

## Northwest Science Forum

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### **Vertebrates of Conservation Concern in the Interior Northwest: Priorities for Research**

Many species of terrestrial vertebrates have been studied extensively, while others have received little research attention. In the past, the degree to which a species was studied may have depended on whether the species had commodity value (game or furbearer species, referred to as commodity species), or was threatened or endangered (listed under the U.S. Endangered Species Act, referred to as TE species). However, few studies have formally documented such patterns. In one study, broad-scale information on habitat requirements of 20 vertebrate species in Idaho was adequate for modeling the needs of most game species, but inadequate for modeling the needs of many other species of interest (Karl et al. 1999).

Within this broad group, commodity status (CS) and TE species deserve research attention. However, many species of conservation concern (species with rare or declining habitats or populations) are neither CS nor TE species, and thus may not be studied extensively. For example, birds and

mammals receive more attention than amphibians and reptiles in the listing and recovery process under the U.S. Endangered Species Act, and as a result, the warm-blooded vertebrates attract more research interest (Tear et al. 1995). This presents a quandary for conservation planning: managers may know which species deserve conservation focus, but knowledge of their environmental requirements and response to management may be lacking, owing to a dearth of research.

In this essay, we identify terrestrial vertebrates of conservation concern in the Interior Northwest, and present results of a literature search used to index the degree of research conducted on these species, based on their status as CS, TE, or neither CS nor TE. Our purpose in conducting the analysis was to document research priorities of the past, and in the process, provide insight about species of conservation concern that have been under-studied and deserve increased attention in future studies.

## Identifying Species of Conservation Concern

We identified terrestrial vertebrates of conservation concern from two comprehensive landscape studies (Lehmkuhl et al. 1997, Wisdom et al. 2000) conducted recently on such species in the Interior Columbia Basin and adjacent portions of the Klamath and northern Great Basins in the Interior Northwest (referred to as Basin). The Basin includes all areas drained by the Columbia River east of the Cascade Mountains in Washington, Oregon, Idaho, Montana, and Wyoming; the Klamath and Great Basins in Oregon; and small portions of the northern Great Basin in Nevada and Utah (see Figure 1, Wisdom et al. 2002). The 58 million-ha Basin encompasses a vast area of the Interior Northwest, and thus provides an opportunity to identify a comprehensive suite of species of conservation concern across a major region of the western United States.

We specifically identified 218 species from Lehmkuhl et al. (1997) and Wisdom et al. (2000) as a comprehensive suite of terrestrial vertebrates whose habitats or populations are rare or declining in the Basin (Appendix). This list included all species identified by Wisdom et al. (2000), and all but 11 species identified by Lehmkuhl et al. (1997). We dropped these 11 species because

further review indicated that ranges of these species have little or no overlap with the Basin.

Identifying the 218 species as a comprehensive set of species of conservation concern appeared most appropriate because Lehmkuhl et al. (1997) and Wisdom et al. (2000) used diverse criteria to identify all potential species with rare or declining populations or habitats. That is, a variety of evidence was used to identify such species, even when available empirical data were limited but suggested a high probability of rarity or decline. Consequently, the list of 218 is likely to include most or all terrestrial vertebrates with rare or declining habitats or populations in the Basin. Not all species identified under selection criteria necessarily have rare or declining habitats or populations, only that the available evidence suggested a high probability of rarity or decline (Lehmkuhl et al. 1997, Wisdom et al. 2000).

The list of 218 species was composed of 10 amphibians, 151 birds, 42 mammals, and 15 reptiles (Appendix). Birds made up the highest percentage (69%) of species, followed by mammals (19%), reptiles (7%), and amphibians (5%). These percentages were similar to the percentages of species in each vertebrate class in the Basin that were not of conservation concern. That is, of the 329 species of terrestrial vertebrates in the Basin

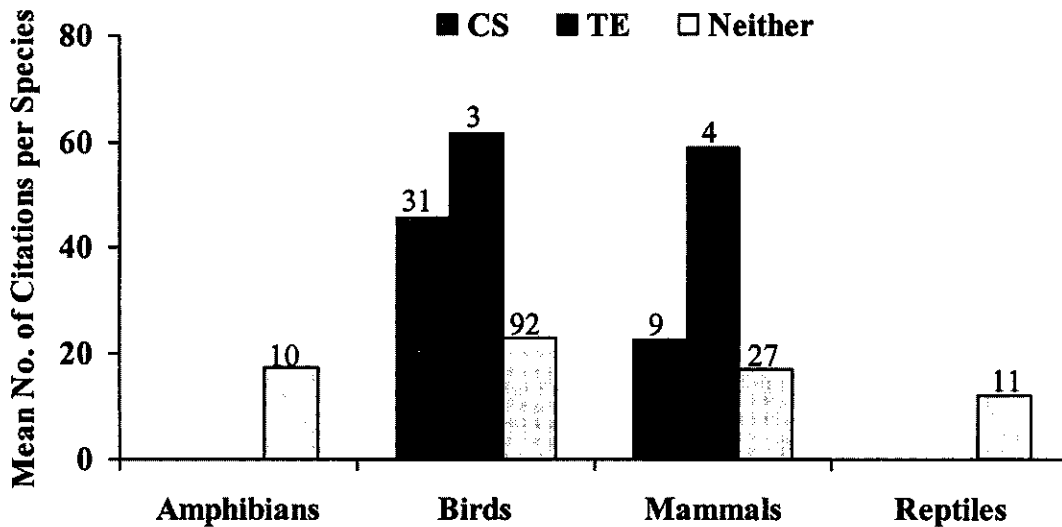


Figure 1. Mean citations per species in each management category and vertebrate class for 187 species of conservation concern identified for the Interior Columbia Basin and adjacent portions of the Klamath Basin and northern Great Basin in the western United States. Numbers of species in each management category and vertebrate class are shown above each bar.

not identified as being of conservation concern, birds composed the highest percentage (64%), followed by mammals (27%), amphibians (5%), and reptiles (4%) (Marcot et al. 1997).

### Assessing Research Priorities

Our ultimate goal was to understand the implications of different categories of management on the degree to which studies have been conducted on the species of conservation concern. Consequently, we analyzed 187 of the 218 species (Appendix) in two steps: (1) by assigning each species to a unique management category that reflected special management status versus no special management status; (2) by conducting a literature search on each species and summarizing the results by management category and vertebrate class.

The 187 species included those initially selected by Wisdom et al. (2000), based on results from Lehmkuhl et al. (1997) and peer review. These 187 species were considered by Wisdom et al. (2001) to have a substantially higher probability of rare or declining habitats or populations, compared to the larger set of 218 species. Consequently, these 187 species appeared most suitable for our assessment of research priorities. The criteria used to establish and refine this list were based on Wisdom et al. (2000).

We assigned each of the 187 species to one of three management categories: (1) CS, (2) TE, or (3) neither CS nor TE (Appendix). CS species were defined as game or furbearer species harvested under requirement of hunting or trapping license by state agencies. TE species were designated as threatened or endangered under the U.S. Endangered Species Act (ESA). All other species were characterized as being neither CS nor TE species.

In a few cases, the management category of a species had changed over time. In these cases, we placed species in the category in which they were historically managed during the latter part of the 20th Century, corresponding to the time period over which most research was conducted and published. An example is Canada lynx (*Lynx canadensis*), listed in 2000 as federally threatened in the continental United States but historically managed as a furbearer. Consequently, we assigned lynx to the CS category because most research was conducted while the species had

commodity status. Moreover, lynx remains a CS species outside the continental United States, where most research on the species has occurred. Another example is peregrine falcon (*Falco peregrinus*), a species historically listed as threatened but recently delisted under ESA. Consequently, we assigned peregrine falcon to the TE category (Appendix).

Admittedly, our system of categorizing species could have been refined with more categories, such as proposed or candidate species under ESA, or state-level designations of sensitive, threatened, or endangered. We explored the use of an increased number of categories, but this resulted in small sample sizes per category, with some categories containing as few as one species. These extremely low sample sizes, and highly variable sample sizes across categories, did not appear sufficient to obtain robust indices of the degree to which studies have been conducted on species in each category.

We searched for literature on the 187 species during 1997 at the University of Montana, Missoula, using all databases available at its library. We used a variety of key words to ensure that we found literature related to habitat and population status and trends, potential limiting factors, and environmental requirements. Our search was not exhaustive but instead was designed to find literature pertinent to conservation and management of each species. Our search included literature from research conducted both within and outside the Basin.

We summarized results of the literature search in three ways: (1) by management category; (2) by vertebrate class; and (3) by all combinations of management category and vertebrate class. For each summary, we calculated the mean number of citations per species.

### Research is Biased by Management Category and Vertebrate Class

Of the 187 species for which we conducted a literature search, a large majority (75%) was neither CS nor TE, with a substantially smaller percentage in CS (21%) and TE (4%) categories. By contrast, mean citations per species was highest for TE species ( $\bar{x} = 59.9$ ), intermediate for CS species ( $\bar{x} = 40.3$ ), and lowest for species that were neither CS nor TE ( $\bar{x} = 20.3$ ). By vertebrate class, birds had the highest mean citations per species

( $\bar{x}$  = 29.2), followed by mammals ( $\bar{x}$  = 22.3), amphibians ( $\bar{x}$  = 17.3), and reptiles ( $\bar{x}$  = 12.2).

Notably, all TE and CS species were birds or mammals (Figure 1). By contrast, reptile and amphibian species, all of which lacked special status, had the two lowest mean citations (Figure 1).

These results confirm that the majority of vertebrates of conservation concern in the Interior Northwest have received little attention from research compared to those with CS or TE designations. This pattern was particularly evident for amphibians, mammals, and reptiles that were neither CS nor TE species. These vertebrates averaged <17 citations per species, lowest among all combinations of management category and vertebrate class (Figure 1). By contrast, mean citations per species for TE birds (61) and mammals (59) represented a three- to four-fold difference over species that were neither CS nor TE. Further disparities were evident from results for CS species of birds and mammals: mean citations per species for these vertebrates was 45 and 23, a level intermediate to the extremes of TE species versus those without CS or TE status.

Interestingly, a bias favoring research on birds was evident when TE species were not considered. CS birds had the highest mean citations per species among all combinations of management category and vertebrate class except TE birds and mammals (Figure 1). Moreover, mean citations per species for birds that were neither CS nor TE were equivalent to that for CS mammals, and higher than that for amphibians, mammals, and reptiles that were neither CS nor TE species.

### **Are New Research Priorities Needed?**

Our results provide compelling evidence that research on species with special management status is heavily favored over research on species of conservation concern that lack special status. In particular, researchers have given relatively little attention to species until they become threatened or endangered, which may be a function of the availability of research funds. That is, research on a given species may not receive funding until the species is petitioned or listed as threatened or endangered. If this scenario is true, it represents a highly inefficient way to research and manage species and their habitats, in contrast to an approach that attempts to address all species of conservation concern more equitably. Without studies

conducted before a species might be listed under ESA, the knowledge required to identify threats, enact appropriate conservation measures, and avoid the listing process is foregone. Clearly, a different approach is needed to address the obvious and substantial research inequities among species of conservation concern if knowledge is to be generated for efficient, preemptive management.

We believe our results could be used as a framework to develop new priorities for research on such species in the Interior Northwest. Species of conservation concern that have received little research attention in the past could be identified as having high priority for future studies. For example, lists of these species are available from a variety of private, state, and federal sources, and could be used in combination with our list to guide the development of new priorities. Species that occur consistently among such lists, and that lack special management status, would be compelling candidates for increased research emphasis.

A fundamental question about any new research priorities, in our view, is how well the new priorities mitigate past research inequities. We contend that novel designs for research on species of conservation concern must be developed by scientists and supported by managers to address past inequities. While most research has focused on single or few species (Karl et al. 1999), community-level studies are urgently needed to efficiently address the collective knowledge gaps among all species of conservation concern, especially across large landscapes such as the Basin. In an example in this issue, Wisdom et al. (2002) characterized a comprehensive network of habitats for 44 species of conservation concern in the Interior Northwest, based on estimates of habitat abundance, quality, resiliency, and connectivity derived from prior landscape research (Wisdom et al. 2000, Hann et al. 2002). Such holistic research and conservation designs are needed to deal efficiently with the large number of species that deserve conservation attention (Noss and Cooperrider 1994).

Although we advocate the development of new research priorities, we acknowledge that research on TE species is necessarily a high priority. That research, however, should not come at the expense of ignoring other species of concern whose ecological status may be just as compelling from a conservation view. Unfortunately, the listing and

recovery process under ESA is confounded by political, social, and economic considerations (Tear et al. 1995), which impede the use of this process as an ecological guide for setting research priorities. Consequently, we believe that more objective, ecological criteria are needed to develop new research priorities, in concert with use of existing processes such as those under ESA.

Professional societies in the ecological and conservation sciences are uniquely positioned to take the lead in establishing new research priorities. As independent, credible voices of science, the collective views of professional societies regarding appropriate research priorities for species of conservation concern could have substantial influence on funding decisions. For example, if a consortium of professional societies identified and published a suggested set of research priorities and designs for such species, the results could be used by a variety of private, local, state, and federal entities that fund research. While professional societies cannot make policy decisions

about research funding, they can provide a clinical, diagnostic basis for others to make such decisions.

We welcome the views of scientists and managers on this topic. It is our hope that such discussion can serve as a catalyst for the design and support of more equitable ways to study all species of conservation concern in the Interior Northwest.

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