FACETS
a multidisciplinary open access science journal

EDITORIAL

Upholding science-based risk assessment under a weakened *Endangered Species Act*

Nicolas J. Muñoz[ab*†] **and Debora S. Obrist**[a†]

[a]Earth to Ocean Research Group, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada; [b]Department of Biology, Western University, 1151 Richmond Street, London, ON N6A 3K7, Canada

*nico_munoz@sfu.ca
†These authors contributed equally to this work.

Key words: conservation, climate change, geographic range, habitat loss, science policy, species at risk

Background

Since the United States enacted its first species-at-risk legislation in 1966, many jurisdictions have similarly adopted legislation aimed at conserving biodiversity through the identification of species at risk of extinction, the protection of these species from harm, and the establishment of recovery programs (Ray and Ginsberg 1999; Waples et al. 2013). Although these statutes have successfully thwarted extinction for hundreds of species, they have also failed to recover many at-risk species (Schwartz 2008; Mooers et al. 2010; Evans et al. 2016). As global extinction rates approach those observed during the five mass extinction events in Earth's history (Barnosky et al. 2011), robust, well-implemented conservation laws are critically needed to slow the loss of biodiversity (Westwood et al. 2019; Leclère et al. 2020).

In Canada, the federal species-at-risk legislation (*Species at Risk Act* 2002, S.C. 2002, c. 29) generally applies only to land under federal jurisdiction and thus relies on provincial or territorial governments to adopt and implement their own legislation. Ontario's *Endangered Species Act* (henceforth OESA or the Act) passed in 2007 and has been considered the strongest species-at-risk legislation among the provinces and territories with such legislation (Nixon et al. 2012; Olive and Penton 2018). The implementation of OESA begins with the Committee on the Status of Species at Risk in Ontario (COSSARO), which is an independent panel of scientists and other experts that is responsible for developing criteria for assessing the status of species and using these criteria to classify species as endangered, threatened, special concern, or not at risk. The assessment criteria used by COSSARO largely follow those used by COSSARO's federal counterpart (The Committee on the Status of Endangered Wildlife in Canada (COSEWIC)) and consider risk factors such as declining abundance, declining geographic range, small population size, and extinction risk estimates based on life history traits (COSSARO 2014a). After COSSARO classifies a species, the Minister of Environment, Conservation, and Parks either accepts the classification (thereby "listing" the species), rejects the classification (if listing would entail significant social or economic impacts), or requires a reclassification from COSSARO (if of the opinion that the classification is inappropriate). After a classification is accepted, endangered and threatened species (and their habitat) receive legal protection from harm, and programs aimed at recovering at-risk species are developed.

OPEN ACCESS

Citation: Muñoz NJ and Obrist DS. 2020. Upholding science-based risk assessment under a weakened *Endangered Species Act*. FACETS 5: 980–988. doi:10.1139/facets-2020-0051

Handling Editor: Fanie Pelletier

Received: June 26, 2020

Accepted: September 22, 2020

Published: December 10, 2020

Published by: Canadian Science Publishing

In July 2019, the government of Ontario made five fundamental changes to OESA with the stated aim of improving species protections, streamlining the Act's implementation, and maintaining support for economic development (MECP 2019). These five changes involve (*i*) requiring risk classifications to reflect the status of species throughout their geographic range inside and outside of Ontario (instead of focusing on status inside of Ontario); (*ii*) opening up COSSARO membership to individuals with "community knowledge" (instead of membership being limited to scientists and Traditional Knowledge holders); (*iii*) increasing the timelines between classification, listing, and protection; (*iv*) allowing permit holders to engage in activities harmful to listed species across large geographic areas via "landscape agreements"; and (*v*) allowing parties to engage in harmful activities and avoid conservation action by paying into a fund (Ogden 2019; Bergman et al. 2020).

In their review, Bergman et al. (2020) argued that these amendments collectively weaken the ability of OESA to conserve biodiversity and recommend that they should be reversed or modified in the future. Although we agree with these conclusions, there remain interpretations of the amended legislation that must be made imminently by those who implement OESA (e.g., COSSARO). These interpretations will determine some of the consequences of the amendments for species at risk in Ontario and will occur far sooner than any legislative changes to OESA. As biologists, we describe here possible interpretations of the clauses relevant to change (*i*) and discuss their implications for species at risk. We focus on change (*i*) because it concerns which species are to be listed under OESA, and listing determinations are the step "from which all other consequences" of species-at-risk legislation come (Bean and Rowland 1997).

Interpreting ambiguity

When assessing the status of a species, COSSARO must now consider "[. . .] the condition of the species across the broader biologically relevant geographic range in which it exists both inside and outside of Ontario" (*Endangered Species Act* 2007, S.O. 2007, c. 6, s. 5 (4)). If consideration of a species' condition both inside and outside of Ontario would result in a lower-risk classification than if only condition inside of Ontario was considered, OESA now requires that the classification must reflect the lower level of risk that the species faces across its "biologically relevant" range (*Endangered Species Act* 2007, S.O. 2007, c. 6, s. 5 (5)).

For these clauses to be implemented by COSSARO, ambiguities in the amended language will require interpretation. What makes a given part of a species' geographic range "biologically relevant"? To what or to whom is it relevant? How does one evaluate the "condition" of a species? Guiding any interpretation is the fact that COSSARO is mandated in the Act to carry out status classifications using the best available science. Indeed, one of the purposes of OESA is to "identify species at risk based on the best available scientific information" (*Endangered Species Act* 2007, S.O. 2007, c. 6, s. 1). The purpose of OESA was not amended in 2019, meaning COSSARO must translate the new language in the Act into assessment criteria while ensuring that status assessments remain scientifically derived.

If "biologically relevant geographic range" is interpreted as the range that is relevant to the entire species, a simple approach would be to consider the entire geographic range of the species. However, this approach is problematic for wide-ranging species. For example, the gypsy cuckoo bumble bee (*Bombus bohemicus*) is distributed throughout the northern hemisphere and is stable in Europe but has sharply declined in North America (COSSARO 2014b). On what scientific grounds could it be argued that its status in Europe is "biologically relevant" to its status in North America? A different approach would be to borrow from interpretations of the U.S. *Endangered Species Act*. There, the status of a species across a "significant portion of its range" is considered in status assessments. After being the subject of much controversy and litigation (reviewed in Wilhere 2017), this phrase has been defined as the range without which the entire species would become endangered or

threatened (FWS and NMFS 2014). Robust quantification of such a "significant portion" is highly limited by data availability, requires substantial assumptions, and is more difficult for species with complex life histories (Earl et al. 2018).

Instead of considering a range that is relevant to the entire species, one could argue that the considered range should be "biologically relevant" to the species' subpopulations in Ontario. In this case, the relevant range outside of Ontario would be that to which Ontario subpopulations are biologically connected in the form of migration and metapopulation dynamics. Such connectivity to extra-regional subpopulations is already considered in COSSARO status assessments to evaluate the potential for rescue effects (i.e., the mitigation of local extinction risk due to the immigration of gametes or individuals into Ontario). If there is evidence for rescue effects, the species' status classification is downgraded by one category. For example, the gray fox (*Urocyon cinereoargenteus*) meets the COSSARO criteria for endangered due to its population size in Ontario being fewer than 110 mature individuals; however, its status was downgraded to threatened because there is immigration of individuals from adjacent US jurisdictions (COSSARO 2016).

Another interpretation that must be made is the term "condition". Condition outside of Ontario could be described by considering whether extra-regional subpopulations are stable, increasing, or decreasing and whether there are any significant threats facing these subpopulations. Such information is already used in COSSARO status assessments. Specifically, condition outside of Ontario is described using the rankings provided by the nonprofit organization NatureServe (natureserve.org). These rankings convey the extinction risk of a species at global, national, and subnational (i.e., state, provincial) levels and are derived from shared, standardized methods. When these rankings are available, they are used to inform the potential for rescue effects. For example, the gray fox is ranked as "apparently secure" or "secure" (i.e., fairly low or very low risk of extinction) in the US states from which individuals migrate to Ontario (**Table 1**), causing COSSARO to downgrade the status of gray fox from endangered to threatened (COSSARO 2016).

As described above, the potential for rescue effects is currently used by COSSARO to downgrade risk categories, and this potential is evaluated by considering the extent of immigration into Ontario subpopulations as well as the status of source populations. If "biologically relevant geographic range" is interpreted as the range to which Ontario subpopulations are biologically connected, the criteria for evaluating rescue effects sufficiently encapsulate the language in the amendment. If, instead, this phrase is interpreted as the range that is relevant to the entire species, intra-regional status would often be devalued in favour of extra-regional status for species that have a geographic range outside of Ontario.

Table 1. NatureServe conservation ranks of the gray fox (*Urocyon cinereoargenteus*), including ranks in Ontario and in adjacent U.S. jurisdictions (from COSSARO 2016).

Jurisdiction	Level	Rank
Canada	National	1 (critically imperiled)
Ontario	Subnational	1 (critically imperiled)
United States	National	5 (secure)
Michigan	Subnational	4 (apparently secure)
Minnesota	Subnational	NR (not ranked)
New York	Subnational	5 (secure)
Ohio	Subnational	NR (not ranked)
Pennsylvania	Subnational	5 (secure)

Implications for species at risk

If risk classifications are determined more by extra-regional status than by intra-regional status, many species could be arbitrarily precluded from listing owing to the biogeography of Ontario. Southern Ontario represents the northern range limit for a myriad of species distributed throughout eastern North America (Ricketts et al. 1999), particularly those native to the Eastern Temperate Forest ecoregion (henceforth ETFE), which extends from southern Canada to Florida and from the Atlantic coast to Texas (CEC 1997; **Fig. 1**). Populations living at the periphery of their species' geographic range are often less abundant than those at the core of their range (Brown et al. 1995), meaning many species that are native to the ETFE may be common outside of Ontario relative to inside. For example, the spotted turtle (*Clemmys guttata*; **Fig. 2a**) has a geographic range that typifies that of many species from the ETFE and is locally common at the core of its range in eastern United States but is endangered in Ontario (COSSARO 2015; NatureServe 2016; **Fig. 2b**). This pattern is pervasive; of the 152 species listed as endangered or threatened under OESA, 80% of species ($n = 121$) reach their northern

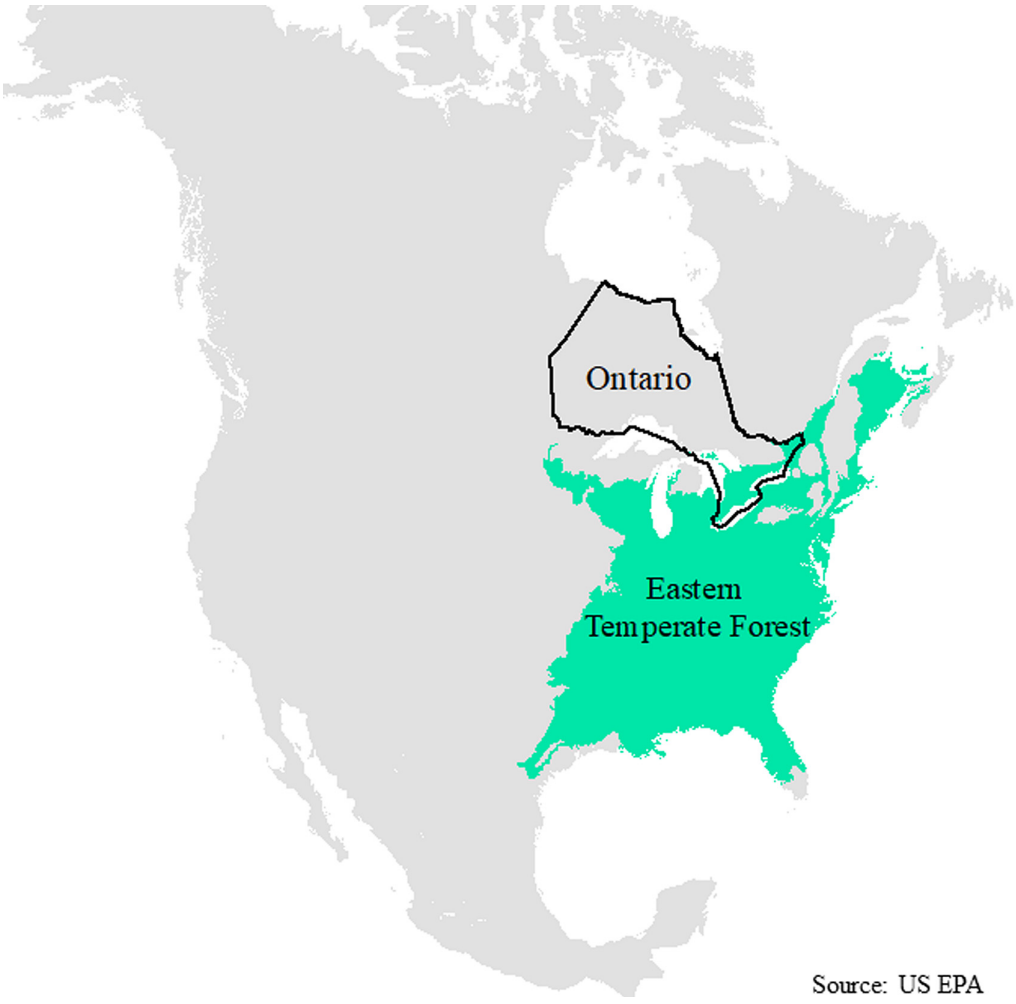

Fig. 1. Map of North America showing the boundaries of the Eastern Temperate Forest ecoregion (CEC 1997) and the province of Ontario, Canada.

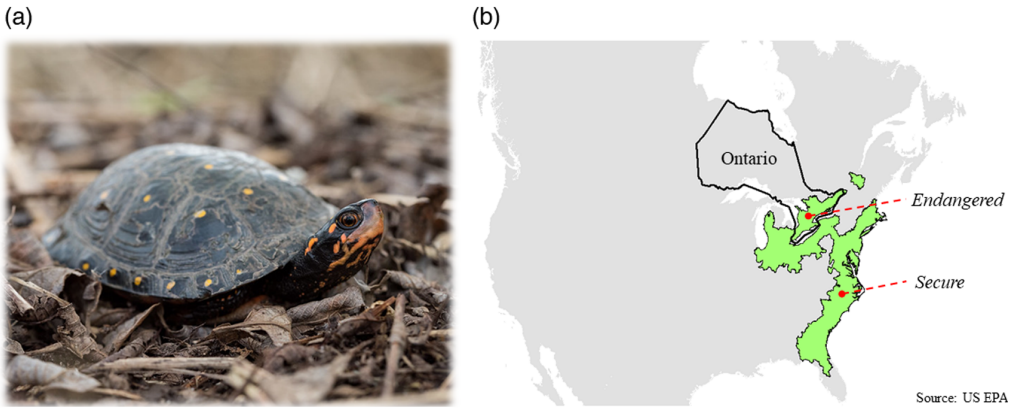

Fig. 2. (a) The spotted turtle (*Clemmys guttata*) is among the species that could be left unprotected in Ontario due to its biogeography. (b) Map of North America showing the geographic range of the spotted turtle (highlighted in green) and the boundaries of Ontario, Canada. The spotted turtle is classified as endangered in Ontario and as secure in the core of its range (COSSARO 2015; NatureServe 2016). Photo by Patrick Randall.

range limit in Ontario and have a broader geographic range that spans multiple other jurisdictions in eastern United States.

The portion of southern Ontario that overlaps with the ETFE is the most densely populated region in Canada. Upwards of 88% of habitat here has been lost to agriculture or urban development (Kerr and Deguise 2004), and this habitat loss has caused this region to have one of the highest densities of species at risk in Canada (Kerr and Cihlar 2004; Coristine et al. 2018). Removing or failing to provide protection for species based on extra-regional status would leave many species from the ETFE unprotected in a region where recovery potential is already limited by extensive habitat loss (Kerr and Deguise 2004). Thus, such a policy would likely lead to the extirpation (i.e., local extinction) of many ETFE species from Ontario.

Populations at the periphery of a species' geographic range are key to the overall survival of the species for several reasons (Steen and Barrett 2015). Firstly, species often persist at the edges of their historical ranges following human-induced range contraction (Channell and Lomolino 2000; Calkins et al. 2012). Across the eastern United States, land-use demands have caused a net loss of forest habitat in recent years (Drummond and Loveland 2010), increasing the importance of peripheral habitat such as in southern Ontario. Secondly, peripheral populations are on the front lines of the poleward range expansion being driven by climate change (Sunday et al. 2012). Indeed, shifting northward in tandem with suitable climatic conditions has already been documented for species at risk in Ontario (e.g., Melles et al. 2011). Lastly, peripheral populations are often genetically distinct from their core counterparts. For example, the Ontario population of the branched bartonia (*Bartonia paniculata* subsp. *paniculata*)—listed as threatened in Ontario—has high genetic distinctiveness from core populations in the United States (Ciotir et al. 2013). The conservation of genetically distinct, leading-edge populations is vital for facilitating persistence under anthropogenic stressors such as climate change (Gibson et al. 2009); allowing the extirpation of species from Ontario would therefore directly increase the global extinction risk of affected species.

Conclusion

There is overwhelming scientific evidence indicating that devaluing intra-regional status in favour of extra-regional status would undermine OESA's goal of biological conservation. COSSARO's mandate

to identify species at risk based on the best available science should compel COSSARO to ensure that the implementation of the new clauses in OESA does not lead to the de facto preclusion of peripheral populations from listing. To that end, "biologically relevant geographic range" should be interpreted as the range that is relevant to species' subpopulations in Ontario. This interpretation would avoid the scientific issues inherent in considering a range that is relevant to the entire species (e.g., Earl et al. 2018) while recognizing that extirpation from Ontario can have global consequences for many species. This interpretation could also avoid any litigation that might arise from scientifically flawed interpretations of this phrase, as occurred with a similar phrase in the U.S. *Endangered Species Act* (Wilhere 2017). Indeed, legal experts should be consulted to inform the validity of possible interpretations of the new clauses in OESA.

Species-at-risk legislation is an imperfect tool that can be regarded as the "last line of defence" (ECO 2013) for species faced with extinction. Ontario has an important role in North American conservation given its biogeography and its 1.08 million km^2 of land and water; a weakening of Ontario's species-at-risk legislation is a weakening of region-wide conservation prospects. Although we recognize that fulfilling commitments to biological conservation while minimizing impediments to economic development is a daunting task for any government, amending species-at-risk legislation such that it tacitly permits extirpation is egregiously regressive. We hope that this editorial helps COSSARO uphold the integrity of evidence-based risk assessment in Ontario at a time when effective conservation is needed most.

Author contributions

NJM and DSO drafted or revised the manuscript.

Competing interests

The authors have declared that no competing interests exist.

Data availability statement

All relevant data are within the paper.

References

Barnosky AD, Matzke N, Tomiva S, Wogan GOU, Swartz B, Quental TB, et al. 2011. Has the Earth's sixth mass extinction already arrived? Nature, 471(7336): 51–57. PMID: 21368823 DOI: 10.1038/nature09678

Bean MJ, and Rowland MJ. 1997. The evolution of national wildlife law. 3rd ed. Praeger, Westport, Connecticut.

Bergman JN, Binleya AD, Murphy RE, Proctor CA, Nguyen TT, Urness ES, et al. 2020. How to rescue Ontario's *Endangered Species Act*: a biologist's perspective. FACETS, 5: 423–431. DOI: 10.1139/facets-2019-0050

Brown JH, Mehlman DW, and Stevens GC. 1995. Spatial variation in abundance. Ecology, 76(7): 2028–2043. DOI: 10.2307/1941678

Calkins MT, Beever EA, Boykin KG, Frey JK, and Andersen MC. 2012. Not-so-splendid isolation: modeling climate-mediated range collapse of a montane mammal *Ochotona princeps* across numerous ecoregions. Ecography, 35(9): 780–791. DOI: 10.1111/j.1600-0587.2011.07227.x

Channell R, and Lomolino MV. 2000. Dynamic biogeography and conservation of endangered species. Nature, 403(6765): 84–86. PMID: 10638757 DOI: 10.1038/47487

Ciotir C, Yesson C, and Freeland J. 2013. The evolutionary history and conservation value of disjunct *Bartonia paniculata* subsp. *paniculata* (Branched Bartonia) populations in Canada. Botany, 91(9): 605–613. DOI: 10.1139/cjb-2013-0063

Commission for Environmental Cooperation (CEC). 1997. Ecological regions of North America: toward a common perspective [online]: Available from www3.cec.org/islandora/en/item/1701-ecological-regions-north-america-toward-common-perspective-en.pdf.

Coristine LE, Jacob AL, Schuster R, Otto SP, Baron NE, Bennett NJ, et al. 2018. Informing Canada's commitment to biodiversity conservation: a science-based framework to help guide protected areas designation through Target 1 and beyond. FACETS, 3: 531–562. DOI: 10.1139/facets-2017-0102

COSSARO. 2014a. Categories and criteria for status assessment used by the Committee on the Status of Species at Risk in Ontario (COSSARO) [online]: Available from cossaroagency.ca/wp-content/uploads/2017/06/Accessible_COSSAROcriteria201403En.pdf.

COSSARO. 2014b. Ontario species at risk evaluation report for gypsy cuckoo bumble bee (*Bombus bohemicus*) [online]: Available from cossaroagency.ca/wp-content/uploads/2017/12/AccessibleCOSSAROevalGypsyCuckooBumbleBee.pdf.

COSSARO. 2015. Ontario species at risk evaluation report for spotted turtle (*Clemmys guttata*) [online]: Available from cossaroagency.ca/wp-content/uploads/2017/06/Accessible_COSSARO-evaluation-Spotted-Turtle.pdf.

COSSARO. 2016. Ontario species at risk evaluation report for gray fox (*Urocyon cinereoargenteus*) [online]: Available from cossaroagency.ca/wp-content/uploads/2017/06/Accessible_Final_COSSAROEvaluation_Gray-Fox_June2016.pdf.

Drummond MA, and Loveland TR. 2010. Land-use pressure and a transition to forest-cover loss in the eastern United States. BioScience, 60(4): 286–298. DOI: 10.1525/bio.2010.60.4.7

Earl JE, Nicol S, Wiederholt R, Diffendorfer JE, Semmens D, Flockhart DTT, et al. 2018. Quantitative tools for implementing the new definition of significant portion of the range in the U.S. Endangered Species Act. Conservation Biology, 32(1): 35–49. PMID: 28574183 DOI: 10.1111/cobi.12963

Endangered Species Act. 2007. c. 9 [online]: Available from https://www.ontario.ca/laws/statute/07e06.

Environmental Commissioner of Ontario (ECO). 2013. Laying siege to the last line of defence: a review of Ontario's weakened protections for species at risk [online]: Available from docs.assets.eco.on.ca/reports/special-reports/2013/2013-Laying-Siege-to-ESA.pdf.

Evans DM, Che-Castaldo JP, Crouse C, Davis FW, Epanchin-Niell R, Flather CH, et al. 2016. Species recovery in the United States: increasing the effectiveness of the Endangered Species Act. Issues in Ecology. Report No. 20. Ecological Society of America, Washington, D.C. 27 p. [online]: Available from https://www.fs.fed.us/rm/pubs_journals/2016/rmrs_2016_evans_d001.pdf.

Gibson SY, Van der Marel RC, and Starzomski BM. 2009. Climate change and conservation of leading-edge peripheral populations. Conservation Biology, 23(6): 1369–1373. PMID: 20078636 DOI: 10.1111/j.1523-1739.2009.01375.x

Kerr JT, and Cihlar J. 2004. Patterns and causes of species endangerment in Canada. Ecological Applications, 14(3): 743–753. DOI: 10.1890/02-5117

Kerr JT, and Deguise I. 2004. Habitat loss and the limits to endangered species recovery. Ecology Letters, 7(12): 1163–1169. DOI: 10.1111/j.1461-0248.2004.00676.x

Leclère D, Obersteiner M, Barrett M, Butchart SHM, Chaudhary A, De Palma A, et al. 2020. Bending the curve of terrestrial biodiversity needs an integrated strategy. Nature, 585: 551–556. PMID: 32908312 DOI: 10.1038/s41586-020-2705-y

Melles SJ, Fortin M-J, Lindsay K, and Badzinski D. 2011. Expanding northward: influence of climate change, forest connectivity, and population processes on a threatened species' range shift. Global Change Biology, 17(1): 17–31. DOI: 10.1111/j.1365-2486.2010.02214.x

Ministry of the Environment, Conservation, and Parks (MECP). 2019. 10th year review of Ontario's Endangered Species Act: discussion paper. Environmental Registry of Ontario [online]: Available from https://ero.ontario.ca/notice/013-4143.

Mooers AO, Doak DF, Findlay CS, Green DM, Grouios C, Manne LL, et al. 2010. Species, policy, and species at risk in Canada. BioScience, 60(10): 843–849. DOI: 10.1525/bio.2010.60.10.11

NatureServe. 2016. Spotted turtle (*Clemmys guttata*) [online]: Available from https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.100580/Clemmys_guttata.

Nixon S, Page D, Pinkus S, Podolsky L, and Russell S. 2012. Failure to protect: grading Canada's species at risk laws. Ecojustice Canada, Vancouver, British Columbia [online]: Available from ecojustice.ca/wp-content/uploads/2014/08/Failure-to-protect_Grading-Canadas-Species-at-Risk-Laws.pdf.

Ogden LE. 2019. Ontario weakens species at risk act. Frontiers in Ecology and the Environment, 17(5): 248–252. DOI: 10.1002/fee.2051

Olive A, and Penton G. 2018. Species at risk in Ontario: an examination of environmental non-governmental organizations. The Canadian Geographer/Le Géographe canadien, 62(4): 562–574. DOI: 10.1111/cag.12483

Ray JC, and Ginsberg JR. 1999. Endangered species legislation beyond the borders of the United States. Conservation Biology, 13(5): 956–958. DOI: 10.1046/j.1523-1739.1999.099i1.x

Ricketts TH, Dinerstein E, Olson DM, Loucks CJ, Eichbaum W, DellaSala DA, et al. 1999. Terrestrial ecoregions of North America: a conservation assessment. Island Press, Washington, D.C.

Schwartz MW. 2008. The performance of the Endangered Species Act. Annual Review of Ecology, Evolution, and Systematics, 39(1): 279–299. DOI: 10.1146/annurev.ecolsys.39.110707.173538

Species at Risk Act. 2002. c. 29 [online]: Available from https://laws-lois.justice.gc.ca/eng/acts/S-15.3/index.html.

Steen DA, and Barrett K. 2015. Should states in the USA value species at the edge of their geographic range? Journal of Wildlife Management, 79(6): 872–876. DOI: 10.1002/jwmg.897

Sunday JM, Bates AE, and Dulvy NK. 2012. Thermal tolerance and the global redistribution of animals. Nature Climate Change, 2(9): 686–690. DOI: 10.1038/nclimate1539

U.S. Fish and Wildlife Service and National Marine Fisheries Service (FWS and NMFS). 2014. Final policy on interpretation of the phrase "significant portion of its range" in the Endangered Species Act's definitions of "endangered species" and "threatened species". Federal Register, 79: 37578–37612.

Waples RS, Nammack M, Cochrane JF, and Hutchings JA. 2013. A tale of two acts: endangered species listing practices in Canada and the United States. BioScience, 63(9): 723–734. DOI: 10.1093/bioscience/63.9.723

Westwood AR, Otto SP, Mooers A, Darimont C, Hodges KE, Johnson C, et al. 2019. Protecting biodiversity in British Columbia: recommendations for developing species at risk legislation. FACETS, 4: 136–160. DOI: 10.1139/facets-2018-0042

Wilhere GF. 2017. The role of scientists in statutory interpretation of the U.S. Endangered Species Act. Conservation Biology, 31(2): 252–260. PMID: 27601227 DOI: 10.1111/cobi.12833