Canadian Herpetological Society
Société d'Herpétologie du Canada

Important Amphibian and Reptile Areas Nomination Form

NIAGARA GORGE – WHIRLPOOL, SMEATON, QUEENSTON SITES - LOWER NIAGARA RIVER, ONTARIO

PART 1: Nomination Eligibility Criteria

Nominations for an Important Amphibian and Reptile Areas Program (IMPARA) site must be made on this Nomination Form. Please read through the IMPARA site eligibility criteria below to ensure that your nomination complies. These criteria are intended to be the first step in a dialogue between the nominator and Canadian Herpetological Society (CHS). Your nomination may not be considered if you fail to comply with this checklist.

IMPARA eligibility criteria:

a. Site has species of conservation concern.
b. Site has a high diversity of species.
c. Site fulfills important life history function for gatherings of individuals or aggregations of species.

1.1 Species of Conservation Concern

A site that that is nominated under this criterion must contain a significant number of individuals of a species that is of conservation concern. CHS uses the broad definition of a species used by COSEWIC, which defines species as, "Any indigenous species, subspecies, variety or geographically defined population of wild fauna and flora."

Species of conservation concern are any species with the following designations:

- Globally designated as Critically Endangered, Endangered or Vulnerable by the International Union for the Conservation of Nature (IUCN). See (http://www.iucnredlist.org/search) and enter species name.

- Nationally designated as at-risk (Endangered, Threatened, and Species of Special Concern) by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the federal Species at Risk Public Registry (SARA).
- Provincially/territorially designated as at-risk by the provincial or territorial government or other designated group that assesses the status of species within a province, or a provincial/regional Conservation Data Centre.

Defining what is meant by a "significant" number of individuals of any species is difficult given the diversity of life histories, geographic distributions and abundances of amphibians and reptiles. Here are two suggested methods to use as a guideline to define a significant number of individuals:

- The site holds greater than or equal to 1% of a species' Canadian population.
- The site is one of 50 or fewer sites, or is one of the most important sites supporting the Canadian population of a species.

These two methods reflect the reality that a great deal is known about the occurrence of some species of amphibians and reptiles, and relatively little about the majority. Therefore, we encourage nominators to include as much information as they can in their nomination and as necessary propose the nominator's logic as to why this site is significant. For example, when it is possible to estimate the number of individuals at a site as well as in all of Canada, then method 1 should apply. Otherwise, if the total number of sites at which the species occurs is known, method 2 should apply.

Sites from which a species has been extirpated (i.e., when a species ceases to exist in a geographic area, though still exists elsewhere) may also be nominated if habitat restoration and/or re-introductions are underway or planned.

1.2 High Diversity of Species

A site that is nominated under this criterion regularly holds a large proportion of the amphibian and/or reptile species known to be present within the nation, province/territory, region, or another spatial scale. The goal of this criterion is to identify sites that contain higher than average numbers of species. Species diversity varies significantly from region to region across Canada, and lower latitudes generally have more species than higher latitudes. This means that a significant proportion of the amphibian and/or reptile species in one region may be relatively insignificant in another region, and vice versa. Therefore, it is up to the nominator to define the geographic scale (i.e. national, provincial/territorial, regional, or other) under consideration, and to demonstrate how the site's diversity is relatively high.

Nominators may also choose to make their case based on various taxonomic levels. For example, the site may hold a large proportion of the province's snake species.

1.3 Important Life History Requirements

A site that is nominated under this criterion is used by exceptionally large numbers of amphibians and/or reptiles that gather or aggregate for the purpose of completing some life history activity such as reproduction, hibernation, foraging, or thermoregulation (e.g., communal hibernation sites, vernal breeding ponds, etc.). The nominator should define the geographic scale at which this site should be considered important. Nominators should also provide evidence supporting their claim that the congregation of a species at the site is exceptionally large.

1.4 Boundary Justification

Important Amphibian and Reptile Areas must have clear boundaries (geographical or political), and must be large enough to potentially support self-sustaining populations. However, they should also be small enough that they form units amenable to locally-oriented conservation and restoration. Provide a concise explanation of the reasons or methods used for selecting and determining the boundaries of the Nomination. A verbal boundary description or a scale map precisely defining the property boundaries must also be given.

While areas that already protect amphibian and reptiles (i.e., parks and conservation areas) are obvious candidates for IMPARA designation, it is also important to nominate areas that are not currently protected.

PART 2: Nomination Form

2.1 Nominator Information (repeat this section if more than one nominator)

Name: **Wayne F. Weller***
Organization/Affiliation: **Ontario Dusky Salamander Recovery & Implementation Team**
Address: 7038 Kelly Drive
City/Town: Niagara Falls
Province/Territory: Ontario
Postal Code: L2H 3J9
Telephone: 905-354-3709
E-mail: **wayneweller@bell.net**

* on behalf of the members of the Team

2.2 Location

Site names: Queenston Seep; Smeaton Creek; Whirlpool Seep (3 sites)
Province/Territory: County/Region/District(s): Ontario, Regional Municipality of Niagara
Closest City/Town: Queenston, Ontario; Niagara Falls, Ontario
UTM/Geographical Coordinates: The specific locations of these three Dusky Salamander sites are considered extremely sensitive, and for reasons that will be apparent from the information below, the Latitude/Longitude or UTM grid coordinates are not being provided in this document.

Directions to Site: The three sites are located along the Niagara Parkway between Thompson's Point and the Village of Queenston.

Maps (please attach):

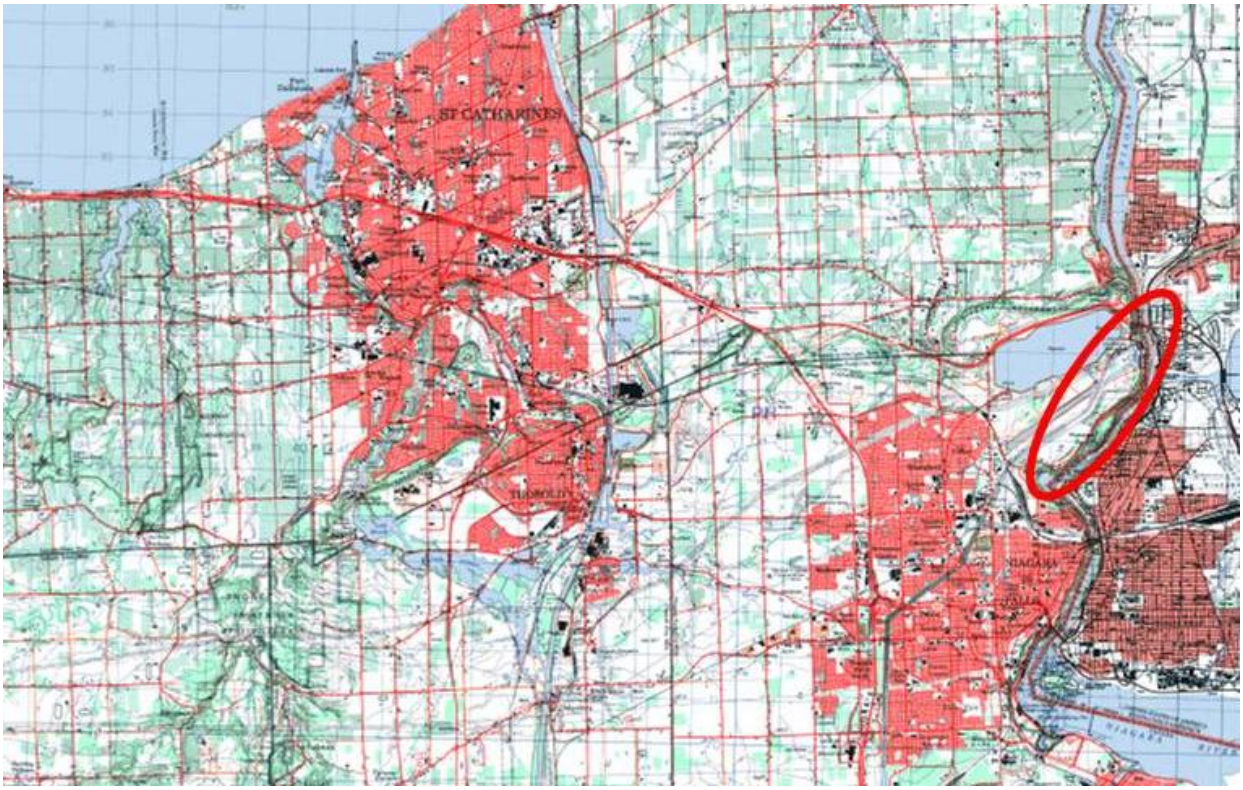

Figure 1. General location (red oval) of the 3 Dusky Salamander sites in the Niagara Peninsula with respect to the cities of St. Catharines and Niagara Falls.

2.3 Physical Description

Area (please specify units): The area being nominated for IMPARA status is within a 4.3 km stretch of the Niagara Gorge along a section of the lower Niagara River between Thompson's Point and the Village of Queenston. It is not the entire stretch, but rather three distinct sites along the face of the Gorge. The northernmost site is referred to as the "Queenston Seep". It is a groundwater feed stream that emerges from a seam in the rock face near the top of the Gorge. In June 1989, Dusky Salamanders, originally thought to be Northern Dusky Salamanders, *Desmognathus fuscus*, but now confirmed to be Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, were discovered. The estimated area of significant habitat of the Queenston Seep is approximately 1.7 ha (Yagi and Tervo 2008a), but the size is likely more because this amount does not include the water source feeding the habitat. The southernmost site is referred to as the "Whirlpool Seep". It too is a groundwater feed stream that emerges from a seam in the rock face near the top of the Gorge. Northern Dusky Salamanders, *Desmognathus fuscus*, were discovered at this site in April 1989. The estimated area of significant habitat of the Whirlpool site is approximately 1.9 ha (Yagi and Tervo 2008b). The site between these is referred to as "Smeaton Creek". It is a stream feed by groundwater, and

water from the power canal that seeps from a seam in the rock face near the top of the Gorge. Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, were discovered at this location in October 2010. The significant habitat of the Smeaton Creek site has not been assessed.

Please describe the site, providing information of habitat type, vegetation type, presence and type of waterbodies: The stream water at all three sites emerges from between rock layers near the top of the Niagara Gorge, and descends as a narrow channel down a relatively steep rock face and discharges into the Niagara River. Very large rocks, gravel, and ground vegetation make up the stream channel at the Queenston Seep and Smeaton Creek sites. At the Whirlpool Seep site the stream channel consists of mud, rocks, and woody debris. The vegetation of the Niagara Gorge area and the Niagara River area where these areas occur has been described in detail by Oldham (2007, 2010).

Queenston Seep site: Figure 2 shows the stream channel downstream from behind the first waterfall curtain near the source. Note the Niagara River (bluish colour), and the steepness of the slope. Figure 3 shows the stream channel looking up the hillside towards the source.

Figure 2.

Figure 3.

Table 1. List of plant species found in the vicinity of the Queenston Seep in 2016.

Family Name	New Scientific Name (FOIBIS 2008)	Common Name (FOIBIS)	COSEWIC (Sep 2007)	COSSARO (Sep 2009)	S-RANK (200_)	NIAGARA (To be input from NPCA)
Aceraceae	*Acer negundo*	Manitoba Maple			S5	
Aceraceae	*Acer nigrum*	Black Maple			S4?	
Anacardiaceae	*Toxicodendron radicans* ssp. *negundo*	Poison Ivy			S5	
Asteraceae	*Tussilago farfara*	Colt's Foot			SNA	
Balsaminaceae	*Impatiens capensis*	Spotted Jewel-weed			S5	
Betulaceae	*Alnus glutinosa*	European Black Alde			SNA	
Betulaceae	*Betula papyrifera*	Paper Birch			S5	
Betulaceae	*Ostrya virginiana*	Eastern Hop-hornbe			S5	
Caprifoliaceae	*Lonicera* sp.	Honeysuckle Specie				
Caprifoliaceae	*Sambucus racemosa* var. *racemosa*	Red-berried Elder			S5	
Cornaceae	*Cornus sericea* ssp. *sericea*	Red-osier Dogwood			S5	
Lamiaceae	*Lycopus* sp.	Bugleweed Species				
Moraceae	*Morus rubra*	Red Mulberry	END	END-R	S2	R
Oleaceae	*Fraxinus nigra*	Black Ash			S5	
Plantaginaceae	*Plantago major*	Nipple-seed Plantair			SNA	
Poaceae	*Phragmites australis*	Common Reed			S5	
Rosaceae	*Prunus serotina*	Wild Black Cherry			S5	
Solanaceae	*Solanum dulcamara*	Climbing Nightshade			SNA	
Tiliaceae	*Tilia americana*	American Basswood			S5	
Vitaceae	*Parthenocissus vitacea*	Thicket Creeper			S5	
Poaceae	*Muhlenbergia* sp.	Satin Grass Species				

Examples of Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, found at the Queenston Seep site are shown in Figures 4 and 5.

Figure 4.

Figure 5.

Desmognathus ochrophaeus is vouchered (June 1989) at the Queenston Seep site by ROM 19813, Royal Ontario Museum, Toronto.

Smeaton Creek site: Figure 6 shows the stream at its source (where groundwater emerges), and the first of several waterfalls (Figure 7) immediately downstream of where the water bursts from between rock layers.

Figure 6.

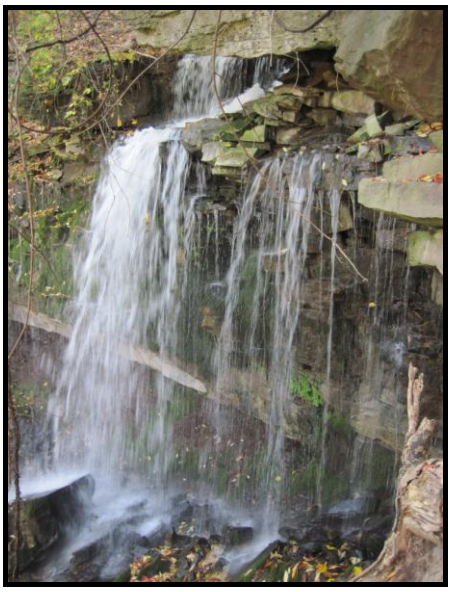

Figure 7.

Figure 8 shows the stream channel immediately downstream of first waterfall (Figure 7), and Figure 9 shows smaller waterfalls and the stream channel near bottom of hillside.

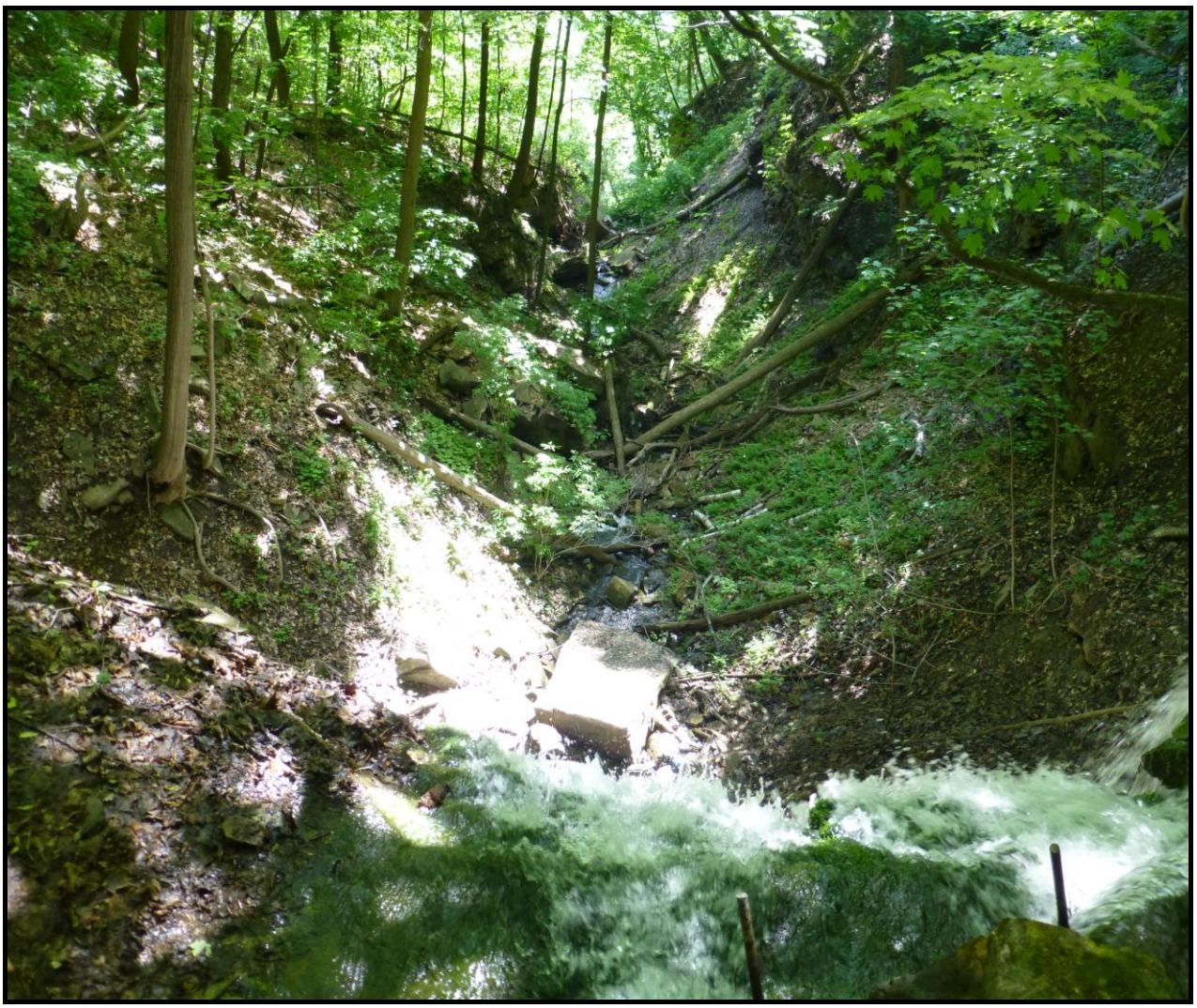

Figure 8.

Figure 9.

Table 2. List of plant species found in the vicinity of the Smeaton Creek site in 2016.

Family Name	New Scientific Name (FOIBIS 2008)	Common Name (FOIBIS)	COSEWIC (Sep 2007)	COSSARO (Sep 2009)	S-RANK (200_)	NIAGARA (To be input from NPCA)
Aceraceae	*Acer negundo*	Manitoba Maple			S5	
Aceraceae	*Acer nigrum*	Black Maple			S4?	
Aceraceae	*Acer platanoides*	Norway Maple			SNA	
Anacardiaceae	*Rhus hirta*	Staghorn Sumac			S5	
Anacardiaceae	*Toxicodendron radicans* ssp. *negundo*	Poison Ivy			S5	
Araceae	*Arisaema triphyllum* ssp. *triphyllum*	Jack-in-the-pulpit			S5	
Aristolochiaceae	*Asarum canadense*	Wild Ginger			S5	
Asteraceae	*Solidago canadensis* var. *scabra*	Tall Goldenrod			S5	
Asteraceae	*Solidago flexicaulis*	Broad-leaved Goldenrod			S5	
Balsaminaceae	*Impatiens pallida*	Pale Jewel-weed			S5	
Betulaceae	*Betula papyrifera*	Paper Birch			S5	
Betulaceae	*Carpinus caroliniana* ssp. *virginiana*	American Hornbeam			S5	
Caprifoliaceae	*Sambucus racemosa* var. *racemosa*	Red-berried Elder			S5	
Dryopteridaceae	*Cystopteris bulbifera*	Bulblet Fern			S5	
Geraniaceae	*Geranium robertianum*	Herb-robert			SNA	
Juglandaceae	*Carya cordiformis*	Bitternut Hickory			S5	
Liliaceae	*Maianthemum racemosum* ssp. *racemosum*	False Solomon's Seal			S5	
Oleaceae	*Fraxinus pennsylvanica*	Green Ash			S5	
Osmundaceae	*Osmunda cinnamomea*	Cinnamon Fern			S5	
Ranunculaceae	*Actaea pachypoda*	White Baneberry			S5	
Ranunculaceae	*Thalictrum dioicum*	Early Meadowrue			S5	
Rhamnaceae	*Rhamnus cathartica*	Buckthorn			SNA	
Rosaceae	*Rubus odoratus*	Purple-flowering Raspberry			S5	
Salicaceae	*Populus deltoides* ssp. *deltoides*	Eastern Cottonwood			SU	
Solanaceae	*Solanum dulcamara*	Climbing Nightshade			SNA	
Tiliaceae	*Tilia americana*	American Basswood			S5	
Vitaceae	*Parthenocissus vitacea*	Thicket Creeper			S5	
Vitaceae	*Vitis riparia*	Riverbank Grape			S5	

Figure 10 shows a juvenile *Desmognathus ochrophaeus* from the Smeaton Creek site, and Figure 11, an adult.

Figure 10.

Figure 11.

Desmognathus ochrophaeus is vouchered (October 2010) at the Smeaton Creek site by a digital photo, ROM dm00375, Royal Ontario Museum, Toronto.

Whirlpool Seep site: Figure 12 shows one of several stream channels at the source location.

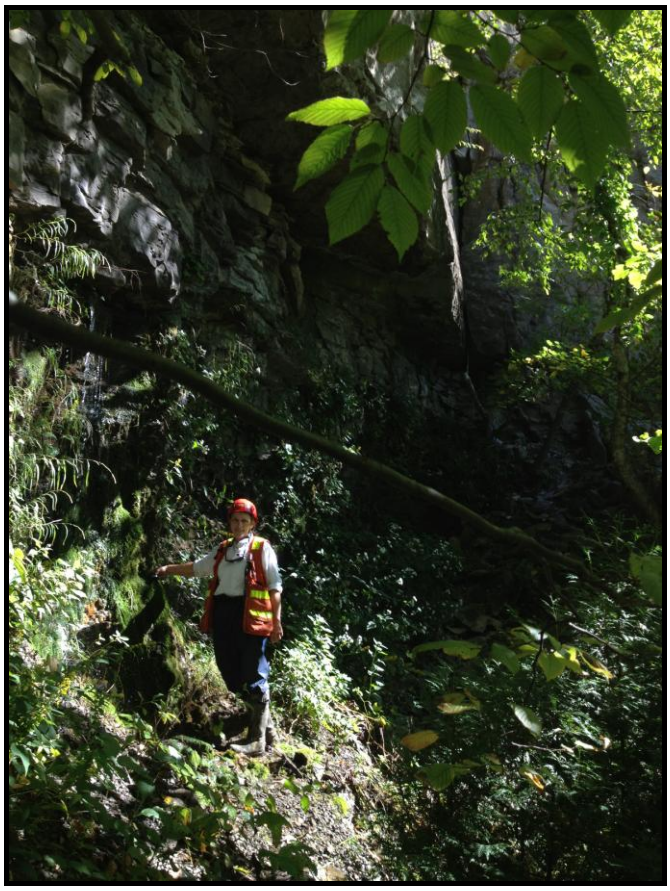

Figure 12.

Figures 13 and 14 show adult Northern Dusky Salamanders, *Desmognathus fuscus*, from the Whirlpool Seep site.

Figure 13.

Figure 14.

Desmognathus fuscus is vouchered (April 1989) at the Whirlpool site by CMNAR 31985, Canadian Museum of Nature, Ottawa.

2.4 Land Ownership

If there are five or fewer owners, please list them. Otherwise, an appropriate government representative, such as municipal council or regional district, is sufficient.

Name: Mr. Corey Burant[1]
Organization/Affiliation: The Niagara Parks Commission (NPC)
Address: 7805 Niagara Parkway
City/Town: Niagara Falls
Province/Territory: Ontario
Postal Code: L2E 6T2
Telephone: 905-295-4396 Ext. 3262
E-mail: cburant@niagaraparks.com

Name: Dr. David Stanley[2]
Organization/Affiliation: Ontario Power Generation (OPG)
Address: 14000 Niagara Parkway, RR #1
City/Town: Niagara-on-the-Lake
Province/Territory: Ontario
Postal Code: L0S 1J0
Telephone: 905-357-0322 Ext. 7015
E-mail: david.stanley@opg.com

[1] Land owner representative for all 3 Dusky Salamander sites
[2] Land leasee representative for the Smeaton Creek Dusky Salamander site

Local community support:

- Are the land owners/managers/stewards aware of the importance of the site to amphibian and reptile conservation? Representatives of both the land owner (NPC) and the company leasing land (OPG) are aware of the importance of these 3 sites, and that these sites represent the only known Dusky Salamanders locations in Ontario.
- Are they aware of this site nomination, and if so did they participate in the process? NPC and OPG were advised in advance that these 3 Dusky Salamander sites were to be nominated as Important Amphibian and Reptile Areas (IMPARA) in Canada by the Ontario Dusky Salamander Recovery and Implementation Team. Neither representative participated in the preparation of this nomination, but both were provided with a draft of the Nomination Form for review and comments prior to submission to the Canadian Herpetological Society.

The following guidelines for Nominations have been created to help you complete the nomination process. They are somewhat flexible, depending on the specifics of the site.

2.5 Species Diversity and Status

In the table provided, please: 1) list all species of amphibians and reptiles recorded at the site, estimated numbers of individuals of each species (if known), and any citations from which information was obtained (include the name of an observer if information is not published). Provide a Literature Cited section at the end of the nomination; and 2) list status designations for species of conservation concern based on applicable categorization processes listed in Section 1.1.

Quantifying the number of individuals at the proposed IMPARA site for all of the listed reptile and amphibian species can be challenging. Quantitative information may be available for some species based on population estimates. If these exist please enter the estimate, along with confidence intervals if generated, in the column for No. of individuals. For many species population estimates will not exist. We suggest two alternative methods of estimating abundance rather than leaving the column blank.

1. Numerical estimates, for when you have a general idea of numbers:
    a. 1-100 (or tens)
    b. 101-1000 (or hundreds)
    c. 1001+ (or thousands)

2. Relative Abundance based on encounters or reports:
    a. **Rare**: restricted to specialized habitat which is a small proportion of site and/or occurs at low density. Rarely encountered or reported, i.e., only once or twice per year, not necessarily every year.
    b. **Uncommon**: Usually encountered over long (several day) surveys; typically encountered or reported on a monthly basis.
    c. **Common:** Usually encountered during surveys of high quality habitat; typically widespread and occurs in a variety of habitats at the site. Encountered or reported on a weekly basis.
    d. **Abundant:** Many individuals encountered during surveys, especially in high quality habitats (i.e., leopard frogs along a shoreline), widespread and in many habitats in the site. Reported or encountered on an almost daily basis.

Queenston Seep site:

Species	Status [1]	No. of Individuals	References
Desmognathus ochrophaeus	Endangered	Rare to Uncommon	
Plethodon cinereus	No status	Abundant	
Thamnophis sirtalis	No status	Unknown	
Nerodea sipedon	No status	Unknown	

Smeaton Creek site:

Species	Status [1]	No. of Individuals	References
Desmognathus ochrophaeus	Endangered	Rare or Uncommon	
Plethodon cinereus	No status	Abundant	
Lithobates clamitans	No status	Uncommon	
Nerodia sipedon	No status	Uncommon	
Thamnophis sirtalis	No status	Uncommon	

Whirlpool Seep site:

Species	Status [1]	No. of Individuals	References
Desmognathus fuscus	Endangered	Uncommon	
Plethodon cinereus	No status	Abundant	
Thamnophis sirtalis	No status	Unknown	

[1] Both species of *Desmognathus* at these locations belong to the Carolinian population (= "designatable unit") under COSEWIC. Both species are listed as ENDANGERED under both the Federal Species at Risk Act (SARA S.C. 2002, c. 29, Schedule 1 List of Wildlife Species at Risk, Part 2 Endangered Species) and the Ontario Endangered Species Act (ESA, 2007 S.O. 2007, c. 6, Ontario Regulation 230/08 Species at Risk in Ontario List, Schedule 2 Endangered Species).

Other Species

Please list other significant non-amphibian and non-reptile species (e.g. rare or endemic) that are present at the site and describe the importance of the site to these species.

None of the three sites have been intensively surveyed for non-amphibian or non-reptile species. Some species of plants may have federal or provincial status. Refer to Oldham (2007, 2010) and also Tables 1 and 2 above.

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Species	Status	Importance of Site	References

2.6 Site Criteria

Under each category, please provide a description of how this site fulfills the Important Amphibian and Reptile Areas criteria (see Part 1). If a category does not apply to this site then simply leave it blank (e.g., if there are no species of conservation concern present then leave the "Species of Conservation Concern" category blank).

1. Species of Conservation Concern: All three sites contain species determined to be Endangered under both the federal SARA and provincial ESA, 2007. The Queenston Seep site and the Smeaton Creek site are the only locations in Ontario where the Allegheny Mountain Dusky Salamander, *Desmognathus ochrophaeus* is known to occur, and the

Whirlpool Seep site is the only location in Ontario where the Northern Dusky Salamander, *Desmognathus fuscus*, is known to occur.

2. High Species Diversity: The species diversity of amphibians and reptiles at all 3 sites is very low (refer to section above).

3. Important Life History Requirements: These sites provide the requirements for all life history stages of these salamanders: overwintering hibernation sites, non-winter shelter sites, feeding sites, breeding sites, larval development sites. No other Dusky Salamanders sites are known in this area of the Niagara Gorge. The 3 sites that are known provide the requirements for all life history stages.

2.7 Human Impacts

Please describe how human activities are impacting the site and the immediately surrounding areas in the following ways:

The greatest threats were deemed by a panel of experts to be dams and water management, associated habitat modifications, industrial effluents and other sources of contamination, and geological events such as landslides (Boutin 2017). These were all scored as "high impact".

- Current site usage (if any), e.g., industrial, residential, farming, logging, camping, recreation, etc. (please indicate relative importance): Stream water samples were taken from the Queenston Seep and the Whirlpool Seep sites in 2006 to determine if there was a presence of industrial or agricultural chemicals. Results indicated no presence of these chemicals. The Smeaton Creek site has not been sampled. None of the sites are developed, but trails which allow human impact and perhaps collection of specimens, do occur through, and/or near the sites.

- Pollution (air, water, light, noise): Air pollution has not been studied to determine if any of the sites are undergoing acidification. Reduction of water quality and quantity could severely impact all three sites. Contamination of the groundwater or surface water runoff, and accumulation of human debris, could also severely impacts all three sites. Drought and/or extreme weather events, such as very high precipitation events, could cause water contamination. Garbage and solid waste has been noted at these sites. Illegal disposal of containers once containing hazardous material such as petrochemical products could pollute these sites.

- Threats to habitat (e.g., development, habitat loss or degradation, succession, fire): Habitat loss/degradation through natural events (erosion, land/rock slides) could severely impact any of the three sites. This threat was considered to be significant not only for stream contamination, but also for habitat elimination in the case of torrential rainfall events and associated catastrophic landslides.

- Past or current habitat conservation or restoration efforts: Dense colonies of the invasive strain of the European Common Reed (*Phragmites australis*) have become

established at the base of the Niagara Gorge, along gently sloping sections of the bed of some streams, including the Queenston stream. *Phragmites* has been somewhat controlled temporarily at the Queenston Seep site. It could eventually colonize upstream areas if not checked. A small colony of *Phragmites* was discovered in June 2016 at the base of the cliff near where the spring that feeds the Queenston Seep bursts out of the rock face. Tree planting has occurred at the Queenston Seep site with low success, and at the Whirlpool Seep site in an attempt to extend or supplement shade and ground moisture. No habitat conservation or restoration efforts have been undertaken at the Smeaton Creek site.

2.8 Recommended Conservation Actions

Please describe any conservation actions that are needed/recommended for this area:
Invasive plant species control and planting trees to supplement natural regeneration and population monitoring are recommended. We recommend that the condition of the habitat be monitored during field surveys.

Efforts have been made to educate the general public and bring awareness of the plight of Dusky Salamanders in Ontario. This has been accomplished through the production and distribution to the public of refrigerator magnets (Figure 15) and species at risk cards (Figure 16).

Figure 15. Dusky Salamander refrigerator magnets.

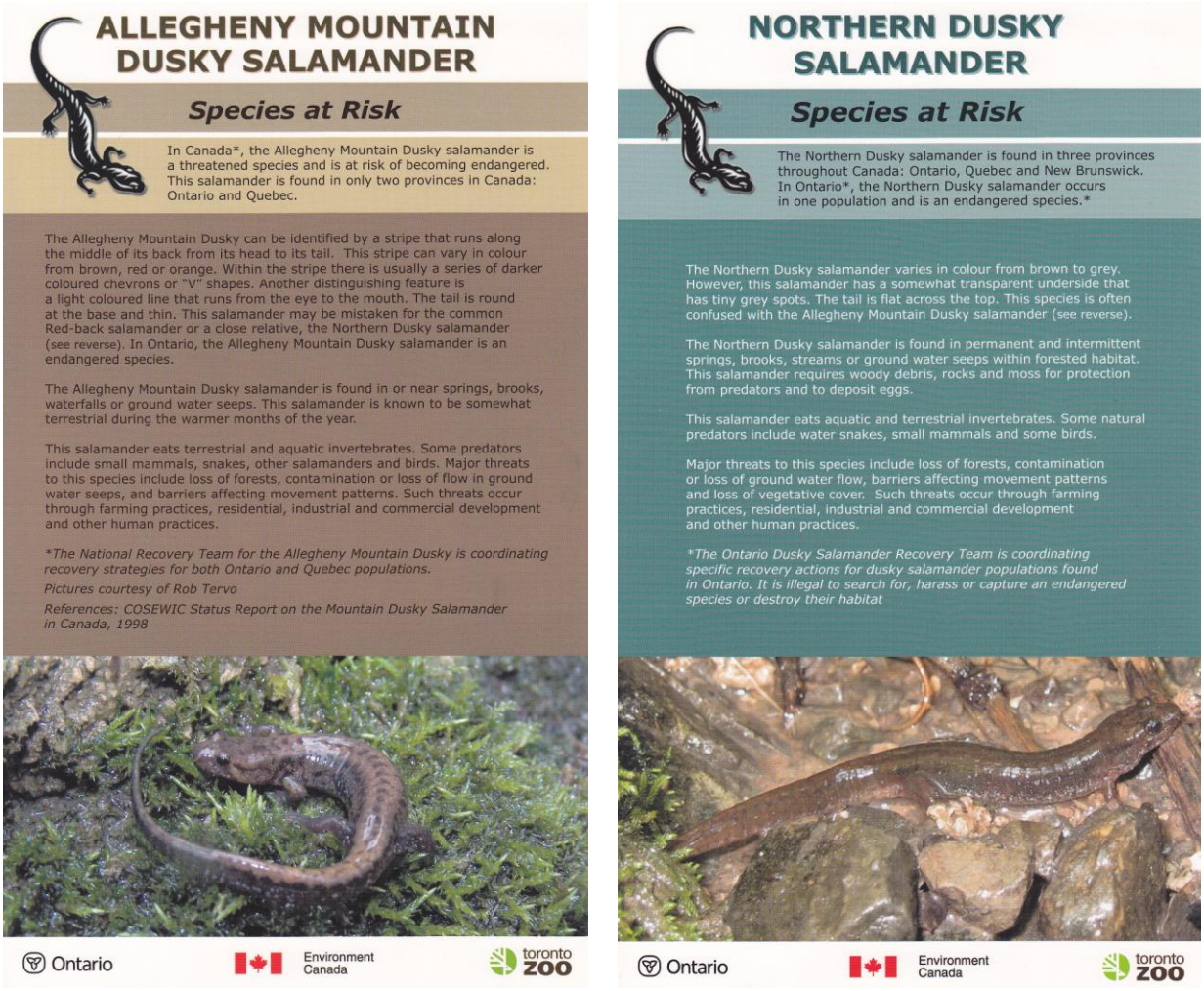

Figure 16. Allegheny Mountain Dusky and Northern Dusky Salamander species at risk cards.

2.9 Other Concerned Organizations

Please provide contact information for organizations or individuals that are involved in protection/conservation of this site, i.e., World Wildlife Fund Canada, Nature Conservancy Canada, Ducks Unlimited, Federation of Nova Scotia Naturalists, etc.: No organizations other than NPC and OPG are involved in the direct protection and conservation of these sites; however, the Ontario Dusky Salamander Recovery & Implementation Team needs to be kept informed since it is this organization that recommends conservation strategies and connects to COSEWIC. COSEWIC and the Natural Heritage Information Centre, Ontario Ministry of Natural Resources and Forestry also need to be kept informed for potential status re-assessments, and Ontario Nature needs to be kept informed because it is the organization which compiles the atlas of Ontario amphibians and reptiles.

2.10 Previous Work

Please list studies/documents/papers that have been derived from this site. If possible, include the documents with the submission or provide enough information so that the sources can be retrieved by CHS.

Government material - Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*)

COSSARO. 2007. COSSARO Candidate Species at Risk Evaluation Form for Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*). Prepared by the Natural Heritage Information Centre for the Committee on the Status of Species at Risk in Ontario (COSSARO). Ontario Ministry of Natural Resources, Peterborough. April 2007. 14 pages.

COSEWIC. 2007. COSEWIC assessment and update status report on the Allegheny Mountain Dusky Salamander *Desmognathus ochrophaeus* (Great Lakes/St. Lawrence population and Carolinian population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. viii + 32 pages.

COSEWIC. 2007. Response Statement - Allegheny Mountain Dusky Salamander, Carolinian population. Committee on the Status of Endangered Wildlife in Canada. Ottawa. December 4, 2007. 1 page.

Environment and Climate Change Canada. 2016. Recovery Strategy for the Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) – Carolinian population in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. 23 pages + Annexes.

Boutin, A. 2017. COSEWIC Status Report on Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) - Adirondack and Carolinian populations. Six-month Interim Status Report. Draft Report. Environment and Climate Change Canada. 96 pages.

Government material - Northern Dusky Salamander (*Desmognathus fuscus*)

COSSARO. 2012. COSSARO Candidate Species at Risk Evaluation for Northern Dusky Salamander (*Desmognathus fuscus*). Prepared by the Committee on the Status of Species at Risk in Ontario (COSSARO). Ontario Ministry of Natural Resources, Peterborough. May 2012. 11 pages.

COSEWIC. 2012. COSEWIC assessment and status report on the Northern Dusky Salamander *Desmognathus fuscus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 56 pages.

COSEWIC. 2013. Response Statement - Northern Dusky Salamander, Carolinian population. Committee on the Status of Endangered Wildlife in Canada. Ottawa. January 3, 2013. 1 page.

Government material - both species

Ontario Ministry of Natural Resources. 2013. Ontario Government Response Statement - Allegheny Mountain Dusky Salamander and Northern Dusky Salamander. October 11, 2013. 5 pages.

Other Important Material

NOTE: The reports noted by "*****" are considered confidential to Ontario Power Generation, and are not available to the public.

*****Golder Associates. 2012. Findings of the flow monitoring near salamander habitat adjacent to the OPG SAB PGS Reservoir during the Comprehensive Geotechnical Investigation (CGI). Technical Memorandum. Prepared for Ontario Power Generation. April, 2012. 38 pages. File Name: 10-1118-0099 TM DOC0099 SalamanderHabitat_Rev0_16Apr2012.

*****Golder Associates. 2014. On-going monitoring of the salamander habitats in the vicinity of the Ontario Power Generation Sir Adam Beck Generating Station. Technical Memorandum. Prepared for Environment Services - Natural Sciences, Ontario Power Generation, Niagara-on-the-Lake, Ontario. January, 2014. 52 pages. File Name: 12-1118-0005 DOC0044 OPG SAB FlowMemo_Rev 2 31Jan2014.

Kamstra, J. 1991. Rediscovery of the Northern Dusky Salamander, *Desmognathus f. fuscus*, in Ontario. Canadian Field-Naturalist 105(4): 561-563.

Markle, T.M. and D.M. Green. 2005. Molecular identification of Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, in southern Ontario. Unpublished report for the Ontario Ministry of Natural Resources, Vineland, Ontario. 8 pages.

Markle, T.M., and D.M. Green. 2006. Molecular Comparison of Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, in Southern Ontario and Western New York State. Report for Ontario Ministry of Natural Resources, Vineland, Ontario. 7 pages.

Markle, T.M., D.M. Green, A. Yagi, W.F. Weller. 2006. Geographic Distribution. *Desmognathus ochrophaeus*. Herpetological Review 37(4): 482-483.

Markle, T.M., A.R. Yagi and D.M. Green. 2013. Recovery Strategy for the Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) and the Northern Dusky Salamander (*Desmognathus fuscus*) in Ontario. Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. January 11, 2013. vi + 30 pages.

*****Weller, W.F. 2010. Results of Field Investigations for Dusky Salamanders (*Desmognathus*) in Smeaton Creek, R.M. Niagara in 2010. Report prepared by Environment Division, Hydro

Business, Ontario Power Generation for Niagara Plant Group, Hydro Business, Ontario Power Generation. December, 2010. 15 pages.

*****Weller, W.F. 2011. Results of Field Investigations for Dusky Salamanders (*Desmognathus*) in Smeaton Creek, R.M. Niagara in 2011. Report prepared by Environment Division, Hydro Business, Ontario Power Generation for Niagara Plant Group, Hydro Business, Ontario Power Generation. December, 2011. 27 pages.

*****Weller, W.F. 2012. Results of Field Investigations for Dusky Salamanders (*Desmognathus*) in Smeaton Creek, R.M. Niagara in 2012. Report prepared by Commercial Operations & Environment, Environment Division, Ontario Power Generation for Niagara Plant Group, Hydro-Thermal Operations, Ontario Power Generation. November, 2012. 31 pages.

*****Weller, W.F. 2013. Results of Field Investigations for Dusky Salamanders (*Desmognathus*) in Smeaton Creek, R.M. Niagara in 2013. Report prepared by Commercial Operations & Environment, Environmental Services Division, Ontario Power Generation for Niagara Plant Group, Hydro-Thermal Operations, Ontario Power Generation. November, 2013. 21 pages.

Weller, W.F. and D.M. Green. 1997. Checklist and Current Status of Canadian Amphibians *in* Green, D.M. (ed.). 1997. Amphibians in decline: Canadian Studies of a Global Problem. Herpetological Conservation Volume One. Society for the Study of Amphibians and Reptiles. 338 pages.

*****Weller, W.F. and D. Stanley. 2015. Impact of additional stream flow on Dusky Salamanders and their habitat in Smeaton Creek. Report prepared by Commercial Operations & Environment, Environmental Services – Natural Sciences for Ontario Power Generation's Niagara Plant Group, Hydro-Thermal Operations, Niagara-on-the-Lake, Ontario. March, 2015. *Draft Report*. 40 pages.

Yagi, A.R., T.M. Markle, A. Brant and R. Tervo. 2010. Quebec & Ontario Stream Salamander Stewardship Guide. Prepared for Environment Canada Habitat Stewardship Program. iii + 37 pages.

NOTE: A chronological list of reports and publications which refer to the occurrence of *Desmognathus* in Ontario follows:

1908 – Nash, C.W. 1908. Check list of the Batrachians and Reptiles of Ontario *in* Manual of Vertebrates of Ontario. Department of Education, Toronto. Warwick Bros. & Rutter, Limited, Toronto. 32 pages. *Desmognathus f. fuscus* is "rare, has been taken in south-western Ontario" (p. 7).

1937 – Logier, E.B.S. 1937. The Amphibians of Ontario. Royal Ontario Museum of Zoology Handbook No. 3. 16 pages. The Dusky Salamander, *Desmognathus f. fuscus*, is not included in the list of salamander species (p. 2-7).

1942 – Logier, E.B.S. and G.C. Toner. 1942. Amphibians and Reptiles of Canada. Canadian Field-Naturalist 56(2): 15-16. No reference is made as to which provinces the species listed occur in. The Dusky Salamander (*Desmognathus f. fuscus*) is listed but likely refers to those occurring in New Brunswick and Québec. The Mountain Salamander (*Desmognathus o. ochrophaeus*) likely refers to its occurrence in New Brunswick; however, upon further examination, specimens were determined to be *Desmognathus f. fuscus*.

1943 - Bishop, S.C. 1943. Handbook of Salamanders. Comstock Publishing Company, Inc. Ithaca, New York. 535 pages. *Desmognathus f. fuscus* occurs in "Ontario opposite Buffalo, New York" (p. 188), and shown to occur throughout the Niagara Peninsula (map 23, p.189).

1948 – Mills, R.C. 1948. A check list of the amphibians and reptiles of Canada. Herpetologica 4 (Second Supplement): 1-15. Northern Dusky Salamander, *Desmognathus f. fuscus*, occurs in "southeastern Ontario opposite Buffalo, N.Y." (p. 4).

1952 – Logier, E.B.S. 1952. The Frogs, Toads and Salamanders of Eastern Canada. Clarke, Irwin & Company Limited. 127 pages. *Desmognathus f. fuscus* occurs in "Welland County, Ontario" (p. 70).

1955 – Logier, E.B.S. and G.C. Toner. 1955. Check-list of the Amphibians and Reptiles of Canada and Alaska. Contributions of the Royal Ontario Museum of Zoology and Palaeontolgy No. 41. 88 pages. *Desmognathus f. fuscus* occurs in "Southern Ontario near Niagara River: Welland Co., opposite Buffalo, New York" (p. 15).

1958 – Bleakney, J.S. 1958. A Zoogeographical Study of the Amphibians and Reptiles of Eastern Canada. National Museum of Canada Bulletin No. 155. 119 pages. *Desmognathus f. fuscus* is shown to occur in the extreme south-eastern part of the Niagara Peninsula (map 12, p. 81).

1958 - Conant, R. 1958. A Field Guide to Reptiles and Amphibians of the United States and Canada East of the 100th Meridian. Houghton Mifflin Company, Boston. 366 pages. *Desmognathus f. fuscus* is not mentioned as occurring in Ontario (p. 218), but is shown to occur in the extreme eastern part of Niagara Peninsula (map 171, p. 341).

1961 – Logier, E.B.S. and G.C. Toner. 1961. Check List of the Amphibians and Reptiles of Canada and Alaska. Life Sciences Division – Contribution No. 53, Royal Ontario Museum, Toronto. 92 pages. *Desmognathus f. fuscus* occurs in "ONTARIO. Welland Co., Opposite Buffalo, New York" (p. 20).

1975 – Conant, R. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Second Edition. Houghton Mifflin Company, Boston. 429 pages. *Desmognathus f. fuscus* is not mentioned as occurring in Ontario (p. 262), but is shown to occur in the extreme eastern part of Niagara Peninsula (map 213).

1984 – Cook, F.R. 1984. Introduction to Canadian Amphibians and Reptiles. National Museum of Natural Sciences, National Museums of Canada, Ottawa, Canada. 200 pages. *Desmognathus f. fuscus* occurs "opposite Buffalo" (p. 44).

1991 – Kamstra, J. 1991. Rediscovery of the Northern Dusky Salamander, *Desmognathus f. fuscus*, in Ontario. Canadian Field-Naturalist 105(4): 561-563. *Desmognathus f. fuscus* occurs at "2 localities in the Niagara River gorge (Whirlpool and Queenston)".

1991 – Conant, R. and J.T. Collins. 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third Edition. Houghton Mifflin Company, Boston. 450 pages. *Desmognathus f. fuscus* is not mentioned as occurring in Ontario (p. 261), but is shown to occur in the extreme eastern part of Niagara Peninsula (map 230).

1997 – Weller, W.F. and D.M. Green. 1997. Checklist and Current Status of Canadian Amphibians *in* Green, D.M. (Ed.). 1997. Amphibians in decline: Canadian Studies of a Global Problem. Herpetological Conservation Volume One, Society for the Study of Amphibians and Reptiles. 338 pages. *Desmognathus fuscus* is "known from only the Niagara River area in southern Ontario" (p. 313).

1998 – Conant, R. and J.T. Collins. 1998. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third Edition, Expanded. Houghton Mifflin Company, Boston. 616 pages. *Desmognathus f. fuscus* is not mentioned as occurring in Ontario, but is shown to occur in the extreme eastern part of Niagara Peninsula (p. 448).

2002 - MacCulloch, R.D. 2002. The ROM Field Guide to Amphibians and Reptiles of Ontario. Royal Ontario Museum, and McClelland & Stewart Ltd, Toronto, Ontario. 168 pages. *Desmognathus fuscus* is "relatively rare in Ontario", and is shown to occur in the extreme eastern part of Niagara Peninsula (p. 56).

2005 – Markle, T.M. and D.M. Green. 2005. Molecular identification of Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, in southern Ontario. Unpublished report for the Ontario Ministry of Natural Resources, Vineland, Ontario. 8 pages. The "population at the Queenston site is *Desmognathus ochrophaeus*".

2006 - Markle, T.M., and D.M. Green. 2006. Molecular Comparison of Allegheny Mountain Dusky Salamanders, *Desmognathus ochrophaeus*, in Southern Ontario and Western New York State. Report for Ontario Ministry of Natural Resources, Vineland, Ontario. 7 pages. *Desmognathus ochrophaeus* occurs in the Niagara Gorge at the Queenston site, and *D. fuscus* at the Whirlpool site.

2006 – Markle, T.M., D.M. Green, A.R. Yagi, W.F. Weller. 2006. Geographic Distribution. *Desmognathus ochrophaeus*. Herpetological Review 37(4): 482-483. *Desmognathus ochrophaeus* occurs in the "Niagara Gorge (north of Niagara Falls) near Queenston". The

original identification of the voucher specimen taken at the Queenston site in June 1989 (Kamstra 1991) is corrected, and the specimen reassigned to *D. ochrophaeus*.

2007 – Fisher, C.C., A. Joynt, and R.J. Brooks. 2007. Reptiles and Amphibians of Canada. Lone Pine Publishing, Edmonton, Alberta. 208 pages. Northern Dusky Salamander (*Desmognathus fuscus*) is "found at one site near Niagara Falls ... Niagara Gorge (ON)", and is shown to occur throughout the Niagara Peninsula and adjacent Hamilton-Wentworth R.M. and Haldimand-Norfolk R.M. (p. 137); Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) is found in "the Niagara Gorge", and is shown to occur throughout the Niagara Peninsula. (p. 139).

2015 – Gillingwater, S.D. and A.S. MacKenzie. 2015. Photo Field Guide to the Reptiles and Amphibians of Ontario. St. Thomas Field Naturalist Club Incorporated. 144 pages. *Desmognathus fuscus* occurs "only in the Niagara gorge" (p. 124); *Desmognathus ochrophaeus* "occurs at 2 localized sites in the Niagara region" (p. 126).

2016 – Powell, R., R. Conant, and J.T. Collins. 2016. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Fourth Edition. Houghton Mifflin Harcourt, Boston and New York. 492 pages. *Desmognathus fuscus* is not mentioned as occurring in Ontario (p. 46), but is shown to occur in the extreme eastern part of Niagara Peninsula (p. 45); is also not mentioned as occurring in Ontario (p. 48), but is shown to occur in the extreme eastern part of Niagara Peninsula (p. 49).

2016 – Mills, P.B. 2016. METAMORPHOSIS – Ontario's Amphibians at all Stages of Development. SLG Group, Brampton, Ontario. 104 pages. Both Dusky Salamander species are "extremely localized in Ontario, existing at only a few sites along the Niagara River" (p. 50).

2017 – Harding, J.H. and D.A. Mifsud. 2017. Amphibians and Reptiles of the Great Lakes Region, Revised Edition. University of Michigan Press, Ann Arbor. 392 pages. *Desmognathus fuscus* occurs "south of ... Lake Ontario (including the Niagara River gorge area of Ontario" (p. 81). *Desmognathus ochrophaeus* was "recently recorded from the Niagara River gorge in Ontario (where they are considered endangered)" (p. 85).

2.11 Literature Cited

Please list any references cited in this nomination.

Oldham, M.J. 2007. Vascular Plants of the Niagara River, Ontario. Report for Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario. January, 2007. 782 pages.

Oldham, M.J. 2010. Checklist of the Vascular Plants of Niagara Regional Municipality, Ontario. Report for Niagara Peninsula Conservation Authority, Welland, Ontario. March, 2010. 223 pages.

Yagi A.R. and R. Tervo. 2008a. Species at Risk Habitat Mapping for the Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) - a Test of Draft Habitat Mapping Guidelines. Ontario Ministry of Natural Resources. 12 pages.

Yagi A.R. and R. Tervo. 2008b. 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 pages.

Niagara Gorge – Whirlpool, Smeaton, Queenston Sites – Lower Niagara River, Ontario was designated as an IMPARA in November 2018.

2 August 2017