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The Species at Risk Act (2002) and Transboundary Species Listings along the US–Canada Border

Sarah Raymond [1], Sarah E. Perkins [1] and Greg Garrard [2,*]

[1] School of Biosciences, Cardiff University, Sir Martin Evans Building, Cardiff CF10 3AX, UK; raymondsc@cardiff.ac.uk (S.R.); perkinss@cardiff.ac.uk (S.E.P.)
[2] Department of English and Cultural Studies, The University of British Columbia, Kelowna, BC V1V 1V7, Canada
* Correspondence: greg.garrard@ubc.ca

Abstract: This paper is a collaborative interdisciplinary examination of the scientific, political, and cultural determinants of the conservation status of mammal species that occur in both Canada and the USA. We read Canada's Species at Risk Act as a document of bio-cultural nationalism circumscribed by the weak federalism and Crown–Indigenous relations of the nation's constitution. We also provide a numerical comparison of at-risk species listings either side of the US–Canada border and examples of provincial/state listings in comparison with those at a federal level. We find 17 mammal species listed as at-risk in Canada as distinct from the USA, and only 6 transboundary species that have comparable levels of protection in both countries, and we consider several explanations for this asymmetry. We evaluate the concept of 'jurisdictional rarity', in which species are endangered only because a geopolitical boundary isolates a small population. The paper begins and ends with reflections on interdisciplinary collaboration, and our findings highlight the importance of considering and explicitly acknowledging political influences on science and conservation-decision making, including in the context of at-risk-species protection.

Keywords: conservation legislation; Canada; USA; environmental humanities; jurisdictional rarity; science and technology studies

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1. Introduction

Environmental scientists and humanists[1] share the desire to understand and alleviate human impacts on the environment. We differ in our methods, in the kinds of questions we tend to ask, and in the ways that knowledge is produced and validated within our disciplines. Raymond and Perkins, for example, co-authored a paper titled 'Temporal patterns of roadkill in the UK' (Raymond et al. 2021), that quantified seasonal variations in wildlife–vehicle collisions for 19 commonly-reported taxa of mammals and birds. The paper delivers useable knowledge: increased risk of wildlife mortality is seasonally linked to a given species biology, for example, increased foraging or natal dispersal. Such inference may ultimately provide anthropocentric insights to road safety with road accidents linked to drivers trying to avoid killing the animals. It argues that 'By quantifying seasonal patterns in roadkill, we highlight a significant anthropogenic impact on wild species, which is important in relation to conservation, animal welfare, and human safety.' For each taxon (e.g., gulls, hares), the annual reported roadkill are modelled across six years of data. Statistical analysis is used to test the correlation of modelled variation with seasonal variations in mean temperature and mean monthly rainfall.

Raymond et al. (2021) conforms to the 'epistemic culture' (Knorr-Cetina 1999) of wildlife ecology and its methods seek to minimize 'bias' by ensuring statistical validity. Its findings are presented in a paper with five listed co-authors, and is written in an impersonal idiom with a standardised structure (methods, data, results, discussion) and supporting graphs. The paper is an approved (i.e. peer-reviewed, published) output of a process by

which 'what counts as knowledge and technology is accomplished in designated settings through specific strategies that generate, validate, and communicate scientific accomplishments' (Knorr-Cetina and Reichmann 2015). Garrard's publications, by contrast, are almost all single-authored critical and reflective discussions of topics in ecocriticism, devoid of data and infographics but otherwise heterogenous in presentation and organisation (Garrard 2020, 2023). Their validity depends on the persuasive interpretation of statistically insignificant numbers of mainly literary texts. Pedagogical papers aside, Garrard's publications have no practical implication beyond suggesting which books a prospective reader might consider worthwhile. The present paper represents an interdisciplinary integration of these distinct epistemic cultures, drawing also on social science sources, that explains how and why transboundary mammal species are differently classified as 'endangered' within the regimes of environmental governance in the USA and Canada.

Integration, though, must proceed from an honest appraisal of the prevalent epistemic hierarchy that values quantitative knowledge above qualitative (i.e. social science), and empirical knowledge in general above the hermeneutic, or interpretive, claims of humanistic scholarship. Scientific knowledges are sought and valued across many spheres of environmental governance from pollution detection and regulation through biodiversity protection to climate change. Though scientific knowledges are more politically persuasive than humanistic ones, they are not decisive, as we have seen in the cases of climate science and wildfire ecology. Nevertheless, the contribution of environmental humanities to, in this case, wildlife conservation is far from obvious, and has to be justified.

The meaning of the term 'endangered species' seems self-evident: it is a biological type represented by so few individuals it is at risk of extinction. The globalisation of environmental NGOs, such as the WWF and Greenpeace, and the wide influence of wildlife documentaries, reinforce the idea that there *just are* endangered species, and that this is a sad fact. As Ursula Heise (2016a) points out, conservation campaigns frame dwindling numbers of, say, mountain gorillas, *Gorilla beringei beringei*, or right whales, *Eubalaena* sp., within:

> . . . a similar story template: the idea that modern society has degraded a natural world that used to be beautiful, harmonious, and self-sustaining and that might disappear completely if modern humans do not change their way of life. (p. 7)

In literary history, the 'elegy' is a genre, usually of poetry, that mourns the loss of beloved people, animals, and places. Heise therefore calls the prevalent story template of conservation 'elegiac'.

The concept of endangered species and the elegiac template are so familiar it can be difficult to see them as culturally contingent, rather than 'how things really are'. Luckily, it is the role of the environmental humanities to raise awkward questions. The accepted language of endangerment is shaped, above all, by the International Union for the Conservation of Nature's (IUCN) trademarked 'Red List of Threatened Species', which categorizes all biological species for which data exist into seven hierarchical categories from 'extinct' to 'least concern'. While the IUCN endeavours to use an objective (i.e., quantitative) methodology for its listing, Heise (2016c, p. 72) points out that 'a narrative of risk and of value attribution is hardwired into these very categories, where extinction and endangerment are defined positively, whereas species that thrive are tagged by means of negation or approximation: "near threatened" and "least concern"—as opposed to, say, labels such as "safe," "stable," or "increasing."' The elegiac template is implicit, in other words, even within the universalizing context of the IUCN database. Recognising this, the IUCN has been developing a 'Green List' since 2018 that would recognise effective conservation and recovery of Red Listed species (Hockings et al. 2019).

The globalised rhetoric of endangered species wrongly implies that both the object of concern—the species—and its objective—to relieve endangerment—are truly universal. Yet Heise's comparative analysis of biodiversity legislation from Germany, the USA, the European Union, and Bolivia shows that, while international treaties impose globalising frameworks, 'biodiversity laws . . . differ from one another in surprising ways, and they are passed and adjusted at particular historical moments for quite divergent reasons' (Heise

2016b, p. 89). In this paper, we undertake a cultural analysis of Canada's Species at Risk Act (SARA 2002) to show how this pivotal text is shaped by two tensions: first, between federal and other jurisdictions, and second, between liberal internationalism and deference to American exceptionalism. Next, we present a comparative examination of USA/Canada transboundary mammalian species classifications that reveals how and why Canada is disproportionately engaged in conserving species that are rare on its side of the border, but globally secure.

2. Reading the Species at Risk Act

The Canadian federal government came rather late to comprehensive nationwide conservation legislation. As Heise's discussion points out, Germany's first nature protection act was passed by the National Socialist (AKA 'Nazi') government in 1935; the American Endangered Species Act (ESA) passed in December 1973; and the first of many European Union Habitats Directives was issued in 1992. The Canada Wildlife Act (CWA), passed in July 1973, provided for national wildlife areas (NWA), but otherwise mandated the federal government merely to fund research into non-domestic terrestrial animals, and to coax and coordinate other jurisdictions. Section 8 of the CWA made it possible for the federal government to protect wildlife by regulation in concert with the provinces:

> The Minister may, in cooperation with one or more provincial governments having an interest therein, take such measures as the Minister deems necessary for the protection of any species of wildlife in danger of extinction.

In 1994, the CWA was amended to apply to 'any animal, plant or other organism belonging to a species that is wild by nature … and to the habitat of any such animal, plant or other organism' (Donihee 2000, p. 60). Still, the federal government had to defer to the provinces.

John Donihee notes that, while the Canadian 'Constitution Act, 1867' includes no mention of terrestrial wildlife, conservation is a provincial jurisdiction by default: 'Provincial authorities over wildlife are based on ownership of Crown lands in the province … and on legislative authorities granted by subsections 92(5) "the management and sale of public lands belonging to the province …", 92(13) "property and civil rights in the province" and 92(16) "generally all matters of a merely local or private nature in a province".' (p. 4) The federal government is entitled to override provincial jurisdiction in order to fulfil international treaties it has signed, such as those concerning migratory birds, the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the 1992 United Nations Convention on Conservation of Biological Diversity (UNCCBD). Even the fulfilment of treaty obligations has, Donihee (2000) argues, required 'cooperative federalism' (p. 6) because Canada gained control of its foreign affairs in 1926. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an example of such cooperation. It was founded following a conference of federal–provincial–territorial conservation bureaucrats in 1976 to provide scientific evidence of the status of species at risk, and was later incorporated on a statutory, albeit advisory, basis into the Canadian Species at Risk Act (SARA).

Canadian 'Crown land' (i.e., public land) is divided between the federal and territorial or provincial governments; the Yukon, Northwest and Nunavut territories are almost entirely federal Crown land, whereas the federal government controls between 0.2% (Quebec) and 10.6% (Alberta) of the ten provinces' land areas (Neimanis 2011) in the form of National Parks, Indian Reserves and Canadian Forces bases. The provinces derive a great deal of their revenue from the sale of Crown land for development, and from the licensing of commercial activities, such as mining and forestry, on it. Canada contrasts in this regard with the USA, where the high proportion of federally-administered land in western states (80.1% in Nevada) is an ongoing cause of conflict (Vincent et al. 2020).

Following the 1992 Rio Summit, and Canada's ratification of the Convention on Biological Diversity, the federal Liberal government, led by Prime Minister Jean Chrétien, introduced a series of bills designed to protect species at risk (Hoffman 2018). Bill C-65

(1996–7) was a radical legislative proposal that would have empowered COSEWIC itself to list species for protection, and authorised citizens to compel governments to protect species by bringing lawsuits. The draft bill made federal listing binding on provinces with respect to aquatic species and migratory birds (so-called 'federal species'), and a later amendment asserted Ottawa's jurisdiction over all 'transboundary' species (Illical and Harrison 2007). The bill met with 'immediate rejection by industry' (Olive 2014b, p. 4) and the provinces, and then 'died in 1997 when a federal election was called' (p. 4).

The Liberal's third attempt, Bill C-5, was passed as the 'Species At Risk Act' on 12 December 2002. Mary Illical and Kathryn Harrison's comparison of the legislative process and outcome of the ESA and the SARA explains that 'the more discretionary approach taken in the SARA flows from the fusion of legislative and executive functions in Canada's parliamentary government, in contrast to the institutionalized distrust within the American separation of powers' (Illical and Harrison 2007, p. 368). The authors' interviews with key Canadian players also reveal that the ESA 'was in fact an important source of *negative* lessons for Canadian business and, in turn, Canadian legislators, who consciously sought to avoid the economic consequences and litigiousness that flowed from the nondiscretionary approach of the US ESA' (p. 372). For example, Bill C-65's provision for 'citizen [law] suits', which was modelled on the ESA, was deleted; the SARA 2002 merely allows citizens to request investigation of potential species at risk. Although federal jurisdiction over endangered species was greatly extended in the SARA, as we shall see, the Act frames this safety net in terms that ensure it will hardly ever be used.

Heise (2016b, p. 90) argues that:

> Legal texts allow us to trace why and how . . . communities see the fate of nonhuman species as part of their own identity and history, and—given the institutional power of legal texts to shape and enforce social practices . . .—how they envision the best possible relation between humans and nonhumans now and in the future.

Reading the SARA (2002) from this perspective, we notice that the eighteen-part Preamble acknowledges a wide variety of motivations for the Act, including protection of 'natural heritage' ['le patrimoine naturel']; the 'value' that wildlife has 'in and of itself'; as well as its value to 'Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons'. Beyond their value to the nation, 'Canadian wildlife species and ecosystems are also part of the world's heritage' [patrimoine mondial]', as the Government of Canada recognizes through its ratification of the UNCCBD. The federal government is therefore 'committed to conserving biological diversity' as a nation-building project and as a token of Canada's commitment to liberal internationalism—so long, that is, as conservation measures are 'cost-effective'. The Act's advocacy of 'national standards of environmental conservation', 'national leadership' from the new Canadian Endangered Species Conservation Council (CESCC), and the 'vital' contribution of 'Canada's protected areas, especially national parks', exist in tension with the 'essential' role of the 'aboriginal peoples of Canada' and the constitutional reality that 'responsibility for the conservation of wildlife in Canada is shared among the governments of this country'. Perhaps because the SARA is so recent, relative to similar laws elsewhere, its Preamble encompasses all of the following extant rationales for conservation: intrinsic and instrumental value, individual species and 'biodiversity', national and international 'heritage', and indigenous ethics and governance.

Whilst the Preamble provides the expansive mood music, the text of the Act itself partially retreats from its implications. Section 3 is a non-derogation statement that, 'For greater certainty', aboriginal or treaty rights affirmed in section 35 of the Constitution Act, 1982, will always prevail. The 'constitutional paramountcy of aboriginal rights' (Donihee 2000, p. 59), which distinguishes Canadian from US law, is further affirmed in repeated statements throughout the text of the government's duty to consult with First Nations and Wildlife Management Boards established as part of aboriginal land claims processes.

The legal definition of a wildlife species *(espèce sauvage*) in Section 2 'Interpretation: Definitions' is capacious:

> wildlife species means a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and
>
> (a) is native to Canada; or
>
> (b) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.

In keeping with its reputation for welcoming migrants, Canada's SARA provides for wildlife species to 'naturalise', to use a term from immigration law, although the stipulated period is far longer than the three years humans must reside in the country as permanent residents prior to applying for citizenship. We are unaware of any naturalised species in the present SARA list, although if the European starling, *Sturnus vulgaris*, ever suffered a severe population decline, it would presumably qualify.[2]

Moreover, the definition ventures much further down the taxonomic levels of biology than the name of the Act—*species* at risk—might suggest. Calla Raymond and colleagues comment that, while COSEWIC's determination of the appropriate 'Designatable Unit' (DU) of conservation may be ecologically valid, its guidelines are 'subjective', thus 'subject to uncertainty and debate' (Raymond et al. 2018, p. 74). In a later section, we ask if the geopolitical boundary influences, in subtle ways, COSEWIC's decisions about Dus, over and above ecological considerations. Finally, we might also note that the definition excludes feral species by invoking a questionable conception of being 'wild by nature' that receives no further definition in the Act.

By contrast with the Preamble, the statutory definition of the 'Purposes' (Section 6) of the Act is restrictive:

> The purposes of this Act are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.

Following Heise (2016a), we would say that the SARA closely follows the US Endangered Species Act (ESA) in putting conservation of individual species at its centre, rather than objectives such as biodiversity, German *Landschaft* ('landscape'), or the rights of *La Madre Tierra* ('Mother Earth'), as in Bolivia. Whereas the EU's Natura 2000 scheme aims to preserve habitats, and the species that live in them as a consequence, the ESA added protection of a listed species' 'critical habitat' as a later amendment, while the SARA included designation of critical habitat in the law from the outset as part of a 'recovery action plan' (Sec.49, 58) (Heise 2016b). However, as Andrea Olive shows in a helpful comparison of the two laws in relation to key issues, the ESA mandates the US Fish and Wildlife Service (USFWS) to designate habitat at the same time a species is listed, whereas the SARA assigns critical habitat listing to the later 'recovery strategy' phase (Olive 2014b). Moreover, the SARA's categories of endangerment and assessment methodology map onto those of the IUCN Red List, as we discuss below, whereas the ESA employs its own categories.

The perennial tension between federal and provincial jurisdictions is clearest when the Act sets out 'Measures to Protect Listed Wildlife Species'. Section 32 states that 'No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species.' However, because federal law only applies to federal species, or on federal land within provinces, Section 34 immediately withdraws the application of Section 32—unless 'the Minister is of the opinion that laws of the province do not effectively protect the species...' (Section 34.3), in which case they 'must recommend' (Section 34.3) to the Governor in Council (i.e., the Crown's representative in Canada, the Governor-General) that a protection order be issued, thereby overriding provincial jurisdiction. As if to cool the impact of this incendiary provision, Section 36 commits the government to automatic protection on federal land of any non-SARA-listed species that a territorial or provincial minister designates. This, somewhat comical, to and fro amounts to the federal government warning the provinces

that they *could* pull rank . . . but they *won't* . . . but they *might*. As a matter of fact, the SARA's power to impose an emergency order (Section 80) has been invoked twice: in 2013, to protect remnant populations of the Greater Sage-Grouse, *Centrocercus urophasianus*, in Alberta and Saskatchewan (ECCC 2013), and in 2016, to protect a subpopulation of the Western Chorus Frog, *Pseudacris triseriata* (ECCC 2016), an aquatic species. The latter is also the only example of critical habitat designation extending to private land. At the time of writing, the federal government has decided, against the advice of the Minister of Energy, Environment and Climate Change, Stephen Guilbeault, not to issue an emergency order that would overrule the provincial government and designate 120,000 hectares of additional critical habitat for the Northern Spotted Owl, *Strix occidentalis caurina*, of which just one individual survives in the wild in Canada (Cox 2023).

The provinces and territories have exercised their legislative authority in widely differing ways. A comprehensive survey of 'federal, provincial, and territorial laws' (p. 1044) pertaining to biodiversity identified no fewer than 201 pieces of legislation (Ray et al. 2021). British Columbia, for instance, has nine major statutes affecting species at risk, yet, in common with Alberta, Saskatchewan, Yukon, and Prince Edward Island, it has no standalone species-at-risk law. The list of 85 BC species protected under the province's Forest and Range Practices Act has not been updated since 2006 (Ministry of Environment 2006). Whilst Québec has enacted provincial legislation, separatist sentiment deters its governments from participating in federally coordinated initiatives such as the 1996 National Accord for the Protection of Species at Risk. Biologists had previously considered Ontario's 2007 Endangered Species Act (OESA) 'the best of its kind in Canada' (Bergman et al. 2020, p. 424) because listed species received automatic legal protection, and then the Progressive Conservative provincial government elected in 2018 'reformed' the ESA to lessen its powers. British Columbia's left-wing New Democratic Party government pledged, in 2018, to replace the province's 'inadequate patchwork of legislation' (Westwood et al. 2019, p. 138) with a single law, but the 'consultation' is still ongoing. In the meantime, the BC Wildlife Act (1982), the Land Act (1979), the BC Forest and Range Practices Act (2002), together with a 2005 federal–provincial agreement, govern conservation in the province (Cruickshank 2022). This example underscores that 'Biodiversity [in Canada] is formally protected and managed through a bewildering array of policy instruments administered by different levels . . . or scales of government' (Ray et al. 2021, p. 1045).

Having provided a textual analysis of the SARA, we now quantify the differences between its Schedule One list of at-risk mammalian dUs (i.e., species, subspecies or populations), the global IUCN Red List, and the species protected by America's ESA. This granular analysis complements the overview of Raymond et al. (2018), which scores all 729 dUs in Schedule One (as of 2017) in relation to their 'IUCN threat category' only, and Thornton et al. (2018), which quantifies 'asymmetric protection' of 'peripheral transboundary species (PTS)' in three taxa across the US–Canada and US–Mexico borders. Our study is limited to and focused on mammals (including marine) because of their high mobility, over other taxa. We acknowledge that this in itself is a form of taxonomic bias, as is often reflected in conservation or in scientific studies. Still, we consider mammals sufficiently representative because they are mobile animals that can move across the 49th parallel (marking most of the terrestrial border) with relative ease. Considering the two nations' vast size and contiguity, and the conspicuous arbitrariness of the geopolitical boundary at the 49th parallel of latitude, we might expect a great deal of overlap between the SARA, the ESA and the IUCN Red List, when, in reality, discontinuity prevails.

3. Methods

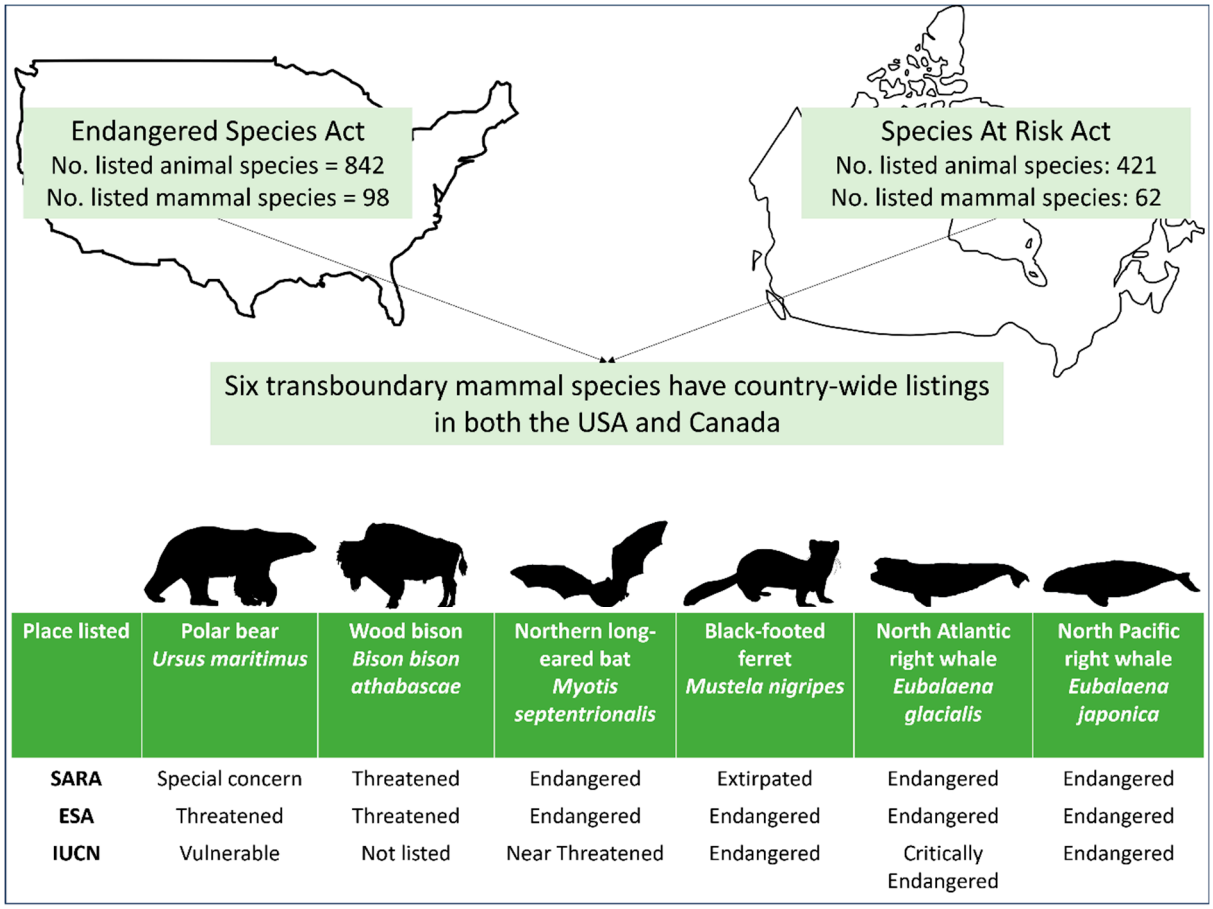
To investigate the current status of species with transboundary distributions across the US–Canada border, lists of species-at-risk were obtained from the Canadian Species At Risk Act (SARA 2002) and the USA's Endangered Species Act (USFWS 1973) and National Oceanic and Atmospheric Administration for aquatic species (NOAA 2023). Initially, a count of all listed species was obtained for comparison, and then specifically for mammal species, subspecies and populations—specific populations (designatable units (DUs) in Canada and distinct population segments (DPS) in the USA) are sometimes listed as opposed to the whole species at a country-wide level. We extracted the name and status of each mammal species or subspecies (e.g., endangered or threatened; see Supplementary Table S1 for all potential statuses) for each country. Additionally, we obtained the relevant IUCN classification for each of these species for comparison (IUCN 2023). We used NatureServe Explorer (NatureServe 2023) to check whether species and subspecies distributions were transboundary or only found on one side of the US–Canada border. We identified those species and subspecies with transboundary distributions which were either (a) listed as a species-at-risk on both sides of the border or (b) only listed on one side of the border.

The epistemic culture of biology expects statistical tests to be applied wherever possible. Thus, to test whether the USA and Canada share similar overall numbers of endangered and threatened mammal species with country-wide listings (i.e., excluding those only listed for a specific population), we used a chi-squared test for independence on the count of species in each category using R v4.3.0 (R Core Team 2022).

In addition, to provide a regional example of how federal species-at-risk listing aligns with provincial or state assessments, we extracted a count and details of the mammal species listed in the British Columbia (Canada) Red, Blue and Yellow lists (CDC 2023), and the Washington (USA) State-Listed Species (WDFW 2023). These are both provincial/state-level lists of species and subspecies at particular risk in those regions. We first compared whether the species listed at a federal level (SARA or ESA/NOAA) were also listed on a regional level, and then identified any species that are listed at a regional level but not in the SARA or ESA lists. Regional listings, we must recall, have different political significance on either side of the border. Under the ESA, the Secretary for the Interior is allowed to delegate authority to a state government, 'but only if states first demonstrate that their programs meet federal standards', whereas the SARA effectively requires the federal government to 'justify its involvement' (Illical and Harrison 2007, p. 383).

4. Results

There were 62 mammal listings in the SARA (including species, subspecies and specific populations), and 98 under the ESA (including species, subspecies and distinct population segments (DPS)). Of those mammals listed in the SARA, just over half (n = 34) were listed at a country-wide level i.e., having the same level of risk across the whole of Canada; only six of these species were also listed at a country-wide level under the ESA (Figure 1). The count of endangered and threatened species listed in each country at a country-wide level was statistically similar (χ^2 = 1.2, df = 1, p = 0.274). In addition, two species were listed at a country-wide level in Canada but only for a specific subspecies in the USA (Table 1): sea otter, *Enydra lutris* (*keyoni* and *nereis* ssp.), and mountain beaver, *Aplodontia rufa* (*nigra* ssp.). The Steller sea lion, *Eumetopias jubatus*, was listed at a species level in Canada but only for a specific population (western DPS) in the USA (Supplementary Table S2). Five species were listed at a country-wide level in the USA but only at the population level in Canada, while five species were listed at the population-level in both countries (Supplementary Table S2).



Place listed	Polar bear *Ursus maritimus*	Wood bison *Bison bison athabascae*	Northern long-eared bat *Myotis septentrionalis*	Black-footed ferret *Mustela nigripes*	North Atlantic right whale *Eubalaena glacialis*	North Pacific right whale *Eubalaena japonica*
SARA	Special concern	Threatened	Endangered	Extirpated	Endangered	Endangered
ESA	Threatened	Threatened	Endangered	Endangered	Endangered	Endangered
IUCN	Vulnerable	Not listed	Near Threatened	Endangered	Critically Endangered	Endangered

Figure 1. The number of animal and mammal species listed under the SARA (in Canada) and ESA (in the USA) are outlined, as well as the number of mammal species with both transboundary distributions and country-wide listings in Canada and the USA. Only six mammal species meet these criteria i.e., the whole species is listed across the entirety of the country, not just a specific population. Specific listings for each of these six species under the SARA and ESA are indicated, as well as their corresponding IUCN classification (if applicable).

Overall, there were 20 transboundary mammal species that were only listed in one country (17 listed under SARA, 3 under the ESA; Table 1). Additionally, five species had one or more DPS listed under the ESA where the species' range extends into Canada, but the species was not listed under SARA: Gray wolf, *Canis lupus,* Northern sea otter, *Enhydra lutris kenyoni*; Fisher, *Pekania pennanti*; Bearded seal, *Erignathus barbatus;* and Ringed seal, *Pusa hispida*. The majority (63%) of endangered species and species of special concern in Canada were not listed in the USA, and of these 53% were assessed as of least concern or not listed under the IUCN Red List (Table 1; Figure 2). There were clear disparities and misalignment in designation at every level under the SARA and ESA, with none of the designations showing complete uniformity across the border (i.e., each category branched at least once (Figure 2).

Table 1. The status of mammal species with distributions in both Canada and the USA and which are listed in at least one country (either under the SARA or ESA). Corresponding IUCN classifications are also shown at a species level. Only country-wide species or subspecies listings are included (i.e., instances where a specific localised population is listed are excluded). Listings in italics indicate where a species or subspecies is listed under both the SARA and ESA. '*' indicates where a specific, named subspecies is listed in one country rather than the species.

Species	SARA	ESA	IUCN
Pallid bat *Antrozous pallidus*	Threatened	Not listed	Least Concern
Black-tailed prairie dog *Cynomys ludovicianus*	Threatened	Not listed	Least Concern
Ord's kangaroo rat *Dipodomys ordii*	Endangered	Not listed	Least Concern
Spotted bat *Euderma maculatum*	Special Concern	Not listed	Least Concern
Wolverine *Gulo gulo*	Special Concern	Not listed	Least Concern
Sowerby's beaked whale *Mesoplodon bidens*	Special Concern	Not listed	Least Concern
Woodland vole *Microtus pinetorum*	Special Concern	Not listed	Least Concern
Haida ermine *Mustela haidarum*	Threatened	Not listed	Not listed
Little brown myotis *Myotis lucifugus*	Endangered	Not listed	Endangered
Collared pika *Ochotona collaris*	Special Concern	Not listed	Least Concern
Tri-coloured bat *Perimyotis subflavus*	Endangered	Not listed	Vulnerable
Western harvest mouse *Reithrodontomys megalotis (dychei)*	Endangered *	Not listed	Not listed
Eastern mole *Scalopus aquaticus*	Special Concern	Not listed	Least Concern
Townsend's mole *Scapanus townsendii*	Endangered	Not listed	Least Concern
Pacific water shrew *Sorex bendirii*	Endangered	Not listed	Least Concern
Grey fox *Urocyon cinereoargenteus*	Threatened	Not listed	Least Concern
Swift fox *Vulpes velox*	Threatened	Not listed	Least Concern
Canada lynx *Lynx canadensis*	Not listed	Threatened	Least Concern
Pacific marten *Martes caurina*	Not listed	Threatened	Least Concern
Sperm whale *Physeter macrocephalus*	Not listed	Endangered	Vulnerable
Mountain beaver *Aplodontia rufa (nigra)*	Special Concern	Endangered *	Least Concern
Sea otter *Enhydra lutris (kenyoni)*	Special Concern	Threatened *	Endangered
Sea otter *Enhydra lutris (nereis)*	Special Concern	Threatened *	Endangered
Polar bear *Ursus maritimus*	Special Concern	Threatened	Vulnerable
Wood bison *Bison bison athabascae*	*Threatened*	*Threatened*	*Not listed*
Northern myotis *Myotis septentrionalis*	*Endangered*	*Endangered*	*Near Threatened*
Black-footed ferret *Mustela nigripes*	*Extirpated*	*Endangered*	*Endangered*
North Atlantic right whale *Eubalaena glacialis*	*Endangered*	*Endangered*	*Critically Endangered*
North Pacific right whale *Eubalaena japonica*	*Endangered*	*Endangered*	*Endangered*

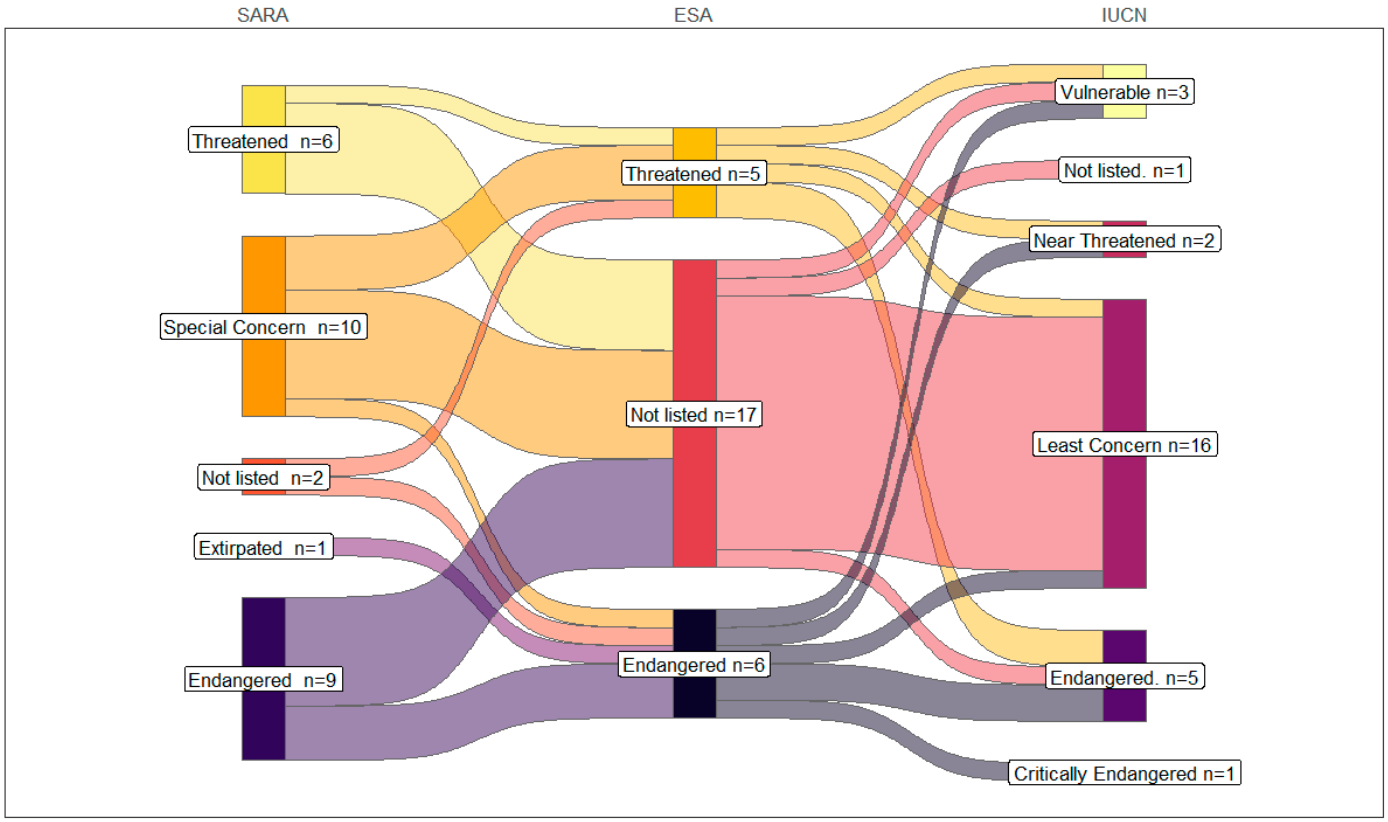


Figure 2. The relationship between the at-risk status of mammal species in Canada ('SARA'), the US ('ESA') and globally according to the IUCN. Only mammal species and subspecies which are listed as at-risk on at least one side of the US–Canada border are included, and only if they are listed at a species or subspecies level (not for a specific population or DPS). All IUCN classifications are at a species level. 'Not listed' means that the species or subspecies occurs in that country but is not considered as at-risk, or, if written above 'IUCN' on the x-axis, it means that the species does not have an IUCN classification. Colours are used to aid with interpretation and to follow connections between the different listings and levels of protection. Branching indicates discrepancies between species-at-risk classifications across the three lists: SARA, ESA and IUCN.

Provincial-Scale

Of the 34 mammal species listed country-wide in SARA, there were only 2 subspecies that were found in BC but did not have a provincial classification in BC: the Western harvest mouse, *megalotis,* of subspecies *Reithrodontomys megalotis megalotis*, and Nuttall's cottontail, *nuttallii,* of subspecies *Sylvilagus nuttalli nuttalli.* Both subspecies were listed as of special concern under the SARA but were not featured at a subspecies level on any BC species lists (Supplementary Table S3). The remaining 32 species either had BC classifications or do not currently have distributions in BC, so were not listed. Interestingly, there were also 16 mammal species, subspecies or distinct populations with designations on the BC Red List that were not listed at a country-wide scale in the SARA (Supplementary Table S3). Similarly, there were 20 mammal species or subspecies on the BC Blue List that are not listed in SARA.

The lack of alignment between provincial and federal listings in Canada is not replicated in the USA. All ESA-listed mammal species whose distributions extend into the state of Washington were also listed in the Washington State Listed Species (n = 12; Supplementary Table S4), and there were just two species and three subspecies listed in Washington that were not listed in the ESA (Supplementary Table S4); for example, the Cascade red fox, *Vulpes vulpes cascadensis*, is endangered and endemic to Washington, whilst the Western

gray squirrel, *Sciurus griseus,* is threatened in Washington but its distribution extends into other US states too.

5. Discussion

The ESA and SARA have formed the basis of wildlife conservation and protection on either side of the US–Canada border for the last 50 and 21 years, respectively. Both pieces of legislation take a species-centred approach, prioritising the listing of species vulnerable to extinction and endangerment, in order to try and reduce human impacts on these species and encourage conservation efforts to restore populations. Two previous studies of transboundary species (Raymond et al. 2018; Thornton et al. 2018) identify discontinuity of conservation status across the US–Canada border, as we do, but derive quite different conclusions from the data, as discussed below. In this study, we reveal that the vast majority (69%) of listed mammal species with transboundary distributions are only protected on one side of the border. Six species currently have listings on both sides, of which only four have equivalent statuses. We also highlight the discrepancy between federal and provincial/state-protected mammal species listings in Washington and BC, which is much greater in Canada than in the USA. All but 2 species listed in the SARA and ESA are also included in these more localised lists; however, 5 additional species or subspecies are listed locally in Washington, and 36 in BC, which are not listed federally. Here, we discuss two categories of explanation for the discrepancy: methodological and political–institutional.

5.1. Differences in Listing Methodology and Terminology

Variation amongst species listings seen in this study could be ascribed to distinctive differences in listing methodologies and terminology across country and state/provincial borders. For example, COSEWIC bases its recommendations for classification on the quantitative criteria prescribed by the IUCN Red List (IUCN 2022; SARA 2002). In addition to providing transparency and facilitating comparisons across geopolitical boundaries, adoption of the IUCN criteria reflects Canada's vocal commitment to liberal internationalism. However, there are differences: there is no equivalent to the IUCN's 'Least Concern' category, Schedule 1's 'Extirpated' extends a term from island biogeography to the level of the nation-state, and the IUCN's 'Threatened' and 'Critically Endangered' categories align most closely to 'Special Concern' and 'Endangered' in Canada (Dorey and Walker 2018; McCune et al. 2013; Turcotte et al. 2021).

In contrast, the ESA only relatively recently (in 2016) adopted a Species Status Assessment Framework (Smith et al. 2018), which prescribes a series of steps for assessing a candidate species' ecology and life history, the current condition of a species' habitat and distribution, and predictions into the future. Although the ESA's framework has a definite procedure, it does not share the same specific numeric criteria as the SARA and IUCN. Additionally, whereas Canada entrusts assessments to an independent expert body, COSEWIC, which is expected to incorporate 'aboriginal traditional knowledge' (Section 15:2, 16: 2), a comparable organisation does not exist in the US (Waples et al. 2013). Instead, the status of species is assessed by employees of the USFWS and NOAA, or, in some cases, determined by lawsuits. On a more localised scale, the BC species-at-risk list uses different criteria to SARA, adopting the NatureServe methodologies and categories instead, which may contribute to the disparity between it and SARA's Schedule 1. NatureServe, a North American non-profit, has its own 'Rank Calculator' and uses different category names to those used by the IUCN (and SARA); however, there is some overlap in its methods, with a focus on, for instance, 'area of occupancy' and 'range extent'. Indeed, NatureServe ranks are often used to inform IUCN Red List assessment in relevant regions (Master et al. 2012).

Terminological differences may also explain some of the variation in status for transboundary species between both the US and Canada and between federal and provincial or state listings. For example, the definitions of 'Endangered' and 'Threatened' differ slightly between the SARA and ESA. An endangered species under the SARA is defined as 'a

wildlife species that is facing imminent extirpation or extinction', whereas, under the ESA, an endangered species is classed as 'a species in danger of extinction throughout all or a significant portion of its range'. The use of the word 'imminent' in the SARA suggests that a species will only be classified as endangered if it is right on the brink of becoming locally or more widely extinct, rather than if it could be subject to a future, albeit real, threat. There is, however, no temporal element to the ESA definition. Similarly, specifying that 'a significant portion' of a species' entire range, within and beyond the USA, must be imperilled for species under the ESA to be classified as endangered, leads to potentially differing interpretations of what constitutes 'significant' (Waples et al. 2013). SARA's most idiosyncratic feature is its 'Special Concern' category, which identifies species considered 'sensitive to human activities or natural events' without meeting the criteria for higher classification. The ESA has no direct equivalent; its list of 'Candidate species' merely includes species awaiting assessment.

American and Canadian endangered species laws emerge out of distinct political cultures, as Illical and Harrison (2007) show, and they are implemented by institutional actors, such as the USFWS, within broader cultural contexts that strongly influence their impact. The enormous power of the US federal government to mandate conservation, buttressed by control of a vast land base, has been challenged repeatedly by the kinds of rebellion that US culture mythologises, notably the 'war in the woods' during the 1980s and 90s over the listing of the spotted owl, *Strix occidentalis caurina,* in the Pacific northwest. Canada, a settler-colonial nation founded on the basis of loyalty to the British Crown, is known for having a less confrontational political culture, and a more deferential citizenry. Whereas the 1776 Declaration of Independence cites 'Life, Liberty, and the pursuit of Happiness' as 'inalienable rights', the 1867 British North America Act, the constitution of the Dominion of Canada, empowers parliament to maintain 'peace, order, and good government'. This collaborative political culture informs both the text of the SARA, as we have seen, and the lack of controversy attending its implementation to date.

Furthermore, classificatory terminology, along with the methods that determine its application, may aim at universality, but they gain legitimacy and are operationalised in conservation thanks to what Sheila Jasanoff (2005) calls 'civic epistemologies', which she defines as follows:

> the institutionalized practices by which members of a given society test and deploy knowledge claims used as a basis for making collective choices. Just as any culture has established folkways that give meaning to its social interactions, so I suggest that modern technoscientific cultures have developed tacit knowledge-ways through which they assess the rationality and robustness of claims that seek to order their lives; demonstrations or arguments that fail to meet these tests may be dismissed as illegitimate or irrational. (p. 255)

We are not in a position, here, to undertake a full comparative analysis of conservation science and law in terms of the following six dimensions listed by Jasanoff (2005): (1) the dominant participatory styles of public knowledge-making, (2) the methods of ensuring accountability, (3) the practices of public demonstration, (4) the preferred registers of objectivity, (5) the accepted bases of expertise, and (6) the visibility of expert bodies.

It is arguable, though, that the over-powered sanctions built into the ESA, and the fierce resistance encountered on occasion by its enforcer, the USFWS, has engendered a relatively conservative approach to species listings. They have certainly spawned a wealth of creative ways, including habitat conservation plans, safe harbour agreements and candidate conservation agreements, to avoid punishing American landowners (Olive 2014b). If the USFWS declines to act, as in the case of the spotted owl, American environmental organisations may take it to court to hash out competing knowledge claims. This transparent, pluralistic, adversarial style of knowledge production contrasts with Canada's consensus-seeking approach, which values expert rationality (including aboriginal knowledge, at least in principle) and negotiations behind closed doors. While some Canadian scientists argue that effective conservation requires more technocratic, coercive

legislation (Westwood et al. 2019), it is possible that BC and COSEWIC scientists list far more species than their colleagues down south precisely *because* their determinations make less difference. Moreover, as we note above, determinations of designatable units (DUs), including distinctions between genotypes, are not wholly objective. In the absence of motivations not to define DUs that lie within the scientists' geopolitical sphere of influence, it seems plausible that unconscious national or provincial bias influences their decisions.

In a 2004 paper, the forest scientist Fred Bunnell argued that the NatureServe methodology then used to develop the BC Red and Blue lists had a bias towards listing 'peripheral species', i.e., those existing at the edge of their range (Bunnell et al. 2004). He noted the 'plethora of peripherals' (p. 4) in the provincial lists, which he attributed to the following two factors: the mountainous topography of the province, which 'encourages small extensions of species that are more abundant elsewhere' (Bunnell et al. 2004), and 'unacknowledged correlates among features producing the rankings'. As he observed, 'Local rarity, low viability, erratic trend, small population size, and small ranges are natural characteristics of peripheral populations', which may be misidentified as endangered. The NatureServe methodology was revised in 2012 to minimize this bias (Master et al. 2012)—and yet the preponderance of peripheral species remains, as we have shown.

Bunnell also criticized the conservation of peripheral species in the following, pungent, terms:

Efforts to conserve species that are locally rare but globally common often simply ignore the ecologically marginal nature of habitat and population. They engage in a fight with nature. As well as being wasteful, this fight confronts common sense. Consider the fact that, had the United States prevailed in the "fifty-four forty or fight" (54°40′) argument of 1846, Sage Thrashers (*Oreoscoptes montanus* Townsend) and White-headed Woodpeckers (*Picoides albolarvatus* Cassin) would not be "critically imperiled" in British Columbia, but Pacific Tree Frogs (*Pseudacris regilla* Baird and Girard) and Brewer's Blackbirds (*Euphagm cyanocephalus* Wagler) would be. That change of status would have occurred with no change in abundance or distribution of the species.

Bunnell later coined the term 'jurisdictional rarity' (p. 79) to describe peripheral populations marooned on the wrong side of a geopolitical border, but abundant elsewhere (Bunnell et al. 2009). Whilst the 2009 Conservation Framework he developed for the BC government includes, as Goal 3, the maintenance of 'the full diversity of native species and ecosystems', it is put in the balance with the province's responsibility to protect globally endangered and endemic species (Goal 1) and practice preventive conservation (Goal 2). Bunnell is clear that Goal 1 implies greater 'stewardship responsibility' than Goal 3.

5.2. Cross-Border Conservation and Jurisdictional Rarity

Biologists argue that differences in conservation legislation and species' listings between countries, particularly those that exist on the same land mass without physical borders, act as a hindrance to species protection and conservation goals (Dallimer and Strange 2015; Titley et al. 2021). Species may face persecution on one side of a political border, but not the other, potentially coming into danger if they have shifting or migratory distributions. This is particularly relevant in light of future uncertainties regarding the climate crisis and predicted changes in species distributions as a result of warming temperatures. Species are expected to shift poleward as a result of increasing global temperatures (Chen et al. 2011), potentially resulting in the crossing of international borders, and the establishment of populations in previously unoccupied areas. As a result, the issue of transboundary conservation only becomes more complex, and differences in legislation could have an impact on whether a species is able to successfully establish in new environments (Pecl et al. 2017; Rüter et al. 2014; Thornton et al. 2018).

Such flagship cross-border efforts as the Y2Y Yellowstone to Yukon Conservation Initiative (https://y2y.net/; accessed on 15 December 2023) show that collaboration is possible, albeit hampered by the cultural, legal and political discontinuities discussed above. More typical, perhaps, is the radio silence that Andrea Olive (2014c) found between,

in this case, USFWS officials in Ohio and their counterparts in Ontario, both of whom were trying to save the Lake Erie water snake (*Nerodia sipedon insularum*). The American population of the water snake was listed under the ESA in 2003, regulations (including on private property) were introduced, recovery goals were set and met—largely because an invasive fish provided a new food source for the snake—and the snake was delisted in 2011. On the Canadian side, COSEWIC listed the snake in 2006, and assembled a federal recovery team, but 'no recovery or action plan was ever created' (Olive 2014c, p. 49). Whilst the Ontario Ministry of Natural Resources (OMNR) also listed the snake under the OESA, imposing restrictions on dock building and the use of pesticides on the Pelee Islands in Lake Erie, it also failed to publish a recovery plan. COSEWIC eventually delisted the water snake in 2015. During her 2007 fieldwork, Olive found her American respondents were familiar with state and federal conservation officials, whereas the Canadians had seldom seen an OMNR officer. Both sides, though, said they had seen lots of water snakes, which drastically affected their sense of the legitimacy of conservation. Amazingly, there had been 'virtually no communication' about the snake, even though the islands were just five miles apart. In addition to the limited capacity of Canadian authorities to undertake assessments, Olive wonders if the snake continued to be listed in Canada because of the geopolitical boundary: 'It is as though the border creates endangered species by limiting the species' habitat' (Olive 2014a, pp. 3–24).

Two recent studies of peripheral species underscore both the lack of transboundary coordination and biologists' conflicting assessments of jurisdictional rarity (Raymond et al. 2018; Thornton et al. 2018). Reviewing 729 dUs (species, subspecies and populations) in SARA's Schedule 1, Calla Raymond and colleagues cross-referenced those with Action Plans—a proxy for conservation priority—with the IUCN Red List and ESA. They find that 'subspecies units and peripheral populations of globally secure species are being given high priority, while endemic and globally endangered species are neglected' (p. 77). The red mulberry, *Morus rubra*, for instance, is common throughout the USA, yet is listed as endangered in both Schedule 1 of the SARA and the OESA because it survives in fragments of forest in southern Ontario. While the authors acknowledge that there may be compelling reasons to conserve peripheral populations in some instances, they conclude that scarce conservation resources in Canada—starkly illustrated in the case of the water snake above—mandate that 'the full, endemic threatened species for which a jurisdiction bears the sole responsibility must be the highest priority, and that globally threatened species should also be given high priority' (Raymond et al. 2018, p. 78).

Daniel Thornton and colleagues use a different methodology to compare the federal legal conservation status of peripheral transboundary mammals, birds and herpetofauna (PTS) in Canada, Mexico and the USA (Thornton et al. 2018). They, too, find 'asymmetric protection' where 'Peripheral range segments were protected at a higher rate than core range segments as a percentage of the total number of PTS (22% vs. 2% for US–CA …)' (p. 4). However, their conclusion is quite different. They note approvingly that the listing bias for Canadian PTS might protect species as they migrate northward in response to climate change. They also observe that Mexico is more likely to list PTS, despite its southern location, and furthermore that climatically induced migration is not a criterion for listing in Canada. Thornton et al. (2018) take for granted the 'high conservation importance' (p. 2) of peripheral populations, ignoring both the natural constraints highlighted by Bunnell and the problem of jurisdictional rarity.

6. Conclusions

We have seen that, while the SARA conveys expansive motivations for conservation, in practice it adopts a species-centred approach modelled on the ESA. At the same time, the Canadian constitution, political culture, and paucity of resources relative to the nation's enormous land mass render the legislation relatively ineffective in its direct application. The apparent scale of the problem is exacerbated by the marked tendency for COSEWIC and its provincial equivalents to list peripheral species that are, in many cases, globally

secure. Ecosystems such as the Okanagan shrub steppe and the Carolinian forest, which happen to lie within Canada's borders, are typically identified as 'biodiversity hotspots' where conservation is considered a priority rather than, as Bunnell might have it, 'a fight with nature' (Bunnell et al. 2004). Oddly, while Canadian scholars seem repeatedly to rediscover jurisdictional rarity—neither Thornton et al. (2018) nor Raymond et al. (2018) cite any of Bunnell's publications—others ignore it entirely. For example, one of the changes made to the OESA by the Progressive Conservatives in 2019 was a requirement for the Committee on the Status of Species at Risk in Ontario (COSSARO) to consider the risk to a species 'across its entire geographic range, rather than focusing on its status within Ontario' (Bergman et al. 2020). Jordanna Bergman and colleagues criticise the change, citing their Carleton University colleagues Calla Raymond et al. and observing that extirpation of a peripheral population 'may... lead to the loss of unique traits that are potentially important for range expansion and adaptation to future conditions' (p. 425). However, they do not mention that 'peripheral populations can also be subject to gene swamping from core populations' (Bunnell et al. 2004; Raymond et al. 2018, p. 75), and they leave out the source article's critique of jurisdictional rarity. They therefore push for COSSARO to go back to classifying species 'based solely on their status in Ontario, as was formerly done'. Likewise, Alana Westwood and colleagues' proposal for a BC Species at Risk Protection Act (BCSARPA) recommends the automatic listing of provincially at-risk species, and automatic protection on Crown lands (i.e., 94% of the province), including 'B.C.-specific assessment' for 'designatable units or sub-populations in B.C. that are more at risk than their federal status indicates (e.g., red-listed species that are endangered in B.C. but only listed as of special concern in Canada)' (Westwood et al. 2019). In other words, they advocate an even more parochial system of listing and protection than presently exists. We agree with Thornton et al. about the desirability of improved cross-border collaboration, though we would observe that better alignment might come from the demotion or delisting of Canadian species, a possibility that they do not consider.

It is understandable that biologists might wish to circumvent politics by reserving for themselves the power to list endangered species and regulate activities that could harm them. Such technocratic proposals, though, fail to consider the crucial role of legitimacy in successful conservation. Olive points out that coercive 'command-and-control' approaches to conservation are not only impossible to enforce, but liable to create perverse incentives for landowners to shoot, shovel, and shut-up before authorities can step in. On the other hand, her research finds strong support for conservation across a wide range of constituencies in the USA and Canada so long as authorities adhere to 'procedural justice' in their listing and regulatory decisions (Olive 2014c). If Canadian or provincial authorities fail to address jurisdictional rarity—which might include explaining why Canadian populations of globally secure species should be protected—they risk provoking a legitimacy crisis. We recommend, therefore, that COSEWIC and its provincial equivalents incorporate jurisdictional rarity in their conservation categories according to agreed criteria, e.g., an endangered Canadian population that makes up <10% of the species' total range would be designated 'Endangered in Canada', and so on.

7. Reflections

This cross-disciplinary collaboration has enabled innovation in both results and presentation. Expert quantitative examination of mammals' conservation status in three databases confirmed the findings of previous studies (e.g., Raymond et al. (2018); Thornton et al. (2018)) that species listings do not align across the US/Canada border. Infographic presentation and tabulation has then made these findings immediately accessible (Table 1, Figure 2). Humanities methods are most conspicuous in the close reading of the SARA 2002, and its broad contextualisation within Canadian political and constitutional history, but they have also informed the treatment of scientific research itself. Just as biologists automatically include both the common and Linnaean name of a species in their text, social and natural scientists almost always cite sources as authorities, using parenthetical lists

of publications in order to support a claim within their own argument. Literary scholars, by contrast, consider all texts, including scholarly ones, as open to interpretation, hence requiring quotations as evidence for discussion. To a literature scholar, in other words, an article is more than its abstract. Our analysis is also informed by science and technology studies, a grouping of humanities and social science disciplines that treats science as a social practice shaped by—though not reducible to—its contexts, primarily geopolitical in this instance. STS scholarship suggests that humanists are often called upon to translate between, and attempt to integrate, the humanities with the natural and social sciences, as here.

In the natural sciences, bias is seen as something we aim to avoid or, ideally, to eradicate, by employing standardised methods in experimental design or by applying statistical methods post-hoc that account for or reduce bias. Consciousness of bias, and the methods that flow from it, allows scientists to make robust inferences from a given experimental design. Our analysis proposes a shift in thinking about bias. We have confirmed and extended Heise's insight that every jurisdiction embeds its distinctive cultural interests into its conservation laws, thereby imparting a positive 'bias' to scientific research and policy implementation within its ambit. Hence, whilst scientists undertake studies in good faith to answer particular questions in conservation, they may be unaware of structuring biases that skew or delimit their research *ab initio*. Humanities scholars, for their part, must be prepared to offer evidence that remains intelligible and compelling outside their own discipline, and to make actionable recommendations rather than taking refuge in mere critique. In this article, we show that bias-limiting methods can be productively combined with contextual reasoning and evidence, or, to put it another way, that 'political' considerations can enhance science, not just detract from it.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/h13010038/s1, Table S1: Definitions and sources; Table S2: Population-level listings; Table S3: Canadian federal vs. provincial listings; Table S4: American federal vs state listings. Department of Fish and Wildlife (2023), ECCC (2014), Harper et al. (1994), IUCN (2012), Office of Protected Resources (2023), USFWS (2017) are cited in Supplementary Materials.

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Notes

1 In this paper we use this term as shorthand for 'humanities scholar'.

2 COSEWIC's definition of a 'native wildlife species' is more restrictive than the Act that the Committee implements: 'A wildlife species that occurs in Canada naturally, or that has expanded its range into Canada without human intervention from a region where it naturally occurred, has produced viable subpopulations, and has persisted in Canada for at least 50 years.' So starlings need not apply.

References

Bergman, Jordanna N., Allison D. Binley, Rowan E. Murphy, Caitlyn A. Proctor, Thuong Tran Nguyen, Elise S. Urness, Michelle A. Vala, Jaimie G. Vincent, Lenore Fahrig, and Joseph R. Bennett. 2020. How to rescue Ontario's Endangered Species Act: A biologist's perspective. *FACETS* 5: 423–31. [CrossRef]

Bunnell, Fred L., David F. Fraser, and Andrew P. Harcombe. 2009. Increasing Effectiveness of Conservation Decisions: A System and its Application. *Natural Areas Journal* 29: 79–90. [CrossRef]

Bunnell, Fred L., R. Wayne Campbell, and Kelly Squires. 2004. Allocating Scarce Resources for Conservation in a Species-rich Environment: Guidelines from History and Science. Paper presented at the Species at Risk 2004 Pathways to Recovery Conference, Victoria, BC, Canada, March 2–6.

CDC. 2023. BC Species & Ecosystems Explorer. Available online: https://a100.gov.bc.ca/pub/eswp/ (accessed on 2 August 2023).

Chen, I-Ching, Jane K. Hill, Ralf Ohlemüller, David B. Roy, and Chris D. Thomas. 2011. Rapid Range Shifts of Species Associated with High Levels of Climate Warming. *Science* 333: 1024–26. [CrossRef]

Cox, Sarah. 2023. Investigation: B.C. to Feds: Don't Issue Emergency Order to Save the Endangered Spotted Owl. Available online: https://thenarwhal.ca/spotted-owl-emergency-order-documents/ (accessed on 27 November 2023).

Cruickshank, Ainslie. 2022. 'Huge Legal Gaps' Are Driving B.C. Species to Extinction, Conservation Groups Say. Available online: https://thenarwhal.ca/bc-species-at-risk-cop15/ (accessed on 27 November 2023).

Dallimer, Martin, and Niels Strange. 2015. Why socio-political borders and boundaries matter in conservation. *Trends Ecol Evol* 30: 132–39. [CrossRef] [PubMed]

Department of Fish and Wildlife. 2023. *WAC 220-610-110: Endangered, Threatened, and Sensitive Wildlife Species Classification*; Washington: Washington State Legislature, p. 110.

Donihee, John. 2000. The Evolution of Wildlife Law in Canada. In *Occasional Paper No. 9*. Calgary: Canadian Institute of Resources Law.

Dorey, Katherine, and Tony R. Walker. 2018. Limitations of threatened species lists in Canada: A federal and provincial perspective. *Biological Conservation* 217: 259–68. [CrossRef]

ECCC. 2013. *Greater Sage-Grouse: Emergency Protection Order*. Toronto: Environment and Climate Change Canada.

ECCC. 2014. *Categories of Species at Risk: Poster*. Available online: https://www.canada.ca/en/environment-climate-change/services/species-risk-education-centre/poster.html (accessed on 4 December 2023).

ECCC. 2016. Emergency order for the protection of the Western chorus frog (Great Lakes/St. Lawrence—Canadian shield population). In *SOR/2016-211*. Toronto: Environment and Climate Change Canada.

Garrard, Greg. 2020. Brexit ecocriticism. *Green Letters* 24: 110–24. [CrossRef]

Garrard, Greg. 2023. *Ecocriticism*, 3rd ed. The New Critical Idiom. Oxfordshire: Routledge.

Harper, Bill, Sydney Canngings, David Fraser, and William T. Munro. 1994. Provincial lists of species at risk. In *Biodiversity in British Columbia*. Edited by L. E. Harding and E. McCullum. Delta: Canadian Wildlife Service.

Heise, Ursula K. 2016a. From Arks to ARKive.org: Database, Epic, and Biodiversity. In *Imagining Extinction: The Culturual Meanings of Endangered Species*. Chicago: University of Chicago Press, pp. 55–86.

Heise, Ursula K. 2016b. *Imagining Extinction: The Cultural Meanings of Endangered Species*. Chicago: University of Chicago Press.

Heise, Ursula K. 2016c. The Legal Lives of Endangered Species: Biodiversity Laws and Culture. In *Imagining Extinction: The Cultural Meanings of Endangered Species*. Chicago: University of Chicago Press, pp. 87–126.

Hockings, Marc, James Hardcastle, Stephen Woodley, Trevor Sandwith, Joanne Wilson, Marnie Bammert, Sandra Valenzuela, Beatrice Chataigner, Thierry Lefebvre, Fiona Leverington, and et al. 2019. The IUCN Green List of Protected and Conserved Areas: Setting the standard for effective conservation. *Parks* 25.2: 57–66. [CrossRef]

Hoffman, Nadine. 2018. Species at Risk Act a Comprehensive Inventory of Legislative Documents 1973–2017. Paper presented at the A Symposium on Environment in the Courtroom: Enforcement Issues in Canadian Wildlife Protection, Calgary, AB, Canada, March 2–3.

Illical, Mary, and Kathryn Harrison. 2007. Protecting Endangered Species in the US and Canada: The Role of Negative Lesson Drawing. *Canadian Journal of Political Science/Revue Canadienne de Science Politique* 40: 367–94. [CrossRef]

IUCN. 2012. *IUCN Red List categories and criteria: Version 3.1*, 2nd ed. Gland and Cambridge: IUCN, vol. iv.

IUCN. 2022. *Guidelines for Using the IUCN Red List Categories and Criteria. Version 15.1*. IUCN Standards and Petitions Subcomittee. Available online: https://www.iucnredlist.org/documents/RedListGuidelines.pdf (accessed on 2 August 2023).

IUCN. 2023. The IUCN Red List of Threatened Species. Available online: https://www.iucnredlist.org/ (accessed on 2 August 2023).

Jasanoff, Sheila. 2005. Civic Epistemology. In *Designs on Nature*. Princeton: Princeton University Press, pp. 247–71.

Knorr-Cetina, Karin. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge: Harvard University Press.

Knorr-Cetina, Karin, and Werner Reichmann. 2015. Epistemic Cultures. *International Encyclopedia of the Social & Behavioral Sciences (Second Edition)*, 873–880. [CrossRef]

Master, Lawrence L., Don Faber-Langendoen, Roxanne Bittman, Geoffrey A. Hammerson, Bonnie Heidel, Leah Ramsay, Kristin Snow, Andy Teucher, and Adele Tomaino. 2012. *NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk*. Arlington: NatureServe.

McCune, Jenny L., William L. Harrower, Stephanie Avery-Gomm, Jason M. Brogan, Anna-Mária Csergő, Lindsay N. K. Davidson, Alice Garani, Luke R. Halpin, Linda P. J. Lipsen, Christopher Lee, and et al. 2013. Threats to Canadian species at risk: An analysis of finalized recovery strategies. *Biological Conservation* 166: 254–65. [CrossRef]

Ministry of Environment. 2006. *Order—Category of Species at Risk*; Victoria: British Columbia Ministry of Environment.
NatureServe. 2023. NatureServe Explorer. Available online: https://explorer.natureserve.org/Search (accessed on 2 August 2023).
Neimanis, V. P. 2011. Crown Land. Available online: https://www.thecanadianencyclopedia.ca/en/article/crown-land (accessed on 20 November 2023).
NOAA. 2023. Species Directory: ESA Threatened & Endangered. Available online: https://www.fisheries.noaa.gov/species-directory/threatened-endangered (accessed on 2 August 2023).
Office of Protected Resources. 2023. Candidate Species under the Endangered Species Act. Available online: https://www.fisheries.noaa.gov/endangered-species-conservation/candidate-species-under-endangered-species-act (accessed on 4 December 2023).
Olive, Andrea. 2014a. Canada's strategy for species at risk. In *Land, Stewardship, and Legitimacy: Endangered Species Policy in Canada and the United States*. Toronto: University of Toronto Press, pp. 49–73.
Olive, Andrea. 2014b. Introduction. In *Land, Stewardship, and Legitimacy: Endangered Species Policy in Canada and the United States*. Toronto: University of Toronto Press, pp. 3–24.
Olive, Andrea. 2014c. Lake Erie Islands Case Study. In *Land, Stewardship, and Legitimacy: Endangered Species Policy in Canada and the United States*. Toronto: University of Toronto Press, pp. 144–70.
Pecl, Gretta T., Miguel B. Araújo, Johann D. Bell, Julia Blanchard, Timothy C. Bonebrake, I-Ching Chen, Timothy D. Clark, Robert K. Colwell, Finn Danielsen, Birgitta Evengård, and et al. 2017. Biodiversity redistribution under climate change: Impacts on ecosystems and human well-being. *Science* 355: eaai9214. [CrossRef]
Ray, Justina C., Jaime Grimm, and Andrea Olive. 2021. The biodiversity crisis in Canada: Failures and challenges of federal and sub-national strategic and legal frameworks. *FACETS* 6: 1044–68. [CrossRef]
Raymond, Calla V., Lina Wen, Steven J. Cooke, and Joseph R. Bennett. 2018. National attention to endangered wildlife is not affected by global endangerment: A case study of Canada's species at risk program. *Environmental Science & Policy* 84: 74–79. [CrossRef]
Raymond, Sarah, Amy L. W. Schwartz, Robert J. Thomas, Elizabeth Chadwick, and Sarah E. Perkins. 2021. Temporal patterns of wildlife roadkill in the UK. *PLoS ONE* 16: e0258083. [CrossRef] [PubMed]
R Core Team. 2022. *R: A Language and Environment for Statistical Computing Version 4.1.1*. Vienna: R Foundation for Statistical Computing.
Rüter, Stefan, Claire C. Vos, Michiel van Eupen, and Hilke Rühmkorf. 2014. Transboundary ecological networks as an adaptation strategy to climate change: The example of the Dutch—German border. *Basic and Applied Ecology* 15: 639–50. [CrossRef]
SARA. 2002. Species at Risk Act, S.C. c. 29. Available online: https://laws.justice.gc.ca/eng/acts/s-15.3/ (accessed on 2 August 2023).
Smith, David R., Nathan L. Allan, Conor P. McGowan, Jennifer A. Szymanski, Susan R. Oetker, and Heather M. Bell. 2018. Development of a Species Status Assessment Process for Decisions under the U.S. Endangered Species Act. *Journal of Fish and Wildlife Management* 9: 302–20. [CrossRef]
Thornton, Daniel H., Aaron J. Wirsing, Carlos Lopez-Gonzalez, John R. Squires, Scott Fisher, Karl W. Larsen, Alan Peatt, Matt A. Scrafford, Ron A. Moen, Arthur E. Scully, and et al. 2018. Asymmetric cross-border protection of peripheral transboundary species. *Conservation Letters* 11: e12430. [CrossRef]
Titley, Mark A., Stuart H. M. Butchart, Victoria R. Jones, Mark J. Whittingham, and Stephen G. Willis. 2021. Global inequities and political borders challenge nature conservation under climate change. *Proceedings of the National Academy of Sciences* 118: e2011204118. [CrossRef]
Turcotte, Audrey, Natalie Kermany, Sharla Foster, Caitlyn A. Proctor, Sydney M. Gilmour, Maria Doria, James Sebes, Jeannette Whitton, Steven J. Cooke, and Joseph R. Bennett. 2021. Fixing the Canadian Species at Risk Act: Identifying major issues and recommendations for increasing accountability and efficiency. *FACETS* 6: 1474–94. [CrossRef]
USFWS. 1973. Endangered Species Act of 1973 as Amended through the 108th Congress. U.S Department of the Interior. Available online: https://www.fws.gov/sites/default/files/documents/endangered-species-act-accessible.pdf (accessed on 27 November 2023).
USFWS. 2017. U.S. Fish & Wildlife Service: Candidate Species: Section 4 of the Endangered Species Act. Available online: https://www.fws.gov/sites/default/files/documents/Candidate-Species.pdf (accessed on 2 August 2023).
Vincent, C. H., L. A. Hanson, and L. F. Bermejo. 2020. *Federal Land Ownership: Overview and Data*. Available online: https://sgp.fas.org/crs/misc/R42346.pdf (accessed on 27 November 2023).
Waples, Robin S., Marta Nammack, Jean Fitts Cochrane, and Jeffrey A. Hutchings. 2013. A Tale of Two Acts: Endangered Species Listing Practices in Canada and the United States. *BioScience* 63: 723–34. [CrossRef]
WDFW. 2023. Washington State Listed Species. Available online: https://wdfw.wa.gov/species-habitats/at-risk/listed (accessed on 2 August 2023).
Westwood, Alana R., Sarah P. Otto, Arne Mooers, Chris Darimont, Karen E. Hodges, Chris Johnson, Brian M. Starzomski, Cole Burton, Kai M. A. Chan, Marco Festa-Bianchet, and et al. 2019. Protecting biodiversity in British Columbia: Recommendations for developing species at risk legislation. *FACETS* 4: 136–60. [CrossRef]

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