEWIC 2012).

3.3 COSSARO Evaluation Results

1. Criteria satisfied in each status category
Number of primary and secondary criteria met in each status category:

Endangered – [1/3]
Threatened – [0/0]
Special Concern – [0/0]

Number of Ontario-specific criteria met in each status category (these are primary criteria numbers 5, 6 and 7):

Endangered – [1]
Threatened – [0]
Special Concern– [0]

2. Data deficiency
No.

3. Status Based on COSSARO Evaluation Criteria
The application of COSSARO evaluation criteria suggests that Northern Dusky Salamander 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
Not applicable, as there are no data indicating decline

Criterion B – small distribution range and decline or fluctuation
Endangered. Meets Endangered B1ab(iii)+2ab(iii) with EO and IAO well under thresholds, a continuing decline in quality of habitat, and only one location.

Criterion C – small and declining number of mature individuals
Not applicable, as there is no evidence of continuing decline in abundance.

Criterion D – very small or restricted total population
Endangered. Meets Endangered D1 (< 250 adults)

Criterion E – quantitative analysis
Not done

Rescue effect
No. Northern Dusky Salamanders in Ontario are constrained to a single small site by highly specific requirements for a stream habitat that is rare within southern Ontario. The limited distribution of suitable sites in the Niagara region restricts the salamanders to the Niagara Gorge and curtails their meager capabilities for dispersal (Oldham 2006). There is no possibility for a rescue effect via immigration from populations in New York both because none are nearby and because the Niagara River (velocity of current at whirlpool is ~35 mph) and urban sprawl of Buffalo are potent barriers to dispersal from the closest New York populations to the Ontario side of the mighty Niagara River.

Special Concern status
Not applicable.

4.2 COSEWIC Evaluation Results

1. Criteria satisfied in each status category

Endangered – [yes]
Threatened – [no]
Special Concern – [no]

2. Data deficiency

No

3. Status based on COSEWIC evaluation criteria

The application of COSEWIC evaluation criteria suggests that Northern Dusky Salamander is Endangered in Ontario.

PART 5 - Ontario status determination

5.1 Application of COSSARO and COSEWIC Criteria

COSSARO and COSEWIC criteria give the same result. Yes

5.2 Summary of status evaluation

Northern Dusky Salamander is classified as Endangered in Ontario.

The Northern Dusky Salamander (*Desmognathus fuscus*) is a medium-sized member of the family Plethodontidae (lungless salamanders). Adults are usually brownish with a thin, dark, dorsal stripe that continues onto the first portion of the tail. The body is sparsely covered with dark spots concentrated on the sides and is white or cream on the underside. Old individuals tend to be uniformly dark brown or black. The Northern Dusky Salamander inhabits springs, seepages, and small tributaries of clear headwater streams in forested habitats and is distributed throughout the mountainous regions of eastern North America. The Ontario distribution accounts for less than 1% of the global range and occupies only a single, tiny stream in the Niagara Gorge. There are no data on abundance or population trends, but the total number of adults is likely much fewer than 250. Threats include the effects of small population size including inbreeding and environmental and demographic stochasticity, erosion from flooding and runoff, impairment of water quality from surface contamination and disturbance from hikers. Given its limited range, numbers and numerous ongoing threats the Northern Dusky Salamander is assessed as Endangered in Ontario.

Information sources

1. Literature cited

Austen, M.J., and M.J. Oldham. 1999. COSSARO Candidate V,T,E Species Evaluation Form for Northern Dusky Salamander (Desmognathus fuscus). Unpublished report prepared by Natural Heritage Information Centre for Committee on the Status of Species at Risk in Ontario (COSSARO), Ontario Ministry of Natural Resources. V + 6 pp.

Bishop, S.C. 1941. The salamanders of New York. New York State Museum Bulletin 324: 1-365.

Bonin, J. 1999 (unpublished report). COSEWIC status report on the Northern Dusky Salamander *Desmognathus fuscus*, in COSEWIC assessment and status report on the Northern Dusky Salamander Desmognathus fuscus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 20 p.

Conant, R. and J.T. Collins. 1991. A field guide to reptiles and amphibians - Eastern and Central North America. Houghton Mifflin Company, Boston. 450 pp.

COSEWIC. 1999 (unpublished report). COSEWIC assessment and status report on the Northern Dusky Salamander *Desmognathus fuscus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. v + pp.

COSEWIC. 2012. COSEWIC 2-month interim status assessment and update status report on the northern dusky salamander *Desmognathus fuscus*. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 53 pp.

Crother, B.I., J. Boundy, F.T. Burbrink, J.A. Campbell, and R.A. Pyron. 2008. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico. Edition 6.1. Society for the Study of Amphibians and Reptiles. No. 37 pp. 1-84. Web site: http://www.ssarherps.org/pages/comm_names/Coluber_main.php [accessed August 1, 2011] [link inactive].

Frost, D.R. 2010. Amphibian Species of the World: an Online Reference. Version 5.4 (8 April, 2010). American Museum of Natural History, New York, USA. Electronic Database [Accessed May 28, 2012].

Gray, J.E. 1850. Catalog of the Species of Amphibians in the collection of the British Museum, Part 2, Batrachia Gradientia. p. 31.

Kamstra, J. 1990. Status report on the Northern Dusky Salamander in Ontario (Draft). Gartner Lee Limited. 20 pp. + 2 appendices.

Kamstra, J. 1991. Rediscovery of the Northern Dusky Salamander, *Desmognathus f. fuscus* in Ontario. Canadian Field-Naturalist 105: 561-563.

Markle, T.M. and D.M. Green. 2005. Molecular Identification of Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, in Southern Ontario. Report for the Ontario Ministry of Natural Resources (OMNR), Niagara, Ontario. 8 pp.

Markle, T.M. and D.M. Green. 2006. Molecular comparison of Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, in Southern Ontario and New York State. Report for Ontario Ministry of Natural Resources (OMNR), Niagara, Ontario. 7 p.

Markle, T.M., A.R. Yagi and D.M. Green. 2010. Recovery Strategy for the Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) and Northern Dusky Salamander (*Desmognathus fuscus*) in Ontario. Ontario. Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. [vi] + [23] pp.

NatureServe. 2012. NatureServe web site. Last reviewed August 2006. [Accessed May 15, 2012].

Oldham, M.J. 2006. COSSARO Candidate Species at Risk Evaluation Form for Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) prepared for the Committee on the Status of Species at Risk in Ontario (COSSARO), 11 p.

Petranka, J.W. 1994. Response to impact of timber harvesting on salamanders. Conservation Biology 8: 302-304.

Petranka, J.W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. xvi + 587 p.

Weller, W. pers. comm. 2012. Email correspondence to R.J. Brooks. April 2012. Co-chair of Northern Dusky Salamander Recovery Team.

Yagi, A.R. and R. Tervo. 2008. Species at Risk Habitat Mapping for the Northern Dusky Salamander (*Desmognathus fuscus*) – A Test of Draft Habitat Mapping Guidelines. Ontario Ministry of Natural Resources. 12 p.

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	S4	NatureServe 2012		
DE	S5	"		
IL	NP=Not Present	"		
IN	S4	"		
IA	NP	"		
LB	NP	"		
KY	S5	"		
MA	S4S5	"		
MB	NP	"		
MD	S5	"		
ME	S5	"		
MI	NP	"		
MN	NP	"		
NB	S3	"		
NF	NP	"		
NH	S5	"		
NJ	SNR	"		
NS	NP	"		
NY	S5	"		
OH	SNR	"		
ON	S1	"		
PA	S5	"		
PE	NP	"		
QC	S3	"		
RI	S4	"		
VA	S5	"		
VT	S5	"		
WI	NP	"		
WV	S5	"		

Occurs as a native species in 18 of 29 northeastern jurisdictions

S rank or equivalent information available for 15 of 18 jurisdictions = (83.3%)

S1, S2, SH, or SX in 1 of 15 = (6.6%)