Assessing the need for species conservation action in British Columbia

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Abstract

Assessing needs for conservation action is a challenge anywhere, but will be particularly so in British Columbia. Relatively few North American recovery plans have succeeded. The great species richness and biogeography of British Columbia suggest that the province may be particularly susceptible to failure. The richness increases the number of species considered; the biogeography encourages small intrusions of species of greater abundance elsewhere. These intrusions receive an artificially high rating for risk, and thus for priority because factors that modify local rarity are correlated. Among taxa Red listed by the Conservation Data Centre, about 40–100% are peripheral. Species lists of the national Committee on the Status of Endangered Wildlife in Canada are also affected by bias resulting from peripheral ranges. We propose criteria for selecting species for conservation action that evade some of the past failings and more directly address global stewardship responsibilities.

KEYWORDS: *conservation priorities, peripheral populations, recovery plans,* Species at Risk Act.

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Introduction

Canada's *Species at Risk Act* (*SARA*) will result in the formation of more species recovery strategies. A ranking system is needed to ensure that scarce resources for recovery are spent on the "right" species. The importance of a rigorous ranking process is emphasized by at least two phenomena:

1. First Nations' concerns, and

2. our poor track record of recovery plans continent-wide.

Some First Nations' concerns will be challenging to address (Wiwchar 2004), but all will benefit from a transparent approach to assessing needs for conservation action. Our historical track record is equally challenging. As Winkler (1993) observed, recovery has been grossly ineffective—of 1354 species listed as threatened or endangered in the United States between 1966 and 1992, only 19 species had been removed from the lists, including eight listed in error and seven that became extinct (General Accounting Office 1992). The situation was bad enough that Tear *et al.* (1993) commented: " . . . recovery plans [more] often manage for extinction than for survival."

In British Columbia, we have yet to create a formal strategy for assigning conservation action to species. Regional lists of status are inadequate for the task. We briefly review generic challenges to regional listing processes and then conditions specific to British Columbia. We describe criteria to rank species for the allocation of resources for recovery that may avert past failings.

The Problems with Regional Lists

In North America, the NatureServe ranking system is used by Conservation Data Centres (CDCs) to create jurisdictional lists of species "at risk." Seven factors are used to rank species:

1. estimated number of existing occurrences (rarity);

2. viability of these occurrences;

3. trend in population size and number of occurrences;

4. overall estimated population size within the province;

5. geographic distribution (range);

6. number of occurrences adequately protected and managed; and

7. actual or potential threats facing the species or its habitat.

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The great value of the CDC ranking system is that it is standardized across a large number of jurisdictions (50 states, 10 provinces, and 12 Caribbean and Latin American jurisdictions). It thus contributes greatly to a broad and comparable picture of a taxon's status for a large number of diverse taxonomic groups.

The NatureServe system is our best approach to assessing risk to species at a global scale, but perspective is lost in the shift from thinking globally to acting locally (e.g., Saterson *et al.* 2004). Describing how the British Columbia CDC works with NatureServe, Harcombe *et al.* noted that:

> the number of occurrences is key to the status of many species, since those with very few occurrences are vulnerable to both predictable and unpredictable influences. The score for number of occurrences usually determines an initial rank, which is then modified sequentially based on the scores for other factors. (Harcombe *et al.* 2002:3)

Classes for each modifier can be found in Harcombe (2000). For peripheral species, this ranking system is strongly biased in an unhelpful direction, especially for species that irregularly cross the provincial border (Bunnell *et al.* 2004). These species necessarily have few occurrences and low viability in the province, are erratic in trend, and have small provincial population sizes and ranges. Each of these correlated features emphasizes local rarity and increases the species' ranking. Figure 1 indicates the degree to which that bias has occurred.

Peripheral status is not sufficient reason for omitting species from conservation action. Bunnell *et al.* (2004) reviewed ways of being peripheral and genetic reasons why some peripheral populations merit more concern than others. They also offered the simple operational definition of *peripheral* used here (i.e., < 10 % of the population or range in British Columbia or other jurisdiction). They emphasized that knowing the reasons for local rarity was important in assessing conservation actions.
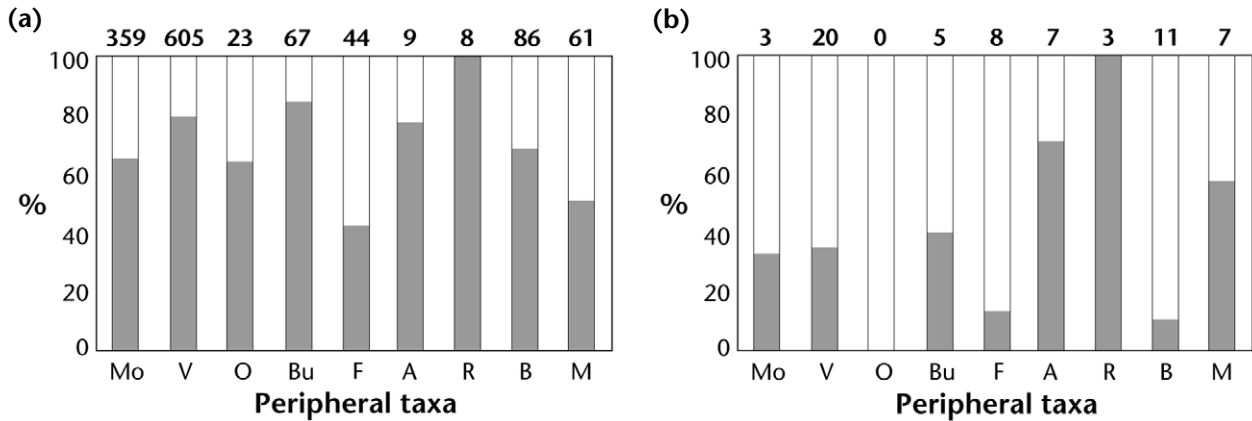
FIGURE 1. Peripheral taxa in British Columbia considered "at risk": Mo (mosses), V (vascular plants), O (Odonata, or dragonflies and damselflies), Bu (butterflies), F (fish), A (amphibians), R (reptiles), B (birds), and M (mammals). Numerals above bars indicate the total number of listed taxa; grey shading indicates percentage of peripheral taxa (< 10% of range in province). (a) Red- and Blue-listed taxa in British Columbia; (b) taxa listed on Schedule 1 of Canada's *Species at Risk Act*.

Using provincial CDC rankings to allocate resources for conservation can result in allocating scarce resources to species that are only locally rare. Researchers have noted that local rarity is an insufficient, and sometimes misleading, criterion for allocating conservation priorities (Millsap *et al.* 1990; Atwood 1994; Gärdenfors 2001; Saterson *et al.* 2004). We agree for three reasons.

1. Rarity has a variety of causes (Karr 1977; Rabinowitz *et al.* 1986; Arita *et al.* 1990), some of which are difficult to discern and some of which do not merit conservation actions.
2. Focus on local rarity ignores species that are globally concentrated within a political jurisdiction.
3. Species not yet locally rare may be declining steadily.

Rarity resulting from the location of political boundaries is both obvious and meaningless (e.g., Craig 2002). Some species are "naturally" rare, but do not necessarily require conservation attention. For example, the endemic northern pocket gopher (*Thomomys talpoides segregatus*) occupied the same small 10-km range in 1997 that it occupied when first discovered 50 years earlier (Munro 1950; Fraker *et al.* 1997). Emphasis on local rarity can overlook declining populations of more common species whose numbers or range are concentrated within a political jurisdiction (e.g., blue grouse *Dendragapus osbscurus* in British Columbia; Figure 2). Because common species are often geographically widespread, their population trends may serve as early warnings of ecosystem degradation in localized areas. The ability to be proactive is effectively eliminated by failure to consider

downward trend as sufficient reason for conservation action. One of the most common reasons why recovery plans have failed is because efforts have started too late, when species have declined to the point of rarity (e.g., Abbitt and Scott 2001).

Reliance on local rarity as a criterion to allocate conservation resources can be irresponsible because resources spent on population peripheries may have no or minimal effect on the remainder of the species' population. Worse, such practice diverts resources that could be used for species that are globally concentrated in a political unit. In his review, Atwood (1994:338) noted that, "over-emphasis on protection of peripheral

FIGURE 2. British Columbia hosts significant portions of many species' ranges. Some, like this blue grouse, show negative trends, but are still too common to merit listing in our current rating systems.

Regional lists developed by CDCs throughout North America serve useful purposes in deriving a species' global status, but are inadequate to guide regional conservation priorities for most species.

populations showing no evidence of widespread declines, have created a vague and confusing system with minimal value to scientists or conservationists." While such "peripheral" populations may merit watching, their inclusion on state and provincial lists of species of high conservation priority may "ultimately threaten the public credibility and support of the overall endangered species listing process" (Atwood 1994:338). We conclude that regional lists developed by CDCs throughout North America serve useful purposes in deriving a species' global status, but are inadequate to guide regional conservation priorities for most species.

The Problem in British Columbia

Among north temperate jurisdictions, British Columbia is one of the most species-rich (e.g., Bunnell and Williams 1980). The British Columbia Conservation Data Centre (BCCDC) estimates there are at least 5250 species of plants, 1138 species of vertebrates, 60 000 species of invertebrates, and 10 000 species of fungi in the province. British Columbia also is one of few regions that still retain the same suite of large carnivores and their prey as was present 5000 years ago. Moreover, because British Columbia still has relatively large undisturbed areas, human impacts on ecosystems are accelerating faster relative to most other north temperate jurisdictions. Thus, an urgent need exists to assign appropriate priorities to efforts at protecting and maintaining species richness within the province.

Because of biogeography, British Columbia also is uncommonly rich in species at the edge of their range. The ranges of species much more common to the south extend through the Puget Sound lowlands, Okanagan Valley, and Rocky Mountain trench, while the Peace River lowlands and Tatsenshini-Alsek triangle include the ranges of species more common to the east and

north (Bunnell *et al*. 2004). Not only are there long-standing peripheral populations in British Columbia, but also many taxa that are "politically peripheral," those that straggle erratically across the border only in particular years (Figure 1). Because local rarity is the dominant criterion in ranking, the percentage of Red-listed taxa that are peripheral ranges from 40% to 100% for all groups except fish. The result is a list of "at risk" species that includes many species which are rare within the province, but are not of conservation concern across their entire range.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is not immune from this bias when they determine the status of vulnerable, threatened, and endangered species for consideration by the federal government under *SARA*. Such bias is evident in Figure 1b and in recently initiated recovery efforts in British Columbia. Bunnell *et al*. (2004) used data of the Biodiversity Centre of Wildlife Studies to examine the number of years over a 117-year period that species included in recent recovery efforts had been reported from British Columbia. Among their findings were:

- 2 years for the green turtle (*Chelonia mydas*),
- 3 years for the leatherback turtle (*Dermochelys coriacea*), and
- 26 years for the white-headed woodpecker (*Picoides albolarvatus*).

They argued that species such as these, which entered the province less than once in every 4 years, were unlikely to establish productive populations and that recovery plans would fail.

Assessing Priorities for Conservation Effort

We suggest three broad criteria to rank species according to priority for conservation efforts, such as monitoring or recovery. The approach we outline draws on our own research (Bunnell and Squires 2005), and the work of Dunn *et al*. (1999) and others developing methodologies for Partners in Flight in Canada, Mexico, and the United States. The criteria are:

1. portion of world populations or ranges in British Columbia,
2. population trends, and
3. species vulnerability and threats.

Dunn *et al*. (1999) recognized that these criteria incorporate two major issues: "responsibility" and

"concern." *Responsibility* assesses whether a species is relatively concentrated in the area for which ranks are being assigned (e.g., British Columbia). A high level of relative concentration reflects a high level of stewardship responsibility. *Concern* encompasses vulnerability, threats, and population declines (trend). For a taxon to rank high in priority for the allocation of resources, it should not only be of high concern, but also be of high stewardship responsibility. Dunn *et al.* (1999) developed their system for land birds, but noted its applicability to other taxa, even if "concern" scores were derived using different features. We have been evaluating the criteria for other groups and believe they apply to all species, and possibly plant communities as well. Each criterion is discussed in the following sections.

Significant World Populations or Ranges in British Columbia

Either population or range can be used to evaluate stewardship responsibility. Because an endemic species is "exclusively confined to a particular place," that place has exclusive responsibility for its conservation. Other things being equal, a species that is endemic should have higher priority for resources than one that is not. British Columbia hosts endemic species or subspecies of lichens, moss, vascular plants, butterflies, fish, birds, and mammals (Figure 3).

Excluding marine environments, at least 74 endemic species and subspecies occur in British Columbia (Figure 3). The marine flora and fauna off British Columbia's coast is inadequately sampled, but appears to include several species of marine invertebrates endemic to provincial waters (Austin 2000). Of these 74 taxa, only 23 are species, 49 are subspecies, and 2 are as yet un-named fish populations. Many subspecies distinctions are not supported by genetic or taxonomic studies, particularly among small mammals. Focusing conservation effort on subspecies may be misguided because of the dramatic mismatch between named subspecies and genetically distinct populations (Zink 2004). Nonetheless, subspecies show physical differences that may

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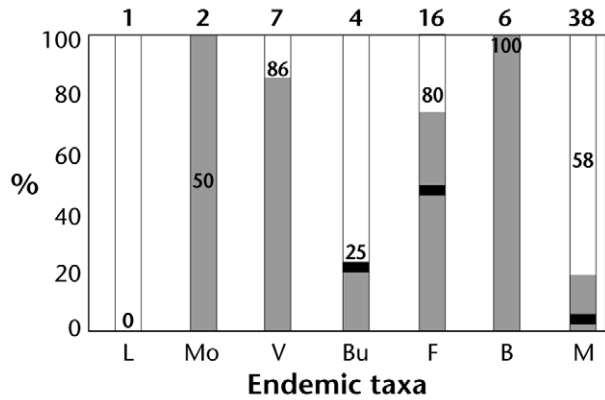

FIGURE 3. Endemic taxa restricted to British Columbia: L (lichens), Mo (mosses), V (vascular plants), Bu (Butterflies), F (fish), B (birds), and M (mammals). Numerals above bars indicate total number of endemic taxa; numerals within bars indicate the percentage that are island-dwelling; grey shading indicates the percentage that appear on the provincial Red and Blue lists; line across bars indicates percentage listed on Schedule 1 of Canada's *Species at Risk Act.* Note that British Columbia's CDC currently does not track lichens.

represent important genetic differences. Of the 74 taxa, only 10 are listed on Schedule 1 of *SARA*, and 34 appear on provincial Red and Blue lists.

Endemic taxa usually are restricted to islands, and in British Columbia, 66% of endemic freshwater and terrestrial taxa are restricted to islands (Bunnell and Squires 2005). Since the 1600s, 93% of the bird species and subspecies that have become extinct were island endemics (King 1980). For these reasons, the International Council for Bird Preservation identified the long-term monitoring of endemic island species as a conservation priority (Johnson 1988). The vulnerability conferred by endemism is not restricted to birds and is equally evident in plants (Lowry 1998; Myers *et al.* 2000), mammals (Diamond 1984, 1989), reptiles (Case *et al.* 1992), molluscs (see IUCN/SSC Mollusc Specialist Group's *Tentacle* newsletter), and all other groups (excluding marine mammals) for which lists of species at risk have been compiled (see *IUCN Red List of Threatened Species* [IUCN Species Survival Commission 2004]). Acknowledging this global pattern across taxa, any ranking system for conservation priorities must consider island-dwelling endemics a high priority.

The disappearance of island forms does not mean that mainland forms will replace them. Most endemics, even among birds, do not migrate. They are resident and must survive where they now occur. Some live in

environments that will be altered. These observations coupled with historical trends suggest that the risk of extinction is high. A discrete pool of genetic variability—a fundamental reason for sustaining biological diversity—is then lost.

British Columbia also hosts significant world populations or ranges of taxa that are not endemic. It is difficult to census widespread species unless the entire population is concentrated some time during the year. Partners in Flight has global estimates for all 448 land birds that breed regularly in Canada or the United States, but acknowledges that regional estimates are lacking. For most taxa, estimates of total numbers will remain elusive. The relative proportion of populations present in an area frequently is used to designate the importance of a site to migratory species (e.g., Ramsar Convention, Western Hemisphere Shorebird Reserve Network, and the Important Bird Areas Program). Among resident species (fungi, lichens, plants, amphibians, reptiles, most mammals, many fish and birds), range is a useful surrogate for population size. Moreover, range often is a useful representation of favourable habitat.

Because of its large size and diverse habitat, British Columbia hosts large portions of some species' numbers or contributes major portions to species' ranges. These concentrations may be seasonal (e.g., trumpeter swan, *Cygnus buccinator*; Barrow's goldeneye, *Bucephala islandica*) or year-round (e.g., mountain goat, *Oreamnus americanus*). We estimate that British Columbia hosts at least one third of the global population during some season, or one third of the global range year-round, for 537 taxa (Figure 4). Most of these are mosses (177 taxa) and vascular plants (145 taxa), but include representatives of most groups that are well documented. Less than half (238 taxa) are Red or Blue listed by the BCCDC. COSEWIC has not assessed the status of most of these taxa, but has determined that seven were not at risk and 28 were "endangered," "threatened," or of "special concern." Although British Columbia has a major responsibility for sustaining these taxa, many do not show up on Red or Blue lists because they are not sufficiently rare.

Population Trends

To merit a high level of regional conservation action, a taxon should not only have high stewardship responsibility, but there should be documented concern about the taxon's status. When available, trend data are the most compelling element of measures of "concern." Assessment of concern should not be restricted to rare species. It is important to address trends of relatively
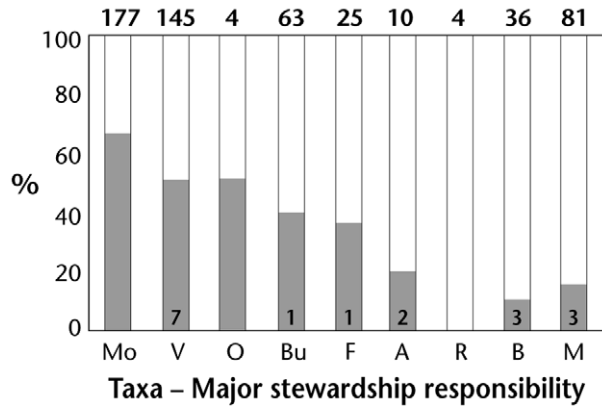

FIGURE 4. Taxa for which British Columbia has major stewardship responsibility (> 30% of their range or population occurs sometime in the province) excluding endemics for: Mo (mosses), V (vascular plants), O (Odonata, or dragonflies and damselflies), Bu (butterflies), F (fish), A (amphibians), R (reptiles), B (birds), and M (mammals). Numerals above bars indicate total number of taxa; grey shading indicates percentage of taxa appearing on provincial Red and Blue lists; numerals inside bars indicate the number of taxa listed on Schedule 1 of Canada's *Species at Risk Act.*

common species before they become rare enough to be listed by CDCs on regional lists because:

- recovery is more likely if the species is not already rare;
- recovery will be cheaper when the species is still relatively abundant;
- preservation of abundant and widespread native species in natural numbers helps ensure that habitats and ecosystems characteristic of the jurisdiction are sustained; and
- trends in more common and widespread species may indicate the "health" of our environment in local areas, and serve as early warnings that particular ecosystems are degrading.

Relatively common species showing sustained declines merit higher priority for conservation measures than rare, but stable species.

Throughout North America, the absence of summaries of declining (and increasing) species based on analyses of Breeding Bird Surveys or other monitoring programs has been a major weakness in most regional lists of imperilled birds (Atwood 1994). Where possible, historical trends in populations in British Columbia should be analyzed before allocating conservation resources or designating endangered or threatened status.

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Species' Vulnerability and Threats

Vulnerability and threat both contribute to conservation concern. The BCCDC recognizes threat in its final factor influencing rankings. It is useful to distinguish between vulnerability and threat. Vulnerability may be conferred simply by localized abundance for which there is little management solution, whereas threat represents an activity that can be modified. Vulnerable species may be relatively abundant, but have some feature in their life cycle (e.g., seasonal concentrations) that confers vulnerability. In some cases, vulnerable periods or locations are known. For example, most of the province's nesting tufted puffins (*Fratercula cirrhata*) are vulnerable during a short period each spring as they aggregate near nesting colonies.

Known threats also are reason for concern, but can be dealt with more directly. Potential weak links in the life cycle can be distilled from basic natural history data. For example, the decline of the Lewis's woodpecker (*Melanerpes lewis*) in southwestern British Columbia appears to be a product of its dependence on fire-created habitat. Fire suppression will continue, but knowing the kinds of habitat required can allow for the creation of suitable habitat by specific forest practices. Bobolink (*Dolichonyx oryzivorus*) populations in British Columbia could be aided by eliminating early spring and night mowing (van Damme 1999). Learning from experience in other regions can be helpful. In their approach to identifying and managing fauna sensitive to forest management, the first criterion Huggard *et al.* (2000) proposed was "species extirpated, endangered, or threatened elsewhere (or habitat elements lost)." Their argument was that we should learn from areas with similar habitats that are more populous or have a longer history of resource extraction. Species that have proven vulnerable in such areas should be considered potentially vulnerable in the province, even if a local population decline is not yet discernable. Acknowledging experience elsewhere clearly is not a sufficient basis for recovery actions, but it does provide the opportunity to be proactive and preventive, which often is cheaper and more successful.

Conclusions

We have noted ways in which we may be undermining public support, ways in which we have allocated scarce conservation resources in a direction that science suggests is wasteful, and how we have directed funding away from species for which the province has global responsibility. We agree with Lackey (2001:27) that much of our action and information "misleads the public into endorsing false expectations of the likelihood of recovery." In the case of many of our peripheral populations, there often is nothing to restore. We believe a transparent priority-ranking system would help correct our past record of failings. We suggest that the criteria we have described here are credible and would assist the assessment of species meriting conservation action.

Acknowledgements

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Test Your Knowledge . . .

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How well can you recall some of the main messages in the preceding extension note?
Test your knowledge by answering the following questions. Answers are at the bottom of the page.

1. British Columbia has a formal strategy for assigning conservation actions to species.
   A) True
   B) False

2. Conservation Data Centres serve a useful purpose by:
   A) Contributing to a standardized assessment of local status
   B) Assessing regional status through a standardized set of criteria
   C) Assigning regional priorities for conservation action

3. For most organisms, other than fish, the percentage of taxa on Red and Blue lists that have less than 10% of their global range in British Columbia is:
   A) 10–30%
   B) 25–60%
   C) 40–80%

4. The number of species and subspecies occurring in British Columbia and nowhere else in the world is:
   A) 10–20
   B) 40–50
   C) more than 70