

**SETTING PRIORITIES FOR WILDLIFE
CONSERVATION:
THE ALASKA SPECIES PRIORITIZATION RANKING
SYSTEM**



Prepared for

The Alaska Department of Fish and Game
Nongame Program

by

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EXECUTIVE SUMMARY

In order to identify and prioritize projects that address the species of greatest conservation need in Alaska, the Alaska Department of Fish and Game's (ADF&G) Nongame Program recognized the need to implement a systematic approach to evaluate and quantitatively analyze the state's wildlife and fish conservation needs. The goal of this project was to research and develop a consistent and transparent priority ranking system for wildlife species in Alaska with the goal of providing more specific programmatic guidance. The project objective was to provide a logical ranking for all vertebrate taxa included in ADF&G's Comprehensive Wildlife Conservation Strategy (CWCS) nominee species list.

To meet this need, ADF&G Nongame Program and staff selected the approach used by the Florida Game and Fresh Water Fish Commission (FGFWFC), and first described by Millsap et al. (1990), as a model for Alaska's species ranking effort. Within the Millsap et al. (1990) ranking system, vertebrate species are ranked based on biological vulnerability and extent of knowledge of population status and management needs. Advantages of the Millsap et al. (1990) approach include scores that are explicit and traceable, the ability to update ranks as better information becomes available, and flexibility in setting priorities as a result of separate subscores and sorting mechanisms.

We modified the ranking system developed by Millsap et al. (1990) to improve the system's applicability to Alaska. We also modified the scoring system so that it better captured uncertainty and missing data. The ranking system was divided into three component parts: 1) **Biological Scores** were the sum of eight variables that reflected different aspects of a taxon's distribution, abundance and life history. High biological scores indicated greater vulnerability to extirpation; 2) **Action Scores** were the sum of individual scores for four variables that reflected the current state of knowledge or extent of conservation efforts directed toward a given taxon within Alaska. High action scores denoted poorly known, unmanaged taxa; and 3) four **Supplemental Variables** were used to sort taxa to answer specific questions in relation to taxonomic significance, season of occurrence, harvest and whether or not a taxon was peripheral. Our system provided a biological score and an action score for each taxon evaluated. The use of multiple variables allowed for flexibility in the ranking system so that it could be queried in a myriad of ways to provide answers to specific conservation questions.

We ranked a total of 341 taxa including 6 amphibians, 213 birds, and 122 mammals. A major two year effort was required to complete the ranking process. System development included a pilot project to rank and evaluate a subset of the nominee taxa, an internal review by ADF&G Nongame staff after all taxa were ranked, an expert review for taxa with missing information, and a consistency check across all variables.

We examined the results of the ranking process to assess the ability of the system to adequately evaluate biological vulnerability and the state of current knowledge. We conducted analyses to explore the interrelationships among variables, compare scores to other existing agency listing designations, and to assess taxonomic bias. To better assist with interpretation of biological and action scores, we also devised categories to group taxa according to biological vulnerability and action need.

We found no strong correlations among the biological variables or the action variables. The principal components analysis partitioned the biological variables into three components. The first and third components considered population and distribution attributes indicating that they reflected population status. The second component reflected life history attributes. We concluded that both population status and life history variables were important in explaining the variance in biological scores. Ecological specialization, distribution trend, and population trend contributed the least to explaining the variance in biological scores, but were retained due to the current imbalance in taxonomic representation of Alaska terrestrial vertebrates within the ranking system.

When comparing biological scores to federal and state status designation, no difference was observed between unlisted species and listed taxa. This was attributed to the high proportion of federally listed taxa that occur primarily outside of Alaska and the obsolete nature of the state Species of Concern list. A more meaningful comparison was made with NatureServe ranks, which revealed an increase in median biological scores from global and state critically imperiled and imperiled (G1, G2, S1, S2) through taxa considered secure (G4, G5, S4, S5). This analysis indicated that the system follows a similar pattern observed in a well known and accepted ranking system and accurately represents the relative status of taxa across a wide range of status conditions.

Comparison of scores among classes revealed higher biological scores for mammals and higher action scores for mammals and amphibians than for birds. Higher biological and action scores for mammals were due to a high proportion of endemic taxa included in the ranking. Individual action scores were also compared among classes. Beyond an initial survey to assess distribution, more funding has been allocated towards bird monitoring and research. Management efforts have been greater for birds and amphibians compared to mammals.

Results from the variable analyses were not used to adjust the ranking system. Instead, they were included to alert users of the potential biases and limitations of the system. In order to fairly evaluate the system, all vertebrate taxa need to be included. The current system provides biological and action scores based on the best available knowledge. To fully interpret and use the scores to guide decisions regarding conservation, users of the system should read the criteria justification provided in the database and acknowledge the extent of the expert review prior to drawing conclusions. Supplemental variables may also be used to sort the taxa based on taxonomic significance, seasonal occurrence, level of harvest, and peripheral status depending on the objectives of the user.

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INTRODUCTION

Resources (e.g. time and money) available for biodiversity conservation are invariably in short supply relative to the needs for those resources (Master 1991, Regan et al. 2004). Not surprisingly, methods for prioritizing potential target species in terms of their conservation status are integral components of the conservation planning process (Knapp et al. 2003). Many states in the U.S. have developed their own systems in order to prioritize conservation actions (e.g. Millsap et al. 1990) and/or to appoint “official” state designations such as “endangered”, “threatened” and “species of special concern” (Master 1991).

To make the best use of federal funds provided through the Wildlife Conservation and Restoration and the State Wildlife Grants (SWG) programs, Congress directed each state to develop a Comprehensive Wildlife Conservation Strategy (CWCS). As a primary objective, Congress further directed each state to identify and focus on species of greatest conservation need (SGCN). With the completion and approval of Alaska’s CWCS in 2005, the Alaska Department of Fish and Game (ADF&G) became eligible for congressional SWG appropriations. In order to identify and prioritize projects that address the species of greatest conservation need in Alaska, ADF&G recognized the need to implement a systematic approach to evaluate and quantitatively analyze the state’s wildlife and fish conservation needs.

About 600 species or subspecies of vertebrate animals regularly occupy Alaska’s terrestrial habitats. With such a large array of taxa it is difficult to objectively allocate limited resources to those most in need of active conservation. When the State of Alaska developed their Comprehensive Wildlife Conservation Strategy (CWCS) in 2006, they compiled a list of nominee species that contained 400 species of greatest conservation need. This list was derived from conservation plans, lists from conservation organizations, and expert and public comments. Although a number of evaluation criteria were considered to develop the nominee list, no criteria were used to objectively score species. This approach, along with the sizeable number of species, has limitations for guiding future projects and funding decisions. The CWCS identified the need for an objective ranking process and suggested that a key requirement is to complete a systematic statewide species ranking process in the near future.

To meet this need, ADF&G Nongame Program staff reviewed a variety of options for systematically ranking and evaluating the conservation status of species, including a number of basic approaches that were described in other states’ conservation strategies. After extensive consultation and discussion with other nongame programs, the approach used by the Florida Game and Fresh Water Fish Commission (FGFWFC), and first described by Millsap et al. (1990), was selected as a model for Alaska’s species ranking effort. Within the Millsap et al. (1990) ranking system, vertebrate species are ranked based on biological vulnerability and extent of knowledge of population status and management. Advantages of the Millsap et al. (1990) approach include scores that are explicit and traceable, the ability to update ranks as better information becomes available, and flexibility in setting priorities as a result of separate subscores and sorting mechanisms.

Since the publication of Millsap et al. (1990) Wildlife Monograph, this procedure has been adjusted and employed as a tool to guide conservation decision making in a number of states,

other countries, and also within the National Park system. At the state level, a modified Millsap approach was used to set priorities for species ranking in Indiana (Knapp et al. 2003) and for identifying species of concern in Maine (Ritchie et al. 2005). Baldi et al. (2001) adapted the Millsap system to set priorities for the conservation of terrestrial vertebrates in Hungary and Lunney et al. (1996) customized the Millsap et al. (1990) ranking system to identify and prioritize endangered fauna in New South Wales, Australia. At a finer scale, Garret and Wright (2000) used a modified Millsap approach to prioritize research and monitoring needs for terrestrial mammals in national parks.

During 2006/07 and 2007/08, ADF&G'S Nongame Program entered into a partnership with the Alaska Natural Heritage Program (AKNHP) to research and develop a consistent and transparent priority ranking system for wildlife species in Alaska with the goal of providing more specific programmatic guidance. The project objective was to provide a logical ranking of all vertebrate taxa with respect to biological vulnerability and current state of knowledge. Results of the ranking exercise would be used to provide up-to-date species level information for strategic decision making, better-inform cooperators, allow for better inter-divisional coordination, and to increase public support for Nongame Program expenditures.

Here, we describe the Alaska species priority ranking system and present rankings of taxa according to specific sets of criteria. We summarize the methods that were employed to develop the priority ranking system, including modifications to the Millsap et al. (1990) ranking and scoring system, which improved its efficiency in Alaska. We also illustrate ways that ranks can be used to prioritize wildlife conservation decisions in Alaska.

METHODS

Development of the Ranking System

System development began in January 2006. ADF&G, AKNHP and U.S. Fish and Wildlife staff participated in a teleconference with Thomas Eason and Jeff Gore from the Florida Fish and Wildlife Conservation Commission (FF&WCC). Jeff Gore was a co-author on the Millsap et al. (1990) Wildlife Monograph and the FF&WCC has been using the Millsap ranking system to guide conservation decisions in Florida for almost two decades. The Florida team advised us of the strengths and weaknesses of the Millsap system and made suggestions for modifications that would improve the applicability of a similar ranking system for Alaska. They also provided us with a copy of their project database, which they currently use to house and update all project data.

Based on our discussions with the FF&WCC team and review of the ranking literature, we decided to implement a three-pronged ranking system similar to Millsap et al. (1990), which considers biological, action, and supplemental variables. Biological variables measure characteristics of a taxon's distribution, abundance and life history, while action variables reflect the current state of knowledge of the taxon's distribution, population trend, limiting factors, and current extent of conservation efforts. High biological scores denote species with greater vulnerability to extirpation, while high action scores indicate poorly understood, unmanaged taxa. Supplemental variables are not used in the scoring process, but instead, are used to sort and categorize taxa to answer specific questions that reflect various biogeographic, systematic and

political attributes. We specifically selected this three-pronged approach because variables are designed to be applicable to all vertebrate taxa, the system yields independent measures of biological vulnerability and state of knowledge for each taxon, and the system is flexible enough to allow sorting of taxa based on any combination of variables (Millsap et al. 1990). Categories were adopted from Millsap et al. (1990) and adjusted when deemed necessary to describe the range of variation within each variable. For biological and action variables, points were assigned to each category with each variable worth a maximum of 10 points and a minimum of -10 points. Modifications that were made to the Millsap et al. (1990) ranking and scoring system for Alaska are provided in detail later in this report following the description of the ranking variables.

To test our initial system, a pilot evaluation was conducted using a subset of 26 species from the CWCS nominee species list (ADFG 2005). These pilot species were selected by ADF&G and AKNHP staff because they represented a sample of potentially data deficient, common, and rare species across all vertebrate taxonomic groups, including birds, fishes, mammals, and amphibians (Appendix I). The results of the pilot study were reviewed by ADF&G nongame and AKNHP staff to assess the consistency and accuracy of the ranking system. Criteria were refined to assign more accurate weights, to maximize consistency, and to reduce taxonomic bias.

During 2006/07, AKNHP ranked 200 species and presented these preliminary results to ADF&G Nongame Program staff for further evaluation. With a much larger sample, reviewers were able to better identify ambiguities in the evaluation criteria and scores. Once again, the criteria were modified based on reviewer comments. Using the now refined ranking system, during 2007/08, we: 1) updated any pertinent information for the previously ranked 200 species as a result of changes to the ranking criteria and 2) completed ranking for all remaining taxa.

Selection of Taxa

Criteria for Inclusion: The list of nominee species included in the Alaska CWCS (ADFG 2005) was derived from existing conservation plans, lists from conservation organizations, and expert and public comments. The list included 400 taxa represented by five classes: birds, mammals, amphibians, fishes and invertebrates. The CWCS nominee species list was considered representative of the species of greatest conservation need in Alaska, but also subject to change depending on updates in conservation plans and by organizations. Prior to implementing the ranking system, we refined the nominee species list to reflect any recent changes to conservation status, taxonomic status, and occurrence in Alaska (taxa considered accidental and casual were excluded). When bird taxa at the species level were included on the nominee list and all subspecies that occur in Alaska were also included, the species level was not ranked. The same was not applied to mammals due to the high number of mammals with questionable taxonomic status.

Although two fish species were included during the pilot testing to insure that the system worked across all taxa, fishes and invertebrates were excluded from the remainder of the ranking process. Overall, a total of 341 species, subspecies, or populations were ranked for this project, including: 213 birds, 122 mammals, and 6 amphibians.

We ranked subspecies and populations (e.g. Cook Inlet Beluga whale) that were included in the nominee list, although this was sometimes problematic. In Alaska, the systematic status of many

subspecies is not well understood or researched. Many subspecific designations were made >50 years ago and are based on morphological measurement from often times very small sample sizes. The authors of the Millsap et al (1990) monograph were also concerned that by using all described subspecies, they risked ranking a taxon highly that might later be found identical to more wide-spread, secure populations of the same species. We elected to rank all subspecies that were included in the nominee list, cognizant of the fact that many of the subspecies that we treated separately may not be highly differentiated and may no longer warrant subspecific status. To that end, we encourage end-users of the Alaska ranking system to consider taxonomic status of high-ranking taxa when setting conservation priorities, and have included a sorting mechanism for this consideration in the supplemental variables (described below). Populations were ranked in a similar manner and identified as such through the taxonomic significance supplemental variable.

When ranking marine mammal stocks, oftentimes the “stock” was inclusive of the entire population of that species that occurs in Alaska (e.g. Bowhead, Western Arctic). Consequently, most marine mammal stocks were categorized as species and ranked accordingly. Exceptions to this rule included the Stellar sea lion, which has two stocks in Alaska (Eastern and Western) and was therefore ranked as two separate populations, and the Northern sea otter, which was ranked at the species level (inclusive of all three stocks that occur in Alaska) and also at the population level for the declining Southwest stock.

Description of the Ranking Variables

As noted previously, we adopted the basic structure of the Millsap et al. (1990) ranking system, which divided variables used to rank taxa into 3 groups (Figure 1). The first group consisted of 8 **biological variables**, which were used to measure aspects of a taxon’s distribution, abundance and life history. Scores for these 8 variables were summed to yield a biological score for each taxon, with higher biological scores suggesting greater vulnerability to extirpation. The second group consisted of 4 **action variables** that measured the current state of knowledge or extent of conservation efforts directed toward a given taxon within Alaska. The sum of scores for the 4 action variables yielded an action score, with higher action scores denoting lack of knowledge or conservation action. The third group contained 4 **supplemental variables** that were used to sort taxa to answer specific questions in relation to taxonomic significance, season of occurrence, harvest and whether or not a taxon was peripheral. Each taxon was evaluated for each of the 16 total variables. The use of multiple variables allowed for flexibility in the ranking system so that it could be queried in a myriad of ways to provide answers to specific conservation questions.

Alaska's Species Ranking System

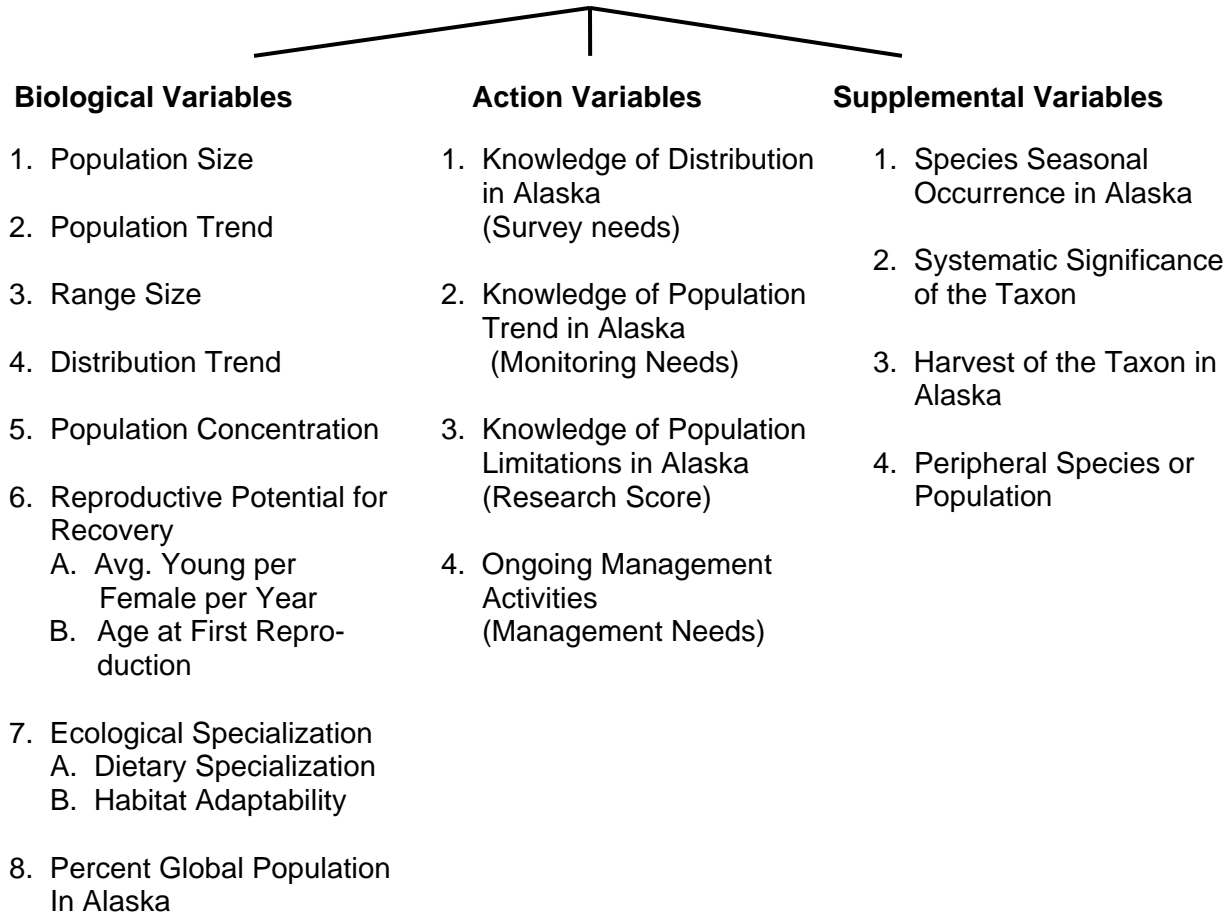


Figure 1. Structural schematic of Alaska's species priority ranking system. The highest possible biological score for a taxon is 80 points. The highest action score for a taxon is 40 points. Supplemental variables are used to sort and do not receive numerical scores (adapted from Millsap et al. 1990).

Biological variables – Scores for biological variables were based on the geographic range of the unit (species, subspecies, population) within Alaska. Biological scores were calculated from the sum of eight variables whose individual scores range from -10 to 10 (Table 1). The potential range of the total biological score for each taxa was -80 to 80 points.

1. **Population Size.** – The known or suspected adult population size in Alaska. This variable gives the highest score to taxa with the lowest number of adult individuals, recognizing that taxa with smaller population sizes are more vulnerable to extirpation. If the adult population size is unknown, but suspected to be small, the taxon is placed in category “B”. If the adult population size is unknown, but suspected to be large the taxon is placed in category “E”.
2. **Population Trend.** – The overall trend in number of individuals throughout the taxon’s range in Alaska over the last two decades. This variable recognizes that taxa with declining population trends are a concern regardless of population size. Categories were separated according to increasing or decreasing and known or suspected trends.

For birds, we used Breeding Bird Survey (BBS) data to assess population trend when better sources of data were unavailable. Alaska BBS data was only used when credibility levels were <3 (range 1 to 3; highest to lowest). Insignificant trends with credibility scores of <3 were designated as “unknown, but suspected to be stable or increasing” (B). Trends with a credibility equal to 3 were ranked as “unknown” (score = 0). When Alaska BBS data was unavailable or had credibility scores equal to 3, BBS data for the continental U.S. and Canada were used to evaluate trends. When national data were used, trends were always designated as “unknown, but suspected increasing (B) or decreasing” (D).

3. **Range Size.** – The total areal extent occupied by the taxa with no consideration of habitat suitability. This variable gives the highest weight to taxa with the smallest ranges recognizing that they are more vulnerable to disturbance. When a significant portion of the taxa’s population is present in Alaska during more than one season, this variable is based on the season when range size is most restricted.
4. **Distribution Trend.** – The percent historical change in distribution over the last 50 years. Distribution is the spatial extent occupied by the taxa with consideration of habitat suitability in the area that is occupied or utilized within Alaska. This variable assumes that taxa with fragmenting or contracting ranges are more vulnerable to extirpation than taxa with intact or expanding ranges.
5. **Population Concentration.** – The degree to which individuals within populations concentrate or aggregate seasonally at specific locations in Alaska (i.e. breeding sites, migration stopover areas, hibernacula). This variable implies a regular temporal compression of the distribution. This variable gives more weight to taxa that concentrate, assuming that they are more susceptible to stochastic events than species that do not aggregate.
6. **Reproductive Potential for Recovery.** – The ability of taxa to recover from serious declines in population size. This variable consists of two parts. The first part considers the number of potential offspring typically produced per year per breeding female and is an indication of the

taxon's ability to rebound after disturbance or respond to management actions. The second part considers the minimum age at which a female first reproduces, which also strongly influences a taxon's ability to rebound from population declines. This variable gives the most weight to taxa that produce fewer offspring at a later age assuming that they take longer to recover from or respond to environmental changes.

7. Ecological Adaptability. – This variable consists of two parts and measures different ways in which taxa might be specialized in response to environmental factors. The first part (A), dietary specialization, recognizes that taxa that have specific dietary niches are more vulnerable to environmental change than taxa with wide feeding tolerances. The second portion (B) considers habitat adaptability and considers habitat use within the season when taxa are the most specialized. This variable gives the most weight to dietary and habitat specialists that depend on scarce resources, assuming that they are less capable of adapting to environmental changes.
8. Percent of Global Population in Alaska. – This variable reflects Alaska's role in the recovery and conservation of a taxon. More weight is given to taxa with that have a high percentage of the world's population occurring within Alaska, assuming that the greater the percentage the more important status and actions within the state are to the persistence of the taxa.

Table 1. Biological variables, categories within variables and scores used to rank taxa.

Biological variables and categories	Score	Biological variables and categories	Score
1. Population size: known or suspected adult population size in Alaska		B. Area occupied has declined by 25-49%	6
A. 0-500	10	C. Area occupied has declined by 10-24%	2
B. 501-1000, or population is unknown but suspected small	6	D. Area occupied has declined by 1-9%	-5
C. 1001-3000	2	E. Area occupied is stable or has increased	-10
D. 3001-10000	-2	5. Population concentration: degree to which populations aggregate at sites seasonally in Alaska (within season when aggregate the most)	
E. 10001-25000, or population is unknown, but suspected to be large	-6	A. Population concentrates or occurs at single site	10
F. >25000	-10	B. Population concentrates or occurs at 1-25 sites	2
2. Population trend: overall trend in Alaska over the last 2 decades		C. Population concentrates or occurs > 25 sites	-6
A. Population size known to be decreasing	10	D. Population concentrates or occurs at > 250 sites or does not concentrate	-10
B. Trend unknown, but population size suspected to be decreasing	6	6. Reproductive potential for recovery	
C. Population formerly experienced serious declines, but is presently stable or increasing	2	<u>A. Average number of eggs or live young produced/adult female/yr</u>	
D. Population size stable or suspected to be stable or increasing	-6	a. <1 offspring	5
E. Population size known to be increasing	-10	b. 1-2 offspring	3
3. Overall range size: size of the range within Alaska (total areal extent occupied with no consideration of habitat suitability) during the season when range is most restricted.		c. 2-9 offspring	1
A. < 100 km ² (<1 township, St. Paul Island)	10	c. 10-100 offspring	-3
B. 100 km ² to 1,000 km ² (1-10 township, St. Paul Island to Etolin Island)	8	d. >100 offspring	-5
C. 1,001 km ² to 10,000 km ² (~1/1500 to 1/150 size of Alaska, Etolin Island to Kodiak Island)	4	<u>B. Minimum age at which females typically first reproduce</u>	
D. 10,001 km ² to 100,000 km ² (~1/150 to 1/15 size of Alaska, Kodiak Island to Arctic National Wildlife Refuge)	-2	a. >8 years	5
E. 100,000 km ² to 400,000 km ² (~1/15 to 1/4 size of Alaska, Arctic National Wildlife Refuge to Brooks Range + North Slope)	-8	b. 4-8 years	1
F. >400,000 km ² (>1/4 size of Alaska, Brooks Range + North Slope)	-10	c. 2-3 years	-3
4. Distribution trend: % historical change in distribution (spatial extent occupied with consideration of habitat suitability) over the last 50 years in area occupied within Alaska		d. <2 years	-5
A. Area occupied has declined by >50%	10	7. Ecological adaptability: degree to which population is dependent on environmental factors	
		<u>A. Dietary specialization</u>	
		a. Not adaptable; dietary specialist with key requirements scarce	5
		b. Moderately adaptable; dietary specialist with key requirements fairly common	1
		c. Highly adaptable; opportunistic feeder	-5
		<u>B. Habitat adaptability; refers to the habitat used within the season that is most limiting in Alaska</u>	
		a. Not adaptable; habitat specialist with key requirements scarce	5
		b. Moderately adaptable; habitat specialist with key requirements fairly common	1
		c. Highly adaptable; habitat generalist	-5

Table 1, continued.

	Biological variables and categories	Score
8.	Percent of Global population in Alaska	
	A. Species is endemic to AK	10
	B. > 90% of global population occurs in AK	6
	C. 75-89% of global population occurs in	2
	D. 50-74% of global population occurs in AK	-2
	E. 25-49% of global population occurs in AK	-6
	F. <25% of global population occurs in	-10

Action Variables – Action variables considered how much was known about a taxon within Alaska. Action scores were calculated based on the sum of four action variables whose individual scores range from -10 to 10 (Table 2). The total action score for each taxa had the potential to range from -40 to 40 points.

1. Knowledge of Distribution in Alaska (Survey). – Knowledge of a taxon’s distribution within the state is a prerequisite to effective conservation management. This variable gives the highest score to taxa whose distribution in Alaska is least well known.
2. Knowledge of Population Trend in Alaska (Monitoring). – Knowledge of abundance and population trend is an important component to effective management. Taxa that are not currently monitored receive the highest score for this variable. Local monitoring or monitoring that is inadequate to detect a trend is weighed more heavily than statewide monitoring that provides statistically valid abundance or trend estimates.
3. Knowledge of Alaska Population Limitations (Research). – Effective conservation actions require knowledge of the factors that are currently limiting to populations. The highest scores for this variable are given to taxa whose major factors limiting distribution and population size are not well known.
4. Ongoing Management Activities (Management). – Current regulations and management plans for taxa are also a prerequisite to effective conservation planning. This variable gives the most weight to taxa that are not managed. An intermediate score is given to taxa that are managed in the form of conservation laws and regulations while taxa that are actively managed receive the lowest scores.

Table 2. Action variables, categories within variables and scores used to rank taxa.

Action variables and categories	Score
Knowledge of distribution in Alaska (Survey)	
A. Distribution is extrapolated from few locations or knowledge limited to general range maps.	10
B. Broad range limits or habitat associations somewhat known, but distribution is not well understood throughout range in Alaska.	2
C. Distribution is well known throughout range in Alaska with knowledge of habitat associations.	-10
Knowledge of population trend in Alaska (Monitoring)	
A. Not currently monitored.	10
B. Monitored locally or statewide monitoring inadequate to detect trend.	2
C. Statewide monitoring adequate to detect population trend.	-2
D. Statewide monitoring based on population estimates, or nearly complete censuses.	-10
Knowledge of Alaska population limitations (Research s)	
A. Factors potentially affecting population size and distribution are speculative, with little awareness about which are limiting.	10
B. Factors potentially affecting the population are known, with some agreement on which 2 or 3 are likely limiting.	2
C. Factors limiting populations are known, and there is broad consensus about which are limiting.	-10
Status of species planning and management (Management)	
A. None directed primarily at the taxon.	10
B. Management mostly related to enforcement of conservation laws.	2
C. Some direct management activities in place to benefit this taxon.	-10

Supplemental Variables – Four supplemental variables were included as mechanisms for sorting the data based on season of occurrence, taxonomic significance, level of harvest, and whether Alaska is on the periphery of a taxon’s range. Supplemental variables were not used to rank taxa. Rather, they were useful in sorting taxa ranked by biological or action scores (Table 3).

1. Species occurrence in Alaska. – Effective conservation planning and management requires knowledge of the period of residence of the taxon within the state. For example, Alaska is home to a wide-variety of breeding birds during the summer, but many of these animals winter elsewhere; therefore, opportunities for management actions may be limited temporally for many species. This variable enables sorting of target taxa by season of occurrence or permanent residence.
2. Systematic significance of the taxon. – One of the goals of the ADF&G Nongame Program is to promote and sustain wildlife biodiversity in Alaska. This variable helps to address this goal by recognizing that the more genetically distinct a taxon is, the higher its value to overall species diversity. In this sorting variable, taxonomic categories are used as a gauge for genetic distinctiveness. Members of monotypic families (e.g. the Pacific walrus) are considered of greater systematic significance than intergrading subspecies (e.g. Turner’s Rock Ptarmigan).
3. Harvest of the taxon in Alaska. – This variable identifies the extent of protection from harvest and take currently afforded under state and federal law and can be used to recognize highly vulnerable taxa that are not protected.
4. Peripheral Species. – Because of Alaska’s geography, many of the taxa that occur in the state are at the northernmost limits of their ranges or occur irregularly in the state for very short time periods (e.g. many Asiatic bird species only occur in westernmost Alaska during spring and fall migration). We define peripheral as any taxon that is at the edge of its range with less than 10% of its global range known to occur in Alaska. While it is important to consider peripheral species as part of the Alaska fauna, this sorting variable was included to insure that conservation efforts are not diverted to species that may be rare in Alaska but widespread elsewhere, simply because they are at the limits of their range.

Table 3. Supplemental variables and categories within variables used to sort taxa.

Supplemental variables
Species occurrence in Alaska
A. Permanent year-round resident
B. Resident only during breeding season
C. Resident only during nonbreeding season
D. Transient
Systematic significance of the taxon (highest level of systematic significance)
A. Monotypic family
B. Monotypic genus
C. Monotypic species
D. Disjunct population below the species level
E. Intergrading subspecies
Harvest of the taxon in Alaska
A. Harvest is substantial with no regulations in place.
B. Harvest is substantial with regulations in place.
C. Harvest is not substantial (minor subsistence take, accidental take, or harvest of nuisance animals).
D. Harvest is prohibited by regulation or the taxon is not harvested.
Peripheral species - <10% of global range is in Alaska
A. Yes
B. No

Modifications from Millsap et al. (1990)

Ranking criteria: Several criteria from the Millsap ranking system were adjusted to better address conservation needs specific to Alaska. Millsap et al. (1990) answered the biological variables from a range wide (global) perspective. We believe that conservation efforts in Alaska will best address range wide issues by conserving species that face challenges within the state as opposed to species that experience issues elsewhere, but that are secure in Alaska. As a result, we modified the biological variables to reflect a state wide perspective (e.g. Population size: known or suspected adult population size in Alaska).

Within the biological variables, we condensed the ecological specialization variables from three to two, by combining the Millsap categories “reproductive specialization” and “other specialization” into a single attribute labeled “habitat specialization”. Within the Millsap ranking system, the “other specialization” category captured ecological or behavioral specializations not covered under reproductive or ecological specialization (e.g., strict habitat requirements for hibernacula, specific roosting structures, etc.). Due to the high rate of seasonal occurrence of many species in Alaska (i.e. migratory birds), we found that the “other specialization” category resulted in a high number of unknowns. We felt that combining the two categories better captured habitat specialization during the season when a taxon was most specialized and was a

more efficient and consistent approach that was easier to interpret and compare among taxa. The responses were also changed for this attribute in order to distinguish between specialists with scarce resources and specialists with resources common (Master et al. 2003).

Lastly, we added an eighth biological variable to address Alaska's role in conservation. The percent of the global population that occurs in Alaska was added to improve the efficacy of conservation efforts by increasing scores for species that have a higher dependency on Alaska for their persistence.

Scoring system: Since the publication of Millsap et al. (1990) ranking system, a number of authors have evaluated similar ranking systems and suggested improvements to help reduce uncertainty. Regan et al. (2005) identified two types of uncertainty associated with the attributes used to assign ranks – linguistic and epistemic. Linguistic uncertainty arises from differences in interpretation of attribute definitions by different reviewers. Regan et al. (2005) emphasized the importance of discussion and review to reduce inconsistencies and misinterpretation resulting from this type of uncertainty. To address linguistic uncertainty, attributes were explicitly defined and initial assessments were only performed by two individuals to maximize consistency. When experts were consulted, definitions were explained and the initial assessor was available to answer any questions. After ranking was completed for the suite of taxa, consistency checks for each variable were performed. One person reviewed all taxa for each criteria to minimize reviewer bias.

Epistemic uncertainty is associated with our knowledge of the state of the system and may result from temporal, spatial, and environmental stochasticity, sampling variance, or data interpretation (Regan et al. 2002, Regan et al. 2005). Weighted averages, Probabilistic rule sets, and fuzzy sets are several measures of epistemic uncertainty that have been incorporated into conservation priority systems (Knapp et al. 2003). We used weighted averages to compensate for epistemic uncertainty because they were found to provide the best balance between straightforward calculation and incorporating the full probability distribution (Knapp et al. 2003). A probability was assigned to each response category when the response spanned two to three answers. From this, a weighted average was calculated for each attribute:

$$\sum_{i=1}^m \sum_{j=1}^n X_{ij} P_{ij}$$

Where m = number of attributes, i = attribute, n = number of response categories, j = response category, X = point value for category, P = probability (Knapp et al. 2003). When uncertainty for an attribute spanned greater than 3 response categories the attribute was considered unknown and a value of 0 was applied.

Another disadvantage of some classification schemes, including Millsap et al. (1990), is how they handle missing data. The Millsap et al. (1990) system ranked biological and action variables on a scale of 0 to 10, with higher scores indicating greater vulnerability (biological) or lack of knowledge (action). When reviewers were able to answer a question, Millsap et al. (1990) substituted expert opinion for missing data. When data were not available to answer the question and expert opinion was lacking, the question was answered as unknown and it received the

lowest possible score. In this type of scoring system, unknowns are assigned a value of zero. As a result, taxa that are less known tend to be classified as less threatened (Regan et al. 2005).

In order to address the problem of missing data and to avoid taxa that are less known from scoring as less threatened, we modified the scoring system used for Alaska so that scores for an individual variable ranged from -10 to 10 and missing data were given a value of 0, which was the middle score instead of the lowest score.

Evaluation Process

AKNHP zoology program staff was responsible for evaluating and scoring all taxa included in the priority ranking based on literature review and information gleaned from the Heritage Program's Biotics and NatureServe database. All answers and sources of information used to categorize each taxon for each variable were entered into a project specific Access database. In 2007, experts were consulted to evaluate only those variables that the initial reviewer had answered as "unknown". Experts were provided with a subset of criteria for only the unknown answers. In 2008, the review process was modified and experts were asked to evaluate the entire suite of criteria, including the answers to all variables already completed by the initial reviewer. Experts were given explicit instructions and were asked to evaluate only taxa that they were familiar with. Adequate justification and supportive data were required to make changes to the ranks. Justification and comments from experts and not criteria scores were used to adjust the scores.

Analyses

We examined the results of the ranking process to assess the ability of the system to adequately evaluate biological vulnerability and the state of current knowledge. We conducted analyses to explore the interrelationships among variables, compare scores to other existing agency listing designations, to assess taxonomic bias, and to guide conservation in Alaska. Because the scoring system for most variables was non-linear (successive intervals between the scores were not equal), the median was the most appropriate statistic for describing the central tendency of the results.

To examine the interrelationships among biological and action variables, we calculated Spearman's rank correlations. We used R-type principal components analysis without rotation to further investigate the interrelationships among biological variables and to understand how each variable contributed to the overall ranking.

To assess the accuracy of the ranking system we looked at median biological and action scores of taxa of known status. Taxa of known status included (1) taxa thought to be recently extinct, (2) taxa designated as threatened or endangered by the U. S. Fish and Wildlife Service or a Species of Special Concern by the State of Alaska, and (3) taxa ranked by AKNHP using the Nature Conservancy's element ranking process.

To determine if the ranking system was taxonomically biased we compared biological scores among the three classes of vertebrates that were represented in the ranking system: Amphibia, Aves, and Mammalia. We predicted a priori that mammal biological scores would be higher due to the large number of endemic mammals on the nominee list, whose restricted range and small populations could potentially raise the scores. To test this hypothesis, we examined differences

in scores among classes for all taxa and then repeated this analysis with endemics excluded. We also predicted that if there was a taxonomic bias in the ranking system it would likely be attributable to two biological variables, population size and reproductive potential. Millsap et al. (1990) found these two variables were of questionable comparability among classes. To determine how these variables influenced biological scores, we then compared biological scores that excluded population size and reproductive potential. Action scores were also compared among classes. Median biological and action scores are presented for comparison due to the nonlinearity of the scoring system. However, when analyzing among class comparisons, Kruskal-Wallis rank sum tests were used due to the nonparametric nature of the data.

Taxa were also classified into categories based on biological vulnerability and need for conservation action. Preliminary designations were based on division of taxa into low (1/3 lowest scores), moderate, and high (1/3 highest scores) categories for both biological scores and action scores. Categories were developed for all taxa and for taxa at the species level only. Subsequent adjustments were based on the following ranking criteria:

Category I. Taxa in this category have moderate to high biological vulnerability and are in high to moderate need of surveys, monitoring, research, and/or management. Alaska also has a global responsibility to these taxa with greater than 25% of the global population occurring in the state.

Category II. Taxa in this category have moderate to high biological vulnerability, but low action scores.

Category III. Taxa in this category have (1) moderate to high biological vulnerability and moderate to high action needs with < 25% of their global population occurring in Alaska or (2) they are not considered biologically vulnerable (low biological scores), but are in need of surveys, monitoring, research, and/or management (moderate to high action scores).

Category IV. Taxa are in this category are abundant (population size > 25,000), widespread (range size > 400,000 km²), and stable (currently believed to be stable or increasing), or migrate through Alaska in very small numbers (< 1,000).

To demonstrate different ways that the ranking system can be utilized for conservation, we produced separate lists of taxa in need of investigation based on individual action criteria scores. A list of taxa in need of surveys was devised based on taxa with poorly known distributions (survey score = 10). Monitoring efforts were suggested for taxa with moderately understood distribution (survey score < 10), but that did not currently have adequate monitoring strategies in place (monitoring score > 2). Research was recommended for taxa that have unknown limiting factors (research score > 2) and are known or suspected to be declining in Alaska (population trend > 2).

RESULTS and DISCUSSION

Evaluation Process

For each taxon evaluated we calculated the total biological and action score (Appendix II). In total, we ranked 341 taxa including 6 amphibians, 213 birds, and 122 mammals. Of the 341 taxa ranked, 81 were subspecies, 8 were ranked at the population level, and 80 were designated as peripheral. Biological scores ranged from 42.0 to -72.0 while action scores ranged from 40.0 to -40.0. By class, median biological scores were: amphibians (-30.5), birds (-35.0) and mammals (-15.0); median actions scores were: amphibians (20.0), birds (10.0) and mammals (22.0). A detailed exploration of the scoring variables and the validity of the ranking system are provided below.

The expert review process was not consistent for the full duration of the project nor is it complete upon the delivery of this report. Our initial goal was to have experts help answer criteria for which the response was unknown. As the process evolved, we found that it was more straightforward to provide reviewers with all of the questions as well as the full response(s) already recorded by the initial reviewer. Overall, partial reviews were completed for 95 taxa, full reviews were completed for 32 taxa, and reviews for 59 taxa are pending. Reviews were requested for an additional 115 taxa with no response from the expert(s) contacted and reviews for 40 taxa were not requested at all due to time constraints or the evaluation by the initial assessor was deemed complete.

Interrelationships among variables

To examine the degree of association among variables, we computed Spearman's rank correlations for both biological and action variables. We found no strong correlations among the biological variables ($r > 0.50$; Table 4) or the action variables ($r > 0.50$; Table 5). However, there were moderately strong associations between population size and range size for the biological scores ($r = 0.47$; Table 4) and survey and monitoring action scores ($r = 0.42$; Table 5).

Table 4. Spearman's rank correlations between biological variables.

	Biological variables							
	Population size	Population trend	Range size	Distribution trend	Population concentration	Reproductive potential	Ecological specialization	Percent global
Population size	1.00	0.01	0.47**	0.14**	0.03	0.00	-0.07	0.13*
Population trend		1.00	-0.05	0.18**	0.22**	0.15**	0.04	0.04
Range size			1.00	0.14*	0.15**	-0.21**	-0.04	0.39**
Distribution trend				1.00	-0.03	-0.07	0.08	0.12*
Population concentration					1.00	0.36**	0.18**	0.02
Reproductive potential						1.00	0.24**	-0.23**
Ecological specialization							1.00	-0.01
Percent global								1.00

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 5. Spearman’s rank correlations between action variables.

	Action variables			
	Survey	Monitoring	Research	Management
Survey	1.00	0.42**	0.20**	0.21**
Monitoring		1.00	0.21**	0.37**
Research			1.00	0.31**
Management				1.00

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

We used R-type principal components analysis without rotation to further investigate the interrelationships among biological variables and to understand how each variable contributed to the overall ranking. Population size, range size, and percent global population were strongly associated with the first component, which accounted for 24% of the total variance in scores (Table 6). Population concentration and reproductive potential loaded highly on the second component along with a moderate association with ecological specialization, accounting for 19% of the total variance. Population trend and distribution trend were strongly associated with the third component, accounting for 13% of the total variance in scores. The first and third components considered population and distribution attributes indicating that they reflected population status. The second component reflected life history attributes. We conclude that both population status and life history variables were important in explaining the variance in biological scores.

Table 6. Unrotated factor loadings of biological variables based on R-type principal components analysis of the correlation matrix. Shaded cells indicate which component the factor was most associated with.

	Component		
	I	II	III
Eigenvalue:	1.9	1.6	1.1
% variance:	24.3	19.4	13.3
Population size	0.63	0.20	-0.30
Population trend	0.06	0.51	0.59
Range size	0.87	0.03	-0.23
Distribution trend	0.34	0.25	0.67
Population concentration	0.09	0.75	-0.28
Reproductive potential	-0.36	0.65	-0.26
Ecological specialization	-0.14	0.47	-0.05
Percent global	0.72	-0.04	0.06

Millsap et al. (1990), observed similar divisions between population status and life history components. However, in their analyses, population trend and distribution trend were associated with the first component and accounted for a higher percent of the variation than the Alaska system. In our study, population status variables were separated into two components, the first and the third. It is likely that the low percentage of the variance accounted for by the third component is due to the high number of unknowns for the categories distribution trend and population trend (distribution trend was unknown for 218 taxa and population trend was unknown for 146 taxa). We expect that improved knowledge of population and distribution trends in Alaska would increase the percent of the total variance in biological scores attributable

to these two variables. Distribution trend currently provides little value to the ranking system due to the number of unknowns and the relatively pristine condition of habitats in Alaska. This variable may gain importance in the future as anthropogenic affects, such as gas and oil development, and climate change become more influential on the Alaskan landscape. Knowledge of population trend is likely to improve in the future for birds with the realization of the Alaska Landbird Monitoring System (ALMS) and more adequate execution of the BBS.

Ecological specialization, along with distribution trend and population trend, contributed the least to explaining the variance in biological scores and, as a result, was less effective at delineating biological vulnerability. Ecological specialization also accounted for the least amount of variation in the Florida ranking system (Millsap et al. 1990). At this juncture, we do not recommend removal of any variables from the Alaska ranking system because not all taxa in Alaska were ranked and an apparent imbalance in taxonomic representation of Alaska terrestrial vertebrates currently exists within the ranking system, which could be affecting the variable analyses.

Accuracy of Biological and Action scores

To determine if the system adequately ranked imperiled taxa, median biological scores were computed and graphed for federal and state listed vertebrates. Of the 341 taxa ranked, only 2 had a high probability of being extinct. The two presumably extinct taxa were the Eskimo Curlew, which ranked second and the Glacier Bay water shrew, which ranked eighteenth. Millsap et al. (1990) found a correlation between extinct taxa and high biological vulnerability. Lack of an adequate sample size in Alaska precluded an adequate comparison.

The histogram comparison of federal and state listed vertebrates revealed no difference between unlisted species and Species of Special Concern in Alaska (Figure 2). The interquartile range revealed a large amount of variation in biological scores for Species of Special Concern. The similarity in biological scores between unlisted and Species of Special Concern in Alaska was attributed to an outdated state list. Development of this ranking system was partially motivated by the need for an objective state listing process in Alaska.

Millsap et al. (1990) found marked differences in biological scores between listed and unlisted taxa. Their data demonstrated an increasing trend for median biological scores from state listed through federally endangered taxa. A similar comparison of the Alaska ranking system to state and federally listed taxa did not yield comparable results. Instead, the Alaska ranking system lacked a strong trend and showed a high amount of variation for federally-listed taxa (Figure 2). Compared to Florida, Alaska likely has a higher probability of having federally listed taxa that are not necessarily imperiled in the state, but face challenges elsewhere in their range, either due to reduced anthropogenic impacts to the landscape and/or the high number of peripheral and seasonal occurrences in Alaska. For example, a large portion of federally listed taxa principally occur outside of Alaska (e.g. 8 of the 16 federally listed taxa in the state have less than 25% of their global population in the state). The large number of unlisted biologically vulnerable endemics on the ranking list also likely contributed to the lack of a strong difference between federally listed and unlisted taxa.

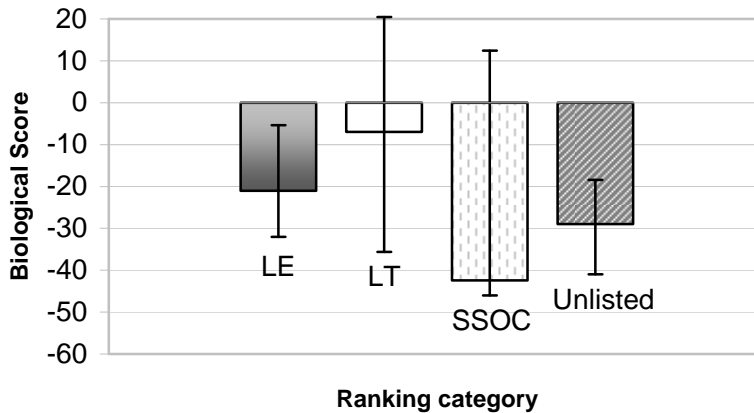


Figure 2. Histogram of median biological scores for federal- and state-listed taxa. Error bars are interquartile ranges. LE = federally-listed endangered (n = 11), LT = federally-listed threatened (n = 5), SSOC = state-listed Species of Special Concern (n = 11), unlisted (n = 314).

A more meaningful evaluation of the ranking system to adequately identify species of concern was a comparison with the Nature Conservancy’s element ranking system. The conservation status of a species is designated by a number from 1 to 5 (1 = critically imperiled to 5 = demonstrably widespread, abundant, and secure), preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global, S = Subnational). G ranks consider the relative imperilment of a taxon across its global range, while S ranks only consider the status of the taxa within the state. G and S ranks allow for comparisons among a range of status designations and reduce the influence of critically imperiled taxa that primarily occur outside of Alaska. S ranks consider status only within the state, and therefore, provide the best contrast to biological scores, which score criteria according to status in Alaska as well.

A histogram of median biological scores versus NatureServe ranks revealed an increase in median biological scores from global and state critically imperiled and imperiled (G1, G2, S1, S2) through taxa considered secure (G4, G5, S4, S5; Figure 3). This analysis indicated that the system follows a similar pattern observed in a well known and accepted ranking system and accurately represents the relative status of taxa across a wide range of status conditions. Deviations within G and S rank categories and overlap between categories indicate that some taxa may be more vulnerable than previously perceived and warrant further investigation.

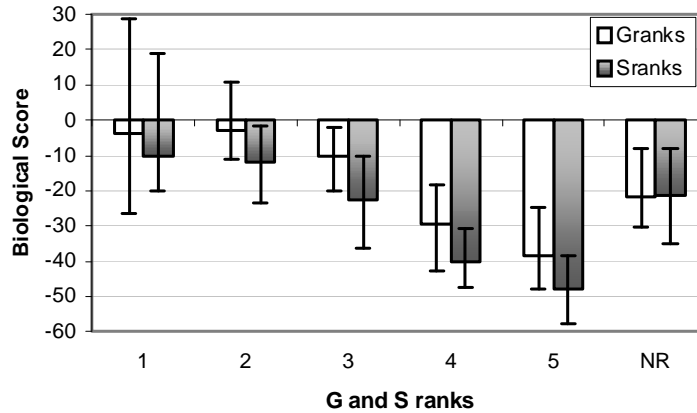


Figure 3. Histogram of median biological scores for the Nature Conservancy's global and state ranks from G1 to G5 and S1 to S5. Error bars are interquartile ranges. Categories are G1 = critically imperiled globally (n = 5), S1 = critically imperiled in Alaska (n = 9), G2 = imperiled globally (n = 18), S2 = imperiled in Alaska (n = 66), G3 = vulnerable globally (n = 59), S3 = vulnerable in Alaska (n = 105), G4 = apparently secure globally (n = 32), S4 = apparently secure in Alaska (n = 62), G5 = secure globally (n = 194), S5 = secure in Alaska (n = 65), GNR = not ranked globally (n = 31), SNR = not ranked in Alaska (n = 32).

As expected, listed taxa had lower action scores than unlisted taxa (Figure 4). This trend reflects the higher funding allocations and/or research directed toward species of known concern.

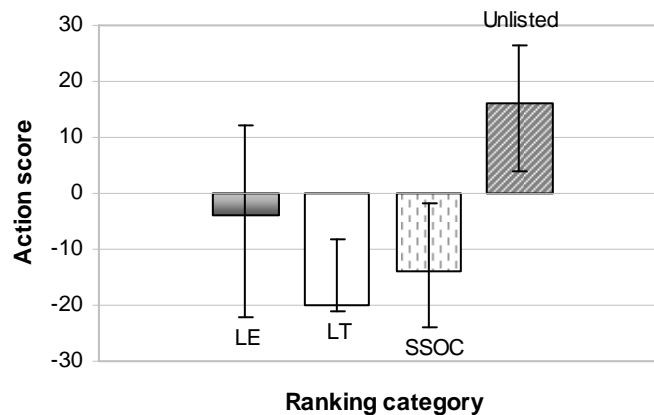


Figure 4. Histogram of median action scores for federal- and state-listed taxa. Error bars are interquartile ranges. LE = federally-listed endangered (n = 11), LT = federally-listed threatened (n = 5), SSOC = state-listed Species of Special Concern (n = 11), unlisted (n = 314).

Comparisons Among Taxa

To assess whether there were trends in scores among higher taxonomic categories, we compared biological and action scores among the three classes: birds, mammals and amphibians. It is

important to note that within the nominee list, there were likely preexisting taxonomic biases which may have affected these results. For example, the mammal nominee list was heavily weighted towards small and marine mammals while large terrestrial mammals were not well represented. Most orders and families of birds were well represented, with the exception of the order Anseriformes (family Anatidae).

Overall, median biological scores ranged from -15 to -35 for all taxa combined (Figure 5). Within class variation is represented by the broad overlap of interquartile ranges. Biological scores were higher for mammals ($m_d = -15.0$; $n = 122$; $\chi^2 = 29.6$, $p < 0.00$) compared to birds ($m_d = -35.0$; $n = 213$) and amphibians ($m_d = -30.5$; $n = 6$; Figure 5).

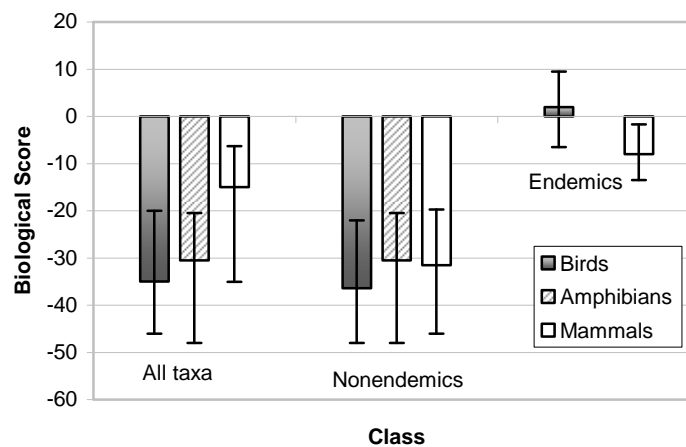


Figure 5. Histogram of median biological scores for all birds ($n = 213$), all amphibians ($n = 6$), all mammals ($n = 122$), nonendemic birds ($n = 199$), nonendemic amphibians ($n = 6$), nonendemic mammals ($n = 66$), endemic birds ($n = 14$), and endemic mammals ($n = 56$). Error bars are interquartile ranges.

We attributed the higher biological scores for mammals to a high proportion of endemic species and subspecies included in the ranking, which accounted for 46% of the mammals compared to 7% of the birds and 0% of amphibians ranked. Because of this disparity, we wanted to test the assumption that differences in biological scores were potentially due to the high proportion of endemic mammals included in the ranking. To do so, we compared biological scores of mammals and birds and excluded all endemics (Figure 5). No statistically significant difference in rank sums of biological scores was observed between birds ($m_d = -36.4$; $n = 199$; $\chi^2 = 21.6$, $p = 0.45$) and mammals ($m_d = -31.5$; $n = 66$) and amphibians (same as with all taxa shown above) once endemics were removed from the analysis. We conclude that the high number of endemic small mammals ranked accounted for the between class differences observed between mammals and birds.

To ascertain if certain variables were taxonomically biasing the ranking system, we adjusted the biological score by excluding the biological variables population size and reproductive potential for nonendemic taxa. Overall the rank sum of the adjusted biological scores for birds ($m_d = -30.0$; $n = 199$; $\chi^2 = 0.15$, $p = 0.93$), mammals ($m_d = -29.1$; $n = 66$), and amphibians ($m_d = -27.0$; n

= 6) were not significantly different (Figure 6). Although the observed difference was insignificant, the disparity between nonendemic mammals and birds was smaller for the adjusted biological scores than the unadjusted biological scores. This difference was accounted for by the variable population size, which was higher for mammals due to lower population sizes in Alaska. Population size was also primarily responsible for differences in median biological scores between amphibians and birds. Predicted differences in reproductive potential did not occur. This is likely due to the high proportion of small mammals included in the ranking system, which have a high fecundity and low minimum age at first reproduction.

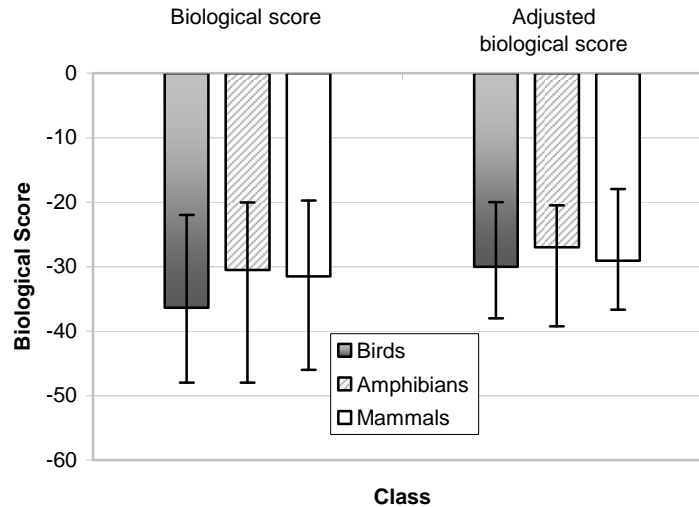


Figure 6. Histogram of biological scores and adjusted biological scores for nonendemic birds (n = 199), amphibians (n = 6), and mammals (n = 66).

There was no statistical difference among classes for nonendemic taxa prior to removal of the population size and reproductive potential variables. Millsap et al. (1990) conducted similar analysis and found that with the exception of amphibians, unadjusted biological scores were comparable among classes. We conclude that class level taxonomic differences are primarily a product of the taxa included in the ranking process and the inherent biological vulnerability of endemics, especially island endemics, and did not appear to result from large taxonomic biases in the criteria.

Median action scores for all classes ranged from 10 to 22. By class, birds had the lowest action scores ($m_d = 10$; $n = 213$; $\chi^2 = 23.45$, $p < 0.00$), while amphibians ($m_d = 20$; $n = 6$) and mammals ($m_d = 22$; $n = 122$) had correspondingly higher action scores (Figure 7). Within class variation is represented by the broad overlap of interquartile ranges.

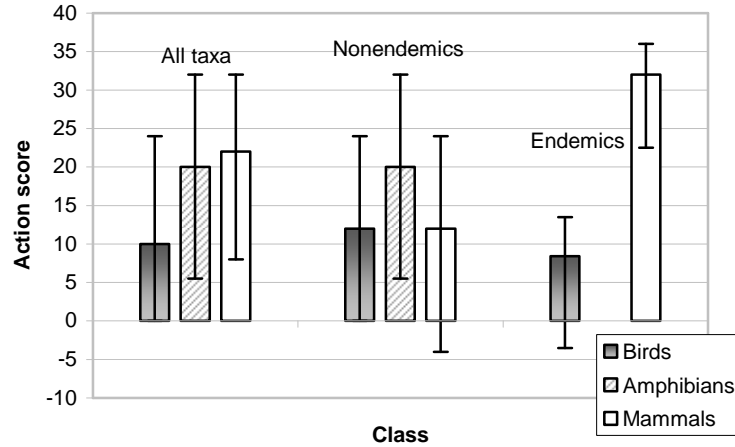


Figure 7. Histogram of median action scores for all birds (n = 213), all amphibians (n = 6), all mammals (n = 122), nonendemic birds (n = 199), nonendemic amphibians (n = 6), nonendemic mammals (n = 66), endemic birds (n = 14), and endemic mammals (n = 56). Error bars are interquartile ranges.

To test the assumption that differences in action scores were due to the high proportion of endemic mammals in the ranking system, we compared action scores of mammals and birds excluding endemics (Figure 7). Removing endemics from the comparison dissolved the differences in action scores between birds ($m_d=12.0$; $n=199$; $\chi^2 = 1.78$, $p = 0.41$) and mammals ($m_d=12.0$; $n=66$). The median action score for amphibians remained higher indicating that more action should be considered.

Within action scores, there were differences among classes for the individual action criteria (Figure 8). Survey effort was similar among all three classes, while class differences were more evident within the monitoring, research, and management variables. Overall, birds had the lowest median action scores for monitoring and research, indicating that more funding and effort has been allocated towards this class than for mammals or amphibians. Management scores were highest for mammals, and equal for birds and amphibians. The observed differences in management effort were likely due to the high degree of legal protection afforded to most birds by the Migratory Bird Treaty Act (1918) and to amphibians by ADF&G statute 16.05.030, which prohibits handling, collection, and transport without a valid permit.

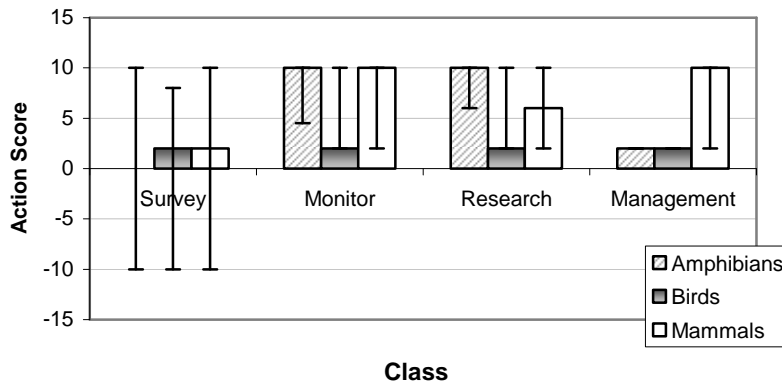


Figure 8. Histogram of median scores for individual action scores of amphibians (n = 6), birds (n = 213), and mammals (n = 122). Categories are survey, monitor, research, and management scores. Error bars are interquartile ranges.

When endemics were removed from this comparison, median research and management scores were equivalent for birds and mammals, while the other differences remained (Figure 9). The change in research and management scores may be explained by the preponderance of small endemic mammals ranked and the lack of research conducted and protection afforded to small mammals. Legal protection does exist for a number of the larger mammals (e.g., marine mammals are protected by the U.S. Marine Mammal Protection Act, 1972) resulting in similar management scores for birds and mammals.

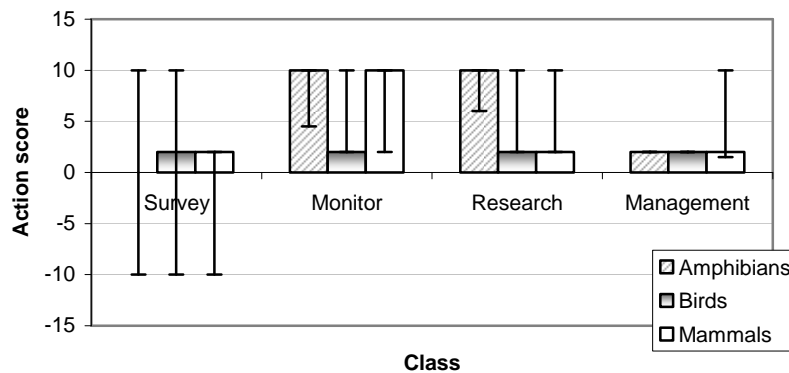


Figure 9. Histogram of median scores for individual action scores of nonendemic amphibians (n = 6), birds (n = 213), and mammals (n = 122). Categories are survey, monitor, research, and management scores. Error bars are interquartile ranges.

Implications for Conservation of Alaska's Vertebrate Fauna

The results of the ranking system can be manipulated and interpreted in numerous ways to answer different questions. Here, we provide several examples of how the data can be presented to make conservation based decisions, but this list is by no means exhaustive.

Categories

Based on comments received from the Florida Fish and Wildlife Commission, we developed categories to compartmentalize taxa based on biological vulnerability and action need. The categorization employs a combination of biological and action scores to assign taxa to different groups. Results from the categorization approach are presented for all taxa (Table 7) and also at the species level only (Table 8).

Using action scores to make recommendations for conservation planning

Revealing trends in relative state of knowledge can be useful for planning purposes and can be used to determine what aspects of research may be needed in the future. To demonstrate different ways that the ranking system can be utilized, we produced separate lists of taxa in need of investigation based on the individual action criteria scores. A list of taxa in need of surveys was devised based on knowledge of distribution (Table 9). A list of taxa with high monitoring needs was developed based on taxa with moderately understood distribution, but that did not currently have adequate monitoring strategies in place (Table 10). Research was recommended for taxa that have unknown limiting factors and are suspected or known to be declining in Alaska (Table 11).

Table 7. Category classification for all taxa. Category I = medium to high biological and action scores with > 25% of global population in Alaska, Category II = moderate to high biological vulnerability with low action scores, Category III = medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores, Category IV = abundant, widespread, and stable taxa or taxa that migrate through Alaska in very small numbers.

Category I: Medium to high biological and action scores with > 25% of global population in Alaska.				
	Grank	Srank	Biological	Action
Birds				
Surf Scoter	G5	S4B,S4N	-24.0	8.0
Spruce Grouse, Prince of Wales	GNR	SNR	2.3	24.0
Great Blue Heron, Pacific	G5T4	S3B	-15.6	12.0
Merlin, Black	G4T4	SNR	-12.2	10.0
Peregrine Falcon, Peales	G4T3	S2S3	-12.0	8.0
Wandering Tattler	G5	S4B	-34.2	24.0
Lesser Yellowlegs	G5	S5B	-38.0	15.2
Surfbird	G5	S2N, S3B	-10.0	16.0
Rock Sandpiper, Aleutian	GNR	SNR	-4.0	24.0
Rock Sandpiper, Bering Sea	GNR	SNR	-12.0	24.0
Rock Sandpiper, Pribilof	G5T3	S2N, S3B	4.0	8.0
Dunlin, Pacific	GNR	SNR	-22.0	18.4
Rosss Gull	G3G4	S3M	-35.0	32.0
Marbled Murrelet	G3G4	S2S3	-11.2	12.0
Kittlitzs Murrelet	G2	S2B,S2N	0.8	10.4
Northern Hawk-owl	G5	S4	-37.4	8.0
Winter Wren, Attu	G5T3	S2	-16.0	8.8
Winter Wren, Kiska	G5T3	S3	-14.0	8.8
Winter Wren, Kodiak	G5T3	S3	-22.0	18.0
Winter Wren, Pribilof	G5T3	S2	0.0	10.0
Golden-crowned Sparrow	G5	S5B	-36.0	24.0
Mammals				
Alaska marmot	G4	S4	-26.0	32.0
Hoary marmot, Glacier Bay	G5TUQ	S2S3Q	6.0	40.0
Hoary marmot, Montague Island	G5T2T3	S2Q	13.2	32.0
Arctic ground squirrel, Aleutian	GNR	SNR	-35.9	28.0
Arctic ground squirrel, Kodiak Island	G5T3	S3	2.6	36.0
Arctic ground squirrel, Osgoods	G5T3?	S3	8.1	37.0
Arctic ground squirrel, Shumagin Islands	G5T3	S3	-11.2	36.0
Arctic ground squirrel, St. Lawrence Island	G5T3	S3	-6.4	40.0
Red squirrel, Kenai	G5T3?	SNR	-10.0	24.0
Red squirrel, Kupreanof	G5T3?	S3	-30.0	12.0
Beaver, Admiralty	G5T3	S3	1.0	12.0
Collared lemming, peninsulae	GNR	SNR	-8.0	36.0
Collared lemming, St. Lawrence Island	G5T4	S4	2.0	36.0
Collared lemming, Stevensons	G5T3	S3	-2.0	36.0
Collared lemming, Unalaska	G3	SNR	-2.0	36.0
Brown lemming, Nunivak Island	G5T3	S4	-6.0	32.0
Brown lemming, black-footed	G5T4	S4	6.0	24.0
Insular vole	G3Q	S3	-16.0	40.0
Insular vole, Hall Island	G3QT3	S2	-4.0	40.0

Table 7, continued.

Category I: Medium to high biological and action scores with > 25% of global population in Alaska.

	Grank	Srank	Biological	Action
Insular vole, St. Mathew Island	G3QT3	S3	-10.0	40.0
Long-tailed vole, Coronation Island	G5T3Q	S3	-4.0	32.0
Long-tailed vole, littoralis	GNR	SNR	-26.0	26.0
Root vole, Montague Island	G5T2	S2	-1.6	20.0
Root vole, Penuk Island	G5T1	S1	-3.8	24.0
Root vole, Shumagin Island	G5T3	S3	2.0	40.0
Root vole, Sitka	G5T3	S3	-8.0	32.0
Root vole, St. Lawrence Island	G5T3	S3	-8.0	32.0
Root vole, Unalaska	G5T3	S3	-18.0	40.0
Root vole, Yakutat	G5T4	S4	-10.0	32.0
Meadow vole, Admiralty	G5T3	S3	-20.0	32.0
Southern red-backed vole, Gappers	GNR	S3	-26.0	36.0
Southern red-backed vole, Revillagigedo Island	G5T3	S3	-14.0	36.0
Southern red-backed vole, Wrangell Island	G5T2T3	S3	-14.0	36.0
Northern red-backed vole, Glacier Bay	G5T3	S3	-10.0	24.0
Northern red-backed vole, Island	G5T3	S3	-8.0	24.0
Northern red-backed vole, Orca	G5T3	S3	-18.0	32.0
Northern red-backed vole, St. Lawrence Island	G5T3	S3	-14.0	32.0
Northwestern deermouse, algidus	GNR	SNR	-29.5	22.0
Northwestern deermouse, hylaeus	GNR	SNR	-20.5	22.0
Northwestern deermouse, macrorhinus	GNR	SNR	-30.5	22.0
Northwestern deermouse, oceanicus	GNR	SNR	-8.5	32.0
Northwestern deermouse, sitkensis	GNR	SNR	-5.5	32.0
Collared pika	G5	S5	-34.0	22.0
Alaskan hare	G3G4	S3S4	-11.4	14.0
Alaskan hare, poadromus	GNR	SNR	-6.0	30.0
St. Lawrence Island shrew	G3	S3	-25.6	32.0
Dusky shrew, Warren Island	G5T3Q	S3Q	-4.0	28.0
Dusky shrew, Yakutat	GNR	SNR	-14.0	24.0
Glacier Bay water shrew	GHQ	SH	7.0	40.0
Dusky shrew, Queen Charlotte Islands	GNR	SNR	-26.0	12.0
Pribilof Island shrew	G3	S3	-14.0	12.0
Tundra shrew	G5	S5	-38.0	40.0
Alaska tiny shrew	GU	S3	-22.8	32.0
Keens myotis	G2G3	S2	-4.0	32.0
Wolf, Alexander Archipelago	G4T2T3Q	S3	-10.8	12.0
Bearded seal	G4G5	S4	-36.8	16.0
River otter, Prince of Wales	G5T3T4	S3S4	-2.4	24.0
Marten, Kenai	GNR	S3	-9.0	28.0
Ermine, Admiralty Island	G5T3T4	S3S4	-0.4	24.0
Ermine, Baranof	G5T3T4	S3	-10.4	16.0
Ermine, Prince of Wales	G5T3Q	S3	-10.4	8.0
Ermine, Suemez Island	G5T2T3Q	S3	-6.4	16.0
Ermine, Kodiak Island	G5T4	S4	-28.4	8.0
Sei whale, North Pacific	G3	S2	-5.4	12.0
Gray whale, Eastern Pacific	G3G4	S3S4	-34.0	12.0
Bairds beaked whale, Alaska	G4	S4	-14.0	12.0

Table 7, continued.

Category II: Moderate to high biological vulnerability with low action scores.

	Grank	Srank	Biological	Action
Birds				
White-fronted Goose, Tule	G5T3?	S2B	14.0	2.0
Cackling Goose, Aleutian	G5T4	S4B	12.4	-32.0
Stellers Eider	G3	S2B,S3N	25.4	-0.4
Spectacled Eider	G2	S2B	-7.0	-20.0
King Eider	G5	S3B, S3N	-25.0	4.0
Common Eider, Pacific	G5	S3S4B, S3N	-38.0	-10.0
		S3S4B,		
Black Scoter	G5	S3S4N	-20.4	-4.0
Long-tailed Duck	G5	S4B, S4N	-32.0	0.0
Rock Ptarmigan, Evermanns	G5T2T3	S2	15.0	-20.0
Rock Ptarmigan, Townsends	G5T2T3	S2S3	9.0	-8.0
Rock Ptarmigan, Turners	G5T2T3	S2S3	11.0	-8.0
Horned Grebe	G5	S5	-24.8	6.0
Red-necked Grebe	G5	S4S5B, S4N	-35.0	-4.0
Laysan Albatross	G3	S3N	-25.0	4.0
Black-footed Albatross	G3G4	S3S4N	-26.0	-20.0
Short-tailed Albatross	G1	S1N	-32.0	-14.0
Pink-footed Shearwater	G1G2Q	S1S2N	-21.0	-8.0
Fork-tailed Storm-Petrel, furcata	GNR	SNR	-22.0	-28.0
Fork-tailed Storm-Petrel, plumbea	GNR	SNR	-38.0	4.0
Brandts Cormorant	G5	S1B	22.4	-16.0
Red-faced Cormorant	G5	S2S3	-27.0	2.0
Bald Eagle	G5	S5	-28.3	-28.0
Goshawk, Queen Charlotte	G5T2	S2	-9.0	-16.0
Golden Eagle	G5	S4B, S3N	-36.4	-16.0
Peregrine Falcon, American	G4T4	S3B	-36.0	-4.0
Black Oystercatcher	G5	S2S3B,S2N	-19.0	-5.2
Bristle-thighed Curlew	G2	S2B	-12.0	4.0
Bar-tailed Godwit	G5	S4B	-20.0	0.0
Black Turnstone	G5	S3N, S4B	-26.0	4.0
Western Sandpiper	G5	S5B	-6.0	4.0
Dunlin, Arctic	GNR	SNR	-22.0	-4.0
Black-legged Kittiwake	GNR	SNR	-32.5	-16.0
Red-legged Kittiwake	G2G3	S2S3B,S2N	0.4	5.0
Aleutian Tern	G4	S3B	-31.7	-10.0
Caspian Tern	G5	S3B	-20.0	-8.0
Arctic Tern	G5	S4S5B	-32.0	0.0
Pigeon Guillemot	G5	S5	-37.0	-4.0
Ancient Murrelet	G4	S4	-36.0	-22.0
Least Auklet	G5	S5	-25.0	-18.4
Whiskered Auklet	G4	S4	-27.6	-16.0
Crested Auklet	G5	S5	-29.6	-16.0
Great Gray Owl	G5	S4	-36.0	-4.0
Three-toed Woodpecker	G5	S5	-34.0	-4.0
Chestnut-backed Chickadee	G5	S5	-38.0	-4.0
Winter Wren, Semidi	G5T3	S2S3	2.0	-2.0

Table 7, continued.

Category II: Moderate to high biological vulnerability with low action scores.

	Grank	Srank	Biological	Action
Song Sparrow, Aleutian	G5T4	S3	2.0	4.0
Mckays Bunting	G3G4	S3S4	2.0	4.0
Rusty Blackbird	G4	S3S4B	-38.0	0.0
Mammals				
Northern flying squirrel, Prince of Wales	G5T2?Q	S2	10.5	-8.0
Root vole, Amak Island	G5T2Q	S2	-12.0	4.0
Alaskan hare, othus	GNR	SNR	-8.0	2.0
Canadian lynx	G5	S4	-31.6	-16.0
Brown bear, Kenai population	GNR	SNR	26.0	-26.0
Polar bear	G3	S3	15.5	-16.0
Northern fur seal	G3	S3	-8.0	-12.0
Steller sealion, Western U.S. stock	G3	S2	-24.0	-28.0
Walrus	G4	S3	-10.5	-16.0
Ribbon seal	G5	S4	-19.0	-4.0
Spotted seal	G4G5	S3S4	-27.6	4.0
Northern sea otter, SW Alaska population	G4T4	S2S3	-31.2	-22.0
Marten, Pacific	GNR	S2	-12.1	4.0
Woodland caribou, Chisana herd		SNR	-2.0	-40.0
Bowhead, Western Arctic	G4	S3	-9.0	-28.0
North Pacific right whale, Eastern North Pacific	G1	S1	15.5	0.0
Blue whale, North Pacific	G3G4	S2	-20.0	4.0
Fin whale, Northeast Pacific	G3G4	S2	-21.0	-4.0
Killer whale	G4G5	S3S4	-18.0	-4.0
Beluga whale, Cook Inlet population	G4T1	S1	42.0	-40.0
Sperm whale, North Pacific	G3G4	S3S4	-23.0	-8.0

Category III: Medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores.

	Grank	Srank	Biological	Action
Amphibians				
Long-toed salamander	G5	S3	-24.4	28.0
Northwestern salamander	G5	S3	-27.8	32.0
Roughskin newt	G5	S4	-33.2	12.0
Wood frog	G5	S5	-70.2	8.0
Columbia spotted frog	G4	S2	-9.0	32.0
Birds				
White-winged Scoter	G5	S4B,S4N	-42.0	16.0
Sooty Grouse	G5	SNR	-59.0	8.0
Arctic Loon	G5	S1B	-10.0	24.0
Pied-billed Grebe	G5	S2B	-38.4	30.4
Bullers Shearwater	G3	S3N	-23.0	32.0
American Bittern	G4	S3B	-21.8	24.0
Osprey	G5	S2B	-42.5	8.0
Northern Harrier	G5	S4B	-24.0	16.0
Sharp-shinned Hawk	G5	S4B,S3N	-53.5	18.0
Goshawk, Northern	GNR	SNR	-47.0	16.0
Swainsons Hawk	G5	S2S3B	-35.0	28.0

Table 7, continued.

Category III: Medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores.

	Grank	Srank	Biological	Action
Red-tailed Hawk	G5	S5B	-46.0	12.0
Rough-legged Hawk	G5	S5B	-41.0	16.0
Gyr Falcon	G5	S4	-38.0	8.0
Sora	G5	S3B	-33.0	32.0
American Coot	G5	S3B,S3N	-3.0	32.0
American Golden-plover	G5	S5B	-54.0	12.0
Killdeer	G5	S3S4B	-18.0	20.0
Eurasian Dotterel	G5	S2B	-21.0	32.0
Solitary Sandpiper	G5	S3S4B	-46.0	16.0
Upland Sandpiper	G5	S5B	-32.0	32.0
Eskimo Curlew	GH	SH or SX	27.0	18.0
Whimbrel	G5	S3S4B	-52.0	16.0
Hudsonian Godwit	G4	S3B	-24.0	16.0
Marbled Godwit	G5T2	S2B	-8.0	12.0
Red Knot	G5	S2S3B	-16.0	12.0
Semipalmated Sandpiper	G5	S5B	-46.0	12.0
Sharp-tailed Sandpiper	G5	S4M	-58.2	32.0
White-rumped Sandpiper	G5	S3B	-35.0	16.0
Bairds Sandpiper	G5	S5B	-52.0	24.0
Sanderling	G5	S2B	-6.0	32.0
Stilt Sandpiper	G5	S3B	-38.2	22.0
Short-billed Dowitcher	G5	S5B	-40.8	24.0
Wilson's Snipe	G5	S5B	-65.0	16.0
Red Phalarope	G5	S4S5B	-52.0	12.0
Ring-billed Gull	G5	S3N	-13.0	32.0
California Gull	G5	S3N	-17.0	32.0
Slaty-backed Gull	G5	S2B	9.0	32.0
Glaucous Gull	G5	S5B, S4N	-57.2	16.0
Ivory Gull	G5	S3N	-14.5	34.0
Dovekie	G5	S1B	-10.0	24.0
Black Guillemot	G5	S2	-6.0	18.0
Band-tailed Pigeon	G5	S3B	-22.0	24.0
Western Screech-Owl	G5	S2	-17.4	8.0
Great Horned Owl	G5	S5	-46.0	12.0
Snowy Owl	G5	S3S4B, S3N	-40.0	12.0
Northern Pygmy-owl	G5	S3	-28.0	16.0
Barred Owl	G5	S2	-36.5	13.6
Short-eared Owl	G5	S5B	-48.0	14.4
Boreal Owl	G5	S4	-44.0	8.0
Northern Saw-whet Owl	G5	S4	-28.0	8.0
Black Swift	G4	S2B	-16.4	24.0
Vauxs Swift	G5	S2S3B	-33.6	16.0
Annas Hummingbird	G5	S3N	-45.0	24.0
Belted Kingfisher	G5	S5	-40.0	16.0
Yellow-bellied Sapsucker	G5	S3B	-34.0	24.0
Black-backed Woodpecker	G5	S3	-31.5	16.0

Table 7, continued.

Category III: Medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores.

	Grank	Srank	Biological	Action
Northern Flicker	G5	S5B	-32.0	8.0
Olive-sided Flycatcher	G4	S4S5B	-48.0	8.0
Hammonds Flycatcher	G5	S5B	-60.0	8.0
Pacific-slope Flycatcher	G5	S4B	-46.0	8.0
Northern Shrike	G5	S4B,S4N	-48.0	28.0
Red-eyed Vireo	G5	S2B	-31.5	24.0
American Crow	G5	S2B	-34.0	28.0
Sky Lark	G5	S1B	-19.0	28.0
Northern Rough-winged Swallow	G5	S2B	-44.0	28.0
Barn Swallow	G5	S5B	-38.0	16.0
Gray-headed Chickadee	G5	S3	-32.4	32.0
Red-breasted Nuthatch	G5	S4	-42.0	8.0
Arctic Warbler	G5	S5B	-48.0	12.0
Bluethroat	G5	S3B	-52.0	32.0
Mountain Bluebird	G5	S3B	-48.0	18.0
Townsend's Solitaire	G5	S3S4B	-52.0	24.0
Eastern Yellow Wagtail	G5	S5B	-56.0	12.0
White Wagtail	G5	S3B	-42.0	32.0
Tennessee Warbler	G5	S2S3B	-22.0	14.4
Townsend's Warbler	G5	S5B	-48.0	8.0
American Redstart	G5	S3B	-40.0	16.0
Macgillivray's Warbler	G5	S4B	-61.6	20.0
Wilson's Warbler	G5	S5B	-44.0	8.0
Western Tanager	G5	S3B	-48.0	32.0
American Tree Sparrow	G5	S3N,S5B	-48.0	12.0
Dark-eyed Junco	G5	S5B	-68.0	16.0
Smith's longspur	G5	S3S4B	-36.0	24.0
Red-winged Blackbird	G5	S3B	-28.0	24.0
Brown-headed Cowbird	G5	S3B	-37.6	24.0
Gray-crowned Rosy-finch	G5	S3N,S5B	-38.4	16.0
Red Crossbill	G5	S5	-34.0	8.0
Hoary Redpoll	G5	S5B,S5N	-46.0	32.0
Mammals				
Northern flying squirrel	G5	S4	-24.9	24.0
Arctic ground squirrel	G5	S5	-51.2	8.0
Arctic ground squirrel, Barrow	GNR	SNR	-53.1	20.0
Meadow jumping mouse	G5	S5	-48.0	20.0
Collared lemming	G5	S4	-42.0	28.0
Brown lemming	G5	S5	-40.0	24.0
Long-tailed vole	G5	S5	-54.0	20.0
Singing vole	G4	S4	-56.0	12.0
Meadow vole	G5	S5	-62.0	12.0
Taiga vole (yellow-cheeked vole)	G5	S4S5	-46.0	12.0
Southern red-backed vole	G5	S4	-40.0	28.0
Southern red-backed vole, pheasus	GNR	SNR	-38.6	36.0
Northwestern deer mouse	G5	S3	-48.5	10.0

Table 7, continued.

Category III: Medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores.

	Grank	Srank	Biological	Action
North American deermouse	G5	SNR	-40.0	40.0
Northern bog lemming	G4	S4	-47.2	20.0
Pygmy shrew	G5	S5	-46.0	32.0
Dusky shrew	G5	S5	-55.3	12.0
Water shrew	G5	S4	-47.6	32.0
Silver-haired bat	G5	S2	-24.0	24.0
California myotis	G3G4	S2	-1.6	32.0
Little brown myotis	G5	S4	-31.4	12.0
Long-legged myotis	G5	S2	-11.6	28.0
Northern elephant seal	G5	S4	-32.2	32.0
Common minke whale, Alaska	G5	S4	-34.8	8.0
Harbor porpoise	G4G5	S3	-46.8	8.0
Stejnegers beaked whale, Alaska	G3	S3	-14.0	32.0
Cuviers beaked whale, Alaska	G4	S3	-20.0	32.0

Category IV: Abundant, widespread, and stable taxa or taxa that migrate through Alaska in very small numbers.

	Grank	Srank	Biological	Action
Amphibians				
Western toad	G4	S3S4	-40.6	-2.0
Birds				
Red-throated Loon	G5	S4B, S4N	-46.2	-4.0
Pacific Loon	G5	S5B,S4S5N	-48.0	-4.0
Common Loon	G5	S5B, S4N	-38.4	4.0
Yellow-billed Loon	G4	S2S3B, S3N	-42.0	-4.0
Double-crested Cormorant	G5	S3S4	-42.4	-2.0
Pelagic Cormorant	G5	S4S5	-56.0	-2.0
Merlin	G5	S4B, S3N	-48.4	2.0
Peregrine Falcon	G4	S3B, S3N	-50.0	-16.0
Peregrine Falcon, Arctic	G4T3T4	S3B	-42.4	-16.0
Black-bellied Plover	G5	S4B	-48.0	0.0
Pacific Golden-plover	G5	S4B	-58.0	4.0
Lesser Sand-Plover	G4G5	S2M	-21.0	32.0
Common Sandpiper	G5	S2M	-20.0	24.0
Gray-tailed Tattler	G4G5	S3M	-5.2	32.0
Common Greenshank	G5	S2M	-3.0	24.0
Long-toed Stint	G4G5	S2M	-19.0	24.0
Buff-breasted Sandpiper	G4	S2B	-44.6	4.0
Ruff	G5	SNA	-17.0	24.0
Red-necked Phalarope	G4G5	S4S5B	-54.0	4.0
Black-headed Gull	G5	S3M	-25.0	24.0
Common Tern	G5	S2M	-8.5	24.0
Common Murre	G5	S5	-56.0	-4.0
Thick-billed Murre	G5	S4	-52.0	-6.4
Rufous Hummingbird	G5	S5B	-39.0	-4.0
Red-breasted Sapsucker	G5	S5B	-44.0	-8.0

Table 7, continued.

Category IV: Abundant, widespread, and stable taxa or taxa that migrate through Alaska in very small numbers.

	Grank	Srank	Biological	Action
Hairy Woodpecker	G5	S5	-59.5	-10.0
Western Wood-pewee	G5	S4B	-45.0	4.0
Eastern Kingbird	G5	S2M	-23.5	32.0
Stellers Jay	G5	S5	-59.6	16.0
Northwestern Crow	G5	S5	-64.0	12.0
Violet-green Swallow	G5	S5B	-54.0	16.0
Bank Swallow	G5	S5B	-52.0	4.0
Cliff Swallow	G5	S5B	-70.0	8.0
Boreal Chickadee	G5	S5	-50.0	8.0
Brown Creeper	G5	S4	-44.0	-10.0
American Dipper	G5	S4	-48.0	2.0
Golden-crowned Kinglet	G5	S5	-46.0	-10.0
Siberian Rubythroat	G5	S2N	-20.0	24.0
Gray-cheeked Thrush	G5	S4S5B	-44.0	-4.0
Swainsons Thrush	G5	S5B	-60.0	-4.0
Hermit Thrush	G5	S5B	-70.0	4.0
Eye-browed Thrush	G5	S2M	-19.0	24.0
American Robin	G5	S5B	-72.0	-8.0
Varied Thrush	G5	S5B	-46.0	0.0
Bohemian Waxwing	G5	S5B,S5N	-54.0	4.0
Blackpoll Warbler	G5	S4B	-40.0	2.8
Northern Waterthrush	G5	S4S5B	-50.0	4.0
Fox Sparrow	G5	S5B, S3N	-50.0	16.0
White-crowned Sparrow	G5	S5B	-56.0	16.0
Rustic Bunting	G5	S2M	-24.0	32.0
Brambling	G5	S2N	-18.0	24.0
Pine Grosbeak	G5	S5	-70.0	16.0
White-winged Crossbill	G5	S5	-48.0	-4.0
Pine Siskin	G5	S5	-52.0	4.0
Mammals				
Root vole	G5	S5	-64.0	20.0
Northern red-backed vole	G5	S5	-64.0	4.0
Steller sealion, Eastern U.S. stock	G3	S3	-40.0	-20.0
Harbor seal	G5	S4S5	-46.0	-8.0
Ringed seal	G5	S4	-40.0	-16.0
Northern sea otter, all 3 AK stocks	G4T4	S4	-42.8	-22.0
Ermine	G5	S5	-60.4	-4.0
Humpback whale, Central and Western North Pacific	G3	S2	-46.0	-22.0

Table 8. Category classification for species only. Category I = medium to high biological and action scores with > 25% of global population in Alaska, Category II = moderate to high biological vulnerability with low action scores, Category III = medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores, Category IV = abundant, widespread, and stable taxa or taxa that migrate through Alaska in very small numbers.

Category I: Medium to high biological and action scores with > 25% of global population in Alaska.				
	Grank	Srank	Biological	Action
Birds				
Surf Scoter	G5	S4B,S4N	-24.0	8.0
Horned Grebe	G5	S5	-24.8	6.0
Wandering Tattler	G5	S4B	-34.2	24.0
Lesser Yellowlegs	G5	S5B	-38.0	15.2
Surfbird	G5	S2N, S3B	-10.0	16.0
Short-billed Dowitcher	G5	S5B	-40.8	24.0
Red-legged Kittiwake	G2G3	S2S3B,S2N	0.4	5.0
Rosss Gull	G3G4	S3M	-35.0	32.0
Marbled Murrelet	G3G4	S2S3	-11.2	12.0
Kittlitzs Murrelet	G2	S2B,S2N	0.8	10.4
Northern Hawk-owl	G5	S4	-37.4	8.0
Red-breasted Nuthatch	G5	S4	-42.0	8.0
Wilson's Warbler	G5	S5B	-44.0	8.0
Golden-crowned Sparrow	G5	S5B	-36.0	24.0
Mammals				
Alaska marmot	G4	S4	-26.0	32.0
Insular vole	G3Q	S3	-16.0	40.0
Collared pika	G5	S5	-34.0	22.0
Alaskan hare	G3G4	S3S4	-11.4	14.0
St. Lawrence Island shrew	G3	S3	-25.6	32.0
Glacier Bay water shrew	GHQ	SH	7.0	40.0
Pribilof Island shrew	G3	S3	-14.0	12.0
Tundra shrew	G5	S5	-38.0	40.0
Alaska tiny shrew	GU	S3	-22.8	32.0
Keens myotis	G2G3	S2	-4.0	32.0
Bearded seal	G4G5	S4	-36.8	16.0
Northern elephant seal	G5	S4	-32.2	32.0
River otter, Prince of Wales	G5T3T4	S3S4	-2.4	24.0
Sei whale, North Pacific	G3	S2	-5.4	12.0
Gray whale, Eastern Pacific	G3G4	S3S4	-34.0	12.0
Bairds beaked whale, Alaska	G4	S4	-14.0	12.0
Stejnegers beaked whale, Alaska	G3	S3	-14.0	32.0
Category II: Moderate to high biological vulnerability with low action scores.				
	Grank	Srank	Biological	Action
Amphibians				
Western toad	G4	S3S4	-40.6	-2.0
Birds				
Stellers Eider	G3	S2B,S3N	25.4	-0.4
Spectacled Eider	G2	S2B	-7.0	-20.0
King Eider	G5	S3B, S3N	-25.0	4.0

Table 8, continued.

Category II: Moderate to high biological vulnerability with low action scores.

	Grank	Srank	Biological	Action
Black Scoter	G5	S3S4B, S3S4N	-20.4	-4.0
Long-tailed Duck	G5	S4B, S4N	-32.0	0.0
Common Loon	G5	S5B, S4N	-38.4	4.0
Yellow-billed Loon	G4	S2S3B, S3N	-42.0	-4.0
Red-necked Grebe	G5	S4S5B, S4N	-35.0	-4.0
Laysan Albatross	G3	S3N	-25.0	4.0
Black-footed Albatross	G3G4	S3S4N	-26.0	-20.0
Short-tailed Albatross	G1	S1N	-32.0	-14.0
Pink-footed Shearwater	G1G2Q	S1S2N	-21.0	-8.0
Leachs Storm-petrel	GNR	SNR	-43.6	-16.0
Brandts Cormorant	G5	S1B	22.4	-16.0
Double-crested Cormorant	G5	S3S4	-42.4	-2.0
Red-faced Cormorant	G5	S2S3	-27.0	2.0
Bald Eagle	G5	S5	-28.3	-28.0
Golden Eagle	G5	S4B, S3N	-36.4	-16.0
Black Oystercatcher	G5	S2S3B,S2N	-19.0	-5.2
Bristle-thighed Curlew	G2	S2B	-12.0	4.0
Bar-tailed Godwit	G5	S4B	-20.0	0.0
Black Turnstone	G5	S3N, S4B	-26.0	4.0
Western Sandpiper	G5	S5B	-6.0	4.0
Black-legged Kittiwake	GNR	SNR	-32.5	-16.0
Aleutian Tern	G4	S3B	-31.7	-10.0
Caspian Tern	G5	S3B	-20.0	-8.0
Arctic Tern	G5	S4S5B	-32.0	0.0
Pigeon Guillemot	G5	S5	-37.0	-4.0
Ancient Murrelet	G4	S4	-36.0	-22.0
Least Auklet	G5	S5	-25.0	-18.4
Whiskered Auklet	G4	S4	-27.6	-16.0
Crested Auklet	G5	S5	-29.6	-16.0
Great Gray Owl	G5	S4	-36.0	-4.0
Rufous Hummingbird	G5	S5B	-39.0	-4.0
Red-breasted Sapsucker	G5	S5B	-44.0	-8.0
Three-toed Woodpecker	G5	S5	-34.0	-4.0
Chestnut-backed Chickadee	G5	S5	-38.0	-4.0
Brown Creeper	G5	S4	-44.0	-10.0
Gray-cheeked Thrush	G5	S4S5B	-44.0	-4.0
Blackpoll Warbler	G5	S4B	-40.0	2.8
Mckays Bunting	G3G4	S3S4	2.0	4.0
Rusty Blackbird	G4	S3S4B	-38.0	0.0
Mammals				
Canadian lynx	G5	S4	-31.6	-16.0
Polar bear	G3	S3	15.5	-16.0
Northern fur seal	G3	S3	-8.0	-12.0
Walrus	G4	S3	-10.5	-16.0
Ribbon seal	G5	S4	-19.0	-4.0
Spotted seal	G4G5	S3S4	-27.6	4.0

Table 8, continued.

Category II: Moderate to high biological vulnerability with low action scores.

	Grank	Srank	Biological	Action
Ringed seal	G5	S4	-40.0	-16.0
Northern sea otter, all 3 AK stocks	G4T4	S4	-42.8	-22.0
Bowhead, Western Arctic	G4	S3	-9.0	-28.0
North Pacific right whale, Eastern North Pacific	G1	S1	15.5	0.0
Blue whale, North Pacific	G3G4	S2	-20.0	4.0
Fin whale, Northeast Pacific	G3G4	S2	-21.0	-4.0
Killer whale	G4G5	S3S4	-18.0	-4.0
Sperm whale, North Pacific	G3G4	S3S4	-23.0	-8.0

Category III: Medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores.

	Grank	Srank	Biological	Action
Amphibians				
Long-toed salamander	G5	S3	-24.4	28.0
Northwestern salamander	G5	S3	-27.8	32.0
Roughskin newt	G5	S4	-33.2	12.0
Wood frog	G5	S5	-70.2	8.0
Columbia spotted frog	G4	S2	-9.0	32.0
White-winged Scoter	G5	S4B,S4N	-42.0	16.0
Sooty Grouse	G5	SNR	-59.0	8.0
Birds				
Arctic Loon	G5	S1B	-10.0	24.0
Pied-billed Grebe	G5	S2B	-38.4	30.4
Bullers Shearwater	G3	S3N	-23.0	32.0
American Bittern	G4	S3B	-21.8	24.0
Osprey	G5	S2B	-42.5	8.0
Northern Harrier	G5	S4B	-24.0	16.0
Sharp-shinned Hawk	G5	S4B,S3N	-53.5	18.0
Goshawk, Northern	GNR	SNR	-47.0	16.0
Swainsons Hawk	G5	S2S3B	-35.0	28.0
Red-tailed Hawk	G5	S5B	-46.0	12.0
Rough-legged Hawk	G5	S5B	-41.0	16.0
Gyrfalcon	G5	S4	-38.0	8.0
Sora	G5	S3B	-33.0	32.0
American Coot	G5	S3B,S3N	-3.0	32.0
American Golden-plover	G5	S5B	-54.0	12.0
Killdeer	G5	S3S4B	-18.0	20.0
Eurasian Dotterel	G5	S2B	-21.0	32.0
Solitary Sandpiper	G5	S3S4B	-46.0	16.0
Upland Sandpiper	G5	S5B	-32.0	32.0
Eskimo Curlew	GH	SH or SX	27.0	18.0
Whimbrel	G5	S3S4B	-52.0	16.0
Hudsonian Godwit	G4	S3B	-24.0	16.0
Marbled Godwit	G5T2	S2B	-8.0	12.0
Red Knot	G5	S2S3B	-16.0	12.0
Sharp-tailed Sandpiper	G5	S4M	-58.2	32.0
White-rumped Sandpiper	G5	S3B	-35.0	16.0

Table 8, continued.

Category III: Medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores.

	Grank	Srank	Biological	Action
Bairds Sandpiper	G5	S5B	-52.0	24.0
Sanderling	G5	S2B	-6.0	32.0
Semipalmated Sandpiper	G5	S5B	-46.0	12.0
Stilt Sandpiper	G5	S3B	-38.2	22.0
Wilson's Snipe	G5	S5B	-65.0	16.0
Red Phalarope	G5	S4S5B	-52.0	12.0
Ring-billed Gull	G5	S3N	-13.0	32.0
California Gull	G5	S3N	-17.0	32.0
Slaty-backed Gull	G5	S2B	9.0	32.0
Glaucous Gull	G5	S5B, S4N	-57.2	16.0
Ivory Gull	G5	S3N	-14.5	34.0
Dovekie	G5	S1B	-10.0	24.0
Black Guillemot	G5	S2	-6.0	18.0
Band-tailed Pigeon	G5	S3B	-22.0	24.0
Western Screech-Owl	G5	S2	-17.4	8.0
Great Horned Owl	G5	S5	-46.0	12.0
Snowy Owl	G5	S3S4B, S3N	-40.0	12.0
Northern Pygmy-owl	G5	S3	-28.0	16.0
Barred Owl	G5	S2	-36.5	13.6
Short-eared Owl	G5	S5B	-48.0	14.4
Boreal Owl	G5	S4	-44.0	8.0
Northern Saw-whet Owl	G5	S4	-28.0	8.0
Black Swift	G4	S2B	-16.4	24.0
Vauxs Swift	G5	S2S3B	-33.6	16.0
Annas Hummingbird	G5	S3N	-45.0	24.0
Belted Kingfisher	G5	S5	-40.0	16.0
Yellow-bellied Sapsucker	G5	S3B	-34.0	24.0
Black-backed Woodpecker	G5	S3	-31.5	16.0
Northern Flicker	G5	S5B	-32.0	8.0
Olive-sided Flycatcher	G4	S4S5B	-48.0	8.0
Hammonds Flycatcher	G5	S5B	-60.0	8.0
Pacific-slope Flycatcher	G5	S4B	-46.0	8.0
Northern Shrike	G5	S4B,S4N	-48.0	28.0
Red-eyed Vireo	G5	S2B	-31.5	24.0
American Crow	G5	S2B	-34.0	28.0
Sky Lark	G5	S1B	-19.0	28.0
Northern Rough-winged Swallow	G5	S2B	-44.0	28.0
Barn Swallow	G5	S5B	-38.0	16.0
Gray-headed Chickadee	G5	S3	-32.4	32.0
Arctic Warbler	G5	S5B	-48.0	12.0
Bluethroat	G5	S3B	-52.0	32.0
Mountain Bluebird	G5	S3B	-48.0	18.0
Townsend's Solitaire	G5	S3S4B	-52.0	24.0
Eastern Yellow Wagtail	G5	S5B	-56.0	12.0
White Wagtail	G5	S3B	-42.0	32.0
Tennessee Warbler	G5	S2S3B	-22.0	14.4

Table 8, continued.

Category III: Medium to high biological and action scores with < 25% of global population in Alaska or low biological scores with medium to high action scores.

	Grank	Srank	Biological	Action
Townsend's Warbler	G5	S5B	-48.0	8.0
American Redstart	G5	S3B	-40.0	16.0
Macgillivray's Warbler	G5	S4B	-61.6	20.0
Western Tanager	G5	S3B	-48.0	32.0
American Tree Sparrow	G5	S3N,S5B	-48.0	12.0
Dark-eyed Junco	G5	S5B	-68.0	16.0
Smith's longspur	G5	S3S4B	-36.0	24.0
Red-winged Blackbird	G5	S3B	-28.0	24.0
Brown-headed Cowbird	G5	S3B	-37.6	24.0
Gray-crowned Rosy-finch	G5	S3N,S5B	-38.4	16.0
Red Crossbill	G5	S5	-34.0	8.0
Hoary Redpoll	G5	S5B,S5N	-46.0	32.0
Mammals				
Northern flying squirrel	G5	S4	-24.9	24.0
Arctic ground squirrel	G5	S5	-51.2	8.0
Meadow jumping mouse	G5	S5	-48.0	20.0
Collared lemming	G5	S4	-42.0	28.0
Brown lemming	G5	S5	-40.0	24.0
Long-tailed vole	G5	S5	-54.0	20.0
Singing vole	G4	S4	-56.0	12.0
Meadow vole	G5	S5	-62.0	12.0
Taiga vole (yellow-cheeked vole)	G5	S4S5	-46.0	12.0
Southern red-backed vole	G5	S4	-40.0	28.0
Northwestern deer mouse	G5	S3	-48.5	10.0
North American deer mouse	G5	SNR	-40.0	40.0
Northern bog lemming	G4	S4	-47.2	20.0
Pygmy shrew	G5	S5	-46.0	32.0
Dusky shrew	G5	S5	-55.3	12.0
Water shrew	G5	S4	-47.6	32.0
Silver-haired bat	G5	S2	-24.0	24.0
California myotis	G3G4	S2	-1.6	32.0
Little brown myotis	G5	S4	-31.4	12.0
Long-legged myotis	G5	S2	-11.6	28.0
Common minke whale, Alaska	G5	S4	-34.8	8.0
Harbor porpoise	G4G5	S3	-46.8	8.0
Cuvier's beaked whale, Alaska	G4	S3	-20.0	32.0

Category IV: Abundant, widespread, and stable taxa or taxa that migrate through Alaska in very small numbers.

	Grank	Srank	Biological	Action
Birds				
Red-throated Loon	G5	S4B, S4N	-46.2	-4.0
Pacific Loon	G5	S5B,S4S5N	-48.0	-4.0
Pelagic Cormorant	G5	S4S5	-56.0	-2.0
Merlin	G5	S4B, S3N	-48.4	2.0
Peregrine Falcon	G4	S3B, S3N	-50.0	-16.0
Black-bellied Plover	G5	S4B	-48.0	0.0

Table 8, continued.

Category IV: Abundant, widespread, and stable taxa or taxa that migrate through Alaska in very small numbers.

	Grank	Srank	Biological	Action
Pacific Golden-plover	G5	S4B	-58.0	4.0
Lesser Sand-Plover	G4G5	S2M	-21.0	32.0
Common Sandpiper	G5	S2M	-20.0	24.0
Gray-tailed Tattler	G4G5	S3M	-5.2	32.0
Common Greenshank	G5	S2M	-3.0	24.0
Long-toed Stint	G4G5	S2M	-19.0	24.0
Buff-breasted Sandpiper	G4	S2B	-44.6	4.0
Ruff	G5	SNA	-17.0	24.0
Red-necked Phalarope	G4G5	S4S5B	-54.0	4.0
Black-headed Gull	G5	S3M	-25.0	24.0
Common Tern	G5	S2M	-8.5	24.0
Common Murre	G5	S5	-56.0	-4.0
Thick-billed Murre	G5	S4	-52.0	-6.4
Hairy Woodpecker	G5	S5	-59.5	-10.0
Western Wood-pewee	G5	S4B	-45.0	4.0
Eastern Kingbird	G5	S2M	-23.5	32.0
Stellers Jay	G5	S5	-59.6	16.0
Northwestern Crow	G5	S5	-64.0	12.0
Violet-green Swallow	G5	S5B	-54.0	16.0
Bank Swallow	G5	S5B	-52.0	4.0
Cliff Swallow	G5	S5B	-70.0	8.0
Boreal Chickadee	G5	S5	-50.0	8.0
American Dipper	G5	S4	-48.0	2.0
Golden-crowned Kinglet	G5	S5	-46.0	-10.0
Siberian Rubythroat	G5	S2N	-20.0	24.0
Swainsons Thrush	G5	S5B	-60.0	-4.0
Hermit Thrush	G5	S5B	-70.0	4.0
Eye-browed Thrush	G5	S2M	-19.0	24.0
American Robin	G5	S5B	-72.0	-8.0
Varied Thrush	G5	S5B	-46.0	0.0
Bohemian Waxwing	G5	S5B,S5N	-54.0	4.0
Northern Waterthrush	G5	S4S5B	-50.0	4.0
Fox Sparrow	G5	S5B, S3N	-50.0	16.0
White-crowned Sparrow	G5	S5B	-56.0	16.0
Rustic Bunting	G5	S2M	-24.0	32.0
Brambling	G5	S2N	-18.0	24.0
Pine Grosbeak	G5	S5	-70.0	16.0
White-winged Crossbill	G5	S5	-48.0	-4.0
Pine Siskin	G5	S5	-52.0	4.0
Mammals				
Root vole	G5	S5	-64.0	20.0
Northern red-backed vole	G5	S5	-64.0	4.0
Harbor seal	G5	S4S5	-46.0	-8.0
Ermine	G5	S5	-60.4	-4.0
Humpback whale, Central and Western North Pacific	G3	S2	-46.0	-22.0

Table 9. Candidate taxa for survey efforts in Alaska. Distributions of these taxa are poorly known (survey score = 10). Taxa are listed in order of decreasing biological scores. Columns for range and % global population in Alaska list scores for these biological variables. Alaska occurrence and systematic significance (taxonomy) are supplemental variables.

Common name	Biological Score	Range	% Global	Alaska Occurrence	Systematic Significance
Eskimo Curlew	27.0	10.0	-10.0	Breeding	Monotypic species
Slaty-backed Gull	9.0	10.0	-10.0	Year-round	Monotypic species
Arctic ground squirrel, Osgoods	8.1	9.5	10.0	Year-round	Subspecies
Glacier Bay water shrew	7.0	10.0	10.0	Year-round	Monotypic species
Hoary marmot, Glacier Bay	6.0	8.0	10.0	Year-round	Subspecies
Arctic ground squirrel, Kodiak Island	2.6	8.0	10.0	Year-round	Subspecies
Collared lemming, St. Lawrence Island	2.0	8.0	10.0	Year-round	Subspecies
Root vole, Shumagin Island	2.0	8.0	10.0	Year-round	Subspecies
Beaver, Admiralty	1.0	4.0	10.0	Year-round	Subspecies
Kittlitzs Murrelet	0.8	-8.0	6.0	Year-round	Monotypic species
Ermine, Admiralty Island	-0.4	8.0	10.0	Year-round	Subspecies
Collared lemming, Stevensons	-2.0	4.0	10.0	Year-round	Subspecies
Collared lemming, Unalaska	-2.0	4.0	10.0	Year-round	Subspecies
American Coot	-3.0	10.0	-10.0	Year-round	Monotypic species
Rock Sandpiper, Aleutian	-4.0	-2.0	10.0	Year-round	Subspecies
Keens myotis	-4.0	-2.0	-4.0	Breeding	Monotypic species
Insular vole, Hall Island	-4.0	10.0	10.0	Year-round	Subspecies
Gray-tailed Tattler	-5.2	2.8	0.0	Migratory	Monotypic species
Sei whale, North Pacific	-5.4	-9.4	0.0	Migratory	Monotypic species
Alaskan hare, podromus	-6.0	-8.0	10.0	Year-round	Subspecies
Brown lemming, Nunivak Island	-6.0	4.0	10.0	Year-round	Subspecies
Sanderling	-6.0	-2.0	-10.0	Year-round	Monotypic species
Ermine, Suemez Island	-6.4	8.0	10.0	Year-round	Subspecies
Arctic ground squirrel, St. Lawrence Island	-6.4	4.0	10.0	Year-round	Subspecies
Collared lemming, peninsulae	-8.0	-2.0	10.0	Year-round	Subspecies
Common Tern	-8.5	4.0	-10.0	Migratory	Monotypic species
Columbia spotted frog	-9.0	4.0	-10.0	Year-round	Monotypic species
Marten, Kenai	-9.0	-2.0	10.0	Year-round	Subspecies
Dovekie	-10.0	4.0	-10.0	Breeding	Monotypic genus
Insular vole, St. Mathew Island	-10.0	8.0	10.0	Year-round	Subspecies
Ermine, Baranof	-10.4	4.0	10.0	Year-round	Subspecies
Arctic ground squirrel, Shumagin Islands	-11.2	8.0	10.0	Year-round	Subspecies
Marbled Murrelet	-11.2	-8.0	2.0	Year-round	Monotypic species
Rock Sandpiper, Bering Sea	-12.0	-8.0	2.0	Year-round	Subspecies
Merlin, Black	-12.2	-2.0	-2.0	Year-round	Subspecies
Ring-billed Gull	-13.0	0.0	-10.0	Year-round	Monotypic species
Northern red-backed vole, St. Lawrence Island	-14.0	4.0	10.0	Year-round	Subspecies
Stejnegers beaked whale, Alaska	-14.0	-10.0	-7.0	Year-round	Monotypic species
Southern red-backed vole, Revillagigedo Island	-14.0	4.0	10.0	Year-round	Subspecies

Table 9, continued.

Common name	Biological Score	Range	% Global	Alaska Occurrence	Systematic Significance
Southern red-backed vole, Wrangell Island	-14.0	4.0	10.0	Year-round	Subspecies
Ivory Gull	-14.5	-2.0	-10.0	Wintering	Monotypic genus
Insular vole	-16.0	8.0	10.0	Year-round	Monotypic species
California Gull	-17.0	-2.0	-10.0	Year-round	Monotypic species
Northern red-backed vole, Orca	-18.0	0.0	10.0	Year-round	Subspecies
Root vole, Unalaska	-18.0	0.0	10.0	Year-round	Subspecies
Killdeer	-18.0	-2.0	-10.0	Year-round	Monotypic species
Sky Lark	-19.0	4.0	-10.0	Breeding	Monotypic genus
Blue whale, North Pacific	-20.0	-10.0	-10.0	Migratory	Monotypic species
Cuviers beaked whale, Alaska	-20.0	-10.0	-10.0	Year-round	Monotypic species
Eurasian Dotterel	-21.0	-2.0	-10.0	Breeding	Monotypic species
Lesser Sand-Plover	-21.0	-2.0	-10.0	Breeding	Monotypic genus
American Bittern	-21.8	0.0	-10.0	Breeding	Monotypic species
Tennessee Warbler	-22.0	-2.0	-10.0	Breeding	Monotypic species
Winter Wren, Kodiak	-22.0	-2.0	10.0	Year-round	Subspecies
Band-tailed Pigeon	-22.0	-2.0	-10.0	Breeding	Monotypic species
Bullers Shearwater	-23.0	-10.0	-10.0	Wintering	Monotypic species
Eastern Kingbird	-23.5	-2.0	-10.0	Migratory	Monotypic species
Rustic Bunting	-24.0	4.0	-10.0	Migratory	Monotypic species
Long-toed salamander	-24.4	-2.0	-10.0	Year-round	Monotypic species
St. Lawrence Island shrew	-25.6	4.0	10.0	Year-round	Monotypic species
Southern red-backed vole, Gappers	-26.0	4.0	-2.0	Year-round	Subspecies
Northwestern salamander	-27.8	-2.0	-10.0	Year-round	Monotypic species
Red-winged Blackbird	-28.0	-2.0	-10.0	Year-round	Monotypic species
Red-eyed Vireo	-31.5	8.0	-10.0	Breeding	Monotypic species
Upland Sandpiper	-32.0	-8.0	-10.0	Breeding	Monotypic genus
Northern elephant seal	-32.2	-2.0	-8.0	Migratory	Monotypic species
Gray-headed Chickadee	-32.4	-8.0	-10.0	Year-round	Monotypic species
Sora	-33.0	-2.0	-10.0	Breeding	Monotypic species
Yellow-bellied Sapsucker	-34.0	-2.0	-10.0	Breeding	Monotypic species
American Crow	-34.0	8.0	-10.0	Breeding	Monotypic species
White-rumped Sandpiper	-35.0	-2.0	-10.0	Breeding	Monotypic species
Swainsons Hawk	-35.0	-8.0	-10.0	Breeding	Monotypic species
Rosss Gull	-35.0	-8.0	3.2	Migratory	Monotypic genus
Barred Owl	-36.5	-2.0	-10.0	Year-round	Monotypic species
Brown-headed Cowbird	-37.6	-2.0	-10.0	Breeding	Monotypic species
Barn Swallow	-38.0	-8.0	-10.0	Breeding	Monotypic species
Tundra shrew	-38.0	-10.0	0.0	Year-round	Monotypic species
Stilt Sandpiper	-38.2	-2.0	-10.0	Breeding	Monotypic species
Pied-billed Grebe	-38.4	0.0	-10.0	Year-round	Monotypic species
Southern red-backed vole, pheaus	-38.6	4.0	-10.0	Year-round	Subspecies
North American deermouse	-40.0	-2.0	-10.0	Year-round	Monotypic species
White Wagtail	-42.0	-2.0	-10.0	Breeding	Monotypic species
Northern Rough-winged Swallow	-44.0	8.0	-10.0	Breeding	Monotypic species
Annas Hummingbird	-45.0	-2.0	-10.0	Year-round	Monotypic species

Table 9, continued.

Common name	Biological Score	Range	% Global	Alaska Occurrence	Systematic Significance
Hoary Redpoll	-46.0	-10.0	-10.0	Year-round	Monotypic species
Goshawk, Northern	-47.0	-10.0	-10.0	Year-round	Monotypic species
Mountain Bluebird	-48.0	-8.0	-10.0	Breeding	Monotypic species
Northern Shrike	-48.0	-8.0	-10.0	Year-round	Monotypic species
Western Tanager	-48.0	-2.0	-10.0	Breeding	Monotypic species
Townsend's Solitaire	-52.0	-8.0	-10.0	Breeding	Monotypic species
Bluethroat	-52.0	-8.0	-10.0	Breeding	Monotypic species
Sharp-tailed Sandpiper	-58.2	-3.2	-10.0	Migratory	Monotypic species
Macgillivray's Warbler	-61.6	-2.0	-10.0	Breeding	Monotypic species

Table 10. Candidate taxa for monitoring efforts in Alaska. Distributions of listed taxa are reasonably known (survey score < 10), but listed taxa are not monitored or are only monitored locally (monitoring score > 2). Taxa are listed in order of decreasing biological scores. Range scores were included to demonstrate the spatial extent that requires consideration if statewide monitoring efforts are to be implemented and % global scores are included to show the global responsibility that Alaska has for each taxa.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Brandts Cormorant	22.4	-10.0	2.0	10.0	-10.0	Breeding	Monotypic species
Polar bear	15.5	-10.0	2.0	-2.0	-10.0	Year-round	Monotypic species
North Pacific right whale, Eastern North Pacific	15.5	2.0	2.0	-9.5	0.0	Year-round	Monotypic species
Rock Ptarmigan, Evermanns	15.0	-10.0	10.0	4.0	10.0	Year-round	Subspecies
White-fronted Goose, Tule	14.0	2.0	2.0	4.0	6.0	Breeding	Subspecies
Hoary marmot, Montague Island	13.2	2.0	10.0	8.0	10.0	Year-round	Subspecies
Rock Ptarmigan, Turners	11.0	2.0	10.0	4.0	10.0	Year-round	Subspecies
Northern flying squirrel, Prince of Wales	10.5	-10.0	10.0	-2.0	10.0	Year-round	Subspecies
Rock Ptarmigan, Townsends	9.0	2.0	10.0	8.0	10.0	Year-round	Subspecies
Brown lemming, black-footed	6.0	2.0	10.0	10.0	10.0	Year-round	Subspecies
Rock Sandpiper, Pribilof	4.0	2.0	-0.8	8.0	10.0	Year-round	Subspecies
Spruce Grouse, Prince of Wales	2.3	2.0	10.0	4.0	10.0	Year-round	Population Monotypic species
Mckays Bunting	2.0	-10.0	10.0	8.0	10.0	Year-round	Subspecies
Winter Wren, Semidi	2.0	2.0	10.0	10.0	10.0	Year-round	Subspecies
Song Sparrow, Aleutian	2.0	2.0	10.0	4.0	10.0	Year-round	Subspecies
Winter Wren, Pribilof	0.0	2.0	10.0	8.0	10.0	Year-round	Subspecies
Root vole, Montague Island	-1.6	-10.0	10.0	8.0	10.0	Year-round	Subspecies
California myotis	-1.6	2.0	10.0	4.0	-10.0	Year-round	Monotypic species
River otter, Prince of Wales	-2.4	2.0	10.0	-2.0	10.0	Year-round	Monotypic species
Common Greenshank	-3.0	2.0	10.0	4.0	-10.0	Migratory	Monotypic species
Root vole, Pুনuk Island	-3.8	2.0	10.0	10.0	10.0	Year-round	Subspecies
Long-tailed vole, Coronation Island	-4.0	2.0	10.0	8.0	10.0	Year-round	Subspecies
Dusky shrew, Warren Island	-4.0	6.0	10.0	8.0	10.0	Year-round	Subspecies
Northwestern deer mouse, sitkensis	-5.5	2.0	10.0	4.0	10.0	Year-round	Subspecies
Western Sandpiper	-6.0	-10.0	10.0	-8.0	6.0	Breeding	Monotypic species
Black Guillemot	-6.0	2.0	2.0	-2.0	-10.0	Year-round	Monotypic species
Alaskan hare, othus	-8.0	-10.0	8.0	-8.0	10.0	Year-round	Subspecies
Marbled Godwit	-8.0	-10.0	10.0	4.0	10.0	Breeding	Monotypic species

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Northern red-backed vole, Island	-8.0	2.0	10.0	10.0	10.0	Year-round	Subspecies
Root vole, Sitka	-8.0	2.0	10.0	4.0	10.0	Year-round	Subspecies
Root vole, St. Lawrence Island	-8.0	2.0	10.0	4.0	10.0	Year-round	Subspecies
Northwestern deer mouse, oceanicus	-8.5	2.0	10.0	10.0	10.0	Year-round	Subspecies
Goshawk, Queen Charlotte	-9.0	-10.0	2.0	-2.0	-6.0	Year-round	Subspecies
Red squirrel, Kenai	-10.0	2.0	10.0	-2.0	10.0	Year-round	Subspecies
Northern red-backed vole, Glacier Bay	-10.0	2.0	10.0	8.0	10.0	Year-round	Subspecies
Arctic Loon	-10.0	2.0	10.0	-2.0	-10.0	Breeding	Monotypic species
Root vole, Yakutat	-10.0	2.0	10.0	8.0	10.0	Year-round	Subspecies
Surfbird	-10.0	2.0	2.0	-8.0	2.0	Year-round	Monotypic genus
Ermine, Prince of Wales	-10.4	2.0	2.0	4.0	10.0	Year-round	Subspecies
Walrus	-10.5	-10.0	2.0	-10.0	1.0	Year-round	Monotypic family
Wolf, Alexander Archipelago	-10.8	2.0	10.0	8.0	10.0	Year-round	Population
Alaskan hare	-11.4	2.0	8.0	-8.0	9.2	Year-round	Monotypic species
Long-legged myotis	-11.6	2.0	10.0	-8.0	-10.0	Year-round	Monotypic species
Root vole, Amak Island	-12.0	-10.0	10.0	10.0	10.0	Year-round	Subspecies
Bristle-thighed Curlew	-12.0	-10.0	2.0	-2.0	6.0	Breeding	Monotypic species
Peregrine Falcon, Peales	-12.0	2.0	2.0	-8.0	6.0	Year-round	Subspecies
Marten, Pacific	-12.1	2.0	10.0	4.0	-6.0	Year-round	Subspecies
Pribilof Island shrew	-14.0	-10.0	10.0	10.0	10.0	Year-round	Monotypic species
Winter Wren, Kiska	-14.0	2.0	10.0	-2.0	10.0	Year-round	Subspecies
Dusky shrew, Yakutat	-14.0	2.0	10.0	-2.0	10.0	Year-round	Subspecies
Bairds beaked whale, Alaska	-14.0	2.0	6.0	-10.0	0.0	Migratory	Monotypic species
Great Blue Heron, Pacific	-15.6	2.0	2.0	-2.0	6.0	Year-round	Subspecies
Winter Wren, Attu	-16.0	2.0	10.0	4.0	10.0	Year-round	Subspecies
Red Knot	-16.0	2.0	2.0	-2.0	-10.0	Breeding	Monotypic species
Black Swift	-16.4	2.0	10.0	-2.0	-10.0	Year-round	Monotypic genus
Ruff	-17.0	2.0	10.0	4.0	-10.0	Migratory	Monotypic genus
Western Screech-Owl	-17.4	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Killer whale	-18.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Brambling	-18.0	2.0	10.0	4.0	-10.0	Breeding	Monotypic species
Black Oystercatcher	-19.0	-10.0	2.0	-2.0	-2.0	Year-round	Monotypic species

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Long-toed Stint	-19.0	2.0	10.0	4.0	-10.0	Migratory	Monotypic species
Eye-browed Thrush	-19.0	2.0	10.0	4.0	-10.0	Migratory	Monotypic species
Ribbon seal	-19.0	2.0	2.0	-9.0	-4.0	Year-round	Monotypic genus
Caspian Tern	-20.0	-10.0	10.0	4.0	-10.0	Breeding	Monotypic species
Bar-tailed Godwit	-20.0	-10.0	2.0	4.0	-10.0	Breeding	Monotypic species
Common Sandpiper	-20.0	2.0	10.0	4.0	-10.0	Migratory	Monotypic species
Siberian Rubythroat	-20.0	2.0	10.0	4.0	-10.0	Migratory	Monotypic species
Meadow vole, Admiralty	-20.0	2.0	10.0	8.0	10.0	Year-round	Subspecies
Black Scoter	-20.4	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Northwestern deermouse, hylaesus	-20.5	2.0	10.0	-2.0	10.0	Year-round	Subspecies
Pink-footed Shearwater	-21.0	-10.0	10.0	-10.0	-10.0	Wintering	Monotypic species
Fin whale, Northeast Pacific	-21.0	2.0	2.0	-10.0	-10.0	Migratory	Monotypic species
Fork-tailed Storm-Petrel, furcata	-22.0	-10.0	2.0	-10.0	6.0	Year-round	Subspecies
Dunlin, Arctic	-22.0	-10.0	2.0	-8.0	6.0	Year-round	Subspecies
Dunlin, Pacific	-22.0	2.0	10.0	-8.0	6.0	Year-round	Subspecies
Alaska tiny shrew	-22.8	2.0	10.0	-8.8	10.0	Year-round	Monotypic species
Sperm whale, North Pacific	-23.0	-10.0	10.0	-10.0	-10.0	Migratory	Monotypic species
Hudsonian Godwit	-24.0	2.0	10.0	-2.0	-10.0	Breeding	Monotypic species
Silver-haired bat	-24.0	2.0	10.0	-2.0	-10.0	Year-round	Monotypic species
Surf Scoter	-24.0	2.0	2.0	-2.0	0.0	Year-round	Monotypic species
Northern Harrier	-24.0	2.0	2.0	-2.0	-10.0	Year-round	Monotypic genus
Horned Grebe	-24.8	-10.0	2.0	-8.0	0.0	Year-round	Monotypic species
Northern flying squirrel	-24.9	2.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Laysan Albatross	-25.0	-10.0	10.0	-10.0	-10.0	Wintering	Monotypic species
Least Auklet	-25.0	-10.0	2.0	-2.0	-2.0	Year-round	Monotypic species
Black-headed Gull	-25.0	2.0	10.0	-2.0	-10.0	Migratory	Monotypic species
Dusky shrew, Queen Charlotte Islands	-26.0	-10.0	10.0	-2.0	-2.0	Year-round	Subspecies

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Black-footed Albatross	-26.0	-10.0	10.0	-10.0	-10.0	Wintering	Monotypic species
Long-tailed vole, littoralis	-26.0	-4.0	10.0	-2.0	-2.0	Year-round	Subspecies
Alaska marmot	-26.0	2.0	10.0	-8.0	9.0	Year-round	Monotypic species
Red-faced Cormorant	-27.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Spotted seal	-27.6	-10.0	10.0	-10.0	-7.6	Year-round	Monotypic species
Whiskered Auklet	-27.6	-10.0	2.0	-2.0	2.4	Year-round	Monotypic species
Northern Saw-whet Owl	-28.0	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Northern Pygmy-owl	-28.0	2.0	2.0	-2.0	-10.0	Year-round	Monotypic species
Bald Eagle	-28.3	-10.0	2.0	-8.0	-2.0	Year-round	Monotypic species
Ermine, Kodiak Island	-28.4	2.0	2.0	-2.0	10.0	Year-round	Subspecies
Northwestern deermouse, algidus	-29.5	2.0	10.0	4.0	-5.0	Year-round	Subspecies
Crested Auklet	-29.6	-10.0	2.0	-2.0	-2.0	Year-round	Monotypic species
Red squirrel, Kupreanof	-30.0	-10.0	10.0	-2.0	0.0	Year-round	Subspecies
Northwestern deermouse, macrorhinus	-30.5	2.0	10.0	-2.0	0.0	Year-round	Subspecies
Little brown myotis	-31.4	-10.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Black-backed Woodpecker	-31.5	2.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Canadian lynx	-31.6	2.0	2.0	-10.0	-8.0	Year-round	Monotypic species
Aleutian Tern	-31.7	-10.0	2.0	-10.0	-6.0	Breeding	Monotypic species
Short-tailed Albatross	-32.0	-10.0	10.0	-10.0	-8.0	Wintering	Monotypic species
Long-tailed Duck	-32.0	-10.0	2.0	-8.0	-6.0	Year-round	Monotypic genus
Northern Flicker	-32.0	2.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Arctic Tern	-32.0	6.0	2.0	-10.0	6.0	Breeding	Monotypic species
Black-legged Kittiwake	-32.5	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Roughskin newt	-33.2	-10.0	10.0	-2.0	-10.0	Year-round	Monotypic species
Vauxs Swift	-33.6	2.0	10.0	-2.0	-10.0	Breeding	Monotypic species
Three-toed Woodpecker	-34.0	-10.0	2.0	-10.0	-6.0	Year-round	Monotypic species
Collared pika	-34.0	2.0	10.0	-10.0	-5.2	Year-round	Monotypic species

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Red Crossbill	-34.0	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Wandering Tattler	-34.2	2.0	10.0	-10.0	-2.0	Breeding	Monotypic species
Common minke whale, Alaska	-34.8	2.0	2.0	-10.0	-10.0	Migratory	Monotypic species
Red-necked Grebe	-35.0	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Arctic ground squirrel, Aleutian	-35.9	2.0	10.0	-6.5	10.0	Year-round	Subspecies
Ancient Murrelet	-36.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Golden-crowned Sparrow	-36.0	2.0	10.0	-10.0	2.0	Breeding	Monotypic species
Smiths longspur	-36.0	2.0	10.0	-8.0	-10.0	Breeding	Monotypic species
Peregrine Falcon, American	-36.0	2.0	2.0	-10.0	-6.0	Breeding	Subspecies
Great Gray Owl	-36.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic genus
Golden Eagle	-36.4	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Bearded seal	-36.8	2.0	10.0	-8.8	-3.0	Year-round	Monotypic species
Pigeon Guillemot	-37.0	2.0	2.0	-10.0	-2.0	Year-round	Monotypic species
Northern Hawk-owl	-37.4	2.0	2.0	-10.0	-6.0	Year-round	Monotypic genus
Common Eider, Pacific	-38.0	-10.0	2.0	-8.0	-6.0	Year-round	Subspecies
Chestnut-backed Chickadee	-38.0	-10.0	2.0	-8.0	-6.0	Year-round	Monotypic species
Rusty Blackbird	-38.0	-10.0	2.0	-10.0	-6.0	Breeding	Monotypic species
Fork-tailed Storm-Petrel, plumbea	-38.0	2.0	10.0	-8.0	-10.0	Year-round	Subspecies
Gyrfalcon	-38.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Lesser Yellowlegs	-38.0	2.0	1.2	-10.0	-6.0	Breeding	Monotypic species
Common Loon	-38.4	-10.0	10.0	-8.0	-10.0	Year-round	Monotypic species
Gray-crowned Rosy-finch	-38.4	2.0	10.0	-2.0	-10.0	Year-round	Monotypic species
Rufous Hummingbird	-39.0	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Ringed seal	-40.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Blackpoll Warbler	-40.0	-10.0	0.8	-10.0	-6.0	Breeding	Monotypic species
Brown lemming	-40.0	2.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Southern red-backed vole	-40.0	2.0	10.0	4.0	-10.0	Year-round	Monotypic species

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Snowy Owl	-40.0	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Belted Kingfisher	-40.0	2.0	2.0	-8.0	-10.0	Year-round	Monotypic spec.
American Redstart	-40.0	2.0	2.0	-2.0	-10.0	Breeding	Monotypic genus
Western toad	-40.6	-10.0	0.0	-8.0	-10.0	Year-round	Monotypic species
Short-billed Dowitcher	-40.8	2.0	10.0	-8.0	-6.0	Breeding	Monotypic species
Rough-legged Hawk	-41.0	2.0	10.0	-10.0	-10.0	Breeding	Monotypic species
Yellow-billed Loon	-42.0	-10.0	2.0	-8.0	-2.0	Year-round	Monotypic species
Collared lemming	-42.0	2.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Red-breasted Nuthatch	-42.0	2.0	2.0	-8.0	0.0	Year-round	Monotypic species
White-winged Scoter	-42.0	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Peregrine Falcon, Arctic	-42.4	-10.0	2.0	-10.0	-10.0	Breeding	Subspecies
Double-crested Cormorant	-42.4	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Osprey	-42.5	2.0	2.0	-10.0	-10.0	Breeding	Monotypic genus
Leachs Storm-petrel, (leucorhoa)	-43.6	2.0	2.0	-10.0	-2.6	Year-round	Monotypic species
Brown Creeper	-44.0	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Gray-cheeked Thrush	-44.0	-10.0	2.0	-10.0	-6.0	Breeding	Monotypic species
Boreal Owl	-44.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Wilson's Warbler	-44.0	2.0	2.0	-10.0	-6.0	Breeding	Monotypic species
Buff-breasted Sandpiper	-44.6	-10.0	10.0	-8.0	-6.6	Breeding	Monotypic species
Western Wood-pewee	-45.0	-10.0	2.0	-8.0	-10.0	Breeding	Monotypic species
Humpback whale, Central and Western North Pacific	-46.0	-10.0	2.0	-10.0	-10.0	Migratory	Monotypic species
Golden-crowned Kinglet	-46.0	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Varied Thrush	-46.0	-10.0	2.0	-2.0	-4.0	Year-round	Monotypic genus
Taiga vole (yellow-cheeked vole)	-46.0	-10.0	2.0	-2.0	-10.0	Year-round	Monotypic species
Semipalmated Sandpiper	-46.0	-10.0	0.0	-8.0	-8.0	Breeding	Monotypic species
Pygmy shrew	-46.0	2.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Pacific-slope Flycatcher	-46.0	2.0	2.0	-2.0	-10.0	Breeding	Monotypic species

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Red-tailed Hawk	-46.0	2.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Great Horned Owl	-46.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Solitary Sandpiper	-46.0	2.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Harbor porpoise	-46.8	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Northern bog lemming	-47.2	-10.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Water shrew	-47.6	2.0	10.0	0.4	-10.0	Year-round	Monotypic species
Arctic Warbler	-48.0	-10.0	10.0	-10.0	-10.0	Breeding	Monotypic species
American Tree Sparrow	-48.0	-10.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Meadow jumping mouse	-48.0	-10.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Pacific Loon	-48.0	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
White-winged Crossbill	-48.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
American Dipper	-48.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Olive-sided Flycatcher	-48.0	2.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Townsend's Warbler	-48.0	2.0	2.0	-8.0	-6.0	Breeding	Monotypic species
Short-eared Owl	-48.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Merlin	-48.4	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Northwestern deermouse	-48.5	-10.0	10.0	-8.0	-6.0	Year-round	Monotypic species
Peregrine Falcon	-50.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Northern Waterthrush	-50.0	-10.0	2.0	-10.0	-6.0	Breeding	Monotypic species
Boreal Chickadee	-50.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Fox Sparrow	-50.0	2.0	2.0	-10.0	-6.0	Year-round	Monotypic genus
Arctic ground squirrel	-51.2	-10.0	2.0	-10.0	-4.0	Year-round	Monotypic species
Red Phalarope	-52.0	-10.0	10.0	-8.0	-10.0	Breeding	Monotypic species
Thick-billed Murre	-52.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Bank Swallow	-52.0	-10.0	2.0	-10.0	-10.0	Breeding	Monotypic species

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Pine Siskin	-52.0	-10.0	2.0	-2.0	-10.0	Year-round	Monotypic species
Whimbrel	-52.0	2.0	10.0	-2.0	-10.0	Breeding	Monotypic spec.
Bairds Sandpiper	-52.0	2.0	10.0	-10.0	-10.0	Breeding	Monotypic species
Arctic ground squirrel, Barrow	-53.1	2.0	2.0	-6.5	2.0	Year-round	Subspecies
Sharp-shinned Hawk	-53.5	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Bohemian Waxwing	-54.0	-10.0	10.0	-10.0	-10.0	Year-round	Monotypic species
American Golden-plover	-54.0	-10.0	10.0	-8.0	-6.0	Breeding	Monotypic species
Long-tailed vole	-54.0	-10.0	10.0	-10.0	-10.0	Year-round	Monotypic species
Red-necked Phalarope	-54.0	-10.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Violet-green Swallow	-54.0	2.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Dusky shrew	-55.3	-10.0	10.0	-10.0	-7.3	Year-round	Monotypic species
Eastern Yellow Wagtail	-56.0	-10.0	10.0	-8.0	-10.0	Breeding	Monotypic species
Common Murre	-56.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Pelagic Cormorant	-56.0	-10.0	2.0	-10.0	-6.0	Year-round	Monotypic species
Singing vole	-56.0	-10.0	2.0	-10.0	-3.0	Year-round	Monotypic species
White-crowned Sparrow	-56.0	2.0	2.0	-10.0	-6.0	Year-round	Monotypic species
Glaucous Gull	-57.2	2.0	2.0	-8.0	-9.2	Year-round	Monotypic species
Pacific Golden-plover	-58.0	-10.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Sooty Grouse	-59.0	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Hairy Woodpecker	-59.5	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Stellers Jay	-59.6	2.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Swainsons Thrush	-60.0	-10.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Hammonds Flycatcher	-60.0	2.0	2.0	-8.0	-10.0	Breeding	Monotypic species
Ermine	-60.4	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic species
Meadow vole	-62.0	-10.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Root vole	-64.0	-10.0	10.0	-10.0	-10.0	Year-round	Monotypic species

Table 10, continued.

Common name	Biological score	Survey	Monitor	Range	% Global	Alaska Occurrence	Systematic Significance
Northern red-backed vole	-64.0	-10.0	2.0	-10.0	-10.0	Year-round	Monotypic spec.
Northwestern Crow	-64.0	2.0	2.0	-10.0	-6.0	Year-round	Monotypic species
Wilson's Snipe	-65.0	2.0	2.0	-8.0	-10.0	Year-round	Monotypic spec.
Dark-eyed Junco	-68.0	2.0	2.0	-8.0	-10.0	Year-round	Monotypic species
Hermit Thrush	-70.0	-10.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Cliff Swallow	-70.0	2.0	2.0	-10.0	-10.0	Breeding	Monotypic species
Pine Grosbeak	-70.0	2.0	2.0	-10.0	-10.0	Year-round	Monotypic genus
Wood frog	-70.2	-10.0	6.0	-10.0	-10.0	Year-round	Monotypic species

Table 11. Candidate taxa for research efforts in Alaska. Taxa listed have limiting factors that are not well known (research score > 2) and are known or suspected to be declining in Alaska (population trend > 2). Taxa are listed in order of decreasing biological scores. Range scores were included to demonstrate the spatial extent that requires consideration if statewide research efforts are to be implemented and % global scores are included to show the global responsibility that Alaska has for each taxa.

Common name	Biological Score	Range	% Global	Alaska Occurrence	Taxonomy
Stellers Eider	25.4	-2.0	2.0	Year-round	Monotypic genus
North Pacific right whale, Eastern North Pacific	15.5	-9.5	0.0	Year-round	Monotypic species
Root vole, Shumagin Island	2.0	8.0	10.0	Year-round	Subspecies
American Coot	-3.0	10.0	-10.0	Year-round	Monotypic species
Sanderling	-6.0	-2.0	-10.0	Year-round	Monotypic species
Alaskan hare, poadromus	-6.0	-8.0	10.0	Year-round	Subspecies
Northern fur seal	-8.0	8.0	-2.0	Year-round	Monotypic genus
Columbia spotted frog	-9.0	4.0	-10.0	Year-round	Monotypic species
Surfbird	-10.0	-8.0	2.0	Year-round	Monotypic genus
Arctic Loon	-10.0	-2.0	-10.0	Breeding	Monotypic species
Ivory Gull	-14.5	-2.0	-10.0	Wintering	Monotypic genus
Red Knot	-16.0	-2.0	-10.0	Breeding	Monotypic species
Black Swift	-16.4	-2.0	-10.0	Year-round	Monotypic genus
Killdeer	-18.0	-2.0	-10.0	Year-round	Monotypic species
Bar-tailed Godwit	-20.0	4.0	-10.0	Breeding	Monotypic species
Dunlin, Pacific	-22.0	-8.0	6.0	Year-round	Subspecies
Eastern Kingbird	-23.5	-2.0	-10.0	Migratory	Monotypic species
Northern Harrier	-24.0	-2.0	-10.0	Year-round	Monotypic genus
Horned Grebe	-24.8	-8.0	0.0	Year-round	Monotypic species
Red-faced Cormorant	-27.0	-10.0	-10.0	Year-round	Monotypic species
Red-winged Blackbird	-28.0	-2.0	-10.0	Year-round	Monotypic species
Upland Sandpiper	-32.0	-8.0	-10.0	Breeding	Monotypic genus
Long-tailed Duck	-32.0	-8.0	-6.0	Year-round	Monotypic genus
Lesser Yellowlegs	-38.0	-10.0	-6.0	Breeding	Monotypic species
Rusty Blackbird	-38.0	-10.0	-6.0	Breeding	Monotypic species
Blackpoll Warbler	-40.0	-10.0	-6.0	Breeding	Monotypic species
Belted Kingfisher	-40.0	-8.0	-10.0	Year-round	Monotypic species
American Redstart	-40.0	-2.0	-10.0	Breeding	Monotypic genus
Western toad	-40.6	-8.0	-10.0	Year-round	Monotypic species
Western Wood-pewee	-45.0	-8.0	-10.0	Breeding	Monotypic species
Great Horned Owl	-46.0	-10.0	-10.0	Year-round	Monotypic species
Black-bellied Plover	-48.0	-8.0	-6.0	Breeding	Monotypic species
Short-eared Owl	-48.0	-10.0	-10.0	Year-round	Monotypic species
Bank Swallow	-52.0	-10.0	-10.0	Breeding	Monotypic species
American Golden-plover	-54.0	-8.0	-6.0	Breeding	Monotypic species
Pacific Golden-plover	-58.0	-10.0	-10.0	Breeding	Monotypic species

Criteria Considerations and Suggestions

Survival and longevity

During the ADF&G internal review of the ranking criteria there was some concern that average number of eggs or live young produced annually and age at first breeding did not adequately reflect reproductive potential because it did not capture offspring survival. Despite some opposition from reviewers, we elected to use the same reproductive criteria as Millsap et al. (1990) and others (Lunney et al. 1996, Garrett and Wright 2000, Baldi et al. 2001). Millsap et al. (1990) acknowledged that reproductive potential would be better represented by scoring according to productivity, but recognized that this information is unavailable across taxa. Instead, reproductive potential, as defined by Millsap et al. (1990), was used as an indicator of a taxa's ability to rebound following a decline. An amphibian that produces several hundred offspring will likely rebound much faster than a black bear that produces one or two offspring every other year. The biological criteria also failed to reflect adult survival and longevity, which contribute to differences in biological vulnerability among taxa and are relevant in the interpretation of population size and its impact on biological vulnerability. Longevity and survival are unknown for most taxa and trying to answer questions about survival and longevity would do little to improve upon the ability to distinguish fine differences in status.

Systematic Studies

In congruence with the findings of Millsap et al. (1990), geographically restricted subspecies and peripheral populations of widespread species received some of the highest biological scores. These high scores were largely driven by restricted ranges and small population sizes. While we acknowledge that both subspecies and peripheral populations are an integral and important component of the overall diversity of Alaska fauna, we believe that the observed trends in the biological data are meaningful but should be interpreted with some caution. In many cases, subspecific designations were based on slight morphological differences from a small number of specimens, many of which had not been revisited for examination since first described. While recent molecular techniques have elucidated some of these taxonomic uncertainties for small mammals in Southeast Alaska (see Conroy and Cook 2000, Bidlack and Cook 2001, Cook and MacDonald 2001, Cook et al. 2001, MacDonald and Cook 1999, 2007), the majority of small mammal subspecific designations in the state remain questionable. Many of the peripheral species that were ranked were birds that travel to Alaska from Asia annually during spring and fall migration or occur on the periphery of their conterminous U. S. range in Southeast Alaska. While these birds occur with some regularity in the margins of the state, their numbers are generally low and they are relatively unstudied, which is reflected in their relatively high biological scores.

We caution users of the system to examine a combination of biological and action scores for individual taxa, especially subspecies and peripherals, before making management or funding decisions. We also encourage users of the ranking system to utilize the supplemental variables such as seasonal occurrence, systematic significance, and/or peripheral occurrence to sort and filter the data to further aid in the decision making process.

CONCLUSIONS AND FUTURE DIRECTIONS

Our goal was to develop a species ranking system that would assist the ADF&G Nongame Program with setting priorities for conservation. Although this report summarizes our findings, the scope of the project exceeds the results contained herein. An Access database was developed to house all the information gathered during this effort. It is our hope that this database will continue to be updated as new information becomes available and will become a dynamic tool to help guide decision making by ADF&G for years to come.

The modified Millsap et al. (1990) approach presented here provides an objective procedure for evaluating the status of vertebrate species in Alaska. The strengths of this system include: answers to criteria are transparent and repeatable, equal effort was spent on each species, consistent criteria were used for all taxa, and a wide range of expert opinion was included. Results of the Alaska Species Priority Ranking System can now be used as a decision support tool to identify priority species for conservation with minimal bias.

Even though we used the Millsap et al. (1990) classification system as a template, it still took considerable time to develop the ranking and scoring system to be Alaska specific. This included two reviews by ADF&G staff, one at an early stage after completion of the pilot project, and another near the completion of the project, when all the species had been ranked but not reviewed. Each review resulted in modifications to the ranking and scoring system. It is likely that further modifications may be warranted as ADF&G staff begins to use the system to address specific conservation issues in Alaska.

Our knowledge of the ecology of vertebrate species in Alaska is far from complete; therefore any ranking system will be imperfect. Species prioritization depends highly on the availability and quality of data (Baldi et al. 2001). Insufficient data can result in misleading species ranks. Expert evaluation of unknown criteria could greatly improve the strength of the ranking system and subsequent results. Due to time and budgetary constraints, only a partial expert review of the criteria was completed. We recommend a full review for the remaining species as well as a peer review of the ranking system itself.

If the overall goal of the species ranking project is to develop a defensible methodology for establishing research and management priorities for terrestrial vertebrate species in Alaska, then all terrestrial vertebrates should be included in the process, or they should at least be selected based upon consistent criteria. The 341 nominee species that were included in this analysis were selected because they were either mentioned or listed by numerous organizations, were suggested by the public and other reviewers, or were nominated by species experts. Although a number of evaluation criteria were considered for including a species, no single criteria was used to objectively score species and the rationale for inclusion was often times inconsistent.

In order to address the full array of wildlife and wildlife-related issues in the state, a comprehensive assessment of all taxa is desirable. Based on the inconsistent manner in which the nominee species list was developed, it is likely the list is biased, which will subsequently bias the scoring results and the ability to assess the efficacy of the ranking system. For example, the list is heavily loaded with endemic small mammals, marine mammals, shorebirds and landbirds,

while waterfowl and large terrestrial mammals are underrepresented. Millsap et al. (1990) ranked all vertebrate taxa in the state of Florida (including fishes) and found that the objective view provided by taxa ranks steered the Florida Nongame Wildlife Program into areas that were not intuitively obvious beforehand. Similar to Florida, we recommend a full ranking for all terrestrial vertebrate species in Alaska.

Results from the variable analyses were not used to adjust the ranking system. Instead, they were included to alert users of the potential biases and limitations of the system. In order to fairly evaluate the system, all vertebrate taxa need to be included. The current system provides biological and action scores based on the best available knowledge. To fully interpret and use the scores to guide decisions regarding conservation, users of the system should read the criteria justification provided in the database and acknowledge the extent of the expert review prior to drawing conclusions. Supplemental variables may also be used to sort the taxa based on taxonomic significance, seasonal occurrence, level of harvest, and peripheral status depending on the objectives of the user.

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Appendix I. List of 26 species used in pilot testing to assess the accuracy and consistency of the modified Alaska ranking criteria.

Taxa	Grank	Srank	Biological	Action
Amphibians				
Northwestern salamander	G5	S3	-27.8	32.0
Western toad	G4	S3S4	-40.6	-2.0
Wood frog	G5	S5	-70.2	8.0
Birds				
King Eider	G5	S3B, S3N	-25.0	4.0
Red-throated Loon	G5	S4B, S4N	-46.2	-4.0
Merlin	G5	S4B, S3N	-48.4	2.0
Lesser Yellowlegs	G5	S5B	-38.0	15.2
Bristle-thighed Curlew	G2	S2B	-12.0	4.0
Surfbird	G5	S2N, S3B	-10.0	16.0
Ivory Gull	G5	S3N	-14.5	34.0
Crested Auklet	G5	S5	-29.6	-16.0
Northern Pygmy-owl	G5	S3	-28.0	16.0
Olive-sided Flycatcher	G4	S4S5B	-48.0	8.0
Red-eyed Vireo	G5	S2B	-31.5	24.0
Mammals				
Root vole, Montague Island	G5T2	S2	-1.6	20.0
Northwestern deermouse	G5	S3	-48.5	10.0
Collared pika	G5	S5	-34.0	22.0
St. Lawrence Island shrew	G3	S3	-25.6	32.0
Little brown myotis	G5	S4	-31.4	12.0
Canadian lynx	G5	S4	-31.6	-16.0
Walrus	G4	S3	-10.5	-16.0
Harbor seal	G5	S4S5	-46.0	-8.0
Humpback whale, Central and Western North Pacific	G3	S2	-46.0	-22.0
Beluga whale, Cook Inlet population	G4T1	S1	42.0	-40.0
Fishes				
Bering cisco	G4	S4	-11.0	20.0
Western brook lamprey	G4G5	S1S2	2.4	40.0

Appendix II. Taxa ranked alphabetically by class and in phylogenetic order below class. Biological and action scores are listed with the percentage of taxa that ranked below in parentheses.

Taxa	Biological score	Action score
AMPHIBIA		
Caudata		
Long-toed salamander (<i>Ambystoma macrodactylum</i>)	-24.4 (55%)	28.0 (85%)
Northwestern salamander (<i>Ambystoma gracile</i>)	-27.8 (49%)	32.0 (91%)
Roughskin newt (<i>Taricha granulosa</i>)	-33.2 (39%)	12.0 (60%)
Anura		
Western toad (<i>Bufo boreas</i>)	-40.6 (26%)	-2.0 (34%)
Wood frog (<i>Rana sylvatica</i>)	-70.2 (1%)	8.0 (51%)
Columbia spotted frog (<i>Rana luteiventris</i>)	-9.0 (76%)	32.0 (91%)
AVES		
Anseriformes		
White-fronted Goose, Tule (<i>Anser albifrons elgasi</i>)	14.0 (96%)	2.0 (40%)
Cackling Goose, Aleutian (<i>Branta hutchinsii leucopareia</i>)	12.4 (95%)	-32.0 (4%)
Stellers Eider (<i>Polysticta stelleri</i>)	25.4 (98%)	-0.4 (36%)
Spectacled Eider (<i>Somateria fischeri</i>)	-7.0 (77%)	-20.0 (13%)
King Eider (<i>Somateria spectabilis</i>)	-25.0 (53%)	4.0 (45%)
Common Eider, Pacific (<i>Somateria mollissima v-nigra</i>)	-38.0 (30%)	-10.0 (23%)
Surf Scoter (<i>Melanitta perspicillata</i>)	-24.0 (55%)	8.0 (51%)
White-winged Scoter (<i>Melanitta fusca</i>)	-42.0 (24%)	16.0 (70%)
Black Scoter (<i>Melanitta nigra</i>)	-20.4 (61%)	-4.0 (32%)
Long-tailed Duck (<i>Clangula hyemalis</i>)	-32.0 (42%)	0.0 (38%)
Galliformes		
Spruce Grouse, Prince of Wales (<i>Falcapennis canadensis isleibi</i>)	2.3 (89%)	24.0 (81%)
Rock Ptarmigan, Evermanns (<i>Lagopus mutus evermanni</i>)	15.0 (96%)	-20.0 (13%)
Rock Ptarmigan, Townsends (<i>Lagopus mutus townsendi</i>)	9.0 (92%)	-8.0 (26%)
Rock Ptarmigan, Turners (<i>Lagopus mutus atkhensis</i>)	11.0 (93%)	-8.0 (26%)
Sooty Grouse (<i>Dendragopus fuliginosus</i>)	-59.0 (8%)	8.0 (51%)
Gaviformes		
Red-throated Loon (<i>Gavia stellata</i>)	-46.2 (19%)	-4.0 (32%)
Arctic Loon (<i>Gavia arctica</i>)	-10.0 (74%)	24.0 (81%)
Pacific Loon (<i>Gavia pacifica</i>)	-48.0 (16%)	-4.0 (32%)
Common Loon (<i>Gavia immer</i>)	-38.4 (29%)	4.0 (45%)
Yellow-billed Loon (<i>Gavia adamsii</i>)	-42.0 (24%)	-4.0 (32%)
Podicipediformes		
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	-38.4 (29%)	30.4 (89%)
Horned Grebe (<i>Podiceps auritus</i>)	-24.8 (54%)	6.0 (49%)
Red-necked Grebe (<i>Podiceps grisegena</i>)	-35.0 (36%)	-4.0 (32%)

Appendix II, continued.

Taxa	Biological score	Action score
Procellariiformes	0.0 (0%)	0.0 (0%)
Laysan Albatross (<i>Phoebastria immutabilis</i>)	-25.0 (53%)	4.0 (45%)
Black-footed Albatross (<i>Phoebastria nigripes</i>)	-26.0 (51%)	-20.0 (13%)
Short-tailed Albatross (<i>Phoebastria albatrus</i>)	-32.0 (42%)	-14.0 (19%)
Pink-footed Shearwater (<i>Puffinus creatopus</i>)	-21.0 (60%)	-8.0 (26%)
Bullers Shearwater (<i>Puffinus bulleri</i>)	-23.0 (57%)	32.0 (91%)
Fork-tailed Storm-Petrel, furcata (<i>Oceanodroma furcata furcata</i>)	-22.0 (58%)	-28.0 (6%)
Fork-tailed Storm-Petrel, plumbea (<i>Oceanodroma furcata plumbea</i>)	-38.0 (30%)	4.0 (45%)
Leachs Storm-petrel (<i>Oceanodroma leucorhoa</i>)	-43.6 (22%)	-16.0 (17%)
Pelecaniformes		
Brandts Cormorant (<i>Phalacrocorax penicillatus</i>)	22.4 (98%)	-16.0 (17%)
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	-42.4 (24%)	-2.0 (34%)
Red-faced Cormorant (<i>Phalacrocorax urile</i>)	-27.0 (51%)	2.0 (40%)
Pelagic Cormorant (<i>Phalacrocorax pelagicus</i>)	-56.0 (10%)	-2.0 (34%)
Ciconiformes		0.0 (0%)
American Bittern (<i>Botaurus lentiginosus</i>)	-21.8 (59%)	24.0 (81%)
Great Blue Heron, Pacific (<i>Ardea herodias fannini</i>)	-15.6 (67%)	12.0 (60%)
Falconiformes		
Osprey (<i>Pandion haliaetus</i>)	-42.5 (23%)	8.0 (51%)
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	-28.3 (48%)	-28.0 (6%)
Northern Harrier (<i>Circus cyaneus</i>)	-24.0 (55%)	16.0 (70%)
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	-53.5 (12%)	18.0 (72%)
Goshawk, Northern (<i>Accipiter gentilis atricapillus</i>)	-47.0 (18%)	16.0 (70%)
Goshawk, Queen Charlotte (<i>Accipiter gentilis laingi</i>)	-9.0 (76%)	-16.0 (17%)
Swainsons Hawk (<i>Buteo swainsoni</i>)	-35.0 (36%)	28.0 (85%)
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	-46.0 (20%)	12.0 (60%)
Rough-legged Hawk (<i>Buteo lagopus</i>)	-41.0 (25%)	16.0 (70%)
Golden Eagle (<i>Aquila chrysaetos</i>)	-36.4 (33%)	-16.0 (17%)
Merlin (<i>Falco columbarius</i>)	-48.4 (15%)	2.0 (40%)
Merlin, Black (<i>Falco columbarius suckleyi</i>)	-12.2 (69%)	10.0 (55%)
Gyr Falcon (<i>Falco rusticolus</i>)	-38.0 (30%)	8.0 (51%)
Peregrine Falcon (<i>Falco peregrinus</i>)	-50.0 (14%)	-16.0 (17%)
Peregrine Falcon, American (<i>Falco peregrinus anatum</i>)	-36.0 (35%)	-4.0 (32%)
Peregrine Falcon, Arctic (<i>Falco peregrinus tundrius</i>)	-42.4 (24%)	-16.0 (17%)
Peregrine Falcon, Peales (<i>Falco peregrinus pealei</i>)	-12.0 (70%)	8.0 (51%)
Gruiformes		
Sora (<i>Porzana carolina</i>)	-33.0 (39%)	32.0 (91%)
American Coot (<i>Fulica americana</i>)	-3.0 (82%)	32.0 (91%)
Charadriiformes		
Black-bellied Plover (<i>Pluvialis squatarola</i>)	-48.0 (16%)	0.0 (38%)

Appendix II, continued.

Taxa	Biological score	Action score
American Golden-plover (<i>Pluvialis dominica</i>)	-54.0 (11%)	12.0 (60%)
Pacific Golden-plover (<i>Pluvialis fulva</i>)	-58.0 (9%)	4.0 (45%)
Lesser Sand-Plover (<i>Charadrius mongolus</i>)	-21.0 (60%)	32.0 (91%)
Killdeer (<i>Charadrius vociferus</i>)	-18.0 (63%)	20.0 (77%)
Eurasian Dotterel (<i>Charadrius morinellus</i>)	-21.0 (60%)	32.0 (91%)
Black Oystercatcher (<i>Haematopus bachmani</i>)	-19.0 (63%)	-5.2 (30%)
Common Sandpiper (<i>Actitis hypoleucos</i>)	-20.0 (62%)	24.0 (81%)
Solitary Sandpiper (<i>Tringa solitaria</i>)	-46.0 (20%)	16.0 (70%)
Gray-tailed Tattler (<i>Heteroscelus brevipes</i>)	-5.2 (80%)	32.0 (91%)
Wandering Tattler (<i>Heteroscelus incanus</i>)	-34.2 (37%)	24.0 (81%)
Common Greenshank (<i>Tringa nebularia</i>)	-3.0 (82%)	24.0 (81%)
Lesser Yellowlegs (<i>Tringa flavipes</i>)	-38.0 (30%)	15.2 (68%)
Upland Sandpiper (<i>Bartramia longicauda</i>)	-32.0 (42%)	32.0 (91%)
Eskimo Curlew (<i>Numenius borealis</i>)	27.0 (99%)	18.0 (72%)
Whimbrel (<i>Numenius phaeopus</i>)	-52.0 (13%)	16.0 (70%)
Bristle-thighed Curlew (<i>Numenius tahitiensis</i>)	-12.0 (70%)	4.0 (45%)
Hudsonian Godwit (<i>Limosa haemastica</i>)	-24.0 (55%)	16.0 (70%)
Bar-tailed Godwit (<i>Limosa lapponica</i>)	-20.0 (62%)	0.0 (38%)
Marbled Godwit (<i>Limosa fedoa</i>)	-8.0 (77%)	12.0 (60%)
Black Turnstone (<i>Arenaria melanocephala</i>)	-26.0 (51%)	4.0 (45%)
Surfbird (<i>Aphriza virgata</i>)	-10.0 (74%)	16.0 (70%)
Red Knot (<i>Calidris canutus</i>)	-16.0 (66%)	12.0 (60%)
Semipalmated Sandpiper (<i>Calidris pusilla</i>)	-46.0 (20%)	12.0 (60%)
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	-58.2 (8%)	32.0 (91%)
Western Sandpiper (<i>Calidris mauri</i>)	-6.0 (79%)	4.0 (45%)
Long-toed Stint (<i>Calidris subminuta</i>)	-19.0 (63%)	24.0 (81%)
White-rumped Sandpiper (<i>Calidris fuscicollis</i>)	-35.0 (36%)	16.0 (70%)
Bairds Sandpiper (<i>Calidris bairdii</i>)	-52.0 (13%)	24.0 (81%)
Rock Sandpiper, Aleutian (<i>Calidris ptilocnemis couesi</i>)	-4.0 (81%)	24.0 (81%)
Rock Sandpiper, Bering Sea (<i>Calidris ptilocnemis tschukschorum</i>)	-12.0 (70%)	24.0 (81%)
Rock Sandpiper, Pribilof (<i>Calidris ptilocnemis ptilocnemis</i>)	4.0 (90%)	8.0 (51%)
Sanderling (<i>Calidris alba</i>)	-6.0 (79%)	32.0 (91%)
Dunlin, Arctic (<i>Calidris alpina arctica</i>)	-22.0 (58%)	-4.0 (32%)
Dunlin, Pacific (<i>Calidris alpina pacifica</i>)	-22.0 (58%)	18.4 (74%)
Stilt Sandpiper (<i>Calidris himantopus</i>)	-38.2 (29%)	22.0 (79%)
Buff-breasted Sandpiper (<i>Tryngites subruficollis</i>)	-44.6 (21%)	4.0 (45%)
Ruff (<i>Philomachus pugnax</i>)	-17.0 (65%)	24.0 (81%)
Short-billed Dowitcher (<i>Limnodromus griseus</i>)	-40.8 (26%)	24.0 (81%)
Wilson's Snipe (<i>Gallinago gallinago</i>)	-65.0 (3%)	16.0 (70%)
Red-necked Phalarope (<i>Phalaropus grisegena</i>)	-54.0 (11%)	4.0 (45%)
Red Phalarope (<i>Phalaropus fulicaria</i>)	-52.0 (13%)	12.0 (60%)
Black-headed Gull (<i>Larus ridibundus</i>)	-25.0 (53%)	24.0 (81%)
Ring-billed Gull (<i>Larus delawarensis</i>)	-13.0 (68%)	32.0 (91%)
California Gull (<i>Larus californicus</i>)	-17.0 (65%)	32.0 (91%)
Slaty-backed Gull (<i>Larus schistisagus</i>)	9.0 (92%)	32.0 (91%)
Glaucous Gull (<i>Larus hyperboreus</i>)	-57.2 (10%)	16.0 (70%)

Appendix II, continued.

Taxa	Biological score	Action score
Black-legged Kittiwake (<i>Rissa tridactyla</i>)	-32.5 (40%)	-16.0 (17%)
Red-legged Kittiwake (<i>Rissa brevirostris</i>)	0.4 (86%)	5.0 (47%)
Ross's Gull (<i>Rhodostethia rosea</i>)	-35.0 (36%)	32.0 (91%)
Ivory Gull (<i>Pagophila eburnea</i>)	-14.5 (67%)	34.0 (94%)
Aleutian Tern (<i>Sterna aleutica</i>)	-31.7 (42%)	-10.0 (23%)
Caspian Tern (<i>Sterna caspia</i>)	-20.0 (62%)	-8.0 (26%)
Common Tern (<i>Sterna hirundo</i>)	-8.5 (76%)	24.0 (81%)
Arctic Tern (<i>Sterna paradisaea</i>)	-32.0 (42%)	0.0 (38%)
Dovekie (<i>Alle alle</i>)	-10.0 (74%)	24.0 (81%)
Common Murre (<i>Uria aalge</i>)	-56.0 (10%)	-4.0 (32%)
Thick-billed Murre (<i>Uria lomvia</i>)	-52.0 (13%)	-6.4 (28%)
Black Guillemot (<i>Cepphus grylle</i>)	-6.0 (79%)	18.0 (72%)
Pigeon Guillemot (<i>Cepphus columba</i>)	-37.0 (32%)	-4.0 (32%)
Marbled Murrelet (<i>Brachyramphus marmoratus</i>)	-11.2 (71%)	12.0 (60%)
Kittlitz's Murrelet (<i>Brachyramphus brevirostris</i>)	0.8 (87%)	10.4 (57%)
Ancient Murrelet (<i>Synthliboramphus antiquus</i>)	-36.0 (35%)	-22.0 (11%)
Least Auklet (<i>Aethia pusilla</i>)	-25.0 (53%)	-18.4 (15%)
Whiskered Auklet (<i>Aethia pygmaea</i>)	-27.6 (50%)	-16.0 (17%)
Crested Auklet (<i>Aethia cristatella</i>)	-29.6 (46%)	-16.0 (17%)
Columbiformes		
Band-tailed Pigeon (<i>Columba fasciata</i>)	-22.0 (58%)	24.0 (81%)
Strigiformes		
Western Screech-Owl (<i>Otus kennicottii</i>)	-17.4 (64%)	8.0 (51%)
Great Horned Owl (<i>Bubo virginianus</i>)	-46.0 (20%)	12.0 (60%)
Snowy Owl (<i>Bubo scandiacus</i>)	-40.0 (27%)	12.0 (60%)
Northern Hawk-owl (<i>Surnia ulula</i>)	-37.4 (31%)	8.0 (51%)
Northern Pygmy-owl (<i>Glaucidium gnoma</i>)	-28.0 (49%)	16.0 (70%)
Barred Owl (<i>Strix varia</i>)	-36.5 (33%)	13.6 (62%)
Great Gray Owl (<i>Strix nebulosa</i>)	-36.0 (35%)	-4.0 (32%)
Short-eared Owl (<i>Asio flammeus</i>)	-48.0 (16%)	14.4 (66%)
Boreal Owl (<i>Aegolius funereus</i>)	-44.0 (21%)	8.0 (51%)
Northern Saw-whet Owl (<i>Aegolius acadicus</i>)	-28.0 (49%)	8.0 (51%)
Apodiformes		
Black Swift (<i>Cypseloides niger</i>)	-16.4 (65%)	24.0 (81%)
Vaux's Swift (<i>Chaetura vauxi</i>)	-33.6 (38%)	16.0 (70%)
Anna's Hummingbird (<i>Calypte anna</i>)	-45.0 (20%)	24.0 (81%)
Rufous Hummingbird (<i>Selasphorus rufus</i>)	-39.0 (27%)	-4.0 (32%)
Coraciiformes		
Belted Kingfisher (<i>Ceryle alcyon</i>)	-40.0 (27%)	16.0 (70%)
Piciformes		
Yellow-bellied Sapsucker (<i>Sphyrapicus varius</i>)	-34.0 (38%)	24.0 (81%)

Appendix II, continued.

Taxa	Biological score	Action score
Red-breasted Sapsucker (<i>Sphyrapicus ruber</i>)	-44.0 (21%)	-8.0 (26%)
Hairy Woodpecker (<i>Picoides villosus</i>)	-59.5 (7%)	-10.0 (23%)
Three-toed Woodpecker (<i>Picoides tridactylus</i>)	-34.0 (38%)	-4.0 (32%)
Black-backed Woodpecker (<i>Picoides arcticus</i>)	-31.5 (43%)	16.0 (70%)
Northern Flicker (<i>Colaptes auratus</i>)	-32.0 (42%)	8.0 (51%)
Passeriformes		
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	-48.0 (16%)	8.0 (51%)
Western Wood-pewee (<i>Contopus sordidulus</i>)	-45.0 (20%)	4.0 (45%)
Hammonds Flycatcher (<i>Empidonax hammondii</i>)	-60.0 (6%)	8.0 (51%)
Pacific-slope Flycatcher (<i>Empidonax difficilis</i>)	-46.0 (20%)	8.0 (51%)
Eastern Kingbird (<i>Tyrannus tyrannus</i>)	-23.5 (56%)	32.0 (91%)
Northern Shrike (<i>Lanius excubitor</i>)	-48.0 (16%)	28.0 (85%)
Red-eyed Vireo (<i>Vireo olivaceus</i>)	-31.5 (43%)	24.0 (81%)
Stellers Jay (<i>Cyanocitta stelleri</i>)	-59.6 (7%)	16.0 (70%)
American Crow (<i>Corvus brachyrhynchos</i>)	-34.0 (38%)	28.0 (85%)
Northwestern Crow (<i>Corvus caurinus</i>)	-64.0 (4%)	12.0 (60%)
Sky Lark (<i>Alauda arvensis</i>)	-19.0 (63%)	28.0 (85%)
Violet-green Swallow (<i>Tachycineta thalassina</i>)	-54.0 (11%)	16.0 (70%)
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	-44.0 (21%)	28.0 (85%)
Bank Swallow (<i>Riparia riparia</i>)	-52.0 (13%)	4.0 (45%)
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	-70.0 (2%)	8.0 (51%)
Barn Swallow (<i>Hirundo rustica</i>)	-38.0 (30%)	16.0 (70%)
Chestnut-backed Chickadee (<i>Poecile rufescens</i>)	-38.0 (30%)	-4.0 (32%)
Boreal Chickadee (<i>Poecile hudsonica</i>)	-50.0 (14%)	8.0 (51%)
Gray-headed Chickadee (<i>Poecile cincta</i>)	-32.4 (40%)	32.0 (91%)
Red-breasted Nuthatch (<i>Sitta canadensis</i>)	-42.0 (24%)	8.0 (51%)
Brown Creeper (<i>Certhia americana</i>)	-44.0 (21%)	-10.0 (23%)
Winter Wren, Attu (<i>Troglodytes troglodytes meligerus</i>)	-16.0 (66%)	8.8 (53%)
Winter Wren, Kiska (<i>Troglodytes troglodytes kiskensis</i>)	-14.0 (68%)	8.8 (53%)
Winter Wren, Kodiak (<i>Troglodytes troglodytes helleri</i>)	-22.0 (58%)	18.0 (72%)
Winter Wren, Pribilof (<i>Troglodytes troglodytes alascensis</i>)	0.0 (86%)	10.0 (55%)
Winter Wren, Semidi (<i>Troglodytes troglodytes semidiensis</i>)	2.0 (88%)	-2.0 (34%)
American Dipper (<i>Cinclus mexicanus</i>)	-48.0 (16%)	2.0 (40%)
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	-46.0 (20%)	-10.0 (23%)
Arctic Warbler (<i>Phylloscopus borealis</i>)	-48.0 (16%)	12.0 (60%)
Siberian Rubythroat (<i>Luscinia calliope</i>)	-20.0 (62%)	24.0 (81%)
Bluethroat (<i>Luscinia svecica</i>)	-52.0 (13%)	32.0 (91%)
Mountain Bluebird (<i>Sialia currucoides</i>)	-48.0 (16%)	18.0 (72%)
Townsend's Solitaire (<i>Myadestes townsendi</i>)	-52.0 (13%)	24.0 (81%)
Gray-cheeked Thrush (<i>Catharus minimus</i>)	-44.0 (21%)	-4.0 (32%)
Swainson's Thrush (<i>Catharus ustulatus</i>)	-60.0 (6%)	-4.0 (32%)
Hermit Thrush (<i>Catharus guttatus</i>)	-70.0 (2%)	4.0 (45%)
Eye-browed Thrush (<i>Turdus obscurus</i>)	-19.0 (63%)	24.0 (81%)
American Robin (<i>Turdus migratorius</i>)	-72.0 (1%)	-8.0 (26%)
Varied Thrush (<i>Ixoreus naevius</i>)	-46.0 (20%)	0.0 (38%)

Appendix II, continued.

Taxa	Biological score	Action score
Eastern Yellow Wagtail (<i>Motacilla flava</i>)	-56.0 (10%)	12.0 (60%)
White Wagtail (<i>Motacilla alba</i>)	-42.0 (24%)	32.0 (91%)
Bohemian Waxwing (<i>Bombycilla garrulus</i>)	-54.0 (11%)	4.0 (45%)
Tennessee Warbler (<i>Vermivora peregrina</i>)	-22.0 (58%)	14.4 (66%)
Townsend's Warbler (<i>Dendroica townsendi</i>)	-48.0 (16%)	8.0 (51%)
Blackpoll Warbler (<i>Dendroica striata</i>)	-40.0 (27%)	2.8 (43%)
American Redstart (<i>Setophaga ruticilla</i>)	-40.0 (27%)	16.0 (70%)
Northern Waterthrush (<i>Seiurus noveboracensis</i>)	-50.0 (14%)	4.0 (45%)
Macgillivray's Warbler (<i>Oporornis tolmiei</i>)	-61.6 (5%)	20.0 (77%)
Wilson's Warbler (<i>Wilsonia pusilla</i>)	-44.0 (21%)	8.0 (51%)
Western Tanager (<i>Piranga ludoviciana</i>)	-48.0 (16%)	32.0 (91%)
American Tree Sparrow (<i>Spizella arborea</i>)	-48.0 (16%)	12.0 (60%)
Fox Sparrow (<i>Passerella iliaca</i>)	-50.0 (14%)	16.0 (70%)
Song Sparrow, Aleutian (<i>Melospiza melodia maxima</i>)	2.0 (88%)	4.0 (45%)
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	-56.0 (10%)	16.0 (70%)
Golden-crowned Sparrow (<i>Zonotrichia atricapilla</i>)	-36.0 (35%)	24.0 (81%)
Dark-eyed Junco (<i>Junco hyemalis</i>)	-68.0 (2%)	16.0 (70%)
Smith's longspur (<i>Calcarius pictus</i>)	-36.0 (35%)	24.0 (81%)
Rustic Bunting (<i>Emberiza rustica</i>)	-24.0 (55%)	32.0 (91%)
Mckays Bunting (<i>Plectrophenax hyperboreus</i>)	2.0 (88%)	4.0 (45%)
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	-28.0 (49%)	24.0 (81%)
Rusty Blackbird (<i>Euphagus carolinus</i>)	-38.0 (30%)	0.0 (38%)
Brown-headed Cowbird (<i>Molothrus ater</i>)	-37.6 (30%)	24.0 (81%)
Brambling (<i>Fringilla montifringilla</i>)	-18.0 (64%)	24.0 (81%)
Gray-crowned Rosy-finch (<i>Leucosticte tephrocotis</i>)	-38.4 (29%)	16.0 (70%)
Pine Grosbeak (<i>Pinicola enucleator</i>)	-70.0 (2%)	16.0 (70%)
Red Crossbill (<i>Loxia curvirostra</i>)	-34.0 (38%)	8.0 (51%)
White-winged Crossbill (<i>Loxia leucoptera</i>)	-48.0 (16%)	-4.0 (32%)
Hoary Redpoll (<i>Carduelis hornemanni</i>)	-46.0 (20%)	32.0 (91%)
Pine Siskin (<i>Carduelis pinus</i>)	-52.0 (13%)	4.0 (45%)
MAMMALIA		
Rodentia		
Northern flying squirrel (<i>Glaucomys sabrinus</i>)	-24.9 (54%)	24.0 (81%)
Northern flying squirrel, Prince of Wales (<i>Glaucomys sabrinus griseifrons</i>)	10.5 (93%)	-8.0 (26%)
Alaska marmot (<i>Marmota broweri</i>)	-26.0 (51%)	32.0 (91%)
Hoary marmot, Glacier Bay (<i>Marmota caligata vigilis</i>)	6.0 (90%)	40.0 (100%)
Hoary marmot, Montague Island (<i>Marmota caligata sheldoni</i>)	13.2 (95%)	32.0 (91%)
Arctic ground squirrel (<i>Spermophilus parryii</i>)	-51.2 (14%)	8.0 (51%)
Arctic ground squirrel, Aleutian (<i>Spermophilus parryii ablusus</i>)	-35.9 (35%)	28.0 (85%)
Arctic ground squirrel, Kodiak Island (<i>Spermophilus parryii kodiacensis</i>)	2.6 (89%)	36.0 (96%)
Arctic ground squirrel, Osgoods (<i>Spermophilus parryii osgoodi</i>)	8.1 (92%)	37.0 (98%)
Arctic ground squirrel, Shumagin Islands (<i>Spermophilus parryii nebulicola</i>)	-11.2 (71%)	36.0 (96%)
Arctic ground squirrel, Barrow (<i>Spermophilus parryii kennicotti</i>)	-53.1 (13%)	20.0 (77%)
Arctic ground squirrel, St. Lawrence Island (<i>Spermophilus parryii lyratus</i>)	-6.4 (78%)	40.0 (100%)

Appendix II, continued.

Taxa	Biological score	Action score
Red squirrel, Kenai (<i>Tamiasciurus hudsonicus kenaiensis</i>)	-10.0 (74%)	24.0 (81%)
Red squirrel, Kupreanof (<i>Tamiasciurus hudsonicus picatus</i>)	-30.0 (46%)	12.0 (60%)
Beaver, Admiralty (<i>Castor canadensis phaeus</i>)	1.0 (88%)	12.0 (60%)
Meadow jumping mouse (<i>Zapus hudsonius</i>)	-48.0 (16%)	20.0 (77%)
Collared lemming (<i>Dicrostonyx groenlandicus</i>)	-42.0 (24%)	28.0 (85%)
Collared lemming, peninsulae (<i>Dicrostonyx groenlandicus peninsulae</i>)	-8.0 (77%)	36.0 (96%)
Collared lemming, St. Lawrence Island (<i>Dicrostonyx groenlandicus exsul</i>)	2.0 (88%)	36.0 (96%)
Collared lemming, Stevensons (<i>Dicrostonyx groenlandicus stvensoni</i>)	-2.0 (83%)	36.0 (96%)
Collared lemming, Unalaska (<i>Dicrostonyx groenlandicus unalascensis</i>)	-2.0 (83%)	36.0 (96%)
Brown lemming (<i>Lemmus trimucronatus</i>)	-40.0 (27%)	24.0 (81%)
Brown lemming, Nunivak Island (<i>Lemmus trimucronatus harroldi</i>)	-6.0 (79%)	32.0 (91%)
Brown lemming, black-footed (<i>Lemmus trimucronatus nigripes</i>)	6.0 (90%)	24.0 (81%)
Insular vole (<i>Microtus abbreviatus</i>)	-16.0 (66%)	40.0 (100%)
Insular vole, Hall Island (<i>Microtus abbreviatus abbreviatus</i>)	-4.0 (81%)	40.0 (100%)
Insular vole, St. Mathew Island (<i>Microtus abbreviatus fisheri</i>)	-10.0 (74%)	40.0 (100%)
Long-tailed vole (<i>Microtus longicaudus</i>)	-54.0 (11%)	20.0 (77%)
Long-tailed vole, Coronation Island (<i>Microtus longicaudus coronarius</i>)	-4.0 (81%)	32.0 (91%)
Long-tailed vole, littoralis (<i>Microtus longicaudus littoralis</i>)	-26.0 (51%)	26.0 (83%)
Singing vole (<i>Microtus miurus</i>)	-56.0 (10%)	12.0 (60%)
Root vole (<i>Microtus oeconomus</i>)	-64.0 (4%)	20.0 (77%)
Root vole, Amak Island (<i>Microtus oeconomus amakensis</i>)	-12.0 (70%)	4.0 (45%)
Root vole, Montague Island (<i>Microtus oeconomus elymocetes</i>)	-1.6 (85%)	20.0 (77%)
Root vole, Penuk Island (<i>Microtus oeconomus punukensis</i>)	-3.8 (82%)	24.0 (81%)
Root vole, Shumagin Island (<i>Microtus oeconomus popofensis</i>)	2.0 (88%)	40.0 (100%)
Root vole, Sitka (<i>Microtus oeconomus sitkensis</i>)	-8.0 (77%)	32.0 (91%)
Root vole, St. Lawrence Island (<i>Microtus oeconomus innuitus</i>)	-8.0 (77%)	32.0 (91%)
Root vole, Unalaska (<i>Microtus oeconomus unalascensis</i>)	-18.0 (64%)	40.0 (100%)
Root vole, Yakutat (<i>Microtus oeconomus unalascensis</i>)	-10.0 (74%)	32.0 (91%)
Meadow vole (<i>Microtus pennsylvanicus</i>)	-62.0 (4%)	12.0 (60%)
Meadow vole, Admiralty (<i>Microtus pennsylvanicus admiraltae</i>)	-20.0 (62%)	32.0 (91%)
Taiga vole (yellow-cheeked vole) (<i>Microtus xanthognathus</i>)	-46.0 (20%)	12.0 (60%)
Southern red-backed vole (<i>Myodes gapperi</i>)	-40.0 (27%)	28.0 (85%)
Southern red-backed vole, Gappers (<i>Myodes gapperi stikinensis</i>)	-26.0 (52%)	36.0 (96%)
Southern red-backed vole, pheaus (<i>Myodes gapperi pheaus</i>)	-38.6 (28%)	36.0 (96%)
Southern red-backed vole, Revillagigedo Island (<i>Myodes gapperi soleus</i>)	-14.0 (68%)	36.0 (96%)
Southern red-backed vole, Wrangell Island (<i>Myodes gapperi wrangeli</i>)	-14.0 (68%)	36.0 (96%)
Northern red-backed vole (<i>Myodes rutilus</i>)	-64.0 (4%)	4.0 (45%)
Northern red-backed vole, Glacier Bay (<i>Myodes rutilus glacialis</i>)	-10.0 (74%)	24.0 (81%)
Northern red-backed vole, Island (<i>Myodes rutilus insularis</i>)	-8.0 (77%)	24.0 (81%)
Northern red-backed vole, Orca (<i>Myodes rutilus orca</i>)	-18.0 (64%)	32.0 (91%)
Northern red-backed vole, St. Lawrence Island (<i>Myodes rutilus albiventer</i>)	-14.0 (68%)	32.0 (91%)
Northwestern deer mouse (<i>Peromyscus keeni</i>)	-48.5 (15%)	10.0 (55%)
Northwestern deer mouse, algidus (<i>Peromyscus keeni algidus</i>)	-29.5 (47%)	22.0 (79%)
Northwestern deer mouse, hylaeus (<i>Peromyscus keeni hylaeus</i>)	-20.5 (61%)	22.0 (79%)
Northwestern deer mouse, macrorhinus (<i>Peromyscus keeni macrorhinus</i>)	-30.5 (45%)	22.0 (79%)
Northwestern deer mouse, oceanicus (<i>Peromyscus keeni oceanicus</i>)	-8.5 (76%)	32.0 (91%)

Appendix II, continued.

Taxa	Biological score	Action score
Northwestern deer mouse, sitkensis (<i>Peromyscus keeni sitkensis</i>)	-5.5 (79%)	32.0 (91%)
North American deer mouse (<i>Peromyscus maniculatus</i>)	-40.0 (27%)	40.0 (100%)
Northern bog lemming (<i>Synaptomys borealis</i>)	-47.2 (17%)	20.0 (77%)
Lagomorpha		
Collared pika (<i>Ochotona collaris</i>)	-34.0 (38%)	22.0 (79%)
Alaskan hare (<i>Lepus othus</i>)	-11.4 (71%)	14.0 (64%)
Alaskan hare, othus (<i>Lepus othus othus</i>)	-8.0 (77%)	2.0 (40%)
Alaskan hare, poadromus (<i>Lepus othus poadromus</i>)	-6.0 (79%)	30.0 (87%)
Soricomorpha		
Pygmy shrew (<i>Sorex hoyi</i>)	-46.0 (20%)	32.0 (91%)
St. Lawrence Island shrew (<i>Sorex jacksoni</i>)	-25.6 (52%)	32.0 (91%)
Dusky shrew (<i>Sorex monticolus</i>)	-55.3 (11%)	12.0 (60%)
Dusky shrew, Warren Island (<i>Sorex monticolus malitiosus</i>)	-4.0 (81%)	28.0 (85%)
Dusky shrew, Yakutat (<i>Sorex monticolus alascensis</i>)	-14.0 (68%)	24.0 (81%)
Glacier Bay water shrew (<i>Sorex alaskanus</i>)	7.0 (91%)	40.0 (100%)
Dusky shrew, Queen Charlotte Islands (<i>Sorex monticolus ellassodon</i>)	-26.0 (52%)	12.0 (60%)
Water shrew (<i>Sorex palustris</i>)	-47.6 (17%)	32.0 (91%)
Pribilof Island shrew (<i>Sorex pribilofensis</i>)	-14.0 (68%)	12.0 (60%)
Tundra shrew (<i>Sorex tundrensis</i>)	-38.0 (30%)	40.0 (100%)
Alaska tiny shrew (<i>Sorex yukonicus</i>)	-22.8 (58%)	32.0 (91%)
Chiroptera		
Silver-haired bat (<i>Lasionycteris noctivagans</i>)	-24.0 (55%)	24.0 (81%)
California myotis (<i>Myotis californicus</i>)	-1.6 (84%)	32.0 (91%)
Keens myotis (<i>Myotis keenii</i>)	-4.0 (81%)	32.0 (91%)
Little brown myotis (<i>Myotis lucifugus</i>)	-31.4 (44%)	12.0 (60%)
Long-legged myotis (<i>Myotis volans</i>)	-11.6 (70%)	28.0 (85%)
Carnivora		
Canadian lynx (<i>Lynx canadensis</i>)	-31.6 (43%)	-16.0 (17%)
Wolf, Alexander Archipelago (<i>Canis lupus ligoni</i>)	-10.8 (73%)	12.0 (60%)
Brown bear, Kenai population (<i>Ursus arctos kenai</i>)	26.0 (99%)	-26.0 (9%)
Polar bear (<i>Ursus maritimus</i>)	15.5 (97%)	-16.0 (17%)
Northern fur seal (<i>Callorhinus ursinus</i>)	-8.0 (77%)	-12.0 (21%)
Steller sealion, Eastern U.S. stock (<i>Eumatopias jubatus</i>)	-40.0 (27%)	-20.0 (13%)
Steller sealion, Western U.S. stock (<i>Eumatopias jubatus</i>)	-24.0 (55%)	-28.0 (6%)
Walrus (<i>Odobenus rosmarus</i>)	-10.5 (73%)	-16.0 (17%)
Bearded seal (<i>Erigrathus barbatus</i>)	-36.8 (32%)	16.0 (70%)
Ribbon seal (<i>Phoca fasciata</i>)	-19.0 (63%)	-4.0 (32%)
Northern elephant seal (<i>Mirounga angustirostris</i>)	-32.2 (41%)	32.0 (91%)
Spotted seal (<i>Phoca largha</i>)	-27.6 (50%)	4.0 (45%)
Harbor seal (<i>Phoca vitulina</i>)	-46.0 (20%)	-8.0 (26%)
Ringed seal (<i>Pusa hispida</i>)	-40.0 (27%)	-16.0 (17%)
Northern sea otter, all 3 AK stocks (<i>Enhydra lutris kenyoni</i>)	-42.8 (23%)	-22.0 (11%)

Appendix II, continued.

Taxa	Biological score	Action score
Northern sea otter, SW Alaska population (<i>Enhydra lutris kenyoni</i>)	-31.2 (45%)	-22.0 (11%)
River otter, Prince of Wales (<i>Lontra canadensis mira</i>)	-2.4 (83%)	24.0 (81%)
Marten, Kenai (<i>Martes americana kenaiensis</i>)	-9.0 (76%)	28.0 (85%)
Marten, Pacific (<i>Martes americana caurina</i>)	-12.1 (69%)	4.0 (45%)
Ermine (<i>Mustela erminea</i>)	-60.4 (5%)	-4.0 (32%)
Ermine, Admiralty Island (<i>Mustela erminea salva</i>)	-0.4 (85%)	24.0 (81%)
Ermine, Baranof (<i>Mustela erminea initis</i>)	-10.4 (74%)	16.0 (70%)
Ermine, Prince of Wales (<i>Mustela erminea celenda</i>)	-10.4 (74%)	8.0 (51%)
Ermine, Suemez Island (<i>Mustela erminea seclusa</i>)	-6.4 (78%)	16.0 (70%)
Ermine, Kodiak Island (<i>Mustela erminea kadacensis</i>)	-28.4 (48%)	8.0 (51%)
Artiodactyla		
Woodland caribou, Chisana herd (<i>Rangifer tarandus caribou</i>)	-2.0 (83%)	-40.0 (2%)
Cetacea		
Bowhead, Western Arctic (<i>Balaena mysticetus</i> -)	-9.0 (76%)	-28.0 (6%)
North Pacific right whale, Eastern North Pacific (<i>Eubalaena japonica</i>)	15.5 (97%)	0.0 (38%)
Common minke whale, Alaska (<i>Balaenoptera acutorostrata</i>)	-34.8 (36%)	8.0 (51%)
Sei whale, North Pacific (<i>Balaenoptera borealis</i>)	-5.4 (80%)	12.0 (60%)
Blue whale, North Pacific (<i>Balaenoptera musculus</i>)	-20.0 (62%)	4.0 (45%)
Fin whale, Northeast Pacific (<i>Balaenoptera physalus</i>)	-21.0 (60%)	-4.0 (32%)
Humpback whale, Central and Western North Pacific (<i>Megaptera novaeangliae</i>)	-46.0 (20%)	-22.0 (11%)
Gray whale, Eastern Pacific (<i>Eschrichtius robustus</i>)	-34.0 (38%)	12.0 (60%)
Killer whale (<i>Orcinus orca</i>)	-18.0 (64%)	-4.0 (32%)
Beluga whale, Cook Inlet population (<i>Delphinapterus leucas</i>)	42.0 (100%)	-40.0 (2%)
Harbor porpoise (<i>Phocoena phocoena</i>)	-46.8 (18%)	8.0 (51%)
Sperm whale, North Pacific (<i>Physeter macrocephalus</i>)	-23.0 (57%)	-8.0 (26%)
Bairds beaked whale, Alaska (<i>Berardius bairdii</i>)	-14.0 (68%)	12.0 (60%)
Stejnegers beaked whale, Alaska (<i>Mesoplodon stejnegeri</i>)	-14.0 (68%)	32.0 (91%)
Cuviers beaked whale, Alaska (<i>Ziphius cavirostris</i>)	-20.0 (62%)	32.0 (91%)