THE WYOMING GAP ANALYSIS PROJECT

FINAL REPORT

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Dr. Evelyn H. Merrill, Principal Investigator
Department of Zoology and Physiology
University of Wyoming, Laramie, Wyoming 82071

Thomas W. Kohley, Research Associate
Wyoming Cooperative Fish and Wildlife Research Unit
University of Wyoming, Laramie, Wyoming 82071

Margo E. Herdendorf, Research Associate
Wyoming Cooperative Fish and Wildlife Research Unit
University of Wyoming, Laramie, Wyoming 82071

Dr. William A. Reiners, Co-Principal Investigator
Department of Botany
University of Wyoming, Laramie, Wyoming 82071

Kenneth L. Driese, Research Associate
Department of Botany
University of Wyoming, Laramie, Wyoming 82071

Dr. Ronald W. Marrs, Co-Principal Investigator
Department of Geology
University of Wyoming, Laramie, Wyoming 82071

Dr. Stanley H. Anderson, Co-Principal Investigator
Wyoming Cooperative Fish and Wildlife Research Unit
University of Wyoming, Laramie, Wyoming 82071

Contract Administration Through:
Wyoming Cooperative Fish and Wildlife Research Unit
University of Wyoming, Laramie, Wyoming 82071

Submitted by:
Evelyn H. Merrill

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We dedicate the first Wyoming gap analysis to the present and future natural resources of Wyoming.

This is a project completion report for the Wyoming Gap Analysis Project (WY-GAP). It will undergo subsequent review by National GAP and the U.S. Geological Survey which will result in release of the official USGS publication on CD-ROM (see GAP homepage at http://www/gap/uidaho.edu/gap for availability). The publication may differ somewhat from this report. The official USGS publication should be referenced for future data use, interpretation, and citations.

EXECUTIVE SUMMARY

The Wyoming Gap Analysis project (WY-GAP) was initiated in 1991 as a cooperative effort between the Biological Resource Division of the U.S. Geological Survey, and state, federal, and private natural resources groups in Wyoming. The major objectives of the project were to (1) produce GIS-databases describing actual land cover type, terrestrial vertebrate species distributions, land stewardship, and land management status at a scale of 1:100,000, (2) identify land cover types and terrestrial vertebrate species that currently are not represented or are under-represented in areas managed for long-term maintenance of biodiversity, i.e., "gaps", and (3) facilitate cooperative development and use of information so that institutions, agencies, and private land owners may be more effective stewards of Wyoming's natural resources. The WY-GAP project is a preliminary step toward the more detailed efforts and studies needed for long-term planning for biodiversity conservation in Wyoming.

The map of actual land cover was the first GIS layer completed for WY-GAP. This data layer includes the distribution of 41 land cover types, mapped as polygons with minimum mapping units (MMU) of 100 ha for uplands and 40 ha for wetlands. Map polygons were drawn and described using manual digitizing of polygon boundaries and on-screen, visual interpretation of Thematic Mapper (TM) imagery. Attributes assigned to each polygon describe primary, secondary and "other" land cover, crown closure for forested primary types, and the types of wetlands and/or disturbance found in the polygon, if any. Polygon attributes were assigned using image interpretation, existing maps, field reconnaissance (> 16,000 km of road transects), and literature sources. Formal state-wide validation of the land cover maps was not a requirement for this phase of the project, but will be conducted in conjunction with the Colorado Gap Analysis Project (CO-GAP) in 1996-1998. Informal field checks of 1809 of the 14,490 polygons from the map by agency personnel and volunteers during the summer of 1994 indicate > 79% accuracy of primary cover mapping, but this accuracy does not have a formal statistical foundation.

Individual distributions of 445 vertebrate species were predicted using both point locality records and habitat associations. Range limits of each species were delineated within a grid of 436 hexagons (635 km^2) based on > 700,000 locality records and review by > 60 local experts. Within hexagons, species distributions were modeled based on species-land cover associations, elevational restrictions, and the presence of riparian areas. Comparisons of species predicted to occur in 8 field sites to species lists maintained for the sites indicated an overall accuracy of 79.5%. Uncertainties in modeling strategies and final species distribution maps are discussed.

The Gap Analysis Program (GAP) uses a scale of 1 through 4 to denote the relative degree of management for biodiversity maintenance for each tract of land, with "1" being the highest, most permanent and comprehensive level of maintenance, and "4" being the lowest, or unknown status. Status codes were assigned to public lands cooperatively with state and federal

land management agencies based on legal and intended management and using a key developed by the New Mexico Gap Analysis Project (NM-GAP). Most private lands were assigned status 3 or 4 depending on the availability of information on their intended long-term management. Land management status was overlayed with land cover and vertebrate species distributions to conduct a gap analysis of Wyoming. We considered land cover types and vertebrate species as under-represented (i.e., "gaps") in management areas if < 1% or < 50,000 ha of the land they occupied or their habitat in Wyoming fell within status 1 and 2 lands.

Less than 10% of the state of Wyoming is classified as status 1 and 2 lands and 90% of these lands occur in the Greater Yellowstone Ecosystem (GYE) in the northwestern portion of the state. Seven of the 41 land cover types occur at high elevations and are well (> 50%) protected in Wyoming because they occur in national parks and wilderness areas. Sixteen (44%) of 36 natural (non-anthropogenic) land cover types have ≤ 1% or < 50,000 ha of the area they occupy in status 1 and 2 lands. The highest priority for further protection is recommended for vegetated dunes, active dunes, forest-dominated riparian, shrub-dominated riparian and grass-dominated wetlands because their current protection is low and they are the most vulnerable to ongoing land management practices. Wetland types are not satisfactorily mapped at our current MMU, and further efforts are needed to provide an adequate spatial description of their location before long-term planning for their conservation can be accomplished. Bur oak woodland, Great Basin foothills grassland, xeric upland shrub, limber pine woodland, saltbush fans and flats, desert shrub, greasewood fans and flats, and unvegetated playas were identified as second in priority. Management of the last four types could easily be accommodated in conjunction to one another along topographic gradients, and the Bureau of Land Management (BLM) is likely to play an important role in their conservation since they are largely under BLM's stewardship. Because of their restricted distributions, opportunities for the conservation of bur oak and Great Basin foothills grasslands are more limited and are likely to reside with the U.S. Forest Service (USFS). Third priority for further protection is recommended for shortgrass prairie, mesic shrubland and ponderosa pine and the conservation of these types will require working cooperatively with private land owners.

On average, a smaller percent of the potential habitat of amphibians (8.8%) and reptiles (2.6%) occurs in status 1 and 2 lands than either birds (14.4%) or mammals (14.5%). Species that have a high level of habitat protection (> 50%) were restricted to the GYE. Habitats of 6 (50 %) amphibians, 8 (31%) reptiles, 25 (22 %) mammals, and 41 (14%) birds that are not considered peripheral in Wyoming merit increased management attention. The habitat of most of these species is primarily at low elevations in the eastern portion of the state or in the Green River area where status 1 and 2 lands are uncommon. Management on multiple-use lands under the stewardship of the USFS in the Black Hills and the BLM in the Green River area, and cooperative efforts with private land owners in both the eastern portion of the state and in the Green River area, will be important to the long-term conservation of a large number of vertebrate gap species in Wyoming. Some species, such as the bats and rodents, were inadequately mapped resulting in an overestimation of habitat in status 1 and 2 lands. Additional efforts to survey and map these species will be necessary to reliably evaluate their current status.

With the completion of the Wyoming Gap Analysis Project, two initiatives have been established under the direction of the Wyoming Water Resources Center to promote the long-term maintenance and application of the WY-GAP databases. First, the Spatial Data and Visualization Cluster (SDVC) is a project funded by the National Science Foundation's Experimental Program for the Stimulation of Competitive Research (EPSCoR) program and the Wyoming Science Technology and Energy Authority (STEA) for developing spatial geologic and natural resource databases (Gloss et al. 1996). Second, a partnership with the USGS Biological Resource Division has been established to develop a Wyoming Bioinformation Node (WBN) as part of the National Biological Information Infrastructure (NBII) (Kohley et al. 1996). The purpose of the WBN is to help facilitate the dissemination and use of WY-GAP databases by developing a coordinated approach to provide increasing access to the WY-GAP and other natural resource databases.

Acknowledgments

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Within Wyoming, the Gap Analysis project would not have been possible without the continuous support and feedback of our state, private, and federal cooperators. We acknowledge the Wyoming Game and Fish Department (WGFD) for their financial support and for use of the Wyoming Wildlife Observation data base, the Bureau of Land Management (BLM) for their early and continual support of the project and for providing digital data on land ownership and vegetation for portions of Wyoming, The Nature Conservancy (TNC) for use of their Biological Conservation Database (BCD) and input on management status designations, and the U.S. Forest Service (USFS) for information on vegetation of Wyoming. In particular, we thank Bill Daniels, Bruce Keating, Patrick Madigan, Bruce Daughton, and Tim Bottomly of the BLM, George Jones and Ben Pierce of TNC, Reg Rothwell, Kirk Nordyke, Bob Luce, Bob Oakleaf, and Andrea Cervoski of WGFD, Steve Gloss and Jeff Hamerlink of the Wyoming Water Resource Center, Dave Ferderer of the U.S. Bureau of Mines, and Tim Peterson of the U.S. Army Corps of Engineers for facilitating the exchange of information and ideas, for administrative support, and for field verification efforts. The University of Wyoming (UW) Departments of Zoology and Physiology, Botany, and Geology, and the Wyoming Cooperative Fish and Wildlife Research Unit provided secretarial support and computer facilities.

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We are extremely grateful to the over 60 reviewers who critiqued our vertebrate distribution maps for their dedication and patience during the reviews and for improving the quality of the final map products. We are also grateful to the agency personnel and private volunteers who took our land cover maps to the field and provided feedback on their accuracy.

We benefited from the experience and expertise of members of other State Gap Analysis projects. We are indebted to Frank Davis and the California Gap Analysis project (CA-GAP) for our initial training, direction, and advice on land cover mapping, to Tom Edwards, Colin Homer, and Douglas Ramsey of the Utah Gap Analysis project (UT-GAP) for their continual advice in the face of mapping adversities, to Roland Redmond and Zhenkui Ma of the Montana Gap Analysis project (MT-GAP), and to Tom Thompson of the Colorado Gap Analysis project (CO-GAP) for their cooperative efforts on mapping land cover, to Don Schrupp of the Colorado Division of Wildlife for expertise on mapping vertebrates and providing us with the Colorado Wildlife Habitat Relationships data base, to Bruce Thompson of the New Mexico Gap Analysis project (NM-GAP) for advice and use of his land status classification scheme, and to Blair Csuti of the Oregon Gap Analysis project (OR-GAP) for his exchange of ideas on mapping vertebrates. Sara Vickerman of the Defenders of Wildlife provided vision on how the Wyoming Gap Analysis project (WY-GAP) could develop into a Biodiversity Consortium.

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CHAPTER 1

Introduction

Thou shalt conserve biodiversity. - Al Gore

1.1 Background

The loss of biological diversity remains one of mankind's most significant ecological problems. Traditional responses to increased loss of biodiversity in the United States have concentrated on rescuing individual species under the Endangered Species Act. Effort expended on a species-by-species basis, however, has been criticized as inefficient, expensive, and biased toward species with broad public appeal (Pitelka 1981, Scott et al. 1987, Noss 1991). The goal of biodiversity conservation is to reverse the processes of biotic impoverishment at each level of organization - genes, species, ecosystems and landscapes - and is concerned with ecological and evolutionary processes as much as species diversity and composition (Scott et al. 1993). Thus, biological conservation represents a significant step beyond rare and endangered species conservation (Noss 1991, Scott et al. 1991).

Most conservationists agree that the best strategy for conserving biodiversity is to manage for native species in natural landscapes that are sufficiently large to maintain both species and natural processes, and that are linked to allow genetic interchange (Noss 1983, McNeeley 1994). This approach requires planning for a cohesive, representative system of areas managed for the maintenance of long-term biodiversity. We view these areas as management areas rather than reserves because management for the maintenance of biodiversity does not necessarily preclude land management. Implementation of such a plan first requires knowledge of the patterns and dynamics of elements of biodiversity in a state-wide to regional context. Gap analysis has emerged as a rapid and efficient method for characterizing the state-wide distributional patterns and the current conservation status of two elements of biodiversity - actual vegetation types (hereafter called land cover types) and terrestrial vertebrate species.

1.2 The Gap Analysis Concept

Inventories of biodiversity can be visualized as "filters" designed to capture elements of biodiversity at various levels of organization. The filter concept has been applied by The Nature Conservancy (TNC), which has established Natural Heritage Programs in all 50 states. The Nature Conservancy employs a fine filter approach for rare species inventory and protection and a coarse filter approach for community protection (Jenkins 1985, Noss 1987). It is postulated that 85-90% of species and land cover types can be protected by the coarse filter, without having to inventory or plan for those species individually. A fine filter is then applied to the remaining 10-15% of the species and plant communities to ensure their protection (Scott et al. 1993).

Gap analysis is essentially an expanded coarse-filter approach to biodiversity protection (Noss 1987). It uses actual land cover types (mapped from satellite imagery) and existing survey and species-habitat information to identify unprotected species, plant communities, and sites of high biodiversity value that may merit consideration for the long-term maintenance of native species and natural ecosystems before they become critically rare. Thus, it is expected to reduce the rate at which species require listing as threatened or endangered. Those species already imperiled will still require individual efforts to assure their recovery. The community-level (coarse filter) approach of gap analysis is a complement to, not a substitute for, protection of individual rare species and functions as a preliminary step to the more detailed studies needed for biodiversity planning.

The land cover types mapped in gap analysis serve directly as a coarse filter, with the goal of assuring adequate representation of all ecosystems in biodiversity management areas. The major role of vertebrates in gap analysis is to represent faunal diversity. This use implies a high correlation between vertebrate richness and overall biodiversity. While it has been suggested that vertebrates often provide a protective umbrella for other taxa (Murphy and Wilcox 1986), recent comparisons of geographical coincidences in species rich areas among taxonomic groups have not always supported this relationship (Prendergast et al. 1993, Saetersdal et al. 1993, Lawton et al. 1994). In fact, emphasis on vertebrate species has resulted from a greater amount of information on these taxa. As more information on other taxa become available similar analyses can be conducted. Also, because the spatial scale at which organisms use the environment differs tremendously among species, and depends on body size, food habits, mobility, and other factors, no coarse filter will be a complete assessment of biodiversity protection status and needs. Species that fall through the pores of the coarse filter, such as endemics and wide-ranging animals, can be captured by the safety net of the fine filter.

In assembling information to conduct a gap analysis, the Gap Analysis Program (GAP) brings together the problem solving capabilities of federal, state, and private scientists to tackle the difficult issues of land cover mapping, vertebrate habitat characterization, assessment methods, and biodiversity conservation at the state, regional and national levels. The program seeks to facilitate cooperative development and use of information, so that institutions, agencies, and private land owners and managers may be more effective land stewards.

1.3 Objectives Of Gap Analysis

There are four major objectives of the gap analysis program: (1) map land cover as closely as possible to the alliance level (Jennings 1993), (2) map the state-wide distribution of those terrestrial vertebrate species for which adequate information on habitat associations and mapped habitat variables is available, (3) document the occurrence of land cover types and terrestrial vertebrate species that are inadequately represented in areas managed for biodiversity conservation (i.e., "gaps"), and (4) make all information developed available to users in a readily accessible format.

1.4 State Goals For Gap Analysis

To meet the above objectives, it was necessary for gap analysis to be conducted at the state level yet to maintain consistency with national standards. The Wyoming Gap Analysis Project (WY-GAP) was initiated in 1991 as a cooperative effort among many state, federal, and private agencies all of whom contributed to the success of the project. Since none of the databases needed for the Wyoming gap analysis were available on a state-wide basis at the initiation of the project, we worked closely with our state cooperators to share data and resources to compile the necessary state-wide information system described in this report. In compiling these databases, we have maintained the integrity and documentation of the source files, and have developed a re-distribution policy for data containing sensitive species data.

Recognizing that WY-GAP databases would be the most comprehensive source of state-wide, GIS maps of biological resources for the near future, the data were organized in a manner that would facilitate other uses of the information within the state, while also meeting the requirements of the national program. Additionally, our goal has been to gain acceptance of the information through a state-wide review process. We have found that the WY-GAP databases have already been useful for several state-level analyses, but due to the scale at which the information was developed, we caution against inappropriate uses of the data (see Chapter 7) and suggest that the most appropriate uses of these data sets are to address landscape or state-wide analyses and to provide context for a smaller areas.

1.5 General Caveats

Overall limitations of the gap analysis approach must be recognized so that additional studies can supplement the results of the Wyoming gap analysis. Specific limitations of the data inputs are described in the subsequent chapters of this report. The following are a list of general caveats in the use of gap analysis results. First, results of the gap analyses were derived from remote sensing and predictive models and are used to make general assessments about conservation status. Any decisions based on the data must be supported by ground-truthing and more detailed analyses.

Second, the static nature of gap analysis data limits their utility in conservation risk assessment. Our databases provide a snapshot of a region in which land cover and land stewardship are both very dynamic, but provide the basis for establishing changes in these elements through time. Third, gap analysis is not a substitute for a thorough national biological inventory. As a response to rapid habitat loss, gap analysis provides a quick assessment of the distribution of vegetation and associated species before they are lost. As such, it provides immediate focus and direction for a national program to maintain biodiversity. The process of improving knowledge in systematics, taxonomy, and species distributions is lengthy and expensive, but must be continued and expedited to provide the detailed information needed for a comprehensive assessment of our nation's biodiversity. Maps of land cover and species distributions developed by gap analysis projects can be used to make such surveys more cost-effective by stratifying sampling areas according to expected variation in biological attributes.

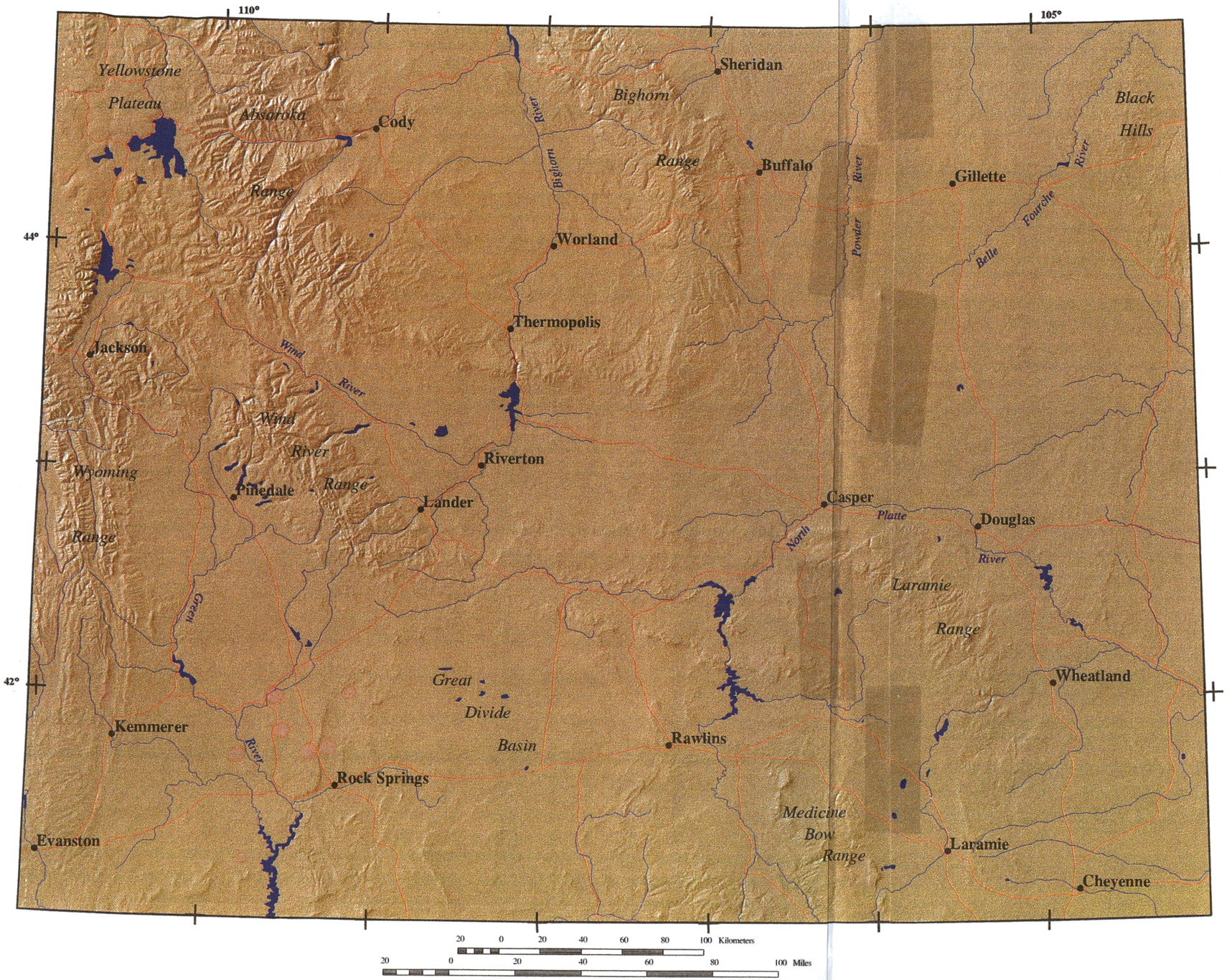
1.6 How This Report Is Organized

The organization of this report follows the general chronology of the project's development, beginning with the production of the individual data layers including land cover (Chapter 2), predicted vertebrate species distribution (Chapter 3), and land stewardship (Chapter 4), followed by analysis of the data (Chapter 5), management implications and current directions (Chapter 6), and ending with how to acquire and use GAP data (Chapter 7). The format diverges from standard scientific reporting by embedding results and discussion sections within individual chapters. This approach was taken to allow the individual data products to stand on their own and to provide data users with a concise and complete report for each product.

1.7 Study Area

The project study area includes the entire state of Wyoming and portions of Montana and Idaho which fall within the bounds of Yellowstone National Park (Map. 1.1). Clark and Stromberg (1987) and Knight (1994) have described the physiographic setting, climatic patterns, vegetation, and general faunal distributions of Wyoming in detail. Generally, Wyoming straddles the Continental Divide and has abrupt topographic relief created by alternating basins and mountain ranges. Thirty-seven percent of Wyoming's land base is above 2,134 m (7,000 ft) elevation with the highest point (4,207 m) at the summit of Gannett Peak in the Wind River mountains. The lowest point in Wyoming (930 m) occurs where the Belle Fourche River flows into South Dakota. Major mountain ranges are generally oriented in a north-south manner. The Absaroka, Beartooth, Gros Ventre, Teton, Wind River, Salt River, and Wyoming mountain ranges are in the northwest part of the state. The Bighorn Mountains are in the northcentral part of the state, the Sierra Madre, Medicine Bow, and Laramie Ranges in the southeast, and the Black Hills are in the northeast. Smaller east-west oriented ranges including the Owl Creek, Green, Rattlesnake, Ferris, Seminoe and Shirley mountains occur near the middle of the state. Internal basins and eastern plains are rolling to flat and the eastern plains are part of the Great Plains.

Vegetation of Wyoming includes sagebrush, greasewood, and saltbush shrublands in the intermountain basins, grasslands on the Great Plains, juniper and mountain mahogany shrublands in the foothills, and forest and alpine meadows in the mountains (Knight 1994). The climate of Wyoming varies considerably from semiarid in lower to middle elevations, to wetter, colder conditions in the mountains. Across Wyoming, precipitation varies ten fold from 15 to 150 cm each year. In general, the intermountain basins in the western two thirds of the state are drier, with averages of 15-30 cm/yr, than the Great Plains region to the east, with an average of 30-40 cm per year. The foothills and mountains receive 40-150 cm/yr.



Major roads
Major water features
Major towns

Lambert Conformal Conic Projection
1st standard parallel: 33.00
2nd standard parallel: 45.00
Central meridian: -107.30
Latitude of origin: 41.00
Datum: NAD27

N
W E
S

Produced by Wyoming Cooperative
Fish and Wildlife Research Unit
University of Wyoming, Laramie Wyoming
Map produced: December, 1996

Wyoming Gap Analysis

Map 1.1. Major human and physiographic features in Wyoming.

CHAPTER 2

Land Cover Classification and Mapping

Of all the branches of botany there is none whose elucidation demands so much preparatory study, or so extensive an acquaintance with plants and their affinities, as that of their geographic distribution. - Sir Joseph Dalton Hooker

2.1 Background

Vegetation patterns are an integrated reflection of the physical, chemical, and biotic factors that shape the environment of a given land area (Whittaker 1965). As such, gap analysis relies on maps of dominant land cover types as the most fundamental spatial component for the analysis of terrestrial environments (Scott et al. 1993). The mapped extent and distribution of existing land cover is used in gap analysis to evaluate the management status of natural land cover types in Wyoming, to provide a spatial database for modeling wildlife habitat and vertebrate distributions across Wyoming, and to establish a single temporal data set of current land cover patterns in Wyoming for future reference (Stoms 1994). Because gap analysis was conceived to provide conservation assessment of large areas, Landsat Thematic Mapper (TM) data were chosen as the basis for mapping land cover. TM data provide sufficient spectral and spatial resolution for land cover discrimination and are available for the entire United States, providing a consistent base for the National GAP (Scott and Jennings 1994).

Although each state conducting gap analysis uses methods appropriate to mapping land cover in their region, land cover mapping standards have evolved to insure that the products of state gap projects are compatible and allow their integration into regional and national products (Jennings 1993). National standards for land cover mapping required the use of TM satellite imagery less than 3 years old at the initiation of the project, classification of land cover types and wetlands consistent with a national template (Jennings 1993, Cowardin et al. 1992), specific cartographic criteria (i.e., MMU of 100 ha for land and 40 ha for wetlands, map products at a scale of 1:100,000) and land cover mapping into adjacent states to facilitate regional edge-matching of land cover maps. A review of existing land cover maps in Wyoming showed that neither state-wide maps (Wyoming Department of Agriculture 1987), nor maps of large portions of the state (Despain 1990, United States Forest Service Resource Inventory System [USFS RIS] data) provided both the spatial resolution and the land cover classes necessary to satisfy the GAP standards. As a result, a new land cover map for Wyoming that met national standards was developed based on the protocols described below.

2.2 Methods

2.2.1 Rationale For Visual Interpretation vs. Digital Classification.

Two general approaches have been used to develop land cover maps from digital TM imagery for GAP: digital classification and visual interpretation. Digital classification assigns image pixels to cover classes based on statistical differences in spectral characteristics. Classes are defined either before classification (supervised) or after (unsupervised) and pixels are assigned to the classes using any of a suite of statistical techniques (Richards 1993). The resulting classes can be refined using other sources of information, such as elevation data, existing maps, or field reconnaissance. Digital classification requires considerable computational resources both for preparation of images prior to classification and for the digital classification. Each TM scene must be classified either individually or all scenes must be corrected to eliminate differences caused by atmospheric characteristics unrelated to the target land cover before classification. The resulting per-pixel classification must be aggregated to the standard MMU of 100 ha, a non-trivial task because individual pixels must be merged with adjacent pixels by applying aggregation rules that can vary across the landscape (Stoms 1994). The primary advantages of digital classification are that classes are statistically consistent and the classification results are repeatable.

The second approach, visual interpretation of the satellite imagery, uses a human interpreter to define areas of homogeneous land cover. Difficulties with the visual interpretation method arise from subjective interpretation by different analysts and from human errors, some of which are difficult to document. On the other hand, visual interpretation requires fewer computer resources than computer classification, both in data storage and central processing unit time, and aggregation is not necessary because units are drafted to fit the MMU. In effect, aggregation is accomplished *during* mapping using rules that make sense in the landscape context. Individual TM scenes are not atmospherically corrected, and edge-matching between scenes is accomplished by extending the map from one scene to the next as it is created. Perhaps most importantly, the ability of the human analyst to integrate texture and context with spectral information allows discrimination of cover types which might not be discernible based on spectral characteristics alone (Estes et al. 1983). For these reasons, and based on the success of mapping efforts by the CA-GAP (Davis et al. 1995), Wyoming chose to adopt the visual interpretation approach.

2.2.2 Classification System

Development of the land cover classification for the WY-GAP project was constrained by several practical considerations. First, the land cover map had to be compatible with the habitat types used to map vertebrate distributions. Second, the cover types had to be discernible on Landsat TM imagery. Third, types had to be consistent with national standards and the classifications of surrounding states (Jennings 1993).

The Wyoming land cover classification was developed in 1991 based on a vegetation classification by Jones (1992) and was consistent with the UNESCO classification scheme for

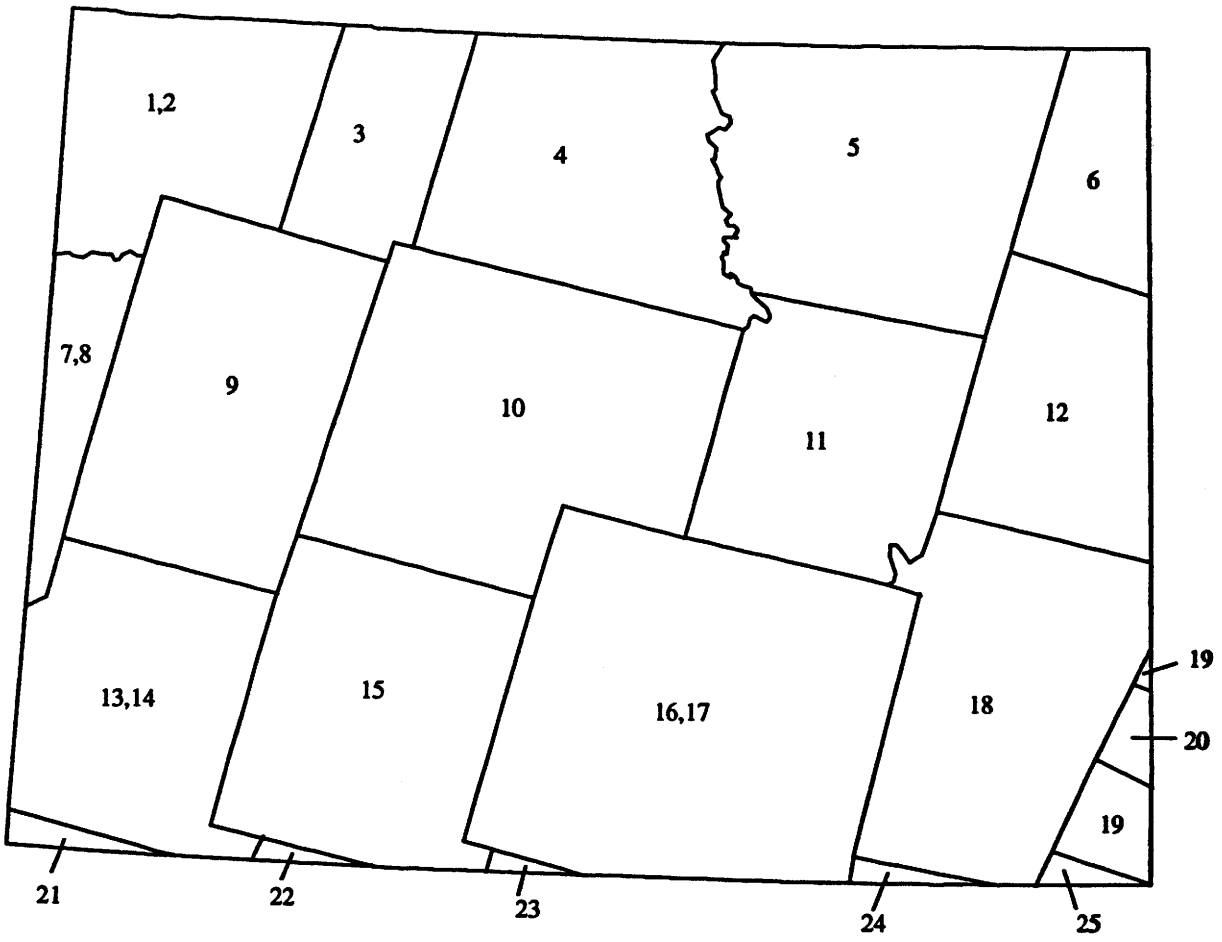
vegetation (Driscoll et al. 1984). Later, Jennings (1993) outlined the UNESCO system as a template for GAP classifications. The UNESCO system organizes vegetation communities into a hierarchical structure with *classes* based on gross physiognomy at the coarsest level (also referred to as *level 1*), and *community types* based on dominant species composition at the finest level (*level 6*). GAP required land cover at the *cover type or alliance* (*level 5*) whenever possible, but practical constraints sometimes forced the mapping of combinations of several *cover type* units. The classification system developed for WY-GAP (Appendix 2.1) was crosswalked to the Wyoming Game and Fish Department habitat classification at the outset of the project to ensure that our types were compatible with existing vertebrate habitat associations. Detailed descriptions and range maps for the Wyoming cover types are provided in a separate land cover atlas (Merrill et al. 1996a) and an example of the atlas is presented in Appendix 2.5.

Because of their disproportionate importance in an arid state like Wyoming, wetlands were considered at several levels in WY-GAP. We use the term "wetlands" to refer to areas defined by Cowardin et al. (1992) as both wetlands and as deep water habitat. These areas include bogs, swamps, marshes, ponds, lakes and riparian areas (vegetation associated with streams and rivers) and any other environments where standing or moving water is present or where saturation by water is the key factor controlling the ecology of the area. Wetlands are included as types in the classification (e.g. open water, forested riparian, grass-dominated wetlands) and are mapped as primary or secondary types within polygons when they are larger than the wetland MMU (40 ha). We also used a wetland attribute to describe wetland inclusions within polygons using the classification of Cowardin et al. (1992), even when the inclusion was small in extent. Finally, a riparian/aquatic model was developed for the purpose of improving the predicted distributions of species with riparian/aquatic associations (see section 3.2.3).

2.2.3 Imagery Acquisition and Processing

All image processing for WY-GAP was performed using the Map and Image Processing Systems (MIPS) (MicroImages Inc., Lincoln, Nebraska) and is described in detail by Thurston (1993). Twenty-three Landsat TM scenes were used to create the bulk of the Wyoming land cover map (Fig. 2.1, Appendix 2.2). All imagery contained < 10% cloud cover and was acquired from mid-June to late August between the years 1984 and 1993; scenes older than 1988 were updated with new TM data prior to the release of the map in 1995. Cloudy areas, though minimal in Wyoming, were handled either by using alternative cloud-free TM data, or, in a few cases, by extrapolating polygon boundaries across small clouds. Eight of the 23 TM scenes were terrain-corrected (Appendix 2.2). A small area in southeastern Wyoming was digitized from a combination of *Satellite Pour l'Observation de la Terre* (SPOT) imagery and the 1987 Wyoming Land Inventory (WLI) map (Wyoming Department of Agriculture 1987) because TM data for that area were not available (Fig 2.1).

Images were georeferenced by establishing a relationship between an image coordinate system (line, column) and a map coordinate system (e.g. Universal Transverse Mercater [UTM], Lambert). We identified control points on the image that could also be located on 1:24,000 scale USGS topographic sheets. Approximately 18 control points were distributed across each image



Index Number	TM Path/Row	Index Number	TM Path/Row	Index Number	TM Path/Row	Index Number	TM Path/Row
1	38/29	8	38/30	15	36/31	22	36/32
2	38/29	9	37/30	16	35/31	23	35/32
3	37/29	10	36/30	17	35/31	24	34/32
4	36/29	11	35/30	18	34/31	25	33/32
5	35/29	12	34/30	19	WLI*		
6	34/29	13	38/31	20	SPOT**		
7	38/30	14	37/31	21	37/32		

*WLI - Wyoming Land Inventory, 1987.
**SPOT - SPOT satellite image.

Figure 2.1. Landsat TM scenes used to develop the WY-GAP land cover map. Numbers on the map refer to the path and row of the TM satellite imagery in the table.

as 9 pairs of 2 points each. This strategy was a compromise between the CA-GAP approach, which used 8 to 12 control points, and the UT-GAP approach, which used 9 clusters of 5 points. Points with root mean square (RMS) errors greater than one pixel (30 m) for rows and two pixels (60 m) for columns were inactivated. Column errors were slightly larger than row errors due to the interaction of terrain with the geometry of the TM sensor (Thurston 1993). Data were not warped to fit the control points because tests showed that although warping could force residual errors of the control points to zero, areas between control points showed little improvement (Thurston 1993). The TM data were resampled from full resolution to a 100-m degraded pixel size to reduce data storage and processing time. Davis et al. (1995) found that for mapping to a relatively large MMU (100 ha) over large areas at the 1:100,000 scale, little information was lost by degrading the original data to 100-m pixels. We used an affine (linear) transformation model and nearest neighbor resampling for most of the TM data. Four scenes processed in the latter part of the project were resampled using a 3rd-order polynomial transformation (Appendix 2.2). A normalized contrast enhancement was applied to each of the three spectral bands used for interpretation. Contrast enhanced TM spectral bands 3, 4 and 5, representing red and near-infrared portions of the spectrum, were used to create false color composite images for photointerpretation.

2.2.4 Land Cover Mapping

On-screen digitizing

Vector polygons enclosing "landscape units" (Davis et al. 1995) were drafted manually, on-screen, using the enhanced TM composite images as guides. These units consisted of either a single homogeneous land cover type or mixtures of several land cover types which together occupied an area equal to or greater than the 100 ha MMU. Polygons were generally drawn over the imagery displayed such that a 100-m TM pixel covered about 1 mm on the screen. This simulated an approximate scale of 1:100,000, but image magnification was increased or decreased to more accurately delineate features when necessary. Although paper maps for WY-GAP are produced at a scale of 1:100,000, the concept of scale for digital data has no meaning, since the data may be viewed on the computer screen at any scale. As digitizing progressed from one TM scene to the next, lines were extended into the new scene to create a seamless final product.

Riparian and wetland areas are spectrally distinct regions on the satellite imagery. These areas were mapped on the land cover map as separate polygons when they were both larger than the wetland MMU (40 ha) and wider than 2 pixels in the imagery. Smaller or narrower riparian/wetland areas were subsumed by surrounding polygons and noted as polygon attributes. Riparian areas were also modeled in more detail as a separate GIS layer because of their disproportionate importance as vertebrate habitat (see section 3.2.3).

Disturbance (e.g. logging, fire) in some parts of Wyoming affects areas larger than the 100 ha MMU. Disturbed land cover types were included in the classification system as clearcut conifer and burned conifer (Appendix 2.1). These types were mapped from the satellite imagery using the same procedures as for other, non-disturbed types, because they comprised a significant

part of the Wyoming landscape and because existing vegetation (rather than potential) was used to predict animal habitat. Less clearly defined seral vegetation (e.g. old growth forest) was not mapped because it is difficult to distinguish using satellite imagery without extensive ground truthing.

Polygon topology was built after the initial digitizing using Arc/Info and problems such as dangling nodes, unclosed polygons, and polygons smaller than the MMU were identified, and corrected or eliminated. The positions of polygon boundaries were examined, and corrected if necessary, during polygon attributing and after field review. In most cases this involved deleting polygon boundaries that did not correspond to features in the imagery and re-drafting them. In a few cases, map notes by field reviewers were used to re-draft boundaries.

Polygon attributing

Attributes assigned to each polygon describe primary and secondary cover types, the relative area of each polygon occupied by these types as well as other important features occurring in the polygon (Table 2.1). Because predictions of vertebrate species distributions were based on primary and secondary land cover types in each polygon, these attributes were completed for all polygons in Wyoming. Other data fields provided important information (i.e., disturbance, forest crown closure) about the composition of the polygons and were filled when information was available.

Table 2.1. Attributes used to describe land cover of each polygon within the WY-GAP land cover map.

Attribute Name	Attribute Description
Primary	Land cover type occupying the largest area within the polygon
Prim_Percent	Percent area of the polygon occupied by the primary land cover type
Prim_Crown	Amount of crown closure for primary forest types
Secondary	Land cover type occupying the second largest area within the polygon
Sec_Percent	Percent area of the polygon occupied by the secondary cover type
Wetlands	Most important wetland (or deep water) type occurring in the polygon (if any)
Other	Other land cover type present in the polygon
Disturbance	Disturbance type (e.g. logging, fire) found within the polygon (if any)
Scenecode	Reference to the TM scene used for interpretation of the polygon
Source	Reference link to sources of information used to add attributes to the polygon
Checked	Indication of whether or not the polygon attributes have been checked in the field
Checker	Name of the individual who field checked the polygon, if it was checked

Literature, existing maps (Appendix 2.3), and field reconnaissance were used to assign land cover attributes to polygons. Published papers, theses, and federal and state reports were useful for local areas. Small-scale maps of the entire state (e.g., WLI) and larger scale maps of particular areas of the state (e.g., USFS RIS data) were used when they were available. In addition to existing documentation, we conducted field reconnaissance along nearly 16,000 km of road transects throughout the state, and recorded land cover on USGS 1:100,000 scale topographic maps for photointerpretation of the satellite imagery. Sources of information for

attributing polygons, and whether the polygon attributes were checked on the ground, are documented in tables linked to each polygon (see Metadata section in Chapter 7).

Edge-matching to other states

Polygon boundaries were extended at least to closure and often to > 10 km into surrounding states (Montana, South Dakota, Nebraska, Colorado, Utah, and Idaho) to facilitate regional edge matching. Edge matching from Colorado to Wyoming was performed by CO-GAP personnel. At the completion of the WY-GAP land cover map, corresponding maps were not available for Montana, South Dakota, Nebraska or Idaho. Edge matching between the western states will be accomplished by consensus between these states, orchestrated by the National GAP.

Area calculations

In this chapter, we present two area calculations for land cover types in Wyoming. The area of land cover polygons in Table 2.2 is the sum of the area of all polygons for each primary and secondary type. The proportional area of land cover was derived by multiplying the area of a polygon by the percent of the polygon occupied by the primary and secondary land cover types (Table 2.2). The proportional area gives a closer approximation to the area of each of the land cover types in the state than either the primary area or secondary area alone. While these proportional areas are useful for approximating the actual area of cover types in the state, they cannot be used to determine the location. This is because the database only records a percentage of variation of the primary and secondary cover types, but the variation is not mapped. Therefore, all area statistics presented in this report (with the exception of this chapter) are based on the area of land cover polygons, not the proportional area of land cover.

2.3 Results

The WY-GAP land cover classification includes 41 primary and secondary cover types (Table 2.2, Map 2.1). Not all these types are consistent with the *cover type* level (level 5) of the UNESCO classification, the template provided for the land cover classification (Jennings 1993), since practical constraints forced mapping of some combinations of cover type units. For example, herbaceous tundra and shrub-dominated tundra types were combined into a single alpine tundra class since the two types were indistinguishable on TM imagery. Other examples where combinations occurred are listed in the separate volume of appendices (Appendix 2.5, Merrill et al. 1996a), along with definitions of the 41 cover type classifications presented here.

Two cover types, Wyoming big sagebrush (30.8%) and mixed-grass (20.2%), occupied about half of the land area of the WY-GAP land cover map, based on the proportional area of land cover (Table 2.2). Lodgepole pine (6.1%) and Ponderosa pine (2.7%) comprised the greatest amount of forested area. Irrigated agriculture occupied 4.2% of the land area of Wyoming. The rarest land cover types in the state were basin big sagebrush, bur oak, and bitterbrush (Table 2.2). Mesic shrub, bur oak and basin big sagebrush occurred more often as a secondary type than a primary type. These types were rare in Wyoming, did not usually occur in patches larger than 100 ha, were difficult to distinguish from other types using satellite imagery, or were not mapped due to a combination of these reasons. Rare types were often found in the

Table 2.2. Total area (ha) and percent of primary and secondary cover types in Wyoming. Proportional area of land cover gives the most accurate estimate of the area of each of the land cover types in the state (see text).

	Area of land cover polygons				Proportional area of land cover			
	Primary		Secondary		Primary	Secondary	Total	Total
Cover Type	Ha	%	Ha	%	Ha	Ha	Ha	%
Forest Types								
Spruce - fir	505,743	2.00	1,228,106	5.21	366,501	244,828	611,329	2.49
Douglas fir	405,657	1.61	356,840	1.51	297,269	66,060	363,330	1.48
Lodgepole pine	1,674,932	6.63	957,512	4.06	1,265,966	236,475	1,502,442	6.12
Whitebark pine	73,255	0.29	57,991	0.25	56,782	11,676	68,458	0.28
Limber pine woodland	193,009	0.76	399,164	1.69	122,481	73,720	196,201	0.80
Ponderosa pine	827,442	3.28	319,602	1.36	590,615	72,624	663,239	2.70
Juniper woodland	569,190	2.25	526,439	2.23	368,631	124,162	492,793	2.01
Clearcut conifer	103,512	0.41	36,167	0.15	73,465	7,420	80,885	0.33
Burned conifer	287,785	1.14	55,335	0.23	217,138	11,193	228,331	0.93
Aspen forest	281,870	1.12	531,955	2.26	215,532	111,302	326,835	1.33
Bur oak woodland	10,083	0.04	88,942	0.38	6,524	20,238	26,762	0.11
Forest dominated riparian	288,386	1.14	382,621	1.62	223,213	73,554	296,767	1.21
Shrub Types								
Mesic upland shrub	26,418	0.10	187,921	0.80	17,586	40,117	57,703	0.24
Xeric upland shrub	199,927	0.79	187,529	0.80	136,938	47,053	183,993	0.75
Bitterbrush shrub steppe	2,562	0.01	6,000	0.03	1,474	1,067	2,541	0.01
Mountain big sagebrush	906,742	3.59	734,308	3.12	680,214	166,378	846,592	3.45
Wyoming big sagebrush	8,385,650	33.19	4,455,160	18.90	6,416,079	1,148,160	7,564,239	30.83
Black sagebrush steppe	47,336	0.19	42,357	0.18	31,825	9,255	41,080	0.17
Basin big sagebrush	73	0.00	9,335	0.04	44	1,651	1,695	0.01
Desert shrub	971,983	3.85	1,335,705	5.67	685,179	312,278	997,457	4.07
Saltbush fans and flats	757,194	3.00	158,290	0.67	622,059	43,105	665,163	2.71
Greasewood fans and flats	362,857	1.44	545,746	2.32	253,280	115,103	368,383	1.50
Vegetated dunes	44,193	0.17	84,252	0.36	29,159	12,762	41,921	0.17
Shrub dominated riparian	283,634	1.12	313,090	1.33	227,097	72,142	299,239	1.22

Table 2.2 continued.

Cover Type	Area of land cover polygons: Primary Ha	Primary %	Secondary Ha	Secondary %	Proportional area of land cover*: Primary Ha	Secondary Ha	Total Ha	Total %
Grass Types								
Meadow tundra	86,501	0.34	144,369	0.61	61,885	30,230	92,115	0.38
Subalpine meadow	713,837	2.83	722,940	3.07	543,431	162,938	706,369	2.88
Mixed grass prairie	4,407,291	17.45	7,023,838	29.80	3,395,225	1,555,178	4,950,403	20.17
Short grass prairie	11,483	0.05	3,601	0.02	9,633	1,072	10,705	0.04
Great Basin foothills grassland	20,023	0.08	5,366	0.02	15,378	1,222	16,600	0.07
Grass dominated wetland	12,184	0.05	21,950	0.09	9,748	3,532	13,280	0.05
Grass dominated riparian	65,239	0.26	54,736	0.23	54,276	10,740	65,016	0.26
Unvegetated Types								
Alpine exposed rock/soil	288,908	1.14	248,822	1.06	210,400	57,735	268,135	1.09
Basin exposed rock/soil	351,361	1.39	766,836	3.25	249,662	165,435	415,097	1.69
Unvegetated playa	8,482	0.03	19,725	0.08	6,030	6,584	12,614	0.05
Active sand dunes	17,708	0.07	1,316	0.01	15,068	395	15,463	0.06
Permanent snow	2,653	0.01	12,343	0.05	1,829	1,824	3,653	0.02
Anthropogenic/Water Types								
Human settlements	71,113	0.28	52,415	0.22	60,942	10,812	71,754	0.29
Dry-land crops	689,298	2.73	830,864	3.52	552,181	195,163	747,344	3.05
Irrigated crops	1,116,123	4.42	613,542	2.60	905,493	125,191	1,030,684	4.20
Surface mining operations	54,137	0.21	31,968	0.14	42,269	7,918	50,187	0.21
Open water	137,543	0.54	16,262	0.07	136,777	3,852	140,629	0.57
Total	25,263,316							

* Proportional area of land cover = (area of polygon * percent of polygon that is primary land cover) + (area of polygon * percent of polygon that is secondary land cover).

ecotones between the more common cover types or in unique micro-habitats, such as places where topography and wind interacted to enhance snow accumulation.

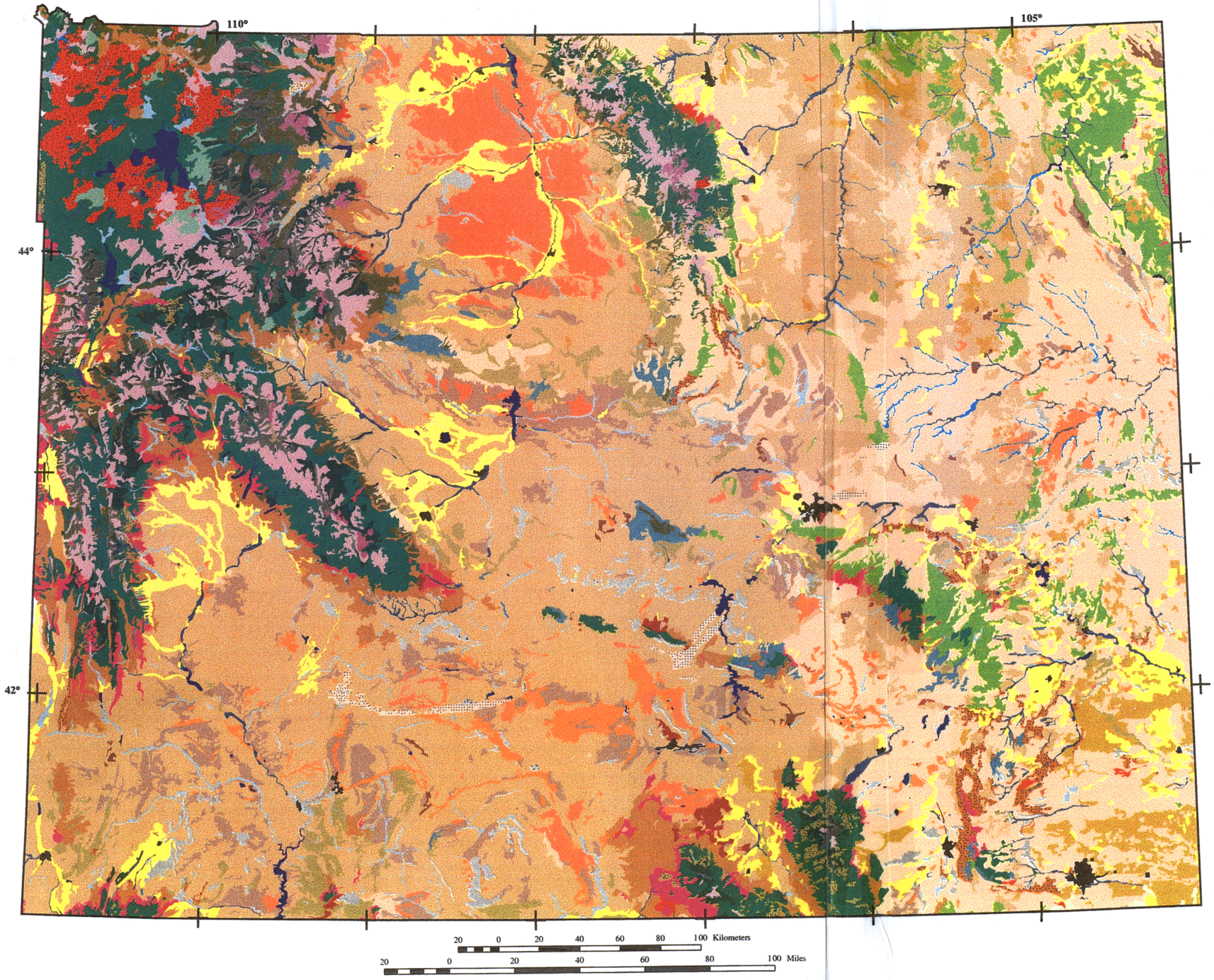
2.4 Accuracy Assessment

As of this writing, no formal state-wide validation of the Wyoming land cover map has been undertaken. Additional funding has been provided to validate the map using aerial videography, initiated in fall of 1996 and be completed by the end of 1998. Aerial videography is currently being used to provide an error estimate of thematic accuracy in the land cover map. It may also provide useful training data for a next generation mapping effort.

Prior to this validation, two informal efforts were conducted as pilot studies for full validation. During the summer and fall of 1993, WY-GAP personnel conducted a statistically designed assessment of 4, small subsections of the land cover map which included both montane and basin land cover (Ball et al. 1994). *A priori* accuracy estimates for each cover type were used to determine the number of field samples necessary to estimate map accuracy within 10 % of the true value, 95% of the time. The *a priori* estimates were "best guesses" by the original interpreter. Accuracy of primary and secondary attribute data for the test polygons was determined in the field by surveying a 450-m transect through the approximate center of each polygon. The proportion of each land cover type encountered along the transect was recorded and eventually compared to the primary and secondary cover designations from the land cover map by analyzing an error matrix with rows representing cover from the land cover map and columns representing cover from field observation (Story and Congalton 1986).

This preliminary accuracy assessment was not successful for two reasons. First, it was difficult or impossible to access a large number of the randomly chosen polygons due to private ownership and poor roads. Second, even when polygons were accessible, their large size made it impossible to sample intensively enough from the ground to assess the overall, relative proportions of primary and secondary types in the polygon. Thus, differences found in land cover designations of polygons between ground sampling and photointerpretation of satellite imagery were more a function of the scale of perspective than a true test of the accuracy of polygon classification (Ball et al. 1994). To gain a true measure of polygon composition on the ground would require many long transects located randomly throughout the polygon. This pilot study provided a basis for estimating the costs of more intensive validation efforts.

During the summer of 1994, personnel from the Bureau of Land Management (BLM), U.S. Forest Service, National Park Service, Soil Conservation Service (SCS), U.S. Fish and Wildlife Service (USFWS), Wyoming Game and Fish Department, and TNC performed informal spot checks of primary and secondary attributes by visiting polygons during the course of their normal activities. In some cases, there were multiple reviews of the same map area. In total, 133 copies of 1:100K quadrangle maps were distributed and 51 were returned, covering 38 of the 56 (68%) quadrangles in Wyoming. These 38 maps were either partially or completely checked by



Forest types

- Spruce-Fir
- Douglas fir
- Lodgepole pine
- Whitebark pine
- Limber pine
- Ponderosa pine
- Juniper woodland
- Clearcut conifer
- Burned conifer
- Aspen forest
- Bur oak woodland
- Forest- dominated riparian

Grass types

- Alpine tundra
- Subalpine meadow
- Mixed grass prairie
- Short grass prairie
- G.B. Foothills grassland
- Grass- dominated wetland
- Grass- dominated riparian

Shrub types

- Mesic upland shrub
- Xeric upland shrub
- Bitterbrush steppe
- Mountain big sagebrush
- Wyoming big sagebrush
- Black sagebrush steppe
- Basin big sagebrush
- Desert shrub
- Saltbush fans and flats
- Greasewood fans and flats
- Vegetated dunes
- Shrub- dominated riparian

Unvegetated types

- Unvegetated playa
- Active dunes
- Basin bare rock or soil
- Alpine bare rock or soil
- Permanent snow

Other types

- Human settlement
- Dry land agriculture
- Irrigated agriculture
- Surface mining operations
- Open water

Lambert Conformal Conic Projection
1st standard parallel: 33.00
2nd standard parallel: 45.00
Central meridian: -107.30
Latitude of origin: 41.00
Datum: NAD27

N
W E
S

Produced by Wyoming Cooperative
Fish and Wildlife Research Unit
University of Wyoming, Laramie Wyoming
Map produced: December, 1996
Source date for land cover: 1994

Wyoming Gap Analysis

Map 2.1. Land Cover for Wyoming.

field personnel during the course of their normal activities (Appendix 2.4). The field personnel either noted the correct cover type on the mylar or indicated that the original designation was correct. Additional notes on polygon content were also made on separate data sheets which we provided. Of the 14,690 polygons, 1809 (12.3 %) were checked. Reviewers reported that based on their field reconnaissance, 1439 polygons (79.6 %) were labeled correctly for primary land cover. Mislabeled polygons were corrected before the release of the map. The most common errors reported were confusion between agricultural areas and riparian zones (these types are frequently intermingled in Wyoming and were mapped as single polygons) and confusion between juniper woodland and xeric shrub communities (both occur in similar spectral situations). These problems are discussed in more detail in the following section.

2.5 Limitations and Discussion

Visual interpretation of satellite imagery required subjective decisions during the drafting of polygon boundaries, and during interpretation of cover within each polygon. Several steps were taken to mitigate this subjectivity. *A priori* rules were used (e.g., zooming guidelines, riparian corridor minimum widths; see Methods) to increase consistency among digitizing personnel. In addition, boundaries were checked and, if necessary, adjusted, several times between the first draft and the final product. Polygon attributes were assigned by a single interpreter for all but a few polygons in the southeastern corner of Wyoming. The identity of the interpreter for each polygon is included in associated metadata tables (see Chapter 7).

The coarse scale (1:100,000) and large MMU (100 ha) of the land cover map restricts it to use for large area management and for regional analyses. The Wyoming land cover map was not designed for use in analyses and management at finer scales. Cognizance of the issues and limitations imposed by map scale for spatial analyses is critical, and is the responsibility of the map user. Areas calculated using spatial data, such as the Wyoming land cover map, are very sensitive to map scale and resolution (Davis et al. 1995). Areas occupied by the Wyoming cover types reported here are not comparable to areas calculated from map products at other scales, because finer-scale maps depict boundaries with more detail than is possible in the WY-GAP map, which in turn affects area calculations. Also, fine-scale maps may have a smaller MMU, and therefore may include smaller units in calculation of area.

Some of the cover types mapped for WY-GAP occupied huge areas and spanned environmental gradients. Because of this, there can be large variation in the appearance of some of these types across the landscape. Canopy coverage, physiognomic habit and subdominant species can vary within a single land cover type and this variation could not be mapped within the constraints of WY-GAP. The most important example of this is Wyoming big sagebrush, the single most common cover type in Wyoming. Very often it occurred in rolling terrain over which it varied in its coverage and composition by orders of magnitude. This land cover type should be understood and interpreted as a complex gradient-mosaic, of which Wyoming big sagebrush is the dominant species over most of the area (Reiners et al. 1989, Burke et al. 1989).

Some land cover types presented particular problems for mapping from TM imagery. These problems were overcome using additional data when available. Conifers in Wyoming (e.g., lodgepole pine, Englemann spruce, and subalpine fir) have similar spectral signatures, occur in similar environments and are often in adjacent or mixed stands. We used USFS RIS data, field reconnaissance and, in a few cases, digital elevation data to help identify boundaries between conifer types. Shrublands and grasslands in Wyoming form a complex matrix that is patchy in some places and homogeneously mixed in others, and spectral separation was difficult. To separate these types, we relied primarily on field data and site context. Areas in the eastern part of Wyoming are more likely to be grass-dominated, while the western two-thirds of the state are primarily shrub-dominated. Juniper woodlands and xeric shrub communities both occur on shallow soils and rock outcrops in Wyoming and their spectral signatures are dominated by the substrate rather than by vegetation. Efforts to correct this problem were based on field review.

Because irrigated agriculture and riparian areas are often intermingled and difficult to separate spectrally, and because of their disproportionate importance to vertebrates, especially in the arid Wyoming climate, we made additional efforts to model riparian area in more detail as a separate layer (see section 3.2.3).

2.6 Summary and Conclusions

Wyoming big sagebrush (30.8%) and mixed grass (20.2%) occupied about half the land area of Wyoming. Lodgepole pine (6.1%) and Ponderosa pine (2.7%) comprised the greatest amount of forested area. Rare types more often occur as secondary types than a primary types. Formal assessments of the land cover map will be completed in 1998. Informal assessment of the map indicated a thematic accuracy of 79.6%. Despite several *caveats* we discuss about the WY-GAP land cover map, it is a useful representation of Wyoming land cover that represents a "snapshot" of the actual land cover of the state in time. Although land cover in Wyoming changes very slowly for the most part, it is by nature dynamic (i.e., the 1988 Yellowstone fires) and change with time will not be reflected in the current version of the map. We hope that this map will be updated and maintained over time, but users should be aware that some changes in land cover may have already occurred since the completion of the Wyoming land cover map.

CHAPTER 3

Predicted Vertebrate Species Distributions and Richness

Suddenly, as rare things will, it vanished. - R. Browning

3.1 Background

All species range maps are predictions about the occurrence of those species within a particular area (Csuti 1994). Traditionally, predicted distributions of species have been derived from sample collections made at individual points or in grids (Scott et al. 1993). This approach typically relies on the location of specimens, and includes limited information on the ecological conditions that favor the presence of the species. Habitat features, such as vegetation, also have been used in conservation and management to predict species presence (Verner et al. 1986, Morrison et al. 1992) and can enhance traditional approaches despite some limitations (Scott et al. 1993). In this chapter, we describe vertebrate species distributions predicted using both point locality records and habitat conditions.

The purpose of the vertebrate species maps developed for gap analysis is to provide more precise information about the current distribution of individual native species within their general ranges. With this information, better estimates can be made about the actual amount of habitat area and the nature of its configuration. Gap analysis uses the predicted distributions of native vertebrate species to evaluate their conservation status relative to existing land management (Scott et al. 1993). Previous to this effort there were no maps available, digital or otherwise, showing the likely present-day distribution of species, by habitat, across their ranges in Wyoming. Because of this, ordinary species (i.e., those not threatened with extinction or not managed as game animals) are generally not given sufficient consideration in land-use decisions. As incremental loss of habitat occurs, the decline of such species can, and does, result in an accelerating increase in numbers of threatened or endangered species. Creating a consistent spatial framework for storing, retrieving, analyzing, and updating our knowledge about the status of each vertebrate species is one of the most necessary and basic elements for preventing further erosion of biological resources.

Besides gap analysis, the maps of vertebrate species distributions described in this chapter may be used to answer a wide variety of management, planning, and research questions relating to individual species or groups of species. In addition to the maps, great utility may be found in the consolidated species locality records and literature that are assembled into databases used to produce the maps.

3.2 Methods

The modeling approach used to predict vertebrate distributions in Wyoming included five steps. First, criteria were developed to choose which species would be included in the current analyses. Second, the distributional limits of each species were defined by recording the species' presence or absence within the Environmental Protection Agency's (EPA) hexagon grid system for Wyoming (White et al. 1992). Third, we developed a Wildlife-Habitat Relationships (WHR) database which defined the affinities of terrestrial vertebrate species to habitat features including land cover types, riparian/aquatic habitats, and elevation. Fourth, the hexagon and WHR databases were used in a GIS-modeling process which assigned species to habitat polygons based on their known or expected occurrence within hexagons and their association to habitat features. Finally, hardcopy maps of predicted species distributions were reviewed by over 60 acknowledged experts including state and federal biologists, university professors, and Audubon Society members.

3.2.1 Criteria for Including Species in WY-GAP

There are over 600 terrestrial vertebrate species known to occur in Wyoming (Wyoming Natural Diversity Database 1994). Many of these species are rare or accidental migratory birds which have been documented within the state only a few times. We developed the following set of criteria to include species in our analysis. Species were included if they were:

1) year-round, summer, or winter resident as defined by Oakleaf et al. (1992),
2) neotropical migratory bird as defined by Oakleaf et al. (1992),
3) migratory shorebird or waterfowl as defined by Oakleaf et al. (1992),
4) exotic game species as defined by Wyoming Natural Diversity Database (1994),
5) species or sub-species of management concern (listed as endangered, threatened, candidate, sensitive, or TNC State Rank of ≥ 2),
6) sub-species recognized as the only representative of its species in Wyoming,
7) all amphibian and reptile species and subspecies in Wyoming as listed by Baxter and Stone (1985).

Wyoming-specific field guides and atlases, in addition to the opinion of experts, were used to decide whether a species met these criteria. In particular, "accidental" or "rare" migrant birds, and exotic non-game mammals and birds were not included (Wyoming Natural Diversity Database 1994, Dorn and Dorn 1990, and Oakleaf et al. 1992). Some species, like the house mouse *(Mus muculus)* and the Norway rat (*Rattus norvegicus*) are not uncommon in Wyoming, but we did not include them in our analysis because they are non-native species. The taxonomy and nomenclature used to describe species was adopted from TNC and selected as a standard by the National GAP (Wilson and Reeder 1993, AOU Committee on Classification and Nomenclature 1983, Collins 1990, Frost 1985).

3.2.2 Occurrence of Species within Hexagons

Counties and latilongs are common units used to document the general location of species. Wyoming consists of 23 counties (average size = 10,950 km^2) and 28 latilong blocks (average size = 9,004 km^2). Using either of these geographic units to make species predictions would have overestimated distributions of species in cases where a species' range extended only partly into a county or latilong. To reduce this problem, we mapped the distributional limits of species using smaller, hexagon units (635 km^2) which are part of a global hexagonal grid system developed by the EPA (White et al. 1992). Advantages to using the hexagon grid include its equal area sampling structure, its independence from political and administrative boundaries (resulting in more consistent mapping of animal distributions), and its hierarchical structure which can facilitate increasing or decreasing grid densities in future analyses (White et al. 1992).

Species were recorded within each of the 436 hexagons for Wyoming using 1 of 7 definitions (Table 3.1). We adopted the first 3 definitions of species occurrence from the Biodiversity Research Consortium (Master et al. 1995), which is a complementary effort coordinated by EPA's Habitat/Biodiversity Program whose objective is to identify areas of the country where risks to biodiversity are greatest. The remaining 4 definitions (Table 3.1) were developed to enhance the species-hexagon database and are shown as part of the vertebrate species maps (Merrill et al. 1996b). We used only the data classified in the first 4 categories to conduct our gap analysis. Statement of probabilities in these descriptors were used as guidelines to subjectively qualify the occurrence of a species within a hexagon consistent with the descriptions in Table 3.1. At this time, they do not represent a quantified analysis of the probability of occurrence. Future refinements to the database may allow a quantified probability statement of species occurrence.

Three primary sources of information were used to document the occurrence (or expected occurrence) of a species within a hexagon: (1) species locality records, (2) published range maps, and (3) the opinions of experts. Species locality records (i.e., recorded occurrences of observed, trapped, or killed individuals) were obtained from 16 existing wildlife databases collected from state and federal agencies, conservation groups, museums, and outdoor science schools in Wyoming (Table 3.2). Fifteen of the species databases were non-spatial, tabular databases which included Public Land Survey System (PLSS) descriptions or coordinates for the location of observed species. PLSS locational descriptions were converted to latitude-longitude coordinates for import into Arc/Info using a fortran program called TR-LL (Morgan and McNellis 1965). Hexagons encompassing locality records with a date $\geq$ 1950 were coded as Confirmed, while those populated with locality records < 1950 were coded as Historical. Historical hexagons that were immediately adjacent to other hexagons coded as Confirmed, Probable, or Possible, were initially included within a species' current distribution. In cases where the historical hexagon was geographically isolated from a species' contiguous range, the hexagon was initially excluded from the species' current distribution, but was not removed from the species-hexagon range maps. Later, when expert reviewers examined the maps (see below), they were given the chance to modify historical records as necessary.

Table 3.1. Categories used to qualify species occurrence within hexagons used to predict vertebrate species distributions. The first three definitions were adopted from the Biodiversity Research Consortium (Master et al. 1995). The remaining four definitions were developed for use in Wyoming Gap Analysis.

CONFIRMED (C)	The species is confidently assumed (> 95% certain) or known to occur in the hexagon. Information sources confirming occurrence within a hexagon included species locality records and expert opinion.
PREDICTED (PR)	The species is predicted to occur in the hexagon based on the "fact-pattern" (i.e., presence of suitable habitat or conditions and historical record and/or presence in adjacent hexagons[s]); at least 80% certain that the species occurs in the hexagon. Information sources used to document a species within a hexagon included expert opinion only.
POSSIBLE (PO)	The species possibly or potentially occurs in the hexagon; its estimated likelihood of occurrence in the hexagon is thought to be between 80% and 10% (or less for extremely rare species where suitable habitat or conditions may be present). Information sources used to document a species as Possible within a hexagon included expert opinion and published range maps.
HISTORICAL (H) (Included)	The species is confidently assumed (> 95% certain) or known to have occurred in the hexagon prior to 1950. The historical presence within the hexagon was included as part of the species' current distribution. Information sources used to document a species as historical (included) within a hexagon included species locality records and expert opinion.
HISTORICAL (Hx) (Excluded)	The species is confidently assumed (> 95% certain) or known to have occurred in the hexagon prior to 1950. The historical presence within the hexagon was not included as part of the species' current distribution. Information sources used to document a species as historical (excluded) within a hexagon included species locality records and expert opinion.
QUESTIONABLE (?) (Excluded)	The occurrence of the species within a hexagon was still in question after having been reviewed by experts. Hexagons coded as questionable were not included as part of the species' current distribution. Information sources used to document a species as questionable within a hexagon included expert opinion only.
EXCLUDED (X)	The documented occurrence of a species was excluded by expert review after once having been coded as confirmed, predicted, or possible. Information sources used to document a species as excluded within a hexagon included expert opinion only.

Range maps published by Clark and Stromberg (1987) and Baxter and Stone (1985) also were used to document the occurrence of species within hexagons for mammal and herptile species. Wyoming-specific range maps for birds did not exist. For mammals and herptiles, the geographic range of each species was manually transferred from paper maps to the computerized hexagon grid using a mouse to select the hexagons which overlapped with range map polygons. Hexagons populated in this manner were coded as Possible.

Table 3.2. Databases used to document species occurrence within hexagons.

Database	Source of Database	No. of Records	Date of Acquisition
Wildlife Observation System*	Wyoming Game & Fish Department	666,567	5/92
Element occurrence Database*	Wyoming Natural Diversity Database	2,880	7/94
Vertebrate Museum Database	Museum Databases	4,389	6/93
Wildlife Observation Database	Grand Teton National Park	6,668	3/92
Devils Tower Fauna Database	Devils Tower National Monument	199	4/92
Green River Sage Lek Database	BLM -Green River Resource Area	128	9/92
Green River Raptor Database	BLM -Green River Resource Area	1,577	9/92
Lander Raptor Database	BLM -Lander Resource Area	162	3/92
Kemmerer Raptor Database	BLM -Kemmerer Resource Area	125	2/92
Cody Raptor Database	BLM -Cody Resource Area	1,060	7/92
Cody Nongame Bird Database	BLM -Cody Resource Area	225	7/92
Grizzly Bear Database	NPS -Interagency Study Team	9,338	3/92
M.A.P.S database	Teton Science School	332	10/92
Amphibian Survey Database	Teton Science School	35	10/92
Wind River Wildlife Database	U.S. Fish & Wildlife Service	2,775	3/93
Great Divide RA Raptor Database	BLM - Great Divide Resource Area	3,266	3/93

* Includes additional records from 1994 or 1995 for specific areas and/or taxonomic groups

Species-hexagon range maps developed from locality records and published range maps were reviewed by over 60 acknowledged experts consisting of federal and state biologists, university professors, and Audubon Society members (Appendix 3.1). Reviewers were asked to check, and if necessary, correct the hexagon occurrences that were based on questionable locality records or range maps. Reviewers were also given the opportunity to add animal occurrences within hexagons using the definitions in Table 3.1. The 1994 review of the species-hexagon range maps represented the first of two distinct map reviews.

Maps of species richness within hexagons were derived by totaling the number of species documented/expected to occur within hexagons and do not reflect species distributions modeled using habitat associations. For this analysis, we used only species occurrences which qualified as one of the first four definitions in Table 3.1. The five categories of species richness identified in the maps were determined using an equal-interval classification.

In developing the database for species distributions for Wyoming, we did not differentiate between breeding and winter ranges for bird species. Seasonal information for birds existed only by latilong blocks and interpolation of breeding ranges to the hexagon level within these larger units would have represented an unreasonable refinement of scale. The refinement to seasonal ranges also would have complicated the review process beyond reasonable time demands of the reviewers since most bird reviewers reviewed all 291 bird distribution maps. Further, the

conservation of bird species must consider the maintenance of habitat throughout the year (Csuti 1996). Future refinements to the bird distribution maps should separate breeding and wintering ranges and incorporate new information on seasonal habitat use by individual bird species.

3.2.3 Wildlife-Habitat Relationships

Once species were documented within the appropriate hexagons, we assigned species to spatially-explicit polygons of mapped habitat. We use the term habitat to represent areas characterized by several environmental features, specifically land cover, elevation, and the presence of riparian/aquatic features. WHR databases for Wyoming that existed at the initiation of this project contained information that was too general to predict species within the land cover types we mapped. For this reason, we compiled detailed WHR information and entered it into the Biological Conservation Database (BCD) developed and maintained by TNC. Vertebrate characterization abstracts within the BCD were used to document: (1) the associations of individual species to habitats, (2) sources of information which defined species-habitat associations, and (3) reviewer's notes on special habitat requirements which may limit the species' distribution within Wyoming.

Information used to complete the vertebrate characterization abstracts came from existing WHR databases, published and unpublished literature, and individuals having expert knowledge of a particular species. The majority of the WHR information was provided by the Colorado Division of Wildlife (Schrupp and Cade 1990) who developed a tabular database from an existing WHR publication (U.S. Forest Service 1981). In addition, we used WHR information from the UT-GAP and regional species guides to check and supplement WHRs defined by Colorado. We also completed an extensive literature review on habitat associations for 103 species of concern (i.e., federally listed as an endangered, threatened, or candidate species, USFS sensitive species, WGFD priority species, or species having a TNC state rank of ≥ 2) in Wyoming (Garber 1995) and on Wyoming species that were not recorded in the Colorado database. Lastly, information on species-habitat associations was recorded from expert reviewers who reviewed the species-habitat associations as part of the second review of the species distribution maps (see section 3.2.5). WHR information compiled from these three sources was input into the BCD and also Arc/Info as three separate species-habitat "matrices" and linked to the 3 GIS habitat layers described below to model species distributions.

Land Cover Matrix

Many of the documented associations between species and land cover types were derived from the Colorado database. A crosswalk between similar land cover types was developed to facilitate the transfer of information from the Colorado database to Arc/Info (Merrill et al. 1996b). Some of Colorado's WHR information was too specific, and in other cases, too general to be matched to Wyoming's land cover types. As a result, we did not include any of the Colorado habitats in our database that could not be confidently matched with Wyoming land cover types. The crosswalk did match land cover/habitat types from the Colorado database to 39

of the 41 land cover types mapped for Wyoming. One of the missing types (greasewood) was matched from UT-GAP's WHR database, and the other missing type, burned conifer, was added where appropriate to species' associations through literature and expert review.

Riparian/Aquatic Feature Matrix

Riparian areas are defined as lands adjacent to streams and rivers where vegetation is strongly influenced by the presence of water. In the arid west, riparian areas can constitute less than 1% of landscape (Chaney et al. 1991), yet their importance to the distribution of vertebrate species is far out of proportion to the area they represent (Gerhart and Olsen 1982; Szaro and Jackle 1985; Szaro and Belfit 1986, 1987; Finch 1989). Because riparian areas are often small and linear by nature they are difficult to map at the scale at which the land cover is produced (Csuti 1994), and as a result GAP has adopted a 40-ha MMU standard for delineating riparian and other wetland features in the land cover map (Jennings 1993). Although this is a significant reduction from the 100-ha unit used in mapping upland land cover types, many small riparian and aquatic features still are not distinguished from upland cover types. In order to better predict the distributions of species associated with riparian and aquatic areas, we modeled riparian areas by creating buffers around hydrographic (surface water) features. A similar approach was taken by the Idaho GAP (ID-GAP) and UT-GAP (Scott et al. 1993, Edwards et al. 1995). This approach, refined by varying the width of the buffer according to stream order, allowed us to approximate the location and amount of area in riparian vegetation zones. Unlike other riparian mapping approaches, such as aerial videography, it did not allow us to determine the vegetative composition or structure within the buffer. Another major limitation with our approach is that it did not identify wetlands associated with groundwater, which constitutes a significant proportion of total wetland habitat.

The riparian/aquatic model was developed in four steps. First, hydrographic features (streams, lakes, ponds, reservoirs) were extracted from USGS 1:100,000 scale digital line graphs (DLGs). Second, streams from the DLGs were then ordered using the automated Strahler stream ordering method developed by the USGS (Lanfear 1990). Third, buffer widths for each of the resultant seven stream orders and wide rivers (rivers represented by two shorelines in the DLGs) were determined by overlaying hydrographic features on a Landsat TM image of the southeast corner of the state (Path 34 / Row 31, 17 June 1991). Widths of the riparian vegetation were measured at approximately 1-km intervals along every perennial stream within the extent of the TM scene. Buffer widths were averaged by order (Table 3.3) and values rounded to the nearest 10 m were used for the buffer widths.

To refine predicted distributions of vertebrate species associated with riparian areas, the final step in developing the riparian model was to assign land cover types to the buffered areas. An initial attempt to classify land cover types within the buffered areas from spectral characteristics of Landsat images was not completed because sufficient ancillary data on riparian vegetation were not available and the field reconnaissance required for this interpretation required a time commitment beyond the scope of this project. The approach we used was to interpret riparian vegetation characteristics based on the land cover map (Chapter 2). Where a buffer intersected a polygon with a primary riparian cover type (cover type with largest area within the polygon) or secondary riparian cover type (cover

Table 3.3. Mean, standard deviation, and sample size (n) of riparian buffer widths measured on TM imagery for the southeastern portion of Wyoming.

Stream Order	Mean	Standard deviation	n	Buffer Width (m)
1	38.9	9.33	222	40
2	40.2	6.19	137	40
3	59.6	7.86	8	60
4	91.3	10.26	87	90
5	121.3	10.50	62	120
6	148.6	11.46	66	150
7	210.0	13.19	90	210
Wide Rivers	305.7	42.72	90	300
Lakes/reservoirs/ponds	n/a	n/a	n/a	90

type with second largest area within the polygon), that riparian cover type was assigned to the buffer. If there were no riparian cover types associated with the land cover polygon, the buffer segment of the polygon was designated as "unclassified riparian". We note that the riparian classification associated with the 2-ha MMU riparian map is limited because of the low resolution of the land cover map from which it was derived.

Following the development of the riparian model, it was incorporated with the main land cover map to be used in the prediction of species distributions. We combined information on the presence of riparian/aquatic features from the land cover map and the riparian/aquatic model to develop a matrix which recorded the presence or absence of species within riparian and aquatic features (Appendix 3.2). Species associated with any of the mapped riparian habitats (forest-, shrub-, and grass-dominated riparian) in the land cover map were also assigned to modeled riparian types in which the riparian vegetation was unclassified. Our reviewers agreed that despite the fact that the majority of the modeled riparian was unclassified, associating species to the unclassified riparian was still likely to portray a more accurate representation of the species distribution than the riparian types in the land cover map alone, and this was confirmed in our accuracy assessment of riparian species (see section 3.4).

Because of the limitations of the riparian/aquatic model, discussed in detail in Appendix 3.3., we emphasize that its sole purpose is to improve the predicted distributions of vertebrate species, and it should not be considered a "stand alone" map of riparian/aquatic areas in Wyoming.

Elevation Matrix

The third habitat characteristic used to refine species distributions was elevation. The elevational gradient in Wyoming ranges from approximately 973 to 4185 m and introduces climatic zonation which often limits the distribution of vertebrate species. Elevational ranges used by vertebrate species were obtained from the Colorado database or literature sources and

summarized within the vertebrate characterization abstracts. In cases where there were no specific literature sources documenting species-elevation associations for Wyoming, sources from other states within the region (CO, MT, ID, UT) were used. In these cases, we adjusted the elevational range documented in the literature to similar ranges in Wyoming using the treeline elevation as a reference for adjustment. The rate of decline of the treeline between 40° N and 55° N latitude is approximately 100 m elevation per degree of latitude (Peet 1988, Driese et al. in press). For instance, sources of minimum and maximum elevation ranges from Colorado, usually Armstrong (1972) or Bailey and Niedrach (1965), were each reduced by 400 m for Wyoming species because the difference in the mean latitudes of Colorado (39° N) and Wyoming (43° N) was 4 degrees.

The species-elevation matrix was used in conjunction with a GIS layer of contoured elevation to restrict species distributions. The elevation layer was derived from a Digital Elevation Model (DEM) of 90-meter resolution and was produced with a contour interval of 150 m, chosen because it corresponded closely to values given for elevational ranges of species reported by Clark and Stromberg (1987) and other literature sources.

3.2.4 GIS Modeling of Species Habitat and Distributions

The GIS layers of hexagons, land cover, elevation, and riparian/aquatic areas were combined in a GIS overlay process to develop a composite "habitat layer" for predicting species distributions. In addition, we produced a similar layer excluding the modeled riparian/aquatic areas (but still including mapped riparian and aquatic features from the land cover map) to assess the effect that modeled riparian areas might have on predicted species distributions (see section 3.4 Accuracy Assessment). In the union process "sliver" polygons ≤ 0.2 ha were eliminated to remove small, insignificant polygons and to simplify the composite layer. Species occurrence was predicted in habitat polygons if: (1) species occurrence was documented in the hexagon, (2) suitable land cover was present, and (3) the land cover was within the documented elevational range for the species. Both the primary (land cover occupying the largest proportion of the area of each polygon) and secondary (land cover occupying the second largest proportion of the area of each polygon) types were used to place a species in a polygon of associated habitat. For reporting purposes, we summarized the area of a species' predicted distribution based on primary and secondary habitat types separately in Merrill et al. 1996b, but our analysis in Chapter 5 does not differentiate between the two designations and reflects the largest extent of the species' range.

Our modeling process sometimes resulted in species distributions which ended abruptly at the edge of hexagons, even when suitable habitat was present outside of the hexagon where species occurrence was not documented. To mitigate this problem, species distributions were extrapolated beyond the hexagon boundaries into immediately adjacent polygons of suitable habitat.

3.2.5 Expert Review of Species Distribution Maps

We conducted a second review of vertebrate species distribution maps in 1995. In this review, participants (Appendix 3.1) were asked to review both the WHR information used to predict species distributions and an 11 x 7.5-in color map of each species distribution. Initial attempts to have the reviewers provide an accuracy rating for each map were abandoned because it resulted in excessive demands on the reviewers' time. Upon completion of the expert review, suggested changes were incorporated into the databases.

3.2.6 Edgematching Species Distributions with Adjacent States

WY-GAP species-habitat associations were checked for consistency with UT-GAP species-habitat associations when we incorporated WHRs from both states into our species database. Comparison of associations between WY-GAP and CO-GAP were not possible at the time that the Colorado WHR was crosswalked to Wyoming land cover types, because the land cover classification for CO-GAP had not yet been developed. Since that time, spatial edge-matching of land cover types has been completed for Utah and Colorado. We expect that there will be some discrepancies in the distributions of species due to the different geographic units used by each state to define species ranges (e.g. latilong blocks, counties, hexagons).

3.3 Results

Distributions of 445 terrestrial vertebrate species were predicted including 291 birds, 116 mammals, 26 reptiles, and 12 amphibians. Of the 445 species, 370 species (83%) had an association with riparian/aquatic habitats, and 291 species (65%) had specific minimum and maximum elevational limits, documented in literature or by the reviewers (Appendix 3.2). A listing of WHRs, source references, habitat area summaries, and statewide distribution maps for each species are included in an atlas that is separate from this report (Merrill et al. 1996b). However, we give an example of this information in Appendix 3.3 of this report.

Total species richness within hexagons ranged from 113 to 333 with a mean of 179 ± 39 (Fig. 3.1). Species richness appeared bimodal reflecting the low species richness of basins and high species richness of mountainous areas in the state. Hexagons containing the highest diversity of terrestrial vertebrate species were located near Jackson Hole (297, 297, and 303 species), Casper (333 species), and Buffalo (326 species) (Fig. 3.2).

Avian species richness ranged from 48 to 257 per hexagon (Fig. 3.3) with the highest species occurring in hexagons around Jackson (218, 219, and 225), Buffalo (249), and Casper (257) (Fig. 3.4). Mammalian species richness ranged from 49 to 75 species (Fig. 3.3) with the highest richness occurring in the mountainous regions and the lowest richness in the basins (Fig 3.5). Only 3 to 7 amphibian species occurred per hexagon (Fig. 3.3) across Wyoming with the most diverse areas occurring near the towns of Laramie (7) and Douglas (7) (Fig. 3.6). Reptilian species richness ranged from 1 to 18 species (Fig 3.3), and was greatest in the eastern Platte river valley (15-18) and scattered hexagons near the Black Hills region (15) (Fig 3.7).

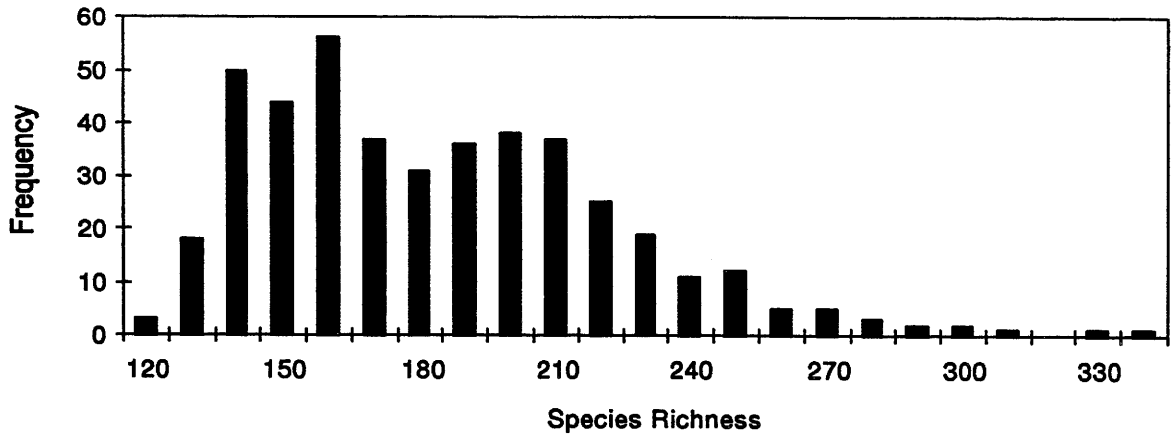


Fig. 3.1. Frequency distribution of total vertebrate species richness within 436 equal area hexagons located across Wyoming.

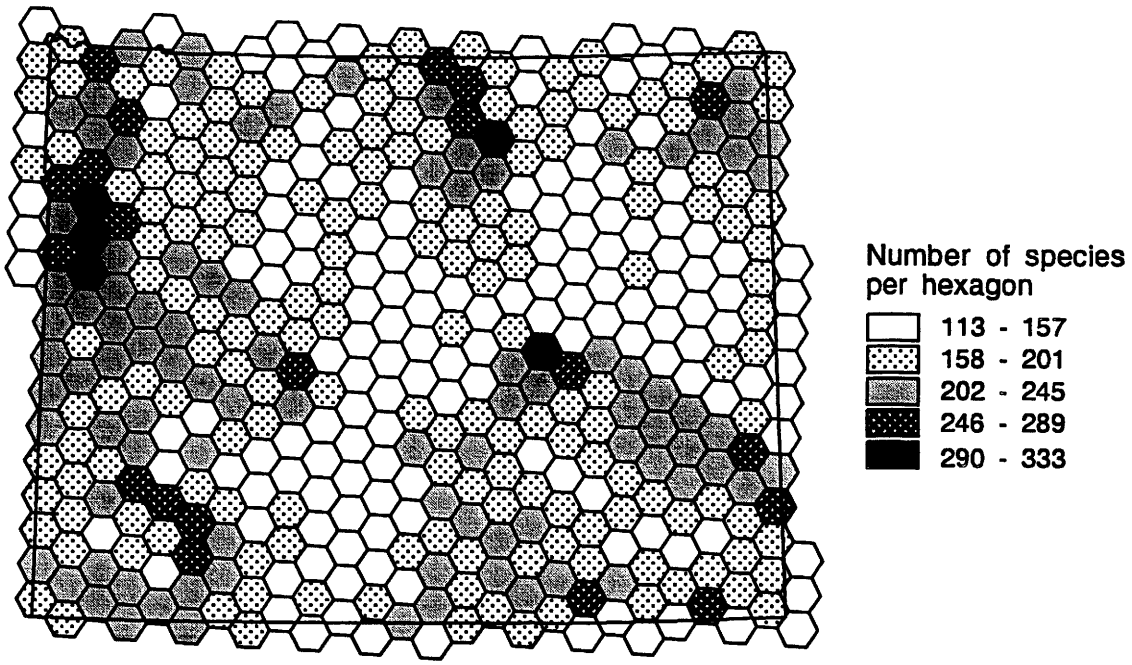


Figure 3.2. Predicted distribution of total vertebrate species richness within hexagons across Wyoming.

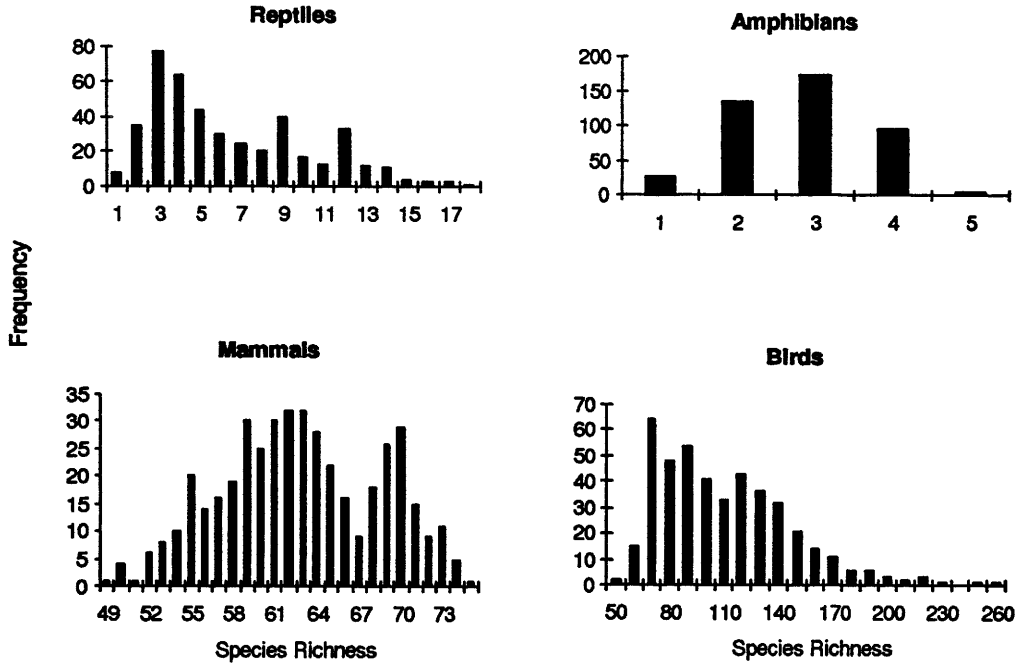


Fig. 3.3. Frequency distribution of species richness of birds, mammals, amphibians, and reptiles within 436 equal area hexagons

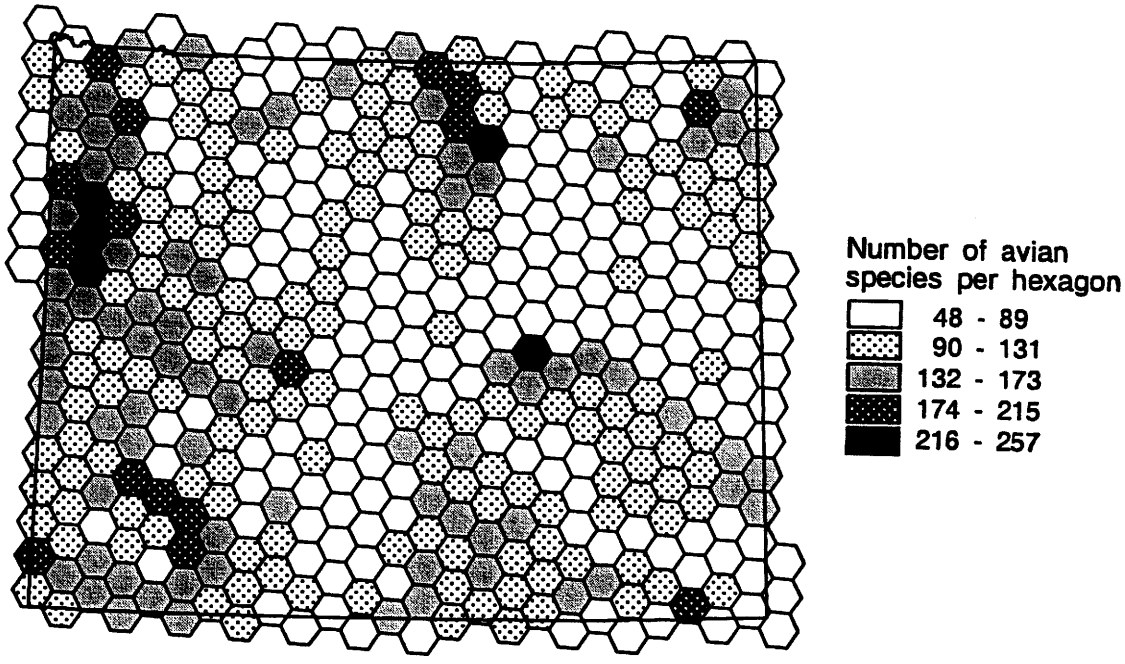


Figure 3.4. Predicted distribution of species richness of birds within hexagons across Wyoming.

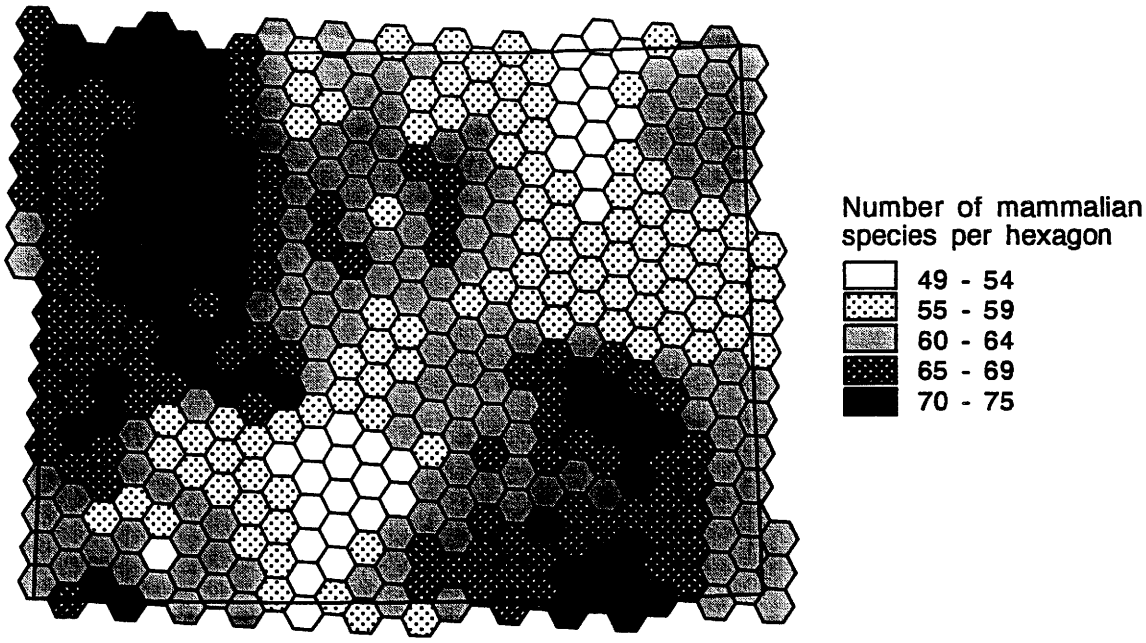


Figure 3.5 Predicted distribution of species richness of mammals within hexagons across Wyoming.

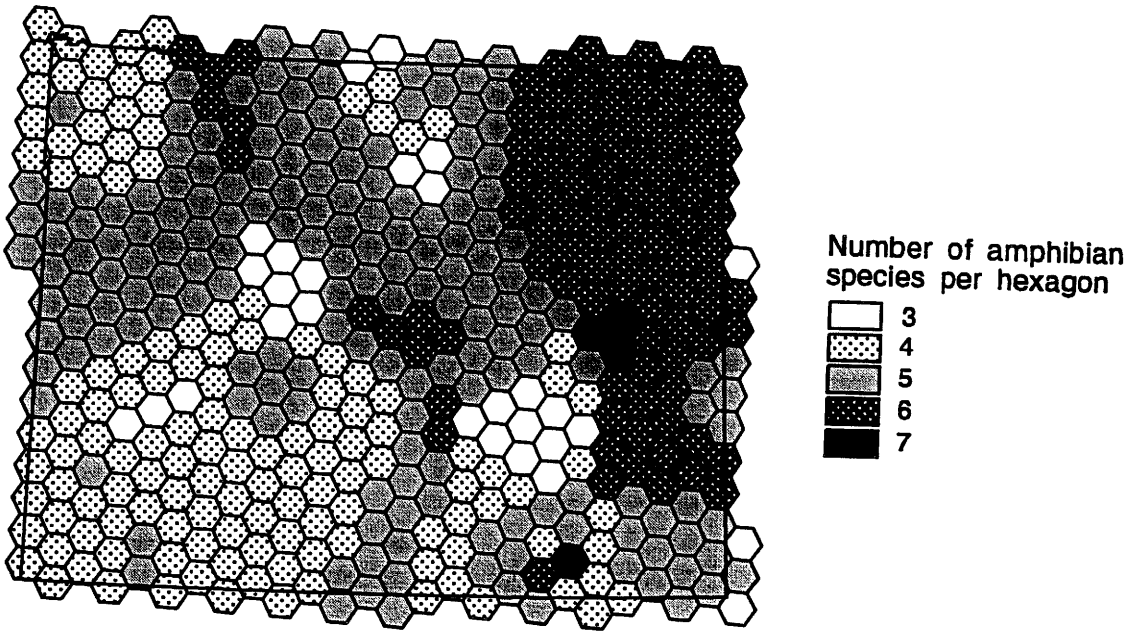


Figure 3.6 Predicted distribution of species richness of amphibians within hexagons across Wyoming.

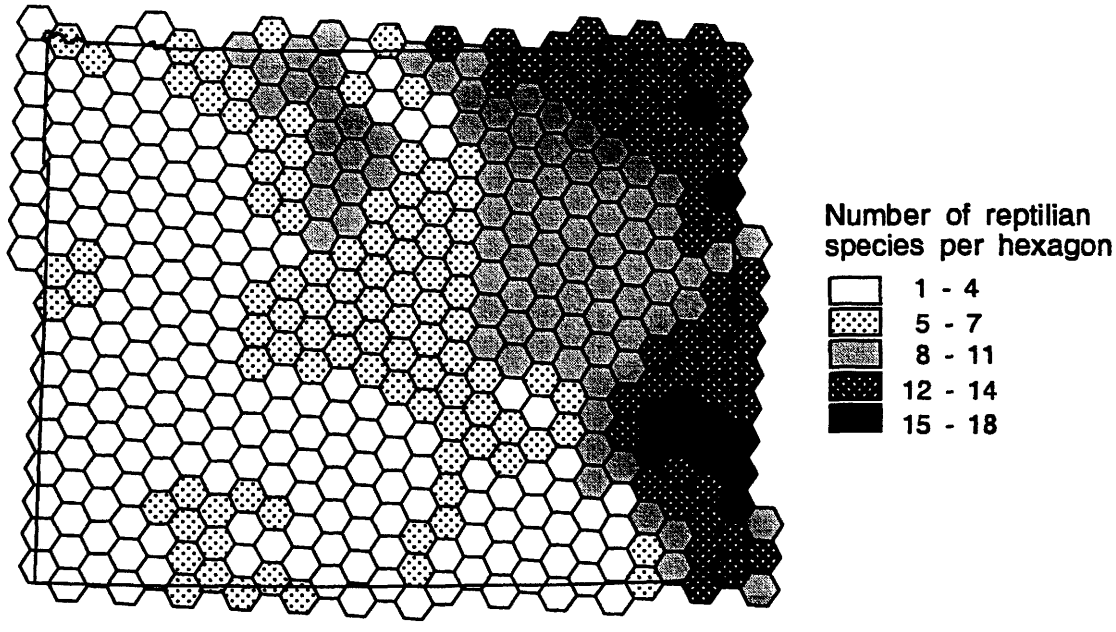


Figure 3.7 Predicted distribution of species richness of reptiles within hexagons across Wyoming.

3.4 Accuracy Assessment

Properly designed, long-term field surveys provide the best source of independent data to assess our predicted vertebrate distributions. The large size of Wyoming, the high number of vertebrate species in this analysis, and the spatial-temporal problems associated with interpolating animal ranges from survey records are all difficult to address with limited personnel, funds, and perhaps most importantly, time (Csuti 1994). We chose to follow an approach used by UT-GAP (Edwards et al. 1995), based on comparison with existing species checklists, to assess our predicted vertebrate distributions.

3.4.1 Methods

We compared lists of predicted species to checklists of terrestrial vertebrate species developed for 2 national parks/monuments, 2 wildlife refuges, 2 national forests-grasslands, 1 national recreation area, and a bird observation checklist developed for Jackson Hole which encompassed Grand Teton National Park (Fig. 3.8, Table 3.4). The species checklists compiled for all the areas were derived from published and unpublished reports that were not used directly in developing the WY-GAP databases. Of the 8 test areas, only 3 of them (Devils Tower National Monument, Yellowstone National Park, and the Bighorn National Recreation Area) had complete checklists for all 4 taxonomic groups. The other areas had checklists for either birds or mammals.

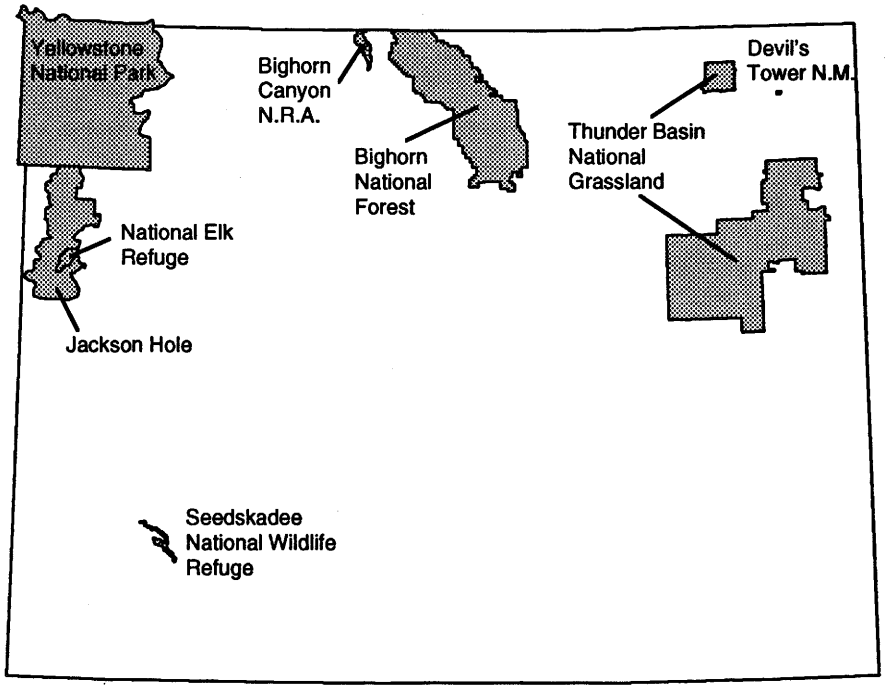


Fig 3.8. Location of the 8 areas used to assess the accuracy of predicted species distributions.

Number of omission errors (N_o), defined as the number of species not included on our list of predicted species, but present on the area's corresponding field checklist, and number of commission errors (N_c), defined as the number of predicted species included on our list, but not contained on the area's corresponding field checklist, were tabulated for all 8 areas. The accuracy of our predictions of species occurrences was derived by dividing the number of species which matched both lists (N_m) by the total number (N_t) of species contained on both lists. To determine the influence of the modeling strategies on the accuracy of species distributions, we conducted the accuracy assessment based on results generated both with and without inclusion of modeled riparian/aquatic areas and with and without the inclusion of species distributed within "Possible" hexagons.

3.4.2 Results

When species predictions were based on modeled riparian areas, our accuracy averaged 79.5% across sites and taxa (Table 3.5). The exclusion of modeled riparian areas generally had little to no effect on accuracy of predicting reptiles and mammals, but reduced the accuracy of predicting the occurrence of birds and amphibians at some sites by 10 - 30%. The reduction in accuracy was the result of species, such as waterfowl, shorebirds and riparian- or water-dependent birds and amphibians, which were omitted for one of two reasons. One third of these

Table 3.4. Location, checklist source, size (ha), elevation range (m), and predominant habitats of the 8 areas used to assess the accuracy of predicted distributions of vertebrate species within Wyoming.

Location	Checklist Source	Size [1]	Elevation[2]	Predominant Habitats
Bighorn National Forest	Merrill et al. (in prep.), U.S. Forest Service (1980)	449,095	1350-4050	Lodgepole pine, spruce fir forests, alpine meadows, riparian (Despain 1973)
Jackson Hole	Raynes and Raynes (1991)	234,760	1950-3750	River bottoms, lakes and ponds, sageflats, ranches and hayfields, morainal and piedmont forests, mountainsides, alpine, and settlements (Raynes and Raynes 1991)
Thunder Basin Natl. Grassland	U.S. Forest Service (1992)	732,612	1200-1650	Ponderosa pine woodlands, scoria outcrops, sagebrush-steppe, grassland and numerous small wetland areas (U.S. Forest Service 1992)
Seedskadee National Wildlife Refuge	U.S. Fish and Wildlife Service (1993)	8,925	1950-2100	Cottonwood, willows, and grasslands in the river bottoms; sagebrush is predominant in the upland areas (U.S. Fish and Wildlife 1988)
National Elk Refuge	U.S. Fish and Wildlife Service (1995)	10,036	1950-2250	Sagebrush, irrigated grasslands, douglas fir, ponderosa pine, and aspen forest (Cooper 1994)
Devils Tower Natl. Monument	San Miguel (1995)	549	1350	Ponderosa pine, oak-woodlands, mixed grass prairies, floodplain grasslands (McDaniel 1994)
Yellowstone National Park	National Park Service (1994)	890,421	1650-3450	Subalpine and douglas fir, whitebark pine, sagebrush, grasslands (Despain 1990)
Bighorn Canyon N.R.A.	Peters (1992), Wolf (1990)	11,823	1200-1650	Saltbush and greasewood communities, and plains cottonwood along the rivers. Further north, communities of utah juniper, sagebrush, mountain mahogany and grasslands dominate the uplands (Anderson et al. 1987)

[1]The size of each area was derived from the WY-GAP land stewardship GIS layer.
[2]The elevation of each area was derived from a GIS Digital Elevation Model having a contour interval of 150 m.

cases were species associated with cover types that were not mapped within the 40 ha MMU of the land cover map, and were represented only by modeled riparian within these sites. The remaining cases occurred when species were not recorded within the hexagons encompassing the assessment sites. The species were recorded in hexagons adjacent to the accuracy assessment site, and their habitat was extended into the site along corridors of modeled riparian because of the "smoothing" process applied in the habitat modeling procedure (see Section 3.2.4).

Errors of omission averaged 12.2% (0 - 36.6%) for all taxonomic groups, and were often high for birds (Table 3.5), indicating that our models tended to under-predict the presence of bird

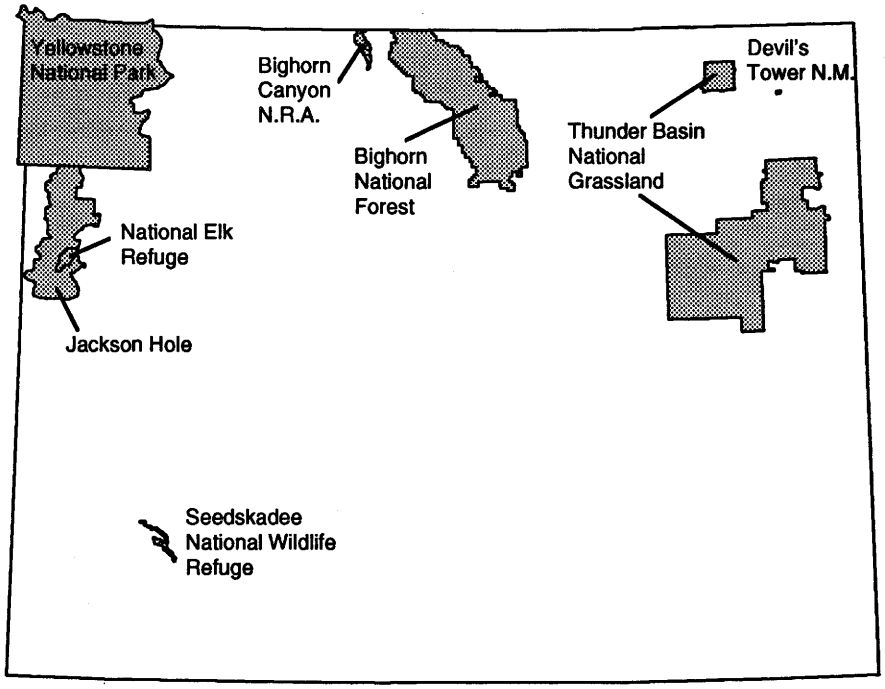


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Table 3.5. Number of commission errors (N_c), omission errors (N_o), matches (N_m), and percent accuracy (N_m/N_t x 100) of predicted species occurrences in 8 areas compared to species lists compiled for the same areas. Results are presented for species predictions developed with modeled riparian/aquatic features (R) and those without modeled riparian/aquatic features (NR).

Taxonomic Group	Model	N_c	% N_c	N_o	% N_o	N_m	% N_m/N_t
Birds							
Bighorn Natl. Forest	R	11	4.01	23	8.40	240	87.59
	NR	7	2.59	56	20.70	207	76.67
Jackson Hole	R	6	2.26	13	4.90	246	92.83
	NR	6	2.26	13	4.90	246	92.83
Thunder Basin Natl. Grassland	R	26	10.83	40	16.70	174	72.50
	NR	23	9.70	49	20.70	165	69.62
Seedskadee Natl. Wildlife Refuge	R	38	15.83	15	6.28	186	77.82
	NR	35	14.77	37	15.61	165	69.62
Devils Tower Natl. Monument	R	32	17.20	6	3.20	148	79.57
	NR	25	13.97	9	5.00	145	81.00
Yellowstone Natl. Park	R	3	1.18	26	10.20	226	88.63
	NR	3	1.18	27	10.60	225	88.24
Bighorn Canyon Natl. Rec. Area	R	11	4.91	82	36.60	131	58.48
	NR	11	4.91	83	37.10	130	58.04
Site Mean	**R**		**8.03**		**12.33**		**79.63**
	NR		**7.05**		**16.37**		**76.62**
Mammals							
Natl. Elk Refuge	R	20	29.85	1	1.50	46	68.66
	NR	19	28.36	1	1.50	47	70.15
Devil's Tower Natl. Monument	R	23	34.85	1	1.50	42	63.64
	NR	20	31.75	1	1.60	42	66.67
Yellowstone Natl. Park	R	5	6.76	2	2.70	67	90.54
	NR	5	6.76	2	2.70	67	90.54
Bighorn Canyon Natl. Rec. Area	R	11	17.19	5	7.80	48	75.00
	NR	11	17.19	5	7.80	48	75.00
Site Mean	**R**		**22.16**		**3.38**		**74.46**
	NR		**21.02**		**3.40**		**75.59**
Amphibians							
Devil's Tower Natl. Monument	R	2	33.33	0	0.00	4	66.67
	NR	2	33.33	0	0.00	4	66.67
Yellowstone Natl. Park	R	0	0.00	1	14.30	6	85.71
	NR	0	0.00	3	42.90	4	57.14
Bighorn Canyon Natl. Rec. Area	R	0	0.00	0	0.00	5	100.00
	NR	0	0.00	0	0.00	5	100.00
Site Mean	**R**		**11.11**		**4.77**		**84.13**
	NR		**11.11**		**14.30**		**74.60**
Reptiles							
Devil's Tower Natl. Monument	R	3	21.43	1	7.10	10	71.43
	NR	3	21.43	1	7.10	10	71.43
Yellowstone Natl. Park	R	0	0.00	1	11.10	8	88.89
	NR	0	0.00	1	11.10	8	88.89
Bighorn Canyon Natl. Rec. Area	R	1	9.09	1	9.10	9	81.82
	NR	1	9.09	1	9.10	9	81.82
Site Mean	**R**		**10.17**		**9.10**		**80.71**
	NR		**10.17**		**9.10**		**80.71**

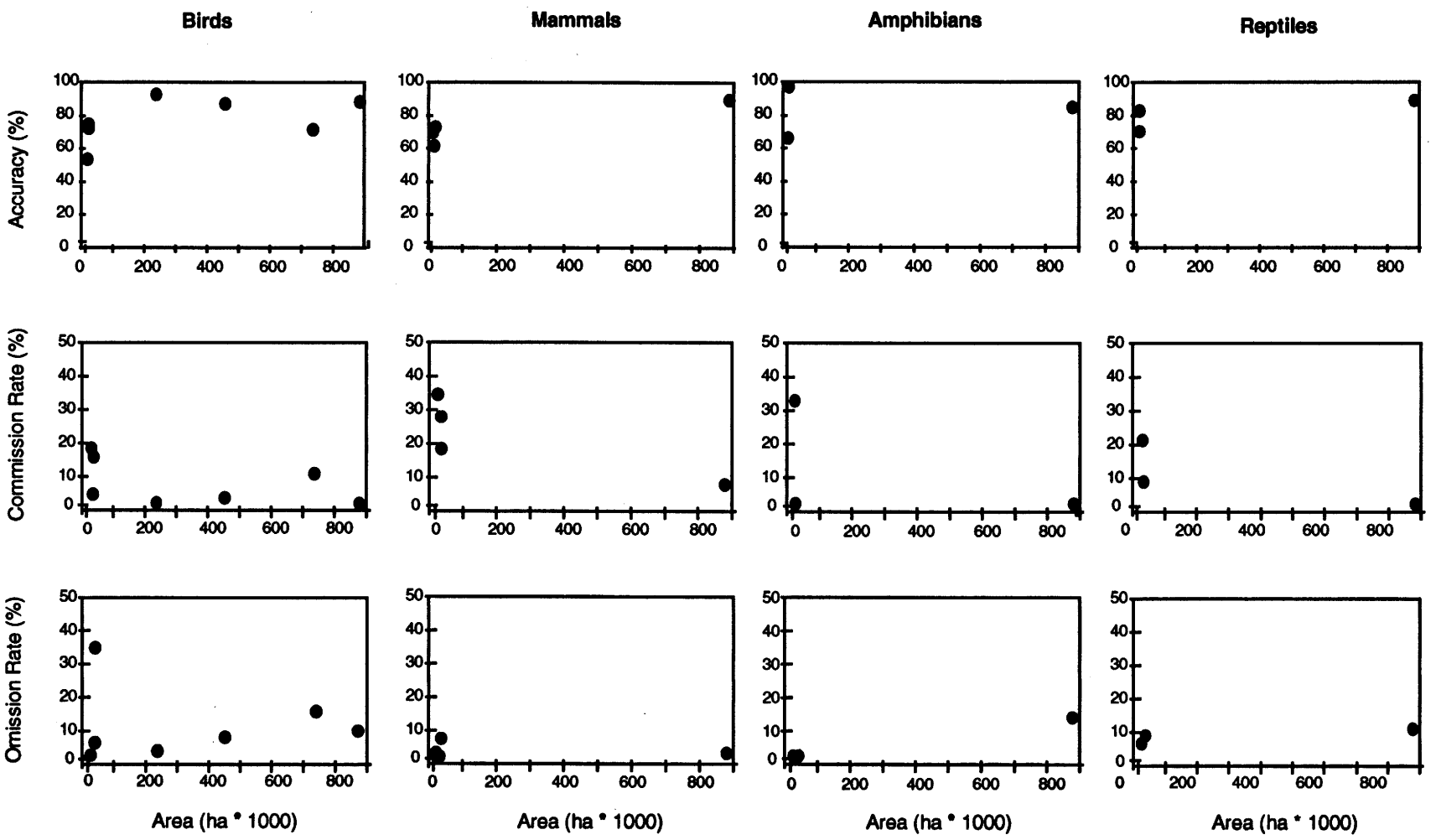


Figure 3.9. Omission and commission errors by taxonomic group as a function of park size. Accuracy = N_m/N_t x 100. Omission error rate = N_o/N_t x 100. Commission error rate = N_o/N_t x 100.

species. Of the 206 total bird omissions, only two birds, the blue grouse (*Dendragapus obscurus*) and northern saw-whet owl (*Aegolius acadicus*) were omitted because of an apparently erroneous restriction in elevation. Three birds, the long-billed dowitcher (*Limnodromus scolopaceus*), rosy finch (*Leucosticte arctoa*), and white-winged crossbill (*Loxia leucoptera*), were omitted because none of their associated land cover types were mapped within the areas. The remaining 201 (96%) omission errors were the result of no recorded occurrence of the species within any of the hexagons encompassing the accuracy assessment area(s).

The highest omission error occurred for birds in the Bighorn Canyon National Recreation Area (BCNRA). The northern portion of BCNRA extends into Montana and contains additional habitat types not present in the Wyoming portion of the site, which may affect bird species composition (Anderson et al. 1987). The species checklist used in this comparison was compiled for both the Wyoming and Montana portions of BCNRA and it was not possible to determine which species were present only in the Wyoming portion of the BCNRA from the species check list. Errors of omission were also high for the Bighorn National Forest area, probably due to problems in interpreting the actual boundaries of the area used to compile the checklist, which extended beyond the official boundary of the National Forest.

Errors of commission averaged 8.3% (0 - 34.8%) for all taxonomic groups and were highest for mammals (Table 3.5), indicating that our models tended to over-predict the presence of mammal species. Most of the commission errors for mammals were the result of over-predictions of bat, rodent and rabbit/hare species. For example, of the 40 predicted to be present, but not on the checklists, 31 species were either bats, rodents or rabbits/hares. In particular, at Devils Tower National Monument, which had the highest commission error of the four accuracy assessment sites for mammals, 22 of the 23 committed species were within these taxa. Over-predicted distributions of bat, rodent, and rabbit/hare species were related to a lack of point locality data used to define range extent. Lack of information resulted in the inclusion of many hexagons labeled as "Possible" in the distributions of these taxa because published range maps showed these species widely distributed across large portions of the state. The remaining nine commission errors included species such as the wolverine, marten, lynx and black bear. These species were incorrectly predicted to occur at National Elk Refuge or DTNM because their habitat existed within the hexagons encompassing these sites, though the species had never actually been documented within the boundaries of the sites (or had been extirpated from the sites).

Exclusion of Possible hexagons in predicting species distributions generally reduced the number of commission errors for species with an uncommon or unknown distribution, but significantly increased the omission errors for widely-distributed and common species (e.g., thirteen-lined ground squirrel, Nuttall's cottontail, and striped skunk). Exclusion of Possible hexagons increased the accuracy rating of mammals at two sites, but it also greatly reduced the accuracy of mammals at the other two sites (Table 3.6). The exclusion of Possible reduced the accuracy of our predictions of amphibian and reptilian species by an average of 37%. However, there was little substantive effect on the accuracy of bird predictions.

Table 3.6. Comparison of accuracy assessment results across 8 areas, with (P) and without (NP) the use of the "possible" designation of species occurrence within hexagons which were used to develop species distribution maps. Dashed lines indicate that a checklist for the taxonomic group was not available for that area.

	Birds		Mammals		Amphibians		Reptiles	
	P	NP	P	NP	P	NP	P	NP
Bighorn National Forest	87.6	88.2	----	----	----	----	----	----
Jackson Hole	92.8	93.9	----	----	----	----	----	----
Thunder Basin Natl. Grassland	72.5	71.4	----	----	----	----	----	----
Seedskadee Natl. Wildlife Refuge	77.8	78.0	----	----	----	----	----	----
National Elk Refuge	----	----	68.7	74.1	----	----	----	----
Devils Tower Natl. Monument	79.6	80.8	63.6	76.1	66.7	16.6	71.4	36.4
Yellowstone National Park	88.6	87.8	90.5	71.0	85.7	60.0	88.9	55.6
Bighorn Canyon Natl. Rec. Area	58.5	57.2	75.0	55.2	100.0	60.0	81.8	40.0
Mean of all sites	**79.6**	**79.6**	**74.5**	**69.1**	**84.1**	**45.5**	**80.7**	**44.0**

We did not find strong evidence that error rates decreased with increasing size of the assessment area (Figure 3.9) as suggested by UT-GAP (Edwards et al. 1996). The number of assessment sites available to us was low and incorporation of Wyoming's results with results from other state gap analysis projects may provide a better analysis of these patterns.

3.5 Limitations and Discussion

Successful assessment of the protection status of species through gap analysis requires accurate mapping of species distributions. The goal set by National GAP is to produce maps that predict species occurrences with an overall accuracy of 80% or higher (Csuti 1994). Our average accuracy (79.5 %) fell just at or below this level. With one exception, accuracy ratings of individual sites were within the range reported by UT-GAP (Edwards et al. 1996). The exception was the Bighorn Canyon National Recreation Area which included areas outside Wyoming that were not modeled. UT-GAP reported accuracy rates that, on average, were highest among birds and mammals while we found our accuracy was highest for amphibians and lowest for mammals. Part of the GAP effort is to determine for which species landscape-scale modeling efforts are least likely to apply and, therefore, would be inappropriate (Scott et al. 1996). In mapping and reviewing species distributions in Wyoming, we identified species for which data were insufficient for modeling purposes and found several important factors that may contribute to potential errors in these maps that should be recognized when using them. Modeling species distribution was a two step process, and errors were introduced when mapping species ranges within hexagons, as well as when modeling species distributions using habitat associations.

3.5.1 Species Distributions Within Hexagons

Limits to a species' range were determined by defining the presence of a species within hexagons using locality records. For many species there were an inadequate number of locality records to confidently determine its range. For example, sightings of the fisher (*Martes pennanti*) were uncommon and often questioned by our reviewers resulting in limited data for describing the overall range of the fisher. In particular, there was a dearth of information for many bat species and some small mammals which was most likely due to their inconspicuous and/or nocturnal behavior. In one instance, we did not have sufficient new data to map the distribution of the three, recently-recognized species of rosy finch (*Leucosticte tephrocotis, L. atrata, L. australis)* because existing locality records for the rosy finch did not differentiate between these new species.

To compensate for the lack of locality records for amphibians, reptiles, and mammals, we used existing range maps from Baxter and Stone (1985) and Clark and Stromberg (1987) to assign the presence of a species in a hexagon and labeled these hexagons as Possible. In contrast, range maps did not exist for birds and we relied solely on point locality records and expert opinion to determine ranges of birds. During the review process, we found that the reviewers of the maps were hesitant to extrapolate the range of birds far beyond known occurrences or to contract the ranges of amphibians, reptiles and mammals from published range maps. As a result, the number of hexagons designated as Possible is much lower for birds than for herptiles and mammals and maps of bird distributions are more fragmented. These differences may affect future management area evaluations. For example, Freitag et al. (1996) found that in evaluating the existing conservation reserve network in the Transvaal region of South Africa, the current system represented 66% of the hypothetical sites necessary to represent all species in the reserve system when based on point locality records, but only 38-54% when based on range maps. Which data source provides the most accurate representation of a species distribution is unknown since both types of data have their limitations (Freitag et al. 1995). Nonetheless, our accuracy assessment indicated that the inclusion of Possible hexagons increased the overall accuracy of the mammal and herptile distribution maps, and their exclusion had little effect on the accuracy of the bird distribution maps.

Distributions of some species were identified by reviewers as problematic due to possible misidentification in locality records where species' ranges overlap. Species with a high probability of misidentification included cottontail species (*Sylvilagus floridanus, S. nuttallii,* and *S. audubonii*); the least weasel (*Mustela nivalis)* and the ermine (*M. erminea*); the gray fox (*Urocyon cinereoargenteus ocythous*) and the swift fox (*Vulpes velox velox*); the Yuma myotis (*Myotis yumanensis*); the California myotis (*Myotis californicus*); the grasshopper sparrow (*Ammodramus savannarum*) and savannah sparrow (*Passerculus sandichensis*); and many of the empidonax flycatchers. Thus, the mapped distributions of these species should be used with some caution.

The point locality data, and the reviewers themselves, may have introduced biases into the distribution maps due to opportunistic rather than systematic sampling (i.e., uneven sampling). The location of species locality records collected in the field are undoubtedly influenced by

population densities and existing transportation routes. The areas of highest diversity of birds (Fig. 3.4) were centered on the cities of Casper, Jackson and Buffalo, where there are active Audubon Society chapters. Members from these chapters also participated in the review of our bird distribution maps. Likewise, the lack of reviewers for the Thunder Basin National Grassland may, in part, have contributed to the low bird diversity in this area (Fig 3.4). Thus, areas of high or low species richness may be an artifact of mere data collection intensity or effort. Locality records are also likely biased against species with nocturnal behavior (e.g. bats, rubber boa [*Charina bottae*]), inconspicuous habits or small size. While we are confident that the review process reduced the omission errors in the species distribution maps, we must acknowledge the potential biases associated with "overconfidence of experts" (Fischhoff et al. 1981, Suter et al. 1987).

3.5.2 Habitat Associations and Species Mapping

Within hexagons, the reliability of predicting species distributions based primarily on vegetation that is mapped on a "coarse scale" has been questioned (Short and Hestbeck 1995, but see Davis 1996, Edwards 1996, Scott et al. 1996). Indeed, working with remotely sensed data limited our ability to map micro-habitats (e.g., caves, cliffs) and small "pocket" habitats such as juniper, aspen, or bitterbrush shrub which occur in narrow strips along ridges or within canyons. As a result, species could be under or overestimated. For example, the distribution of cedar waxwings (*Bombycilla cedrorum*) whose habitat includes "open aspen stands", may have been under-estimated due to our inability to map many of the smaller, interspersed stands of aspen in foothill environments. We compensated to some degree for this problem by using both primary and secondary land cover types to make species predictions.

In contrast, we mapped the distribution of other micro-habitat specialists by assigning them to broad land cover types, based on the assumption that certain land cover polygons contain the micro-habitat features of importance. For example, the distribution of the cliff chipmunk (*Tamias dorsalis utahensis*) and the canyon mouse (*Peromyscus crinitus doutii*) were predicted using juniper cover, even though these species are limited to rock outcrops that are usually encompassed by juniper habitats. As a result the distribution of these species are over-estimated. Our use of small geographic units such as the hexagon minimized the extent of over-estimation for micro-habitat specialists with restricted ranges, such as the canyon wren (*Catherpes mexicanus*), and the chimney swift (*Chaetura pelagica*), but it was difficult to minimize over-prediction for micro-habitat specialists with broad ranges. Many species of bats have broad geographic ranges, but may actually be limited within these extents because of special roosting requirements, features such as caves, abandoned mine shafts and buildings that could not be mapped at the scale of our land cover map. We have documented most of these micro-habitat mapping problems (Merrill et al. 1996b) and data users should be cognizant of these limitations.

The ability to predict species occurrences from generalized land cover types has also been questioned because associations between species occurrence and vegetation type are not always tight. Factors other than vegetation, such as climate or small scale features such as subcanopy vegetation, tree or snag density, or even spatial arrangement of a number of cover types may be required for reliable predictions (Short and Hestbeck 1995, Flather et al. 1996). Because

topographic relief in Wyoming landscapes is a dominant feature that influences climate, we included elevation in our models of species distributions. We also included hydrologic and associated riparian features in our modeling efforts because in the arid west many species are associated with these features and often dependent on them (Finch 1989, Szaro and Belfit 1986, 1987, Szaro and Jackle 1985). Addition of a GIS layer depicting soil types might further improve predictions of fossorial species such as the Wyoming pocket gopher (*Thomomys clusius*) and the olive-backed pocket mouse (*Perognathus fasciatus*). Soil types and other more detailed features could not be included in our models because these features are not mapped across the entire state and the vast majority of species have not been studied in sufficient detail to determine their association with such fine-scale features or habitat configurations (Scott et al. 1996). In fact, we found that for many of the 445 species we modeled, habitat relationships have been described only very generally. In some extreme cases, the best habitat description for forest bird species was "associated with coniferous forests". We had to assign these species to all seven coniferous types resulting in generalized and potentially overestimated species distributions. However, even when species predictions are based on more detailed information, usually at finer scales, observed error rates have been equally variable and high (Block et al. 1994, Hollander et al. 1994, Timothy and Stauffer 1991, Raphael and Marcot 1986, Dedon et al. 1986).

3.6 Summary and Conclusions

Gap analysis procedures should not be regarded as a substitute for detailed biological inventories on species distributions (Scott et al. 1993). Rather they are a methodology for organizing existing data into static maps that represent dynamic distributions (Edwards et al. 1996). Uncertainty exists in the current predictions of species due to incomplete information, data biases, map resolution, habitat models, and dynamics of species populations. To date, there have been only a few efforts to quantify the effects of the uncertainty in the data used to map species distributions and its effect on the interpretation of the program's results (Stoms et al. 1992, Dean et al. 1996, Kohley in prep). Nonetheless, the gap distribution maps represent the most up-to-date compilation and review of species distributions in Wyoming.

Although species check lists provide a preliminary assessment of our ability to map species distributions, species lists usually are not completely independent sources of information that provide reliable accuracy assessments. For example, in Wyoming, data used in the species check lists were not directly used in determining species ranges, but past observations on which the lists were based are likely to have been incorporated into state-wide databases (although we could not identify them) and published range maps. Also, several of the species check lists were partially developed by map reviewers. We recommend that error assessment of vertebrate databases, including both statistical assessments of modeling approaches as well as field validations, become a priority of GAP now that a number of state gap databases are completed. Even with these additional assessment efforts, we suspect that the basic lack of information on ranges and habitat associations of many species will hinder even the best modeling capabilities. In the immediate future, we believe one of the most important contributions of WY-GAP is to provide a management framework for designing further field surveys and research projects toward improving our understanding of species distributions in Wyoming.

CHAPTER 4

Land Stewardship and Management

All land management is biodiversity management, whether intended or not. - R. Noss and A. Cooperrider

4.1 Background

In gap analysis, distributions of land cover types and vertebrate species distributions are compared to land management status to provide a preliminary indication of protection status. We mapped lands into 4 categories of management status which reflect different levels of commitment to biodiversity protection. We used land ownership and administrative units as a basis for mapping management categories since they provide some indication of the kinds of activity that can occur on a given piece of land, and hence, provide an indication of the potential impact on the land's biodiversity. For example, federal mandates preclude the permanent conversion of natural habitats to anthropogenic habitats on most federal lands. In contrast, most private landowners are less constrained and can modify their land management for their individual goals. We recognize, however, that gap analysis procedures identify private land only as a homogenous category and do not differentiate individual tracts or owners unless there is information that indicates a permanent commitment to long-term biodiversity maintenance. At the same time, it is necessary to distinguish between ownership and management/administration because a tract of land may be under the jurisdiction of one landowner but under management for several different levels of biodiversity maintenance. We currently use the term "stewardship" to encompass both the ownership and administration of land areas, in recognition that legal ownership alone does not necessarily reflect the management objectives and policies in place for land areas.

The Gap Analysis Program uses a scale of 1 through 4 to denote the relative degree of management for biodiversity maintenance for each tract of land, with "1" being the highest, most permanent and comprehensive level of maintenance, and "4" being the lowest, or unknown status (Table 4.1). This is a highly subjective approach and we recognize a variety of limitations in this scheme (Scott et al. 1993). Two principles were used in assigning the status level to individual tracts of land. The first principle was that land stewardship was the primary determinant in assigning status rather than land ownership alone. The second principle was that despite incomplete information and changes in management objectives through time, we can use the intent of a land steward as evidenced by legal and institutional factors to assign management status. In Wyoming, we worked closely with local land managers to assign management status whenever possible.

Table 4.1 Description of codes used to designate management status to lands within Wyoming.

Status	Description of management status
1	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency and intensity) are allowed to proceed without interference or are mimicked through management.
2	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive use or management practices that degrade the quality of existing natural communities.
3	An area having permanent protection from conversion of natural land cover for the majority of the area, but is subject to extractive uses of either a broad, low intensity type or localized intense type. It also confers protection to Federally listed endangered and threatened species throughout the area.
4	Lack of irrevocable easement or mandate to prevent conversion of natural habitat types to anthropogenic habitat types and allows for intensive use throughout the tract, or existence of such restrictions are unknown.

Management status designations are not meant to indicate the long-term viability of the elements of biodiversity. We recognize the management status designations do not necessarily reflect adequate management for all elements of biodiversity that may exist within a given area. For instance, a particular management practice or a specific natural disturbance may favor some cover types and species, while adversely affecting other species. Biodiversity is not an indivisible property that responds in a predictable and repeatable manner to management and/or natural events. The management status designations provide only a start to assessing the likelihood of future threats to the elements from land conversion - one of the primary causes of biodiversity decline (Noss and Cooperrider 1994). The immediate purpose of determining the management status of mapped elements of biodiversity is to identify for land stewards the degree to which they may want to consider themselves responsible for the management of a species or land cover type, and to identify other stewards sharing that responsibility. As a result, this information may identify opportunities for cooperative management of resources or may identify a more equitable distribution of that responsibility among stewards. This information directly supports the primary mission of GAP by providing objective, scientific information to decision makers and managers to make informed decisions regarding biodiversity.

4.2 Methods

The land stewardship and management status layer is one of the three central layers developed by WY-GAP. Stewardship is composed of two related themes: land ownership and administrative units. In Wyoming, major land owners include the federal government, the State of Wyoming, and private and native American land holders. Administrative units, such as state areas, national parks, and national recreation areas, are under the jurisdiction of a managing agency but often include a mosaic of federal, state, and private lands. Land management status

was assigned to a parcel of land based on its stewardship and the management objectives of the land in accordance with GAP standards (Edwards et al. 1994).

Since different methods were used to compile information on the land ownership and administrative units in Wyoming, we describe their development in separate sections and summarize land areas by stewardships in this chapter. Analysis of biodiversity by management status categories is presented in Chapter 5.

4.2.1 Land Ownership

Information on Wyoming's land ownership was derived from two sources: (1) digital land ownership files provided by the BLM State Office in Wyoming, and (2) BLM surface management status maps. The BLM State Office provided the WY-GAP with digital copies of land ownership for approximately 35 % of Wyoming (Appendix 4.1). This data was digitized by BLM personnel from 1:24,000 scale mylar overlays drafted from master titles, survey plats, and supplemental index plats.

The remaining 65 % of the land ownership layer was digitized by WY-GAP using 1:100,000-scale Surface Management Status maps produced by the BLM. Mylar copies of the Surface Management Status maps were not accessible to us at the beginning of the project, so paper maps were used for digitizing. Despite efforts to digitize land ownership information from the most recently edited paper maps, maps ranged from recent versions edited in 1992 and in excellent condition to others edited in 1972 and folded (Appendix 4.2). Land ownership polygons digitized by WY-GAP were then edge-matched with the ownership polygons digitized by BLM. In most cases, there was a close match along the edges, requiring only minor shifts in lines. Larger discrepancies (usually the result of differences in scale of the data sources) were closed off without an attempt to force a match. The Surface Management Status Maps from which the ownership was digitized have an accuracy of plus or minus 120 feet according to USGS standards, and each 1:100,000-scale quadrangle was digitized with a maximum root mean square error (RMS) tolerance of ≤ 0.006 digitizing inches (15.24 meters). Because some of the ownership was digitized from folded maps, the accuracy is probably closer to plus or minus 300 feet.

Selected water features from U.S. Geological Survey 1:100,000-scale digital line graphs (DLGs) were included in the digital land ownership layer. Lakes and reservoirs ≥ 5 ha and major rivers were selected from the DLGs and edgematched to existing land ownership polygons. These water polygons do not reflect surface or subsurface ownership in this layer, and are not coded with any ownership designation. The digital files provided by the BLM also included some water features which were retained and supplemented with water features from the DLGs.

To update the digitized land ownership through 1994, maps and legal descriptions of recent land acquisitions or releases ≥ 640 acres were requested from federal and state agencies and, in most cases, incorporated into the database. Some purchases/exchanges could not be included because the complete legal description (subdivision descriptions by metes and bounds)

could not be interpreted accurately to 1:100,000 maps by township, range and section. Updates incorporated into the current version of the database are documented in Appendix 4.3.

4.2.2 Administrative Units

Boundaries for administrative units such as wilderness areas, wildlife refuges and nature preserves were compiled from a variety of sources at different map scales, projections, and qualities of base materials. While some administrative unit boundaries were available as existing GIS layers digitized by their administrative agency, others units were digitized by WY-GAP. When these units were digitized directly off 1:24,000 scale source maps provided by agencies, a maximum RMS error tolerance of ≤ 0.01 digitizing inches (6 m) was used. In other cases, the source maps could not be directly digitized because either they did not contain registration points or their boundaries had to be interpreted from legal descriptions. In these cases, the boundaries were manually transcribed onto the BLM surface management status maps and digitized. Areas that were not included in the database are proposed units (legislation still pending as of September 1995) such as USFS and BLM wilderness study areas. Based upon the recommendation of BLM officials, BLM Areas of Critical Environmental Concern were not included because the dynamic nature of their management plans precludes the assurance of long-term protection of natural elements and communities from extractive (mining, timber harvesting) activities.

4.2.3 Management Status

Categories and definitions of management status used by WY-GAP (Table 4.1) were developed by GAP (Edwards et al. 1994). In general, management status was assigned to an area based on its stewardship and intended management (Table 4.2) using a key developed by NM-GAP (Appendix 4.4). Because specific management objectives for many administrative units in the state were difficult to obtain or interpret, we contacted land managers and real estate specialists within the BLM, USFS, NPS, USFWS, WGFD, and TNC to collaboratively assign a management status to administrative units under the agencies' jurisdiction (Appendix 4.5). Collaborators used the definitions provided by GAP (Table 4.1) and the NM-GAP key (Appendix 4.4) to assign land units to management status categories.

Table 4.2 Management status designated to land stewardship categories in Wyoming.

Status 1	Status 2	Status 3	Status 4
USFS Wilderness Areas	USFS Research Natural Areas	State Parks*	Native lands
NPS National Parks*	USFS National Recreation Areas	USFS National Forests*	State trust lands
NPS National Monuments	USFS Special Interest Areas	USFS National Grasslands*	Private lands
Nature Conservancy Preserves	State Wildlife Habitat Management Areas*	BLM lands	
National Wildlife Refuges*	NPS National Recreation Areas*	DOD military lands	

* Units may contain parcels coded to a numerically lower management status due to inclusion of private/state holdings

In some cases, administrative units could not be assigned to a single management status category because the unit was comprised of parcels of different ownership. For example, private and state trust lands occur within the boundaries of national parks, recreation areas and other federal- or state-managed units. The private and state trust lands within these boundaries are not managed in the same manner as the federal or state wildlife lands and were assigned to a different management status. Administrative units frequently had to be evaluated for management status on a case-by-case basis because management objectives specific to that particular area existed. For instance, some wildlife habitat management units managed by WGFD were established to maintain forage resources for specific big game species (status 2) while others were acquired to protect natural land cover types and habitats for a variety of animal species (status 1).

In assigning management status to water features, the same management status of the surrounding land was assigned to the water. Where a water body was encompassed by lands of different management status, such as in the case of rivers and large lakes/reservoirs, the polygon representing the water was partitioned in order to match up with adjacent land polygons of corresponding management status.

4.3 Results

Public lands comprise approximately 53.3% of Wyoming with 47% under federal and 6.3% under state jurisdiction (Table 4.3). The greatest concentration of federal lands occurs in the western, and especially the northwestern, portion of the state (Map 4.1). The BLM administers the largest amount (28%) of public land in the state and, for the most part, these lands exist in a mosaic with state and private lands. Private lands, including native American

Table 4.3. Area (ha) and percent (%) of Wyoming's land stewardship categories. Underlined categories represent 8 stewardship subtotals and bolded categories represent another grouping of 4 stewardship subtotals. The miscellaneous category includes areas such as open water that are not under specific jurisdictions. Accuracy of these numbers is discussed in section 4.2.1.

Land Stewardship Category	Total	%
National Park Service (Total)	(962,298)	(3.81)
National Park/Monument	956,310	3.79
National Recreation Area/Historic Site	5,988	0.02
U.S. Forest Service (Total)	(3,693,026)	(14.62)
National Forest	2,214,362	8.77
National Grassland	235,894	0.93
Wilderness Area/Scenic River	1,207,294	4.78
Research Natural/Special Interest Area	3,733	0.01
National Recreation Area	23,105	0.09
National Wildlife Refuge	8,637	0.03
U.S. Fish and Wildlife Service National Wildlife Refuge	28,771	0.11
Bureau of Land Management	7,181,183	28.43
Department of Defense	16,367	0.06
Total Federal lands	**11,881,645**	**47.03**

Table 4.3. continued.

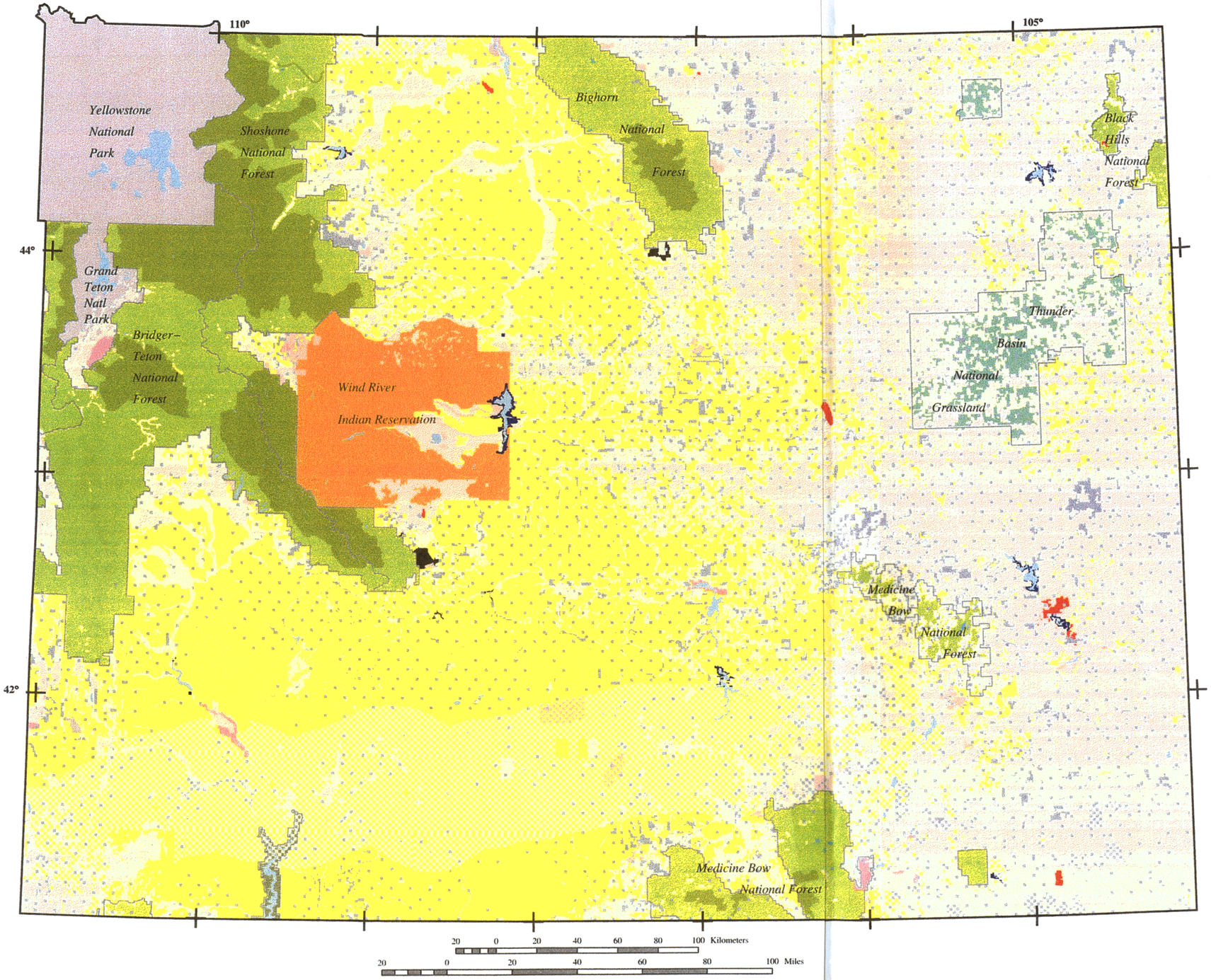
Native American lands		
Total Native American lands	**723,004**	**2.86**
State of Wyoming		
State Trust	1,467,815	5.81
State Park	28,721	0.11
State Wildlife Area	89,782	0.36
Total State of Wyoming lands	**1,586,318**	**6.28**
Private		
The Nature Conservancy	12,699	0.05
Other private lands	10,870,209	43.03
Total Private lands	**10,882,908**	**43.08**
Miscellaneous	189,441	0.75
TOTAL	**25,263,316**	**100.00**

lands (reservations) represent 45.9% of Wyoming's land area and the majority are located in the eastern half of the state (Map 4.1). Approximately 0.8% of Wyoming's surface is occupied by water (Table 4.3).

Less than 10% of Wyoming falls within areas designated as management status 1 and 2 (Table 4.4, Map 4.2). The majority of status 1 and 2 lands are located within the northwestern portion of the state and occur at elevations > 2250 m (7380 ft). Over 90% of all lands in Wyoming are classed as status 3 or 4 and these lands are made up of predominantly privately owned and multiple-use public lands. The area calculations in this section are reported to the nearest hectare so that they sum to the extent of the state, but it is important to note that these figures are only reliable within +/- 300 ft (91 m) (see section 4.2.1).

Table 4.4. Area (ha) and percent of 7 elevation ranges (m) by management status categories.

	Status 1 & 2		Status 3 & 4		Total
Elevation (m)	ha	%	ha	%	ha
900-1350	15,310	0.06	3,234,087	12.80	3,249,397
1350-1800	31,409	0.12	6,871,152	27.20	6,902,561
1800-2250	322,776	1.28	8,476,729	33.55	8,799,505
2250-2700	1,044,403	4.13	3,371,344	13.34	4,415,747
2700-3150	663,379	2.62	809,484	3.20	1,472,863
3150-3600	296,796	1.17	97,085	0.38	393,880
3600-4200	25,667	0.10	3,695	0.01	29,362
Total	2,399,740	9.50	22,863,576	90.50	25,263,316



Federal

- NPS National Park/Monument
- NPS National Recreation Area/Historic Site
- National Wildlife Refuge
- Bureau of Land Management
- Department of Defense
- USFS National Forest
- USFS Wilderness Area
- USFS National Grassland
- USFS National Recreation Area
- USFS Research Natural/Special Interest Area

State

- State Wildlife Habitat Area
- State Park
- Wyoming State Lands

Private

- Native American Lands
- Private Lands
- Nature Conservancy Preserve

Other

- Open Water

Lambert Conformal Conic Projection

1st standard parallel: 33.00
2nd standard parallel: 45.00
Central meridian: -107.30
Latitude of origin: 41.00
Datum: NAD27

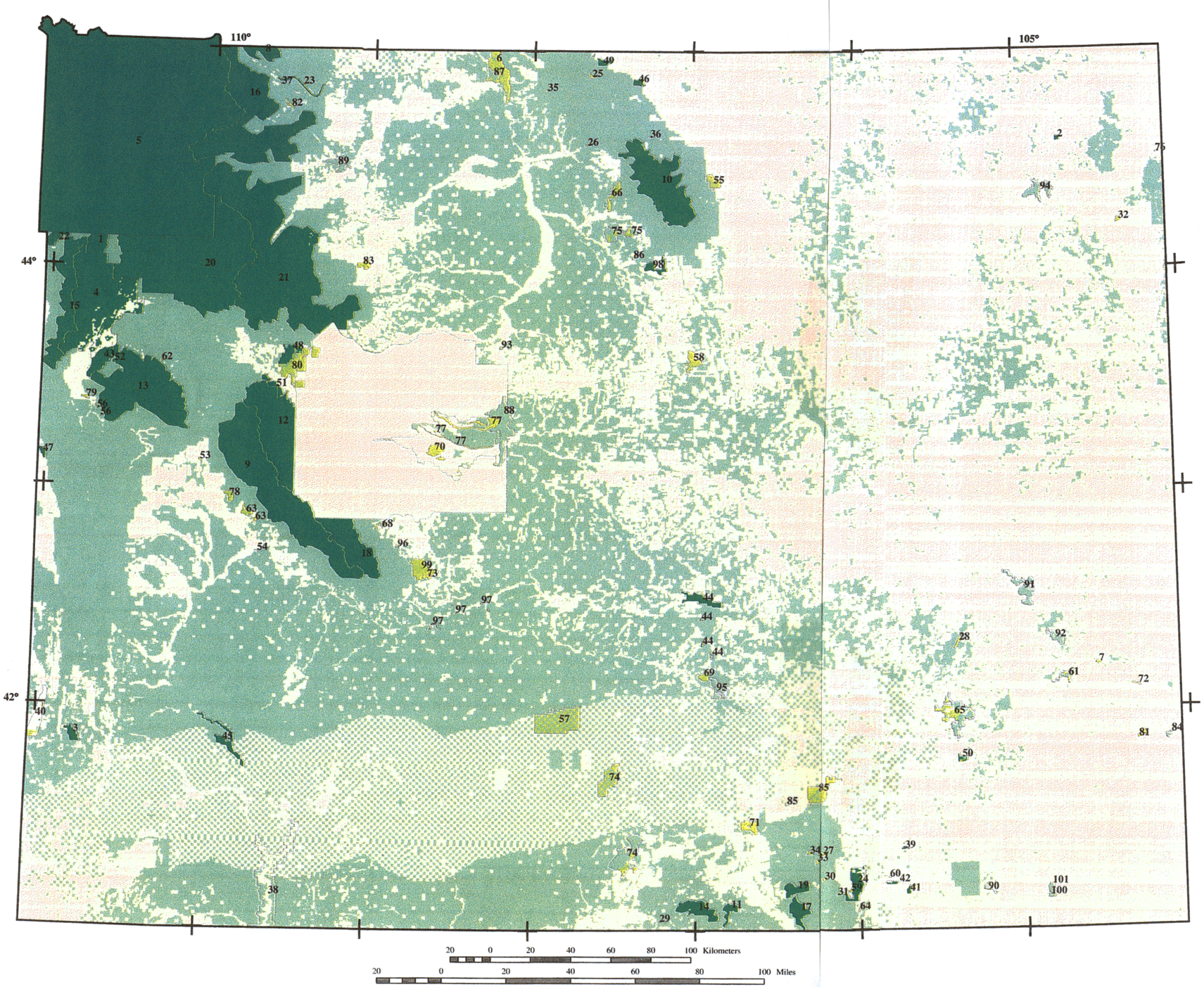
N
W E
S

Produced by Wyoming Cooperative Fish and Wildlife Research Unit

University of Wyoming, Laramie Wyoming
Map produced: December, 1996
Source date for ownership: 1994

Wyoming Gap Analysis

Map 4.1. Land stewardship for Wyoming.



Management Status Categories

- Status 1
- Status 2
- Status 3
- Status 4

Status 1 land has highest potential for biodiversity conservation.
See Table 4.1 for definitions of management status codes.
Numbers correspond to administrative units listed in Appendix 4.5.

Lambert Conformal Conic Projection
1st standard parallel: 33.00
2nd standard parallel: 45.00
Central meridian: -107.30
Latitude of origin: 41.00
Datum: NAD27

N
W E
S

Produced by Wyoming Cooperative
Fish and Wildlife Research Unit
University of Wyoming, Laramie Wyoming
Map produced: December, 1996
Source date for administration: 1994

Wyoming Gap Analysis

Map 4.2. Management status for Wyoming.

4.4 Accuracy Assessment

No formal accuracy assessment has been conducted of the land stewardship database. An informal verification was performed using two methods: by comparing ownership/administrative boundaries and thematic information with original sources, and by requesting informal map reviews from groups to which the map was distributed. Ownership boundaries digitized by WY-GAP were checked systematically for correct land coding by overlaying 1:100,000-scale plots of digital data with the source maps. This overlay process primarily verified thematic accuracy of the coverage, although positional errors greater than several line widths were detected and corrected. Similarly, thematic accuracy of administrative units was systematically checked by a visual comparison with source maps. In this process we did not quantify the number of corrections made nor estimate the overall thematic or positional accuracy. In the informal review process, agencies were asked to make updates and check ownership polygons for errors in exchange for receiving the data in draft form. Twenty three of the 56 1:100,000-scale quads in the state were checked by BLM personnel in this review process, and changes resulting from this review (mostly updates) were incorporated into the final version of the land stewardship map (Appendix 4.1, Appendix 4.3).

4.5 Limitations and Discussion

The land stewardship database includes publicly administrated units in the state with permanent mandates for conservation management. The difficulty in obtaining boundary and management information from private organizations precluded a comprehensive representation of conservation areas in private ownership. As a result, many private or Native American lands currently may be managed for their natural values, but because there were either no legal documents for these management objectives or the documentation was not readily available, they were not classified according to these conservation values. For instance, TNC has conservation easement agreements with private land holders which are legally documented in the land deeds. We were unable to obtain these deeds at the time of this project because they were undergoing revisions by TNC. As a result, the current database includes only three Nature Conservancy preserves for biodiversity protection. Future revisions and updates of the WY-GAP database should incorporate more information on private land management.

Despite protocols based on standard definitions (Table 4.1) and a key (Appendix 4.4) for assigning management status, unequivocal assignment of management status was not possible in all situations. For example, according to our key an administrative unit had to have a mandated management plan in operation to maintain a primarily natural state in order to be classified as management status 1 or 2. This requirement excluded large areas of lands with multiple-use management objectives, such as National Forests and BLM Areas of Critical Environmental Concern. Also, portions of National Forests are designated for timber harvest while other areas are removed from extractive activities to protect natural, biological, or cultural resources. Multiple-use lands, unlike Wilderness Areas that have permanent mandates for maintaining a natural state, are subject to changing management as the forest plans evolve. Therefore, public Multiple-use lands were not classified as status 1 or 2 as defined by GAP (Edwards et al. 1994).

Protocol for assigning management status was also complicated in situations where the boundaries of administrative units encompassed lands of multiple ownership. For instance, many state wildlife areas include private, federal, and state trust land. In some cases, these lands are subject to the management objectives of the administrating agency (WGFD), while in other cases they are subject to federal mandates, or are leased lands that are subject to specific terms of the lease agreement. Units composed of these ownership mosaics could not be uniformly assigned a status category using the key. Instead each management unit had to be reviewed on a case-by-case basis so that areas of different ownership could be assigned the correct management status based on federal, state or private mandates/lease arrangements.

Staying abreast of recent land purchases, consolidations, and exchanges on a statewide level is a formidable task, and it was not the goal of this project to keep the land ownership data up-to-date. Our purpose was to produce a "snapshot" in time of the land ownership status in Wyoming as accurate as possible for that time (1994). The land ownership map should in no way be considered a legal document. Information on land ownership and administrative units are expected to be as accurate and current as the source maps from which they were digitized. There were a significant number of updates and corrections made to the source maps (Appendix 4.3), based on information provided to us from state and federal agencies, but these should not be considered to be comprehensive for the entire state. Land-ownership changes $\leq$ 640 acres were not included, and complicated legal descriptions could not always be accurately recorded to the 1:100,000 scale. Finally, it is important to note that ownership designations currently reflect surface features only, and do not consider mineral or water rights.

4.6 Summary and Conclusions

Public lands comprise approximately 53.3% of Wyoming and occur primarily in the northwestern portion of the state. Less than 10% of the state occurs in status 1 and 2 lands. Most of these lands occur at elevations > 2250 m. Status 3 and 4 lands consist predominately of privately owned or public multiple-use lands. Not all lands could be unequivocally classified as to protection status. Information on the intended, long-term management of private lands, in particular, was not readily available. The land ownership map should in no way be interpreted as a legal document since changes in ownership of source maps used to develop this database have occurred.

CHAPTER 5

Analysis Based on Management Status

It seemed that the next minute they would discover a solution. Yet it was clear to both of them that the end was still far, far off and the hardest and most complicated part was only just beginning. - A. Chekhov

5.1 Background

Gap analysis provides information on the current management of two elements of biodiversity - land cover types and terrestrial vertebrate species - as a first step in planning for the conservation of biological diversity. For this analysis, we make the assumption that lands in management status 1 and 2 (see Chapter 4 for definitions) provide adequate protection to elements such that long-term viability of the elements may be maintained. We identify land cover types and terrestrial vertebrates that do not occur on protected lands (i.e., "gaps") and summarize how much area occupied by each element is protected in Wyoming. In addition, we summarize the stewardship of lands occupied by each land cover type and vertebrate species to provide land stewards with a perspective on their current and potential role in biodiversity conservation. We identify cover types and vertebrate species as candidates for further protection if $\leq 1\%$ or $\leq 50{,}000$ ha of their occupied area or habitat in Wyoming is currently protected. These criteria are preliminary guidelines, and we recognize that a more detailed analysis of area requirements, distribution, disturbance regimes, and other ecological factors will be needed in planning for the long-term maintenance of biodiversity. In the future, other components of biodiversity, such as the distribution of selected groups of invertebrates, rare plants, and aquatic organisms, can be incorporated into the WY-GAP database, and similar analyses can be conducted.

Information on current protection of land cover and terrestrial vertebrate species was generated by overlaying GIS maps of land cover types and predicted habitat of vertebrate species described in Chapters 2 and 3 with the land management status map described in Chapter 4. We highlight the results of these analyses in the sections below and present the detailed summaries in the appendices. Management implications of the results are provided in Chapter 6.

5.2. Land Stewardship and Management Status

Less than 10% of the state of Wyoming falls within status 1 and 2 lands. Most of these lands (90%) occur in the western portion of the state and are aggregated in 2 National Parks, 10 wilderness areas, 11 state Wildlife Habitat Management Areas (WHMA), 1 National Wildlife Refuge, and several other minor conservation areas in the Greater Yellowstone Ecosystem (GYE) (Table 5.1, Appendix 5.5). In contrast, most of the eastern third of the state is

Table 5.1. Area (ha) and percent (%) of Wyoming's land stewardship categories by land management status. Total area under public and private jurisdictions are bolded. Total area under the 8 major stewards in Wyoming are in parenthesis The miscellaneous category includes areas such as open water that are not under specific jurisdictions. Accuracy of these numbers is discussed in section 4.2.1.

	Status 1		Status 2		Status 3		Status 4		Total	
Land Stewardship Category	ha	%	ha	%	ha	%	ha	%	ha	%
National Park Service (Total)	(956,234)	(3.79)	(5,988)	(0.02)	(76)	(0.00)	(0)	(0.00)	(962,298)	(3.81)
National Park/Monument	956,234	3.79	0	0.00	76	>0.00	0	0.00	956,310	3.79
National Recreation Area/Historic Site	0	0.00	5,988	0.02	0	0.00	0	0.00	5,988	0.02
U.S. Forest Service (Total)	(1,216,211)	(4.81)	(3,807)	(0.02)	(2,473,008)	(9.79)	(0)	(0.00)	(3,693,026)	(14.62)
National Forest	280	>0.00	74	>0.00	2,214,009	8.76	0	0.00	2,214,362	8.77
National Grassland	0	0.00	0	0.00	235,894	0.93	0	0.00	235,894	0.93
Wilderness Area/Scenic River	1,207,294	4.78	0	0.00	0	0.00	0	0.00	1,207,294	4.78
Research Natural/Special Interest Area	0	0.00	3,733	0.01	0	0.00	0	0.00	3,733	0.01
National Recreation Area	0	0.00	0	0.00	23,105	0.09	0	0.00	23,105	0.09
National Wildlife Refuge	8,637	0.03	0	0.00	0	0.00	0	0.00	8,637	0.03
U.S. Fish and Wildlife Service Natl. Wildlife Refuge	27,221	0.11	1,462	0.01	88	>0.00	0	0.00	28,771	0.11
Bureau of Land Management	1,210	>0.00	11,070	0.04	7,168,903	28.38	0	0.00	7,181,183	28.43
Department of Defense	0	0.00	77	>0.00	16,290	0.06	0	0.00	16,367	0.06
Total Federal lands	**2,200,876**	**8.71**	**22,404**	**0.09**	**9,658,365**	**38.23**	**0**	**0.00**	**11,881,645**	**47.03**
Native American lands										
Total Native American lands	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**723,004**	**2.86**	**723,004**	**2.86**
State of Wyoming										
State Trust	259	>0.00	0	0.00	12,926	0.05	1,454,630	5.76	1,467,815	5.81
State Park	0	0.00	0	0.00	28,699	0.11	22	>0.00	28,721	0.11
State Wildlife Area	12,320	0.05	76,132	0.30	1,330	0.01	0	0.00	89,782	0.36
Total State of Wyoming lands	**12,579**	**0.05**	**76,132**	**0.30**	**42,955**	**0.17**	**1,454,652**	**5.76**	**1,586,318**	**6.28**
Private										
The Nature Conservancy	5,216	0.02	7,483	0.03	0	0.00	0	0.00	12,699	0.05
Other private lands	128	>0.00	2,689	0.01	7,670	0.03	10,859,722	42.99	10,870,209	43.03
Total Private lands	**5,344**	**0.02**	**10,171**	**0.04**	**7,670**	**0.03**	**10,859,722**	**42.99**	**10,882,908**	**43.08**
Miscellaneous	65,494	0.26	6,740	0.03	60,605	0.24	56,603	0.22	189,441	0.75
TOTAL	**2,284,293**	**9.04**	**115,447**	**0.46**	**9,769,595**	**38.67**	**13,093,981**	**51.83**	**25,263,316**	**100.00**

in private hands where the climate supports grassland vegetation, and dry-land farming is sometimes possible. Public lands in the eastern portion of the state are limited and are rarely in status 1 and 2 (Map 4.1). The only private lands that currently are designated as status 1 and 2 lands are TNC lands and private easements on national wildlife refuges. We recognize that we do not have a comprehensive representation of private lands in management status 1 and 2 because we were limited to voluntary submission of information about management of these lands.

Approximately 39% of the state of Wyoming is classified as management status 3 and these lands are largely in multiple use under the jurisdiction of the BLM (28.4%) and the USFS (9.8%). Just under half of the state is classified as status 4 because it occurs on lands under the stewardship of private citizens or Native Americans.

5.3 Land Cover

Anthropogenic types including irrigated cropland, dry-land cropland, human settlement, and mining operations were mapped as land cover types in Wyoming, but their conservation is not discussed in our gap analyses because they are not natural plant communities. Clearcuts are areas that are also modified by man, but are included in our analysis because they represent early successional stages of natural communities. Conservation of open water habitat is not emphasized in our analyses, even though it provides habitat for vertebrate species, because water resources will be addressed in the Aquatic Gap Program in more detail (P. Crist, personal communication). For the purpose of this discussion, we consider "minor" land cover types as those occupying < 50,000 ha (< 0.1%) of the state.

5.3.1 Land Cover and Land Stewardship

With the exceptions of ponderosa pine, limber pine woodland, and forest-dominated riparian, most forested land cover types found in Wyoming are under federal jurisdiction (Table 5.2). A high percentage of lands occupied by ponderosa pine (62%), limber pine (39%), and forest-dominated riparian (75%) are under private stewardship because they occur at low elevations, and in linear strips along mountain foothills, rocky ridges, or streams, About 3 times as much of the forested lands under federal stewardship in Wyoming are administered by the USFS as by either the NPS or the BLM (Appendix 5.1). The State of Wyoming administers relatively more forested areas occupied by limber pine, juniper woodland, and Douglas fir than other forest types for the same reasons described for private lands.

High elevation cover types, such as subalpine meadows, tundra meadows and grass-dominated wetlands, fall largely under federal jurisdiction. In contrast, grasslands occurring at low elevations (primarily in the eastern portion of the state) usually are privately owned (Table 5.2). Generally, shrubland cover types are more evenly distributed among public and private lands than are forested or grassland cover types (Table 5.2). Mesic and xeric upland shrubs are more prevalent on private and Native American lands than on federal or state lands, while basin big sagebrush and saltbush fans and flats exist primarily on federal lands. With the exception of unvegetated playas, most other natural land cover types occur on federal lands.

Table 5.2. Area and percent of land cover types within major land stewardship categories. The miscellaneous category includes areas such as open water that are not under specific jurisdictions. Accuracy of these numbers is discussed in section 4.2.1.

	Federal		Native		State		Private		Miscellaneous		Total
Cover type	ha	%	ha	%	ha	%	ha	%	ha	%	ha
Forest types											
Spruce-fir	455,395	90.05	22,892	4.53	3,224	0.64	22,290	4.41	1,942	0.38	505,743
Douglas fir	342,101	84.33	30,560	7.53	6,690	1.65	26,045	6.42	261	0.06	405,657
Lodgepole pine	1,529,046	91.29	37,090	2.21	23,269	1.39	77,994	4.66	7,533	0.45	1,674,932
Whitebark pine	72,947	99.58	0	0.00	138	0.19	129	0.18	42	0.06	73,255
Limber pine woodland	83,622	43.32	20,240	10.49	14,477	7.50	74,623	38.66	47	0.02	193,009
Ponderosa pine	224,607	27.14	0	0.00	71,514	8.64	531,184	64.20	137	0.02	827,442
Juniper woodland	287,128	50.45	48,881	8.59	44,422	7.80	187,656	32.97	1,103	0.19	569,190
Clearcut conifer	98,754	95.41	0	0.00	813	0.78	3,849	3.72	96	0.09	103,512
Burned conifer	287,216	99.80	0	0.00	0	0.00	0	0.00	569	0.20	287,785
Aspen forest	183,607	65.14	1,246	0.44	17,929	6.36	78,827	27.97	261	0.09	281,870
Bur oak woodland	7,891	78.27	0	0.00	44	0.44	2,148	21.30	0	0.00	10,083
Forest-dominated riparian	35,909	12.45	10,008	3.47	18,082	6.27	216,631	75.12	7,756	2.69	288,386
Shrub types											
Mesic upland shrub	7,023	26.58	0	0.00	3,424	12.96	15,949	60.37	22	0.08	26,418
Xeric upland shrub	41,779	20.90	0	0.00	21,811	10.91	136,268	68.16	69	0.03	199,927
Bitterbrush shrub steppe	1,579	61.73	273	10.63	343	13.38	349	13.60	18	0.65	2,562
Mountain big sagebrush	502,080	55.37	24,094	2.66	88,051	9.71	291,448	32.14	1,069	0.12	906,742
Wyoming big sagebrush	4,225,236	50.39	320,565	3.82	556,073	6.63	3,273,493	39.04	10,283	0.12	8,385,650
Black sagebrush steppe	29,197	61.68	0	0.00	3,894	8.23	14,229	30.06	16	0.03	47,336
Basin big sagebrush	73	100.00	0	0.00	0	0.00	0	0.00	0	0.00	73
Desert shrub	556,418	57.25	60,238	6.20	54,419	5.60	298,333	30.69	2,575	0.26	971,983
Saltbush fans and flats	619,257	81.78	12,823	1.69	35,568	4.70	88,686	11.71	860	0.11	757,194
Greasewood fans and flats	162,257	44.72	1,670	0.46	25,480	7.02	169,945	46.83	3,505	0.97	362,857
Vegetated dunes	25,146	56.90	0	0.00	4,025	9.11	14,730	33.33	292	0.66	44,193
Shrub-dominated riparian	110,898	39.10	7,367	2.60	22,681	8.00	138,818	48.94	3,870	1.36	283,634
Grass types											
Meadow tundra	84,767	98.00	0	0.00	142	0.16	1,122	1.30	470	0.54	86,501
Subalpine meadow	672,194	94.17	21,323	2.99	1,642	0.23	15,623	2.19	3,055	0.43	713,837
Mixed grass prairie	617,204	14.00	47,476	1.08	436,975	9.91	3,300,419	74.89	5,217	0.12	4,407,291
Short grass prairie	40	0.34	0	0.00	2,212	19.26	9,210	80.22	21	0.17	11,483
Great Basin foothills grassland	13,428	67.07	0	0.00	555	2.77	6,020	30.06	20	0.10	20,023
Grass-dominated wetland	9,075	74.49	211	1.73	448	3.67	1,603	13.16	847	6.95	12,184
Grass-dominated riparian	6,122	9.38	0	0.00	8,031	12.31	50,415	77.28	671	1.03	65,239
Unvegetated types											
Alpine exposed rock/soil	279,579	96.77	7,312	2.53	23	0.01	732	0.25	1,262	0.44	288,908
Basin exposed rock/soil	191,308	54.45	11,153	3.17	21,130	6.01	125,343	35.67	2,427	0.69	351,361
Unvegetated playa	4,357	1.37	0	0.00	574	6.77	1,980	23.34	1,571	18.52	8,482
Active sand dunes	14,315	80.85	0	0.00	479	2.71	2,911	16.43	3	0.01	17,708
Permanent snow	2,653	100.00	0	0.00	0	0.00	0	0.00	0	0.00	2,653
Anthropogenic/water types											
Human settlements	2,913	4.09	1,480	2.08	2,488	3.50	63,710	89.60	522	0.73	71,113
Dry-land crops	25,277	3.67	1,304	0.19	39,356	5.71	622,510	90.31	851	0.12	689,298
Irrigated crops	48,071	4.31	34,217	3.07	48,215	4.32	978,149	87.64	7,471	0.67	1,116,123
Surface mining operations	13,379	24.71	0	0.00	4,856	8.97	35,427	65.44	475	0.88	54,137
Miscellaneous	7,856	5.71	572	0.42	2,807	2.04	4,099	2.98	122,209	88.85	137,543
Total	11,881,702		722,995		1,586,304		10,882,897		189,418		25,263,316

5.3.2 Land Cover and Management Status

Seven natural land cover types have > 50% of their land area protected (Table 5.3) and are the best protected among all Wyoming land cover types. Subalpine meadow, alpine exposed rock, meadow tundra, whitebark pine, and permanent snow are well protected because they occur at the highest elevations (Fig. 5.1), where most protected lands are found (Table 5.3). Of these types, whitebark pine deserves further conservation attention because of its limited extent (Table 5.3) and its vulnerability to pine bark beetle attack (Kendall 1995). The burned conifer type is 99% protected because, with one exception in the Bighorn Mountains, burned areas mapped at our 100-ha MMU occurred only in and adjacent to Yellowstone National Park (Merrill et al. 1996a) and resulted from the widespread fires of 1988.

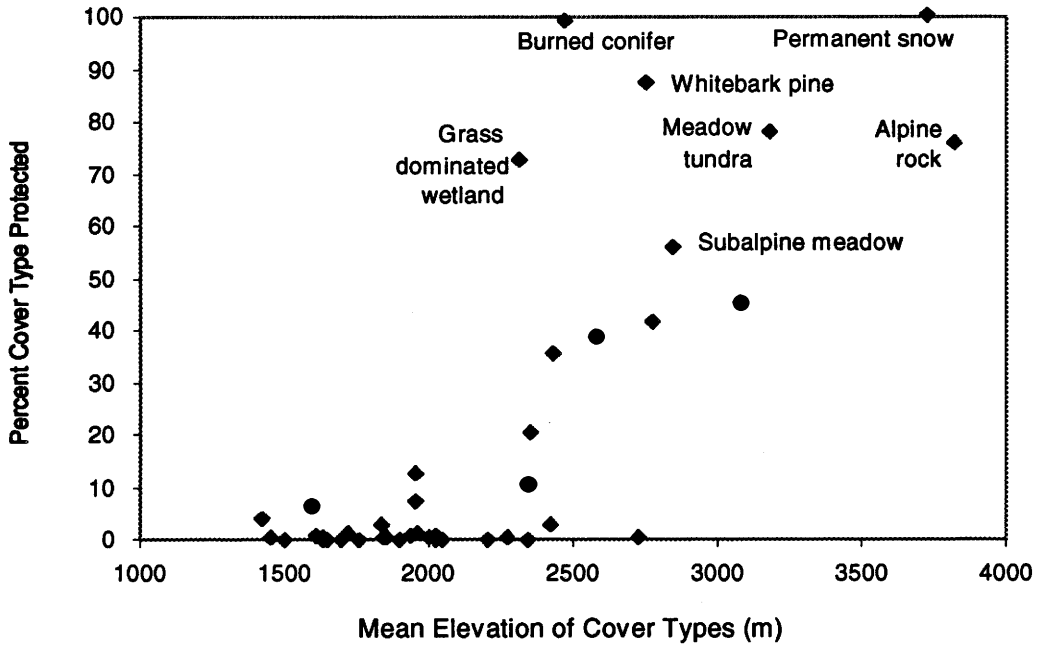


Figure 5.1. Percent of land cover types in management status 1 and 2 in relation to mean elevation (m) of the area occupied by cover types.

Our analysis also indicates that grass-dominated wetland is well protected (73%), but this result is biased because information on wetlands in Yellowstone National Park was incorporated directly into our map from Despain (1990). Wetlands are distributed more widely in other areas of the state than the land cover data indicate, but because they usually occur in small patches, they were not readily distinguishable at our MMU. Given their ecological importance, especially in arid areas, and the limitations of our large MMU for delineating wetlands, further analysis is needed to adequately address their conservation.

Six land cover types have over 10% but less than 50% of the land they occupy in status 1 and 2 lands (Table 5.3). Because they are widespread and have > 50,000 ha in protected lands, the principal concern for conserving 4 of these types (spruce-fir, lodgepole pine, Douglas fir, and

Table 5.3. Area (ha) and percent of land cover types by management status. Accuracy of these numbers is discussed in section 4.2.1.

	Status 1		Status 2		Status 3		Status 4		Status 1 & 2		State
Cover type	ha	%	ha	%	ha	%	ha	%	ha	%	ha
≥ 1,000,000 ha											
Wyoming big sagebrush	19,291	0.23	30,278	0.36	4,227,455	50.41	4,108,626	49.00	49,569	0.59	8,385,650
Mixed grass prairie	9,473	0.21	13,621	0.31	617,403	14.01	3,766,794	85.47	23,094	0.52	4,407,291
Lodgepole pine	646,148	38.58	2,096	0.13	889,959	53.13	136,728	8.16	648,244	38.70	1,674,932
≥ 500,000 ha											
Desert shrub	414	0.04	5,190	0.53	563,778	58.00	402,602	41.42	5,604	0.58	971,983
Mountain big sagebrush	79,653	8.78	15,728	1.73	426,583	47.05	384,777	42.44	95,381	10.52	906,742
Ponderosa pine	830	0.10	5,793	0.70	223,379	27.00	597,440	72.20	6,623	0.80	827,442
Saltbush fans and flats	0	0.00	3,929	0.52	617,919	81.61	135,346	17.87	3,929	0.52	757,194
Subalpine meadow	398,837	55.87	168	0.02	275,872	38.65	38,960	5.46	399,005	55.90	713,837
Juniper woodland	1,512	0.27	4,796	0.84	288,641	50.71	274,241	48.18	6,308	1.11	569,190
Spruce-fir	210,607	41.64	288	0	245,824	48.61	49,024	9.69	210,895	41.70	505,743
≥ 100,000 ha											
Douglas fir	142,322	35.08	1,061	0.26	202,401	49.89	59,873	14.76	143,383	35.35	405,657
Greasewood fans and flats	3,226	0.89	7,791	2.15	162,088	44.67	189,752	52.29	11,017	3.04	362,857
Basin exposed rock/soil	2,749	0.78	1,746	0.50	188,293	53.59	158,573	45.13	4,495	1.28	351,361
Alpine exposed rock/soil	218,637	75.68	456	0.16	61,656	21.34	8,158	2.82	219,093	75.84	288,908
Burned conifer	286,161	99.44	0	0.00	1,624	0.56	0	0.00	286,161	99.44	287,785
Forest-dominated riparian	14,245	4.94	4,046	1.40	24,052	8.34	246,042	85.32	18,291	6.34	288,386
Shrub-dominated riparian	32,515	11.46	3,098	1.09	80,075	28.23	167,945	59.21	35,613	12.56	283,634
Aspen forest	7,560	2.68	795	0.28	176,731	62.70	96,784	34.34	8,355	2.96	281,870
Xeric upland shrub	347	0.17	296	0.15	41,680	20.85	157,605	78.83	643	0.32	199,927
Limber pine woodland	4	0.00	520	0.27	84,012	43.53	108,473	56.20	524	0.27	193,009
Clearcut conifer	124	0.12	95	0.09	98,581	95.24	4,713	4.55	218	0.21	103,512
≥ 50,000 ha											
Meadow tundra	67,346	77.86	0	0.00	17,890	20.68	1,265	1.46	67,346	77.86	86,501
Whitebark pine	63,919	87.26	0	0.00	9,067	12.38	268	0.37	63,919	87.26	73,255
Grass-dominated riparian	2,674	4.10	0	0.00	4,294	6.58	58,271	89.32	2,674	4.10	65,239
< 50,000 ha											
Black sagebrush steppe	0	0.00	0	0.00	29,192	61.67	18,144	38.33	0	0.00	47,336
Vegetated dunes	293	0.66	0	0.00	25,063	56.71	18,837	42.62	293	0.66	44,193
Mesic upland shrub	1,899	7.19	35	0.13	5,123	19.39	19,361	73.29	1,934	7.32	26,418
Great Basin foothills grassland	3,834	19.15	291	1.45	9,613	48.01	6,285	31.39	4,125	20.60	20,023
Active sand dunes	0	0.00	0	0.00	14,317	80.85	3,391	19.15	0	0.00	17,708
Grass-dominated wetland	8,438	69.25	439	3.61	1,187	9.74	2,120	17.40	8,877	72.85	12,184
Short grass prairie	0	0.00	0	0.00	40	0.34	11,444	99.66	0	0.00	11,483
Bur oak woodland	0	0.00	0	0.00	7,890	78.25	2,193	21.75	0	0.00	10,083
Unvegetated playa	0	0.00	0	0.00	5,447	64.22	3,035	35.78	0	0.00	8,482
Permanent snow	2,653	100.00	0	0.00	0	0.00	0	0.00	2,653	100.0	2,653
Bitterbrush shrub steppe	0	0.00	0	0.00	1,729	67.49	833	32.51	0	0.00	2,562
Basin big sagebrush	0	0.00	0	0.00	73	99.86	0	0.14	0	0.00	73
Anthropogenic/water types											
Human settlements	17	0.02	50	0.07	2,940	4.13	68,106	95.77	67	0.09	71,113
Dry-land crops	4	0.00	1,166	0.17	26,042	3.78	662,086	96.05	1,170	0.17	689,298
Irrigated crops	1,846	0.17	6,081	0.54	50,536	4.53	1,057,661	94.76	7,927	0.71	1,116,123
Surface mining operations	6	0.01	0	0.00	13,535	25.00	40,596	74.99	6	0.01	54,137
Open water	56,711	41.23	5,592	4.07	47,609	34.61	27,630	20.09	62,303	45.30	137,543
Total	2,284,292		115,447		9,769,596		13,093,981		2,399,739		25,263,316

mountain big sagebrush) is the maintenance of their structural characteristics originally maintained by fire (Loope and Gruell 1973, Britton and Ralphs 1979, Romme and Knight 1981), rather than their continued existence in Wyoming (Knight 1987, Ferry et al. 1995). For example, areas of lodgepole pine that are not in status 1 and 2 lands largely undergo clearcut management, developing block patterns of more or less even-aged trees, separated by a relatively dense network of roads. Whether or not clear-cutting simulates wildfires in maintaining the integrity of this ecosystem is debatable (Knight 1994). Even in status 1 and 2 lands, fire management policy is subject to political forces and fire regimes are influenced by roads and special area management (Knight and Wallace 1989).

In contrast, Great Basin foothills grassland is a relatively uncommon type in Wyoming because it occurs only in the foothills of mountains and only 21% (4,125 ha) of the area occupied is in management status 1 or 2. Most of this occurs along the base of the Tetons and in the Bighorn mountains. The Great Basin foothills grassland cover type is similar in floristic composition to the Palouse prairie of eastern Washington (Barbour et al. 1987), a vegetation type that has largely been converted to agriculture. Additional protection of this type is important, and could be accomplished along with other foothills environments, through judicious selection of management areas in coordination with conservation efforts in Montana and Idaho.

Seven of the land cover types have between 1 and 10% of their areas protected. Mesic upland shrub has the smallest area protected (< 2,000 ha). This type most commonly occurs in small, mesic, micro-environments (Knight 1994) that are often smaller than the GAP MMU. For this reason they are probably under-represented in their distribution on the WY-GAP land cover map. Mesic upland shrub communities are vulnerable to grazing disturbance, but less vulnerable to mining, logging or agriculture because they are widely scattered and occur in foothill areas where the latter land management practices are not as economically viable. Greasewood fans and flats and basin exposed rock and soil are widely distributed (> 350,000 ha), yet these types also are relatively unprotected. Greasewood fans and flats have little agricultural value and this type is mainly grazed by sheep and cattle, but within limits, because of the protective spines and toxic foliage of this species (Robertson 1983, Smith et al. 1992). The only foreseeable threat to this type would be destruction through oil and gas exploitation (Bureau of Land Management 1990, 1992). Grazing could be a threat to the graminoids and forbs that are associated with the greasewood. Basin exposed rock and soil is also relatively unprotected. From a biological point of view, the 1.28% protected may be adequate because this type is widely distributed across an extensive area and is unlikely to become vegetated due its innate instability. Some badland areas may be of greater interest for their esthetic values.

Although only 1.1% of the juniper woodlands in Wyoming is protected, there is little concern over its future because it is abundant both in Wyoming (> 500,000 ha) and in neighboring states to the south and west (Kuchler 1964). In the latter areas, the juniper type is, itself, a threat through its rapid expansion in the absence of fire (Ferry et al. 1995). In contrast, aspen is usually a successional type and whether current protection (3%) is sufficient depends on the maintenance of natural disturbance regimes through fire management (Schier and Campbell 1978, Bartos 1991, Knight 1994), clearcutting (Schier and Campbell 1978, Shields 1981), or compensatory cutting to stimulate regeneration (Greenway 1990).

Riparian types are only moderately protected in Wyoming (Table 5.3), but are of great importance for the maintenance of biodiversity on both local and landscape scales because the features they provide in arid environments are unique for a variety of species (Auble 1995). The situation with riparian cover types is similar to that described for grass-dominated wetlands above because they occur in small, often linear areas that are generally less than the MMU and are likely to be under-represented in the land cover data. In particular, protection is inadequate in the dry, western basins and in the eastern Great Plains. Because of their ecological importance, as well as their vulnerability to grazing and exotic invasions (Busch and Scott 1995), additional efforts to estimate the extent and condition of riparian zones throughout the state should be a high priority for future assessment of habitat conditions in Wyoming.

Sixteen land cover types have ≤ 1% of the land they occupy in status 1 and 2 lands (Table 5.3), indicating a need to further protect these land cover types in Wyoming. Two of these land cover types, Wyoming big sagebrush and mixed grass prairie, are widely distributed (> 4 million ha) in Wyoming, and in adjacent states (West 1983), and are probably not a high priority for conservation efforts overall. Nevertheless, the structure and functioning of the Wyoming big sagebrush type may be altered by grazing, fire regimes, exotic invasions and development of oil and gas (Miller et al. 1996, Young 1983, West and Hassan 1985, Bureau of Land Management 1990, 1992). Mixed grass prairies are primarily concentrated in the eastern third of the state where they are mainly used for cattle grazing, which does not pose a threat to this type in Wyoming as long as the grazing is moderate. Where extensive flat areas occur in this type, some of the area has been converted to dry-land farming for wheat, while in other cases sites have been plowed and reseeded to exotic range grasses. Should this conversion process continue, it could have serious consequences (Laurenroth et al. 1994), but no data on the extent or rate at which this conversion is taking place exist.

Saltbush fans and flats, along with desert shrub, greasewood fans and flats, and unvegetated playas have <1% of their areas in protection status 1 and 2. These four land cover types are part of topographic sequences in the lower portions of the western Wyoming basins. Collectively they amount to a very large area, but they are not well protected because they typically have received little ecological or conservation attention, especially compared with more mesic land cover types in the mountainous areas. If the currently proposed BLM wilderness study areas are formalized, it will only increase the amount of protected saltbush fans and flats and desert shrub by 1.4% and 0.91%, respectively, and will not increase the amount of protected area for unvegetated playa and greasewood fans and flats. All four of these basin types are vulnerable in equal or lesser degrees to many of the same kinds of threats as described for Wyoming big sagebrush. Changes in fire regimes or invasion by exotic plants are perhaps more serious considerations for desert shrub (West 1983) than the more xeric saltbush and greasewood types. Xeric saltbush and greasewood types are less likely to ever have carried fire, and the extreme edaphic sites occupied by these types are less vulnerable to exotic plant invasion. Saltbush fans and flats are also less likely to be threatened by grazing because the dominant species, saltbush (*Atriplex gardneri* (Moq.) D. Dietr.), is protected by high concentrations of salt (Knight 1994) and oxalic acid (Ellern et al. 1974) and rebounds well after grazing (West 1988).

Although ponderosa pine is also fairly widespread in Wyoming, over much of its extent it has been altered by logging and natural fire suppression so that natural, open stands of ponderosa pine are rare (Knight 1994, Ferry et al. 1995). Fire suppression in ponderosa pine areas has resulted in crowded stands, highly susceptible to drought, disease and insect attack, and to severe stand-destroying fires (Mutch et al. 1993). Maintenance of this type within protected lands requires prescribed ground fires due to the demographics of the species, and to vulnerability of old growth stands to pine bark beetle attack (Knight 1994). Despite long-standing requests by environmental groups for setting aside part of the finest stands in the Laramie Range in southeastern Wyoming, none have achieved protection status. Further protection of natural stands of ponderosa pine should remain a priority in the overall program for maintaining ecosystems in Wyoming.

The xeric upland shrub type and limber pine forests are not restricted in Wyoming but have < 650 ha protected. The xeric upland shrub type occurs on rocky outcrops, particularly on sandstone and limestone ridges of southeastern and southwestern Wyoming and on the fringes of the Bighorn Mountains (Map 2.1). This type is currently protected in small areas under 3 different jurisdictions (Appendix 5.1). The limber pine woodland cover type is found on dry slopes of central and southern Wyoming and in mountain ranges throughout the state with the exception of the Black Hills (Map 2.1), but is protected only in the Laramie Peak WHMA. Because these 2 types are fairly extensive in Wyoming and occur in rocky, dry land areas that are not likely to be developed, they are not of highest conservation priority, but their long-term management nevertheless merits further consideration. Public stewardship of most of the areas occupied by xeric upland shrub (20%) and limber pine (40%) is under the jurisdiction of BLM (Appendix 5.1). With formalization of the BLM wilderness areas, the percent of protected limber pine woodland would not increase, and xeric upland shrub will increase only by 0.64% (1270 ha).

The remaining 8 cover types have little to no protection in Wyoming (Table 5.3), indicating a high priority for conservation. Several of these types, even though they are restricted in Wyoming, are found extensively in other states. For example, < 10,000 ha (none protected) of unvegetated playa is mapped within Wyoming. These areas are extensive throughout the Great Basin as a result of the lakes that covered this area during the Pleistocene but are now dry, saline playas (West 1983). These types could be protected within topographic sequences of western Wyoming basins as described for saltbush flats above with little effort and loss of productive lands. BLM has jurisdiction over most of the public lands occupied by unvegetated playas (51%), saltbush fans and flats (82%), desert shrub (56%), and greasewood fans (44%) (Appendix 5.1).

Similarly, shortgrass prairie, which also has no protection in Wyoming, reaches the northern and western extent of its range in the extreme southeast corner of Wyoming and consequently is a peripheral type in this state (Knight 1994). The cover type extends across large areas southward through Colorado, Kansas, and into the panhandles of Oklahoma and Texas, where warmer temperatures favor it over the mixed grass prairie species that are more common in Wyoming (Barbour et al. 1987). However, unique community associations may exist in the peripheral areas of its range, meriting further management considerations. In Wyoming, this type

occurs in a climate which supports dry-land wheat farming (Map 2.1) and wherever land in this cover type is flat enough to permit large-scale mechanical operations, it is vulnerable to conversion to agricultural land use. Since shortgrass prairie occurs on rougher topographic positions in southeastern Wyoming, a more detailed analysis is needed to indicate whether these areas are sufficient to conserve this type over the long term. Most (19%) of the shortgrass areas on public lands are under the stewardship of the State of Wyoming (Appendix 5.1).

Four land cover types are probably of lower conservation concern than our analysis indicates because they are patchily distributed and probably under-represented in the WY-GAP land cover map. Black sagebrush steppe often is intermixed with Wyoming big sagebrush and, as a result, it may be protected within the enormous extent of Wyoming big sagebrush. In addition, it is common throughout the southwestern states (Zamora and Tueller 1973) and typically occurs on poor, often shallow, soils that are not likely to be used for agriculture. Likewise, bitterbrush shrub steppe is widely distributed as small inclusions in other types in Wyoming, often around rocky outcrops which are not likely to be developed. Bitterbrush communities, though rarely extensive, also are fairly widespread from New Mexico to British Columbia and west from California to Oregon and Washington at elevations from sea level to close to 11,000 feet (Giunta et al. 1978). Basin big sagebrush very rarely exists in areas large enough to comprise a GAP MMU, but this cover type is quite extensive as a narrow, linear feature along the lower terraces of many perennial and ephemeral streams in western Wyoming at low elevations. Because of their typically linear configuration, these stands are unlikely to comprise an entire 100 ha MMU. Should these terraces undergo flood irrigation development, this type would be highly vulnerable to loss (Ganskood 1986). On the other hand, it probably will always be present as small inclusions in draws in Wyoming big sagebrush terrains.

Dune complexes are scattered throughout Wyoming but are most common along a path across the central Great Divide basin near Casper (Map 2.1). While active dunes are easily recognized, and, therefore, probably accurately identified, vegetated dunes are not easily recognized on satellite imagery or even on the ground, and may be under-estimated. In Wyoming, these types are often mosaics of both vegetated and active forms that require careful protection from disturbance due to the unstable soils. We estimate < 300 ha of vegetated dunes are currently protected and this protection occurs at Pathfinder Wildlife Refuge. Active sand dunes currently do not occur on any status 1 or 2 lands. With the formalization of BLM's Sand Dunes and Buffalo Hump Wilderness Study Areas, an estimated 4,527 and 381 additional hectares would be protected, corresponding to a 26.5% increase in protection. Although BLM is the primary steward (56%) of areas occupied by vegetated dunes, this type would not increase with formalization of any of the BLM wilderness study areas.

Finally, bur oak woodland in Wyoming is found only in the Black Hills of the northeastern corner of the state where it occurs as part of a complex mosaic with ponderosa pine, aspen, and mixed grass prairie (Knight 1994). This type extends into the South Dakota Black Hills, but nowhere is it a common type. In fact, this type is of phytogeographic interest as a Pleistocene remnant of eastern deciduous forest elements in the Great Plains (Daubenmire 1978), and undoubtedly contributes to habitat quality through its associated shrub and acorn production (Knight 1994). Although there are no evident threats to this type at this time, it clearly deserves

priority for conservation because it is unprotected. Most lands occupied by this type in Wyoming occur on USFS lands (78%) and efforts to conserve this type may require coordination among jurisdictions in Wyoming and South Dakota.

5.4 Terrestrial Vertebrate Species

In summarizing information on the distribution of terrestrial vertebrate species by management status, it is important to identify special characteristics of some species' distributions (peripheral, disjunct, endemic) which may influence how they should be viewed within a statewide context. We defined peripheral species in Wyoming as those species which have < 10% of their total range distribution in Wyoming and occupy < 10% of the state (B. Csuti, personal communication). Because birds were not mapped from range maps, their habitat is more fragmented than other taxa (see Chapter 3) and frequently constituted < 10% of the state of Wyoming even when they were well distributed throughout the state. Therefore, we considered birds as peripheral if they were listed as peripheral, rare migrants, or uncommon migrants by Oakleaf et al. (1992). We designated a species as disjunct if its habitat in Wyoming was considerably disconnected from the major portion of its range. Species or subspecies were designated endemic if they occurred only in Wyoming or primarily in Wyoming and adjacent portions of other states. Four primary sources other than WY-GAP databases were used to determine whether a species was considered peripheral or disjunct (Robbins et al. 1993, Baxter and Stone 1985, Clark and Stromberg 1987, Oakleaf et al. 1992). Rankings as to species' sensitivity are based on federal (U.S. Fish and Wildlife), state (WGFD), and private (TNC) listings (Garber 1995, Wyoming Game and Fish Dept. 1996).

5.4.1 Species Distribution and Land Stewardship

Habitat of amphibians and reptiles generally occurred more under private stewardship than federal stewardship because they are concentrated in the eastern portion of Wyoming (Table 5.4). In contrast, habitats of birds and mammals were more equally distributed among federal and private stewardships because they are distributed more evenly across the state (Table 5.4). Stewardship of the potential habitat of each species is listed in Appendix 5.2.

Table 5.4. Average percent of the total habitat area (ha) of species within taxonomic groups by major land stewardship categories. The miscellaneous category includes areas such as open water that are not under specific jurisdictions.

Taxonomic group	Federal	Native	State	Private	Miscellaneous
Amphibians	33.60	1.61	7.08	57.04	0.67
Reptiles	30.36	3.07	7.67	59.66	0.24
Mammals	46.54	2.79	6.41	43.91	0.34
Birds	44.43	2.38	6.37	46.07	0.75

5.4.2 Species Distributions and Management Status

A smaller percentage of potential habitat of amphibians (8.8%) and reptiles (2.6%) occur on average in status 1 and 2 lands than either birds (14.4%) or mammals (14.5%) (Appendix 5.3).

Amphibians

None of the 12 amphibians occurring in Wyoming had > 50% of their state-wide potential habitat in status 1 and 2 lands, and only 3 species, the spotted frog (*Rana pretiosa*) (49%), the boreal chorus frog (*Pseudacris triseriata maculata*) (20%), and the boreal western toad (*Bufo boreas boreas*) (15%) had >10% of their habitat protected (Table 5.5, Appendix 5.3). The spotted frog and the boreal chorus frog occur at relatively high elevations (Fig 5.2A) including areas in northwestern portion of the state (Merrill et al. 1996b) where 90% of the status 1 and 2 lands occur (Map 4.1).

Table 5.5. Number (No.) and percent (%) of species with 0%, > 0 - 1%, > 1%-10%, > 10-50% and >50% of their potential distribution within management status 1 and 2.

	0 %		> 0 - 1%		>1 - 10%		> 10 - 50%		> 50%		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Amphibians	0	0.0	5	41.7	4	33.3	3	25.0	0	0.0	12
Reptiles	3	11.5	16	61.5	4	15.5	3	11.5	0	0.0	26
Mammals	5	4.3	32	27.6	40	34.5	30	25.9	9	7.7	116
Birds	2	0.7	29	10.0	130	44.7	113	38.8	17	5.8	291

Four amphibians have between 1 - 10% of their habitat in protected areas (Table 5.5). Two of these species, the Wyoming toad (*Bufo hemiophrys baxteri*) and the wood frog (*Rana sylvatica*), have a very limited amount of potential habitat in status 1 and 2 lands (Table 5.6). The Wyoming toad is a subspecies of the Manitoba toad and is a federally listed endangered subspecies. In recent years, much of the potential habitat of the toad mapped by WY-GAP in the Laramie basin has been surveyed (Young 1994), and the toad has been found only in ponds within the Mortenson Lake National Wildlife Refuge. An intensive program is currently underway to recover the Wyoming toad under the Endangered Species Act (Stone 1991). Populations of the wood frog in Wyoming are considered part of the disjunct populations of this species in the central Rocky Mountains. In Wyoming, these populations occur in two separate mountain ranges, the Medicine Bow and Bighorn Mountains, where < 3,500 ha are protected in about equal amounts in each range. The populations of wood frog in Wyoming are glacial relic populations (Bagdonas and Pette 1976) and controversy surrounds their taxonomy (Bagdonas 1971). Studies on the wood frog in Colorado qualified the future of these disjunct populations as uncertain because of their dependence on ephemeral habitat and poor dispersal capabilities, apparently a consequence of the relatively xeric montane forest compared to the more lush conditions of northeastern North America (Haynes and Aird 1981).

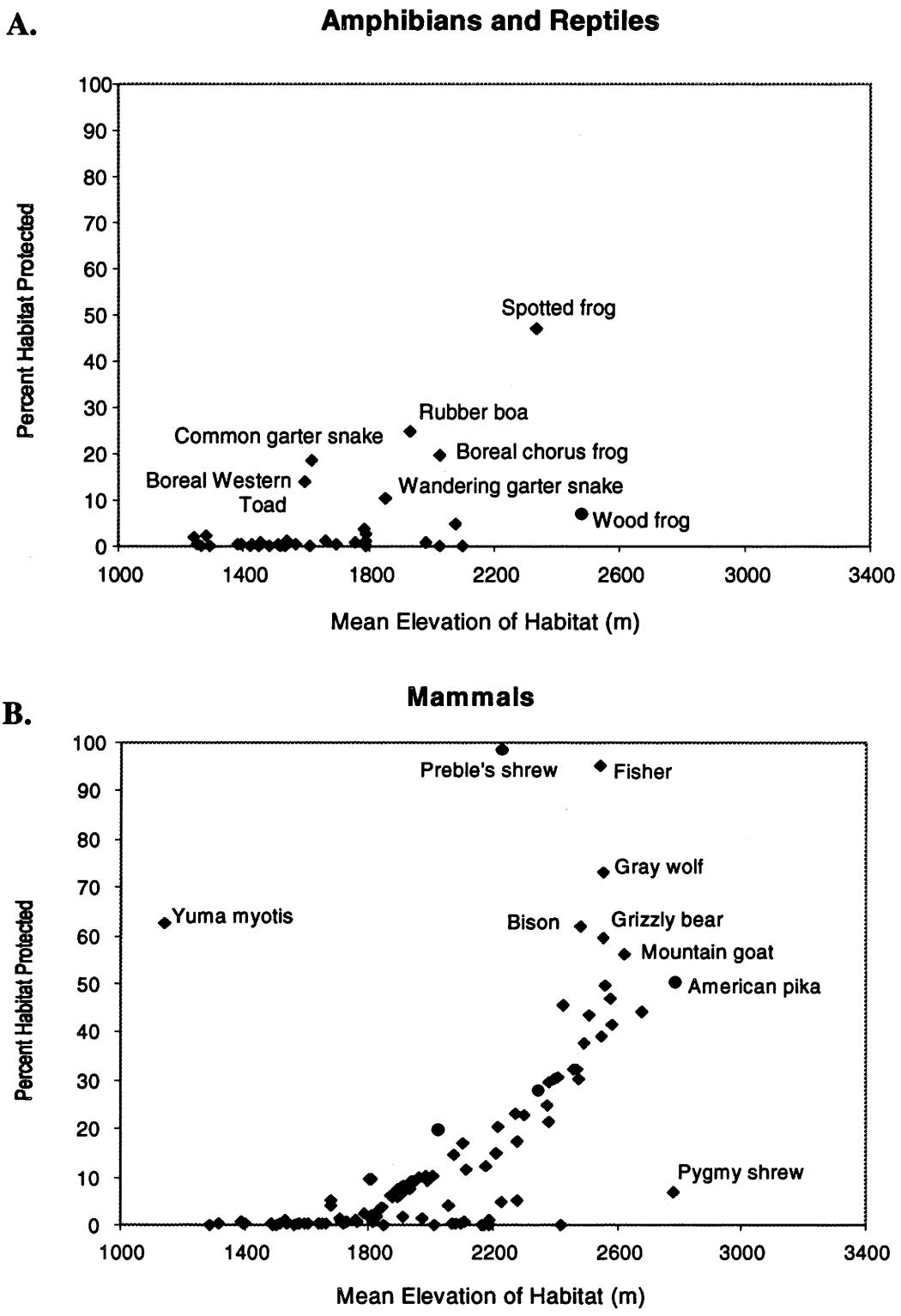


Fig. 5.2. Percent of species habitat in management status 1 and 2 in relation to mean elevation (m) of the species habitat for amphibians and reptiles (A), mammals (B), and birds (C).

C.

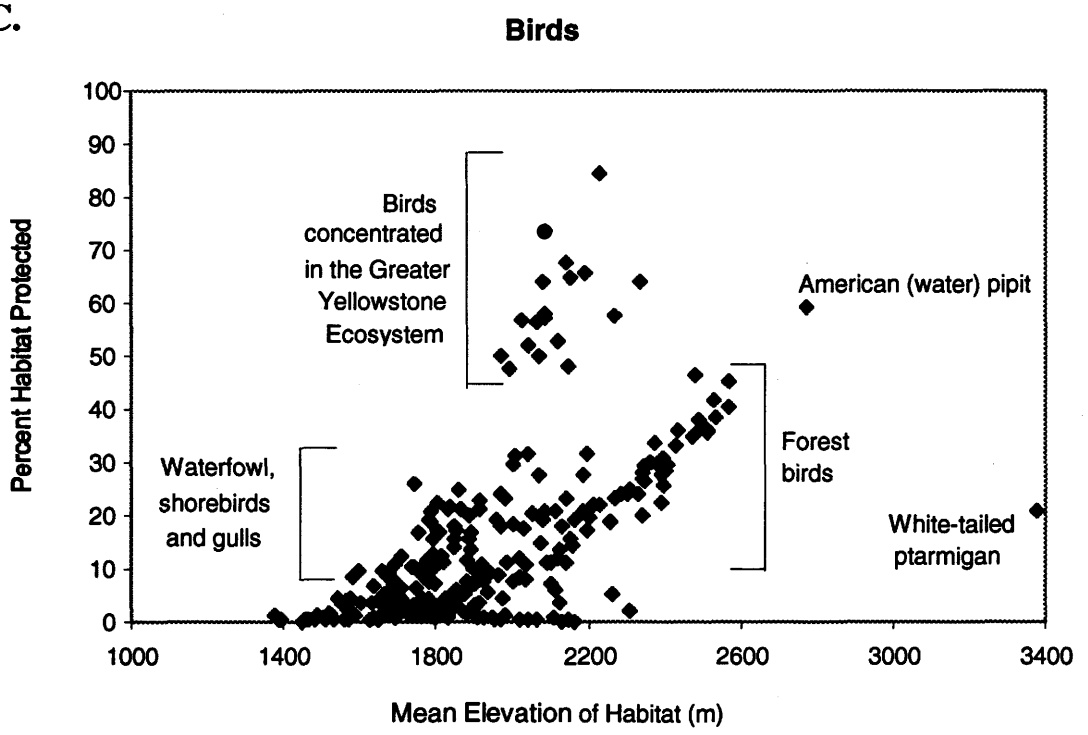


Fig. 5.2 continued.

Four out of five amphibian species that have ≤ 1% of their total habitat in status 1 and 2 lands (Table 5.6) are found primarily in the eastern portion of Wyoming. In particular, the bullfrog (*Rana catesbeiana*) and Great plains toad (*Bufo cognatus*) have a very limited amount of potential habitat protected. The bullfrog ranges from southern Canada to Mexico, but is considered a peripheral species in Wyoming that has spread up the North Platte River from Nebraska (Baxter and Stone 1985). In contrast, the Great Plains toad is listed as a common species (Baxter and Stone 1985) but has very limited protected habitat (208 ha). About half of the Great Plains toad's habitat is mapped in Devils Tower National Monument and the other half in Sand Creek Wildlife Habitat Management Area in northeast Wyoming (Appendix 5.2). Potential habitat that could be managed for this species occurs primarily on state lands along tributaries of the Belle Fourche River (Merrill et al. 1996b).

The Great Basin spadefoot toad (*Scaphiopus intermontanus*) also has < 1 % of its total habitat in status 1 or 2 lands (Table 5.6). This species is the only amphibian in Wyoming with a range limited to the southwestern sagebrush and desert shrub communities of the state. Official designation of the BLM wilderness areas in this portion of the state, particularly the Honeycomb Buttes and Sand Dunes WSAs, would nearly double (0.77% to 1.54%) the amount of protected habitat for this species. Establishment of BLM's proposed wilderness areas would not considerably increase the protection of other amphibian species.

Table 5.6. State range, state and federal rankings, area (ha) and percent habitat of 7 amphibian and 24 reptilian species which have < 1 % or < 50,000 ha of their total potential habitat within management status 1 and 2 lands.

		Rankings			Habitat		
Common name	Range	TNC	FWS	WGFD	Status 1 & 2	Total	Percent
Amphibians							
Great plains toad	.	.	.	.	208	399,432	0.05
Plains spadefoot toad	.	.	.	.	33,871	10,138,807	0.33
Bullfrog	P	.	.	.	1,372	292,067	0.47
Woodhouse's toad	.	.	.	.	9,468	1,571,371	0.60
Great Basin spadefoot toad	.	.	.	.	34,898	4,514,003	0.77
Wyoming toad	END	S1	LE	.	1,641	32,382	5.07
Wood frog	DIS	S2	.	.	3,810	51,722	7.37
Reptiles							
Northern plateau lizard	P	.	.	.	0	599,409	0.00
Northern tree lizard	P	.	.	.	0	517,738	0.00
Northern earless lizard	P	.	.	.	0	347,497	0.00
Northern prairie lizard	P	.	.	.	128	1,225,858	0.01
Ornate box turtle	P	.	.	.	9	63,187	0.02
Northern many-lined skink	P	.	.	.	149	956,147	0.02
Great Basin gopher snake	P	.	.	.	256	1,351,021	0.02
Midget faded rattlesnake	.	.	.	.	141	478,073	0.03
Plains hognose snake	.	.	.	.	4,865	6,410,174	0.08
Red-lipped prairie lizard	P	.	.	.	1,478	914,999	0.16
Black hills redbelly snake	.	.	.	.	483	272,662	0.18
Prairie lined racerunner	P	.	.	.	596	330,940	0.18
Common snapping turtle	P	.	.	.	1,605	496,021	0.32
Pale milk snake	.	.	.	.	11,645	2,739,073	0.43
Bullsnake	.	.	.	.	53,387	11,612,898	0.46
Eastern short-horned lizard	.	.	.	.	88,429	16,046,746	0.55
Western plains garter snake	P	.	.	.	998	180,650	0.55
Northern sagebrush lizard	.	.	.	.	123,178	16,588,830	0.74
Prairie rattlesnake	.	.	.	.	146,051	15,000,506	0.97
Eastern yellowbelly racer	.	.	.	.	34,289	3,070,895	1.12
Smooth green snake	DIS	.	.	.	9,803	856,357	1.14
Western spiny softshell turtle	P	.	.	.	8,412	418,729	2.01
Western painted turtle	P	.	.	.	8,482	373,913	2.27
Common garter snake	P	.	.	.	45,769	235,027	19.47

Range: P is range peripheral to Wyoming; P? is peripheral status uncertain; END is endemic; DIS is disjunct.
TNC rank: S1 and S2 refers to species critically imperiled in the state because of extreme rarity (S1) or rarity (S2). SU is status uncertain; SA is accidental in state; SE is exotic, introduced to the state. B is breeding status, N is non-breeding status (Garber 1995).
FWS rank: LE is listed as endangered; LT is listed as threatened; C is candidate for listing (U.S. Fish and Wildlife Service listings).
WGFD rank: SSC1 is sensitive species of concern 1-3 with 1 being of highest concern (Wy. Game & Fish Dept. 1996).

Reptiles

None of the 26 reptiles found in Wyoming have > 50% of their habitat protected and only three reptiles, the wandering (*Thamnophis elegans vagrans*) and common (*Thamnophis sirtalis*) garter snakes and rubber boa (*Charina bottae*), have > 10% of their potential habitat occurring in status 1 and 2 lands (Table 5.6). The habitat of these species is relatively well protected because they are the only reptiles that have a significant amount of their potential habitat at high elevations, particularly in the Greater Yellowstone Ecosystem (GYE) (Merrill et al. 1996b). Although our results indicate considerable habitat is protected, Baxter and Stone (1985) consider the rubber boa rare and suggest its habitat warrants conservation. Others suspect that the nocturnal and fossorial habits contribute to its apparent rarity (Koch and Peterson 1995).

All of the remaining reptiles in Wyoming have < 2.5 % of their habitat in status 1 and 2 lands (Table 5.6) because they occur primarily at low elevations (Fig. 5.2A) which are not well protected in Wyoming. Four species are widely distributed (> 11 million ha total habitat) and have > 50,000 ha of potential habitat in protected lands (Appendix 5.3). Two of these species, the northern sagebrush lizard (*Sceloporus graciosus graciosus*) and eastern short-horned lizard (*Phrynosoma douglassi brevirostre*) are wide-spread and common in Wyoming, and the opportunities to contribute to the species' conservation with further habitat protection are great. The bullsnake (*Pituophis melanoleucas sayi*) and the prairie rattlesnake (*Crotalus viridis viridis*) are both common species in Wyoming, but their habitat may warrant further protection because of intrusive land development (Baxter and Stone 1985, Koch and Peterson 1995).

The remaining 19 species have either $\leq$ 1% or < 50,000 ha of their total habitat in status 1 and 2 lands. Thirteen of these species, however, meet our definition of peripheral species in Wyoming (Table 5.6), and none are federally listed or candidates for federal listing. Conservation of these species may need to be evaluated on a regional basis rather than within state boundaries alone. Of the six remaining species, the plains hognose snake (*Heterodon nasicus nasicus*), eastern yellowbelly racer (*Coluber constrictor flaviventris*) and pale milk snake (*Lampropeltis triangulum multistrata*) occur primarily on private land (> 65%) in eastern Wyoming, but opportunities for further habitat protection also occur on BLM and State of Wyoming lands (Appendix 5.2). Populations of the smooth green snake (*Opheodrys vernalis*) in the western states, including Wyoming, are isolated from its more eastern populations. The currently protected habitat of the species in Wyoming occurs primarily in three areas under the stewardship of the State of Wyoming and the U.S. Forest Service. Most of the unprotected habitat on public lands occurs in the Medicine Bow and Black Hills National Forests. The U.S. Forest Service is also the principle land steward of unprotected habitat of the Black Hills redbelly snake (*Storeria occipitomaculata pahasapae*) in Wyoming (Appendix 5.2).

Establishment of BLM wilderness areas would not protect sufficient additional habitat of any reptiles to remove them from our list of under-protected species. Habitat of the majority (62%) of the 26 reptiles in Wyoming did not overlap with the proposed WSA. Three of the four species occurring exclusively in the southwestern portion of the state where the WSA exist are considered peripheral to Wyoming. The fourth species, the midget faded rattlesnake (*Crotalus viridis concolor*), occurs primarily in the vicinity the lower Green River, with approximately 50%

of its unprotected habitat occurring under the stewardship of BLM. Official designation of the BLM wilderness areas would increase the protected habitat for this species to only 5,006 ha (1.1 %), based on the two WSAs, Devil's Playground and Twin Buttes, which occur in the lower Green River area.

Mammals

Nine (8%) of the 116 mammals of Wyoming currently have > 50% of their potential habitat in status 1 and 2 lands (Table 5.5). These include the lynx (*Lynx canadensis*) (50%), American pika (*Ochotona princeps*) (51%), mountain goat (*Oreamnos americanus*) (57%), Yuma myotis (*Myotis yumanensis*) (64%), grizzly bear (*Ursus arctos*) (60%), American bison (*Bos bison*) (63%), gray wolf (*Canis lupus*) (73%), fisher (*Martes pennanti*) (96%), and Preble's shrew (*Sorex preblei*) (99%) (Appendix 5.3). With one exception, the potential habitat of all of these species is well protected because it occurs primarily in the GYE in the northwestern portion of the state (Merrill et al. 1996b). The exception is the Yuma myotis, which has 64% of its potential habitat protected in the Bighorn Canyon National Recreation Area. The actual presence of this species in Wyoming is questionable since previous documentation has been refuted based on misidentification of the species (R. Luce, pers. communication). Thirty mammals (26%) have 10 - 50 % and 40 (35%) have > 1 - 10% of their potential habitat in protected lands (Table 5.5, Appendix 5.3). These species occur more broadly across the state, but because protected lands occur at high elevations, species with high elevation habitat preferences are more protected (Fig. 5.2B).

Five mammals (4%) have no habitat and 32 mammals (28%) have $\leq$ 1% of their habitat located in status 1 or 2 lands (Table 5.5) and are considered species in need of further habitat protection. Distributions of 15 of these species are peripheral to Wyoming, although so little is known about the distribution of 10 of these species in Wyoming that their peripheral status is questionable (Table 5.7). WGFD (1996) has designated 4 of the peripheral species as Species of Special Concern (Table 5.7). The importance of habitat in Wyoming to the long-term conservation of these species may need to be assessed at a broader scale. The remaining 22 species with $\leq$ 1% of protected habitat occur primarily in the low elevation grasslands and basins in the eastern half of the state and their habitat falls under private (> 50 %) stewardship. Exceptions are the Wyoming pocket gopher (*Thomomys clusius*), and pygmy rabbit (*Brachylagus idahoensis*) which are restricted to southwestern Wyoming. Over 65% of their unprotected habitat occurs under the stewardship of BLM (Appendix 5.2). Although the amount of protected habitat for these two species would be doubled with the establishment of the BLM wilderness areas, $\leq$ 1 % and < 50,000 ha of their habitat would still be protected and they would remain on the gap list. Only two of the mammals, the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*) and Ord's kangaroo rat (*Dipodomys ordii*), would be removed from the gap list if BLM WSAs were included as status 1 lands. The majority of additional protected habitat for both of these species would occur in the Honeycomb Buttes and Sand Dunes WSAs.

Three other species may be considered gap species because they have < 50,000 ha of protected habitat and are not considered peripheral to Wyoming (Table 5.7). We consider the habitat of two of these, Allen's 13-lined ground squirrel (*Spermophilus tridecemlineatus alleni*)

Table 5.7. State range, state and federal rankings, area (ha) and percent habitat of 43 mammalian species which have < 1 % or < 50,000 ha of their total potential habitat within management status 1 and 2 lands.

		Rankings			Habitat		
Common name	Range	TNC	FWS	WGFD	Status 1 & 2	Total	Percent
Cliff chipmunk	P?	.	.	SSC3	0	201,149	0.00
Abert's squirrel	P	.	.	.	0	14,292	0.00
Canyon mouse	P?	.	.	SSC3	0	200,444	0.00
Pinyon mouse	P?	.	.	SSC3	0	404,643	0.00
Western spotted skunk	P?	.	.	.	0	191,362	0.00
Spotted ground squirrel	P	.	.	.	738	1,343,841	0.05
Brazilian free-tailed bat	P?	.	.	.	50	91,650	0.06
Silky pocket mouse	.	.	.	.	3,129	4,631,182	0.07
Hispid pocket mouse	.	.	.	.	4,164	5,939,713	0.07
Plains pocket gopher	.	.	.	.	5,480	4,633,255	0.12
Bear Lodge meadow jumping mouse	END	S2	.	.	1,219	945,424	0.13
Least weasel	P?	.	.	.	576	317,368	0.18
Black-tailed prairie dog	.	.	.	SSC2	14,188	7,035,376	0.20
Eastern mole	P	.	.	.	2,084	1,015,258	0.21
Gray fox	.	.	.	.	16,509	7,613,806	0.22
Black-tailed jack rabbit	.	.	.	.	19,035	8,341,891	0.23
Keen's myotis	P	SU	.	SSC2	978	416,516	0.23
Eastern cottontail	.	.	.	.	13,585	4,242,956	0.32
Black-footed ferret	.	S1	LE	SSC1	1,966	607,849	0.32
Plains harvest mouse	.	.	.	.	29,847	8,991,187	0.33
Swift fox	.	.	C	SSC3	53,482	13,985,677	0.38
Wyoming pocket gopher	END	.	.	.	3,445	851,363	0.40
Hayden's shrew	P?	S2	.	.	3,936	964,289	0.41
Plains pocket mouse	.	.	.	.	11,144	2,668,075	0.42
California myotis	P?	.	.	.	1,510	346,100	0.44
Pygmy rabbit	.	.	.	SSC3	12,447	2,586,204	0.48
Eastern spotted skunk	P?	.	.	.	3,061	616,414	0.50
Western harvest mouse	.	.	.	.	59,464	11,925,638	0.50
Prairie vole	.	.	.	.	73,412	14,192,042	0.52
Preble's meadow jumping mouse	END	S1	.	.	14,705	2,814,460	0.52
Fringed myotis	.	.	.	SSC2	31,577	5,736,635	0.55
Olive-backed pocket mouse	.	.	.	.	91,108	16,090,406	0.57
Great basin pocket mouse	P?	.	.	.	8,264	1,382,187	0.60
Ord's kangaroo rat	.	.	.	.	100,260	16,672,160	0.60
Northern grasshopper mouse	.	.	.	.	111,018	18,084,310	0.61
White-footed mouse	P	.	.	.	5,923	896,727	0.66
Thirteen-lined ground squirrel	.	.	.	.	171,473	18,483,532	0.93
Eastern fox squirrel	.	SE	.	.	36,285	3,148,084	1.15
Ringtail	P?	.	.	.	22,077	1,847,238	1.20
Allen's 13-lined ground squirrel	END	S1	.	.	40,787	795,132	5.13
Pygmy shrew	DIS	S2	.	SSC2	9,042	132,387	6.83
Yuma myotis	P?	.	.	.	6,171	9,671	63.81
Fisher	P	.	.	.	40,191	41,683	96.42

See Table 5.6 for explanation of codes.

and the pygmy shrew (*Sorex hoyi*), as needing additional protection. Most of the unprotected habitat of the pygmy shrew falls under the stewardship of the U.S. Forest Service (88%) while that of the Allen's 13-lined ground squirrel occurs under a number of stewardships including private landowners (31%), BLM (29%), State of Wyoming (8%) and U.S. Forest Service (13%). In contrast, we do not consider the eastern fox squirrel (*Scurius niger*), which also has < 50,000 ha (1.5%) protected, as a species whose habitat is high priority for conservation. The species does not meet our criteria for a peripheral species, but it reaches its western limit in Wyoming and is considered an exotic species since many of the fox squirrels in Wyoming today are descended from individuals introduced into cities by humans (Clark and Stromberg 1987).

Birds

Seventeen (6%) of the 291 birds in Wyoming had > 50% of their potential habitat in status 1 and 2 lands (Table 5.5). These are all birds associated with open water and all but one have restricted (< 250,000 ha) distributions that occur primarily in the GYE (Merrill et al. 199b). A high proportion of the habitat of these species is protected because it includes Yellowstone and/or Jackson Lakes which are large bodies of water contained in National Parks. Habitat of the American (water) pipit (*Anthus spinoletta*) is widespread (> 1,500,000 ha) because it includes a wide variety of high elevation land cover types (Merrill et al. 1996b) and it occurs in the Bighorn and the Medicine Bow Mountain ranges as well as the GYE (Merrill et al. 1996b).

One hundred thirteen (39%) birds have 10 - 50%, and 130 (45%) birds have 1 - 10% of their potential habitat protected (Table 5.5). Similar to mammals, the protection of avian habitat is related to its elevational distribution (Fig. 5.2C), but unlike mammals, two distinct patterns emerge among bird species. First, birds associated with open water habitats (e.g., waterfowl, shorebirds, gulls) have a higher proportion of their habitat protected than other species at the same elevations (Fig. 5.1C) because they are associated with open water which is generally well (45%) protected in Wyoming (Table 5.3). Second, birds associated with forests in Wyoming are more protected compared to birds associated with basin shrublands and prairie grasslands because forests generally occur at higher elevations and have a higher percentage of lands within management status 1 and 2 (Table 5.3).

Two birds had no habitat and 29 (10%) birds had $\leq$ 1% of their potential habitat in status 1 and 2 lands and are considered gap species whose habitat is in need of further protection (Table 5.8). Habitat of these species is unprotected because they generally occur at low elevations (< 2200 m: Fig. 5.1C) where few protected lands occur. About half (15) of these species are located in the eastern half of the state and > 70% of their habitat occurs on private lands, about one third of the species (10) occur in the Green River area and > 50% of their habitat is under BLM stewardship, and about one fifth (6) of the species occur more broadly across the state in the foothills and basins with their habitat under both private and BLM stewardship. Twelve of these species are peripheral, rare, accidental, or uncommon migrants in Wyoming (Table 5.8) and, as such, their habitat from a species conservation perspective may not receive the highest priority for conservation in the state. An exception is the piping plover which is listed as endangered (Garber 1995).

Table 5.8. State range, state and federal rankings, area (ha) and percent habitat of 74 avian species which have < 1 % or < 50,000 ha of their total potential habitat within management status 1 and 2 lands.

		Rankings			Habitat		
Common name	Range	TNC	FWS	WGFD	Status 1 & 2	Total	Percent
Plain titmouse	P	.	.	SSC3	0	231,761	0.00
Scott's oriole	P	.	.	SSC3	0	613,235	0.00
Cassin's kingbird	.	.	.	.	4,908	2,244,257	0.22
McCown's longspur	.	.	.	.	8,516	3,795,451	0.22
Chimney swift	.	.	.	.	1,093	468,591	0.23
Piping plover	P	S2N	LE	.	10	4,018	0.24
Sharp-tailed grouse	.	.	.	.	19,838	6,798,489	0.29
Orchard oriole	P	.	.	.	6,895	2,361,815	0.29
Upland sandpiper	.	S2B,S3N	.	.	20,621	6,579,293	0.31
Ash-throated flycatcher	P	.	.	SSC3	7,585	2,221,354	0.34
Grasshopper sparrow	.	.	.	.	20,152	5,635,972	0.36
Blue-gray gnatcatcher	.	.	.	.	9,336	2,418,349	0.39
Black-throated gray warbler	.	.	.	.	10,164	2,601,988	0.39
Northern mockingbird	.	.	.	.	11,488	2,661,769	0.43
Bushtit	P	.	.	SSC3	1,838	415,124	0.44
Eastern bluebird	P	.	.	.	4,597	1,019,209	0.45
Baird's sparrow	.	.	.	.	5,471	1,155,207	0.47
Scrub jay	P	.	.	SSC3	11,704	2,335,692	0.50
Northern bobwhite	.	.	.	.	2,013	376,272	0.54
Surf scoter	P	SA	.	.	347	63,136	0.55
Eastern phoebe	P	.	.	.	2,841	505,141	0.56
Gray flycatcher	.	.	.	.	19,120	3,387,683	0.56
Bewick's wren	P	.	.	.	14,648	2,348,269	0.62
Ring-necked pheasant	.	SE	.	.	41,000	6,104,978	0.67
Summer tanager	P	SA	.	.	620	88,726	0.70
Short-eared owl	.	.	.	.	146,453	17,598,442	0.83
Gray partridge	.	SE	.	.	90,735	10,642,216	0.85
Mountain plover	.	S2B,S2N	C	.	52,848	6,074,413	0.87
Sage grouse	.	.	.	.	159,260	17,081,778	0.93
Sage sparrow	.	.	.	.	69,418	7,339,493	0.95
Eastern screech owl	.	.	.	.	121,616	12,332,726	0.99
Snow bunting	.	.	.	.	42,718	4,211,364	1.01
Blue grosbeak	P	.	.	.	8,023	772,387	1.04
Broad-winged hawk	P	SA	.	.	1,356	129,542	1.05
Yellow-breasted chat	.	.	.	.	14,710	1,274,755	1.15
Cattle egret	P	SA	.	.	16,586	1,423,504	1.17
Dickcissel	.	.	.	.	20,466	1,669,178	1.23
Field sparrow	.	.	.	.	19,182	1,563,911	1.23
Blackpoll warbler	P?	SA	.	.	6,975	515,343	1.35
Lesser golden plover	P	.	.	.	9,024	642,741	1.40
Whimbrel	P	.	.	.	3,090	190,159	1.63
Ovenbird	.	.	.	.	21,119	1,199,804	1.76
House finch	.	.	.	.	20,702	1,154,057	1.79
Columbian sharp-tailed grouse	.	S1	.	.	6,676	341,370	1.96
Bobolink	.	.	.	.	44,449	2,016,480	2.20
Long-billed dowitcher	.	.	.	.	15,202	689,078	2.21

Table 5.8 continued.

Common name	Range	Rankings			Habitat		
		TNC	FWS	WGFD	Status 1 & 2	Total	Percent
Rose-breasted grosbeak	.	.	.	.	21,298	686,722	3.10
Lapland longspur	.	.	.	.	31,766	947,969	3.35
Lesser goldfinch	P?	.	.	.	28,625	818,936	3.50
Black-billed cuckoo	.	.	.	.	29,160	726,978	4.01
Black-throated blue warbler	P	SA	.	.	8,496	206,225	4.12
Snowy plover	P?	S1	.	.	937	21,922	4.27
Blue jay	.	.	.	.	44,936	1,032,926	4.35
Yellow-billed cuckoo	.	S2B	.	SSC2	12,660	282,882	4.48
Greater white-fronted goose	P	.	.	.	13,114	292,907	4.48
Purple finch	.	.	.	.	3,899	84,173	4.63
Northern parula	P	SA	.	.	4,418	94,078	4.70
Magnolia warbler	P	SA	.	.	4,996	98,159	5.09
American bittern	.	.	.	SSC3	28,689	510,594	5.62
Canyon wren	.	SA	.	.	49,756	864,162	5.76
Virginia's warbler	.	.	.	.	43,450	694,043	6.26
Harris' sparrow	.	.	.	.	27,202	305,747	8.90
Red-eyed vireo	.	.	.	.	48,747	520,911	9.36
Sprague's pipit	P?	.	.	.	41,521	422,203	9.83
Great egret	P	SA	.	.	44,403	409,960	10.83
Nashville warbler	P	.	.	.	12,042	103,392	11.65
Black-and-white warbler	P?	.	.	.	18,065	139,796	12.92
Chestnut-sided warbler	P	SA	.	.	8,549	52,184	16.38
White-tailed ptarmigan	.	S1	.	.	2,183	10,225	21.35
Northern waterthrush	P?	.	.	.	49,733	222,924	22.31
Herring gull	.	S1B	.	.	44,104	141,022	31.27
Stilt sandpiper	P?	.	.	.	12,041	23,790	50.61
Western sandpiper	P?	.	.	.	36,992	64,169	57.65
Semipalmated sandpiper	P?	.	.	.	48,758	74,170	65.74

See Table 5.6 for explanation of codes.

Of the remaining non-peripheral species with $\leq$ 1% of their habitat protected, thirteen have <50,000 ha in status 1 or 2 lands (Table 5.8) and these species deserve high priority for further habitat protection. Most of these species, including the Cassin's kingbird (*Tyranannus vociferans*), the chimney swift (*Chaetura pelagica*), the blue-gray gnatcatcher (*Polioptila caerulea*), the Baird's sparrow (*Ammodramus bairdii*), and the northern bobwhite (*Colinus virginianus*) are either rare or uncommon residents of Wyoming (Oakleaf et al. 1992. In contrast, McCown's longspur (*Calacrius maccownii*) is a common summer resident that is broadly distributed (> 3.7 million ha) in Wyoming.

An additional 22 species that are not considered peripheral in Wyoming have <50,000 ha of potential habitat protected and, as a result, we include these species in our list of vertebrate species in need of further habitat protection. In particular, 4 species (blue grosbeak (*Guiraca caerulea*), purple finch (*Carpodacus purpureus*) , Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), and the white-tailed ptarmigan (*Lagopus leucurus*)) have the least

amount of habitat in status 1 and 2 lands (<10,000 ha). In Wyoming, the blue grosbeak and purple finch are considered a rare summer resident and an uncommon winter resident, respectively (Oakleaf et al. 1992), but in terms of their overall range, they might be considered peripherals to the state (Robbins et al. 1983). The white-tailed ptarmigan is a high elevation species considered a rare resident of the state (Oakleaf et al. 1992) that has been seen recently only in the Medicine Bow Mountains (Merrill et al. 1996b). However, other suitable habitat exists in other areas of the state primarily under the stewardship of the U.S. Forest Service (98%). Habitat of the Columbian sharp-tailed grouse is protected in three wilderness areas in the Sierra Madre and Medicine Bow mountains, and the potential for additional protection occurs on U.S. Forest Service (22%) and BLM (34%) land.

Eight birds, representing 20% of the bird species on the gap list that are not peripheral, would be removed from the gap list by official designation of the BLM WSAs. These include the sage grouse (*Centrocercus urophasianus*), mountain plover (*Charadrius montanus*), Eastern screech owl (*Otus asio*), short-eared owl (*Asio flammeus*), canyon wren (*Catherpes mexicanus*) and sage sparrow (*Amphispiza belli*). The remaining two species, the gray partridge (*Perdix perdix*) and ring-necked pheasant (*Phasianus colchicus*), are exotic game species which are not considered a priority for biodiversity management in Wyoming.

5.5 Summary

Less than 10% of the state of Wyoming is classified as status 1 and 2 lands, and 90% of these lands occur in the Greater Yellowstone Ecosystem (GYE) in the northwestern portion of the state. Seven of the 41 land cover types occur at high elevations and are well (> 50%) protected in Wyoming because they occur in national parks and wilderness areas. Sixteen of 36 natural (non-anthropogenic) land cover types have $\leq$ 1% or < 50,000 ha of the area they occupy in status 1 and 2 lands, though only 11 (31 %) of these are actually considered to be gaps. Wyoming big sagebrush and mixed grass prairie are not included as gaps because of their wide distribution in the state. Black sagebrush steppe and bitterbrush shrub steppe are also not included as gaps because their actual distribution was probably underestimated in our analysis, due to mapping difficulties. Finally, clearcut conifer is not included because of its anthropogenic nature. In addition to the 11 gap cover types, Great Basin foothills grasslands, mesic upland shrub, and all the riparian/wetland types are also considered to be underprotected in Wyoming, even though they have > 1% of the area they occupy in status 1 and 2 lands.

Habitats of 6 (50 %) amphibians, 8 (31%) reptiles, 25 (22 %) mammals, and 41 (14%) birds that are not considered peripheral in Wyoming merit increased management attention. There are an additional 12 mammals and 9 birds with $\leq$ 1% or < 50,000 ha of habitat in status 1 and 2 lands that are designated as uncertain peripherals, since not enough is known about their distribution to determine whether they should be considered as gaps. The habitat of most of these species is primarily at low elevations in the eastern portion of the state or in the Green River area where status 1 and 2 lands are uncommon. Species that are most protected occur in the northwestern portion of the state and are associated with either open water or forests.

CHAPTER 6

Management Implications and Current Directions

Planning without action is futile. Action without planning is fatal.
- K. Hamilton and E. Bergersen

6.1 Management Implications of Gap Analysis

The purpose of gap analysis is to identify two elements of biodiversity – land cover types and vertebrate species – in need of protection before they become critically rare. The gap analysis approach uses management objectives associated with land area as an indication of the kinds of activities that can occur on an area, and hence the potential impact on the land's biological diversity. As a result, it is only a preliminary indication to the long-term maintenance of these elements of biological diversity. An evaluation of other factors, such area requirements, isolation, or disturbance regimes necessary for maintaining populations, are not considered in gap analysis. For example, some of the status 1 and 2 lands in Wyoming designated as "protected" may be too small in area to actually provide protection for species with large area requirements. Furthermore, species have different responses to the same management practices. Therefore, assigning a single protection code to an area to indicate its suitability for maintaining biodiversity is a simplification. Nevertheless, it provides a first assessment of the protection of the land base or potential habitat for these elements.

In Wyoming, less than 10% the land base has been identified as providing protection for biodiversity and most of this (90%) occurs in the Greater Yellowstone Ecosystem. These lands were not originally established to protect biodiversity, rather the areas were established for their scenic and geologic values. Since that time, the concept of the GYE has advanced through concerns over individual species rather than broader ecological principles (Schullery 1995). As a result, the GYE affords protection to some wide ranging species, like the grizzly bear and wolf, that is not possible in most other areas of the country. Nonetheless, from a state-wide perspective, the majority of protected lands in Wyoming are biased toward high elevation, mountainous areas that protect a relatively narrow set of land cover types and vertebrate species that exist in Wyoming.

We have identified three groups of land cover types in Wyoming that require management priority in the state. The highest priority should be given to protecting vegetated dunes, active sand dunes, forest-dominated riparian, shrub-dominated riparian and grass-dominated wetlands and riparian areas because their current protection is minimal and because they are potentially the most vulnerable to ongoing land management practices. These types are not satisfactorily mapped at our current MMU. Before decisions on their future management are made, further

efforts will be needed to provide an adequate spatial analysis of their location as well to conduct an assessment of their condition.

Second priority are xeric upland shrub, limber pine woodland, saltbush fans and flats, desert shrub, greasewood fans and flats, and unvegetated playas. While in some cases these types comprise extensive areas, they presently have little to no area in status 1 and 2 lands, and they are vulnerable to development, especially from oil and gas extraction activities. The latter four types could easily be accommodated in conjunction to one another along topographic gradients. These types largely occur on land under the jurisdiction of BLM. Currently proposed BLM wilderness areas, which were not included in status 1 and 2 land in our analysis, will only marginally increase the protection of these types. In addition to the above types, bur oak woodland and Great Basin foothills grassland are also second priority for further protection. These types are restricted in distribution and patchy in nature, and as a result opportunities for their conservation are more limited. The opportunity for long-term conservation of these types resides primarily with the U.S. Forest Service.

Shortgrass prairie, mesic shrubland and ponderosa pine are considered land cover third priority because they have small percent of their area in status 1 and 2 lands, and because ponderosa pine is vulnerable to disease and repressed fire regimes associated with current management practices. The conservation of these types may require working cooperatively with private land owners.

Habitats of 6 (50 %) amphibians, 8 (31%) reptiles, 25 (22 %) mammals, and 41 (14%) birds that are not peripheral in Wyoming merit further consideration for protection. The habitats of most of these species are unprotected because they occur at low elevations in the eastern portion of the state or in the Green River area where status 1 and 2 lands are rare. Management on multiple-use lands under the stewardship of the U. S. Forest Service in the Black Hills, the BLM in the Green River area, and cooperative efforts with private land owners in both the eastern portion of the state and in the Green River area will be important to the long-term conservation of a large number of vertebrate gap species in Wyoming. Wyoming state trust and Native American lands may also play an important role for species such as the olive-backed pocket mouse (*Perognathus fasciatus*), prairie vole (*Microtus ochrogaster*), and sage grouse, although more detailed field studies will be required to verify the extent of their distribution on these lands.

Official designation of BLM's proposed wilderness areas will only marginally increase protection of those species occurring on BLM land. Only 11 species (one amphibian, two mammals and eight birds) would be removed from Wyoming's terrestrial vertebrate gap list by the inclusion of the BLM wilderness areas in status 1 lands in Wyoming. BLM's proposed wilderness areas are designated primarily on the basis of their natural or esthetic appearance and potential for wilderness-dependent opportunities and experiences, and only secondarily for their potential to conserve cover-types and critical habitat types (Bureau of Land Management 1991).

We emphasize that our current database is inadequate to reliably map a large number of vertebrate species in Wyoming. In compiling and reviewing the species distribution maps, we

have identified species for which information is incomplete and documented mapping problems that we have recognized (Merrill et al. 1996b, see also Wyoming Game and Fish Dept. 1996). Because of the uncertainty in the maps of many vertebrate species, we stress the need for further data collection and mapping efforts. In particular, refining the database so that the distribution of breeding birds may be identified separately from their overall distribution may be valuable for conservation purposes. We promote the use of the WY-GAP database structure as a useful framework for designing surveys and updating our current information. Further, a wider array of biotic resources than WY-GAP has addressed need to be incorporated into biodiversity planning in Wyoming. It is clear from the patterns of vertebrate distributions that species richness among vertebrate taxa in Wyoming do not coincide (Chapter 3) and we suspect that similar incongruities exist with other taxa.

Because gap analysis takes a coarse filter approach to habitat protection, it did not identify a number of vertebrates species which already have been recognized as needing special management by public agencies or TNC (Appendix 5.3). Most of these species, such as the grizzly bear, wolverine, Caspian tern, Forster's tern, trumpeter swan, and Harlequin duck, were not identified because they occur in the GYE and their habitat already has a high level of protection even though their populations are rare or vulnerable. Bats were a second group of species not identified on the gap list, yet they are frequently listed as species of management concern (Wyoming Game and Fish Dept. 1996). Most of the bats have microhabitat roosting requirements and were inadequately assessed in our analysis because their ranges were overestimated, therefore overestimating the amount of their habitat in status 1 and 2 lands. Additional efforts to survey and map these species will be necessary to reliably evaluate their management status. We also found that using the proportion of the land base or habitat in status 1 and 2 lands as a criterion to evaluate species protection may have over-emphasized the need for protection of some common or wide-spread land cover types (e.g., Wyoming big sagebrush) or vertebrate species (e.g. thirteen-lined ground squirrel), and under-represented some species that had a restricted distribution and only a small amount (but large proportion) that was protected. For this reason, we included in our list of "gaps" species that have $\leq$ 50,000 ha of their total predicted habitat in status 1 and 2 lands, even though this was an arbitrary threshold.

Current status 1 and 2 lands in Wyoming may not be sufficient to sustain species and ecosystems in them in the long-term. The lesson from the Greater Yellowstone Ecosystem is clear – it is one of the largest, nearly intact ecosystems in the northern temperate zone (Schullery 1995), yet management for ecological processes and vertebrate species has remained controversial and politicized (Keiter and Boyce 1991, Knight 1994). Outside the GYE, most status 1 and 2 lands in Wyoming are relatively small, isolated tracts that are subject to outside influences. In themselves, these areas probably will not be sufficient for maintaining biodiversity in the long-term, but they will need to become part of a state-wide network of management areas. Establishing such a network will require a cooperative effort among state, federal and private entities in Wyoming. Prototypes for biodiversity consortia currently exist in other states (Vickerman and Smith 1995) and their development was associated with gap analyses or in tandem with gap analyses in their respective states. While we recognize that a network of management areas may play a vital role in biodiversity conservation, it is but one element in an approach for planning for biodiversity (McNeeley 1994). Management outside these areas,

endangered species programs, and control of exotics are among other actions necessary for conserving biodiversity.

6.2. Gap Analysis and State-wide Biodiversity Planning

Gap analysis serves as a preliminary step in directing further, more detailed studies and planning efforts needed to select and design areas for potential biodiversity management (Scott et al. 1993). Vickerman and Smith (1995) have suggested there are three basic approaches to implementing gap analysis, each aimed at making more informed and better land management decisions. First, the gap databases may be used in situation-specific decision making. This involves the use of the gap databases to address project-level questions such as determining the amount of overlap in the predicted distribution of the pygmy rabbit and proposed mine leases in Carbon county, or determining correspondence of bird diversity on an National Forest to recreational areas for bird viewing. To date, most of the applications of the gap databases have been at this level. The second approach involves integrating new information with a landscape perspective to existing land conservation planning. For example, a federal agency could utilize the gap databases in developing a more comprehensive, biological resource management plan for a district. These uses of the gap databases do not necessarily involve multiple jurisdictions. The third approach uses gap information to its greatest potential for a state-wide planning effort for biological conservation. An organized, comprehensive planning effort brings together multiple state and federal agencies and interest groups in a cross-jurisdictional effort aimed at managing species habitats and ecosystems at the landscape scale for long-term maintenance of biological diversity.

The objective of a comprehensive state planning effort is to identify a set of landscapes with the highest potential for efficient, overall management of biological resources. The initial focus of the Gap Analysis Program was identifying "hot spots" of species richness as an efficient means to conserve biodiversity. In the past decade, conservation planners have adopted approaches to selecting management areas by identifying efficient combinations of sites capable of representing a group of species in a region. Methods used to prioritize management areas have proceeded from simple scoring, where sites are ranked, to iterative heuristic methods (Bolton and Specht 1983, Kirkpatrick 1983, Margules et al. 1988, Nicholls and Margules 1993, Church et al. 1996, Csuti et al. in press). Efficiency is achieved using the principle of *complementarity,* where sites are selected that complement one another in terms of species composition, avoiding unnecessary duplication. The result is a *minimum set* of areas that represents all species in a small area. For example, the "greedy" algorithm approach selects the site containing the most species and sequentially includes sites that add the most additional species (Pressy et al. 1993). Other approaches emphasize characteristics of species, such as rarity, endemism, taxonomic richness, or vulnerability, and choose sites in order of the characteristics of species they contain or weighted heavily for the characteristic of interest.

Current approaches focus on minimum set solutions and do not address issues of size, shape, or quality of the sites selection (Csuti et al. in press), but they can be modified to consider spatial relationships (Nicholls and Margules 1993). However, our limited understanding of the spatial requirements of most populations currently hinders our efforts to incorporate these factors

into biodiversity planning. Additional data layers can also be used for a more holistic conservation evaluation. Biological indicators of stress or risk (e.g., human population growth, road density, rate of habitat fragmentation, distribution of pollutants) and socio-economic indicators (e.g. natural resource production activities such as mining, forestry, hunting, and agriculture) can be incorporated into planning to evaluate options among solutions (Machlis et al. 1994). These more detailed analyses were not part of the initial state gap analyses, but are areas of research that National GAP is pursuing and are vital to the long-term success of biodiversity conservation.

6.3 Current Directions For Gap Analysis in Wyoming

With the completion of the Wyoming Gap Analysis Project, two initiatives have been established to promote the long-term maintenance and application of the WY-GAP databases. First, the Spatial Data and Visualization Cluster (SDVC) is a project funded by the National Science Foundation's Experimental Program for the Stimulation of Competitive Research (EPSCoR) and the Wyoming Science Technology and Energy Authority (STEA) for the purpose of developing spatial geologic and natural resource databases (Gloss et al. 1996). Second, a partnership with Biological Resources Division of the USGS has been established to develop a Wyoming Bioinformation Node (WBN) (Kohley et al. 1996) as part of the National Biological Information Infrastructure (NBII). The establishment of a WBN will help facilitate the dissemination and use of the WY-GAP databases by developing a coordinated approach to provide increased access to the WY-GAP and other natural resource databases.

Both the SDVC and the WBN will combine resources under the direction of the Wyoming Water Resources Center (WWRC) to accomplish four objectives. First, they will supplement WY-GAP data with other existing natural resource databases, including big game seasonal range maps, selected TNC heritage program data, watershed boundaries, ecoregional land-type delineations, National Wetlands Inventory, known mineral deposit areas, and U.S. Census Bureau demographic data to allow for further analyses based on a wider array of biotic and socio-economic factors.

Second, an Internet-based World Wide Web (WWW) homepage for Wyoming will be established to facilitate the dissemination of digital biological and related information, though sensitive biological information compiled by WY-GAP or the WBN (e.g. roost locations of verteberate species of concern, or locations of rare/endangered plant species) will be restricted. The WWW webpage will be developed by the SDVC and linked to the National Gap Analysis webpage, and will conform to the standards developed under the NBII. Subtasks to be completed in the development of the WBN-WWW homepage include: (a) metadata documentation of WY-GAP and non-WY-GAP data layers in accordance with the FGDC *Content Standard for Digital Geospatial Metadata* or NBII metadata standards, including development of corresponding GEO attribute sets for implementation under the Z39.50 service protocol; (b) establishment of a server supporting the Z39.50 protocol v.2/3, utilizing I-Site and I-Search "browse and search" software; (c) integration with the existing SDVC WWW server; (d) development of webpage forms for client site access for compatibility with any forms capable web browser; and (e) a browser test of database functionality and usability.

Establishment of a "bioinformation extension program" will promote the use and integration of the WBN databases into natural resource planning, management, and education programs. Specific objectives include: (1) showcase the utility of the WY-GAP databases and demonstrate how they can be integrated with other natural resource databases for planning, management, and education purposes, and (2) demonstrate the value of adopting the standards developed by the NBII for data collection, classification, and documentation to ensure compatibility with the WBN. A portable Arcview demonstration of the WBN databases will provide on-site conceptual demonstrations and technical training in the use the WBN databases. Essential to the demonstration of the WBN databases will be the development of specialized interface tools which facilitate the query and retrieval of biological information. These interface tools will be developed using Arcview Avenue scripts to provide "push-button" functionality to common spatial queries.

Finally, the WBN databases will be applied towards county land-use planning by developing a pilot project at the county level in which the WBN databases are used to assist county planners in developing a cooperative biological data support system. The support system will be used to assess the county's current subdivision regulations and planning documents in terms of managing local biological resources. The WBN databases will also identify elements and areas of biological significance to be considered in future planning efforts, and establish and maintain a permanent, dynamic system for routine use in planning and land-use evaluations. The overall goal of this initiative is to promote the integration of biodiversity considerations into ongoing and proposed land management activities in the hope that they lay the foundation for comprehensive conservation planning at all levels of government.

CHAPTER 7

Data Availability and Use

The great thing about standards is that there are so many to choose from. - Anonymous.

7.1 How To Obtain Wyoming Gap Analysis Data

The digital spatial databases produced by WY-GAP are available for down-loading from the Internet, via the World Wide Web (WWW). The National Gap Analysis Program (GAP) has a Gap Analysis Encyclopedia home page which can be accessed through this universal resource locator (URL) address:

http://www.gap.uidaho.edu/gap

The Gap Analysis Encyclopedia brings together all aspects of GAP into one package, and facilitates the dissemination of GAP information to the user community. The Encyclopedia offers information on the technical aspects of GAP, including the GAP "how-to" handbook, national standards, metadata standards, recent bulletins, references, and state Gap project contacts. It also directs the Internet user to distributed servers maintained by state organizations that store and maintain Gap data.

The WY-GAP databases and accompanying information (including this report) reside on the computing system of the Spatial Data and Visualization Cluster (SDVC) at the University of Wyoming. Access to the SDVC server will be made available through the National GAP Encyclopedia, or directly through the URL address:

http://www.sdvc.uwyo.edu
(under development at time of draft report)

The three digital databases provided by WY-GAP are state land cover, predicted distribution of terrestrial vertebrate species, and land stewardship/management status. These databases are in Arc/Info export format, for use with workstation Arc/Info 7.0+, PC Arc/Info 3.4D+ or Arcview 2.0+. The export files for each of the three databases are available in either statewide extent or in 1:100,000-scale U.S. Geological Survey quadrangle. Due to their size, the full statewide databases will require the use of workstation Arc/Info or Arcview. PC Arc/Info has polygon limits which will limit the use of these data to the 1:100,000-scale quadrangles.

Both statewide and quadrangle databases have complete FGDC-compliant metadata (see Metadata below), available in word processor and ASCII text file format. This report is also

available in postscript format via the internet. In addition to the report, the Wyoming Land Cover Atlas (Merrill et al. 1996a) and the Wyoming Terrestrial Vertebrate Species Atlas (Merrill et al. 1996b) will also be made available. These atlases includes maps of land cover and species distributions along with descriptions of the land cover types, habitat associations, area statistics and references for each species (see Appendices 2.6 and 3.4 for examples).

7.2 Appropriate and Inappropriate Use of Gap Analysis Data

All information is compiled with a specific end use or uses in mind. This is especially true for GIS data, which is expensive to produce and must be directed to meet immediate program needs. For the GAP data, minimum standards were set to meet program needs (Scott and Jennings 1994, Scott et al. 1993). These standards include: scale or resolution (1:100,000 or 100 hectare minimum mapping unit), accuracy (80% accurate at 95% confidence level), and format (ARC/INFO coverage tiled to the 30'x60' USGS quadrangle). For complete project standards, consult the GAP home page (see How to Obtain the Data).

Recognizing, however, that GAP data would be the first, and for many years likely the only, source of statewide biological GIS maps, the data were created with the expectation that they would be used for other applications. Therefore, we list below both appropriate and inappropriate uses. This list is in no way exhaustive but should serve as a guide to assess whether a proposed use can or cannot be supported by GAP data. For most uses, it is unlikely that GAP will provide the only data needed, and for uses with a regulatory outcome, field surveys should verify the result. In the end it will be the responsibility of each data user to determine if GAP data can answer the question being asked, and if they are the best tool to answer that question.

7.2.1 Scale

First, we must address the issue of appropriate scale to which these data may be applied. These data were produced with an intended application at the state or ecoregion level - geographic areas from several hundred thousand to millions of hectares in size. The data provide a coarse-filter approach to analyses, meaning that not every occurrence of every plant community or animal habitat is mapped; only larger, more generalized distributions are mapped. The data are also based on the USGS 1:100,000 mapping scale in both detail and precision. In deciding whether or not GAP data would be useful in a particular application, it would be appropriate to ask "Are the smallest features of interest in this application greater or less than 100 ha in size?" or, "Could I draw the features of interest with a satisfactory level of detail on a 1:100,000 quad sheet?"

7.2.2. Appropriate Uses

GAP data can be used appropriately for coarse-scale ($\geq$ 1:100,000) applications, or to provide context for finer-level maps/applications. Examples of other appropriate uses:

- Statewide biodiversity planning.
- Regional (Councils of Government) planning.

- Regional habitat conservation planning.
- County comprehensive planning.
- Large area resource management planning.
- Coarse-filter evaluation of potential impacts or benefits of major projects or plan initiatives on biodiversity, such as utility or transportation corridors, wilderness proposals, regional open space and recreation proposals, etc.
- Determining relative amounts of management responsibility for specific biological resources among land stewards to facilitate cooperative management and planning.
- Basic research on regional distributions of plants and animals and to help target both specific species and geographic areas for needed research.
- Environmental impact assessment for large projects or military activities.
- Estimation of potential economic impacts from loss of biological resource based activities.
- Education at all levels and for both students and citizens.

7.2.3 Inappropriate Uses

It is far easier to identify appropriate uses than inappropriate ones, but there is a fuzzy line that is eventually crossed when the differences in resolution of the data, size of geographic area being analyzed, and precision of the answer required for the question are no longer compatible. Examples include:

- Use of the data to map small areas (less than thousands of hectares) typically requiring mapping resolution at 1:24,000-scale and using aerial photographs or ground surveys.
- Combining GAP data with other data finer than 1:100,000-scale to produce new hybrid maps or answer queries.
- Generating specific aerial measurements from the data finer than the nearest thousand hectares (MMU size and accuracy affect this precision).
- Establishing exact boundaries for regulation or acquisition.
- Establishing definite occurrence or non-occurrence of any feature for an exact geographic area (for land cover, the percent accuracy will provide a measure of probability).
- Determining abundance, health, or condition of any feature.
- Establishing a measure of accuracy of any other data by comparison with GAP data.
- Altering the data in any way and redistributing them as a GAP data product.
- Using the data without acquiring and reviewing the metadata and this report.

7.2.4 Current Uses of WY-GAP Data

In the preliminary stages of WY-GAP database development, we requested that data users fill out a "WY-GAP Data Request Form" which was developed to track the use and applications of these data. To date, the WY-GAP databases have already been used for a variety of applications ranging from grizzly bear research/management, county land use planning, and predictions of vegetation change in response to climate change (Appendix 6.1). Most of the applications to date have involved the land stewardship/management layer. However, with the completion of the land cover and terrestrial vertebrate species layers, we expect the use of the WY-GAP databases to broaden.

7.3 Metadata

Proper documentation of all information sources used to assemble GAP data layers is central to the scientific defensibility of the Gap Analysis Program. The information used to describe gap analysis data is called metadata. Metadata are information about data. Metadata contain information about the source(s), lineage, content, structure, and availability of a data set. Metadata also describe intentions, limitations, and potential uses, allowing for the informed and appropriate application of the data. Descriptions of metadata function have recently been published by the Federal Geographic Data Committee (FGDC 1994) and a postscript file is available from the GAP web page listed above.

The GAP metadata standards have been closely matched to the FGDC standards to ensure current and future compatibility (Cogan and Edwards 1994). As the FGDC standards evolve beyond the current publication, we anticipate corresponding refinements in GAP documentation. The format of the GAP metadata consists of eight major documentation sections (Table 7.1) containing one or more metadata elements. Each element is named (e.g. Map Projection Name), and the "Type" of entry (text, integer, date, time) and "Domain" of the entry (e.g. $x > 0$) are also defined. Standardized metadata formats can be obtained from the FGDC Internet site (http://geochange.er.usgs.gov/pub/tools/metadata/standard/metadata.html).

Table 7.1. Federal Geographic Data Committee's metadata element categories used by the Gap Analysis Program.

1.	Identification Information: What the data set is called, file format description.
2.	Data Quality Information: Accuracy, consistency, and data sources.
3.	Spatial Data Organization Information: Data structure - raster, vector, point, etc.
4.	Spatial Reference Information: Coordinate units, map projection, spatial resolution.
5.	Entity and Attribute Information: Attribute codes and reference citations.
6.	Distribution Information: How to order the data, on-line access, transfer size.
7.	Metadata Reference Information: Date of the metadata, contact for metadata updates.
8.	Contact Information: General data contact, mail, voice, fax, web, e-mail.

Demands for metadata will increase as electronic networks expand across the national and international scene and more requests are made for distribution of information. As the number of users and the diversity of disciplines and programs sharing the data expand, the information carried by metadata will become increasingly important. One of the goals in defining today's metadata standards is to anticipate these future needs.

7.4 Disclaimer

Following is the official NBS disclaimer as of 1 November 1996 followed by additional disclaimers from GAP. Prior to using the data you should consult the GAP home page (see How to Obtain the Data) for the current disclaimer.

"Although these data have been processed successfully on a computer system at the USGS Biological Resources Division, no warranty expressed or implied is made regarding the accuracy or utility of the data on any other system or for general or scientific purposes, nor shall the act of distribution constitute any such warranty. This disclaimer applies both to individual use of the data and aggregate use with other data. It is strongly recommended that these data are directly acquired from a USGS Biological Resource Division server [see above for approved data providers] and not indirectly through other sources which may have changed the data in some way. It is also strongly recommended that careful attention be paid to the content of the metadata file associated with these data. The Biological Resource Division shall not be held liable for improper or incorrect use of the data described and/or contained herein.

These data were compiled with regard to the following standards. Please be aware of the limitations of the data. These data are meant to be used at a scale of 1:100,000 or smaller (such as 1:250,000 or 1:500,000) for the purpose of assessing the conservation status of vertebrate species and vegetation cover types over large geographic regions. The data may or may not have been assessed for statistical accuracy. Data evaluation and improvement may be ongoing. The Biological Resource Division makes no claim as to the data's suitability for other purposes. These are writable data which may have been altered from the original product if not obtained from a designated data distributor identified above."

Glossary

aerial videography - video images of the land surface taken from an airplane

algorithm - a procedure to solve a problem or model a solution (In GAP, this term typically refers to a GIS procedure used to model an animal distribution)

alliance level - a land unit made up of an "alliance" of natural communities that have the same dominant or co-dominant plant species or, in the absence of vegetation, have the same dominant land cover typically described according to the Anderson land cover classification (see "Natural Community Alliance" in Grossman et al. 1995)

anthropogenic - caused by man

band, spectral - a segment of the electromagnetic spectrum defined by a range of wavelengths (e.g. blue, green, red, near infrared, far infrared) that comprise the Landsat TM imagery

biodiversity - (or biological diversity) generally, the variety of life and its interrelated processes

classification, digital - a computer-assisted approach to developing land cover maps from digital imagery, in which image pixels are classified based on statistical differences in spectral characteristics (see **supervised** and **unsupervised classification**)

classification, visual or visual interpretation - classification of imagery based on human interpretation, as opposed to digital or computer-assisted classification (see **classification, digital**)

coarse filter - the general conservation activities that conserve the common elements of the landscape matrix, as opposed to the "fine filter" conservation activities that are aimed at special cases such as rare elements (see Jenkins 1985)

community - a group of interacting plants and animals

cover type - a non-technical, higher-level floristic and structural description of vegetation cover

cross-walking - matching equivalent land cover categories between two or more classification systems

delineate - identifying the boundaries between more or less homogenous areas on remotely sensed images as visible from differences in tone and texture

digitization - entering spatial data digitally into a Geographic Information System

distribution, species - in a GAP context, this refers to a computer-modeled map of a species' potential distribution for a given area, based on parameters such as range (see **range**) and habitat associations (see **habitat** and **wildlife habitat relationship model**)

ecoregion - a large region, usually spanning several million hectares, characterized by having similar biota, climate, and physiography (topography, hydrology, etc)

ecosystem - a biological community (ranging in scale from a single cave to millions of hectares), its physical environment, and the processes through which matter and energy are transferred among the components

edge-matching - the process of connecting polygons at the boundary between two independently created maps, either between TM scenes or between state GAP data sets

element - a plant community or animal species mapped by GAP, may also be referred to as "element of biodiversity"

error of commission - the occurrence of a species (or other map category) is erroneously predicted in an area where it is in fact absent

error of omission - when a model fails to predict the occurrence of a species that is actually present in an area

fine filter - see **coarse filter**

floristic - pertaining to the plant species that make up the vegetation of a given area

gap analysis - a comparison of the distribution of elements of biodiversity with that of areas managed for their long-term viability to identify elements with inadequate representation

geographic information systems (GIS) - computer hardware and software for storing, retrieving, manipulating, and analyzing spatial data

ground truthing - verifying maps by checking the actual occurrence of plant and animal species in the field at representative sample locations

habitat - the physical structure, vegetational composition, and physiognomy of an area, the characteristics of which determine its suitability for particular animal or plant species

hectare - a metric unit of area of 10,000 square meters and equal to 2.47 acres

hexagon - typically refers to the EPA EMAP hexagonal grid of 635 square kilometer units

latilong - a geographic unit, one degree latitude by one degree longitude

metadata - information about data, e.g., their source, lineage, content, structure, and availability

minimum mapping unit (MMU) - the smallest area that is depicted on a map

pixel - the smallest spatial unit in a raster (cell-based) data structure

polygon - an area enclosed by lines in a vector-based Geographic Information System data layer or a region of contiguous homogeneous pixels in a raster system

range - the geographic limit of a species

registration, spatial - matching different images to each other by finding points on the images that can be matched to known points on the ground

remote sensing - deriving information about the earth's surface from images acquired at a distance, usually relying on measurement of electromagnetic radiation reflected or emitted from the feature of interest

resolution - the ability of a remote sensing system to record and display fine detail in a distinguishable manner, or the smallest feature that can be distinguished or resolved on a map or image, such as a TM pixel

riparian - areas adjacent to streams and rivers where vegetation is strongly influenced by the presence of water. Saturation by water does not necessarily have to be an existing factor as in the definition of wetlands given by Cowardin (1992)

scale, map - the ratio of distance on a map to distance in the real world, expressed as a fraction; the smaller the denominator, the larger the scale, e.g., 1:24,000 is larger than 1:100,000

species richness - the number of species of a particular interest group found in a given area

supervised classification - a type of digital classification of imagery, whereby pixels of unknown identity are classified using samples of known identity (i.e., pixels already assigned to informational classes by ground truthing or registration with known land cover) as training data

Thematic Mapper - a sensor on LANDSAT 4 and 5 satellites that records information in seven spectral bands, has a spatial resolution of about 30 m x 30 m, and represents digital values in 256 levels of brightness per band

transect - a transversely cut line along which physical and biological observations are made

unsupervised classification - a type of digital classification of satellite imagery involving the identification and mapping of natural groups, or classes, of spectral values within an image based on uniformity of brightness in several spectral channels.

visual interpretation - see classification, visual

wetland - an environment where standing or moving water is present or where saturation by water is the key factor controlling the ecology of the area; includes bogs, swamps, marshes, ponds, lakes and in some definitions also includes riparian areas (see **riparian)**

wildlife habitat relationship model - a method of linking patterns of known habitat use by animal species with maps of existing vegetation, thereby identifying the spatial extent of important habitat features for use in conservation and management

ACRONYMS

BCD	Biological Conservation Database (TNC)
BCNRA	Bighorn Canyon Nation Recreation Area
CA-GAP	California Gap Analyis Project
CO-GAP	Colorado Gap Analysis Project
BLM	Bureau of Land Management
DEM	Digital Elevation Model (USGS)
DLG	Digital line graph (USGS)
DTNM	Devil's Tower National Monument
EMAP	Environmental Monitoring & Assessment Program (EPA)
EPA	Environmental Protection Agency
FGDC	Federal Geographic Data Committee
GAP	Gap Analysis Program
GIS	Geographic Information System
GYE	Great Yellowstone Ecosystem
ID-GAP	Idaho Gap Analysis Project
MIPS	Map and Image Processing System
MMU	Minimum mapping unit
NBII	National Biological Information Infrastructure
NBS	National Biological Service
NM-GAP	New Mexico Gap Analysis Project
NPS	National Park Service
NWI	National Wetlands Inventory (USFWS)
PLSS	Public Land Survey System
RIS	Resource Inventory System (USFS)
RMS	Root mean square error
SCS	Soil Conservation Service (Natural Resource Conservation Service)
SDVC	Spatial Data and Visualization Cluster
SPOT	Système Pour l'Observation de la Terre

TM	Thematic Mapper
TNC	The Nature Conservancy
UNESCO	United Nations Educational, Scientific, and Cultural Organization
URL	Universal Resource Locator
USFS	US Forest Service
USGS	US Geological Survey
USFWS	US Fish & Wildlife Service
UT-GAP	Utah Gap Analysis Project
UTM	Universal Transverse Mercator
WBN	Wyoming Bioinformation Node
WGFD	Wyoming Game and Fish Department
WHMA	Wildlife Habitat Management Area (Wyoming Game and Fish Department)
WHR	Wildlife-habitat relationships
WLI	Wyoming Land Inventory
WWW	World Wide Web
WY-GAP	Wyoming Gap Analysis Project

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Appendix 2.1. The WYGAP land cover classification. The 41 types with corresponding 5-digit codes were mapped from Landsat TM data to build the land cover map. Land cover types are described in more detail in a separate volume, the land cover map atlas (Merrill et. al 1996a).

I. **Forest and Woodland Types**

A. **Evergreen Forest**
- 42001 - Spruce-fir
- 42003 - Douglas fir
- 42004 - Lodgepole pine
- 42007 - Clearcut conifer
- 42008 - Whitebark pine
- 42009 - Limber pine woodland
- 42010 - Ponderosa pine
- 42015 - Juniper woodland
- 42016 - Burned conifer

B. **Deciduous Forest**
- 41001 - Aspen
- 41002 - Bur oak woodland

C. **Forested Wetlands**
- 61001 - Forest dominated riparian

II. **Shrub Types**

A. **Shrub and Brush Rangeland**
- 32001 - Mesic upland shrub
- 32002 - Xeric upland shrub
- 32005 - Bitterbrush shrub steppe
- 32006 - Mountain big sagebrush
- 32007 - Wyoming big sagebrush
- 32008 - Black sagebrush steppe
- 32009 - Basin big sagebrush
- 32010 - Desert shrub
- 32011 - Saltbush fans and flats
- 32012 - Greasewood fans and flats
- 32013 - Vegetated dunes

B. **Shrub and Brush Wetland**
- 62001 - Shrub dominated riparian

III. **Graminoid and Forb Types**

A. **Herbaceous Tundra**
- 82001 - Meadow tundra
- 82002 - Subalpine meadow

B. **Herbaceous Rangeland**
- 31001 - Mixed grass prairie
- 31002 - Short grass prairie
- 31003 - Great Basin foothills grassland

C. **Herbaceous Wetlands**
- 62002 - Grass dominated wetland
- 62003 - Grass dominated riparian

IV. **Open Water Types**

- 52001 - Open water

V. **Agricultural Types**

A. **Crop and Improved Pasture**
- 21001 - Dry-land crops
- 21002 - Irrigated crops

VI. **Urban Types**

- 11001 - Human settlements

VII. **Unvegetated Land Types**

A. **Alpine Unvegetated**
- 74002 - Alpine exposed rock/soil

B. **Basin Unvegetated**
- 74001 - Basin exposed rock/soil
- 71001 - Unvegetated playa
- 73001 - Active sand dunes

C. **Minelands and Oilfields**
- 75001 -Surface mining operations

VIII. **Perennial Snow and Glaciers Type**

- 91001 - Permanent snow type

Appendix 2.2. Path and row, acquisition date, correction level applied by EOSAT, and resampling technique for satellite imagery used in the development of the WYGAP land cover map. Map index refers to scene location in Fig. 2.1. Acquisition date is the date when the satellite recorded the image. EOSAT correction status refers to the level of geometric correction applied by EOSAT (e.g. terrain corrected data). Resampling method (affine or polynomial) refers to scheme for resampling to 100 m resolution: affine is a linear transformation process, polynomial refers to a 3rd order polynomial transformation.

Map Index	Satellite Path/Row	Acquistion Date	EOSAT Correction Status	Resampling Technique
1	38/29	8/02/89	System	Affine
2	38/29	7/31/91	Precision	Affine
3	37/29	1991	Terrain	Polynomial
4	36/29	8/18/91	Terrain	Affine
5	35/29	8/11/91	Terrain	Affine
6	34/29	6/17/91	Terrain	Affine
7	38/30	8/23/88	System	Affine
8	38/30	7/20/92	Terrain	Polynomial
9	37/30	7/31/88	System	Affine
10	36/30	7/19/89	System	Affine
11	35/30	6/24/91	*	Affine
12	34/30	8/30/89	Terrain	Affine
13	38/31	*	*	Affine
14	37/31	6/16/89	System	Polynomial
15	36/31	6/17/89	System	Affine
16	35/31	7/06/84	System	Affine
17	35/31	6/23/91	Terrain	Affine
18	34/31	6/17/91	System	Polynomial
19	WLI**	1987	n/a	n/a
20	SPOT***	6/22/90	n/a	Affine
21	37/32	8/14/93	Terrain	Affine
22	36/32	6/22/88	System	Affine
23	35/32	7/04/89	System	Affine
24	34/32	7/05/89	System	Affine
25	33/32	6/23/90	System	Affine

*Unknown
**Wyoming Land Inventory - 1987. Small area in southeast Wyoming digitized directly
***Spot satellite image used to map small area in southeast Wyoming

Appendix 2.3. Sources of information used to designate land cover attributes to the Wyoming land cover map.

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Batesen, E. BLM Office, P.O. Box 518, Cody, WY. 82414.
Jones, G. Research scientist, The Nature Conservancy, Laramie, WY.
Jones, R. The Nature Conservancy, Laramie, WY.
Knight, D.H. Professor, Dep. Botany, Univ. Wyoming, Laramie, WY.
Reiners, W.A Professor, Dep. Botany, Univ. Wyoming, Laramie, WY.

Field reconaissance

Ball, B., graduate student, Dep. Botany, Univ. Wyoming, Laramie, WY.
Driese, K. research associate, Dep. Botany, Univ. Wyoming, Laramie, WY.
Knight, D.H., professor, Dep. Botany, Univ. Wyoming, Laramie, WY.
Neir, G., technician, Dep. Botany, Univ. Wyoming, Laramie, WY.
Petrozki, M., technician, Dep. Botany, Univ. Wyoming, Laramie, WY.
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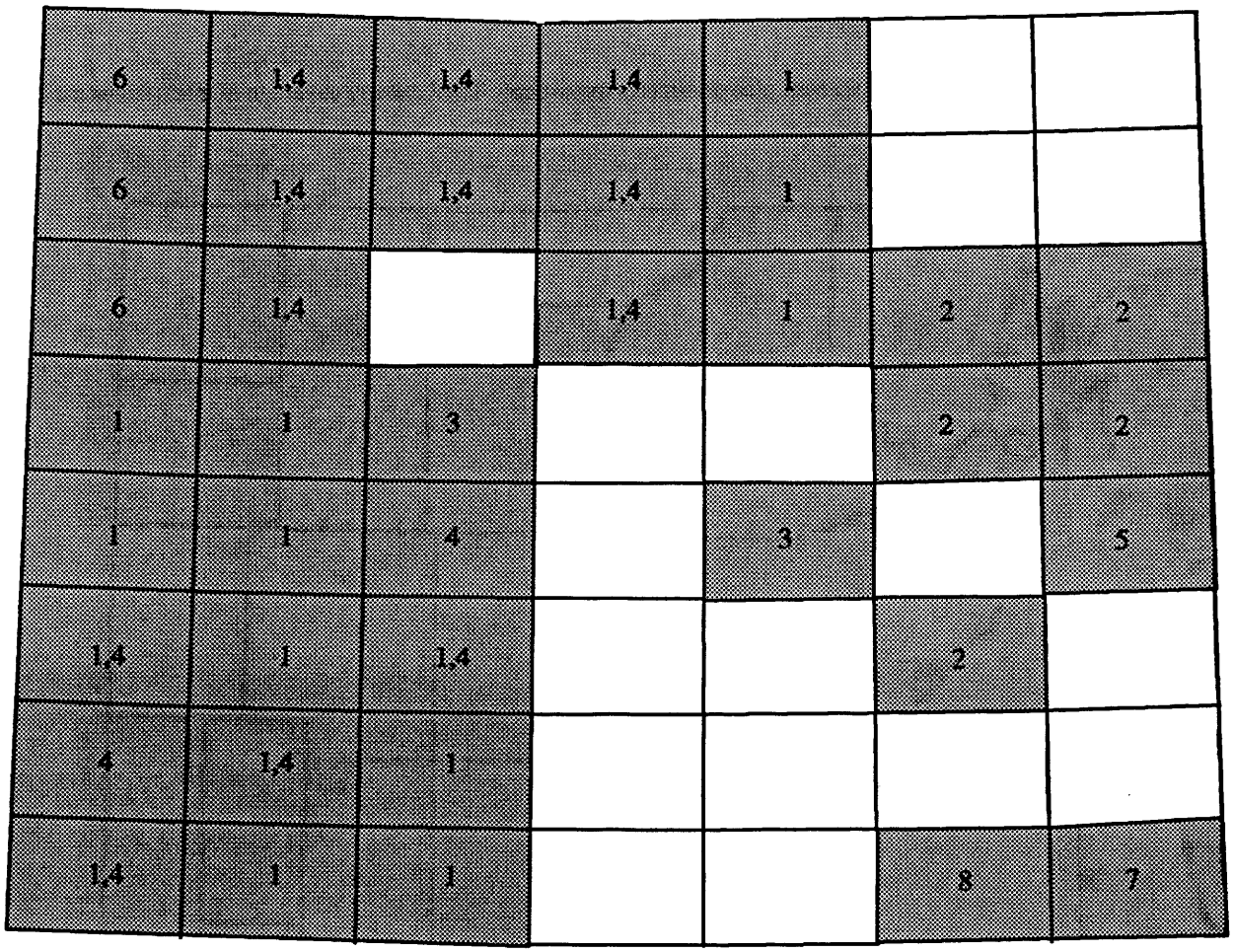
Agricultural Stabilization and Conservation Service. Nat. High Altitude Photography. Roll 80-223 Frames 77-80, 1:58000 - 9/4/80. Geology Library, Univ. Wyoming, Laramie, WY.

Photointerpretation of TM Satellite Image on the computer screen.

Appendix 2.4. USGS 1:100,000 scale quadrangles in which the WYGAP land cover layer was field checked. Shaded quadrangles were field checked in whole or part during the summer of 1994 by personnel from cooperating federal, state and local agencies. Agencies assisting with field checking are listed below and correspond to numbers in the shaded quadrangles from the map. Names of individuals involved the field checking are documented in the metadata for the land cover layer.



1. Wyoming Game and Fish Department
2. U.S. Forest Service
3. U.S. Fish and Wildlife Service
4. Bureau of Land Management
5. Soil Conservation Service
6. National Park Service
7. Laramie County Conservation District
8. Laramie Rivers Conservation District

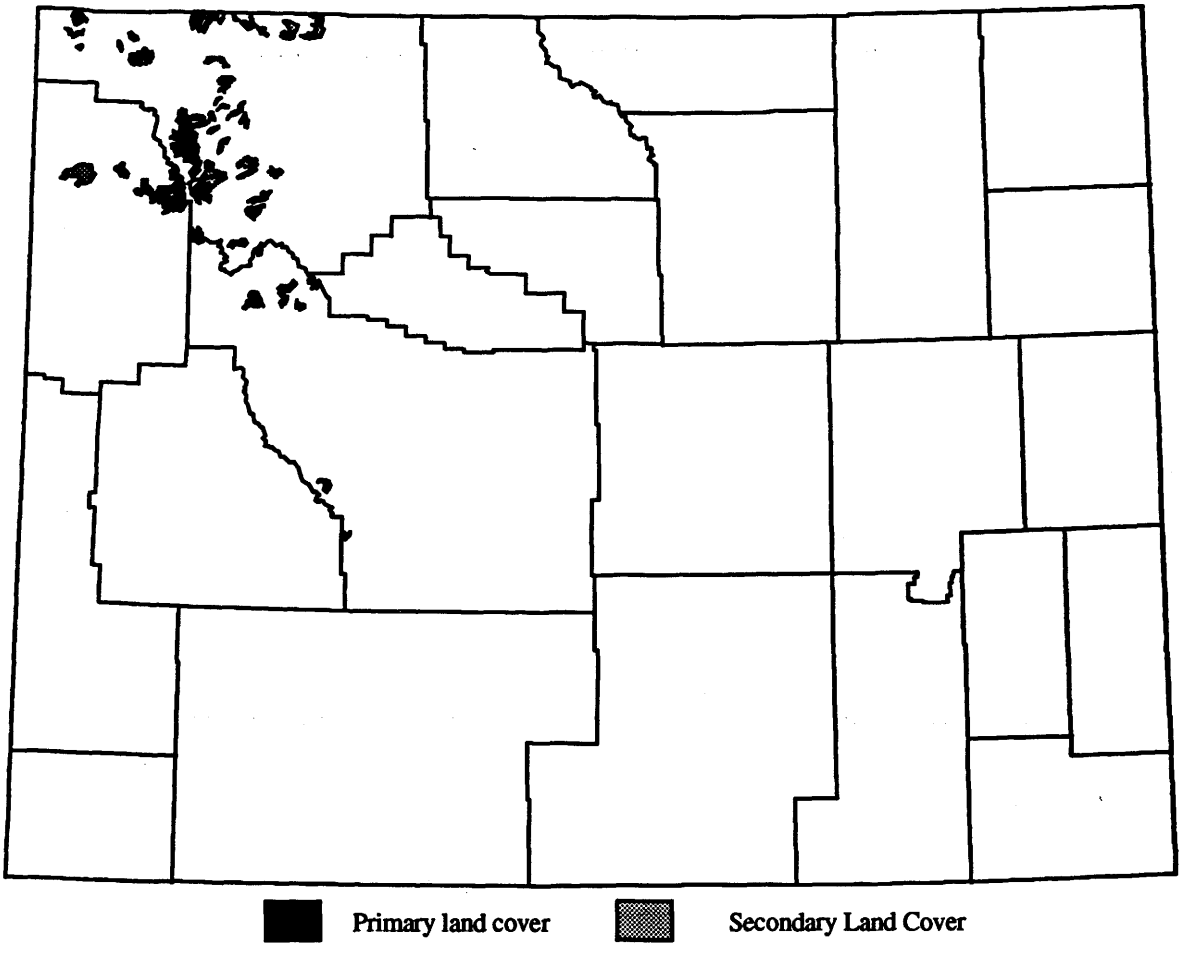
Appendix 2.5. Example of detailed descriptions of the 41 WYGAP land cover types including mapping unit attribute code, mapping unit name, dominant species, description of type, distribution of type, elevation range and diagnostic species. Complete appendix (Merrill et al. 1996a) is available upon request.

MAPPING UNIT ATTRIBUTE CODE 42008

MAPPING UNIT NAME Whitebark pine intact type

DOMINANT SPECIES Pinus albicaulis

DESCRIPTION Forest in which whitebark pine dominates the canopy. Total canopy coverage of tree species must be greater than 25%.



DISTRIBUTION Found in the western mountain ranges of Wyoming, including the Wind River, Teton, Absaroka, Gros Ventre, Owl Creek and Washakie ranges and in Yellowstone National Park. Tends to occur on dry sites near timberline and in the subalpine. Rare at the lower end of its elevation range.

ELEVATION RANGE 1920-3200m (6300'-10,500')

DIAGNOSTIC SPECIES Pinus albicaulis

Appendix 3.1 Names and affliations of reviewers participating in the 1994 and/or 1995 reviews of species habitat associations and distributions. Taxonomic groups reviewed by the individual are listed by number: 1=game mammals, 2=nongame mammals, 3=predators, 4=passerine birds, 5=upland game birds, 6=waterfowl, 7=raptors, 8=amphibians/reptiles.

Name	Affiliate	Taxonomic Group
Jean Adams	Audubon Society	4,6
Art Anderson	U.S. Fish and Wildlife Service	8
Larry Apple	Bureau of Land Management	5,7
George Baxter	University of Wyoming	8
Gary Beauvais	University of Wyoming	2
Ron Beiswenger	University of Wyoming	8
Deane Bjerke	Big Horn Audubon Society	4,5,6,7
Joe Bohne	Wyoming Game and Fish Department	1,2,3,5,6,7
Connie Breckenridge	Bureau of Land Management	5,7
Tim Britt	Wyoming Game and Fish Department	6
Mike Bryant	U.S. Fish and Wildlife Service	4,5,6,7
Steve Buskirk	University of Wyoming	2,3
Tim Byer	U.S. Forest Service	4,5,6,7
John Campbell	Northwest Community College	4,5,6,7
Tom Cartwright	U.S. Forest Service	1,2,3,5
Andrea Cerovski	Wyoming Game and Fish Department	4,5,6,7
Kathy Clark	Wyoming Cooperative Research Unit	7
Tim Clark	Northern Rockies Conservation Coop.	1,2,3
Susan Consolo-Murphy	National Park Service	1,2,3
Steve Corn	National Biological Service	8
Kenneth Diem	Private	5
Katy Duffy	National Park Service	4,5,6,7
Pete Feigley	The Nature Conservancy	2,3
Chris Garber	The Nature Conservancy	2,3,4,5,6,7,8
Larry Gerard	Bureau of Land Management	4,5,6,7
Bill Gern	University of Wyoming	8
Dale Gomez	U.S. Forest Service	1,2,3,8
James Halfpenny	A Naturalist's World	2,3
Harry Harju	Wyoming Game and Fish Department	1,2,3,5,6,7
Jim Herold	Audubon Society	4,5,6,7
Verna Herold	Audubon Society	4,5,6,7
Vicki Herren	Bureau of Land Management	7
Mark Hinschberger	U.S. Forest Service	1,3
Ron Hitchcock	Northwest Community College	4,5,6,7
Gloria Lawrence	Audubon Society	4,5,6,7
Jim Lawrence	Audubon Society	4,5,6,7
Dan Lewis	Private	8
Fred Lindzey	University of Wyoming	1,2,3
Bob Luce	Wyoming Game and Fish Department	2,3
Forrest Luke	Private	4,5,6,7
Daryl Lutz	Wyoming Game and Fish Department	1,3,7
Jerry Mastel	U.S. Forest Service	1,3,5,6,7
Terry McEneany	National Park Service	4,5,6,7
Mark McKinstry	Wyoming Cooperative Research Unit	2,6
Doug McWhirter	Wyoming Game and Fish Department	2,4,5,6,7

Appendix 3.1 continued

Name	Affiliate	Taxonomic Group
Dave Moody	Wyoming Game and Fish Department	1,2,3
Del Nelson	Private	4,5
Bob Oakleaf	Wyoming Game and Fish Department	7
Sue Oberlie	Bureau of Land Management	5,6,7
Chuck Peterson	Idaho State University	8
Vern Phinney	Bureau of Land Management	1,3,5,7
Diane Posner	Private	4,5,6,7
Scott Posner	U.S. Forest Service	4,5,6,7
John Priday	Wyoming Game and Fish Department	2
Elaine Raper	Bureau of Land Management	1,3,5,7
Bert Raynes	Audubon Society	4,5,6,7
Tom Rinkes	Bureau of Land Management	7
Larry Roberts	Wyoming Game and Fish Department	6
Garvis Roby	Wyoming Game and Fish Department	1,2,3,4,5,6,7
Reg Rothwell	Wyoming Game and Fish Department	1,2,3,5,6,7
Tom Ruszkowski	Wyoming Cooperative Research Unit	4
George San Miguel	National Park Service	4,5,6,7
Dick Saul	Wyoming Game and Fish Department	6
Oliver Scott	Audubon Society	4,5,6,7
Clay Speas	U.S. Forest Service	8
Rick Steenberg	Private	4,5,6,7
Eric Stone	Colorado University	4,5,6,7
Tim Thomas	Wyoming Game and Fish Department	1,3,5,6,7
Bob Tigner	Bureau of Land Management	7
Doug Wachob	Wyoming Cooperative Research Unit	4,5,6,7
Rick Wallen	National Park Service	4,5,6,7
Tim Wooley	Wyoming Cooperative Research Unit	2

Appendix 3.2. Element codes, common names, scientific names, and variables used in modeling the distributions of 445 terrestrial vertebrate species in Wyoming. "1" indicates the presence of a documented riparian association, "0" indicates absence. Cover No. refers to the number of land cover types with which each species has documented habitat associations. Species elevation ranges are rounded to 150 meter intervals. For more detailed information on habitat associations and elevation ranges, see Vertebrate Species Map Atlas (Merrill et al. 1996b).

			Riparian	Cover	Elevation	
Element code	Common name	Scientific name	P/A	No.	Min	Max
AAAAA01140	Tiger salamander	*Ambystoma tigrinum*	1	13	900	3150
AAABB01031	Boreal western toad	*Bufo boreas boreas*	1	6	1500	3300
AAABB0900	Great plains toad	*Bufo cognatus*	1	5	900	4200
AAABB01081	Wyoming toad	*Bufo hemiophrys baxteri*	1	5	900	4200
AAABB01180	Woodhouse's toad	*Bufo woodhousii*	1	7	900	2250
AAABC05070	Boreal chorus frog	*Pseudacris triseriata*	1	7	900	3150
AAABF01010	Plains spadefoot toad	*Scaphiopus bombifrons*	1	9	900	2250
AAABF0900	Great Basin spadefoot	*Scaphiopus intermontanus*	1	8	900	2250
AAABH01070	Bullfrog	*Rana catesbeiana*	1	6	900	1650
AAABH01170	Northern leopard frog	*Rana pipiens*	1	5	900	2700
AAABH01180	Spotted frog	*Rana pretiosa*	1	5	900	4200
AAABH01200	Wood frog	*Rana sylvatica*	1	5	2250	3150
ABNBA01030	Common loon	*Gavia immer*	1	5	900	2400
ABNCA02010	Pied-billed grebe	*Podilymbus podiceps*	1	6	900	2400
ABNCA03010	Horned grebe	*Podiceps auritus*	1	6	900	2400
ABNCA03020	Red-necked grebe	*Podiceps grisegena*	1	6	900	2400
ABNCA03030	Eared grebe	*Podiceps nigricollis*	1	6	900	2400
ABNCA04010	Western grebe	*Aechmophorus occidentalis*	1	6	900	2400
ABNCA04020	Clark's grebe	*Aechmophorus clarkii*	1	4	900	2400
ABNFC01010	American white pelican	*Pelecanus erythrorhynchos*	1	6	900	2550
ABNFD01020	Double-crested cormorant	*Phalacrocorax auritus*	1	7	900	2400
ABNGA01020	American bittern	*Botaurus lentiginosus*	1	4	900	2400
ABNGA04010	Great blue heron	*Ardea herodias*	1	7	900	2550
ABNGA05010	Great egret	*Casmerodius albus*	0	6	900	4200
ABNGA06030	Snowy egret	*Egretta thula*	1	7	900	2400
ABNGA07010	Cattle egret	*Bubulcus ibis*	0	11	900	4200
ABNGA11010	Black-crowned night-heron	*Nycticorax nycticorax*	1	6	900	2400
ABNGE02020	White-faced ibis	*Plegadis chihi*	1	6	900	2400
ABNJB02010	Tundra swan	*Cygnus columbianus*	1	6	1200	2400
ABNJB02030	Trumpeter swan	*Cygnus buccinator*	1	6	900	2400
ABNJB03040	Greater white-fronted goose	*Anser albifrons*	1	7	900	2400
ABNJB04010	Snow goose	*Chen caerulescens*	1	7	900	2400
ABNJB05030	Canada goose	*Branta canadensis*	1	14	900	2850
ABNJB09010	Wood duck	*Aix sponsa*	1	6	900	3000
ABNJB10010	Green-winged teal	*Anas crecca*	1	11	900	2550
ABNJB10060	Mallard	*Anas platyrhynchos*	1	11	900	3450
ABNJB10110	Northern pintail	*Anas acuta*	1	10	900	2400
ABNJB10130	Blue-winged teal	*Anas discors*	1	9	900	2550
ABNJB10140	Cinnamon teal	*Anas cyanoptera*	1	9	900	2400
ABNJB10150	Northern shoveler	*Anas clypeata*	1	10	900	2400
ABNJB10160	Gadwall	*Anas strepera*	1	8	900	2400
ABNJB10180	American wigeon	*Anas americana*	1	8	900	2400
ABNJB11020	Canvasback	*Aythya valisineria*	1	7	900	2400
ABNJB11030	Redhead	*Aythya americana*	1	7	900	2400
ABNJB11040	Ring-necked duck	*Aythya collaris*	1	7	900	2700
ABNJB11070	Lesser scaup	*Aythya affinis*	1	7	900	2400
ABNJB15010	Harlequin duck	*Histrionicus histrionicus*	1	5	1950	3000

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian	Cover	Elevation	
			P/A	No.	Min	Max
ABNJB17020	Surf scoter	*Melanitta perspicillata*	0	6	900	4200
ABNJB17030	White-winged scoter	*Melanitta fusca*	1	7	900	2400
ABNJB18010	Common goldeneye	*Bucephala clangula*	1	6	900	3150
ABNJB18020	Barrow's goldeneye	*Bucephala islandica*	1	6	900	2850
ABNJB18030	Bufflehead	*Bucephala albeola*	1	6	900	2850
ABNJB20010	Hooded merganser	*Lophodytes cucullatus*	1	6	900	2400
ABNJB21010	Common merganser	*Mergus merganser*	1	7	900	3300
ABNJB21020	Red-breasted merganser	*Mergus serrator*	1	7	900	2400
ABNJB22010	Ruddy duck	*Oxyura jamaicensis*	1	5	900	2400
ABNKA02010	Turkey vulture	*Cathartes aura*	1	37	900	2700
ABNKC01010	Osprey	*Pandion haliaetus*	1	5	900	4200
ABNKC10010	Bald eagle	*Haliaeetus leucocephalus*	1	41	900	4200
ABNKC11010	Northern harrier	*Circus cyaneus*	1	21	900	4200
ABNKC12020	Sharp-shinned hawk	*Accipiter striatus*	1	21	900	4200
ABNKC12040	Cooper's hawk	*Accipiter cooperii*	1	23	900	4200
ABNKC12060	Northern goshawk	*Accipiter gentilis*	1	21	900	3750
ABNKC19050	Broad-winged hawk	*Buteo platypterus*	0	4	900	4200
ABNKC19070	Swainson's hawk	*Buteo swainsoni*	1	24	900	2700
ABNKC19110	Red-tailed hawk	*Buteo jamaicensis*	1	34	900	2850
ABNKC19120	Ferruginous hawk	*Buteo regalis*	1	24	900	2550
ABNKC19130	Rough-legged hawk	*Buteo lagopus*	0	22	900	3000
ABNKC22010	Golden eagle	*Aquila chrysaetos*	1	30	900	4200
ABNKD06020	American kestrel	*Falco sparverius*	1	28	900	2850
ABNKD06030	Merlin	*Falco columbarius*	1	25	900	2700
ABNKD06070	Peregrine falcon	*Falco peregrinus*	1	34	900	2700
ABNKD06090	Prairie falcon	*Falco mexicanus*	1	30	900	4200
ABNLC01010	Gray partridge	*Perdix perdix*	1	13	900	2400
ABNLC03010	Chukar	*Alectoris chukar*	0	15	1500	2700
ABNLC07010	Ring-necked pheasant	*Phasianus colchicus*	1	14	900	2250
ABNLC09020	Blue grouse	*Dendragapus obscurus*	1	17	1950	3300
ABNLC10030	White-tailed ptarmigan	*Lagopus leucurus*	1	4	3300	3750
ABNLC11010	Ruffed grouse	*Bonasa umbellus*	1	10	900	3150
ABNLC12010	Sage grouse	*Centrocercus urophasianus*	1	13	900	2550
ABNLC13030	Sharp-tailed grouse	*Tympanuchus phasianellus*	1	21	900	2550
ABNLC13033	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	1	10	2100	2550
ABNLC14010	Wild turkey	*Meleagris gallopavo*	1	16	900	4200
ABNLC21020	Northern bobwhite	*Colinus virginianus*	1	6	900	4200
ABNME05030	Virginia rail	*Rallus limicola*	1	7	900	2400
ABNME08020	Sora	*Porzana carolina*	1	7	900	2400
ABNME14020	American coot	*Fulica americana*	1	7	900	2400
ABNMK01010	Sandhill crane	*Grus canadensis*	1	8	900	2850
ABNMK01030	Whooping crane	*Grus americana*	1	8	900	2400
ABNNB02010	Black-bellied plover	*Pluvialis squatarola*	1	8	900	2400
ABNNB02030	Lesser golden plover	*Pluvialis dominica*	1	9	900	4200
ABNNB03030	Snowy plover	*Charadrius alexandrinus*	0	4	900	2400
ABNNB03060	Semipalmated plover	*Charadrius semipalmatus*	1	5	900	2400
ABNNB03070	Piping plover	*Charadrius melodus*	0	2	900	4200
ABNNB03090	Killdeer	*Charadrius vociferus*	1	10	900	2700
ABNNB03100	Mountain plover	*Charadrius montanus*	0	8	900	2400
ABNND01010	Black necked stilt	*Himantopus mexicanus*	1	6	900	2400
ABNND02010	American avocet	*Recurvirostra americana*	1	5	900	2550
ABNNF01020	Greater yellowlegs	*Tringa melanoleuca*	0	3	900	2400

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian	Cover	Elevation	
			P/A	No.	Min	Max
ABNNF01030	Lesser yellowlegs	*Tringa flavipes*	0	4	900	2400
ABNNF01070	Solitary sandpiper	*Tringa solitaria*	0	3	900	2400
ABNNF02010	Willet	*Catoptrophorus semipalmatus*	1	6	900	2400
ABNNF04020	Spotted sandpiper	*Actitis macularia*	1	5	900	3450
ABNNF06010	Upland sandpiper	*Bartramia longicauda*	0	6	900	4200
ABNNF07020	Whimbrel	*Numenius phaeopus*	1	4	900	4200
ABNNF07070	Long-billed curlew	*Numenius americanus*	1	13	900	2400
ABNNF08040	Marbled godwit	*Limosa fedoa*	1	6	900	2400
ABNNF11030	Sanderling	*Calidris alba*	0	2	900	2400
ABNNF11040	Semipalmated sandpiper	*Calidris pusilla*	0	2	900	2400
ABNNF11090	Western sandpiper	*Calidris mauri*	0	2	900	2400
ABNNF11100	Least sandpiper	*Calidris minutilla*	0	3	900	2400
ABNNF11120	Baird's sandpiper	*Calidris bairdii*	0	4	900	2400
ABNNF11130	Pectoral sandpiper	*Calidris melanotos*	0	4	900	2400
ABNNF11190	Stilt sandpiper	*Calidris himantopus*	0	2	900	4200
ABNNF16020	Long-billed dowitcher	*Limnodromus scolopaceus*	0	4	900	2400
ABNNF18010	Common snipe	*Gallinago gallinago*	1	9	900	2550
ABNNF20010	Wilson's phalarope	*Phalaropus tricolor*	1	6	900	2400
ABNNF20020	Red-necked phalarope	*Phalaropus lobatus*	1	4	900	2400
ABNNM03020	Franklin's gull	*Larus pipixcan*	1	8	900	2400
ABNNM03050	Bonaparte's gull	*Larus philadelphia*	0	2	900	2400
ABNNM03100	Ring-billed gull	*Larus delawarensis*	0	5	900	2400
ABNNM03110	California gull	*Larus californicus*	0	5	900	2400
ABNNM03120	Herring gull	*Larus argentatus*	0	3	900	2400
ABNNM08020	Caspian tern	*Sterna caspia*	0	2	900	2400
ABNNM08070	Common tern	*Sterna hirundo*	1	5	900	2400
ABNNM08090	Forster's tern	*Sterna forsteri*	0	3	900	2400
ABNNM10020	Black tern	*Chlidonias niger*	0	3	900	2400
ABNPB04040	Mourning dove	*Zenaida macroura*	1	31	900	2550
ABNRB02010	Black-billed cuckoo	*Coccyzus erythropthalmus*	1	12	900	2400
ABNRB02020	Yellow-billed cuckoo	*Coccyzus americanus*	1	4	900	2250
ABNSA01010	Common barn owl	*Tyto alba*	1	16	900	4200
ABNSB01020	Flammulated owl	*Otus flammeolus*	1	7	900	3000
ABNSB01030	Eastern screech owl	*Otus asio*	1	14	900	2400
ABNSB01040	Western screech owl	*Otus kennicottii*	1	15	900	2400
ABNSB05010	Great-horned owl	*Bubo virginianus*	1	34	900	3000
ABNSB08010	Northern pygmy-owl	*Glaucidium gnoma*	0	8	900	4200
ABNSB10010	Burrowing owl	*Athene cunicularia*	0	13	900	4200
ABNSB12040	Great gray owl	*Strix nebulosa*	1	13	1500	3000
ABNSB13010	Long-eared owl	*Asio otus*	1	18	900	2400
ABNSB13040	Short-eared owl	*Asio flammeus*	1	13	900	2250
ABNSB15010	Boreal owl	*Aegolius funereus*	1	8	1500	3600
ABNSB15020	Northern saw-whet owl	*Aegolius acadicus*	1	10	1500	3150
ABNTA02020	Common nighthawk	*Chordeiles minor*	1	32	900	2700
ABNTA04010	Common poorwill	*Phalaenoptilus nuttallii*	0	13	900	2550
ABNUA03010	Chimney swift	*Chaetura pelagica*	1	9	900	2250
ABNUA06010	White-throated swift	*Aeronautes saxatalis*	1	21	900	2700
ABNUC45020	Black-chinned hummingbird	*Archilochus alexandri*	1	12	900	4200
ABNUC48010	Calliope hummingbird	*Stellula calliope*	1	16	900	2700
ABNUC51010	Broad-tailed hummingbird	*Selasphorus platycercus*	1	19	900	3000
ABNUC51020	Rufous hummingbird	*Selasphorus rufus*	1	22	900	3900
ABNXD01020	Belted kingfisher	*Ceryle alcyon*	1	6	900	4200

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian P/A	Cover No.	Elevation Min	Elevation Max
ABNYF04010	Lewis' woodpecker	*Melanerpes lewis*	1	15	900	2700
ABNYF04040	Red-headed woodpecker	*Melanerpes erythrocephalus*	1	13	900	4200
ABNYF05030	Williamson's sapsucker	*Sphyrapicus thyroideus*	1	10	900	4200
ABNYF05040	Red-naped sapsucker	*Sphyrapicus nuchalis*	1	14	1350	2700
ABNYF07030	Downy woodpecker	*Picoides pubescens*	1	17	900	4200
ABNYF07040	Hairy woodpecker	*Picoides villosus*	1	15	1200	2700
ABNYF07080	Three-toed woodpecker	*Picoides tridactylus*	1	9	1500	4200
ABNYF07090	Black-backed woodpecker	*Picoides arcticus*	0	9	900	2700
ABNYF10020	Northern flicker	*Colaptes auratus*	1	16	900	3150
ABPAE32010	Olive-sided flycatcher	*Contopus borealis*	1	15	1500	3300
ABPAE32050	Western wood pewee	*Contopus sordidulus*	1	17	900	4200
ABPAE33040	Willow flycatcher	*Empidonax traillii*	1	13	900	2850
ABPAE33070	Least flycatcher	*Empidonax minimus*	1	15	900	4200
ABPAE33080	Hammond's flycatcher	*Empidonax hammondii*	1	10	1500	3300
ABPAE33090	Dusky flycatcher	*Empidonax oberholseri*	1	17	900	4200
ABPAE33100	Gray flycatcher	*Empidonax wrightii*	1	10	900	4200
ABPAE33160	Cordilleran flycatcher	*Empidonax occidentalis*	1	13	1350	2700
ABPAE35020	Eastern phoebe	*Sayornis phoebe*	1	8	900	4200
ABPAE35030	Say's phoebe	*Sayornis saya*	1	18	900	2400
ABPAE43050	Ash-throated flycatcher	*Myiarchus cinerascens*	1	11	900	2250
ABPAE52030	Cassin's kingbird	*Tyrannus vociferans*	1	9	1350	2250
ABPAE52050	Western kingbird	*Tyrannus verticalis*	1	21	900	2400
ABPAE52060	Eastern kingbird	*Tyrannus tyrannus*	1	18	900	2400
ABPAT02010	Horned lark	*Eremophila alpestris*	0	17	900	3600
ABPAU03010	Tree swallow	*Tachycineta bicolor*	1	14	900	2700
ABPAU03040	Violet-green swallow	*Tachycineta thalassina*	1	19	900	2550
ABPAU07010	Northern rough-winged swallow	*Stelgidopteryx serripennis*	1	10	900	2550
ABPAU08010	Bank swallow	*Riparia riparia*	1	9	900	2400
ABPAU09010	Cliff swallow	*Hirundo pyrrhonota*	1	15	900	2850
ABPAU09030	Barn swallow	*Hirundo rustica*	1	12	900	2550
ABPAV01010	Gray jay	*Perisoreus canadensis*	1	12	900	4200
ABPAV02010	Steller's jay	*Cyanocitta stelleri*	0	13	900	3000
ABPAV02020	Blue jay	*Cyanocitta cristata*	1	8	900	4200
ABPAV06010	Scrub jay	*Aphelocoma coerulescens*	1	14	900	4200
ABPAV07010	Pinyon jay	*Gymnorhinus cyanocephalus*	1	13	900	2100
ABPAV08010	Clark's nutcracker	*Nucifraga columbiana*	1	18	1350	3750
ABPAV09010	Black-billed magpie	*Pica pica*	1	36	900	2700
ABPAV10010	American crow	*Corvus brachyrhynchos*	1	25	900	2700
ABPAV10110	Common raven	*Corvus corax*	1	36	900	3900
ABPAW01010	Black-capped chickadee	*Parus atricapillus*	1	13	900	2700
ABPAW01040	Mountain chickadee	*Parus gambeli*	1	13	900	3450
ABPAW01100	Plain titmouse	*Parus inornatus*	0	3	1800	2400
ABPAY01010	Bushtit	*Psaltriparus minimus*	1	12	900	2400
ABPAZ01010	Red-breasted nuthatch	*Sitta canadensis*	1	16	1350	4200
ABPAZ01020	White-breasted nuthatch	*Sitta carolinensis*	1	13	900	2550
ABPAZ01030	Pygmy nuthatch	*Sitta pygmaea*	1	7	1350	4200
ABPBA01010	Brown creeper	*Certhia americana*	1	13	1350	4200
ABPBG03010	Rock wren	*Salpinctes obsoletus*	0	20	900	3300
ABPBG04010	Canyon wren	*Catherpes mexicanus*	1	9	900	4200
ABPBG07010	Bewick's wren	*Thryomanes bewickii*	1	8	900	4200
ABPBG09010	House wren	*Troglodytes aedon*	1	18	900	4200
ABPBG10020	Marsh wren	*Cistothorus palustris*	1	6	900	4200

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian	Cover	Elevation	
			P/A	No.	Min	Max
ABPBH01010	American dipper	*Cinclus mexicanus*	1	5	1350	3150
ABPBJ05010	Golden-crowned kinglet	*Regulus satrapa*	1	13	1200	4200
ABPBJ05020	Ruby-crowned kinglet	*Regulus calendula*	1	18	1350	4200
ABPBJ08010	Blue-gray gnatcatcher	*Polioptila caerulea*	1	11	900	2250
ABPBJ15010	Eastern bluebird	*Sialia sialis*	1	10	900	4200
ABPBJ15030	Mountain bluebird	*Sialia currucoides*	1	32	900	3300
ABPBJ16010	Townsend's solitaire	*Myadestes townsendi*	1	20	1350	3150
ABPBJ18080	Veery	*Catharus fuscescens*	1	9	900	2700
ABPBJ18100	Swainson's thrush	*Catharus ustulatus*	1	11	1350	3000
ABPBJ18110	Hermit thrush	*Catharus guttatus*	1	14	1350	4200
ABPBJ20170	American robin	*Turdus migratorius*	1	28	900	3150
ABPBK01010	Catbird	*Dumetella carolinensis*	1	12	900	2250
ABPBK03010	Northern mockingbird	*Mimus polyglottos*	1	10	900	4200
ABPBK04010	Sage thrasher	*Oreoscoptes montanus*	0	10	900	3000
ABPBK06010	Brown thrasher	*Toxostoma rufum*	1	10	900	2550
ABPBM02050	American (water) pipit	*Anthus rubescens*	1	7	900	4200
ABPBM02060	Sprague's pipit	*Anthus spragueii*	0	4	900	4200
ABPBN01010	Bohemian waxwing	*Bombycilla garrulus*	1	13	900	2700
ABPBN01020	Cedar waxwing	*Bombycilla cedrorum*	1	12	900	4200
ABPBR01020	Northern shrike	*Lanius excubitor*	1	23	900	2400
ABPBR01030	Loggerhead shrike	*Lanius ludovicianus*	1	22	900	2700
ABPBW01160	Solitary vireo	*Vireo solitarius*	1	12	900	2550
ABPBW01210	Warbling vireo	*Vireo gilvus*	1	12	900	4200
ABPBW01240	Red-eyed vireo	*Vireo olivaceus*	1	9	900	2250
ABPBX01040	Tennessee warbler	*Vermivora peregrina*	1	15	900	4200
ABPBX0900	Orange-crowned warbler	*Vermivora celata*	1	14	900	2700
ABPBX01060	Nashville warbler	*Vermivora ruficapilla*	1	3	900	4200
ABPBX01070	Virginia's warbler	*Vermivora virginiae*	1	13	900	2700
ABPBX02010	Northern parula	*Parula americana*	1	4	900	4200
ABPBX03010	Yellow warbler	*Dendroica petechia*	1	11	900	2400
ABPBX03020	Chestnut-sided warbler	*Dendroica pensylvanica*	1	5	900	4200
ABPBX03030	Magnolia warbler	*Dendroica magnolia*	1	3	900	4200
ABPBX03050	Black-throated blue warbler	*Dendroica caerulescens*	1	5	900	4200
ABPBX03060	Yellow-rumped warbler	*Dendroica coronata*	1	18	900	3150
ABPBX03070	Black-throated gray warbler	*Dendroica nigrescens*	1	9	900	4200
ABPBX03080	Townsend's warbler	*Dendroica townsendi*	1	10	900	4200
ABPBX03120	Blackburnian warbler	*Dendroica fusca*	1	8	900	4200
ABPBX03230	Blackpoll warbler	*Dendroica striata*	1	7	900	4200
ABPBX05010	Black-and-white warbler	*Mniotilta varia*	1	4	900	4200
ABPBX06010	American redstart	*Setophaga ruticilla*	1	15	900	4200
ABPBX10010	Ovenbird	*Seiurus aurocapillus*	1	13	900	4200
ABPBX10020	Northern waterthrush	*Seiurus noveboracensis*	1	6	900	4200
ABPBX11040	Macgillivray's warbler	*Oporornis tolmiei*	1	18	900	2700
ABPBX12010	Common yellowthroat	*Geothlypis trichas*	1	7	900	2400
ABPBX16020	Wilson's warbler	*Wilsonia pusilla*	1	16	900	4200
ABPBX24010	Yellow-breasted chat	*Icteria virens*	1	7	900	2400
ABPBX45030	Summer tanager	*Piranga rubra*	1	4	900	4200
ABPBX45050	Western tanager	*Piranga ludoviciana*	1	17	900	4200
ABPBX61030	Rose-breasted grosbeak	*Pheucticus ludovicianus*	1	6	900	4200
ABPBX61040	Black-headed grosbeak	*Pheucticus melanocephalus*	1	10	900	2400
ABPBX63010	Blue grosbeak	*Guiraca caerulea*	1	8	900	4200
ABPBX64020	Lazuli bunting	*Passerina amoena*	1	14	900	2700

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian P/A	Cover No.	Elevation Min	Elevation Max
ABPBX64030	Indigo bunting	*Passerina cyanea*	1	12	900	4200
ABPBX65010	Dickcissel	*Spiza americana*	1	7	900	4200
ABPBX74010	Green-tailed towhee	*Pipilo chlorurus*	1	21	1350	3450
ABPBX74030	Rufous-sided towhee	*Pipilo erythrophthalmus*	1	21	900	2400
ABPBX94010	American tree sparrow	*Spizella arborea*	1	16	900	4200
ABPBX94020	Chipping sparrow	*Spizella passerina*	1	38	900	3000
ABPBX94030	Clay-colored sparrow	*Spizella pallida*	1	18	900	4200
ABPBX94040	Brewer's sparrow	*Spizella breweri*	1	15	900	4200
ABPBX94050	Field sparrow	*Spizella pusilla*	1	12	900	4200
ABPBX95010	Vesper sparrow	*Pooecetes gramineus*	1	22	900	4200
ABPBX96010	Lark sparrow	*Chondestes grammacus*	1	18	900	2400
ABPBX97020	Sage sparrow	*Amphispiza belli*	0	11	900	2400
ABPBX98010	Lark bunting	*Calamospiza melanocorys*	1	8	900	4200
ABPBX99010	Savannah sparrow	*Passerculus sandwichensis*	1	14	900	2400
ABPBXA0010	Baird's sparrow	*Ammodramus bairdii*	0	3	900	4200
ABPBXA0020	Grasshopper sparrow	*Ammodramus savannarum*	1	10	900	2100
ABPBXA2010	Fox sparrow	*Passerella iliaca*	1	8	900	4200
ABPBXA3010	Song sparrow	*Melospiza melodia*	1	11	900	4200
ABPBXA3020	Lincoln's sparrow	*Melospiza lincolnii*	1	8	900	3750
ABPBXA4040	White crowned sparrow	*Zonotrichia leucophrys*	1	13	1350	4200
ABPBXA4050	Harris' sparrow	*Zonotrichia querula*	1	6	900	4200
ABPBXA5020	Dark-eyed junco	*Junco hyemalis*	1	17	900	4200
ABPBXA6010	Mccown's longspur	*Calcarius mccownii*	0	7	900	2250
ABPBXA6020	Lapland longspur	*Calcarius lapponicus*	0	6	900	4200
ABPBXA6040	Chestnut-collared longspur	*Calcarius ornatus*	0	7	900	4200
ABPBXA8010	Snow bunting	*Plectrophenax nivalis*	0	11	900	4200
ABPBXA9010	Bobolink	*Dolichonyx oryzivorus*	1	9	900	2250
ABPBXB0010	Red-winged blackbird	*Agelaius phoeniceus*	1	8	900	2850
ABPBXB2030	Western meadowlark	*Sturnella neglecta*	1	13	900	2850
ABPBXB3010	Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	1	5	900	2400
ABPBXB5020	Brewer's blackbird	*Euphagus cyanocephalus*	1	24	900	3000
ABPBXB6070	Common grackle	*Quiscalus quiscula*	1	16	900	4200
ABPBXB7030	Brown-headed cowbird	*Molothrus ater*	1	27	900	2700
ABPBXB9070	Orchard oriole	*Icterus spurius*	1	8	900	1950
ABPBXB9190	Northern oriole	*Icterus galbula*	1	8	900	4200
ABPBXB9200	Scott's oriole	*Icterus parisorum*	0	7	900	4200
ABPBY02010	Rosy finch	*Leucosticte arctoa*	1	19	1500	4200
ABPBY03010	Pine grosbeak	*Pinicola enucleator*	1	9	900	4200
ABPBY04020	Purple finch	*Carpodacus purpureus*	1	3	900	4200
ABPBY04030	Cassin's finch	*Carpodacus cassinii*	1	16	900	3150
ABPBY04040	House finch	*Carpodacus mexicanus*	1	5	900	2400
ABPBY05010	Red crossbill	*Loxia curvirostra*	1	8	900	4200
ABPBY05020	White-winged crossbill	*Loxia leucoptera*	0	4	900	4200
ABPBY06010	Common redpoll	*Carduelis flammea*	1	15	900	4200
ABPBY06030	Pine siskin	*Carduelis pinus*	1	16	900	3150
ABPBY06090	Lesser goldfinch	*Carduelis psaltria*	1	10	900	3150
ABPBY06110	American goldfinch	*Carduelis tristis*	1	12	900	2400
ABPBY09020	Evening grosbeak	*Coccothraustes vespertinus*	1	11	900	4200
AMABA01010	Cinerus or masked shrew	*Sorex cinereus*	1	14	900	2850
AMABA01030	Preble's shrew	*Sorex preblei*	1	13	900	2550
AMABA01070	Vagrant shrew	*Sorex vagrans*	1	19	1500	3150
AMABA01080	Dusky or montane shrew	*Sorex monticolus*	1	19	2100	4200

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian	Cover	Elevation	
			P/A	No.	Min	Max
AMABA01130	Dwarf shrew	*Sorex nanus*	0	14	900	3450
AMABA01150	Water shrew	*Sorex palustris*	1	6	1800	3300
AMABA01230	Merriam's shrew	*Sorex merriami*	1	13	900	2700
AMABA01250	Pygmy shrew	*Sorex hoyi*	1	7	2700	3150
AMABA01280	Hayden's shrew	*Sorex haydeni*	1	9	900	4200
AMABB04010	Eastern mole	*Scalopus aquaticus*	1	9	900	4200
AMACC01010	Little brown myotis	*Myotis lucifugus*	1	30	900	3150
AMACC01020	Yuma myotis	*Myotis yumanensis*	1	5	900	1950
AMACC01060	Keen's myotis	*Myotis keenii*	0	6	1350	1950
AMACC01070	Long-eared myotis	*Myotis evotis*	1	21	900	4200
AMACC01090	Fringed myotis	*Myotis thysanodes*	1	20	900	4200
AMACC01110	Long-legged myotis	*Myotis volans*	1	23	1350	3600
AMACC01120	California myotis	*Myotis californicus*	1	14	900	2550
AMACC01140	Western small-footed myotis	*Myotis ciliolabrum*	1	22	900	2400
AMACC02010	SIlver-haired bat	*Lasionycteris noctivagans*	1	19	900	3000
AMACC04010	Big brown bat	*Eptesicus fuscus*	1	30	900	3300
AMACC05010	Red bat	*Lasiurus borealis*	1	12	900	4200
AMACC05030	Hoary bat	*Lasiurus cinereus*	1	21	900	3000
AMACC07010	Spotted bat	*Euderma maculatum*	1	13	900	2400
AMACC08010	Townsend's big-eared bat	*Plecotus townsendii*	1	17	900	2850
AMACC10010	Pallid bat	*Antrozous pallidus*	1	17	900	2250
AMACD01010	Brazilian free-tailed bat	*Tadarida brasiliensis*	1	10	900	4200
AMAEA01020	American pika	*Ochotona princeps*	0	7	2550	4200
AMAEB01040	Eastern cottontail	*Sylvilagus floridanus*	1	10	900	4200
AMAEB01060	Mountain (nuttall's) cottontail	*Sylvilagus nuttallii*	1	26	1350	2700
AMAEB01070	Desert cottontail	*Sylvilagus audubonii*	1	15	900	4200
AMAEB03010	Snowshoe hare	*Lepus americanus*	1	16	2100	3150
AMAEB03040	White-tailed jack rabbit	*Lepus townsendii*	1	18	900	4200
AMAEB03050	Black-tailed jack rabbit	*Lepus californicus*	1	18	900	4200
AMAEB04010	Pygmy rabbit	*Brachylagus idahoensis*	1	10	1500	2400
AMAFB02020	Least chipmunk	*Tamias minimus*	0	20	900	4200
AMAFB02030	Yellow-pine chipmunk	*Tamias amoenus*	1	9	900	4200
AMAFB02111	Cliff chipmunk	*Tamias dorsalis utahensis*	0	9	1500	2400
AMAFB02190	Uinta chipmunk	*Tamias umbrinus*	1	17	1950	3150
AMAFB03020	Yellow-bellied marmot	*Marmota flaviventris*	1	20	1500	3900
AMAFB05050	Uinta ground squirrel	*Spermophilus armatus*	1	12	900	3450
AMAFB05090	Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	0	18	900	4200
AMAFB05091	Allen's 13-lined ground squirrel	*Spermophilus tridecemlineatus alleni*	0	13	2250	2700
AMAFB05110	Spotted ground squirrel	*Spermophilus spilosoma*	1	10	1350	2250
AMAFB05170	Golden-mantled ground squirrel	*Spermophilus lateralis*	1	20	900	4200
AMAFB05190	Wyoming ground squirrel	*Spermophilus elegans*	1	19	900	4200
AMAFB06010	Black-tailed prairie dog	*Cynomys ludovicianus*	0	2	900	4200
AMAFB06020	White-tailed prairie dog	*Cynomys leucurus*	0	11	900	4200
AMAFB07030	Abert's squirrel	*Sciurus aberti*	0	1	1350	3000
AMAFB07040	Eastern fox squirrel	*Sciurus niger*	1	8	900	4200
AMAFB08010	Red squirrel	*Tamiasciurus hudsonicus*	0	10	900	4200
AMAFB09020	Northern flying squirrel	*Glaucomys sabrinus*	0	6	900	4200
AMAFC01040	Northern pocket gopher	*Thomomys talpoides*	0	30	1200	3900
AMAFC0900	Wyoming pocket gopher	*Thomomys clusius*	0	6	900	4200
AMAFC01070	Idaho pocket gopher	*Thomomys idahoensis*	1	11	900	4200
AMAFC02010	Plains pocket gopher	*Geomys bursarius*	0	5	900	4200
AMAFD01010	Olive-backed pocket mouse	*Perognathus fasciatus*	0	11	900	2400

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian P/A	Cover No.	Elevation Min	Elevation Max
AMAFD01020	Plains pocket mouse	*Perognathus flavescens*	0	6	900	4200
AMAFD01030	Silky pocket mouse	*Perognathus flavus*	0	7	900	4200
AMAFD01070	Great Basin pocket mouse	*Perognathus parvus*	0	11	900	4200
AMAFD01120	Hispid pocket mouse	*Perognathus hispidus*	0	7	900	4200
AMAFD03010	Ord's kangaroo rat	*Dipodomys ordii*	0	12	900	4200
AMAFE01010	American beaver	*Castor canadensis*	1	9	900	4200
AMAFF02010	Plains harvest mouse	*Reithrodontomys montanus*	0	5	900	4200
AMAFF02030	Western harvest mouse	*Reithrodontomys megalotis*	1	13	900	4200
AMAFF03040	Deer mouse	*Peromyscus maniculatus*	1	34	900	3300
AMAFF03070	White-footed mouse	*Peromyscus leucopus*	1	8	900	1950
AMAFF03090	Canyon mouse	*Peromyscus crinitus*	0	3	900	2550
AMAFF03130	Pinyon mouse	*Peromyscus truei*	0	5	900	4200
AMAFF06010	Northern grasshopper mouse	*Onychomys leucogaster*	0	15	900	2850
AMAFF08090	Bushy-tailed wood rat	*Neotoma cinerea*	0	18	900	3450
AMAFF09020	Southern red-backed vole	*Clethrionomys gapperi*	1	13	900	4200
AMAFF10010	Heather vole	*Phenacomys intermedius*	1	12	900	4200
AMAFF11010	Meadow vole	*Microtus pennsylvanicus*	1	7	900	3000
AMAFF11020	Montane vole	*Microtus montanus*	1	12	1650	3150
AMAFF11060	Long-tailed vole	*Microtus longicaudus*	1	16	900	3300
AMAFF11140	Prairie vole	*Microtus ochrogaster*	0	6	900	4200
AMAFF11190	Water vole	*Microtus richardsoni*	1	7	2550	3000
AMAFF13010	Sagebrush vole	*Lemmiscus curtatus*	0	18	900	3450
AMAFF15010	Muskrat	*Ondatra zibethicus*	1	7	900	4200
AMAFH01011	Preble's meadow jumping mouse	*Zapus hudsonius preblei*	1	7	900	2400
AMAFH01013	Bear Lodge meadow jumping m.	*Zapus hudsonius campestris*	1	13	900	4200
AMAFH01020	Western jumping mouse	*Zapus princeps*	1	12	900	4200
AMAFJ01010	Common porcupine	*Erethizon dorsatum*	1	26	900	4200
AMAJA01010	Coyote	*Canis latrans*	1	39	900	4200
AMAJA01030	Gray wolf	*Canis lupus*	1	30	900	4200
AMAJA03010	Red fox	*Vulpes vulpes*	1	34	900	4200
AMAJA03030	Swift fox	*Vulpes velox*	1	10	1350	2250
AMAJA04010	Gray fox	*Urocyon cinereoargenteus*	1	13	900	4200
AMAJB01010	Black bear	*Ursus americanus*	1	23	900	4200
AMAJB01020	Grizzly or brown bear	*Ursus arctos*	1	24	900	4200
AMAJE01010	Ringtail	*Bassariscus astutus*	1	10	900	3000
AMAJE02010	Common raccoon	*Procyon lotor*	1	8	900	2700
AMAJF01010	American marten	*Martes americana*	1	14	1500	3450
AMAJF01020	Fisher	*Martes pennanti*	1	13	900	4200
AMAJF02010	Ermine	*Mustela erminea*	1	25	900	3600
AMAJF02020	Least weasel	*Mustela nivalis*	1	11	1200	1650
AMAJF02030	Long-tailed weasel	*Mustela frenata*	1	28	900	4200
AMAJF02040	Black-footed ferret	*Mustela nigripes*	0	8	900	4200
AMAJF02050	Mink	*Mustela vison*	1	7	900	4200
AMAJF03011	North American wolverine	*Gulo gulo luscus*	1	18	1800	4200
AMAJF04010	American badger	*Taxidea taxus*	1	24	900	3600
AMAJF05010	Eastern spotted skunk	*Spilogale putorius*	1	11	900	4200
AMAJF05020	Western spotted skunk	*Spilogale gracilis*	1	16	900	4200
AMAJF06010	Striped skunk	*Mephitis mephitis*	1	26	900	4200
AMAJF08010	Northern river otter	*Lutra canadensis*	1	6	900	3000
AMAJH01020	Mountain lion	*Felis concolor*	0	23	900	4200
AMAJH03010	Lynx	*Lynx canadensis*	0	11	2100	4200
AMAJH03020	Bobcat	*Lynx rufus*	1	25	900	2700

Appendix 3.2 continued.

Element code	Common name	Scientific name	Riparian	Cover	Elevation	
			P/A	No.	Min	Max
AMALC01010	Wapiti or elk	*Cervus elaphus*	1	27	900	3600
AMALC02010	Mule or black-tailed deer	*Odocoileus hemionus*	1	38	900	4200
AMALC02020	White-tailed deer	*Odocoileus virginianus*	1	18	900	4200
AMALC03010	Moose	*Alces alces*	1	22	900	4200
AMALD01010	Pronghorn	*Antilocapra americana*	0	22	900	2850
AMALE01010	American bison	*Bos bison*	1	16	900	4200
AMALE02010	Mountain goat	*Oreamnos americanus*	1	11	2100	4200
AMALE04010	Mountain sheep	*Ovis canadensis*	1	25	900	4200
ARAAB01010	Common snapping turtle	*Chelydra serpentina*	1	6	900	1800
ARAAD01010	Western painted turtle	*Chrysemys picta*	1	6	900	1800
ARAAD08020	Ornate box turtle	*Terrapene ornata*	0	3	900	2100
ARAAG01030	Western spiny softshell turtle	*Trionyx spiniferus*	1	6	900	1800
ARACF08020	Northern earless lizard	*Holbrookia maculata*	0	3	900	1800
ARACF12030	Eastern short-horned lizard	*Phrynosoma douglassii*	1	9	900	2250
ARACF14030	Northern sagebrush lizard	*Sceloporus graciosus*	0	8	900	2400
ARACF14133	Northern plateau lizard	*Sceloporus undulatus elongatus*	0	5	900	2250
ARACF14134	Red-lipped prairie lizard	*Sceloporus undulatus erythrocheilus*	0	8	900	2250
ARACF14135	Northern prairie lizard	*Sceloporus undulatus garmani*	0	3	900	1800
ARACF16030	Northern tree lizard	*Urosaurus ornatus*	0	4	900	2550
ARACH01090	Northern many-lined skink	*Eumeces multivirgatus*	0	3	900	4200
ARACJ02110	Prairie lined racerunner	*Cnemidophorus sexlineatus*	1	5	900	4200
ARADA01010	Rubber boa	*Charina bottae*	1	6	900	2850
ARADB07014	Eastern yellowbelly racer	*Coluber constrictor flaviventris*	1	9	900	2400
ARADB17010	Plains hognose snake	*Heterodon nasicus*	1	11	900	4200
ARADB19050	Pale milk snake	*Lampropeltis triangulum*	1	9	900	1950
ARADB23020	Smooth green snake	*Opheodrys vernalis*	1	8	900	2400
ARADB26018	Great Basin gopher snake	*Pituophis melanoleucus deserticola*	0	7	900	2250
ARADB2601A	Bullsnake	*Pituophis melanoleucus sayi*	1	10	900	2250
ARADB34033	Black hills redbelly snake	*Storeria occipitomaculata pahasapae*	0	7	900	4200
ARADB36054	Wandering garter snake	*Thamnophis elegans vagrans*	1	5	900	3000
ARADB36101	Western plains garter snake	*Thamnophis radix haydenii*	1	6	900	1950
ARADB36130	Common garter snake	*Thamnophis sirtalis*	1	5	900	4200
ARADE02120	Prairie rattlesnake	*Crotalus viridis*	1	20	900	2550
ARADE02123	Midget faded rattlesnake	*Crotalus viridis concolor*	0	5	1950	2100

Appendix 3.3 Accuracy assessment of riparian/aquatic model used to predict the distributions of vertebrate species in Wyoming (see Chapter 3).

Riparian areas are defined as lands adjacent to streams and rivers where vegetation is strongly influenced by the presence of water and, therefore, are considered wetlands (Cowardin et al. 1992). In the arid west, riparian areas can constitute less than 1 % of landscape (Chaney et al. 1991), yet their importance to the distribution of vertebrate species is far out of proportion to the area they represent (Gerhart and Olsen 1982, Szaro and Jackle 1985, Szaro and Belfit 1986, 1987, Finch 1989). There have been 2 common approaches to predicting the occurrence of species associated with riparian and aquatic habitat for GAP. The first approach has been to identify vegetation polygons which contain small riparian and aquatic features and to predict that the species with riparian assocations occur throughout the polygon. This often results in the inclusion of riparian-associated species in inappropriate upland habitats (Csuti 1994). A second approach is to restrict the species to only riparian and/or aquatic polygons. The disadvantage of this approach is that it can significantly underestimate the distribution of vertebrate species because riparian areas are often small and linear by nature and, as a result, are not mapped adequately (Csuti 1994). GAP has adopted a 40-ha MMU standard for delineating riparian and other wetland features in the land cover map (Jennings 1993). Although this is a significant reduction from the 100-ha unit used in mapping upland land cover types, even with a 40-ha MMU, many small riparian and aquatic features still are not distinguished from upland cover types.

To predict the distribution of riparian-associated species, we chose to adopt the second approach described above and to minimize the problem of underestimation by further refining our map of riparian and aquatic (open water) areas. Based on the assumption that riparian vegetation occurs along streams and other water bodies, we modeled riparian areas by creating buffers around hydrographic features. A similar approach was taken by the Idaho GAP (ID-GAP) and UT-GAP. They created buffers of 200 - 400 meters (Idaho) or 100 meters (Utah) around hydrographic features (Scott et al. 1993, Edwards et al. 1995). We developed a riparian model using a system of variable buffer widths related to stream order, assuming that width of riparian areas along streams increases with stream order. Larger buffers were assigned to streams of higher order than to streams of low order, based on average riparian widths for ordered streams measured off of TM imagery. Our modeling approach was comparing to three other sources of information on riparian/wetland areas in Wyoming in order to determine how well it represented riparian/aquatic areas.

First, we compared our modeled riparian areas to the land cover map developed by WY-GAP (Chapter 2). Both the land cover map and our modeling approach identified approximately 3% of the state as riparian/aquatic areas (Table A3.3.1), but in these 2 maps there was only about 26% spatial overlap in riparian areas, compared to 87% overlap in aquatic areas. Similarly, we compared our modeled riparian to a vegetation map interpreted from full resolution (30 m) Landsat TM imagery and aerial photography for an area of approximately 870,000 ha in the Bighorn Mountains (Fig. A3.3.1), produced for the WGFD (Jellison 1995). Comparison of these digital maps indicated that both approaches

Table A3.3.1. A comparison of total area (ha) and percent between modeled riparian and riparian mapped by WY-GAP for the state of Wyoming (25,263,316 ha) and riparian mapped for a portion of the Bighorn mountains and basin (873,121 ha) interpreted from full resolution Landsat imagery (Jellison 1995). Area of overlap (ha) is area in common between datasets, and percent is based on "mapped" column. Modeled riparian includes both classified and unclassified riparian cover types.

	Comparison To WY-GAP Land Cover						Comparison To Bighorn Vegetation					
Feature	Modeled	%	Mapped	%	Overlap	%	Modeled	%	Mapped	%	Overlap	%
Riparian	713,491	2.82	637,258	2.52	163,427	25.65	33,052	3.79	27,640	3.16	6,158	22.28
Aquatic	185,869	0.74	137,543	0.54	119,487	86.87	3,159	0.36	2,604	0.30	1,929	74.08
Total	899,360	3.56	774,801	3.06			36,211	4.15	30,244	3.46		

again produced about the same total riparian area (Table A3.3.1), but there was only 22 % spatial overlap in the location of riparian areas.

The low percentage of overlap in riparian area resulted because the modeled riparian areas were determined from surface water features (streams, lakes, ponds and reservoirs) and excluded the presence of wetland features associated with ground water, such as marshes, bogs, and wet meadows. Such grass-dominated features made up 44.9% and 10.2% of the riparian types identified in the Bighorn vegetation map and WY-GAP land cover map, respectively, while the modeled riparian identified only 3.8% and 0.0% of the same areas as grass-dominated riparian (Table A3.3.2). In contrast, the modeled riparian approach identified more forest-dominated riparian in comparison to the other two mapping efforts. Riparian areas under forest canopies or adjacent to irrigated agriculture are difficult to identify from satellite imagery, which may explain why the modeling approach identified more forest-dominated riparian than the other two data sets. The vegetation for the majority of modeled riparian areas (63.5%) remained unclassified, complicating our interpretation of these differences.

Table A3.3.2 A comparison of area (ha) and percent of classified riparian features between modeled riparian and mapped riparian based on the WY-GAP land cover map and the Bighorn vegetation map.

	Comparison ToWY-GAP Land Cover				Comparison To Bighorn Vegetation			
Riparian Types	Modeled[1]	%	Mapped	%	Modeled[1]	%	Mapped	%
Grass dominated riparian	9,747	3.84	65,239	10.24	0	0.00	12,428	44.96
Shrub dominated riparian	79,581	31.33	283,634	44.51	533	5.73	11,860	42.91
Forest dominated riparian	164,639	64.83	288,386	45.25	8,776	94.27	3,352	12.13
Total riparian	253,967	100.00	637,259	100.00	9,309	100.00	27,640	100.00

[1]Figures for modeled riparian do not include 459,524 ha of unclassified riparian.

Our third comparison was to National Wetland Inventory (NWI) developed by the U.S. Fish and Wildlife Service. NWI maps were interpreted from 1:62,000-scale color infrared aerial photography with a MMU of approximately 0.1 ha (0.25 acres). For this comparison we selected 7 areas each consisting of four 7.5-minute quadrangles from the NWI maps that were available in digital form (Fig. A3.3.1).

A sampling grid of points spaced 250 meters apart was overlaid on each sampling area. We determined errors of omission/commission at 100 randomly selected points per sampling area within areas mapped as wetlands/riparian on either our potential riparian or the NWI maps. Commission errors (N_c) were the number of selected points that occurred as wetlands only on the WY-GAP modeled riparian map; omission errors (N_o) were the number of points occurring as wetlands only on the NWI map; and matches (N_m) were those points which occurred as riparian/wetlands on both WY-GAP and NWI maps. Errors of both omission and commission were high, but in 4 of the 7 areas the NWI identified more wetland areas than our riparian model (Table A3.3.3). Lack of consistency was largely due to the scale of source maps and definitions of wetlands. For example, the DLG source data used to model riparian areas was at a scale of 1:100,000 whereas NWI maps were produced closer to a scale of 1:24,000. As a result, our riparian model did not reveal as many hydrographic features in the state, such as first order streams and small ponds. Also, it does not have as wide a variety of wetland types as the NWI data, because the model was not able to include wetlands associated with ground water.

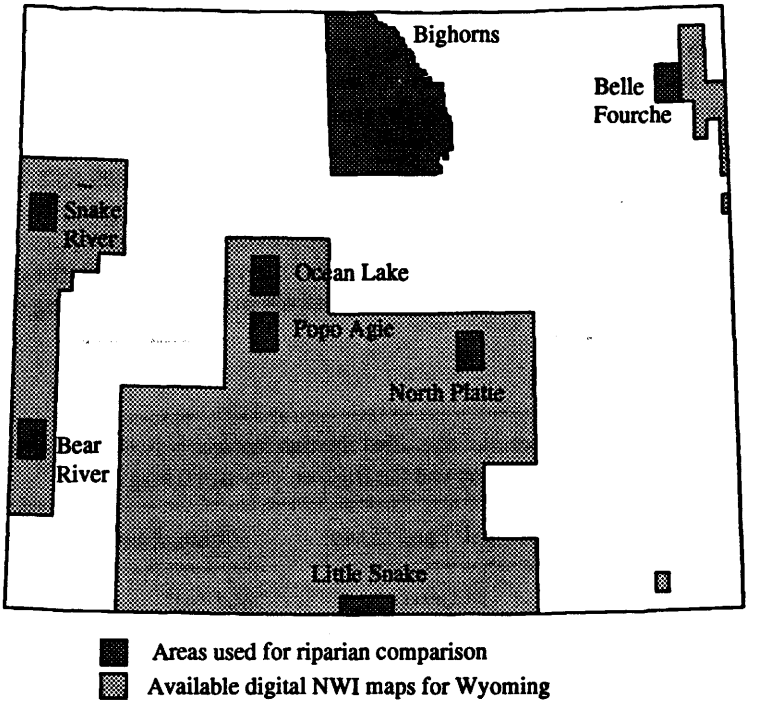


Figure A3.3.1. Location of NWI 7.5 minute quads and the Bighorn dataset used for comparison with the WY-GAP modeled riparian map.

Table A3.2.3. Frequency of commission (N_c) and omission (N_o) errors and matches (N_m) at 100 sites mapped as riparian/wetland by WY-GAP or NWI by sampling area. Percent accuracy = $N_m/(N_c+N_o+N_m)$.

Sample Area	N_c	N_o	N_m	% Accuracy
1 Snake River	50	18	32	32
2 Bear River	29	43	28	28
3 Ocean Lake	15	47	38	38
4 Popo Agie	32	40	28	28
5 Little Snake	20	53	27	27
6 North Platte	79	7	14	14
7 Belle Fourche	95	5	0	0
Mean	45.7	30.4	23.9	23.9

In much of the Belle Fourche and North Platte sample areas, the lack of consistency between the wetlands mapped by WY-GAP and NWI were a result of differences in wetland definitions. WY-GAP's riparian modeling efforts identified a considerable amount of cottonwood gallery forests along the banks of the Belle Fourche and North Platte rivers. However, this riparian forest type was not mapped as wetland by NWI because these riparian forests are not technically "wetlands" as defined by the classification scheme used by NWI (Cowardin et al. 1992).

Appendix 3.4 a. Example of information found in the Wyoming Terrestrial Verterbrate Species Atlas (Merrill et al. 1996b) for 445 terrestrial vertebrates modeled for Wyoming. References are not shown here but are included in the Atlas. See Chapter 7 for availability of the Atlas.

Common name: Fringed myotis
Scientific name: *Myotis thysanodes*
Element code: AMACC01090

Season: undetermined
Abundance: rare

WGFD Rank: SSC2
TNC Rank: S4

USFS Rank: S-USFS R2
USFWS Rank:

Comments about range:
Elevation 900-4200m since no statewide range given; in Black Hills area found from 3800-6150 ft. Range skirts Wyoming to the west and south, but occur as isolated populations from the Black Hills south to Laramie in eastern Wyoming (B87CLA65WYUS).

Comments about habitat associations:
Dry coniferous forests, juniper and desert scrub. Roosts in rock crevices, caves, mines, and buildings (B89CLA02WYUS). Also uses woodland-chaparral, basin-prairie shrublands (B87CLA65WYUS). Grasslands, deserts, woodlands, occasionally observed as high as spruce-fir zone (B87CLA65WYUS). Oak-pinyon association most common (A80OFA01NAUS). Found in evergreen riparian, forested and shrub, also grass dominated riparian (A82GERO1WYUS). Clearcut conifer, aspen, forest dominated riparian, and Wyoming big sagebrush habitats were added (WY-GAP reviewers).

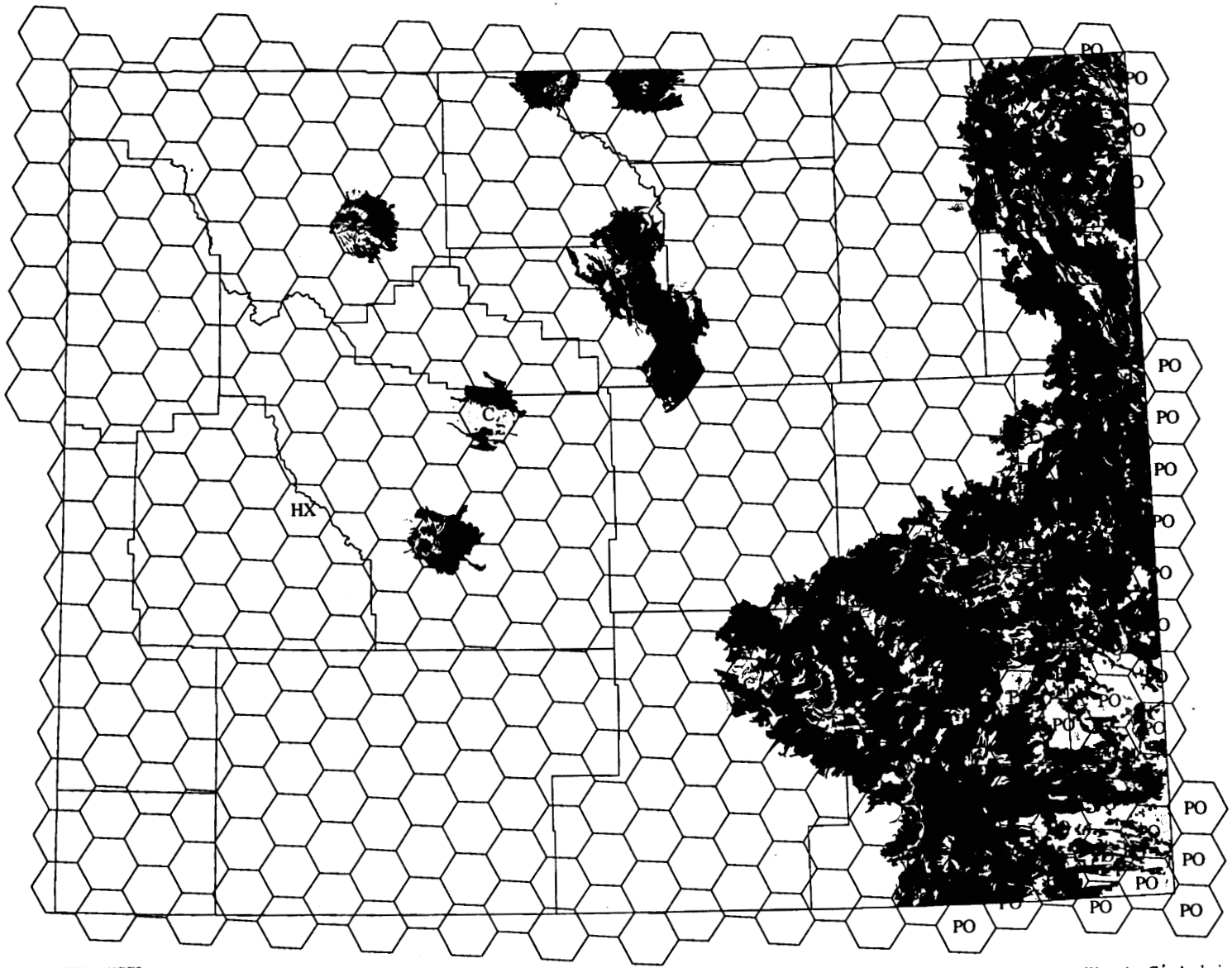
Comments about mapping:
Mapped distribution may be overestimated because habitat resolution does not permit identification of important roosting features such as caves, mineshafts, and buildings.

Total Area of Habitat (Ha): 5,748,963

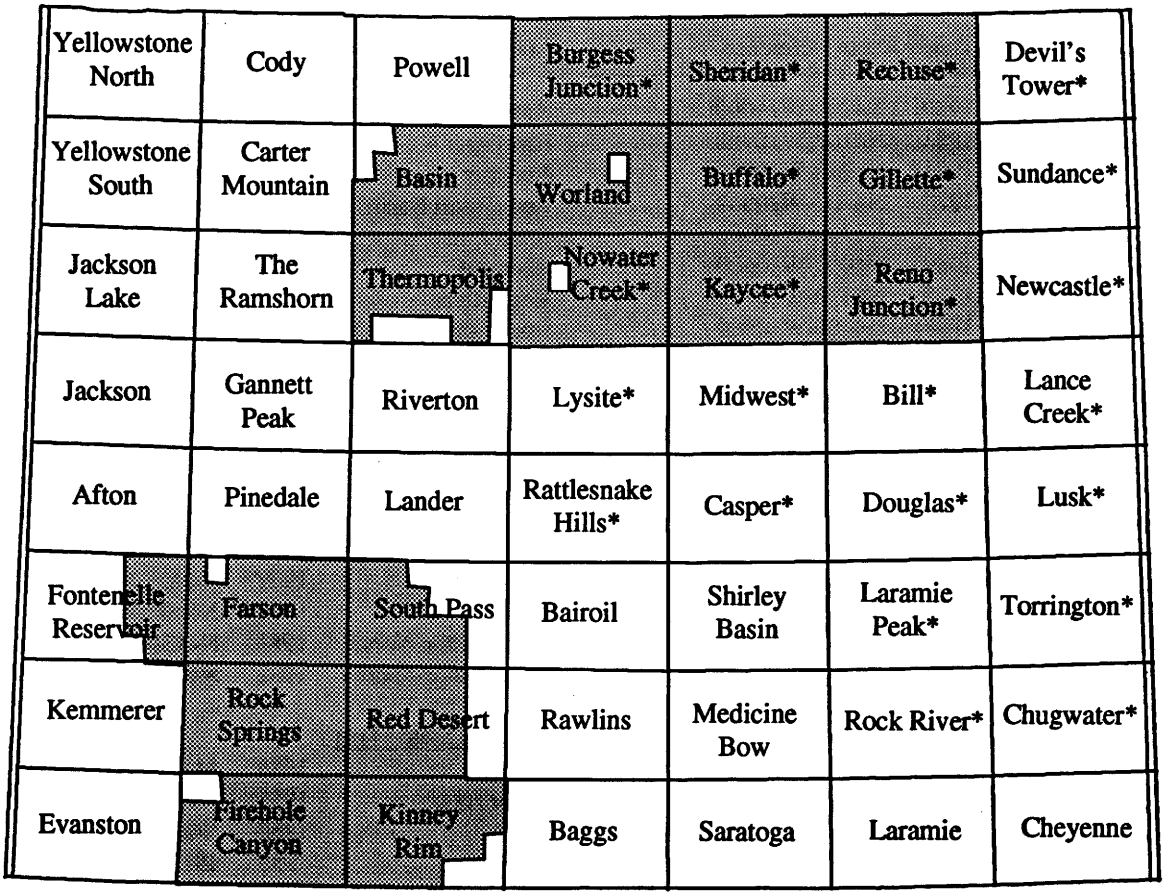
Cover type	Primary	Secondary
Spruce-fir	18,144	3,217
Douglas fir	28,535	0
Lodgepole pine	87,312	20,800
Ponderosa pine	581,153	18,607
Juniper woodland	153,886	2,345
Clearcut conifer	4,524	0
Aspen	24,473	9,947
Bur oak woodland	10,064	15
Forest-dominated riparian	110,744	49,659
Xeric upland shrub	153,886	13,392

Cover type	Primary	Secondary
Wyoming big sagebrush	793,310	131,946
Shrub-dominated riparian	39,223	19,213
Mixed grass prairie	2,781,930	463,990
Basin exposed rock/soil	88,945	8,771
Human settlements	27,764	13142
Unclassified riparian	90,026	0
Total	4,993,919	755,044

Appendix 3.4 b. Example of a distributional map of one of the 445 terrestrial vertebrate species modeled for Wyoming and compiled in the Wyoming Terrestrial Vertebrate Species Atlas (Merrill et al. 1996b). Letters within hexagons refer to qualifications on species occurrences as defined in Table 3.2. See Chapter 7 for availability of the Atlas.



Appendix 4.1. Portions of 1:100,000 scale Surface Management Status maps digitized by BLM Office (gray shade), and digitized by WY-GAP (unshaded).



* Quads checked and updated by BLM personnel in an informal accuracy assessment of the digital land ownership.

Appendix 4.2. Names, dates and reference codes of 1:100,000-scale BLM Surface Management Status maps from which Wyoming land ownership was digitized. Small portions of maps in states adjacent to Wyoming were used to digitize land ownership where the border of Wyoming extended across 1:100,000 quadrangle boundaries.

Map Name	Date	Map Reference	Map Name	Date	Map Reference
Afton	1989	N4230-W11000	Rattlesnake Hills	1991	N4230-W10700
Baggs	1983	N4100-W10700	Rawlins	1984	4107-E1-TM-100
Bairoil	1991	N4200-W10700	Recluse	1982	N4430-W10500
Basin	1982	N4400-W10800	Red Desert Basin	1980	N4130-W10800
Bill	1989	N4300-W10500	Reno Junction	1990	N4130-W11000
Buffalo	1989	N4400-W10600	Riverton	1978	N4300-W10800
Burgess Junction	1979	N4430-W10700	Rock River	1982	N4130-W10500
Carter Mountain	1989	N4400-W10900	Rock Springs	1989	N4130-W10900
Casper	1979	N4230-W10600	Saratoga	1990	N4100-W10600
Cheyenne	1981	N4100-W10400	Sheridan	1989	N4430-W10600
Chugwater	1979	N4130-W10400	Shirley Basin	1989	N4200-W10600
Cody	1980	N4430-W10900	South Pass	1989	42108-A1-TM-100
Devils Tower	1979	N4430-W10400	Sundance	1979	N4400-W10400
Douglas	1981	N4230-W10500	The Ramshorn	1981	N4330-W10900
Evanston	1980	N4100-W11000	Thermopolis	1990	N4330-W10800
Farson	1980	N4200-W10900	Torrington	1977	N4200-W10400
Gannett Peak	1978	N4300-W10900	Worland	1989	N4400-W10700
Firehole Canyon	1980	N4100-W10900	Yellowstone North	1983	N4430-W110
Fontenelle Reservoir	1982	N4200-W11000	Yellowstone South	1982	N4400-W11000
Gannett Peak	1978	N4300-W10900			
Gillette	1974	N4400-W10500	Adjacent State Maps		
Jackson	1988	N4300-W11000	Ashton	1989	44111-A1-TM-100
Jackson Lake	1990	N4330-W11000	Dutch John	1981	N4030-W10900
Kaycee	1989	N4330-W10600	Eaton	1982	N4030-W10400
Kinney Rim	1980	N4100-W10800	Ennis	1989	45111-A1-TM-100
Kemmerer	1990	N4130-W11000	Fort Collins	1980	N4030-W10500
Lance Creek	1981	N4300-W10400	Gardiner	1992	45110-A1-TM-100
Lander	1990	N4230-W10800	Hebgen Lake	1993	44111-E1-TM-100
Laramie	1990	N4100-W10500	Kings Peak	1982	N4030-W11000
Laramie Peak	1981	N4200-W10500	Logan	1984	41111-E1-TM-100
Lusk	1982	N4230-W10400	Ogden	1978	41111-A1-MM-100
Lysite	1990	N4300-W10700	Palisades	1986	43111-A1-TM-100
Medicine Bow	1980	N4130-W10600	Preston	1983	42111-A1-TM-100
Midwest	1990	N4300-W10600	Red Lodge	1989	45109-A1-TM-100
Newcastle	1989	N4330-W10400	Rexburg	1988	43111-E1-TM-100
Nowater Creek	1991	N4330-W10700	Salt Lake City	1980	N4030-W11100
Pinedale	1990	N4230-W10900	Soda Springs	1982	42111-E1-TM-100
Powell	1991	N4430-W10800	Walden	1981	N4030-W106000

Appendix 4.3. Updates of land ownership made to the BLM Surface Management Status maps which were incorporated into the WY-GAP land ownership layer based on records from state and federal agencies. All updates were made through 1994 for areas $\geq$ 640 ac.

Map Name	Township, Range, Section description	Update
Afton	T.31N, R.113W, Sec.16	State to Private
	T.30N, R.111W, portion of Sec.22	Federal to Private
Bairoil	T.29N, R.89W, Sec.16	State to Private
Bill	T.41N, R.74W, Sec.36	State to Private
	T.35N, R.74W, portion of Sec.3,4	State to Private
	T.36N, R.74W, portion of Sec.32	State to Private
Burgess Junction	T.57N, R.85W, portion of Sec.16	State to Private
	T.53N, R.89W, portion of Sec.28,33	Federal to Private
	T.53N, R.92W, portion of Sec.8,13,14,17,18,23,24,27	Federal to Private
	T.53N, R.92W, portion of Sec.10,11,17,20,21,1,2,3	Private to Federal
	T.54N, R.92W, portion of Sec.6,7,17,18,20,21,27,28,29,34,35	Private to Federal
	T.54N, R.92W, portion of Sec.8,18,19	Federal to Private
Buffalo	T.51N, R.82W, portion of Sec.34	State to Private
Casper	T.34N, R.81W., Sec.16	State to Private
	T.31N, R.79W, portion of Sec.11	State to Private
Chugwater	T.19N, R.68W, Sec.10,11,14,15	State to Private
	T.21N, R.60W, portion of Sec.1	Federal to Private
	T.23N, R.62W, portion of Sec.29,32	Federal to Private
	T.23N, R.63W, portion of Sec.7	Federal to Private
	T.22N, R.63W, portion of Sec.29	Federal to Private
	T.23N, R.64W, portion of Sec.31	Federal to Private
	T.22N, R.65W, portion of Sec.4	Federal to Private
Devil's Tower	T.54N, R.65W, Sec.16	State to Private
	T.54N, R.62W, Sec.36	State to Private
	T.56N, R.63W, Sec.16, NE4 Sec.21, NW4 Sec.22	State to Private
	T.54N, R.67W, Sec.36	State to Private
	T.53N. R.66W, Sec.36	State to Private
	T.54N, R.61W, Sec.36	State to Private
	T.54N, R.62W, portion of Sec.28	Federal to Private
	T.54N, R.64W, portion of Sec.25,27	Federal to Private
	T.54N, R.65W, portion of Sec.8,9	Federal to Private
	T.54N, R.66W, portion of Sec.25,26,35	Federal to Private
	T.53N, R.65W, portion of Sec.4	Federal to Private
	T.53N, R.65W, portion of Sec.31	Federal to Private
	T.53N, R.66W, portion of Sec.36	State to Private
	T.53N, R.66W, portion of Sec.9	Federal to Private
	T.54N, R.67W, portion of Sec.36	State to Private
	T.55N, R.66W, portion of Sec.16	Federal to Private
	T.55N, R.64W, portion of Sec.6	Federal to Private
	T.56N, R.63W, portion of Sec.16,21,22	State to Private
	T.56N, R.62W, portion of Sec.33	Federal to Private
	T.56N, R.66W, portion of Sec.9	Federal to Private
	T.57N, R.66W, portion of Sec.23,33	Federal to Private
Douglas	T.32N, R.71W, Sec.34	Federal to Private
Evanston	T.13N, R.115W, portion of Sec.28	Federal to Private
	T.14N, R.119W, portion of Sec.8	Federal to Private
	T.15N, R.121W, portion of Sec.23	Federal to Private

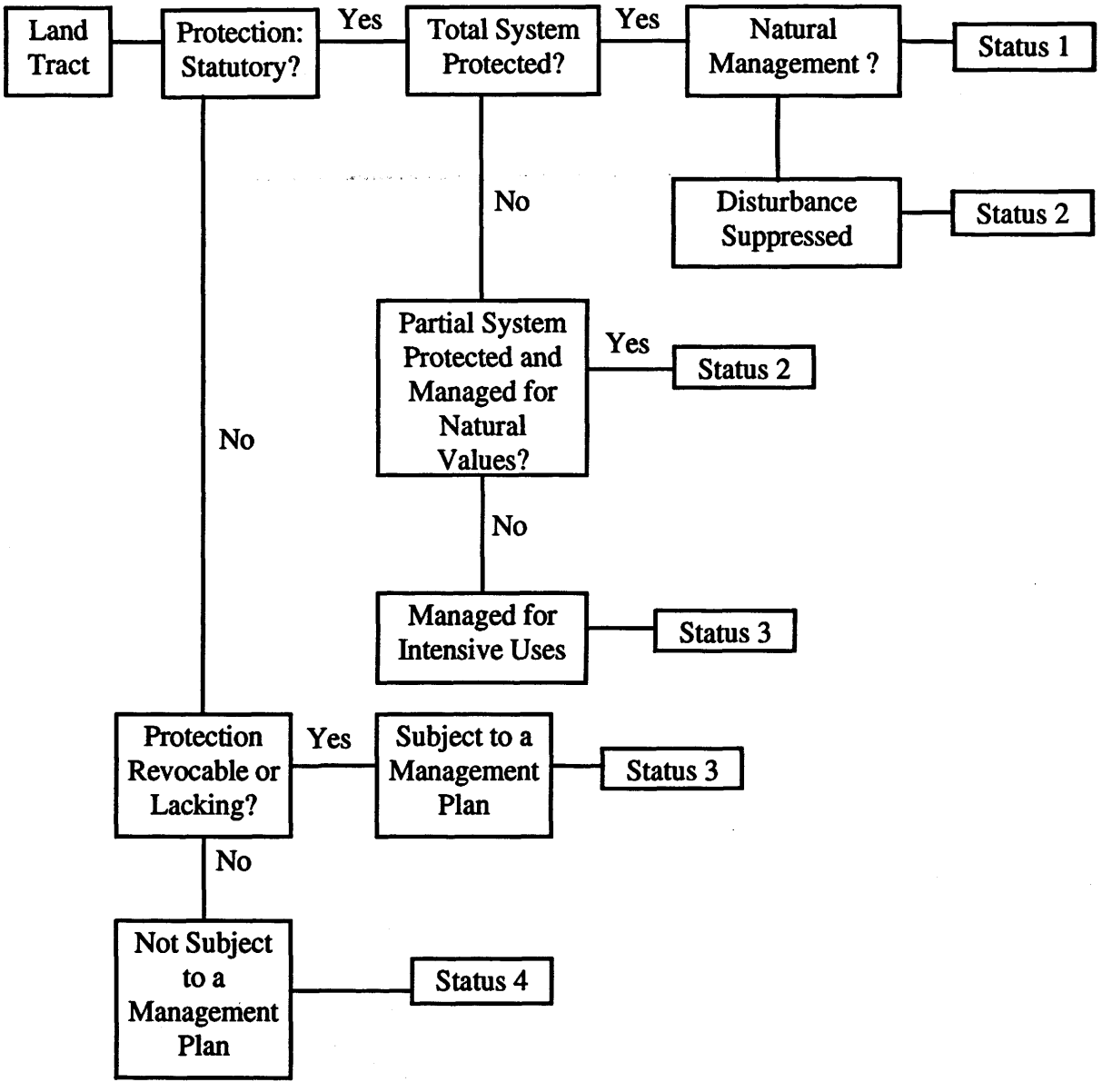
Appendix 4.3. continued.

Map Name	Township, Range, Section description	Update
Fontenelle Reservoir	T.28N, R.112W, portion of Sec.9,10,14, and 15	Federal to Private
	T.28N, R.115W, portion of Sec.4	Federal to Private
	T.23N, R.116W, portion of Sec.1,2,3	Private to Federal
Gillette	T.50N, R.68W, Sec.16	State to Private
	T.50N, R.70W, Sec.16,20,21	State to Private
	T.47N, R.74W, Sec.16	State to Private
	T.51N, R.69W, Sec.25	State to Private
	T.51N, R.68W, Sec.16	State to Private
	T.48N, R.75W, Sec.36,16, SWNW Sec.26, portion of Sec.27	State to Private
	T.49N, R.74W, Sec.20 and W2 of Sec.16	State to Private
	T.49N, R.75W, Sec 36, and SESW Sec.1	State to Private
	T.49N, R.70W, portion of Sec.12,13	State to Private
	T.49N, R.69W, portion of Sec.7	State to Private
	T.50N, R.71W, portion of Sec.30	State to Private
	T.50N, R.72W, portion of Sec.35	Private to State
Jackson	T.41N, R.117W, Sec.36	State to Private
	T.41N, R.111W, portion of Sec.19,29,30,32,and 33	Private to Federal
	T.40N, R.112W, portion of Sec.4	Private to Federal
Jackson Lake	National Elk Refuge land (except T.42, R.115W, Sec.10)	Private to Federal
Kaycee	T.43N, R.79W, Sec.16	State to Private
	T.42N, R.84W, portion of Sec.21,22,23	State to Federal
Kemmerer	T.23N, R.116W, portion of Sec.1 and 2	Private to Federal
	T.20N, R.117W, portion of Sec.14	Private to Federal
	T.21N, R.116W, portion of Sec.21,22,and 27	Federal and Private
	T.23N, R.116W, portion of Sec.1,2,11,12	Federal to Private
Lance Creek	T.37N, R.63W, portion of Sec.36	Private to State
Laramie	T.12N, R.73W, Sec.16	State to Private
	T.12N, R.71W, Sec.16	State to Private
Laramie Peak	T.28N, R.71W, Sec.36	State to Private
Lusk	T.30N, R.64W, Sec.16,36 and portion of Sec.22,28,32	State to Private
	T.30N, R.64W, Sec.36	State to Private
	T.30N, R.65W, Sec.36	State to Private
Medicine Bow	T.20N, R.77W, Sec.12	State to Private
Midwest	T.38N, R.78W, Sec.36	State to Private
	T.37N, R.78W, Sec.36	State to Private
	T.38N, R.77W, Sec.31	State to Private
Newcastle	T.46N, R.63W, portion of Sec.8,9	Federal to Private
Pinedale	T.30N, R.104W, portion of Sec.6	Federal to Private
	T.30N, R.104W, portion of ,7,8,and 9	Private to Federal
	T.30N, R.105W, portion of Sec.1	Federal to Private
Recluse	T.53N, R.72W, Sec.16	State to Private
	T.53N, R.71W, portion of Sec.10,11,15,20,21,32	Federal to Private
	T.53N, R.71W, portion of Sec. 1	Aquired land to Federal
	T.53N, R.71W, portion of Sec. 3	Private to Federal
	T.54N, R.71W, portion of Sec. 34	Private to Federal
	T.54N, R.73W, portion of Sec. 30	State to Private
Reno Junction	T.41N, R.74W, Sec.16	State to Private
	T.42N, R.74W, Sec.36	State to Private
	T.46N, R.73W, Sec.16	State to Private
	T.45N, R.72W, portion of Sec.20,32	Federal to Private

Appendix 4.3. continued.

Map Name	Township, Range, Section description	Update
Reno Junction, continued	T.45N, R.73W, portion of Sec.21	Federal to Private
	T.44N, R.72W, portion of Sec.14,15	Federal to Private
Rock River	T.20N, R.77W, Sec.12	State to Private
	T.19N, R.68W, Sec.16	State to Private
Rock Springs	T.18N, R.104W, Sec.16	State to Private
	T.23N, R.103W, Sec.16	State to Private
Sheridan	T.58N, R.83W, Sec.36	State to Private
	T.56N, R.77W, Sec.36	State to Private
Shirley Basin	T.27N, R.83W, Sec.16	State to Private
	Corrections to parcels around Seminoe Reservoir	Federal to Private
Sundance	T.51N, R.68W, Sec.36	State to Private
	T.51N, R.63W, Sec.36	State to Private
	T.47N, R.60W, portion of Sec.13,20,21,28,29	Federal to Private
	T.47N, R.60W, portion of Sec. 15,21	Federal to State
	T.47N, R.61W, portion of Sec.19	Federalto Private
	T.48N, R.60W, portion of Sec.16.17.22	Federal to State
	T.48N, R.60W, portion of Sec.5,6,17	Federal to Private
The Ramshorn	T.45N, R.103W, Sec.6,7,18,19,20	Private to Federal
	T.46N, R.103W, Sec.21,22,28,29,31,32	Private to Federal
	T.46N, R.104W, Sec.36	Private to Federal
	T.45N, R.104W, Sec.1,2,11,12,13,14,21,22,24	Private to Federal
Torrington	T.24N, R.65W, portion of Sec.24,26	Federal to Private

Appendix 4.4. The flow chart of a dichotmous key developed by New Mexico GAP and used by WY-GAP for designating land management status categories (Crist et al. 1994). This key is designed to be applied to any land tract, regardless of ownership, assuming that any management status category can apply to land parcels with consideration to public, private, tribal, or other owner. When categorizing a land tract, it is recognized that mixed uses will occur, but other uses need not influence the categorization if they represent 5 % or less of the total area of the tract. It is also recognized that every type of management, ownership, or regulation can potentially be changed, but decisions based on the key depended on whether the *intent* inferred permanence of existing management.



Appendix 4.5. Administrative units included in the WY-GAP land stewardship database, listed by their management status, managing agency, whether they are within the area of the Greater Yellowstone Ecosystem (GYE), and the source of their management plan documentation. Numbers correspond to Map 4.1.

	Administrative Unit	Status	Agency	GYE	Source
1	J.D. Rockefeller Jr. Memorial Parkway	1	NPS	Y	National Park Service. 1989. Statement for management. J.D. Rockefeller Jr. Memorial Parkway. Rocky Mountain Regional Office.
2	Devils Tower National Monument	1	NPS		_____. 1995. Statement for management. Devils Tower NM, Rocky Mountain Regional Office.
3	Fossil Butte National Monument	1	NPS		_____. 1989. Statement for management. Fossil Butte NM. Rocky Mountain Regional Office.
4	Grand Teton National Park *	1	NPS	Y	_____. 1989. Statement for management. Grand Teton NP. Rocky Mountain Regional Office.
5	Yellowstone National Park	1	NPS	Y	_____. 1991. Statement for management. Yellowstone NP. Rocky Mountain Regional Office.
6	Bighorn Canyon National Recreation Area * †	2	NPS		_____. 1981. Final general management plan. Bighorn Canyon NRA. Denver Service Center.
7	Fort Laramie National Historic Site	2	NPS		_____. 1989. Statement for management. Fort Laramie NHS. Rocky Mountain Regional Office.
8	Absaroka Beartooth Wilderness	1	USFS	Y	U.S Forest Service. 1986. Land and resource management plan. Shoshone NF, Cody, WY.
9	Bridger Wilderness	1	USFS	Y	_____. 1989. Final EIS/land and resource management plan. Bridger-Teton NF, Jackson, WY.
10	Cloud Peak Wilderness	1	USFS		_____. 1985. Land and resource management plan. Bighorn National Forest, Sheridan, WY.
11	Encampment River Wilderness	1	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
12	Fitzpatrick Wilderness	1	USFS	Y	_____. 1986. Land and resource management plan. Shoshone National Forest, Cody, WY.
13	Gros Ventre Wilderness	1	USFS	Y	_____. 1989. Final EIS/land and resource management plan. Bridger-Teton NF, Jackson, WY.
14	Huston Park Wilderness *	1	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
15	Jedediah Smith Wilderness	1	USFS	Y	_____. 1985. Land and resource management plan. Targhee National Forest, Driggs, ID.
16	North Absaroka Wilderness	1	USFS	Y	_____. 1986. Land and resource management plan. Shoshone National Forest, Cody, WY.
17	Platte River Wilderness	1	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
18	Popo Agie Wilderness	1	USFS	Y	_____. 1986. Land and resource management plan. Shoshone National Forest, Cody, WY.
19	Savage Run Wilderness	1	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
20	Teton Wilderness	1	USFS	Y	_____. 1989. Final EIS/land and resource management plan. Bridger-Teton NF, Jackson, WY.
21	Washakie Wilderness *	1	USFS	Y	_____. 1986. Land and resource management plan. Shoshone National Forest, Cody, WY.
22	Winegar Hole Wilderness	1	USFS	Y	_____. 1985. Land and resource management plan. Targhee National Forest, Driggs, ID.
23	Clarks Fork Wild And Scenic River *	1	USFS	Y	_____. 1986. Land and resource management plan. Shoshone National Forest, Cody, WY.
24	Sheep Mountain National Wildlife Refuge *	1	USFS		_____. 1985. Analysis of the management situation for Sheep Mountain Wildlife Refuge, Medicine Bow National Forest, Laramie, WY.
25	Bull Elk Park Research Natural Area	2	USFS		_____. 1985. Land and resource management plan. Bighorn National Forest, Sheridan, WY.
26	Shell Canyon Research Natural Area	2	USFS		_____. 1985. Land and resource management plan. Bighorn National Forest, Sheridan, WY.
27	Snowy Range Research Natural Area	2	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
28	Ashenfelder Basin Special Interest Area	2	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
29	Battle Mountain Special Botanical Area	2	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
30	Cinnabar Park Special Botanical Area	2	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
31	Dry Park Special Botanical Area	2	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
32	Inyan Kara Historic Site	2	USFS		_____. 1981. Land and resource management plan. Black Hills National Forest, Custer, SD.
33	Libby Flats Special Botanical Area	2	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
34	Medicine Bow Peak Special Botanical Area	2	USFS		_____. 1985. Land and resource management plan. Medicine Bow National Forest, Laramie, WY.
35	Medicine Wheel Archeological Area	2	USFS		_____. 1985. Land and resource management plan. Bighorn National Forest, Sheridan, WY.

Appendix 4.5. continued.

Administrative Unit	Status	Agency	GYE	Source
36 Preacher Rock Bog Special Botanical Area	2	USFS		_____. 1985. Land and resource management plan. Bighorn National Forest, Sheridan, WY.
37 Swamp Lake Special Botanical Area	2	USFS	Y	_____. 1986. Land and resource management plan. Shoshone National Forest, Cody, WY.
38 Flaming Gorge National Recreation Area *	3	USFS		_____. 1986. Final EIS/Land and resource mangement plan. Ashley National Forest, Vernal, UT.
39 Bamforth National Wildlife Refuge	1	USFWS		Management contact: Arapahoe National Wildlife Refuge, Colorado.
40 Cokeville Meadows National Wildlife Refuge *	1	USFWS		U.S. Fish and Wildlife Service. 1992. Cokeville Meadows National Wildlife Refuge Proposal/Final EIS. USFWS Mountain-Prairie Region, Denver CO and BLM Wyoming State Office, Cheyenne WY.
41 Hutton Lake National Wildlife Refuge	1	USFWS		_____. 1958. Land use plan for Hutton Lake National Wildlife Refuge. Region 6, Denver, CO.
42 Mortenson Lake National Wildlife Refuge	1	USFWS		_____. 1992. Decision document for Mortenson Lake Nat. Wildlife Refuge. Region 6, Denver, CO.
43 National Elk Refuge	1	USFWS	Y	_____. 1967. National Elk Refuge Master Plan. National Elk Refuge, Jackson WY.
44 Pathfinder National Wildlife Refuge †	1	USFWS		_____. 1959. Land use plan for Pathfinder National Wildlife Refuge. Region 6, Denver, CO.
45 Seedskadee National Wildlife Refuge	1	USFWS		_____. 1989. Seedskadee National Wildlife Refuge Station Plan (draft refuge plan in progress).
46 Amsden Creek Wildlife Habitat Mgmt. Area	1	WGFD		Wyoming Game and Fish Department. 1981. Management plan for Amsden Creek unit. WGFD State Office, Cheyenne, WY.
47 Greys River WHMA *	1	WGFD	Y	_____. 1981. Management plan for Greys River unit. WGFD State Office, Cheyenne, WY.
48 Inberg/Roy WHMA *	1	WGFD	Y	_____. 1981. Management plan for Inberg/Roy unit. WGFD State Office, Cheyenne, WY.
49 Kerns WHMA *	1	WGFD		_____. 1981. Management plan for Kerns unit. WGFD State Office, Cheyenne, WY
50 Sybille Research Unit/Johnson Creek *	1	WGFD		_____. 1981. Management plan for Sybille Research unit. WGFD State Office, Cheyenne, WY
51 Whiskey Basin And Little Red Creek WHMA	1	WGFD	Y	_____. 1981. Management plan for Whiskey Basin unit. WGFD State Office, Cheyenne, WY
52 Teton WHMA	1	WGFD	Y	Management document contact: WGFD State Office, Cheyenne, WY.
53 Black Butte WHMA	2	WGFD	Y	Management contact: WGFD State Office, Cheyenne, WY.
54 Boulder Fish Rearing Station *	2	WGFD	Y	Management contact: WGFD State Office, Cheyenne, WY.
55 Bud Love WHMA	2	WGFD		Wyoming Game and Fish Dept. 1981. Management plan for Bud Love unit. Cheyenne, WY.
56 Camp Creek/Horse Creek WHMA	2	WGFD	Y	_____. 1986. Management plan for Horse Creek unit. WGFD State Office, Cheyenne, WY
57 Chain Lakes WHMA *	2	WGFD		_____. 1981. Management plan for Chain Lakes unit. WGFD State Office, Cheyenne, WY
58 Ed O. Taylor WHMA *	2	WGFD		_____. 1981. Management plan for Ed O. Taylor unit. WGFD State Office, Cheyenne, WY
59 Forbes/Sheep Mountain WHMA *	2	WGFD		_____. 1981. Management plan for Forbes unit. WGFD State Office, Cheyenne, WY
60 Gelatt Lake WHMA	2	WGFD		Management contact: WGFD State Office, Cheyenne, WY.
61 Grayrocks WHMA *	2	WGFD		Wyoming Game and Fish Dept. 1980. Management plan for Grayrocks unit. Cheyenne, WY
62 Gros Ventre WHMA	2	WGFD	Y	Management contact: WGFD State Office, Cheyenne, WY.
63 Half Moon WHMA *	2	WGFD	Y	Wyoming Game and Fish Dept. 1981. Management plan for Half Moon unit. Cheyenne, WY
64 Jelm WHMA	2	WGFD		Management contact: WGFD State Office, Cheyenne, WY.
65 Laramie Peak WHMA *	2	WGFD		Wyoming Game and Fish Dept. 1981. Management plan for Laramie Peak unit. Cheyenne, WY
66 Medicine Lodge WHMA *	2	WGFD		_____. 1981. Management plan for Medicine Lodge unit. WGFD State Office, Cheyenne, WY
67 Meeboer Lake WHMA	2	WGFD		Management contact: WGFD State Office, Cheyenne, WY.
68 Mexican Creek WHMA	2	WGFD	Y	Wyoming Game and Fish Dept. 1981. Management plan for Mexican Creek unit. Cheyenne, WY
69 Morgan Creek WHMA *	2	WGFD		_____. 1983. Management plan for Morgan Creek unit. WGFD State Office, Cheyenne, WY
70 Ocean Lake WHMA *†	2	WGFD		_____. 1981. Management plan for Ocean Lake unit. WGFD State Office, Cheyenne, WY
71 Pennock Mountain WHMA *	2	WGFD		_____. 1981. Management plan for Pennock Mountain unit. WGFD State Office, Cheyenne, WY

Appendix 4.5. continued.

Administrative Unit	Status	Agency	GYE	Source
72 Rawhide WHMA *	2	WGFD		_____. 1981. Management plan for Rawhide unit. WGFD State Office, Cheyenne, WY
73 Red Canyon WHMA	2	WGFD		_____. 1983. Management plan for Red Canyon unit. WGFD State Office, Cheyenne, WY
74 Red Rim WHMA *	2	WGFD		_____. 1981. Management plan for Red Rim unit. WGFD State Office, Cheyenne, WY
75 Renner WHMA *	2	WGFD		_____. 1984. Management plan for Renner unit. WGFD State Office, Cheyenne, WY
76 Sand Creek WHMA	2	WGFD		_____. 1981. Management plan for Sand Creek unit. WGFD State Office, Cheyenne, WY
77 Sand Mesa WHMA *	2	WGFD		_____. 1981. Management plan for Greys River unit. WGFD State Office, Cheyenne, WY
78 Soda Lake WHMA	2	WGFD	Y	_____. 1981. Management plan for Soda Lake unit. WGFD State Office, Cheyenne, WY
79 South Park WHMA *	2	WGFD	Y	_____. 1981. Management plan for South Park unit. WGFD State Office, Cheyenne, WY
80 Spence/Moriarity WHMA *	2	WGFD	Y	_____. 1981. Management plan for Spence/Moriarity unit. WGFD State Office, Cheyenne, WY
81 Springer/Bump Sullivan WHMA *	2	WGFD		_____. 1981. Management plan for Springer unit. WGFD State Office, Cheyenne, WY
82 Sunlight Basin WHMA *	2	WGFD	Y	_____. 1981. Management plan for Sunlight Basin unit. WGFD State Office, Cheyenne, WY
83 Sunshine Ranch WHMA	2	WGFD	Y	_____. 1981. Management plan for Sunshine Ranch unit. WGFD State Office, Cheyenne, WY
84 Table Mountain WHMA *	2	WGFD		_____. 1981. Management plan for Table Mountain unit. WGFD State Office, Cheyenne, WY
85 Wick Brothers/Beumee WHMA *	2	WGFD		_____. 1981. Management plan for Wick Brothers unit. WGFD State Office, Cheyenne, WY
86 Wigwam Creek Fish Rearing Station	2	WGFD		Management contact: WGFD State Office, Cheyenne, WY
87 Yellowtail WHMA *	2	WGFD		_____. 1981. Management plan for Yellowtail unit. WGFD State Office, Cheyenne, WY
88 Boysen State Park †	3	State		Division of State Parks and Historic Sites. 1995. Wyoming State Parks and Historic Sites Five Year Plan (1995-2000). State of Wyoming Department of Commerce, Cheyenne, WY.
89 Buffalo Bill State Park †	3	State		_____. 1995. Wyoming State Parks and Historic Sites Five Year Plan.
90 Curt Gowdy State Park	3	State		_____. 1995. Wyoming State Parks and Historic Sites Five Year Plan.
91 Glendo State Park †	3	State		_____. 1995. Wyoming State Parks and Historic Sites Five Year Plan.
92 Guernsey State Park †	3	State		_____. 1995. Wyoming State Parks and Historic Sites Five Year Plan.
93 Hot Springs State Park	3	State		_____. 1995. Wyoming State Parks and Historic Sites Five Year Plan.
94 Keyhole State Park	3	State		_____. 1995. Wyoming State Parks and Historic Sites Five Year Plan.
95 Seminoe State Park †	3	State		_____. 1995. Wyoming State Parks and Historic Sites Five Year Plan.
96 Sinks Canyon State Park	2	WGFD		Management contact: WGFD State Office, Cheyenne WY.
97 Sweetwater Preserve (Nature Conservancy)	1	TNC		Management contact: The Nature Conservancy, Wyoming Chapter, Lander WY
98 Tensleep Preserve (Nature Conservancy)	1	TNC		Management contact: The Nature Conservancy, Wyoming Chapter, Lander WY
99 Red Canyon Ranch (Nature Conservancy) *	2	TNC		Management contact: The Nature Conservancy, Wyoming Chapter, Lander WY
100 Colorado Butterfly Plant Res. Natural Area	2	DOD		Marriot, H.J. and G.Jones. 1988. Preserve design package for a proposed Colorado Butterfly Research Natural Area, F.E. Warren Air Force Base. Unpublised doc.
101 F.E. Warren Air Force Base	3	DOD		Management contact: F.E. Warren Air Force Base, Cheyenne, WY.

* May include federal, state or private lands not under jurisdiction of administering agency (different management status).
† Units which are not owned by the managing agency (for example, state parks are owned by Bureau of Reclamation, but managed by Wyoming State Parks and Historic Sites Commission).

Appendix 5.1. Area (ha) of the 41 WY-GAP land cover types by stewardship category and management status. The accuracy of these numbers is discussed in section 4.2.1.

Spruce-fir	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	201,939	7,768	0	3	0	0	29	0	867	210,606
Status 2	288	0	0	0	0	0	0	0	0	288
Status 3	233,957	0	11,440	0	0	0	0	0	428	245,824
Status 4	0	0	0	0	0	22,892	3,195	22,290	647	49,024
Total	436,184	7,768	11,440	3	0	22,892	3,224	22,290	1,942	505,743

Douglas fir	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	100,553	38,461	117	189	0	0	1,697	1,277	28	142,322
Status 2	663	0	188	0	0	0	210	0	0	1,061
Status 3	176,793	0	25,132	0	0	0	251	0	225	202,401
Status 4	0	0	0	0	0	30,561	4,534	24,769	9	59,873
Total	278,008	38,461	25,437	189	0	30,561	6,692	26,046	262	405,657

Lodgepole pine	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	290,892	349,885	169	25	0	0	372	43	4,762	646,148
Status 2	641	0	130	0	0	0	1,320	0	6	2,096
Status 3	815,571	76	71,658	0	0	0	414	0	2,240	889,959
Status 4	0	0	0	0	0	37,089	21,163	77,952	525	136,728
Total	1,107,104	349,961	71,956	25	0	37,089	23,269	77,995	7,533	1,674,932

Whitebark pine	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	13,125	50,787	0	0	0	0	0	0	6	63,919
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	8,942	0	89	0	0	0	0	0	37	9,067
Status 4	0	0	0	0	0	0	139	130	0	268
Total	22,067	50,787	89	0	0	0	139	130	43	73,255

Limber pine woodland	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4	0	0	0	0	0	0	0	0	4
Status 2	0	0	0	0	0	0	520	0	0	520
Status 3	7,473	0	76,137	0	0	0	391	0	11	84,012
Status 4	0	0	0	0	0	20,241	13,569	74,625	38	108,473
Total	7,477	0	76,137	0	0	20,241	14,480	74,625	48	193,009

Appendix 5.1 continued.

Ponderosa pine	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	470	0	117	0	0	243	0	0	830
Status 2	1,281	0	818	0	0	0	3,693	0	0	5,793
Status 3	133,728	0	85,820	0	2,372	0	1,385	16	58	223,379
Status 4	0	0	0	0	0	0	66,192	531,168	80	597,440
Total	135,009	470	86,638	117	2,372	0	71,514	531,184	138	827,442

Juniper woodland	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	227	0	0	0	1,242	42	1,512
Status 2	0	2,010	0	0	0	0	1,165	1,485	136	4,796
Status 3	2,577	0	281,537	0	777	0	2,945	402	403	288,641
Status 4	0	0	0	0	0	48,881	40,313	184,526	522	274,241
Total	2,577	2,010	281,537	227	777	48,881	44,422	187,656	1,103	569,190

Clearcut conifer	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	122	1	0	0	0	0	0	0	0	124
Status 2	95	0	0	0	0	0	0	0	0	95
Status 3	97,549	0	988	0	0	0	0	0	44	98,581
Status 4	0	0	0	0	0	0	813	3,849	51	4,713
Total	97,766	1	988	0	0	0	813	3,849	96	103,512

Burned conifer	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,760	277,832	0	0	0	0	0	0	569	286,161
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	1,624	0	0	0	0	0	0	0	0	1,624
Status 4	0	0	0	0	0	0	0	0	0	0
Total	9,384	277,832	0	0	0	0	0	0	569	287,785

Aspen forest	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,807	890	48	1,296	0	0	421	99	0	7,560
Status 2	3	0	1	0	0	0	154	623	15	795
Status 3	124,694	0	51,869	0	0	0	0	0	168	176,731
Status 4	0	0	0	0	0	1,246	17,354	78,105	78	96,784
Total	129,504	890	51,917	1,296	0	1,246	17,929	78,827	261	281,870

Appendix 5.1 continued.

Bur oak woodland	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	7,890	0	0	0	0	0	0	0	0	7,890
Status 4	0	0	0	0	0	0	45	2,148	0	2,193
Total	7,890	0	0	0	0	0	45	2,148	0	10,083

Forest-dominated riparian	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,191	9,355	2	2,451	0	0	107	163	977	14,246
Status 2	26	386	21	0	0	0	1,584	1,527	502	4,046
Status 3	9,430	0	13,028	0	18	0	796	473	307	24,052
Status 4	0	0	0	0	0	10,008	15,595	214,469	5,970	246,042
Total	10,648	9,742	13,050	2,451	18	10,008	18,082	216,631	7,756	288,386

Mesic upland shrub	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	1,899	0	0	0	0	0	1,899
Status 2	0	0	0	0	0	0	35	0	0	35
Status 3	4,397	0	726	0	0	0	0	0	0	5,123
Status 4	0	0	0	0	0	0	3,389	15,949	23	19,361
Total	4,397	0	726	1,899	0	0	3,424	15,949	23	26,418

Xeric upland shrub	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	60	0	0	287	0	0	347
Status 2	0	0	222	0	0	0	74	0	0	296
Status 3	2,616	0	37,958	0	922	0	154	0	30	41,680
Status 4	0	0	0	0	0	0	21,297	136,268	40	157,605
Total	2,616	0	38,180	60	922	0	21,811	136,268	70	199,927

Bitterbrush shrub steppe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	1,023	0	557	0	0	0	149	0	0	1,729
Status 4	0	0	0	0	0	273	194	349	18	833
Total	1,023	0	557	0	0	273	343	349	18	2,562

Appendix 5.1 continued.

Mountain big sagebrush	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	16,495	56,776	3	4,275	0	0	1,895	105	104	79,653
Status 2	75	0	3,011	0	0	0	9,411	3,225	6	15,728
Status 3	149,257	0	272,184	0	0	0	4,531	0	611	426,583
Status 4	0	0	0	0	0	24,095	72,215	288,119	348	384,777
Total	165,828	56,776	275,198	4,275	0	24,095	88,052	291,448	1,070	906,742

Wyoming big sagebrush	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,668	1,268	872	7,089	0	0	3,428	783	183	19,291
Status 2	0	57	2,464	378	0	0	25,326	1,902	151	30,278
Status 3	80,146	0	4,126,653	88	553	0	10,387	5,263	4,366	4,227,455
Status 4	0	0	0	0	0	320,565	516,932	3,265,545	5,584	4,108,626
Total	85,813	1,326	4,129,989	7,556	553	320,565	556,073	3,273,493	10,283	8,385,650

Black sagebrush steppe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	29,192	0	0	0	0	0	0	29,192
Status 4	0	0	0	0	0	0	3,896	14,231	17	18,144
Total	0	0	29,192	0	0	0	3,896	14,231	17	47,336

Basin big sagebrush	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	73	0	0	0	0	0	0	73
Status 4	0	0	0	0	0	0	0	0	0	0
Total	0	0	73	0	0	0	0	0	0	73

Desert shrub	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	403	0	0	0	0	11	413
Status 2	0	102	0	0	0	0	5,054	14	21	5,190
Status 3	11,226	0	543,064	0	1,622	0	5,844	639	1,383	563,778
Status 4	0	0	0	0	0	60,238	43,522	297,680	1,161	402,602
Total	11,226	102	543,064	403	1,622	60,238	54,419	298,333	2,576	971,983

Appendix 5.1 continued.

Saltbush fans and flats	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	3,095	28	0	0	0	336	370	99	3,929
Status 3	1,340	0	613,567	0	1,220	0	1,349	0	443	617,919
Status 4	0	0	0	0	0	12,825	33,884	88,317	320	135,346
Total	1,340	3,095	613,595	0	1,220	12,825	35,569	88,687	862	757,194

Greasewood fans and flats	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	3,142	0	0	0	0	84	3,226
Status 2	0	0	0	94	0	0	7,662	0	35	7,791
Status 3	5,217	0	153,798	0	0	0	870	852	1,350	162,088
Status 4	0	0	0	0	0	1,673	16,949	169,094	2,037	189,752
Total	5,217	0	153,798	3,236	0	1,673	25,481	169,946	3,506	362,857

Vegetated dunes	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	293	0	0	0	0	0	293
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	24,851	0	0	0	0	0	212	25,063
Status 4	0	0	0	0	0	0	4,026	14,731	80	18,837
Total	0	0	24,851	293	0	0	4,026	14,731	293	44,193

Shrub-dominated riparian	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	9,995	21,185	0	245	0	0	185	122	782	32,515
Status 2	0	104	0	632	0	0	1,835	473	53	3,098
Status 3	20,603	0	58,129	0	0	0	884	0	460	80,075
Status 4	0	0	0	0	0	7,368	19,777	138,223	2,577	167,945
Total	30,598	21,290	58,129	877	0	7,368	22,682	138,819	3,872	283,634

Meadow tundra	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	62,282	4,617	0	0	0	0	0	0	447	67,346
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	16,616	0	1,250	0	0	0	0	0	23	17,890
Status 4	0	0	0	0	0	0	142	1,122	0	1,265
Total	78,899	4,617	1,250	0	0	0	142	1,122	470	86,501

Appendix 5.1 continued.

Subalpine meadow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	319,914	76,978	0	0	0	0	0	2	1,944	398,837
Status 2	168	0	0	0	0	0	0	0	0	168
Status 3	270,882	0	4,246	0	0	0	0	0	744	275,872
Status 4	0	0	0	0	0	21,324	1,643	15,624	369	38,960
Total	590,964	76,978	4,246	0	0	21,324	1,643	15,625	3,057	713,837

Mixed grass prairie	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,242	18	0	3,032	0	0	3,683	1,401	96	9,473
Status 2	112	27	3,066	0	0	0	10,322	0	93	13,621
Status 3	196,940	0	406,980	0	5,787	0	6,443	21	1,233	617,403
Status 4	0	0	0	0	0	47,476	416,527	3,298,997	3,795	3,766,794
Total	198,295	45	410,046	3,032	5,787	47,476	436,975	3,300,419	5,217	4,407,291

Short grass prairie	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	40	0	0	0	0	0	0	40
Status 4	0	0	0	0	0	0	2,212	9,210	21	11,444
Total	0	0	40	0	0	0	2,212	9,210	21	11,483

Great Basin foothills grassland	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	315	3,502	0	0	0	0	0	0	18	3,835
Status 2	1	0	0	0	0	0	290	0	0	291
Status 3	8,865	0	745	0	0	0	0	0	3	9,613
Status 4	0	0	0	0	0	0	266	6,019	0	6,285
Total	9,181	3,502	745	0	0	0	555	6,019	21	20,023

Grass-dominated wetland	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	8,208	0	102	0	0	0	0	128	8,437
Status 2	0	38	0	0	0	0	132	254	15	439
Status 3	111	0	616	0	0	0	134	0	327	1,187
Status 4	0	0	0	0	0	211	182	1,350	377	2,120
Total	111	8,246	616	102	0	211	448	1,603	847	12,184

Appendix 5.1 continued.

Grass-dominated riparian	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	79	2,589	0	0	0	0	0	0	6	2,674
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	2,016	0	1,215	0	224	0	352	0	487	4,294
Status 4	0	0	0	0	0	0	7,678	50,415	178	58,271
Total	2,095	2,589	1,215	0	224	0	8,030	50,415	672	65,239

Open water	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	466	2,412	0	418	0	0	0	0	53,414	56,711
Status 2	0	94	0	0	0	0	366	146	4,986	5,592
Status 3	1,342	0	3,123	0	0	0	2,094	0	41,050	47,609
Status 4	0	0	0	0	0	572	346	3,953	22,759	27,630
Total	1,808	2,506	3,123	419	0	572	2,807	4,099	122,209	137,543

Human settlements	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3	0	0	0	0	0	0	0	0	3
Status 2	23	0	2	0	0	0	1,132	0	9	1,166
Status 3	9,652	0	15,522	0	74	0	475	0	319	26,042
Status 4	0	0	0	0	0	1,304	37,748	622,510	524	662,086
Total	9,679	0	15,524	0	74	1,304	39,356	622,510	851	689,298

Dry-land crops	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	17	204	0	1,368	0	0	229	16	12	1,846
Status 2	0	73	51	357	0	0	4,843	153	604	6,081
Status 3	4,110	0	41,669	0	222	0	2,859	0	1,676	50,536
Status 4	0	0	0	0	0	34,217	40,284	977,980	5,180	1,057,661
Total	4,126	278	41,720	1,726	222	34,217	48,215	978,149	7,471	1,116,123

Irrigated crops	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4	0	0	12	0	0	0	0	0	16
Status 2	50	0	0	0	0	0	0	0	0	50
Status 3	33	0	1,145	0	1,669	0	89	0	5	2,940
Status 4	0	0	0	0	0	1,480	2,399	63,710	517	68,106
Total	87	0	1,145	12	1,669	1,480	2,488	63,710	522	71,113

Appendix 5.1 continued.

Alpine exposed rock/soil	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	176,686	41,029	0	0	0	0	0	0	923	218,638
Status 2	456	0	0	0	0	0	0	0	0	456
Status 3	60,760	0	645	0	0	0	0	0	251	61,656
Status 4	0	0	0	0	0	7,312	23	733	89	8,158
Total	237,901	41,029	645	0	0	7,312	23	733	1,263	288,908

Basin exposed rock/soil	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	1,998	0	573	0	0	3	91	84	2,749
Status 2	0	0	1,068	0	0	0	670	0	8	1,746
Status 3	3,617	0	183,220	0	832	0	159	0	465	188,293
Status 4	0	0	0	0	0	11,153	20,298	125,252	1,871	158,573
Total	3,617	1,998	184,288	573	832	11,153	21,130	125,343	2,428	351,361

Unvegetated playa	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	4,356	0	0	0	0	0	1,091	5,447
Status 4	0	0	0	0	0	0	575	1,980	480	3,035
Total	0	0	4,356	0	0	0	575	1,980	1,571	8,482

Active sand dunes	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	14,314	0	0	0	0	3	0	14,317
Status 4	0	0	0	0	0	0	480	2,907	4	3,391
Total	0	0	14,314	0	0	0	480	2,911	4	17,708

Surface mining operations	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	6	6
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	2,013	0	11,367	0	0	0	0	0	155	13,535
Status 4	0	0	0	0	0	0	4,854	35,427	315	40,596
Total	2,013	0	11,367	0	0	0	4,854	35,427	475	54,137

Appendix 5.1 continued.

Permanent snow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,653	0	0	0	0	0	0	0	2	2,655
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	0	0	0	0	0	0	0	0
Status 4	0	0	0	0	0	0	0	0	0	0
Total	2,653	0	0	0	0	0	0	0	2	2,655

Appendix 5.2. Area (ha) of predicted distribution for 445 terrestrial vertebrate species by stewardship category and management status.

AMPHIBIANS AND REPTILES

Tiger salamander	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	97,309	141,336	796	18,739	0	0	8,967	2,850	61,077	331,075
Status 2	1,025	1,205	5,984	1,368	0	0	44,357	7,798	6,687	68,425
Status 3	786,134	0	3,507,777	1	11,338	0	28,989	4,927	58,110	4,397,276
Status 4	0	0	0	0	0	371,528	1,061,162	8,480,290	53,106	9,966,086
Total	884,468	142,541	3,514,557	20,107	11,338	371,528	1,143,476	8,495,866	178,981	14,762,862

Boreal western toad	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	93,184	114,837	95	3,660	0	0	1,456	561	2,496	216,290
Status 2	315	0	1,083	889	0	0	10,626	3,737	69	16,719
Status 3	377,114	0	225,494	0	15	0	5,750	0	2,174	610,547
Status 4	0	0	0	0	0	32,891	71,911	574,013	3,582	682,397
Total	470,613	114,837	226,671	4,549	15	32,891	89,743	578,311	8,322	1,525,953

Great plains toad	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	107	0	0	0	0	0	0	0	107
Status 2	0	0	0	0	0	0	101	0	0	101
Status 3	9,851	0	6,811	0	0	0	673	12	1,047	18,394
Status 4	0	0	0	0	0	0	32,081	348,164	585	380,830
Total	9,851	107	6,811	0	0	0	32,855	348,176	1,632	399,432

Wyoming toad	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	698	0	0	675	0	0	0	0	104	1,476
Status 2	0	0	0	0	0	0	120	0	44	164
Status 3	109	0	912	0	0	0	0	0	41	1,062
Status 4	0	0	0	0	0	0	1,035	28,283	362	29,680
Total	806	0	912	675	0	0	1,155	28,283	551	32,382

Woodhouse's toad	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	951	107	0	991	0	0	97	178	135	2,459
Status 2	77	1,043	166	0	0	0	2,995	2,096	633	7,009
Status 3	13,075	0	81,368	0	2,520	0	5,426	12	3,233	105,634
Status 4	0	0	0	0	0	4,967	99,087	1,345,354	6,860	1,456,269
Total	14,104	1,150	81,534	991	2,520	4,967	107,605	1,347,639	10,861	1,571,371

Appendix 5.2 continued.

Boreal chorus frog	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	458,469	290,357	50	8,853	0	0	1,717	791	4,756	764,994
Status 2	783	1,043	251	989	0	0	12,195	2,635	658	18,554
Status 3	618,239	0	243,960	0	1,148	0	8,762	517	7,049	879,675
Status 4	0	0	0	0	0	73,011	152,599	1,985,988	9,206	2,220,803
Total	1,077,491	291,400	244,262	9,842	1,148	73,011	175,272	1,989,930	21,669	3,884,026

Plains spadefoot toad	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	32	2,931	0	5,562	0	0	1,826	732	249	11,332
Status 2	598	3,543	2,890	0	0	0	12,423	2,395	691	22,540
Status 3	266,675	0	2,146,412	88	12,104	0	16,452	48	5,242	2,447,020
Status 4	0	0	0	0	0	54,942	836,262	6,756,695	10,017	7,657,917
Total	267,305	6,473	2,149,302	5,650	12,104	54,942	866,962	6,759,871	16,199	10,138,807

Great Basin spadefoot toad	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	12,119	0	0	0	938	503	13,561
Status 2	0	0	78	0	0	0	17,526	3,718	15	21,337
Status 3	21,003	0	2,935,637	88	557	0	8,061	7,174	4,495	2,977,015
Status 4	0	0	0	0	0	36,714	204,172	1,256,360	4,844	1,502,090
Total	21,003	0	2,935,715	12,207	557	36,714	229,758	1,268,191	9,857	4,514,003

Bullfrog	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	320	0	0	0	0	991	0	61	1,372
Status 3	147	0	3,534	0	742	0	1,844	0	1,185	7,453
Status 4	0	0	0	0	0	0	14,387	267,000	1,854	283,241
Total	147	320	3,534	0	742	0	17,222	267,000	3,099	292,067

Northern leopard frog	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	25,573	11,799	2	6,607	0	0	832	777	1,571	47,162
Status 2	196	1,042	207	889	0	0	8,689	2,482	564	14,070
Status 3	120,932	0	191,409	0	783	0	7,273	517	5,486	326,401
Status 4	0	0	0	0	0	45,692	103,453	1,090,826	8,228	1,248,200
Total	146,701	12,841	191,619	7,496	783	45,692	120,247	1,094,603	15,849	1,635,833

Appendix 5.2 continued.

Spotted frog	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	66,501	110,468	2	1,707	0	0	670	25	2,270	181,644
Status 2	110	0	28	0	0	0	2,824	0	19	2,982
Status 3	91,255	0	5,224	0	0	0	452	0	623	97,554
Status 4	0	0	0	0	0	13,206	3,704	72,960	730	90,599
Total	157,867	110,468	5,255	1,707	0	13,206	7,649	72,985	3,641	372,778

Wood frog	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,688	0	0	0	0	0	0	0	1	3,689
Status 2	34	0	10	0	0	0	77	0	0	121
Status 3	15,421	0	1,415	0	0	0	34	0	125	16,996
Status 4	0	0	0	0	0	0	2,906	27,816	194	30,916
Total	19,144	0	1,425	0	0	0	3,017	27,816	320	51,722

Common snapping turtle	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	98	0	0	0	0	0	0	0	98
Status 2	0	320	0	0	0	0	750	0	436	1,506
Status 3	8,581	0	16,947	0	748	0	3,244	12	9,945	39,477
Status 4	0	0	0	0	0	0	41,543	405,647	7,746	454,936
Total	8,581	419	16,947	0	748	0	45,537	405,658	18,128	496,018

Western painted turtle	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	98	0	0	0	0	0	0	0	98
Status 2	0	1,137	37	0	0	0	1,583	2,089	3,538	8,384
Status 3	1,255	0	22,172	0	742	0	3,545	0	9,674	37,388
Status 4	0	0	0	0	0	0	21,210	300,581	6,250	328,040
Total	1,255	1,235	22,208	0	742	0	26,337	302,670	19,462	373,911

Ornate box turtle	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	9	0	1	9
Status 3	0	0	2,520	0	0	0	0	0	0	2,520
Status 4	0	0	0	0	0	0	4,287	56,367	4	60,657
Total	0	0	2,520	0	0	0	4,296	56,367	4	63,187

Appendix 5.2 continued.

Western spiny softshell turtle	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	98	0	0	0	0	52	0	0	150
Status 2	0	1,137	20	0	0	0	1,478	2,089	3,538	8,262
Status 3	2,781	0	20,241	0	742	0	3,494	0	9,256	36,514
Status 4	0	0	0	0	0	2,382	25,816	338,936	6,665	373,800
Total	2,781	1,235	20,261	0	742	2,382	30,839	341,026	19,459	418,726

Northern earless lizard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	0	0	1,974	0	0	0	0	0	0	1,974
Status 4	0	0	0	0	0	0	28,705	316,604	214	345,524
Total	0	0	1,974	0	0	0	28,705	316,604	214	347,497

Eastern short-horned lizard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,521	4,527	0	19,030	0	0	2,084	3,055	556	33,773
Status 2	681	5,181	4,476	473	0	0	37,828	5,331	685	54,656
Status 3	340,543	0	5,693,322	88	12,898	0	29,128	7,491	10,584	6,094,053
Status 4	0	0	0	0	0	291,862	1,117,465	8,440,365	14,552	9,864,244
Total	345,745	9,708	5,697,798	19,590	12,898	291,862	1,186,505	8,456,242	26,376	16,046,726

Northern sagebrush lizard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,135	19,467	260	12,899	0	0	7,030	3,352	298	51,440
Status 2	649	4,684	8,738	473	0	0	52,573	4,241	380	71,738
Status 3	366,335	0	6,173,505	88	12,903	0	28,954	6,941	8,806	6,597,531
Status 4	0	0	0	0	0	501,857	1,157,957	8,197,776	10,512	9,868,102
Total	375,119	24,151	6,182,502	13,459	12,903	501,857	1,246,514	8,212,310	19,996	16,588,811

Northern plateau lizard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	19,433	0	302,366	0	0	0	469	0	59	322,327
Status 4	0	0	0	0	0	0	15,720	259,561	1,800	277,082
Total	19,433	0	302,366	0	0	0	16,189	259,561	1,859	599,409

Appendix 5.2 continued.

Red-lipped prairie lizard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	862	0	0	862
Status 2	26	0	355	0	0	0	234	0	0	616
Status 3	7,420	0	63,198	0	1,049	0	2,075	0	534	74,276
Status 4	0	0	0	0	0	0	90,958	747,198	1,089	839,245
Total	7,447	0	63,553	0	1,049	0	94,130	747,198	1,623	914,999

Northern prairie lizard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	27	0	0	0	0	100	0	1	128
Status 3	701	0	24,620	0	6,240	0	3,040	0	564	35,165
Status 4	0	0	0	0	0	0	120,905	1,069,156	504	1,190,565
Total	701	27	24,620	0	6,240	0	124,045	1,069,156	1,068	1,225,858

Northern tree lizard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	21,787	0	298,043	0	0	0	469	0	26	320,325
Status 4	0	0	0	0	0	0	15,092	180,672	1,650	197,414
Total	21,787	0	298,043	0	0	0	15,560	180,672	1,676	517,738

Nothern many-lined skink	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	49	27	0	0	0	0	71	0	1	149
Status 3	0	0	17,228	0	2,060	0	1,853	0	100	21,241
Status 4	0	0	0	0	0	0	86,570	847,863	324	934,757
Total	49	27	17,228	0	2,060	0	88,495	847,863	425	956,147

Prairie lined racerunner	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	348	0	0	0	0	248	0	1	596
Status 3	0	0	12,380	0	1,264	0	2,542	0	155	16,341
Status 4	0	0	0	0	0	0	26,952	286,582	469	314,002
Total	0	348	12,380	0	1,264	0	29,742	286,582	624	330,940

Appendix 5.2 continued.

Rubber boa	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	26,312	108,159	48	3,650	0	0	654	330	2,092	141,245
Status 2	115	722	78	117	0	0	2,088	2,096	596	5,813
Status 3	63,320	0	24,247	0	158	0	808	0	561	89,094
Status 4	0	0	0	0	0	0	12,303	322,483	1,262	336,049
Total	89,747	108,882	24,373	3,767	158	0	15,853	324,909	4,511	572,200

Eastern yellowbelly racer	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,121	4,735	0	763	0	0	1,120	1,360	99	9,198
Status 2	1,288	2,922	2,549	0	0	0	13,519	3,957	855	25,091
Status 3	151,902	0	427,535	0	4,728	0	12,314	27	4,061	600,567
Status 4	0	0	0	0	0	95,427	229,516	2,103,618	7,474	2,436,035
Total	154,311	7,657	430,084	763	4,728	95,427	256,469	2,108,962	12,490	3,070,892

Plains hognose snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	549	0	0	0	0	862	0	0	1,411
Status 2	549	309	355	0	0	0	1,805	0	436	3,454
Status 3	264,333	0	431,920	0	6,836	0	8,893	48	3,989	716,018
Status 4	0	0	0	0	0	0	506,412	5,177,700	5,159	5,689,270
Total	264,882	858	432,275	0	6,836	0	517,971	5,177,748	9,583	6,410,154

Pale milk snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	541	0	0	0	0	0	0	0	541
Status 2	549	2,910	20	0	0	0	5,039	1,786	799	11,104
Status 3	123,923	0	183,843	0	4,741	0	8,577	27	2,847	323,958
Status 4	0	0	0	0	0	27,624	194,089	2,178,749	3,005	2,403,467
Total	124,471	3,452	183,864	0	4,741	27,624	207,705	2,180,563	6,651	2,739,070

Smooth green snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,852	541	0	252	0	0	0	0	58	2,703
Status 2	1,348	0	289	0	0	0	5,412	0	50	7,100
Status 3	124,086	0	72,656	0	406	0	5,025	16	318	202,507
Status 4	0	0	0	0	0	0	85,607	557,632	806	644,045
Total	127,287	541	72,945	252	406	0	96,045	557,647	1,232	856,355

Appendix 5.2 continued.

Great Basin gopher snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	255	0	0	0	0	0	256
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	21,838	0	789,538	0	0	0	1,477	694	1,332	814,879
Status 4	0	0	0	0	0	0	32,526	500,978	2,382	535,886
Total	21,838	0	789,538	255	0	0	34,004	501,672	3,714	1,351,021

Bullsnake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,370	9,771	0	4,636	0	0	3,650	1,945	133	21,505
Status 2	1,335	5,258	3,834	0	0	0	16,152	4,846	457	31,882
Status 3	346,908	0	2,888,225	88	13,614	0	22,585	48	6,679	3,278,147
Status 4	0	0	0	0	0	312,862	938,862	7,020,860	8,752	8,281,335
Total	349,613	15,029	2,892,058	4,724	13,614	312,862	981,249	7,027,698	16,020	11,612,869

Black Hills redbelly snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	465	0	0	0	0	0	18	0	0	483
Status 3	72,570	0	7,927	0	392	0	0	16	8	80,912
Status 4	0	0	0	0	0	0	16,687	174,539	40	191,266
Total	73,035	0	7,927	0	392	0	16,705	174,555	48	272,661

Wandering garter snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	60,493	109,670	2	6,607	0	0	832	777	2,836	181,218
Status 2	198	1,042	207	889	0	0	8,689	2,482	564	14,072
Status 3	147,833	0	191,765	0	783	0	7,273	517	5,923	354,095
Status 4	0	0	0	0	0	47,809	103,608	1,091,625	8,319	1,251,361
Total	208,524	110,712	191,975	7,496	783	47,809	120,402	1,095,402	17,643	1,800,746

Western plains garter snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	98	0	0	0	0	0	0	0	98
Status 2	0	320	0	0	0	0	579	0	0	899
Status 3	2,124	0	2,877	0	555	0	1,231	0	823	7,610
Status 4	0	0	0	0	0	0	14,021	157,747	272	172,040
Total	2,124	419	2,877	0	555	0	15,831	157,747	1,095	180,648

Appendix 5.2 continued.

Common garter snake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,613	32,556	0	1,682	0	0	188	25	1,283	44,347
Status 2	5	320	5	0	0	0	1,091	0	0	1,422
Status 3	29,504	0	1,649	0	742	0	1,710	0	732	34,337
Status 4	0	0	0	0	0	0	9,574	144,981	365	154,920
Total	38,122	32,876	1,654	1,682	742	0	12,564	145,006	2,379	235,026

Prairie rattlesnake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,863	61,801	0	5,053	0	0	3,650	2,971	139	79,478
Status 2	1,705	5,640	8,236	0	0	0	43,169	6,549	1,274	66,573
Status 3	464,114	0	4,166,325	88	15,694	0	30,857	53	8,807	4,685,937
Status 4	0	0	0	0	0	439,841	1,141,925	8,569,890	16,842	10,168,498
Total	471,682	67,441	4,174,561	5,141	15,694	439,841	1,219,601	8,579,463	27,062	15,000,486

Midget faded rattlesnake	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	141	0	0	0	0	0	141
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	21,688	0	236,093	0	0	0	1,477	665	98	260,022
Status 4	0	0	0	0	0	0	10,154	205,888	1,868	217,910
Total	21,688	0	236,093	141	0	0	11,631	206,553	1,967	478,073

MAMMALS

Cinerus or masked shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	510,522	820,373	1,198	22,826	0	0	12,171	4,531	5,195	1,376,816
Status 2	2,402	3,553	10,419	1,361	0	0	67,657	9,726	618	95,736
Status 3	1,983,432	0	6,388,105	88	9,683	0	34,692	6,959	11,857	8,434,816
Status 4	0	0	0	0	0	580,039	1,108,625	7,624,660	15,796	9,329,120
Total	2,496,356	823,926	6,399,722	24,275	9,683	580,039	1,223,145	7,645,876	33,466	19,236,488

Preble's shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	556	96,370	0	0	0	0	0	0	128	97,054
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	48	0	0	0	0	0	0	0	0	48
Status 4	0	0	0	0	0	0	0	0	0	0
Total	604	96,370	0	0	0	0	0	0	128	97,102

Appendix 5.2 continued.

Dusky or montane shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,191,289	934,556	37	10,295	0	0	6,791	3,741	10,891	2,157,602
Status 2	3,173	0	9,138	0	0	0	39,394	6,503	81	58,290
Status 3	2,023,650	0	2,423,042	0	1,035	0	13,310	752	5,386	4,467,175
Status 4	0	0	0	0	0	370,617	440,540	2,693,026	7,697	3,511,880
Total	3,218,113	934,556	2,432,217	10,295	1,035	370,617	500,035	2,704,022	24,055	10,194,946

Dwarf shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,028,184	636,896	1,116	14,816	0	0	7,015	2,647	8,654	1,699,328
Status 2	2,339	0	5,805	378	0	0	31,258	7,037	168	46,986
Status 3	1,586,778	0	3,336,344	0	9,005	0	19,476	5,229	6,712	4,963,544
Status 4	0	0	0	0	0	508,544	625,750	3,687,206	7,286	4,828,786
Total	2,617,301	636,896	3,343,266	15,194	9,005	508,544	683,499	3,702,119	22,821	11,538,645

Water shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	562,970	291,498	2	6,669	0	0	1,201	742	5,527	868,609
Status 2	956	0	168	889	0	0	4,172	539	69	6,792
Status 3	627,272	0	140,402	0	36	0	2,091	505	3,934	774,241
Status 4	0	0	0	0	0	44,426	53,415	525,779	6,117	629,737
Total	1,191,198	291,498	140,572	7,558	36	44,426	60,878	527,565	15,647	2,279,378

Merriam's shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	58,807	169,419	888	21,410	0	0	10,927	3,989	3,192	268,631
Status 2	1,724	4,906	10,759	1,361	0	0	67,100	8,031	533	94,415
Status 3	813,594	0	6,592,953	88	13,593	0	36,763	6,980	11,298	7,475,269
Status 4	0	0	0	0	0	544,127	1,338,499	9,415,678	15,504	11,313,809
Total	874,125	174,325	6,604,600	22,859	13,593	544,127	1,453,291	9,434,678	30,527	19,152,124

Pygmy shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,446	0	0	0	0	0	0	0	0	8,446
Status 2	577	0	13	0	0	0	0	0	6	596
Status 3	116,000	0	814	0	0	0	0	0	90	116,903
Status 4	0	0	0	0	0	0	954	5,462	26	6,442
Total	125,023	0	827	0	0	0	954	5,462	122	132,387

Appendix 5.2 continued.

Hayden's shrew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	479	0	0	0	0	1,460	1,023	0	2,962
Status 2	848	0	6	0	0	0	121	0	0	975
Status 3	188,327	0	33,202	0	392	0	3,024	37	2,010	226,991
Status 4	0	0	0	0	0	0	74,364	658,715	273	733,352
Total	189,175	479	33,208	0	392	0	78,969	659,774	2,283	964,279

Eastern mole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	348	0	0	0	0	1,300	0	436	2,084
Status 3	0	0	14,944	0	1,577	0	2,618	0	155	19,295
Status 4	0	0	0	0	0	0	72,330	920,077	1,473	993,880
Total	0	348	14,944	0	1,577	0	76,248	920,077	2,064	1,015,259

Little brown myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	846,214	929,451	1,210	27,220	0	0	12,579	5,345	61,635	1,883,654
Status 2	3,162	5,988	11,070	1,462	0	0	76,120	10,171	6,740	114,713
Status 3	2,386,514	0	7,145,371	88	16,290	0	42,798	7,666	60,255	9,658,982
Status 4	0	0	0	0	0	684,119	1,444,487	10,722,499	55,787	12,906,892
Total	3,235,890	935,439	7,157,651	28,770	16,290	684,119	1,575,984	10,745,681	184,416	24,564,241

Yuma myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	663	20	0	0	0	611	1,835	3,041	6,171
Status 3	0	0	928	0	0	0	279	0	0	1,207
Status 4	0	0	0	0	0	0	65	1,975	254	2,293
Total	0	663	948	0	0	0	955	3,810	3,295	9,671

Keen's myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	514	0	0	0	0	0	0	0	514
Status 2	465	0	0	0	0	0	0	0	0	465
Status 3	77,836	0	17,882	0	264	0	786	16	198	96,982
Status 4	0	0	0	0	0	0	25,013	284,144	37	309,195
Total	78,301	514	17,882	0	264	0	25,800	284,160	235	407,155

Appendix 5.2 continued.

Long-eared myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,086,658	929,792	1,210	24,749	0	0	12,173	4,536	65,447	2,124,565
Status 2	3,281	5,352	10,750	1,361	0	0	70,929	9,715	6,628	108,016
Status 3	2,377,489	0	6,848,166	88	11,796	0	38,898	7,645	58,787	9,342,869
Status 4	0	0	0	0	0	687,171	1,190,066	8,236,435	55,065	10,168,737
Total	3,467,428	935,144	6,860,126	26,198	11,796	687,171	1,312,066	8,258,330	185,927	21,744,187

Fringed myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,071	550	0	1,383	0	0	2,200	2,554	129	8,887
Status 2	1,576	348	1,233	0	0	0	16,644	2,843	47	22,691
Status 3	300,545	0	673,116	0	10,878	0	18,582	37	4,953	1,008,111
Status 4	0	0	0	0	0	52,145	492,244	4,147,215	5,343	4,696,947
Total	304,192	897	674,349	1,383	10,878	52,145	529,670	4,152,649	10,472	5,736,636

Long-legged myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,072,026	929,082	1,210	22,848	0	0	12,300	4,532	9,916	2,051,916
Status 2	3,358	3,015	10,595	1,361	0	0	67,532	7,486	242	93,588
Status 3	2,351,905	0	6,570,174	88	11,991	0	36,272	6,959	13,793	8,991,181
Status 4	0	0	0	0	0	690,438	1,142,366	7,749,274	17,390	9,599,468
Total	3,427,289	932,097	6,581,979	24,297	11,991	690,438	1,258,470	7,768,252	41,341	20,736,153

California myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	177	0	0	1,334	0	0	1,510
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	4,685	0	148,784	0	1	0	270	0	62	153,802
Status 4	0	0	0	0	0	37,262	15,126	137,437	963	190,788
Total	4,685	0	148,784	177	1	37,262	16,729	137,437	1,025	346,101

Western small footed myotis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	89,869	223,856	366	24,588	0	0	9,323	5,106	56,415	409,523
Status 2	2,239	5,987	9,364	1,361	0	0	65,777	9,618	6,640	100,987
Status 3	776,542	0	6,796,065	88	16,290	0	40,095	7,666	55,173	7,691,920
Status 4	0	0	0	0	0	548,030	1,343,299	9,903,352	53,601	11,848,282
Total	868,651	229,843	6,805,794	26,037	16,290	548,030	1,458,495	9,925,743	171,829	20,050,712

Appendix 5.2 continued.

Silver-haired bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	711,972	926,821	509	14,525	0	0	8,293	3,870	60,071	1,726,062
Status 2	2,711	5,920	6,001	889	0	0	37,345	8,199	6,624	67,688
Status 3	2,087,378	0	3,517,441	1	8,931	0	28,487	2,445	55,779	5,700,462
Status 4	0	0	0	0	0	349,429	575,884	3,779,527	50,326	4,755,167
Total	2,802,062	932,741	3,523,951	15,414	8,931	349,429	650,009	3,794,041	172,801	12,249,379

Big brown bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	968,393	930,255	1,210	24,561	0	0	12,579	5,342	9,829	1,952,169
Status 2	3,439	5,893	11,070	1,462	0	0	74,058	10,025	1,537	107,484
Status 3	2,418,578	0	7,116,709	88	16,290	0	40,702	7,156	17,724	9,617,246
Status 4	0	0	0	0	0	699,438	1,449,405	10,816,169	29,157	12,994,168
Total	3,390,410	936,148	7,128,988	26,110	16,290	699,438	1,576,742	10,838,692	58,248	24,671,067

Eastern red bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	117,746	114,969	966	23,024	0	0	10,779	4,100	2,942	274,527
Status 2	914	5,286	9,115	1,462	0	0	70,715	9,196	1,445	98,133
Status 3	878,637	0	6,550,938	88	13,598	0	38,336	6,980	12,378	7,500,955
Status 4	0	0	0	0	0	586,445	1,367,788	10,378,898	24,362	12,357,493
Total	997,298	120,255	6,561,019	24,574	13,598	586,445	1,487,618	10,399,174	41,127	20,231,108

Hoary bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	407,643	761,886	1,210	25,592	0	0	11,867	4,682	60,035	1,272,917
Status 2	2,297	5,987	11,025	1,361	0	0	73,393	10,019	6,640	110,723
Status 3	1,966,300	0	7,109,945	88	15,632	0	41,858	7,666	58,967	9,200,457
Status 4	0	0	0	0	0	645,762	1,436,997	10,600,839	55,319	12,738,917
Total	2,376,241	767,873	7,122,180	27,042	15,632	645,762	1,564,116	10,623,207	180,961	23,323,014

Spotted bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	12,736	53,588	262	11,268	0	0	3,203	2,638	2,131	85,827
Status 2	14	5,545	4,659	1,361	0	0	42,340	6,150	610	60,679
Status 3	87,243	0	5,334,826	0	2,005	0	20,188	7,614	6,284	5,458,160
Status 4	0	0	0	0	0	516,074	454,131	2,522,480	10,194	3,502,879
Total	99,994	59,133	5,339,747	12,630	2,005	516,074	519,862	2,538,883	19,219	9,107,545

Appendix 5.2 continued.

Townsend's big eared bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	382,217	836,278	1,150	21,490	0	0	11,385	4,449	4,494	1,261,465
Status 2	2,461	5,679	10,908	1,361	0	0	66,449	9,569	689	97,117
Status 3	1,819,501	0	6,860,095	88	14,861	0	37,117	7,666	11,821	8,751,148
Status 4	0	0	0	0	0	614,471	1,191,904	8,261,366	18,263	10,086,004
Total	2,204,180	841,957	6,872,153	22,939	14,861	614,471	1,306,856	8,283,050	35,267	20,195,734

Pallid bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,523	92,986	10	23,448	0	0	5,349	3,212	16,284	149,812
Status 2	1,492	5,987	6,300	1,361	0	0	51,414	8,376	6,499	81,430
Status 3	483,800	0	6,115,635	88	16,290	0	34,781	7,666	51,095	6,709,355
Status 4	0	0	0	0	0	509,081	1,206,802	9,183,942	52,212	10,952,036
Total	493,814	98,973	6,121,945	24,897	16,290	509,081	1,298,345	9,203,196	126,090	17,892,633

Brazilian free-tailed bat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	50	0	0	0	0	0	0	0	0	50
Status 3	0	0	6,440	0	2,018	0	136	0	11	8,604
Status 4	0	0	0	0	0	9,400	7,748	65,450	397	82,996
Total	50	0	6,440	0	2,018	9,400	7,884	65,450	408	91,650

American pika	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,089,947	548,256	140	6	0	0	543	64	7,279	1,646,236
Status 2	1,429	0	296	0	0	0	885	0	6	2,616
Status 3	1,330,586	0	61,401	0	0	0	51	0	2,613	1,394,650
Status 4	0	0	0	0	0	118,797	13,477	52,521	1,556	186,351
Total	2,421,962	548,256	61,837	6	0	118,797	14,956	52,585	11,455	3,229,853

Eastern cottontail	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	94	550	0	1,996	0	0	0	0	79	2,719
Status 2	88	671	2,517	0	0	0	4,756	1,841	993	10,866
Status 3	154,985	0	564,529	0	9,942	0	3,503	37	2,088	735,083
Status 4	0	0	0	0	0	0	372,427	3,116,802	5,056	3,494,285
Total	155,167	1,220	567,046	1,996	9,942	0	380,686	3,118,680	8,216	4,242,954

Appendix 5.2 continued.

Mountain (Nuttall's) cottontail	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	359,642	820,782	1,106	25,675	0	0	12,545	5,330	5,573	1,230,653
Status 2	2,391	3,330	10,979	1,361	0	0	71,186	7,489	383	97,120
Status 3	1,715,699	0	7,040,962	88	13,830	0	39,628	7,670	15,543	8,833,419
Status 4	0	0	0	0	0	597,428	1,345,544	9,516,121	22,297	11,481,390
Total	2,077,733	824,112	7,053,047	27,124	13,830	597,428	1,468,902	9,536,610	43,796	21,642,582

Desert cottontail	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	121,337	110,679	992	23,508	0	0	10,441	3,989	2,108	273,053
Status 2	932	5,437	10,752	1,361	0	0	68,370	8,335	578	95,765
Status 3	786,379	0	6,952,731	88	14,746	0	37,517	7,670	13,146	7,812,276
Status 4	0	0	0	0	0	576,722	1,339,429	9,400,305	18,747	11,335,202
Total	908,648	116,115	6,964,475	24,957	14,746	576,722	1,455,756	9,420,299	34,579	19,516,296

Snowshoe hare	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	894,181	925,377	454	7,173	0	0	5,627	2,269	7,500	1,842,581
Status 2	2,471	0	4,168	0	0	0	22,999	3,965	80	33,683
Status 3	2,025,478	0	712,361	0	15	0	8,949	0	4,359	2,751,162
Status 4	0	0	0	0	0	170,574	205,817	1,113,726	3,960	1,494,077
Total	2,922,129	925,377	716,983	7,173	15	170,574	243,393	1,119,960	15,899	6,121,503

White-tailed jack rabbit	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	126,709	173,004	1,042	25,116	0	0	10,948	4,000	3,652	344,471
Status 2	935	5,855	10,817	1,462	0	0	73,712	10,014	1,482	104,277
Status 3	816,798	0	6,977,079	88	15,397	0	39,673	7,670	14,310	7,871,014
Status 4	0	0	0	0	0	607,265	1,394,432	10,460,586	25,633	12,487,916
Total	944,441	178,859	6,988,937	26,666	15,397	607,265	1,518,765	10,482,271	45,076	20,807,678

Black-tailed jack rabbit	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,082	499	0	1,721	0	0	862	0	285	10,449
Status 2	136	309	355	0	0	0	7,305	0	480	8,586
Status 3	263,693	0	1,009,587	0	13,693	0	11,859	16	5,491	1,304,338
Status 4	0	0	0	0	0	0	677,992	6,330,717	9,797	7,018,506
Total	270,911	809	1,009,942	1,721	13,693	0	698,018	6,330,733	16,053	8,341,879

Appendix 5.2 continued.

Pygmy rabbit	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	3,292	0	7,298	0	0	0	0	444	11,035
Status 2	0	0	0	1,361	0	0	51	0	0	1,412
Status 3	22,705	0	1,678,262	0	0	0	5,529	7,171	1,661	1,715,329
Status 4	0	0	0	0	0	0	103,469	751,386	3,574	858,429
Total	22,705	3,292	1,678,262	8,659	0	0	109,049	758,557	5,680	2,586,204

Least chipmunk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,008,539	880,364	1,208	22,925	0	0	12,068	4,900	7,286	1,937,291
Status 2	3,383	5,215	10,973	473	0	0	68,608	7,872	448	96,971
Status 3	2,342,296	0	7,092,771	88	15,104	0	36,324	7,648	14,110	9,508,341
Status 4	0	0	0	0	0	670,702	1,376,604	9,523,900	17,931	11,589,137
Total	3,354,218	885,579	7,104,953	23,485	15,104	670,702	1,493,604	9,544,320	39,775	23,131,739

Yellow-pine chipmunk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	751,131	881,051	507	7,334	0	0	5,413	269	6,048	1,651,753
Status 2	185	0	442	889	0	0	7,588	4,054	20	13,177
Status 3	1,243,918	0	339,622	0	0	0	889	5	2,969	1,587,402
Status 4	0	0	0	0	0	66,360	66,627	379,840	2,010	514,837
Total	1,995,233	881,051	340,571	8,223	0	66,360	80,516	384,168	11,047	3,767,170

Cliff chipmunk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	3,069	0	147,827	0	0	0	0	0	0	150,897
Status 4	0	0	0	0	0	0	9,601	40,506	146	50,253
Total	3,069	0	147,827	0	0	0	9,601	40,506	146	201,149

Uinta chipmunk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	843,018	912,098	507	10,985	0	0	5,214	128	7,481	1,779,432
Status 2	888	0	3,112	889	0	0	15,906	2,297	32	23,123
Status 3	1,605,486	0	870,252	0	0	0	6,301	461	3,852	2,486,351
Status 4	0	0	0	0	0	207,002	165,487	846,419	4,598	1,223,506
Total	2,449,392	912,098	873,870	11,873	0	207,002	192,908	849,305	15,963	5,512,412

Appendix 5.2 continued.

Yellow-bellied marmot	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,207,446	948,693	507	15,876	0	0	9,485	3,925	11,593	2,197,525
Status 2	3,720	236	7,959	889	0	0	36,331	5,662	178	54,974
Status 3	2,184,193	0	1,599,529	8	1,857	0	15,046	971	7,685	3,809,289
Status 4	0	0	0	0	0	299,050	391,134	2,155,833	6,537	2,852,553
Total	3,395,359	948,929	1,607,994	16,772	1,857	299,050	451,995	2,166,391	25,993	8,914,341

Uinta ground squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	587,130	341,044	1,086	18,589	0	0	8,155	113	4,104	960,220
Status 2	191	0	2,485	1,394	0	0	17,930	0	25	22,026
Status 3	748,304	0	2,188,592	0	0	0	7,159	7,442	2,744	2,954,241
Status 4	0	0	0	0	0	41,993	191,981	1,431,531	5,254	1,670,760
Total	1,335,625	341,044	2,192,164	19,983	0	41,993	225,225	1,439,087	12,127	5,607,247

Thriteen-lined ground squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	42,360	549	994	14,203	0	0	9,800	3,409	640	71,954
Status 2	755	5,526	10,678	0	0	0	71,336	9,912	1,311	99,518
Status 3	572,485	0	6,046,548	88	15,748	0	37,764	7,365	12,731	6,692,728
Status 4	0	0	0	0	0	598,428	1,304,337	9,693,428	23,117	11,619,310
Total	615,600	6,075	6,058,219	14,291	15,748	598,428	1,423,236	9,714,114	37,799	18,483,511

Allen's thriteen lined ground squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	9,994	0	887	1,380	0	0	6,047	1,026	8	19,342
Status 2	0	0	4,309	0	0	0	16,419	697	20	21,445
Status 3	102,480	0	232,518	0	0	0	1,440	0	414	336,853
Status 4	0	0	0	0	0	108,345	65,473	243,352	322	417,492
Total	112,474	0	237,714	1,380	0	108,345	89,380	245,075	763	795,132

Spotted ground squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	49	27	0	0	0	0	661	0	1	738
Status 3	0	0	33,794	0	8,994	0	4,255	0	947	47,990
Status 4	0	0	0	0	0	0	127,159	1,167,312	643	1,295,113
Total	49	27	33,794	0	8,994	0	132,075	1,167,312	1,590	1,343,841

Appendix 5.2 continued.

Golden-mantled ground squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,075,243	949,164	509	9,015	0	0	6,020	287	9,658	2,049,896
Status 2	2,139	0	3,368	889	0	0	18,558	5,662	82	30,698
Status 3	1,603,422	0	886,876	0	252	0	9,080	0	5,000	2,504,630
Status 4	0	0	0	0	0	241,255	198,088	1,327,818	8,706	1,775,868
Total	2,680,804	949,164	890,753	9,904	252	241,255	231,747	1,333,767	23,446	6,361,092

Wyoming ground squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	260,007	193,271	1,086	26,409	0	0	8,603	1,293	4,082	494,752
Status 2	400	46	8,111	1,462	0	0	66,445	7,483	432	84,378
Status 3	687,585	0	5,485,829	88	3,367	0	31,368	7,614	10,257	6,226,107
Status 4	0	0	0	0	0	621,044	821,199	5,154,671	20,365	6,617,279
Total	947,992	193,317	5,495,026	27,959	3,367	621,044	927,615	5,171,060	35,136	13,422,516

Black-tailed prairie dog	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	478	0	0	0	0	1,420	1,341	0	3,239
Status 2	598	27	1,175	0	0	0	9,149	0	1	10,949
Status 3	254,976	0	898,791	0	9,649	0	8,268	48	2,239	1,173,971
Status 4	0	0	0	0	0	40,399	636,179	5,167,773	2,847	5,847,198
Total	255,574	506	899,966	0	9,649	40,399	655,016	5,169,162	5,086	7,035,358

White-tailed prairie dog	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	41,485	3,377	992	14,387	0	0	6,808	1,451	695	69,195
Status 2	216	3,366	10,443	473	0	0	62,659	7,675	305	85,137
Status 3	257,375	0	6,299,666	88	5,474	0	27,000	7,599	9,037	6,606,239
Status 4	0	0	0	0	0	554,041	751,497	3,919,286	13,622	5,238,447
Total	299,075	6,742	6,311,101	14,948	5,474	554,041	847,964	3,936,012	23,659	11,999,018

Abert's squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	1,157	0	124	0	0	0	0	0	0	1,281
Status 4	0	0	0	0	0	0	944	12,049	19	13,012
Total	1,157	0	124	0	0	0	944	12,049	19	14,293

Appendix 5.2 continued.

Eastern fox squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	17,655	107	2	739	0	0	788	304	120	19,717
Status 2	221	1,032	134	0	0	0	12,111	1,842	1,228	16,568
Status 3	116,155	0	124,113	0	3,329	0	8,169	12	3,459	255,238
Status 4	0	0	0	0	0	62,120	207,016	2,577,382	10,039	2,856,557
Total	134,031	1,139	124,249	739	3,329	62,120	228,085	2,579,540	14,846	3,148,080

Red squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	823,360	840,427	338	3,043	0	0	5,114	3,514	5,458	1,681,254
Status 2	3,198	1,520	3,986	0	0	0	18,592	5,484	522	33,302
Status 3	1,922,130		587,875	0	495	0	11,478	16	6,112	2,528,106
Status 4	0	0	0	0	0	167,933	211,570	1,521,656	6,272	1,907,431
Total	2,748,688	841,947	592,199	3,043	495	167,933	246,754	1,530,670	18,364	6,150,093

Northern flying squirrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	690,970	750,335	337	1,539	0	0	2,050	104	4,337	1,449,672
Status 2	562	0	95	0	0	0	742	0	0	1,400
Status 3	1,105,007	0	98,077	0	392	0	970	16	2,066	1,206,527
Status 4	0	0	0	0	0	100,571	39,553	362,882	1,194	504,200
Total	1,796,540	750,335	98,508	1,539	392	100,571	43,316	363,002	7,597	3,161,799

Northern pocket gopher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,188,376	935,715	1,210	25,047	0	0	12,408	4,937	10,155	2,177,850
Status 2	3,428	5,671	11,041	1,394	0	0	74,524	10,024	1,358	107,441
Status 3	2,448,274	0	7,140,721	88	16,259	0	39,407	7,652	17,216	9,669,616
Status 4	0	0	0	0	0	709,304	1,429,719	10,656,782	25,955	12,821,760
Total	3,640,078	941,386	7,152,972	26,530	16,259	709,304	1,556,058	10,679,394	54,685	24,776,666

Wyoming pocket gopher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	3,445	0	0	3,445
Status 3	0	0	582,754	0	0	0	2,631	0	201	585,586
Status 4	0	0	0	0	0	0	23,151	238,868	313	262,332
Total	0	0	582,754	0	0	0	29,227	238,868	515	851,363

Appendix 5.2 continued.

Idaho pocket gopher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	78,982	3,377	0	31	0	0	0	0	1,674	84,064
Status 2	0	0	0	1,361	0	0	3,531	0	19	4,911
Status 3	69,894	0	1,026,941	0	0	0	136	0	1,193	1,098,164
Status 4	0	0	0	0	0	6,938	87,032	515,342	771	610,083
Total	148,877	3,377	1,026,941	1,392	0	6,938	90,699	515,342	3,657	1,797,222

Plains pocket gopher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	549	0	1,153	0	0	465	0	39	2,206
Status 2	626	309	308	0	0	0	1,596	0	436	3,274
Status 3	255,215	0	168,912	0	8,166	0	7,225	48	3,084	442,650
Status 4	0	0	0	0	0	0	371,115	3,810,455	3,540	4,185,110
Total	255,840	858	169,220	1,153	8,166	0	380,400	3,810,504	7,100	4,633,240

Olive-backed pocket mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,559	479	260	7,412	0	0	6,890	2,168	348	20,118
Status 2	598	3,393	7,158	0	0	0	55,240	3,940	661	70,990
Status 3	353,641	0	5,324,707	88	14,201	0	25,575	746	9,867	5,728,825
Status 4	0	0	0	0	0	493,546	1,140,792	8,620,395	15,720	10,270,453
Total	356,798	3,872	5,332,124	7,500	14,201	493,546	1,228,498	8,627,250	26,596	16,090,386

Plains pocket mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,325	0	0	1,295	0	0	790	0	56	8,467
Status 2	49	27	332	0	0	0	1,894	0	375	2,678
Status 3	24,059	0	186,324	0	8,449	0	5,052	0	1,011	224,896
Status 4	0	0	0	0	0	0	247,948	2,182,023	2,065	2,432,035
Total	30,434	27	186,656	1,295	8,449	0	255,684	2,182,023	3,507	2,668,075

Silky pocket mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	790	0	0	790
Status 2	60	27	332	0	0	0	1,545	0	375	2,339
Status 3	236,046	0	273,815	0	8,708	0	6,657	48	1,511	526,784
Status 4	0	0	0	0	0	0	374,606	3,724,097	2,565	4,101,268
Total	236,106	27	274,147	0	8,708	0	383,598	3,724,146	4,450	4,631,182

Appendix 5.2 continued.

Great Basin pocket mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	1,268	0	6,323	0	0	0	0	201	7,792
Status 2	0	0	0	473	0	0	0	0	0	473
Status 3	22,380	0	777,500	0	0	0	4,226	7,280	38	811,424
Status 4	0	0	0	0	0	0	57,756	502,039	2,703	562,499
Total	22,380	1,268	777,500	6,795	0	0	61,983	509,319	2,942	1,382,187

Hispid pocket mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	479	0	0	0	0	790	0	0	1,269
Status 2	598	27	332	0	0	0	1,563	0	375	2,895
Status 3	282,538	0	338,045	0	8,476	0	7,874	48	2,567	639,547
Status 4	0	0	0	0	0	0	485,258	4,807,493	3,233	5,295,984
Total	283,136	506	338,376	0	8,476	0	495,484	4,807,541	6,175	5,939,695

Ord's kangaroo rat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,159	479	803	12,986	0	0	6,985	2,589	396	31,397
Status 2	598	5,070	7,946	0	0	0	50,455	4,025	768	68,863
Status 3	331,746	0	6,197,546	88	15,084	0	28,918	7,652	11,453	6,592,487
Status 4	0	0	0	0	0	498,659	1,133,824	8,332,315	14,595	9,979,393
Total	339,503	5,549	6,206,296	13,074	15,084	498,659	1,220,181	8,346,581	27,212	16,672,140

American beaver	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	103,835	119,399	95	12,993	0	0	2,312	894	64,776	304,303
Status 2	383	1,137	1,184	989	0	0	20,714	5,978	6,521	36,907
Status 3	462,320	0	437,886	1	1,150	0	15,142	517	53,266	970,281
Status 4	0	0	0	0	0	74,120	228,637	2,307,815	49,419	2,659,991
Total	566,538	120,536	439,165	13,983	1,150	74,120	266,805	2,315,204	173,982	3,971,483

Plains harvest mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,325	479	0	5,145	0	0	862	0	159	12,971
Status 2	598	27	418	0	0	0	15,458	0	375	16,877
Status 3	296,220	0	1,165,581	88	10,950	0	11,565	48	3,838	1,488,289
Status 4	0	0	0	0	0	0	788,616	6,677,110	7,305	7,473,031
Total	303,143	506	1,165,998	5,233	10,950	0	816,501	6,677,159	11,677	8,991,168

Appendix 5.2 continued.

Western harvest mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,211	550	0	3,737	0	0	1,640	2,640	237	13,015
Status 2	709	3,028	3,924	0	0	0	31,802	5,698	1,288	46,449
Status 3	315,259	0	2,352,219	0	12,731	0	19,551	48	7,097	2,706,906
Status 4	0	0	0	0	0	292,829	980,909	7,870,230	15,280	9,159,248
Total	320,179	3,578	2,356,143	3,737	12,731	292,829	1,033,902	7,878,616	23,902	11,925,617

Deer mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	968,391	928,945	1,210	26,811	0	0	12,579	5,342	9,802	1,953,079
Status 2	3,439	5,893	11,070	1,462	0	0	75,766	10,025	1,537	109,192
Status 3	2,420,002	0	7,165,474	88	16,290	0	40,860	7,670	18,782	9,669,167
Status 4	0	0	0	0	0	701,220	1,454,242	10,855,040	30,875	13,041,378
Total	3,391,831	934,838	7,177,754	28,361	16,290	701,220	1,583,446	10,878,077	60,997	24,772,815

White-footed mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	541	0	150	0	0	2,209	0	0	2,901
Status 2	465	320	13	0	0	0	2,205	0	19	3,023
Status 3	72,652	0	72,432	0	3,891	0	4,527	0	1,289	154,792
Status 4	0	0	0	0	0	0	70,338	664,864	808	736,010
Total	73,117	861	72,445	150	3,891	0	79,280	664,864	2,117	896,725

Canyon mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	1,766	0	133,934	0	0	0	0	0	1	135,702
Status 4	0	0	0	0	0	0	9,171	55,481	90	64,742
Total	1,766	0	133,934	0	0	0	9,171	55,481	91	200,444

Pinyon mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	17,066	0	309,331	0	0	0	0	0	0	326,397
Status 4	0	0	0	0	0	0	20,319	57,189	738	78,246
Total	17,066	0	309,331	0	0	0	20,319	57,189	738	404,643

Nothern grasshopper mouse

Status 1	10,062	2,765	791	13,284	0	0	3,859	3,397	629	34,787
Status 2	598	5,049	6,799	473	0	0	58,519	4,025	769	76,231
Status 3	382,633	0	6,613,916	88	15,000	0	31,102	7,652	11,350	7,061,740
Status 4	0	0	0	0	0	436,834	1,264,144	9,194,017	16,537	10,911,533
Total	393,293	7,814	6,621,506	13,844	15,000	436,834	1,357,624	9,209,091	29,284	18,084,291

Bushy-tailed wood rat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	787,679	855,912	1,208	16,952	0	0	11,736	3,982	5,831	1,683,300
Status 2	3,249	4,657	10,568	473	0	0	62,452	7,486	274	89,158
Status 3	2,217,995	0	6,509,133	88	9,858	0	31,450	6,450	9,498	8,784,472
Status 4	0	0	0	0	0	633,000	1,086,542	7,017,307	9,917	8,746,766
Total	3,008,922	860,569	6,520,909	17,512	9,858	633,000	1,192,181	7,035,225	25,519	19,303,696

Southern red-backed vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	822,549	768,176	339	5,089	0	0	5,643	1,800	5,853	1,609,449
Status 2	3,160	1,424	1,345	889	0	0	13,059	5,442	467	25,785
Status 3	1,969,741	0	333,194	0	406	0	7,290	16	3,963	2,314,611
Status 4	0	0	0	0	0	118,929	179,030	1,218,691	3,593	1,520,242
Total	2,795,450	769,600	334,877	5,978	406	118,929	205,022	1,225,948	13,875	5,470,085

Heather vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,122,443	946,619	459	5,727	0	0	5,012	314	9,454	2,090,028
Status 2	2,112	0	3,049	889	0	0	16,194	4,251	178	26,674
Status 3	1,702,790	0	500,510	0	0	0	6,721	0	4,637	2,214,657
Status 4	0	0	0	0	0	199,065	130,282	701,484	3,811	1,034,642
Total	2,827,345	946,619	504,018	6,616	0	199,065	158,210	706,049	18,081	5,366,001

Meadow vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	104,513	195,404	1,084	15,168	0	0	8,460	1,055	3,325	329,009
Status 2	329	3,097	7,467	1,361	0	0	39,847	8,199	257	60,558
Status 3	760,326	0	2,907,288	0	6,780	0	19,553	6,184	5,232	3,705,363
Status 4	0	0	0	0	0	248,988	676,711	4,949,273	7,540	5,882,511
Total	865,168	198,501	2,915,840	16,529	6,780	248,988	744,572	4,964,710	16,353	9,977,441

Appendix 5.2 continued.

Montane vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	789,180	884,213	1,208	20,268	0	0	9,135	2,091	6,532	1,712,626
Status 2	2,508	0	7,948	1,361	0	0	57,628	7,483	196	77,125
Status 3	1,942,835	0	5,226,791	88	1,346	0	19,920	6,489	7,071	7,204,540
Status 4	0	0	0	0	0	568,181	716,965	3,991,709	9,782	5,286,637
Total	2,734,524	884,213	5,235,948	21,717	1,346	568,181	803,648	4,007,772	23,581	14,280,929

Long-tailed vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	702,253	390,370	1,086	24,077	0	0	11,820	4,130	6,739	1,140,475
Status 2	1,831	5,323	10,776	1,361	0	0	68,201	9,823	796	98,112
Status 3	1,602,077	0	6,710,897	88	12,680	0	38,728	6,980	13,871	8,385,321
Status 4	0	0	0	0	0	628,530	1,371,039	9,875,964	19,593	11,895,126
Total	2,306,161	395,694	6,722,759	25,526	12,680	628,530	1,489,787	9,896,897	40,999	21,519,033

Prairie vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,325	549	0	5,838	0	0	1,821	1,463	153	16,149
Status 2	649	3,140	5,461	0	0	0	41,137	5,774	1,102	57,263
Status 3	312,507	0	3,840,647	88	12,835	0	20,718	48	7,763	4,194,606
Status 4	0	0	0	0	0	372,536	1,094,747	8,442,123	14,599	9,924,004
Total	319,481	3,689	3,846,109	5,926	12,835	372,536	1,158,422	8,449,408	23,616	14,192,022

Water vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	329,206	171,234	0	4	0	0	135	2	1,479	502,060
Status 2	1	0	0	0	0	0	1,224	0	0	1,225
Status 3	499,379	0	45,864	0	0	0	25	0	1,090	546,359
Status 4	0	0	0	0	0	5,779	8,076	55,517	235	69,608
Total	828,586	171,234	45,864	4	0	5,779	9,461	55,519	2,805	1,119,252

Sagebrush vole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	56,002	110,296	992	23,285	0	0	10,619	3,545	2,005	206,743
Status 2	1,200	5,215	10,705	473	0	0	68,645	7,793	823	94,853
Status 3	756,782	0	6,994,879	88	15,204	0	36,077	7,615	12,418	7,823,062
Status 4	0	0	0	0	0	581,541	1,330,430	9,353,865	17,662	11,283,499
Total	813,983	115,510	7,006,576	23,846	15,204	581,541	1,445,771	9,372,818	32,908	19,408,157

Appendix 5.2 continued.

Muskrat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	88,614	113,850	50	9,577	0	0	1,259	806	64,769	278,926
Status 2	252	1,137	251	989	0	0	12,997	2,780	6,672	25,080
Status 3	160,219	0	233,059	1	1,150	0	10,667	517	55,753	461,365
Status 4	0	0	0	0	0	70,520	150,766	1,995,829	50,386	2,267,501
Total	249,085	114,988	233,361	10,567	1,150	70,520	175,689	1,999,932	177,580	3,032,872

Preble's meadow jumping mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,001	0	0	1,432	0	0	538	0	149	4,120
Status 2	109	348	333	0	0	0	9,744	0	51	10,585
Status 3	24,080	0	202,328	0	7,534	0	7,128	0	1,680	242,749
Status 4	0	0	0	0	0	0	271,134	2,281,321	4,551	2,557,006
Total	26,189	348	202,661	1,432	7,534	0	288,544	2,281,321	6,431	2,814,460

Bear lodge meadow jumping mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	550	0	0	0	0	0	0	0	550
Status 2	549	0	0	0	0	0	121	0	0	670
Status 3	92,922	0	38,982	0	392	0	3,391	37	2,295	138,018
Status 4	0	0	0	0	0	0	72,316	733,538	312	806,165
Total	93,471	550	38,982	0	392	0	75,827	733,574	2,607	945,403

Western jumping mouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,059,514	870,197	219	10,363	0	0	3,111	1,963	8,862	1,954,227
Status 2	2,819	1,783	1,669	889	0	0	19,100	5,696	599	32,553
Status 3	1,936,429	0	581,004	0	2,267	0	12,252	505	7,656	2,540,112
Status 4	0	0	0	0	0	142,951	226,562	1,577,721	7,799	1,955,033
Total	2,998,762	871,979	582,891	11,252	2,267	142,951	261,024	1,585,884	24,916	6,481,926

Common porcupine	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,205,595	949,922	1,210	24,122	0	0	12,300	4,544	10,649	2,208,343
Status 2	3,388	5,707	10,687	1,462	0	0	72,864	9,721	1,398	105,227
Status 3	2,420,396	0	6,849,802	88	12,950	0	39,220	7,156	15,248	9,344,860
Status 4	0	0	0	0	0	716,555	1,299,966	9,668,018	25,318	11,709,857
Total	3,629,380	955,629	6,861,699	25,672	12,950	716,555	1,424,350	9,689,438	52,614	23,368,288

Appendix 5.2 continued.

Coyote	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,215,789	953,852	1,210	26,811	0	0	12,579	5,342	12,154	2,227,736
Status 2	3,884	5,893	11,070	1,462	0	0	75,766	10,025	1,537	109,637
Status 3	2,471,604	0	7,166,368	88	16,290	0	40,860	7,670	19,409	9,722,289
Status 4	0	0	0	0	0	722,615	1,454,323	10,855,778	31,286	13,064,002
Total	3,691,277	959,745	7,178,648	28,361	16,290	722,615	1,583,527	10,878,815	64,385	25,123,664

Gray wolf	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	536,325	930,470	827	5,485	0	0	1,819	128	5,408	1,480,462
Status 2	152	0	747	0	0	0	1,071	0	0	1,970
Status 3	433,402	0	17,401	0	0	0	65	0	1,345	452,212
Status 4	0	0	0	0	0	0	5,658	70,293	316	76,267
Total	969,879	930,470	18,975	5,485	0	0	8,612	70,422	7,069	2,010,912

Red fox	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,215,789	953,852	1,210	26,443	0	0	12,579	5,342	11,978	2,227,192
Status 2	3,884	5,401	11,070	1,462	0	0	73,365	9,975	1,508	106,664
Status 3	2,469,366	0	6,895,766	88	16,022	0	39,880	7,491	17,309	9,445,921
Status 4	0	0	0	0	0	720,240	1,436,757	10,752,779	28,225	12,938,001
Total	3,689,039	959,253	6,908,046	27,992	16,022	720,240	1,562,580	10,775,586	59,020	24,717,778

Swift fox	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	32	550	0	12,617	0	0	862	1,734	799	16,594
Status 2	682	348	3,505	0	0	0	31,635	0	719	36,888
Status 3	286,590	0	4,690,666	88	11,289	0	27,799	6,980	11,151	5,034,562
Status 4	0	0	0	0	0	135,695	965,291	7,778,743	17,904	8,897,633
Total	287,303	897	4,694,171	12,705	11,289	135,695	1,025,587	7,787,457	30,572	13,985,677

Gray fox	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	550	0	2,101	0	0	0	4,033	79	6,763
Status 2	1,499	348	2,630	0	0	0	4,833	0	436	9,746
Status 3	382,365	0	1,148,027	0	10,555	0	9,698	48	5,849	1,556,543
Status 4	0	0	0	0	0	36,633	656,351	5,341,097	6,653	6,040,734
Total	383,865	897	1,150,657	2,101	10,555	36,633	670,882	5,345,178	13,017	7,613,786

Appendix 5.2 continued.

Black bear	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,201,703	951,988	509	15,770	0	0	8,894	3,478	10,516	2,192,858
Status 2	3,358	2,922	6,019	989	0	0	32,823	7,855	953	54,919
Status 3	2,199,989	0	1,317,369	0	6,257	0	20,164	919	10,194	3,554,892
Status 4	0	0	0	0	0	313,828	393,605	3,047,382	15,927	3,770,742
Total	3,405,050	954,910	1,323,896	16,760	6,257	313,828	455,486	3,059,634	37,591	9,573,412

Grizzly or brown bear	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	907,054	949,920	417	10,794	0	0	5,418	128	5,592	1,879,323
Status 2	152	0	2,188	0	0	0	12,186	0	6	14,532
Status 3	829,930	0	72,291	0	0	0	1,914	0	2,052	906,188
Status 4	0	0	0	0	0	89,943	36,107	220,882	1,418	348,350
Total	1,737,136	949,920	74,896	10,794	0	89,943	55,625	221,011	9,070	3,148,394

Ringtail	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,766	1,722	0	4,848	0	0	0	0	505	12,842
Status 2	66	0	962	889	0	0	7,268	0	50	9,235
Status 3	98,459	0	796,348	0	0	0	5,796	2,112	344	903,059
Status 4	0	0	0	0	0	0	99,266	818,182	4,655	922,103
Total	104,292	1,722	797,311	5,737	0	0	112,329	820,293	5,554	1,847,238

Common raccoon	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	36,871	104,691	50	8,794	0	0	1,259	789	2,716	155,171
Status 2	334	1,070	254	989	0	0	13,264	2,635	1,267	19,813
Status 3	151,777	0	262,241	0	2,966	0	9,455	517	6,346	433,301
Status 4	0	0	0	0	0	68,849	243,078	3,052,682	15,505	3,380,115
Total	188,982	105,761	262,545	9,784	2,966	68,849	267,057	3,056,623	25,835	3,988,400

American marten	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,121,582	909,271	339	2,875	0	0	3,686	263	9,502	2,047,517
Status 2	2,101	228	3,115	0	0	0	18,361	3,929	30	27,764
Status 3	1,890,442	0	311,264	0	0	0	5,939	0	4,315	2,211,961
Status 4	0	0	0	0	0	154,908	73,498	415,403	2,605	646,414
Total	3,014,125	909,499	314,718	2,875	0	154,908	101,484	419,594	16,452	4,933,655

Appendix 5.2 continued.

Fisher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	9,497	30,694	0	0	0	0	0	0	0	40,191
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	1,492	0	0	0	0	0	0	0	0	1,492
Status 4	0	0	0	0	0	0	0	0	0	0
Total	10,989	30,694	0	0	0	0	0	0	0	41,683

Ermine	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,185,153	952,316	509	19,577	0	0	9,601	3,936	11,688	2,182,780
Status 2	3,884	2,949	7,813	989	0	0	43,180	7,855	1,337	68,007
Status 3	2,258,935	0	2,121,823	8	8,352	0	22,481	1,441	11,360	4,424,401
Status 4	0	0	0	0	0	346,593	639,168	5,275,876	19,429	6,281,065
Total	3,447,972	955,265	2,130,145	20,574	8,352	346,593	714,429	5,289,108	43,814	12,956,253

Least weasel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	576	0	0	576
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	1,753	0	14,158	0	201	0	25	0	24	16,161
Status 4	0	0	0	0	0	0	28,074	272,339	216	300,629
Total	1,753	0	14,158	0	201	0	28,675	272,339	240	317,366

Long-tailed weasel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,206,986	951,193	1,210	24,296	0	0	12,579	5,330	10,658	2,212,251
Status 2	3,415	5,744	11,026	1,361	0	0	71,532	9,823	1,185	104,086
Status 3	2,464,049	0	6,926,957	88	15,363	0	40,431	7,156	16,976	9,471,021
Status 4	0	0	0	0	0	707,104	1,431,707	10,589,492	23,614	12,751,916
Total	3,674,450	956,937	6,939,193	25,744	15,363	707,104	1,556,249	10,611,800	52,432	24,539,274

Black-footed ferret	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	1,966	0	0	1,966
Status 3	0	0	233,418	0	0	0	712	0	531	234,661
Status 4	0	0	0	0	0	0	45,869	324,746	606	371,221
Total	0	0	233,418	0	0	0	48,547	324,746	1,137	607,849

Appendix 5.2 continued.

Mink	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	88,614	113,850	50	9,577	0	0	1,259	806	64,769	278,926
Status 2	252	1,137	251	989	0	0	12,942	2,780	6,521	24,874
Status 3	160,219	0	225,653	1	1,150	0	10,659	517	52,347	450,545
Status 4	0	0	0	0	0	70,520	150,204	1,991,263	49,106	2,261,093
Total	249,085	114,988	225,954	10,567	1,150	70,520	175,064	1,995,366	172,743	3,015,437

North American wolverine	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,091,862	949,073	509	7,682	0	0	6,228	287	10,526	2,066,167
Status 2	200	0	2,188	0	0	0	16,141	4,054	21	22,602
Status 3	1,348,199	0	320,976	0	0	0	1,508	0	3,605	1,674,288
Status 4	0	0	0	0	0	196,592	66,603	367,955	3,176	634,325
Total	2,440,261	949,073	323,673	7,682	0	196,592	90,480	372,296	17,328	4,397,383

American badger	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	829,527	374,501	1,042	26,608	0	0	11,455	2,967	8,457	1,254,558
Status 2	2,119	4,915	10,820	1,462	0	0	73,484	9,947	1,504	104,252
Status 3	1,348,660	0	6,918,347	88	15,746	0	39,891	7,670	15,557	8,345,958
Status 4	0	0	0	0	0	632,158	1,393,759	10,535,909	28,764	12,590,590
Total	2,180,306	379,417	6,930,209	28,158	15,746	632,158	1,518,589	10,556,493	54,282	22,295,358

Eastern spotted skunk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	466	0	0	466
Status 2	951	0	310	0	0	0	959	0	376	2,595
Status 3	33,132	0	63,071	0	6,265	0	3,041	0	1,066	106,575
Status 4	0	0	0	0	0	0	60,845	444,750	1,183	506,778
Total	34,082	0	63,381	0	6,265	0	65,310	444,750	2,625	616,414

Western spotted skunk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	555	0	102,170	0	0	0	108	0	1,277	104,111
Status 4	0	0	0	0	0	0	14,220	72,903	128	87,251
Total	555	0	102,170	0	0	0	14,329	72,903	1,404	191,362

Appendix 5.2 continued.

Striped skunk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	868,498	704,851	1,206	24,495	0	0	12,579	5,309	7,357	1,624,295
Status 2	3,035	5,401	11,025	1,462	0	0	72,677	9,975	1,477	105,052
Status 3	1,813,918	0	6,721,070	88	14,590	0	39,511	6,980	14,477	8,610,634
Status 4	0	0	0	0	0	675,817	1,413,510	10,640,517	26,377	12,756,222
Total	2,685,451	710,252	6,733,301	26,045	14,590	675,817	1,538,276	10,662,781	49,689	23,096,203

Northern river otter	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	59,193	112,677	2	7,367	0	0	715	661	59,459	240,075
Status 2	115	0	175	889	0	0	7,753	539	3,034	12,505
Status 3	121,349	0	127,137	1	233	0	6,236	505	43,617	299,077
Status 4	0	0	0	0	0	46,655	54,109	544,743	35,384	680,892
Total	180,657	112,677	127,315	8,256	233	46,655	68,813	546,448	141,494	1,232,549

Mountain lion	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,207,176	948,909	509	15,240	0	0	9,634	3,638	11,565	2,196,670
Status 2	3,732	2,718	7,937	889	0	0	36,767	7,346	444	59,833
Status 3	2,227,850	0	2,082,945	8	6,594	0	17,654	1,397	7,253	4,343,700
Status 4	0	0	0	0	0	318,647	519,019	3,472,669	9,361	4,319,696
Total	3,438,758	951,627	2,091,391	16,137	6,594	318,647	583,073	3,485,050	28,622	10,919,899

Lynx	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	708,258	837,286	284	1,763	0	0	1,903	195	5,017	1,554,704
Status 2	76	0	102	0	0	0	3,973	3,864	0	8,014
Status 3	1,107,864	0	114,663	0	0	0	688	0	1,988	1,225,203
Status 4	0	0	0	0	0	101,272	23,311	195,062	1,680	321,326
Total	1,816,198	837,286	115,048	1,763	0	101,272	29,875	199,120	8,685	3,109,247

Bobcat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	697,324	1,628,507	2,212	35,730	0	0	24,535	5,527	8,488	2,402,323
Status 2	3,948	5,717	14,891	1,361	0	0	101,896	17,306	707	145,826
Status 3	2,909,706	0	7,469,004	88	13,979	0	46,479	7,666	14,220	10,461,142
Status 4	0	0	0	0	0	586,082	1,215,412	8,363,018	18,335	10,182,847
Total	3,610,978	1,634,224	7,486,107	37,179	13,979	586,082	1,388,322	8,393,517	41,750	23,192,139

Appendix 5.2 continued.

Wapiti or elk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,183,879	951,038	1,210	26,792	0	0	12,579	5,342	10,891	2,191,731
Status 2	3,415	5,363	11,070	1,462	0	0	75,296	9,721	1,492	107,819
Status 3	2,460,366	0	6,850,315	88	14,262	0	39,665	7,666	17,084	9,389,445
Status 4	0	0	0	0	0	717,133	1,429,859	10,649,974	28,428	12,825,393
Total	3,647,660	956,401	6,862,595	28,342	14,262	717,133	1,557,399	10,672,702	57,894	24,514,388

Mule or black-tailed deer	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,215,789	953,852	1,210	26,811	0	0	12,579	5,342	12,154	2,227,736
Status 2	3,884	5,893	11,070	1,462	0	0	75,766	10,025	1,537	109,637
Status 3	2,471,604	0	7,166,368	88	16,290	0	40,860	7,670	19,409	9,722,289
Status 4	0	0	0	0	0	722,615	1,454,323	10,855,778	31,286	13,064,002
Total		959,745	7,178,648	28,361	16,290	722,615	1,583,527	10,878,815	64,385	25,123,664

White-tailed deer	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	86,592	111,274	50	8,794	0	0	1,259	403	3,006	211,378
Status 2	797	1,070	254	989	0	0	13,283	2,635	1,267	20,294
Status 3	249,751	0	216,638	0	2,301	0	10,607	517	6,865	486,680
Status 4	0	0	0	0	0	72,146	252,287	3,163,514	15,227	3,503,174
Total	337,140	112,344	216,942	9,784	2,301	72,146	277,436	3,167,068	26,365	4,221,526

Moose	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,202,389	953,908	509	16,383	0	0	6,798	3,853	65,387	2,249,227
Status 2	2,816	1,557	5,133	989	0	0	26,886	6,519	6,120	50,021
Status 3	2,077,945	0	770,541	1	160	0	10,376	505	41,938	2,901,466
Status 4	0	0	0	0	0	246,987	227,399	1,729,566	36,703	2,240,655
Total	3,283,151	955,465	776,183	17,373	160	246,987	271,459	1,740,444	150,148	7,441,369

Pronghorn	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	246,313	297,095	1,074	26,050	0	0	11,637	3,783	3,261	589,213
Status 2	1,221	5,572	10,695	1,462	0	0	72,723	10,001	1,362	103,037
Status 3	1,285,374	0	7,030,030	88	15,663	0	38,919	7,670	14,381	8,392,125
Status 4	0	0	0	0	0	591,711	1,412,618	10,556,824	25,713	12,586,865
Total	1,532,909	302,666	7,041,798	27,600	15,663	591,711	1,535,896	10,578,279	44,717	21,671,240

Appendix 5.2 continued.

American bison	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	522,815	900,974	827	9,651	0	0	1,937	113	4,507	1,440,824
Status 2	152	0	747	0	0	0	2,927	0	2	3,828
Status 3	476,733	0	171,853	0	0	0	279	0	865	649,731
Status 4	0	0	0	0	0	0	19,494	194,585	898	214,977
Total	999,700	900,974	173,427	9,651	0	0	24,637	194,698	6,273	2,309,360

Mountain goat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	462,036	365,111	18	0	0	0	84	0	466	827,714
Status 2	40	0	0	0	0	0	330	0	0	371
Status 3	592,635	0	6,963	0	0	0	0	0	677	600,275
Status 4	0	0	0	0	0	0	5,249	23,069	63	28,381
Total	1,054,711	365,111	6,981	0	0	0	5,663	23,069	1,206	1,456,741

Mountain sheep	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,210,184	946,729	1,210	17,122	0	0	9,261	2,085	11,297	2,197,888
Status 2	2,580	5,015	9,141	0	0	0	47,651	9,721	710	74,818
Status 3	1,906,395	0	2,083,475	88	1,752	0	18,168	0	6,971	4,016,848
Status 4	0	0	0	0	0	480,746	468,168	2,614,321	7,444	3,570,679
Total	3,119,159	951,744	2,093,826	17,210	1,752	480,746	543,248	2,626,127	26,421	9,860,234

BIRDS

Common loon	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,953	58,069	0	5,782	0	0	114	160	56,144	128,222
Status 2	110	565	109	889	0	0	4,553	906	5,779	12,910
Status 3	23,543	0	62,142	1	722	0	6,529	62	45,185	138,184
Status 4	0	0	0	0	0	12,867	24,314	235,082	37,962	310,225
Total	31,606	58,634	62,251	6,671	722	12,867	35,510	236,210	145,070	589,541

Pied-billed grebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,627	55,892	2	7,342	0	0	114	25	55,952	124,954
Status 2	136	1,021	143	889	0	0	6,085	2,433	6,163	16,870
Status 3	19,569	0	78,443	1	729	0	7,574	517	40,036	146,868
Status 4	0	0	0	0	0	32,157	38,659	497,122	28,832	596,770
Total	25,332	56,913	78,589	8,231	729	32,157	52,432	500,098	130,982	885,463

Appendix 5.2 continued.

Horned grebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,414	24,608	0	4,155	0	0	37	25	54,986	87,225
Status 2	26	1,137	115	889	0	0	5,104	2,089	5,972	15,332
Status 3	10,878	0	35,015	1	779	0	6,982	5	41,890	95,548
Status 4	0	0	0	0	0	8,185	19,337	228,365	22,419	278,306
Total	14,318	25,745	35,130	5,044	779	8,185	31,460	230,484	125,267	476,412

Red-necked grebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	658	39,445	0	1,376	0	0	10	0	51,934	93,423
Status 2	0	0	3	0	0	0	2,303	0	2,465	4,771
Status 3	1,878	0	1,330	0	0	0	751	0	2,081	6,039
Status 4	0	0	0	0	0	1,445	1,138	22,990	1,294	26,866
Total	2,536	39,445	1,333	1,376	0	1,445	4,202	22,990	57,773	131,099

Eared grebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,792	61,448	2	7,314	0	0	140	185	55,970	129,851
Status 2	26	1,021	129	889	0	0	6,041	2,433	6,454	16,993
Status 3	20,799	0	80,501	1	779	0	6,915	517	45,631	155,142
Status 4	0	0	0	0	0	33,910	38,560	498,227	37,670	608,368
Total	25,618	62,469	80,631	8,203	779	33,910	51,656	501,362	145,725	910,354

Western grebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,379	48,700	2	6,012	0	0	231	253	55,887	114,463
Status 2	31	1,021	131	889	0	0	5,556	2,433	6,221	16,282
Status 3	18,646	0	87,701	1	784	0	7,696	505	47,371	162,703
Status 4	0	0	0	0	0	33,910	48,239	596,148	38,581	716,878
Total	22,056	49,721	87,834	6,902	784	33,910	61,722	599,339	148,058	1,010,325

Clark's grebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,435	15,589	0	2,091	0	0	0	0	50,085	69,201
Status 2	0	504	9	0	0	0	2,111	423	5,636	8,682
Status 3	2,315	0	4,702	1	21	0	1,561	44	20,337	28,980
Status 4	0	0	0	0	0	1,008	1,946	18,884	6,203	28,041
Total	3,750	16,093	4,711	2,092	21	1,008	5,617	19,351	82,262	134,904

Appendix 5.2 continued.

American white pelican	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	13,817	68,612	2	7,368	0	0	192	87	56,857	146,935
Status 2	31	1,021	151	889	0	0	6,555	2,433	6,356	17,435
Status 3	45,277	0	107,209	1	779	0	8,976	513	49,192	211,946
Status 4	0	0	0	0	0	29,825	52,783	659,746	42,730	785,083
Total	59,125	69,633	107,362	8,257	779	29,825	68,506	662,778	155,135	1,161,399

Double-crested cormorant	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,188	45,740	2	7,314	0	0	222	445	55,832	114,743
Status 2	81	1,021	129	889	0	0	6,404	2,433	6,216	17,173
Status 3	27,574	0	92,360	1	2,482	0	9,001	505	46,643	178,565
Status 4	0	0	0	0	0	37,674	57,791	793,034	40,856	929,355
Total	32,843	46,761	92,490	8,203	2,482	37,674	73,418	796,418	149,546	1,239,836

American bittern	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,167	7,958	48	4,643	0	0	468	0	673	17,957
Status 2	114	583	77	922	0	0	6,137	2,095	804	10,732
Status 3	13,819	0	20,165	0	158	0	1,800	44	1,594	37,580
Status 4	0	0	0	0	0	4,515	15,450	422,184	2,176	444,325
Total	18,100	8,541	20,290	5,565	158	4,515	23,855	424,324	5,246	510,595

Great blue heron	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	17,489	88,927	2	7,422	0	0	244	501	57,058	171,644
Status 2	200	1,021	167	889	0	0	8,403	2,628	6,527	19,835
Status 3	76,000	0	171,710	1	779	0	9,068	513	51,304	309,373
Status 4	0	0	0	0	0	40,140	88,332	987,885	46,703	1,163,059
Total	93,689	89,948	171,880	8,311	779	40,140	106,046	991,527	161,592	1,663,912

Great egret	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	666	15,035	0	6,750	0	0	47	25	15,153	37,676
Status 2	0	0	8	0	0	0	3,843	0	2,877	6,727
Status 3	5,817	0	9,286	0	405	0	1,298	461	8,548	25,816
Status 4	0	0	0	0	0	1,461	13,885	315,942	8,453	339,741
Total	6,483	15,035	9,294	6,750	405	1,461	19,072	316,428	35,031	409,959

Appendix 5.2 continued.

Snowy egret	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,597	32,838	0	5,967	0	0	62	87	49,755	93,306
Status 2	26	771	33	889	0	0	5,222	2,089	6,216	15,246
Status 3	19,382	0	56,479	0	36	0	3,013	505	16,205	95,620
Status 4	0	0	0	0	0	14,683	20,395	372,419	24,000	431,498
Total	24,006	33,609	56,512	6,855	36	14,683	28,692	375,101	96,176	635,670

Cattle egret	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,328	94	0	1,734	0	0	0	0	117	8,273
Status 2	0	0	8	0	0	0	7,809	0	496	8,313
Status 3	5,085	0	234,227	0	201	0	2,403	0	1,626	243,541
Status 4	0	0	0	0	0	37,912	97,343	1,024,446	3,677	1,163,377
Total	11,412	94	234,235	1,734	201	37,912	107,555	1,024,446	5,917	1,423,504

Black-crowned night heron	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,368	37,419	0	5,529	0	0	37	25	50,666	98,044
Status 2	26	725	35	889	0	0	5,659	2,089	6,216	15,640
Status 3	11,883	0	51,148	0	36	0	4,589	505	20,784	88,945
Status 4	0	0	0	0	0	6,106	20,678	329,090	25,509	381,384
Total	16,277	38,145	51,184	6,418	36	6,106	30,963	331,710	103,175	584,013

White-faced ibis	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,495	10,345	48	5,403	0	0	468	0	47,075	66,834
Status 2	8	678	167	922	0	0	5,978	2,585	6,208	16,545
Status 3	21,008	0	51,710	0	228	0	1,830	44	21,726	96,546
Status 4	0	0	0	0	0	18,782	30,482	698,373	25,544	773,182
Total	24,511	11,023	51,925	6,325	228	18,782	38,758	701,003	100,552	953,107

Tundra swan	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,617	45,732	2	6,130	0	0	166	87	53,725	110,458
Status 2	110	701	127	889	0	0	4,252	2,433	5,963	14,475
Status 3	15,884	0	50,921	0	500	0	3,773	505	20,734	92,318
Status 4	0	0	0	0	0	22,975	22,533	393,046	29,668	468,222
Total	20,611	46,433	51,050	7,018	500	22,975	30,724	396,071	110,090	685,473

Appendix 5.2 continued.

Trumpeter swan	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,712	67,392	2	5,441	0	0	144	25	53,930	134,646
Status 2	115	701	27	0	0	0	2,369	2,089	3,662	8,963
Status 3	29,217	0	35,452	0	0	0	1,369	505	13,440	79,984
Status 4	0	0	0	0	0	19,535	17,898	279,823	21,601	338,856
Total	37,044	68,093	35,482	5,441	0	19,535	21,779	282,442	92,633	562,449

Greater white-fronted goose	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	878	9,863	0	530	0	0	0	0	363	11,634
Status 2	0	0	0	0	0	0	1,038	0	442	1,481
Status 3	166	0	5,364	0	554	0	1,709	0	6,493	14,285
Status 4	0	0	0	0	0	0	14,246	246,725	4,536	265,508
Total	1,044	9,863	5,364	530	554	0	16,993	246,725	11,834	292,907

Snow goose	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,517	29,969	0	7,375	0	0	10	0	51,697	93,569
Status 2	59	733	77	117	0	0	8,726	2,241	6,370	18,324
Status 3	13,212	0	63,831	1	712	0	5,429	62	27,475	110,723
Status 4	0	0	0	0	0	4,289	64,804	922,149	12,725	1,003,966
Total	17,789	30,702	63,908	7,492	712	4,289	78,969	924,453	98,267	1,226,581

Canada goose	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	46,845	131,917	910	22,598	0	0	10,253	1,950	57,901	272,373
Status 2	853	3,675	7,243	1,462	0	0	62,216	6,301	6,680	88,430
Status 3	467,105	0	5,534,168	88	10,886	0	35,998	6,976	55,983	6,111,205
Status 4	0	0	0	0	0	511,378	1,106,337	8,747,116	52,436	10,417,267
Total	514,802	135,592	5,542,322	24,148	10,886	511,378	1,214,803	8,762,343	173,000	16,889,275

Wood duck	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,238	86,660	0	5,873	0	0	158	25	54,490	154,444
Status 2	26	1,021	32	889	0	0	5,576	2,433	6,157	16,134
Status 3	31,690	0	46,979	0	779	0	7,246	505	24,784	111,983
Status 4	0	0	0	0	0	31,430	29,418	443,780	16,278	520,905
Total	38,954	87,682	47,011	6,761	779	31,430	42,399	446,743	101,708	803,467

Appendix 5.2 continued.

Green-winged teal	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	20,534	80,899	50	9,631	0	0	1,259	806	57,081	170,261
Status 2	254	1,137	251	989	0	0	13,815	2,780	6,666	25,894
Status 3	100,753	0	250,477	1	2,523	0	10,694	517	52,922	417,886
Status 4	0	0	0	0	0	65,911	153,704	2,061,827	48,997	2,330,438
Total	121,541	82,036	250,779	10,621	2,523	65,911	179,472	2,065,930	165,667	2,944,479

Mallard	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	119,408	199,118	341	13,992	0	0	4,689	898	64,505	402,953
Status 2	472	1,164	4,774	989	0	0	24,680	6,493	6,678	45,251
Status 3	466,384	0	703,314	1	2,970	0	16,647	517	56,425	1,246,257
Status 4	0	0	0	0	0	137,112	353,275	3,488,722	51,304	4,030,414
Total	586,264	200,282	708,428	14,982	2,970	137,112	399,292	3,496,630	178,913	5,724,875

Northern pintail	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,774	37,296	0	9,192	0	0	545	377	52,165	103,348
Status 2	88	771	222	989	0	0	11,947	2,585	6,601	23,205
Status 3	44,361	0	225,275	1	2,341	0	10,221	517	49,818	332,534
Status 4	0	0	0	0	0	57,320	175,081	2,231,024	43,147	2,506,572
Total	48,223	38,067	225,498	10,182	2,341	57,320	197,794	2,234,503	151,731	2,965,658

Blue-winged teal	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	38,938	161,690	101	13,311	0	0	2,519	905	111,159	328,622
Status 2	432	1,137	307	989	0	0	17,381	3,319	6,749	30,314
Status 3	177,271	0	282,080	1	2,683	0	12,489	517	58,199	533,239
Status 4	0	0	0	0	0	90,830	181,422	2,475,251	58,715	2,806,218
Total	216,641	162,827	282,487	14,301	2,683	90,830	213,810	2,479,992	234,822	3,698,393

Cinnamon teal	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	12,648	60,619	50	9,631	0	0	1,106	806	56,274	141,135
Status 2	195	1,137	224	989	0	0	12,554	2,780	6,666	24,546
Status 3	57,510	0	221,847	1	2,468	0	9,591	505	50,103	342,026
Status 4	0	0	0	0	0	65,158	102,382	1,459,315	45,658	1,672,513
Total	70,354	61,756	222,121	10,621	2,468	65,158	125,634	1,463,406	158,701	2,180,220

Appendix 5.2 continued.

Northern shoveler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	13,644	57,567	50	9,631	0	0	1,256	806	56,188	139,142
Status 2	338	1,164	234	989	0	0	13,709	2,780	6,666	25,882
Status 3	96,901	0	267,729	1	2,967	0	11,549	517	52,121	431,785
Status 4	0	0	0	0	0	67,549	240,587	3,041,502	49,125	3,398,763
Total	110,883	58,731	268,013	10,621	2,967	67,549	267,102	3,045,605	164,101	3,995,572

Gadwall	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	13,554	62,917	2	7,447	0	0	828	794	56,274	141,817
Status 2	251	1,137	188	889	0	0	9,170	2,628	6,572	20,835
Status 3	70,573	0	209,092	1	2,488	0	9,394	517	51,225	343,289
Status 4	0	0	0	0	0	45,877	106,595	1,188,093	48,010	1,388,575
Total	84,377	64,054	209,283	8,336	2,488	45,877	125,987	1,192,033	162,081	1,894,516

American wigeon	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	12,557	60,458	2	7,447	0	0	828	794	56,274	138,362
Status 2	251	1,137	188	889	0	0	9,170	2,628	6,572	20,835
Status 3	69,818	0	209,092	1	2,488	0	9,394	517	51,225	342,535
Status 4	0	0	0	0	0	45,877	106,595	1,188,093	48,010	1,388,575
Total	82,627	61,595	209,283	8,336	2,488	45,877	125,987	1,192,033	162,081	1,890,307

Canvasback	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,298	29,773	2	7,314	0	0	170	87	55,528	97,172
Status 2	31	1,137	129	889	0	0	6,023	2,433	6,348	16,989
Status 3	24,828	0	73,251	1	779	0	8,144	505	46,023	153,531
Status 4	0	0	0	0	0	34,175	41,313	556,293	36,068	667,849
Total	29,157	30,910	73,381	8,203	779	34,175	55,651	559,318	143,968	935,541

Redhead	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,125	46,838	0	7,399	0	0	107	25	55,856	113,350
Status 2	26	1,021	144	889	0	0	6,410	2,433	6,447	17,370
Status 3	13,733	0	99,803	1	784	0	8,591	505	47,138	170,555
Status 4	0	0	0	0	0	33,618	57,140	699,788	37,665	828,212
Total	16,885	47,859	99,947	8,288	784	33,618	72,248	702,752	147,105	1,129,486

Appendix 5.2 continued.

Ring-necked duck	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	13,332	89,400	2	5,728	0	0	117	258	54,943	163,780
Status 2	0	701	66	0	0	0	5,925	2,628	6,163	15,483
Status 3	39,369	0	59,742	0	0	0	5,143	505	20,849	125,608
Status 4	0	0	0	0	0	31,064	29,045	340,603	28,272	428,984
Total	52,701	90,101	59,810	5,728	0	31,064	40,229	343,994	110,227	733,855

Lesser scaup	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,703	58,263	0	7,447	0	0	575	25	56,176	128,190
Status 2	141	1,137	149	889	0	0	6,943	2,433	6,492	18,183
Status 3	28,382	0	118,724	1	779	0	9,090	517	48,462	205,953
Status 4	0	0	0	0	0	36,825	54,119	739,429	43,069	873,443
Total	34,226	59,400	118,873	8,336	779	36,825	70,727	742,404	154,200	1,225,770

Harlequin duck	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	26,418	82,743	2	737	0	0	117	25	54,620	164,663
Status 2	14	0	4	0	0	0	851	0	82	951
Status 3	49,746	0	858	0	0	0	122	0	1,127	51,854
Status 4	0	0	0	0	0	11,547	694	18,804	1,735	32,781
Total	76,178	82,743	864	737	0	11,547	1,783	18,830	57,565	250,248

Surf scoter	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	161	0	0	0	0	123	284
Status 2	0	0	0	0	0	0	63	0	0	63
Status 3	781	0	4,750	0	0	0	243	0	764	6,537
Status 4	0	0	0	0	0	0	3,329	42,762	10,160	56,251
Total	781	0	4,750	161	0	0	3,635	42,762	11,047	63,136

White-winged scoter	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	868	13,535	0	261	0	0	0	0	46,020	60,684
Status 2	0	0	3	0	0	0	2,455	344	2,825	5,627
Status 3	1,161	0	5,889	0	0	0	641	0	1,915	9,605
Status 4	0	0	0	0	0	1,448	3,603	52,986	4,063	62,100
Total	2,029	13,535	5,892	261	0	1,448	6,699	53,330	54,823	138,017

Appendix 5.2 continued.

Common goldeneye	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	35,998	87,052	2	7,393	0	0	682	185	59,700	191,012
Status 2	141	1,137	159	889	0	0	8,296	2,433	6,401	19,455
Status 3	81,187	0	94,423	1	779	0	7,975	505	47,893	232,762
Status 4	0	0	0	0	0	41,956	43,685	628,242	41,623	755,505
Total	117,326	88,189	94,584	8,282	779	41,956	60,637	631,365	155,617	1,198,735

Barrow's goldeneye	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	28,156	104,509	2	7,277	0	0	174	25	57,642	197,785
Status 2	115	1,137	119	889	0	0	5,947	2,433	6,018	16,657
Status 3	67,322	0	59,937	1	742	0	7,729	505	43,202	179,438
Status 4	0	0	0	0	0	39,191	25,942	415,182	35,264	515,579
Total	95,592	105,646	60,058	8,166	742	39,191	39,791	418,146	142,125	909,458

Bufflehead	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	27,831	78,546	2	7,288	0	0	225	25	57,112	171,029
Status 2	5	1,021	141	889	0	0	6,269	2,433	6,507	17,265
Status 3	79,245	0	86,416	1	742	0	8,566	505	48,936	224,412
Status 4	0	0	0	0	0	40,600	37,904	543,173	40,398	662,074
Total	107,081	79,567	86,559	8,177	742	40,600	52,964	546,137	152,954	1,074,781

Hooded merganser	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,125	50,325	0	5,278	0	0	62	25	53,689	112,505
Status 2	26	320	0	0	0	0	994	0	301	1,642
Status 3	8,757	0	23,373	0	278	0	821	505	6,519	40,253
Status 4	0	0	0	0	0	2,382	11,324	167,662	16,841	198,209
Total	11,909	50,645	23,373	5,278	278	2,382	13,201	168,193	77,350	352,610

Common merganser	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	47,022	113,490	2	7,267	0	0	319	224	59,439	227,762
Status 2	244	1,021	170	117	0	0	8,182	2,459	6,422	18,615
Status 3	115,731	0	130,701	1	779	0	9,049	505	51,276	308,041
Status 4	0	0	0	0	0	42,547	67,548	827,878	43,159	981,131
Total	162,996	114,511	130,873	7,385	779	42,547	85,097	831,066	160,296	1,535,549

Appendix 5.2 continued.

Red-breasted merganser	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,363	39,535	2	4,309	0	0	156	25	53,420	99,809
Status 2	26	0	97	0	0	0	4,615	0	2,782	7,521
Status 3	6,540	0	37,767	0	36	0	2,688	505	28,336	75,872
Status 4	0	0	0	0	0	6,543	11,013	148,659	7,025	173,240
Total	8,930	39,535	37,866	4,309	36	6,543	18,471	149,189	91,563	356,442

Ruddy duck	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,326	39,372	0	5,751	0	0	362	0	55,641	104,454
Status 2	0	565	130	889	0	0	5,140	906	6,266	13,896
Status 3	15,007	0	69,262	1	446	0	5,226	62	44,601	134,605
Status 4	0	0	0	0	0	13,345	30,580	255,485	31,474	330,884
Total	18,333	39,937	69,393	6,641	446	13,345	41,309	256,453	137,982	583,839

Turkey vulture	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	320,462	259,888	1,106	26,811	0	0	12,545	5,342	3,581	629,735
Status 2	2,491	5,893	11,069	1,462	0	0	75,741	10,025	1,531	108,213
Status 3	1,724,776	0	7,138,852	88	16,290	0	40,860	7,670	17,165	8,945,701
Status 4	0	0	0	0	0	612,209	1,448,400	10,832,155	29,869	12,922,632
Total	2,047,729	265,782	7,151,028	28,361	16,290	612,209	1,577,546	10,855,192	52,146	22,606,281

Osprey	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	57,147	42,775	2	9,666	0	0	1,176	451	63,222	174,440
Status 2	126	1,107	1,972	0	0	0	13,172	1,963	6,390	24,731
Status 3	103,341	0	314,597	8	2,524	0	8,668	1,016	49,813	479,967
Status 4	0	0	0	0	0	56,850	70,535	788,330	42,111	957,826
Total	160,614	43,882	316,572	9,675	2,524	56,850	93,551	791,760	161,536	1,636,963

Bald eagle	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,215,803	952,581	1,210	26,811	0	0	12,579	5,342	12,191	2,226,517
Status 2	3,884	5,893	11,070	1,462	0	0	75,766	10,025	1,537	109,637
Status 3	2,471,649	0	7,166,420	88	16,290	0	40,860	7,670	19,774	9,722,752
Status 4	0	0	0	0	0	722,615	1,454,323	10,855,882	31,822	13,064,643
Total	3,691,337	958,475	7,178,700	28,361	16,290	722,615	1,583,527	10,878,919	65,324	25,123,548

Appendix 5.2 continued.

Northern harrier	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	964,171	895,859	1,210	24,502	0	0	12,409	3,551	8,102	1,909,805
Status 2	3,362	4,252	11,069	1,462	0	0	74,966	9,931	1,477	106,519
Status 3	2,268,258	0	6,954,287	88	15,728	0	40,377	7,156	16,318	9,302,211
Status 4	0	0	0	0	0	686,256	1,422,248	10,654,541	28,695	12,791,740
Total	3,235,790	900,112	6,966,565	26,052	15,728	686,256	1,550,000	10,675,180	54,593	24,110,276

Sharp-shinned hawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,080,617	926,061	509	13,449	0	0	9,023	3,853	9,844	2,043,355
Status 2	3,439	2,988	6,199	889	0	0	32,515	7,449	995	54,473
Status 3	2,214,173	0	1,691,170	0	7,521	0	20,269	931	9,605	3,943,669
Status 4	0	0	0	0	0	294,253	590,263	4,581,112	12,358	5,477,986
Total	3,298,228	929,048	1,697,878	14,337	7,521	294,253	652,070	4,593,345	32,803	11,519,483

Cooper's hawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,080,619	929,976	509	13,449	0	0	9,023	3,853	10,020	2,047,449
Status 2	3,439	2,988	6,199	889	0	0	32,515	7,449	995	54,473
Status 3	2,214,203	0	1,691,170	0	7,521	0	20,269	931	9,680	3,943,774
Status 4	0	0	0	0	0	294,253	591,993	4,588,403	12,358	5,487,007
Total	3,298,261	932,964	1,697,878	14,337	7,521	294,253	653,800	4,600,635	33,053	11,532,703

Northern goshawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,181,910	951,912	1,210	17,783	0	0	11,570	3,684	10,485	2,178,553
Status 2	3,358	4,626	10,416	1,361	0	0	47,743	9,822	533	77,859
Status 3	2,188,483	0	3,468,303	0	8,496	0	24,581	6,642	9,534	5,706,039
Status 4	0	0	0	0	0	294,583	612,625	3,936,932	11,372	4,855,512
Total	3,373,751	956,537	3,479,928	19,144	8,496	294,583	696,520	3,957,079	31,924	12,817,963

Broad-winged hawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	993	0	2	0	0	26	0	0	1,022
Status 2	77	0	2	0	0	0	0	256	0	334
Status 3	3,591	0	4,238	0	1,655	0	92	0	327	9,903
Status 4	0	0	0	0	0	5	6,668	110,990	620	118,283
Total	3,668	993	4,240	2	1,655	5	6,786	111,246	947	129,542

Appendix 5.2 continued.

Swainson's hawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	318,195	820,647	1,106	24,437	0	0	12,386	3,551	4,563	1,184,885
Status 2	2,466	3,543	11,068	1,462	0	0	73,193	9,624	1,428	102,784
Status 3	1,650,151	0	6,611,727	88	14,356	0	39,221	6,980	13,203	8,335,727
Status 4	0	0	0	0	0	582,989	1,400,837	10,569,804	25,487	12,579,117
Total	1,970,812	824,190	6,623,901	25,987	14,356	582,989	1,525,639	10,589,959	44,680	22,202,514

Red-tailed hawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	522,046	896,608	1,198	26,508	0	0	12,579	5,342	5,803	1,470,083
Status 2	2,552	5,745	11,070	1,462	0	0	74,065	9,975	1,531	106,399
Status 3	2,096,285	0	7,008,366	88	16,022	0	40,858	7,666	16,845	9,186,130
Status 4	0	0	0	0	0	637,791	1,441,923	10,799,812	28,778	12,908,304
Total	2,620,883	902,352	7,020,633	28,058	16,022	637,791	1,569,425	10,822,795	52,957	23,670,916

Ferrunginous hawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	54,240	169,493	575	26,629	0	0	10,267	4,108	3,480	268,794
Status 2	1,040	5,893	10,761	1,462	0	0	72,187	10,014	1,488	102,845
Status 3	606,918	0	6,936,942	88	15,502	0	40,145	7,670	14,717	7,621,982
Status 4	0	0	0	0	0	539,385	1,389,691	10,442,871	28,378	12,400,325
Total	662,199	175,387	6,948,277	28,179	15,502	539,385	1,512,290	10,464,662	48,064	20,393,946

Rough-legged hawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	31,369	101,722	1,042	26,570	0	0	10,988	2,665	2,777	177,134
Status 2	1,763	4,366	10,580	1,462	0	0	73,285	9,892	1,365	102,712
Status 3	689,431	0	6,399,452	88	16,252	0	39,303	7,670	13,945	7,166,140
Status 4	0	0	0	0	0	579,645	1,341,590	10,250,997	27,084	12,199,316
Total	722,563	106,088	6,411,074	28,120	16,252	579,645	1,465,167	10,271,224	45,171	19,645,303

Golden eagle	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,001,257	480,036	1,161	26,786	0	0	12,214	5,342	9,137	1,535,933
Status 2	3,289	5,893	11,024	1,462	0	0	75,089	10,025	1,531	108,313
Status 3	1,659,998	0	7,107,776	88	15,962	0	40,774	7,670	17,331	8,849,599
Status 4	0	0	0	0	0	681,629	1,437,406	10,760,462	29,689	12,909,186
Total	2,664,543	485,929	7,119,961	28,335	15,962	681,629	1,565,482	10,783,499	57,688	23,403,031

Appendix 5.2 continued.

American kestrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	296,616	371,833	1,074	26,471	0	0	12,340	4,141	3,927	716,402
Status 2	2,201	5,707	10,828	1,462	0	0	73,130	9,721	1,516	104,564
Status 3	1,463,812	0	6,981,180	88	16,022	0	40,753	7,666	14,873	8,524,393
Status 4	0	0	0	0	0	618,596	1,436,822	10,775,921	28,104	12,859,442
Total	1,762,629	377,540	6,993,081	28,021	16,022	618,596	1,563,045	10,797,449	48,419	22,204,802

Merlin	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	165,172	285,350	1,101	26,483	0	0	12,544	5,340	3,818	499,808
Status 2	2,441	5,745	11,024	1,462	0	0	73,367	9,975	1,531	105,545
Status 3	1,202,645	0	6,969,908	88	16,022	0	40,798	7,666	14,737	8,251,863
Status 4	0	0	0	0	0	607,665	1,431,894	10,754,597	28,123	12,822,278
Total	1,370,257	291,094	6,982,033	28,033	16,022	607,665	1,558,603	10,777,578	48,209	21,679,495

Peregrine falcon	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	366,845	828,514	1,106	27,220	0	0	12,545	5,345	58,054	1,299,629
Status 2	2,491	5,839	11,069	1,462	0	0	74,407	10,121	6,734	112,123
Status 3	1,732,834	0	6,990,599	88	16,022	0	42,953	7,666	57,750	8,847,912
Status 4	0	0	0	0	0	612,521	1,437,479	10,782,724	54,434	12,887,158
Total	2,102,170	834,353	7,002,774	28,770	16,022	612,521	1,567,383	10,805,856	176,973	23,146,823

Prairie falcon	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	895,275	689,197	992	26,194	0	0	11,462	4,122	8,882	1,636,125
Status 2	3,098	5,437	10,759	1,361	0	0	70,505	8,346	977	100,483
Status 3	1,588,286	0	7,072,180	88	15,611	0	38,581	7,670	15,756	8,738,172
Status 4	0	0	0	0	0	626,741	1,407,974	10,115,346	20,970	12,171,030
Total	2,486,660	694,634	7,083,931	27,643	15,611	626,741	1,528,521	10,135,484	46,586	22,645,810

Gray partridge	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,135	24,993	48	9,445	0	0	4,274	1,823	449	45,166
Status 2	21	2,780	5,148	1,462	0	0	26,185	9,211	760	45,569
Status 3	359,096	0	2,884,251	0	10,163	0	21,123	12	6,493	3,281,137
Status 4	0	0	0	0	0	423,029	812,963	6,021,503	12,845	7,270,340
Total	363,252	27,773	2,889,447	10,907	10,163	423,029	864,545	6,032,549	20,547	10,642,211

Appendix 5.2 continued.

Chukar	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,143	1,345	887	2,249	0	0	6,862	1,861	16	20,363
Status 2	100	324	6,278	473	0	0	33,954	7,037	32	48,198
Status 3	101,478	0	2,377,263	0	4,216	0	14,315	0	2,054	2,499,325
Status 4	0	0	0	0	0	488,067	545,874	2,817,817	7,400	3,859,158
Total	108,720	1,669	2,384,428	2,721	4,216	488,067	601,005	2,826,715	9,502	6,427,044

Ring-necked pheasant	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	77	0	10	304	0	0	3,890	1,298	0	5,580
Status 2	0	3,581	2,986	0	0	0	22,390	5,238	1,225	35,420
Status 3	52,532	0	1,566,628	0	9,115	0	16,698	0	2,743	1,647,716
Status 4	0	0	0	0	0	431,893	435,969	3,539,068	9,333	4,416,262
Total	52,609	3,581	1,569,625	304	9,115	431,893	478,946	3,545,604	13,301	6,104,979

Blue grouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	803,304	899,867	1,210	11,032	0	0	9,877	2,942	6,537	1,734,769
Status 2	2,765	0	9,884	117	0	0	41,476	6,503	82	60,827
Status 3	2,004,395	0	1,627,729	0	0	0	13,399	0	4,346	3,649,869
Status 4	0	0	0	0	0	267,185	367,923	1,769,883	5,605	2,410,597
Total	2,810,463	899,867	1,638,824	11,150	0	267,185	432,676	1,779,328	16,570	7,856,062

White-tailed ptarmigan	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	688	1,314	0	0	0	0	0	0	2	2,004
Status 2	180	0	0	0	0	0	0	0	0	180
Status 3	7,955	0	0	0	0	0	0	0	60	8,015
Status 4	0	0	0	0	0	0	0	27	0	27
Total	8,823	1,314	0	0	0	0	0	27	61	10,225

Ruffed grouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	672,104	788,153	509	8,481	0	0	5,848	1,065	5,265	1,481,427
Status 2	507	0	635	117	0	0	10,792	4,054	39	16,145
Status 3	1,513,828	0	330,955	0	365	0	914	0	3,037	1,849,098
Status 4	0	0	0	0	0	91,894	87,959	593,356	2,363	775,572
Total	2,186,440	788,153	332,099	8,599	365	91,894	105,513	598,475	10,704	4,122,242

Appendix 5.2 continued.

Sage grouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	16,428	21,297	644	22,503	0	0	7,301	1,565	1,176	70,913
Status 2	209	3,672	9,190	1,462	0	0	63,340	9,626	847	88,346
Status 3	425,577	0	6,517,432	88	8,720	0	33,319	7,199	10,816	7,003,151
Status 4	0	0	0	0	0	533,258	1,119,734	8,246,753	19,602	9,919,348
Total	442,215	24,969	6,527,265	24,053	8,720	533,258	1,223,694	8,265,143	32,442	17,081,759

Sharp-tailed grouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4	550	0	202	0	0	3,579	0	0	4,335
Status 2	1,062	348	1,257	0	0	0	12,401	0	436	15,503
Status 3	353,317	0	448,751	0	10,193	0	11,847	48	4,146	828,302
Status 4	0	0	0	0	0	0	565,268	5,379,958	5,102	5,950,328
Total	354,384	897	450,007	202	10,193	0	593,095	5,380,006	9,683	6,798,468

Columbian Sharp-tailed grouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,005	0	0	0	0	0	0	0	0	4,005
Status 2	66	0	0	0	0	0	2,605	0	0	2,671
Status 3	74,040	0	116,207	0	0	0	3,973	0	72	194,292
Status 4	0	0	0	0	0	0	30,566	109,732	103	140,402
Total	78,110	0	116,207	0	0	0	37,145	109,732	175	341,370

Wild turkey	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	54,546	550	0	202	0	0	2,976	1,051	74	59,399
Status 2	1,875	2,988	3,541	0	0	0	11,473	1,939	1,052	22,868
Status 3	590,146	0	341,191	0	4,715	0	8,758	27	3,106	947,944
Status 4	0	0	0	0	0	0	323,894	3,063,563	5,521	3,392,978
Total	646,567	3,538	344,732	202	4,715	0	347,101	3,066,580	9,753	4,423,188

Northern bobwhite	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	348	0	0	0	0	1,238	0	428	2,013
Status 3	0	0	4,130	0	902	0	1,182	0	90	6,304
Status 4	0	0	0	0	0	0	22,009	344,920	1,026	367,955
Total	0	348	4,130	0	902	0	24,429	344,920	1,544	376,272

Appendix 5.2 continued.

Virginia rail	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,167	34,470	0	4,785	0	0	10	25	50,252	94,709
Status 2	136	0	0	0	0	0	1,647	344	525	2,652
Status 3	11,315	0	13,019	0	402	0	23	5	4,067	28,829
Status 4	0	0	0	0	0	5	21,250	396,427	7,757	425,439
Total	16,618	34,470	13,019	4,785	402	5	22,930	396,800	62,600	551,629

Sora	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,328	54,539	50	7,841	0	0	650	25	53,739	122,173
Status 2	34	0	116	117	0	0	5,658	344	2,969	9,239
Status 3	36,739	0	52,650	0	402	0	1,741	505	16,581	108,618
Status 4	0	0	0	0	0	4,999	40,132	736,474	13,783	795,388
Total	42,102	54,539	52,816	7,958	402	4,999	48,181	737,348	87,072	1,035,418

American coot	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,235	54,713	2	6,215	0	0	679	185	53,957	122,986
Status 2	141	1,021	169	889	0	0	8,466	2,433	6,527	19,645
Status 3	45,490	0	130,833	0	729	0	8,304	505	42,468	228,329
Status 4	0	0	0	0	0	38,211	56,864	718,672	42,108	855,854
Totals	52,866	55,734	131,004	7,104	729	38,211	74,312	721,795	145,060	1,226,815

Sandhill crane	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	33,401	111,077	50	9,577	0	0	1,259	501	57,747	213,613
Status 2	229	1,049	237	989	0	0	12,641	2,780	6,541	24,466
Status 3	133,259	0	198,125	1	1,905	0	10,233	517	51,180	395,219
Status 4	0	0	0	0	0	52,282	193,931	2,530,833	39,555	2,816,600
Total	166,888	112,126	198,413	10,567	1,905	52,282	218,064	2,534,631	155,023	3,449,899

Whooping crane	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,549	43,654	49	6,965	0	0	468	87	53,300	108,072
Status 2	8	0	11	989	0	0	4,172	0	2,667	7,847
Status 3	28,135	0	35,703	0	0	0	1,240	505	13,013	78,595
Status 4	0	0	0	0	0	16,324	11,974	324,488	3,903	356,689
Total	31,692	43,654	35,762	7,954	0	16,324	17,855	325,080	72,883	551,204

Appendix 5.2 continued.

Black-bellied plover	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	329	20,916	0	207	0	0	0	0	45,932	67,385
Status 2	0	0	10	117	0	0	3,468	0	208	3,803
Status 3	9,460	0	24,277	0	0	0	2,028	0	9,296	45,062
Status 4	0	0	0	0	0	540	13,838	243,487	3,027	260,892
Total	9,790	20,916	24,287	324	0	540	19,334	243,487	58,464	377,141

Lesser golden plover	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	11	0	0	0	6,561	0	2,452	9,024
Status 3	2,564	0	136,252	0	0	0	2,940	0	4,226	145,983
Status 4	0	0	0	0	0	7,876	48,513	428,423	2,921	487,734
Total	2,564	0	136,263	0	0	7,876	58,014	428,423	9,599	642,740

Snowy plover										
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	649	0	288	937
Status 3	0	0	6,197	0	0	0	723	0	8,551	15,471
Status 4	0	0	0	0	0	0	704	2,598	2,210	5,513
Total	0	0	6,197	0	0	0	2,077	2,598	11,050	21,922

Semipalmated plover	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	322	14,646	0	0	0	0	0	0	47,346	62,314
Status 2	0	0	3	0	0	0	1,189	0	2,766	3,958
Status 3	338	0	2,702	0	0	0	1,432	0	9,900	14,372
Status 4	0	0	0	0	0	272	1,548	16,717	3,303	21,840
Total	660	14,646	2,705	0	0	272	4,169	16,717	63,315	102,483

Piping plover	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	2	0	7	10
Status 3	3	0	2	0	0	0	176	0	743	924
Status 4	0	0	0	0	0	0	96	1,126	1,863	3,085
Total	3	0	2	0	0	0	274	1,126	2,612	4,018

Appendix 5.2 continued.

Killdeer	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	35,198	99,096	50	9,631	0	0	1,259	806	57,479	203,520
Status 2	338	1,164	254	989	0	0	14,954	2,780	6,666	27,146
Status 3	152,700	0	284,546	1	2,967	0	11,568	517	53,910	506,208
Status 4	0	0	0	0	0	69,376	245,717	3,072,707	49,585	3,437,386
Total	188,237	100,260	284,850	10,621	2,967	69,376	273,498	3,076,811	167,641	4,174,260

Mountain plover	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,621	1,747	0	16,808	0	0	1,137	532	404	22,249
Status 2	49	0	1,965	473	0	0	28,001	0	111	30,599
Status 3	170,142	0	2,655,135	88	8,276	0	14,303	7,284	6,436	2,861,663
Status 4	0	0	0	0	0	53,707	411,530	2,686,933	7,728	3,159,898
Total	171,813	1,747	2,657,100	17,369	8,276	53,707	454,971	2,694,749	14,679	6,074,410

Black necked stilt	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,782	9,769	0	4,749	0	0	10	0	46,994	63,303
Status 2	0	678	67	922	0	0	4,806	2,241	6,056	14,771
Status 3	4,689	0	12,738	0	0	0	2,593	44	9,382	29,446
Status 4	0	0	0	0	0	18,506	10,974	300,110	17,159	346,749
Total	6,471	10,446	12,805	5,670	0	18,506	18,383	302,396	79,590	454,268

American avocet	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,467	41,038	0	4,052	0	0	51	0	55,912	106,521
Status 2	5	504	141	0	0	0	4,088	511	6,166	11,415
Status 3	24,127	0	49,831	1	691	0	5,826	44	45,480	125,999
Status 4	0	0	0	0	0	7,176	27,107	211,914	39,982	286,179
Total	29,598	41,542	49,973	4,053	691	7,176	37,072	212,469	147,539	530,113

Greater yellowlegs	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	287	10,186	0	1,546	0	0	0	0	51,712	63,731
Status 2	0	0	0	0	0	0	876	0	3,057	3,933
Status 3	600	0	1,372	0	0	0	1,398	0	14,800	18,171
Status 4	0	0	0	0	0	335	693	8,750	19,660	29,438
Total	887	10,186	1,372	1,546	0	335	2,967	8,750	89,230	115,273

Appendix 5.2 continued.

Lesser yellowlegs	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	311	10,353	0	4,285	0	0	0	0	53,724	68,673
Status 2	0	282	8	0	0	0	2,995	0	2,929	6,214
Status 3	691	0	16,399	0	365	0	4,172	0	30,193	51,820
Status 4	0	0	0	0	0	6,343	25,138	593,493	14,052	639,027
Total	1,002	10,634	16,407	4,286	365	6,343	32,305	593,493	100,898	765,734

Solitary sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	287	4,244	0	1,272	0	0	0	0	46,186	51,989
Status 2	0	0	0	0	0	0	0	0	89	89
Status 3	171	0	1,717	0	0	0	562	0	13,098	15,549
Status 4	0	0	0	0	0	77	377	4,443	7,349	12,247
Total	458	4,244	1,717	1,272	0	77	940	4,443	66,723	79,873

Willet	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,087	21,724	50	6,621	0	0	793	0	55,225	87,500
Status 2	8	678	195	922	0	0	8,508	2,585	6,317	19,212
Status 3	21,457	0	42,794	1	228	0	6,339	44	41,783	112,645
Status 4	0	0	0	0	0	32,796	37,274	716,675	32,993	819,737
Total	24,552	22,402	43,038	7,544	228	32,796	52,913	719,304	136,318	1,039,095

Spotted sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	56,645	110,295	2	6,607	0	0	700	258	2,891	177,399
Status 2	244	677	183	889	0	0	6,840	2,482	452	11,767
Status 3	115,640	0	72,829	0	492	0	5,241	517	3,462	198,180
Status 4	0	0	0	0	0	20,570	45,760	573,480	4,573	644,383
Total	172,530	110,972	73,014	7,496	492	20,570	58,541	576,737	11,378	1,031,729

Upland sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	610	1,746	0	8,659	0	0	1,793	0	179	12,987
Status 2	598	309	286	0	0	0	6,001	0	441	7,635
Status 3	252,166	0	508,770	0	8,037	0	10,099	4,844	3,475	787,392
Status 4	0	0	0	0	0	0	516,147	5,249,596	5,516	5,771,259
Total	253,374	2,055	509,056	8,659	8,037	0	534,040	5,254,440	9,611	6,579,273

Appendix 5.2 continued.

Whimbrel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	11	0	0	0	2,917	0	162	3,090
Status 3	146	0	6,299	0	0	0	8	0	174	6,627
Status 4	0	0	0	0	0	833	7,104	171,776	728	180,441
Total	146	0	6,310	0	0	833	10,029	171,776	1,065	190,159

Long-billed curlew	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	23,450	75,853	48	23,306	0	0	4,858	0	1,922	129,437
Status 2	611	3,202	3,476	1,462	0	0	31,685	5,045	1,244	46,725
Status 3	375,175	0	2,909,862	88	10,732	0	23,789	7,462	7,997	3,335,105
Status 4	0	0	0	0	0	217,377	755,435	6,403,581	13,650	7,390,043
Total	399,237	79,055	2,913,386	24,856	10,732	217,377	815,767	6,416,088	24,814	10,901,310

Marbled godwit	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,663	18,556	0	4,212	0	0	10	0	52,679	78,121
Status 2	0	678	67	922	0	0	4,328	2,585	5,712	14,293
Status 3	9,150	0	20,785	0	228	0	4,008	44	15,149	49,364
Status 4	0	0	0	0	0	1,156	12,171	301,192	15,876	330,396
Total	11,813	19,234	20,853	5,134	228	1,156	20,518	303,822	89,417	472,174

Sanderling	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8	1,918	0	738	0	0	0	0	48,129	50,793
Status 2	0	0	0	0	0	0	0	0	98	98
Status 3	0	0	6,920	0	0	0	155	0	10,090	17,165
Status 4	0	0	0	0	0	0	629	2,887	3,337	6,853
Total	8	1,918	6,920	738	0	0	784	2,887	61,654	74,909

Semipalmated sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8	1,741	0	61	0	0	0	0	45,786	47,596
Status 2	0	0	0	0	0	0	922	0	240	1,162
Status 3	72	0	8,921	0	0	0	177	0	3,947	13,117
Status 4	0	0	0	0	0	77	886	6,938	4,395	12,296
Total	80	1,741	8,921	61	0	77	1,985	6,938	54,368	74,170

Appendix 5.2 continued.

Western Sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	1,561	0	9	0	0	0	0	35,308	36,879
Status 2	0	0	0	0	0	0	15	0	98	113
Status 3	369	0	6,516	0	0	0	2	0	2,325	9,211
Status 4	0	0	0	0	0	0	789	6,110	11,067	17,966
Total	369	1,561	6,516	9	0	0	806	6,110	48,798	64,169

Least Sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	37	2,695	0	2,733	0	0	0	0	51,239	56,705
Status 2	0	0	8	0	0	0	2,563	0	2,909	5,479
Status 3	185	0	14,345	0	206	0	158	0	2,514	17,408
Status 4	0	0	0	0	0	773	6,104	186,459	3,631	196,966
Total	221	2,695	14,353	2,733	206	773	8,824	186,459	60,293	276,558

Baird's sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	85	11,017	0	2,938	0	0	4	0	51,342	65,386
Status 2	0	0	0	0	0	0	1,637	0	241	1,878
Status 3	768	0	14,942	0	158	0	667	0	7,210	23,745
Status 4	0	0	0	0	0	0	9,170	199,053	13,829	222,051
Total	853	11,017	14,942	2,938	158	0	11,477	199,053	72,622	313,060

Pectoral sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	65	8,457	0	0	0	0	4	0	46,441	54,965
Status 2	0	0	8	0	0	0	2,264	0	2,359	4,631
Status 3	0	0	2,021	0	0	0	0	0	73	2,094
Status 4	0	0	0	0	0	773	5,309	155,753	2,744	164,578
Total	65	8,457	2,029	0	0	773	7,577	155,753	51,617	226,269

Stilt sandpiper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	27	519	0	9	0	0	0	0	11,395	11,951
Status 2	0	0	0	0	0	0	24	0	66	90
Status 3	6	0	423	0	0	0	0	0	100	528
Status 4	0	0	0	0	0	188	488	5,807	4,737	11,221
Total	33	519	423	9	0	188	513	5,807	16,298	23,790

Appendix 5.2 continued.

Long-billed dowitcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	354	7,465	48	3,223	0	0	455	0	212	11,757
Status 2	3	0	8	0	0	0	3,358	0	75	3,445
Status 3	1,809	0	25,341	0	752	0	1,923	0	909	30,735
Status 4	0	0	0	0	0	17,183	34,027	589,838	2,093	643,141
Total	2,167	7,465	25,397	3,223	752	17,183	39,763	589,838	3,289	689,078

Common snipe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	85,043	173,716	95	12,226	0	0	2,757	275	2,947	277,059
Status 2	645	677	1,155	989	0	0	17,819	3,382	873	25,540
Status 3	376,252	0	286,793	0	402	0	10,098	505	3,593	677,644
Status 4	0	0	0	0	0	56,735	129,672	1,475,540	10,326	1,672,273
Total	461,939	174,393	288,043	13,216	402	56,735	160,347	1,479,702	17,739	2,652,516

Wilson's phalarope	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	4,696	24,270	50	6,621	0	0	801	174	54,638	91,250
Status 2	118	960	211	922	0	0	9,622	2,585	6,601	21,019
Status 3	22,944	0	68,633	1	1,063	0	8,207	44	46,921	147,812
Status 4	0	0	0	0	0	39,415	60,440	1,080,487	36,762	1,217,105
Total	27,757	25,229	68,894	7,544	1,063	39,415	79,071	1,083,291	144,922	1,477,186

Red-necked phalarope	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,748	20,145	0	2,597	0	0	10	0	52,868	78,368
Status 2	0	0	13	0	0	0	932	0	2,532	3,477
Status 3	7,393	0	7,001	0	187	0	750	44	9,758	25,133
Status 4	0	0	0	0	0	60	2,574	28,713	13,893	45,240
Total	10,141	20,145	7,014	2,597	187	60	4,266	28,758	79,050	152,218

Franklin's gull	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,692	47,460	48	6,521	0	0	480	0	55,987	119,188
Status 2	55	309	124	922	0	0	6,282	344	3,267	11,302
Status 3	28,413	0	52,240	1	1,368	0	8,883	44	43,097	134,046
Status 4	0	0	0	0	0	20,216	55,505	864,215	25,008	964,944
Total	37,160	47,769	52,411	7,444	1,368	20,216	71,150	864,603	127,359	1,229,480

Appendix 5.2 continued.

Bonaparte's gull	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	65	6,356	0	1,127	0	0	0	0	47,186	54,733
Status 2	0	0	0	0	0	0	136	0	2,755	2,891
Status 3	32	0	1,095	0	0	0	155	0	2,915	4,197
Status 4	0	0	0	0	0	0	264	2,284	3,372	5,920
Total	97	6,356	1,095	1,127	0	0	555	2,284	56,229	67,743

Ring-Billed gull	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	121	2,909	50	4,159	0	0	451	0	53,793	61,483
Status 2	54	300	62	0	0	0	6,838	2,220	6,042	15,517
Status 3	2,702	0	33,158	0	1,846	0	6,008	0	39,165	82,878
Status 4	0	0	0	0	0	10,196	49,921	854,242	21,971	936,330
Total	2,876	3,210	33,269	4,160	1,846	10,196	63,218	856,462	120,971	1,096,208

California gull	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	119	2,954	50	4,384	0	0	451	0	53,886	61,843
Status 2	54	578	62	922	0	0	7,296	2,220	6,216	17,348
Status 3	10,952	0	43,678	0	2,200	0	6,230	0	44,790	107,851
Status 4	0	0	0	0	0	37,519	61,371	1,050,123	35,726	1,184,739
Total	11,125	3,532	43,790	5,306	2,200	37,519	75,348	1,052,343	140,619	1,371,781

Herring gull	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	1,699	0	58	0	0	0	0	39,404	41,161
Status 2	50	0	0	0	0	0	161	0	2,732	2,943
Status 3	413	0	3,371	0	1,233	0	1,353	0	16,353	22,723
Status 4	0	0	0	0	0	417	2,272	51,535	19,972	74,196
Total	464	1,699	3,371	58	1,233	417	3,786	51,535	78,461	141,022

Caspian tern	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	24	2,471	0	825	0	0	0	0	53,355	56,675
Status 2	0	0	0	0	0	0	792	0	2,620	3,412
Status 3	494	0	2,612	0	0	0	1,067	0	27,399	31,573
Status 4	0	0	0	0	0	42	892	8,032	18,532	27,498
Total	518	2,471	2,612	825	0	42	2,751	8,032	101,907	119,159

Appendix 5.2 continued.

Common tern	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,450	20,101	0	1,987	0	0	10	0	52,693	77,243
Status 2	0	504	9	0	0	0	2,356	423	5,585	8,877
Status 3	4,865	0	5,457	0	0	0	1,571	5	10,839	22,736
Status 4	0	0	0	0	0	865	1,780	24,741	13,776	41,163
Total	7,316	20,605	5,466	1,987	0	865	5,717	25,169	82,893	150,019

Forster's tern	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	287	6,918	0	1,160	0	0	0	0	51,060	59,425
Status 2	0	132	0	0	0	0	944	400	5,793	7,270
Status 3	568	0	7,147	0	0	0	1,847	0	23,562	33,124
Status 4	0	0	0	0	0	42	1,078	9,355	17,253	27,728
Total	855	7,051	7,147	1,160	0	42	3,869	9,755	97,668	127,546

Black tern	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	283	8,709	0	1,185	0	0	0	0	47,875	58,051
Status 2	0	132	0	0	0	0	1,201	400	5,573	7,306
Status 3	561	0	5,213	0	0	0	904	0	11,657	18,335
Status 4	0	0	0	0	0	0	963	12,387	15,936	29,286
Total	844	8,841	5,213	1,185	0	0	3,068	12,787	81,041	112,979

Mourning dove	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	187,832	641,423	859	26,774	0	0	11,934	4,692	4,682	878,197
Status 2	2,414	5,745	10,913	1,462	0	0	74,703	9,974	1,531	106,742
Status 3	1,236,517	0	6,946,816	88	16,022	0	40,805	7,670	15,264	8,263,182
Status 4	0	0	0	0	0	585,935	1,424,614	10,733,299	29,069	12,772,917
Total	1,426,763	647,168	6,958,589	28,324	16,022	585,935	1,552,056	10,755,635	50,546	22,021,038

Black-billed cuckoo	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,925	13,490	87	871	0	0	2,130	0	434	24,938
Status 2	542	24	12	0	0	0	1,870	1,774	0	4,222
Status 3	122,666	0	51,185	0	2,132	0	1,171	0	272	177,426
Status 4	0	0	0	0	0	14,006	37,279	467,988	1,115	520,389
Total	131,133	13,514	51,284	871	2,132	14,006	42,449	469,762	1,822	726,975

Appendix 5.2 continued.

3Yellow-billed cuckoo	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	154	6,654	0	3,711	0	0	93	0	1,302	11,914
Status 2	0	24	5	0	0	0	716	0	0	745
Status 3	4,530	0	23,549	0	388	0	2,717	505	1,537	33,226
Status 4	0	0	0	0	0	107	11,979	223,250	1,658	236,994
Total	4,683	6,679	23,555	3,711	388	107	15,504	223,756	4,497	282,881

Common barn owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	14,089	35,237	48	8,548	0	0	1,791	0	1,557	61,270
Status 2	145	348	355	0	0	0	7,740	0	493	9,080
Status 3	80,279	0	482,322	0	12,152	0	12,126	0	4,671	591,550
Status 4	0	0	0	0	0	38	337,474	3,178,929	6,851	3,523,292
Total	94,512	35,585	482,725	8,548	12,152	38	359,131	3,178,929	13,571	4,185,192

Flammulated owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	44,846	14,440	0	4,191	0	0	282	128	300	64,188
Status 2	951	532	20	0	0	0	2,886	1,550	358	6,296
Status 3	194,306	0	8,937	0	0	0	240	0	207	203,689
Status 4	0	0	0	0	0	0	9,828	80,898	275	91,002
Total	240,102	14,972	8,957	4,191	0	0	13,236	82,576	1,140	365,174

Eastern screech owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	10,711	43,688	160	4,319	0	0	6,607	2,897	937	69,320
Status 2	1,529	2,951	4,943	0	0	0	35,888	5,724	1,261	52,296
Status 3	438,855	0	2,199,105	0	12,837	0	22,701	48	7,109	2,680,655
Status 4	0	0	0	0	0	384,142	1,011,753	8,118,654	15,874	9,530,423
Total	451,095	46,639	2,204,207	4,319	12,837	384,142	1,076,950	8,127,324	25,181	12,332,694

Western screech owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,095	72,870	92	13,640	0	0	1,216	1,184	2,158	99,256
Status 2	74	0	0	1,368	0	0	9,946	5,370	147	16,905
Status 3	156,971	0	1,763,253	0	0	0	7,615	5,273	2,735	1,935,846
Status 4	0	0	0	0	0	0	134,656	1,049,367	5,310	1,189,333
Total	165,140	72,870	1,763,345	15,008	0	0	153,433	1,061,194	10,349	3,241,340

Appendix 5.2 continued.

Nothern pygmy owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	789,236	822,119	337	1,539	0	0	3,655	1,602	4,694	1,623,180
Status 2	2,700	0	1,275	0	0	0	9,656	3,786	6	17,422
Status 3	1,771,424	0	184,880	0	14	0	3,439	0	2,887	1,962,645
Status 4	0	0	0	0	0	98,774	86,398	432,279	1,492	618,943
Total	2,563,360	822,119	186,491	1,539	14	98,774	103,147	437,667	9,079	4,222,190

Burrowing owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	15,778	97,403	48	22,045	0	0	4,373	2,274	1,859	143,781
Status 2	746	4,340	8,180	1,394	0	0	57,892	6,462	1,281	80,296
Status 3	488,380	0	6,612,668	88	15,370	0	35,773	7,652	12,053	7,171,985
Status 4	0	0	0	0	0	325,543	1,325,607	10,039,100	22,018	11,712,268
Total	504,905	101,743	6,620,896	23,528	15,370	325,543	1,423,645	10,055,488	37,212	19,108,329

Great gray owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	617,468	917,166	507	7,779	0	0	5,413	269	6,036	1,554,637
Status 2	226	0	442	0	0	0	7,298	4,262	21	12,249
Status 3	1,220,559	0	172,258	0	0	0	886	0	2,999	1,396,702
Status 4	0	0	0	0	0	62,721	44,819	277,675	1,672	386,887
Total	1,838,253	917,166	173,207	7,779	0	62,721	58,415	282,207	10,729	3,350,476

Long-eared owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	97,131	151,130	458	23,187	0	0	9,293	4,480	3,282	288,961
Status 2	2,231	5,707	9,026	1,462	0	0	67,060	9,320	1,368	96,174
Status 3	879,711	0	6,516,253	88	13,173	0	37,252	7,156	11,981	7,465,614
Status 4	0	0	0	0	0	551,590	1,227,185	9,327,666	23,358	11,129,799
Total	979,073	156,836	6,525,737	24,737	13,173	551,590	1,340,789	9,348,622	39,990	18,980,548

Short-eared owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,796	41,425	58	20,491	0	0	5,021	2,048	1,806	76,646
Status 2	778	4,214	5,479	1,462	0	0	50,265	6,178	1,431	69,808
Status 3	373,156	0	5,935,397	88	14,679	0	31,714	7,156	13,071	6,375,260
Status 4	0	0	0	0	0	506,014	1,182,568	9,365,689	22,436	11,076,706
Total	379,730	45,639	5,940,934	22,041	14,679	506,014	1,269,568	9,381,071	38,744	17,598,420

Appendix 5.2 continued.

Boreal owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	773,020	793,465	339	2,137	0	0	2,640	122	5,640	1,577,362
Status 2	1,070	0	678	0	0	0	8,603	1,286	11	11,649
Status 3	1,400,105	0	100,981	0	0	0	2,010	0	2,580	1,505,677
Status 4	0	0	0	0	0	105,670	37,332	243,208	2,015	388,225
Total	2,174,196	793,465	101,998	2,137	0	105,670	50,585	244,617	10,246	3,482,912

Northern saw-whet owl	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	722,031	841,793	339	5,779	0	0	3,692	1,721	5,452	1,580,806
Status 2	1,465	0	851	889	0	0	11,306	1,286	11	15,808
Status 3	1,738,518	0	176,389	0	392	0	2,464	505	3,179	1,921,447
Status 4	0	0	0	0	0	95,590	69,894	452,449	2,586	620,519
Total	2,462,014	841,793	177,579	6,668	392	95,590	87,356	455,962	11,228	4,138,580

Common nighthawk	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	196,384	529,933	982	27,158	0	0	12,305	4,112	57,829	828,703
Status 2	2,160	5,988	10,828	1,462	0	0	75,305	10,171	6,734	112,648
Status 3	1,174,998	0	7,074,746	88	16,290	0	42,634	7,670	58,052	8,374,478
Status 4	0	0	0	0	0	588,631	1,433,624	10,762,011	54,783	12,839,049
Total	1,373,541	535,921	7,086,555	28,708	16,290	588,631	1,563,869	10,783,964	177,398	22,154,877

Common poorwill	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,770	4,079	573	12,578	0	0	5,851	1,666	469	33,987
Status 2	907	0	6,410	473	0	0	47,398	4,037	161	59,385
Status 3	249,949	0	4,043,811	88	3,564	0	16,909	7,586	5,674	4,327,581
Status 4	0	0	0	0	0	126,218	566,541	3,669,059	7,979	4,369,798
Total	259,626	4,079	4,050,794	13,138	3,564	126,218	636,700	3,682,348	14,284	8,790,752

Chimney swift	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	85	194	0	2	0	0	0	0	1	283
Status 2	77	348	0	0	0	0	334	0	52	811
Status 3	775	0	12,352	0	3,232	0	320	0	62	16,742
Status 4	0	0	0	0	0	0	34,673	414,882	1,200	450,756
Total	937	542	12,352	2	3,232	0	35,327	414,882	1,315	468,591

White-throated swift	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	16,237	128,031	890	17,576	0	0	6,265	1,567	44,269	214,835
Status 2	1,565	5,075	6,607	0	0	0	38,335	8,708	3,469	63,759
Status 3	318,947	0	1,844,131	88	11,883	0	21,371	2,412	35,964	2,234,795
Status 4	0	0	0	0	0	237,402	412,332	2,760,657	27,335	3,437,726
Total	336,749	133,106	1,851,628	17,664	11,883	237,402	478,302	2,773,345	111,037	5,951,116

Black-chinned hummingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	20,302	19,508	94	6,471	0	0	2,333	113	1,033	49,855
Status 2	73	0	4	889	0	0	778	0	0	1,744
Status 3	231,082	0	252,375	0	0	0	172	403	800	484,831
Status 4	0	0	0	0	0	2,774	41,106	369,851	1,850	415,582
Total	251,457	19,508	252,473	7,360	0	2,774	44,389	370,368	3,684	952,012

Calliope hummingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	260,858	420,849	931	14,959	0	0	9,677	4,238	2,507	714,020
Status 2	1,695	0	2,182	0	0	0	29,227	5,557	76	38,737
Status 3	948,565	0	978,341	0	927	0	13,731	4,875	2,606	1,949,044
Status 4	0	0	0	0	0	76,072	307,609	1,902,336	5,823	2,291,840
Total	1,211,119	420,849	981,454	14,959	927	76,072	360,244	1,917,005	11,012	4,993,642

Broad tailed hummingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	481,968	896,948	92	9,191	0	0	5,303	3,381	5,615	1,402,499
Status 2	2,562	70	3,058	889	0	0	17,974	5,662	74	30,290
Status 3	1,767,845	0	763,611	0	2,678	0	9,850	903	4,832	2,549,720
Status 4	0	0	0	0	0	11,317	235,415	1,628,011	5,561	1,880,304
Total	2,252,375	897,018	766,762	10,080	2,678	11,317	268,542	1,637,958	16,083	5,862,812

Rufous hummingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,172,653	946,336	1,040	15,612	0	0	8,260	2,885	9,921	2,156,707
Status 2	1,795	46	3,934	0	0	0	27,566	7,483	82	40,905
Status 3	1,920,622	0	1,589,745	0	3,048	0	15,655	5,244	7,693	3,542,007
Status 4	0	0	0	0	0	235,345	432,841	2,975,445	8,313	3,651,944
Total	3,095,070	946,382	1,594,719	15,612	3,048	235,345	484,322	2,991,057	26,009	9,391,564

Appendix 5.2 continued.

Belted kingfisher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	86,054	103,878	2	7,393	0	0	832	794	64,753	263,706
Status 2	249	1,137	207	889	0	0	9,467	2,628	6,518	21,095
Status 3	155,307	0	191,042	1	784	0	9,370	517	54,844	411,866
Status 4	0	0	0	0	0	51,213	105,114	1,100,715	49,242	1,306,285
Total	241,609	105,015	191,252	8,282	784	51,213	124,783	1,104,655	175,358	2,002,951

Lewis' woodpecker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	59,724	456,546	0	8,752	0	0	1,303	1,679	2,829	530,833
Status 2	1,865	2,867	1,141	0	0	0	9,934	4,158	596	20,562
Status 3	541,497	0	247,718	0	3,072	0	8,262	919	1,235	802,703
Status 4	0	0	0	0	0	14,337	187,414	1,473,349	4,095	1,679,195
Total	603,086	459,413	248,859	8,752	3,072	14,337	206,913	1,480,106	8,756	3,033,293

Red-headed woodpecker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	59,497	51,532	0	8,962	0	0	2,224	3,477	2,269	127,961
Status 2	2,150	2,790	368	0	0	0	13,579	7,218	1,107	27,212
Status 3	444,906	0	304,793	0	5,183	0	11,471	931	3,819	771,103
Status 4	0	0	0	0	0	25,296	260,031	2,696,049	6,989	2,988,364
Total	506,553	54,322	305,160	8,963	5,183	25,296	287,306	2,707,674	14,183	3,914,640

Williamson's sapsucker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	464,144	635,299	339	1,931	0	0	1,308	1,794	4,629	1,109,444
Status 2	1,000	0	724	0	0	0	7,661	3,825	30	13,240
Status 3	1,268,234	0	168,731	0	36	0	1,383	0	2,608	1,440,991
Status 4	0	0	0	0	0	26,945	62,945	431,625	1,065	522,580
Total	1,733,378	635,299	169,793	1,931	36	26,945	73,297	437,244	8,332	3,086,255

Red-naped sapsucker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	232,185	564,084	329	6,324	0	0	4,142	1,819	3,696	812,580
Status 2	2,324	1,386	1,214	0	0	0	14,410	5,664	79	25,077
Status 3	1,236,791	0	553,380	0	5,047	0	10,705	903	2,429	1,809,256
Status 4	0	0	0	0	0	50,566	185,676	1,437,083	2,398	1,675,723
Total	1,471,300	565,471	554,924	6,324	5,047	50,566	214,933	1,445,470	8,602	4,322,637

Appendix 5.2 continued.

Downy woodpecker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	770,865	309,259	509	13,968	0	0	8,020	3,477	5,086	1,111,182
Status 2	3,401	2,867	4,214	989	0	0	26,911	7,601	1,133	47,116
Status 3	2,067,856	0	1,010,353	0	7,170	0	15,137	927	7,232	3,108,674
Status 4	0	0	0	0	0	111,771	376,569	3,091,613	13,102	3,593,055
Total	2,842,121	312,126	1,015,076	14,957	7,170	111,771	426,636	3,103,617	26,553	7,860,027

Hairy woodpecker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	331,315	773,507	329	6,542	0	0	5,359	3,373	4,187	1,124,611
Status 2	2,247	24	3,943	0	0	0	19,755	5,662	74	31,706
Status 3	1,278,254	0	621,539	0	3,480	0	11,622	931	3,806	1,919,632
Status 4	0	0	0	0	0	53,598	225,429	1,575,774	5,150	1,859,952
Total	1,611,816	773,531	625,811	6,542	3,480	53,598	262,165	1,585,739	13,218	4,935,901

Three-toed woodpecker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	752,873	822,117	337	1,564	0	0	2,505	3,131	4,495	1,587,021
Status 2	2,633	0	1,275	0	0	0	8,163	3,277	6	15,353
Status 3	1,686,198	0	160,685	0	0	0	1,683	0	2,460	1,851,027
Status 4	0	0	0	0	0	97,089	67,483	289,678	1,445	455,694
Total	2,441,704	822,117	162,297	1,564	0	97,089	79,834	296,085	8,406	3,909,095

Black-backed woodpecker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	197,366	475,879	87	3,968	0	0	238	128	2,124	679,790
Status 2	489	0	0	0	0	0	613	0	0	1,102
Status 3	442,682	0	18,742	0	392	0	58	0	656	462,530
Status 4	0	0	0	0	0	15,877	20,850	228,451	157	265,336
Total	640,537	475,879	18,829	3,968	392	15,877	21,759	228,580	2,938	1,408,758

Northern flicker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	735,543	882,381	1,210	20,553	0	0	11,570	4,531	6,248	1,662,037
Status 2	3,075	5,258	10,419	1,361	0	0	67,461	9,569	664	97,807
Status 3	2,211,734	0	6,536,807	88	11,938	0	36,191	6,959	12,249	8,815,967
Status 4	0	0	0	0	0	652,742	1,121,409	7,738,206	16,442	9,528,799
Total	2,950,351	887,639	6,548,436	22,002	11,938	652,742	1,236,632	7,759,265	35,603	20,104,609

Appendix 5.2 continued.

Olive-sided flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	959,855	903,293	339	9,351	0	0	5,029	3,284	8,646	1,889,797
Status 2	2,829	0	856	0	0	0	13,508	1,812	99	19,104
Status 3	1,980,489	0	291,864	0	650	0	7,442	505	4,836	2,285,785
Status 4	0	0	0	0	0	113,071	126,285	1,003,323	5,918	1,248,597
Total	2,943,173	903,293	293,058	9,351	650	113,071	152,264	1,008,925	19,499	5,443,283

Western wood pewee	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	516,190	815,744	339	11,910	0	0	6,169	3,391	4,204	1,357,946
Status 2	2,459	2,867	3,298	989	0	0	19,375	7,601	1,175	37,765
Status 3	1,503,438	0	898,440	0	7,241	0	16,506	919	5,393	2,431,938
Status 4	0	0	0	0	0	63,000	327,356	3,019,339	11,099	3,420,794
Total	2,022,088	818,611	902,076	12,899	7,241	63,000	369,405	3,031,250	21,871	7,248,442

Willow flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	116,516	180,355	334	11,549	0	0	4,435	1,282	2,256	316,728
Status 2	713	0	1,015	989	0	0	8,101	3,737	137	14,693
Status 3	640,111	0	261,079	0	551	0	6,972	505	2,471	911,690
Status 4	0	0	0	0	0	32,320	145,261	1,307,428	6,061	1,491,070
Total	757,341	180,355	262,428	12,538	551	32,320	164,769	1,312,952	10,926	2,734,181

Least flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	92,073	52,221	0	7,512	0	0	3,009	1,802	1,834	158,451
Status 2	1,198	348	183	0	0	0	6,108	3,737	517	12,091
Status 3	450,552	0	87,336	0	4,345	0	3,740	513	2,081	548,567
Status 4	0	0	0	0	0	15,592	127,909	1,524,651	6,080	1,674,233
Total	543,823	52,569	87,520	7,512	4,345	15,592	140,766	1,530,703	10,512	2,393,342

Hammond's flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	687,500	396,882	339	8,106	0	0	3,710	201	4,353	1,101,090
Status 2	454	0	173	0	0	0	6,468	3,563	5	10,664
Status 3	1,353,921	0	150,287	0	0	0	2,011	505	3,416	1,510,139
Status 4	0	0	0	0	0	98,221	45,140	299,878	4,351	447,590
Total	2,041,875	396,882	150,799	8,106	0	98,221	57,329	304,147	12,125	3,069,483

Appendix 5.2 continued.

Dusky flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	668,534	543,482	509	12,374	0	0	8,525	1,912	5,512	1,240,848
Status 2	3,173	0	2,934	0	0	0	21,059	5,662	101	32,930
Status 3	2,020,992	0	852,406	0	4,110	0	9,676	903	4,851	2,892,939
Status 4	0	0	0	0	0	169,459	265,046	1,730,130	6,948	2,171,583
Total	2,692,700	543,482	855,850	12,374	4,110	169,459	304,306	1,738,608	17,411	6,338,300

Gray flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	3,377	0	12,066	0	0	0	0	562	16,005
Status 2	0	0	1,754	1,361	0	0	0	0	0	3,115
Status 3	26,849	0	1,947,769	88	0	0	6,361	6,894	1,542	1,989,503
Status 4	0	0	0	0	0	26,258	161,856	1,187,102	3,843	1,379,060
Total	26,849	3,377	1,949,523	13,515	0	26,258	168,217	1,193,996	5,947	3,387,683

Cordilleran (western) flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	208,250	148,299	329	8,662	0	0	5,609	1,734	2,317	375,199
Status 2	1,512	0	1,641	0	0	0	17,657	3,563	55	24,428
Status 3	1,227,957	0	350,768	0	2,439	0	9,717	513	3,368	1,594,761
Status 4	0	0	0	0	0	18,853	189,006	1,287,910	4,593	1,500,362
Total	1,437,719	148,299	352,738	8,662	2,439	18,853	221,989	1,293,719	10,333	3,494,751

Eastern phoebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	550	0	0	0	0	1,177	160	0	1,886
Status 2	0	0	19	0	0	0	936	0	0	955
Status 3	44,446	0	21,659	0	158	0	620	0	181	67,065
Status 4	0	0	0	0	0	715	46,842	387,377	300	435,234
Total	44,446	550	21,678	0	158	715	49,575	387,537	481	505,141

Say's phoebe	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	54,724	168,852	371	23,110	0	0	9,971	3,816	2,902	263,747
Status 2	2,002	5,296	9,400	1,394	0	0	66,258	9,309	1,417	95,078
Status 3	706,125	0	6,384,519	88	14,590	0	37,231	6,980	12,208	7,161,742
Status 4	0	0	0	0	0	544,175	1,331,288	10,215,799	24,190	12,115,452
Total	762,852	174,149	6,394,291	24,593	14,590	544,175	1,444,748	10,235,904	40,718	19,636,019

Appendix 5.2 continued.

Ash-throated flycatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	148	0	0	7,013	0	0	4	0	368	7,534
Status 2	0	0	0	0	0	0	51	0	0	51
Status 3	24,065	0	1,183,501	0	42	0	4,518	6,884	337	1,219,347
Status 4	0	0	0	0	0	0	78,499	912,317	3,605	994,421
Total	24,214	0	1,183,501	7,013	42	0	83,072	919,201	4,311	2,221,353

Cassin's kingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	149	0	0	465	0	0	614
Status 2	626	309	316	0	0	0	2,545	0	498	4,294
Status 3	11,934	0	167,129	0	9,720	0	6,444	0	1,320	196,547
Status 4	0	0	0	0	0	49,562	168,965	1,821,903	2,372	2,042,801
Total	12,560	309	167,445	149	9,720	49,562	178,419	1,821,903	4,190	2,244,256

Western kingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	42,378	143,166	365	23,129	0	0	4,138	1,308	2,915	217,400
Status 2	1,639	348	5,222	1,462	0	0	49,038	7,071	697	65,476
Status 3	493,489	0	5,110,117	88	15,677	0	31,046	6,980	11,677	5,669,074
Status 4	0	0	0	0	0	155,634	1,130,291	9,440,466	22,227	10,748,618
Total	537,505	143,514	5,115,704	24,679	15,677	155,634	1,214,513	9,455,825	37,517	16,700,567

Eastern kingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	22,690	120,694	371	24,272	0	0	9,636	4,019	3,017	184,699
Status 2	1,688	5,363	9,400	1,462	0	0	67,794	9,320	1,462	96,490
Status 3	665,011	0	6,435,920	88	14,590	0	37,166	6,980	12,303	7,172,058
Status 4	0	0	0	0	0	549,623	1,345,449	10,313,965	25,344	12,234,381
Total	689,390	126,057	6,445,691	25,822	14,590	549,623	1,460,045	10,334,285	42,126	19,687,628

Horned lark	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	754,560	248,571	921	22,215	0	0	10,362	2,269	5,633	1,044,531
Status 2	1,834	3,982	8,146	1,394	0	0	65,674	6,155	1,196	88,381
Status 3	1,027,493	0	6,734,474	88	14,620	0	33,886	7,652	14,435	7,832,647
Status 4	0	0	0	0	0	594,724	1,311,988	10,094,865	24,284	12,025,861
Total	1,783,886	252,553	6,743,541	23,697	14,620	594,724	1,421,910	10,110,941	45,548	20,991,421

Appendix 5.2 continued.

Tree swallow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	271,270	752,802	329	7,040	0	0	5,377	3,373	55,673	1,095,864
Stauts 2	2,328	2,977	3,110	889	0	0	16,208	7,595	3,465	36,571
Status 3	1,217,665	0	858,300	0	6,129	0	14,026	911	34,174	2,131,205
Status 4	0	0	0	0	0	83,487	240,686	1,815,536	37,255	2,176,964
Total	1,491,262	755,779	861,739	7,929	6,129	83,487	276,298	1,827,415	130,567	5,440,605

Violet-green swallow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	128,994	618,396	287	12,226	0	0	6,657	1,802	54,994	823,355
Status 2	2,178	2,460	5,826	0	0	0	25,112	6,434	3,529	45,539
Status 3	678,302	0	908,182	0	7,029	0	16,940	1,023	43,013	1,654,489
Status 4	0	0	0	0	0	73,485	240,368	1,826,362	34,020	2,174,235
Total	809,474	620,856	914,295	12,226	7,029	73,485	289,076	1,835,621	135,556	4,697,619

Northern rough-winged swallow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	12,388	83,022	50	11,789	0	0	1,044	403	56,419	165,115
Status 2	145	1,277	1,605	989	0	0	17,170	2,842	6,449	30,478
Status 3	120,291	0	428,034	8	3,833	0	9,259	1,016	45,186	607,626
Status 4	0	0	0	0	0	68,814	150,751	1,924,726	32,957	2,177,249
Total	132,824	84,299	429,689	12,787	3,833	68,814	178,224	1,928,986	141,012	2,980,468

Bank swallow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,549	36,888	50	12,540	0	0	1,750	185	54,893	108,855
Status 2	34	1,277	1,778	0	0	0	18,095	2,647	5,979	29,810
Status 3	45,732	0	426,520	8	3,418	0	9,222	1,016	44,228	530,143
Status 4	0	0	0	0	0	94,798	118,972	1,592,090	36,491	1,842,352
Total	48,316	38,165	428,348	12,549	3,418	94,798	148,039	1,595,938	141,590	2,511,161

Cliff swallow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	79,811	200,423	1,030	25,842	0	0	10,902	2,888	58,050	378,945
Status 2	931	3,788	10,820	1,462	0	0	71,175	10,075	6,700	104,951
Status 3	816,031	0	6,642,149	88	14,005	0	40,630	7,491	58,334	7,578,728
Status 4	0	0	0	0	0	591,984	1,375,695	10,451,984	54,307	12,473,970
Total	896,773	204,211	6,653,999	27,392	14,005	591,984	1,498,403	10,472,438	177,390	20,536,594

Appendix 5.2 continued.

Barn swallow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	11,737	94,632	404	16,436	0	0	4,681	2,764	55,884	186,538
Status 2	626	1,080	3,160	1,368	0	0	26,732	4,601	6,496	44,063
Status 3	389,589	0	2,551,788	1	11,547	0	21,000	4,923	50,912	3,029,759
Status 4	0	0	0	0	0	274,638	759,700	6,602,409	43,237	7,679,984
Total	401,952	95,712	2,555,352	17,804	11,547	274,638	812,114	6,614,697	156,528	10,940,344

Gray jay	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	821,919	863,793	212	2,541	0	0	4,886	3,344	6,022	1,702,717
Status 2	3,160	0	1,304	0	0	0	14,424	3,737	80	22,706
Status 3	1,920,447	0	250,085	0	551	0	7,415	0	3,579	2,182,078
Status 4	0	0	0	0	0	108,649	130,364	954,127	2,690	1,195,830
Total	2,745,526	863,793	251,601	2,541	551	108,649	157,089	961,208	12,371	5,103,330

Steller's jay	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	578,278	867,774	507	8,064	0	0	6,827	282	4,306	1,466,038
Status 2	1,596	0	1,218	0	0	0	17,848	5,247	16	25,924
Status 3	1,647,477	0	593,972	0	4,827	0	9,825	0	3,248	2,259,348
Status 4	0	0	0	0	0	86,302	186,520	977,795	1,956	1,252,573
Total	2,227,351	867,774	595,697	8,064	4,827	86,302	221,019	983,325	9,525	5,003,883

Blue jay	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,731	26,014	0	1,871	0	0	1,491	0	1,297	39,404
Status 2	1,006	320	4	117	0	0	2,797	1,286	0	5,532
Status 3	156,506	0	62,619	0	4,983	0	2,109	8	1,025	227,251
Status 4	0	0	0	0	0	5	79,183	679,257	2,292	760,737
Total	166,243	26,334	62,624	1,988	4,983	5	85,581	680,551	4,615	1,032,924

Scrub jay	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	11	0	0	491	0	0	0	0	137	640
Status 2	66	5,093	46	0	0	0	3,065	2,376	420	11,064
Status 3	46,316	0	1,234,475	0	1,448	0	2,700	694	180	1,285,812
Status 4	0	0	0	0	0	60,800	98,164	875,273	3,938	1,038,175
Total	46,393	5,093	1,234,522	491	1,448	60,800	103,928	878,343	4,675	2,335,692

Appendix 5.2 continued.

Pinyon jay	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,107	29,767	0	13,967	0	0	1,685	361	689	47,576
Status 2	801	5,197	2,166	0	0	0	8,246	6,152	438	23,001
Status 3	126,041	0	1,778,053	0	9,336	0	13,686	7,374	4,004	1,938,494
Status 4	0	0	0	0	0	37,825	312,539	2,559,534	6,281	2,916,180
Total	127,949	34,964	1,780,219	13,967	9,336	37,825	336,155	2,573,421	11,413	4,925,251

Clark's nutcracker	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,197,377	941,393	509	14,644	0	0	8,799	3,466	11,116	2,177,305
Status 2	3,720	0	7,701	0	0	0	32,453	5,329	57	49,260
Status 3	2,165,914	0	1,170,440	8	660	0	11,272	1,410	6,371	3,356,075
Status 4	0	0	0	0	0	193,015	293,203	1,633,398	5,578	2,125,193
Total	3,367,011	941,393	1,178,650	14,652	660	193,015	345,727	1,643,603	23,122	7,707,833

Black-billed magpie	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	270,368	803,115	1,106	26,811	0	0	12,545	5,342	4,786	1,124,071
Status 2	2,491	5,893	11,069	1,462	0	0	75,741	10,025	1,531	108,213
Status 3	1,693,123	0	7,003,579	88	16,290	0	40,860	7,670	16,835	8,778,445
Status 4	0	0	0	0	0	582,186	1,422,700	10,680,509	30,059	12,715,454
Total	1,965,982	809,008	7,015,754	28,361	16,290	582,186	1,551,846	10,703,546	53,211	22,726,183

American crow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	19,005	149,173	938	25,342	0	0	7,083	2,586	3,079	207,206
Status 2	1,600	541	6,997	1,462	0	0	54,956	7,552	740	73,847
Status 3	647,676	0	5,616,338	88	9,825	0	33,656	7,670	12,057	6,327,309
Status 4	0	0	0	0	0	411,175	1,011,961	7,698,730	21,230	9,143,096
Total	668,281	149,714	5,624,273	26,892	9,825	411,175	1,107,656	7,716,538	37,105	15,751,458

Common raven	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,214,414	953,302	1,210	22,161	0	0	12,505	5,342	12,030	2,220,963
Status 2	3,807	5,118	9,266	1,462	0	0	70,726	10,011	1,049	101,438
Status 3	2,315,789	0	5,599,678	0	2,221	0	30,203	7,625	12,186	7,967,701
Status 4	0	0	0	0	0	617,483	755,811	5,007,221	21,511	6,402,027
Total	3,534,010	958,419	5,610,154	23,623	2,221	617,483	869,245	5,030,199	46,776	16,692,130

Appendix 5.2 continued.

Black-capped chickadee	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	150,846	189,060	329	9,482	0	0	5,978	3,379	2,177	361,252
Status 2	2,324	2,762	3,987	0	0	0	24,378	7,449	580	41,481
Status 3	1,160,082	0	935,847	0	5,996	0	17,510	927	5,579	2,125,940
Status 4	0	0	0	0	0	104,257	288,886	2,184,714	8,128	2,585,985
Total	1,313,252	191,822	940,163	9,482	5,996	104,257	336,752	2,196,468	16,465	5,114,657

Mountain chickadee	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	818,090	862,861	339	3,098	0	0	5,411	3,434	6,175	1,699,408
Status 2	2,733	320	3,511	0	0	0	19,017	5,662	80	31,325
Status 3	1,910,065	0	805,773	0	4,655	0	11,830	0	5,088	2,737,411
Status 4	0	0	0	0	0	126,537	217,589	1,341,954	5,697	1,691,776
Total	2,730,889	863,181	809,623	3,098	4,655	126,537	253,848	1,351,050	17,039	6,159,920

Plain titmouse	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	1,766	0	168,003	0	0	0	0	0	0	169,769
Status 4	0	0	0	0	0	0	10,102	51,783	107	61,992
Total	1,766	0	168,003	0	0	0	10,102	51,783	107	231,761

Bushtit	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	1,838	0	0	1,838
Status 3	3,613	0	218,932	0	0	0	538	0	35	223,118
Status 4	0	0	0	0	0	0	30,567	157,721	1,881	190,169
Total	3,613	0	218,932	0	0	0	32,942	157,721	1,916	415,124

Red-breasted nuthatch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	832,712	863,941	339	8,862	0	0	5,643	1,826	6,504	1,719,826
Status 2	3,275	24	3,922	0	0	0	18,464	5,662	80	31,427
Status 3	2,001,750	0	744,003	0	2,693	0	9,457	927	5,555	2,764,384
Status 4	0	0	0	0	0	117,312	242,872	1,633,904	6,838	2,000,927
Total	2,837,737	863,965	748,263	8,862	2,693	117,312	276,436	1,642,319	18,978	6,516,565

Appendix 5.2 continued.

White-breasted nuthatch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	108,646	169,322	287	4,843	0	0	5,664	3,379	1,701	293,843
Status 2	2,119	24	1,623	0	0	0	16,438	5,662	30	25,895
Status 3	885,148	0	331,332	0	3,479	0	8,092	8	3,084	1,231,142
Status 4	0	0	0	0	0	64,098	161,652	1,147,782	2,866	1,376,398
Total	995,913	169,347	333,241	4,843	3,479	64,098	191,847	1,156,830	7,680	2,927,278

Pygmy nuthatch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	38,949	622	0	390	0	0	751	2,648	65	43,426
Status 2	1,010	0	949	0	0	0	5,186	0	0	7,145
Status 3	272,612	0	122,900	0	3,119	0	4,100	0	1,659	404,390
Status 4	0	0	0	0	0	0	78,531	548,085	1,047	627,662
Total	312,571	622	123,850	390	3,119	0	88,568	550,733	2,771	1,082,624

Brown creeper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	795,388	863,793	339	6,429	0	0	5,042	3,373	5,961	1,680,324
Status 2	3,275	0	1,311	0	0	0	14,336	5,662	80	24,665
Status 3	1,885,944	0	500,779	0	1,913	0	6,838	903	3,983	2,400,361
Status 4	0	0	0	0	0	85,367	174,851	1,121,923	4,943	1,387,084
Total	2,684,608	863,793	502,429	6,429	1,913	85,367	201,067	1,131,861	14,967	5,492,433

Rock wren	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	118,400	149,803	992	23,220	0	0	9,715	1,967	2,248	306,345
Status 2	642	4,681	8,768	473	0	0	43,669	7,745	196	66,175
Status 3	405,735	0	4,905,409	88	12,986	0	25,405	7,607	9,311	5,366,540
Status 4	0	0	0	0	0	259,443	843,346	6,056,807	12,883	7,172,479
Total	524,778	154,484	4,915,169	23,780	12,986	259,443	922,135	6,074,126	24,638	12,911,539

Canyon wren	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	11,898	22,415	0	8,018	0	0	1,095	1,439	516	45,381
Status 2	0	27	67	0	0	0	1,534	2,745	2	4,376
Status 3	53,848	0	250,442	0	4,770	0	3,586	0	810	313,456
Status 4	0	0	0	0	0	5,798	74,567	419,542	1,042	500,949
Total	65,746	22,442	250,509	8,018	4,770	5,798	80,782	423,726	2,370	864,161

Appendix 5.2 continued.

Bewick's wren	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	3,912	0	708	5,462	0	0	1,443	0	385	11,909
Status 2	66	0	747	0	0	0	1,926	0	0	2,739
Status 3	49,274	0	1,360,927	0	0	0	5,933	6,212	452	1,422,799
Status 4	0	0	0	0	0	0	85,747	822,099	2,977	910,823
Total	53,251	0	1,362,382	5,462	0	0	95,049	828,311	3,814	2,348,269

House wren	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	145,445	493,213	385	15,627	0	0	8,125	2,165	3,414	668,374
Status 2	1,998	2,988	5,937	989	0	0	33,578	7,601	1,317	54,409
Status 3	1,006,894	0	1,696,251	0	7,556	0	21,200	931	7,027	2,739,858
Status 4	0	0	0	0	0	225,846	610,029	5,043,384	16,679	5,895,938
Total	1,154,337	496,201	1,702,573	16,617	7,556	225,846	672,932	5,054,082	28,437	9,358,580

Marsh wren	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,932	65,813	0	4,377	0	0	13	0	51,306	127,442
Status 2	50	565	32	889	0	0	4,515	562	6,015	12,628
Status 3	13,740	0	58,931	0	1,252	0	2,587	62	20,199	96,772
Status 4	0	0	0	0	0	4,119	16,697	216,141	23,090	260,046
Total	19,723	66,378	58,963	5,266	1,252	4,119	23,812	216,766	100,610	496,888

American dipper	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	70,024	89,532	2	4,925	0	0	832	391	58,347	224,052
Status 2	79	0	155	117	0	0	4,052	539	228	5,170
Status 3	134,131	0	50,094	0	0	0	1,977	505	21,927	208,633
Status 4	0	0	0	0	0	13,225	27,992	297,527	18,868	357,612
Total	204,233	89,532	50,251	5,042	0	13,225	34,853	298,962	99,370	795,468

Golden crowned kinglet	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	428,399	697,483	212	8,083	0	0	4,251	3,379	5,596	1,147,403
Status 2	1,725	0	633	0	0	0	5,487	5,662	30	13,537
Status 3	1,496,267	0	356,019	0	2,056	0	1,325	900	2,967	1,859,533
Status 4	0	0	0	0	0	20,158	98,312	679,270	2,462	800,202
Total	1,926,390	697,483	356,864	8,083	2,056	20,158	109,375	689,211	11,054	3,820,675

Appendix 5.2 continued.

Ruby crowned kinglet	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	832,729	864,209	339	11,581	0	0	6,039	3,391	6,514	1,724,801
Status 2	3,359	24	2,196	0	0	0	19,235	5,662	138	30,615
Status 3	1,994,125	0	731,984	0	2,181	0	8,905	903	4,746	2,742,845
Status 4	0	0	0	0	0	150,417	256,019	2,023,388	8,867	2,438,691
Total	2,830,212	864,233	734,519	11,581	2,181	150,417	290,200	2,033,344	20,265	6,936,952

Blue-gray gnatcatcher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	6,442	0	0	0	0	441	6,883
Status 2	101	0	0	0	0	0	2,352	0	0	2,453
Status 3	23,159	0	1,281,904	0	2,035	0	5,166	6,655	1,003	1,319,922
Status 4	0	0	0	0	0	37,122	99,127	949,007	3,835	1,089,091
Total	23,260	0	1,281,904	6,442	2,035	37,122	106,644	955,662	5,279	2,418,348

Eastern bluebird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	550	0	0	0	0	0	0	0	550
Status 2	549	24	0	0	0	0	1,136	1,909	429	4,047
Status 3	38,010	0	70,002	0	320	0	3,400	0	2,219	113,951
Status 4	0	0	0	0	0	3,205	103,027	792,992	1,434	900,657
Total	38,559	574	70,002	0	320	3,205	107,563	794,902	4,082	1,019,206

Mountain bluebird										
Status 1	1,051,337	951,738	1,210	26,792	0	0	12,579	5,342	10,197	2,059,195
Status 2	3,439	5,401	11,070	1,462	0	0	75,428	9,975	1,508	108,283
Status 3	2,447,523	0	6,940,129	88	15,794	0	39,826	7,662	17,727	9,468,748
Status 4	0	0	0	0	0	699,506	1,440,324	10,793,929	29,255	12,963,014
Total	3,502,298	957,139	6,952,409	28,342	15,794	699,506	1,568,156	10,816,908	58,687	24,599,240

Townsend's solitaire	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	839,942	924,773	509	16,801	0	0	9,730	3,466	8,079	1,803,299
Status 2	3,075	1,682	7,903	0	0	0	34,760	5,664	106	53,191
Status 3	2,101,172	0	1,121,439	8	8,183	0	14,699	1,437	6,513	3,253,451
Status 4	0	0	0	0	0	126,196	313,674	2,096,929	6,307	2,543,106
Total	2,944,189	926,455	1,129,851	16,809	8,183	126,196	372,863	2,107,497	21,004	7,653,047

Appendix 5.2 continued.

Veery	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	152,951	382,215	329	5,437	0	0	4,374	1,800	2,786	549,892
Status 2	1,253	0	826	0	0	0	13,082	3,737	74	18,972
Status 3	1,040,741	0	225,256	0	428	0	6,885	20	2,406	1,275,737
Status 4	0	0	0	0	0	31,493	95,424	709,522	2,460	838,900
Total	1,194,946	382,215	226,411	5,437	428	31,493	119,765	715,079	7,727	2,683,500

Swainson's thrush	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	606,369	760,330	339	8,760	0	0	5,643	1,826	4,874	1,388,140
Status 2	2,078	24	1,715	0	0	0	16,810	5,137	74	25,839
Status 3	1,842,889	0	581,299	0	680	0	3,399	903	3,905	2,433,075
Status 4	0	0	0	0	0	78,682	182,184	1,138,051	3,912	1,402,829
Total	2,451,336	760,354	583,353	8,760	680	78,682	208,036	1,145,918	12,765	5,249,884

Hermit thrush	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	623,307	862,425	339	8,099	0	0	5,367	3,379	5,198	1,508,113
Status 2	2,810	320	3,400	117	0	0	15,874	5,662	75	28,260
Status 3	1,371,808	0	755,779	0	2,816	0	9,452	911	3,599	2,144,363
Status 4	0	0	0	0	0	93,132	194,797	1,236,759	4,213	1,528,901
Total	1,997,925	862,745	759,517	8,216	2,816	93,132	225,489	1,246,711	13,085	5,209,636

American robin	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	903,425	946,743	1,210	19,413	0	0	11,813	5,257	8,282	1,896,142
Status 2	3,162	3,066	9,583	1,368	0	0	51,191	9,675	1,476	79,521
Status 3	2,386,299	0	4,532,149	0	13,603	0	31,678	5,321	14,285	6,983,335
Status 4	0	0	0	0	0	537,401	1,271,111	9,748,356	23,527	11,580,396
Total	3,292,886	949,810	4,542,942	20,780	13,603	537,401	1,365,794	9,768,610	47,569	20,539,394

Catbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,703	43,039	94	11,033	0	0	1,557	383	1,434	59,244
Status 2	259	1,657	162	0	0	0	8,146	3,144	793	14,160
Status 3	108,581	0	99,939	0	4,540	0	5,924	513	2,824	222,322
Status 4	0	0	0	0	0	54,482	115,554	1,389,571	9,033	1,568,640
Total	110,543	44,696	100,195	11,033	4,540	54,482	131,182	1,393,611	14,084	1,864,365

Appendix 5.2 continued.

Northern mockingbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	90	3,066	0	2,125	0	0	1,098	0	414	6,794
Status 2	77	348	0	0	0	0	3,834	0	435	4,694
Status 3	47,337	0	462,333	0	3,881	0	3,604	1,558	532	519,247
Status 4	0	0	0	0	0	0	206,005	1,920,881	4,145	2,131,031
Total	47,505	3,414	462,333	2,125	3,881	0	214,542	1,922,440	5,526	2,661,766

Sage thrasher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	38,510	84,244	992	16,829	0	0	7,172	1,965	1,560	151,270
Status 2	247	5,034	8,999	473	0	0	59,176	7,677	583	82,189
Status 3	542,289	0	6,698,807	88	9,735	0	30,653	7,159	9,000	7,297,731
Stataus 4	0	0	0	0	0	536,572	1,105,613	7,791,136	13,957	9,447,278
Total	581,046	89,278	6,708,798	17,389	9,735	536,572	1,202,614	7,807,937	25,100	16,978,468

Brown thrasher	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,495	30,696	0	9,160	0	0	1,098	113	1,844	45,408
Status 2	226	348	5	0	0	0	3,553	1,812	435	6,379
Status 3	45,945	0	66,286	0	4,225	0	3,708	505	1,815	122,484
Status 4	0	0	0	0	0	159	120,423	1,331,784	4,870	1,457,236
Total	48,667	31,044	66,291	9,160	4,225	159	128,782	1,334,214	8,964	1,631,507

American (water) pipit	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	703,243	280,017	0	2,615	0	0	155	162	5,346	991,537
Status 2	1,311	0	35	0	0	0	256	0	0	1,602
Status 3	524,795	0	17,495	0	0	0	786	44	2,186	545,306
Status 4	0	0	0	0	0	38,108	6,906	60,907	1,009	106,930
Total	1,229,349	280,017	17,529	2,615	0	38,108	8,105	61,113	8,541	1,645,375

Sprague's pipit	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,150	15,715	701	3,058	0	0	1,610	0	11,623	38,858
Status 2	0	0	62	0	0	0	2,535	0	66	2,663
Status 3	5,869	0	26,827	0	42	0	544	0	793	34,076
Status 4	0	0	0	0	0	13,005	46,785	283,891	2,925	346,606
Total	12,019	15,715	27,591	3,058	42	13,005	51,474	283,891	15,407	422,202

Appendix 5.2 continued.

Bohemian waxing	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	51,274	70,476	0	9,361	0	0	3,285	3,379	824	138,599
Status 2	700	2,603	198	117	0	0	6,419	6,867	427	17,331
Status 3	490,428	0	304,571	0	2,191	0	1,912	907	623	800,633
Status 4	0	0	0	0	0	9,356	101,482	721,385	2,125	834,347
Total	542,402	73,080	304,769	9,478	2,191	9,356	113,098	732,537	4,000	1,790,910

Cedar waxing	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	25,170	75,655	92	10,994	0	0	3,589	1,530	2,305	119,335
Status 2	1,230	2,988	1,673	0	0	0	11,473	7,076	1,087	25,526
Status 3	321,321	0	478,333	0	7,241	0	12,947	903	4,246	824,990
Status 4	0	0	0	0	0	36,685	216,893	2,075,735	9,461	2,338,775
Total	347,722	78,643	480,098	10,994	7,241	36,685	244,901	2,085,245	17,098	3,308,626

Northern shrike	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,082	131,604	278	18,984	0	0	4,013	834	2,505	164,301
Status 2	818	4,580	3,566	1,462	0	0	26,569	2,522	1,213	40,731
Status 3	163,819	0	2,373,171	0	6,681	0	14,570	7,593	3,360	2,569,194
Status 4	0	0	0	0	0	185,569	422,980	3,356,237	12,846	3,977,634
Total	170,719	136,184	2,377,015	20,446	6,681	185,569	468,133	3,367,186	19,924	6,751,859

Loggerhead shrike	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	173,725	166,186	938	25,596	0	0	11,421	4,027	3,382	385,275
Status 2	1,202	5,893	10,820	1,462	0	0	73,920	10,014	1,507	104,820
Status 3	958,917	0	6,964,687	88	15,746	0	40,465	7,666	15,177	8,002,745
Status 4	0	0	0	0	0	585,308	1,400,944	10,568,838	28,804	12,583,895
Total	1,133,844	172,080	6,976,445	27,146	15,746	585,308	1,526,750	10,590,546	48,870	21,076,735

Solitary vireo	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	12,656	15,120	190	7,421	0	0	1,497	1,166	1,384	39,433
Status 2	956	24	892	0	0	0	7,765	2,220	0	11,858
Status 3	160,253	0	337,652	0	4,122	0	4,267	903	1,158	508,355
Status 4	0	0	0	0	0	3,950	107,309	831,229	3,185	945,674
Total	173,864	15,144	338,734	7,421	4,122	3,950	120,839	835,519	5,727	1,505,320

Appendix 5.2 continued.

Warbling vireo	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	822,549	766,088	339	8,673	0	0	5,643	3,350	6,273	1,612,915
Status 2		320	1,399	0	0	0	16,547	3,737	80	25,320
Status 3	1,920,483	0	377,421	0	3,593	0	8,902	505	4,780	2,315,685
Status 4	0	0	0	0	0	106,132	179,967	1,319,890	5,442	1,611,432
Total	2,746,269	766,409	379,159	8,673	3,593	106,132	211,059	1,327,482	16,575	5,565,351

Red-eyed vireo	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,092	33,343	92	7,205	0	0	1,424	829	1,525	46,510
Status 2	210	24	0	0	0	0	2,003	0	0	2,237
Status 3	84,976	0	19,371	0	1,791	0	2,129	505	639	109,411
Status 4	0	0	0	0	0	8,706	25,451	326,680	1,914	362,752
Total	87,277	33,367	19,464	7,205	1,791	8,706	31,007	328,014	4,079	520,910

Tennessee warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	18,353	81,955	0	6,294	0	0	376	128	288	107,394
Status 2	49	24	46	0	0	0	11,261	2,852	1	14,233
Status 3	45,630	0	254,124	0	1,340	0	8,372	723	611	310,799
Status 4	0	0	0	0	0	3,202	99,098	666,520	1,958	770,778
Total	64,032	81,980	254,170	6,294	1,340	3,202	119,106	670,223	2,858	1,203,204

Orange-crowned warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	58,575	187,906	92	13,481	0	0	4,466	1,324	2,163	268,007
Status 2	929	24	1,766	889	0	0	5,470	5,662	2	14,742
Status 3	467,852	0	587,196	0	3,954	0	7,975	903	2,633	1,070,514
Status 4	0	0	0	0	0	55,043	150,220	939,026	3,596	1,147,885
Total	527,356	187,931	589,054	14,369	3,954	55,043	168,131	946,916	8,394	2,501,149

Nashville warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	205	6,836	0	4,055	0	0	0	25	809	11,931
Status 2	0	0	0	0	0	0	111	0	0	111
Status 3	4,796	0	15,392	0	0	0	495	505	430	21,618
Status 4	0	0	0	0	0	0	4,417	63,005	2,310	69,732
Total	5,001	6,836	15,392	4,055	0	0	5,022	63,536	3,549	103,392

Appendix 5.2 continued.

Virginia's warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,238	26,260	0	3,863	0	0	0	0	458	36,818
Status 2	77	24	1,754	0	0	0	4,776	0	1	6,632
Status 3	22,057	0	249,975	0	2,035	0	2,296	903	1,681	278,948
Status 4	0	0	0	0	0	0	52,255	317,009	2,380	371,644
Total	28,372	26,284	251,729	3,863	2,035	0	59,328	317,913	4,519	694,043

Northern parula	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	90	0	0	3,709	0	0	0	0	420	4,219
Status 2	0	24	0	0	0	0	174	0	0	199
Status 3	3,097	0	10,921	0	158	0	483	505	246	15,411
Status 4	0	0	0	0	0	0	3,812	68,760	1,676	74,248
Total	3,187	24	10,921	3,709	158	0	4,470	69,265	2,342	94,077

Yellow warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	16,018	66,488	95	12,240	0	0	2,257	877	2,426	100,401
Status 2	465	1,070	740	989	0	0	17,999	5,469	1,267	28,000
Status 3	272,065	0	384,892	0	3,107	0	12,724	517	6,282	679,588
Status 4	0	0	0	0	0	67,310	291,771	3,244,928	15,622	3,619,630
Total	288,548	67,558	385,727	13,230	3,107	67,310	324,750	3,251,791	25,597	4,427,619

Chestnut-sided warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	114	3,242	0	4,221	0	0	52	25	549	8,204
Status 2	26	24	0	0	0	0	242	0	52	345
Status 3	8,536	0	10,407	0	624	0	495	505	428	20,995
Status 4	0	0	0	0	0	0	24,992	317,609	3,252	22,640
Total	19,990	1,113	24,284	1,407	1,455	0	1,496	1,187	1,252	52,184

Magnolia warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	3,709	0	0	52	0	420	4,181
Status 2	26	24	0	0	0	0	421	344	0	816
Status 3	2,368	0	8,035	0	36	0	704	505	542	12,190
Status 4	0	0	0	0	0	3	4,824	74,170	1,975	80,972
Total	2,395	24	8,035	3,709	36	3	6,001	75,019	2,937	98,159

Black-throated blue warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	114	3,135	0	4,537	0	0	0	25	614	8,425
Status 2	26	0	0	0	0	0	45	0	0	71
Status 3	3,054	0	8,768	0	624	0	483	505	257	13,691
Status 4	0	0	0	0	0	0	11,937	169,516	2,585	184,038
Total	3,194	3,135	8,768	4,537	624	0	12,465	170,047	3,456	206,225

Yellow-rumped warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	835,130	905,031	339	11,937	0	0	6,039	3,392	7,394	1,769,263
Status 2	3,079	348	3,949	989	0	0	21,715	5,662	521	36,263
Status 3	2,040,385	0	919,892	0	6,401	0	13,629	903	6,886	2,988,097
Status 4	0	0	0	0	0	122,576	330,245	2,782,995	11,667	3,247,484
Total	2,878,594	905,379	924,179	12,926	6,401	122,576	371,629	2,792,953	26,469	8,041,106

Black-throated gray warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	11	0	0	6,562	0	0	0	1,579	441	8,593
Status 2	26	0	0	0	0	0	1,525	0	19	1,571
Status 3	31,438	0	1,523,967	0	804	0	4,923	6,655	458	1,568,246
Status 4	0	0	0	0	0	42,293	105,231	872,664	3,391	1,023,578
Total	31,476	0	1,523,967	6,562	804	42,293	111,680	880,898	4,309	2,601,988

Townsend's warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	197,597	286,950	246	7,145	0	0	163	128	2,856	495,085
Status 2	1,876	0	215	0	0	0	4,922	1,286	11	8,310
Status 3	511,080	0	72,144	0	802	0	1,438	505	1,892	587,860
Status 4	0	0	0	0	0	20,498	40,310	334,255	3,114	398,178
Total	710,553	286,950	72,605	7,145	802	20,498	46,833	336,175	7,872	1,489,433

Blackburnian warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	26,376	43,847	0	4,287	0	0	64	40	1,772	76,387
Status 2	0	0	0	0	0	0	100	0	0	100
Status 3	69,869	0	21,244	0	0	0	484	505	343	92,445
Status 4	0	0	0	0	0	0	4,527	62,359	2,116	69,002
Total	96,245	43,847	21,244	4,287	0	0	5,174	62,904	4,232	237,933

Appendix 5.2 continued.

Blackpoll warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,293	107	0	4,025	0	0	52	0	484	5,961
Status 2	77	0	0	0	0	0	586	344	7	1,013
Status 3	4,581	0	15,224	0	1,681	0	1,020	505	640	23,650
Status 4	0	0	0	0	0	159	34,135	446,994	3,430	484,718
Total	5,951	107	15,224	4,025	1,681	159	35,792	447,843	4,562	515,343

Black-and-white warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	415	12,360	0	3,709	0	0	52	0	1,335	17,871
Status 2	26	0	0	0	0	0	167	0	0	194
Status 3	3,318	0	24,283	0	36	0	495	505	393	29,031
Status 4	0	0	0	0	0	0	6,651	83,807	2,242	92,700
Total	3,759	12,360	24,283	3,709	36	0	7,365	84,312	3,971	139,796

American redstart	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	60,545	54,219	0	9,409	0	0	2,978	3,758	2,205	133,114
Status 2	742	348	2,624	0	0	0	11,550	5,662	21	20,946
Status 3	402,182	0	427,318	0	6,354	0	7,383	919	2,975	847,131
Status 4	0	0	0	0	0	344	180,838	1,437,153	4,179	1,622,514
Total	463,469	54,567	429,942	9,409	6,354	344	202,749	1,447,493	9,380	2,623,706

Ovenbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	14,046	550	0	802	0	0	2,602	0	246	18,245
Status 2	977	0	12	0	0	0	1,885	0	0	2,874
Status 3	235,769	0	53,100	0	1,798	0	66	5	473	291,212
Status 4	0	0	0	0	0	0	91,287	795,581	605	887,472
Total	250,792	550	53,112	802	1,798	0	95,840	795,585	1,325	1,199,804

Northern waterthrush	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	6,311	34,948	0	5,391	0	0	13	98	1,853	48,614
Status 2	77	0	0	0	0	0	502	539	0	1,118
Status 3	12,057	0	16,458	0	1,427	0	715	505	814	31,976
Status 4	0	0	0	0	0	5	7,652	131,161	2,398	141,215
Total	18,444	34,948	16,458	5,391	1,427	5	8,883	132,303	5,065	222,924

Appendix 5.2 continued.

Macgillivray's warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	266,999	581,900	325	11,694	0	0	5,810	2,833	3,189	872,750
Status 2	2,430	24	2,370	0	0	0	19,207	3,737	522	28,290
Status 3	951,544	0	347,924	0	5,850	0	10,540	505	4,209	1,320,571
Status 4	0	0	0	0	0	48,294	204,157	1,824,496	8,326	2,085,273
Total	1,220,973	581,924	350,618	11,694	5,850	48,294	239,714	1,831,572	16,246	4,306,884

Common yellowthroat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,900	65,895	2	9,863	0	0	1,343	479	2,430	87,913
Status 2	77	1,042	161	117	0	0	6,997	2,482	526	11,403
Status 3	42,824	0	106,175	0	2,433	0	5,745	505	3,815	161,497
Status 4	0	0	0	0	0	18,946	58,315	725,034	6,079	808,375
Total	50,801	66,938	106,338	9,981	2,433	18,946	72,400	728,501	12,850	1,069,187

Wilson's warbler	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	408,631	365,220	1,086	21,352	0	0	8,980	493	4,532	810,294
Status 2	517	0	5,452	1,462	0	0	27,171	4,311	32	38,945
Status 3	786,788	0	2,558,976	0	3,048	0	9,045	7,337	3,256	3,368,451
Status 4	0	0	0	0	0	286,560	386,774	2,545,794	10,985	3,230,113
Total	1,195,935	365,220	2,565,514	22,814	3,048	286,560	431,970	2,557,936	18,805	7,447,802

Yellow breasted chat	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	326	1,479	0	4,187	0	0	772	377	718	7,858
Status 2	77	593	167	0	0	0	3,005	2,380	629	6,852
Status 3	21,348	0	79,169	0	1,681	0	2,289	505	1,310	106,302
Status 4	0	0	0	0	0	159	84,449	1,064,041	5,092	1,153,740
Total	21,751	2,072	79,336	4,187	1,681	159	90,515	1,067,303	7,749	1,274,753

Summer tanager	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	543	0	0	0	0	0	0	0	0	543
Status 2	77	0	0	0	0	0	0	0	0	77
Status 3	2,312	0	2,457	0	1,267	0	0	0	0	6,036
Status 4	0	0	0	0	0	0	3,091	78,685	295	82,070
Total	2,932	0	2,457	0	1,267	0	3,091	78,685	295	88,726

Appendix 5.2 continued.

Western tanager	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	832,563	804,458	509	14,700	0	0	8,699	3,736	6,857	1,671,522
Status 2	2,863	1,333	4,080	0	0	0	25,922	6,119	1,178	41,496
Status 3	2,072,221	0	748,787	0	5,631	0	14,117	521	6,452	2,847,729
Status 4	0	0	0	0	0	177,347	330,074	2,661,305	11,044	3,179,771
Total	2,907,647	805,792	753,376	14,700	5,631	177,347	378,813	2,671,682	25,531	7,740,518

Rose-breasted grosbeak	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,472	7,569	0	5,098	0	0	165	107	158	18,569
Status 2	77	24	45	0	0	0	2,526	0	57	2,729
Status 3	15,166	0	15,012	0	1,789	0	1,156	5	310	33,438
Status 4	0	0	0	0	0	7,482	52,057	570,521	1,926	631,986
Total	20,715	7,594	15,057	5,098	1,789	7,482	55,903	570,633	2,451	686,722

Black-headed grosbeak	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	8,262	33,469	95	8,479	0	0	2,889	1,649	1,512	56,354
Status 2	690	2,840	1,646	0	0	0	10,725	6,561	392	22,853
Status 3	221,302	0	307,699	0	6,688	0	8,531	919	1,861	547,000
Status 4	0	0	0	0	0	3,603	149,984	1,070,955	4,134	1,228,677
Total	230,254	36,309	309,440	8,479	6,688	3,603	172,129	1,080,084	7,899	1,854,885

Blue grosbeak	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	82	0	0	3,709	0	0	0	0	420	4,210
Status 2	26	348	6	0	0	0	2,572	344	517	3,813
Status 3	11,025	0	32,682	0	2,401	0	1,506	505	334	48,453
Status 4	0	0	0	0	0	15,592	49,904	646,254	4,160	715,911
Total	11,133	348	32,687	3,709	2,401	15,592	53,983	647,103	5,430	772,387

Lazuli bunting	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	36,226	120,431	982	23,817	0	0	9,350	1,633	2,320	194,759
Status 2	294	348	9,438	1,462	0	0	42,671	4,311	580	59,105
Status 3	627,161	0	3,732,828	88	9,506	0	28,060	6,638	7,473	4,411,755
Status 4	0	0	0	0	0	293,538	946,923	7,726,885	19,181	8,986,528
Total	663,682	120,779	3,743,248	25,367	9,506	293,538	1,027,005	7,739,468	29,554	13,652,147

Appendix 5.2 continued.

Indigo bunting	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	9,344	34,305	0	7,758	0	0	3,782	0	97	55,285
Status 2	1,526	24	319	0	0	0	9,092	4,311	435	15,708
Status 3	159,182	0	299,244	0	2,398	0	4,960	1,530	630	467,945
Status 4	0	0	0	0	0	3,667	180,511	1,500,164	3,145	1,687,486
Total	170,052	34,329	299,564	7,758	2,398	3,667	198,345	1,506,005	4,306	2,226,424

Dickcissel	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,509	550	0	10,599	0	0	384	0	266	13,308
Status 2	549	348	6	0	0	0	5,753	0	503	7,158
Status 3	70,082	0	104,174	0	1,483	0	8,101	4,876	795	189,511
Status 4	0	0	0	0	0	71,917	117,372	1,267,776	2,123	1,459,186
Total	72,139	897	104,179	10,599	1,483	71,917	131,610	1,272,652	3,687	1,669,163

Green-tailed towhee	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	497,567	298,367	1,113	20,691	0	0	11,333	2,175	4,411	835,658
Status 2	1,775	348	10,853	117	0	0	54,884	7,472	471	75,920
Status 3	1,119,371	0	3,621,798	0	8,619	0	27,130	7,337	7,497	4,791,751
Status 4	0	0	0	0	0	232,334	640,338	4,624,160	13,128	5,509,960
Total	1,618,713	298,715	3,633,765	20,809	8,619	232,334	733,685	4,641,145	25,507	11,213,289

Rufous-sided towhee	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	34,192	133,744	457	15,746	0	0	6,614	3,029	2,307	196,088
Status 2	1,618	348	3,695	0	0	0	27,105	7,082	72	39,920
Status 3	385,714	0	1,378,788	0	9,251	0	14,482	6,650	2,423	1,797,309
Status 4	0	0	0	0	0	118,369	426,675	3,302,676	7,403	3,855,122
Total	421,524	134,092	1,382,940	15,746	9,251	118,369	474,876	3,319,437	12,204	5,888,439

American tree sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	12,212	41,635	853	16,803	0	0	5,268	113	1,592	78,477
Status 2	8	24	1,440	1,462	0	0	18,116	0	66	21,117
Status 3	99,054	0	2,127,978	0	5,787	0	11,019	7,103	3,117	2,254,058
Status 4	0	0	0	0	0	31,647	312,593	2,462,163	8,988	2,815,392
Total	111,274	41,659	2,130,272	18,266	5,787	31,647	346,996	2,469,380	13,762	5,169,043

Appendix 5.2 continued.

Chipping sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	717,029	930,070	1,210	26,811	0	0	12,579	5,342	7,297	1,700,337
Status 2	2,799	5,893	11,070	1,462	0	0	75,766	10,025	1,531	108,546
Status 3	2,323,998	0	7,161,062	88	16,290	0	40,860	7,670	19,055	9,569,024
Status 4	0	0	0	0	0	662,575	1,453,944	10,851,971	30,946	12,999,436
Total	3,043,825	935,963	7,173,342	28,361	16,290	662,575	1,583,148	10,875,008	58,828	24,377,342

Clay-colored sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	15,377	76,575	0	7,176	0	0	1,714	199	1,692	102,733
Status 2	49	348	6	0	0	0	7,492	0	542	8,437
Status 3	78,406	0	400,215	0	3,554	0	2,449	0	329	484,953
Status 4	0	0	0	0	0	59,206	228,798	2,007,170	3,863	2,299,037
Total	93,833	76,923	400,221	7,176	3,554	59,206	240,453	2,007,369	6,426	2,895,160

Brewer's sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	123,302	105,336	992	25,015	0	0	10,477	4,088	2,824	272,035
Status 2	932	5,250	10,752	1,361	0	0	68,230	8,031	562	95,118
Status 3	820,200	0	6,848,321	88	14,478	0	37,515	7,670	12,747	7,741,018
Status 4	0	0	0	0	0	576,722	1,335,191	9,401,432	18,715	11,332,058
Total	944,434	110,586	6,860,066	26,464	14,478	576,722	1,451,412	9,421,220	34,848	19,440,230

Field sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,082	550	0	7,014	0	0	0	0	609	15,255
Status 2	49	0	6	0	0	0	3,383	0	489	3,927
Status 3	45,386	0	145,677	0	1,962	0	7,246	6,616	334	207,221
Status 4	0	0	0	0	0	97,699	106,315	1,131,341	2,154	1,337,508
Total	52,518	550	145,683	7,014	1,962	97,699	116,944	1,137,957	3,585	1,563,911

Vesper sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	718,851	278,048	1,086	26,730	0	0	12,339	4,141	5,949	1,047,146
Status 2	2,630	5,363	10,828	1,462	0	0	74,493	9,721	1,486	105,983
Status 3	1,562,252	0	6,898,764	88	14,262	0	39,560	7,662	14,290	8,536,878
Status 4	0	0	0	0	0	658,170	1,430,785	10,723,433	27,221	12,839,610
Total	2,283,732	283,411	6,910,678	28,280	14,262	658,170	1,557,178	10,744,957	48,947	22,529,616

Appendix 5.2 continued.

Lark sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,435	81,560	326	22,612	0	0	6,485	184	2,230	118,832
Status 2	1,452	4,919	6,186	0	0	0	33,283	6,510	1,119	53,470
Status 3	428,644	0	3,432,250	88	14,590	0	25,177	6,980	7,432	3,915,162
Status 4	0	0	0	0	0	197,444	1,000,341	8,522,936	18,864	9,739,585
Total	435,531	86,479	3,438,763	22,700	14,590	197,444	1,065,286	8,536,611	29,645	13,827,049

Sage sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1,700	18,998	0	16,258	0	0	1,211	7	911	39,085
Status 2	66	0	4,740	0	0	0	21,522	3,999	7	30,333
Status 3	59,185	0	3,882,239	88	10,341	0	13,805	7,596	6,092	3,979,345
Status 4	0	0	0	0	0	40,088	452,511	2,790,473	7,658	3,290,730
Total	60,950	18,998	3,886,979	16,346	10,341	40,088	489,050	2,802,074	14,667	7,339,493

Lark bunting	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	31,943	28,705	874	20,054	0	0	9,590	1,885	1,157	94,209
Status 2	756	3,438	8,241	1,394	0	0	62,754	5,901	1,247	83,731
Status 3	456,304	0	5,229,135	88	12,978	0	32,942	6,966	9,918	5,748,331
Status 4	0	0	0	0	0	554,888	1,188,104	9,307,309	18,510	11,068,810
Total	489,004	32,143	5,238,250	21,536	12,978	554,888	1,293,390	9,322,060	30,832	16,995,081

Savannah sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	37,872	188,784	327	23,699	0	0	5,872	1,062	3,665	261,281
Status 2	965	348	6,786	1,462	0	0	46,095	0	715	56,370
Status 3	491,335	0	3,727,896	88	11,490	0	31,349	7,386	9,621	4,279,164
Status 4	0	0	0	0	0	176,513	1,044,366	8,928,827	20,639	10,170,345
Total	530,172	189,132	3,735,008	25,249	11,490	176,513	1,127,682	8,937,274	34,640	14,767,160

Baird's sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	1	479	0	0	0	0	2,191	0	0	2,671
Status 2	549	0	35	0	0	0	2,216	0	0	2,801
Status 3	16,152	0	62,173	0	42	0	168	0	7	78,543
Status 4	0	0	0	0	0	63,295	118,457	888,477	964	1,071,193
Total	16,702	479	62,209	0	42	63,295	123,032	888,477	971	1,155,207

Appendix 5.2 continued.

Grasshopper sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	10	10,648	0	3,208	0	0	940	0	168	14,974
Status 2	598	309	0	0	0	0	3,835	0	436	5,178
Status 3	153,304	0	717,392	0	8,794	0	7,571	1,578	2,156	890,795
Status 4	0	0	0	0	0	0	463,540	4,256,224	5,248	4,725,011
Total	153,912	10,957	717,392	3,208	8,794	0	475,885	4,257,802	8,008	5,635,958

Fox sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	34,068	104,176	93	8,018	0	0	1,705	186	1,502	149,748
Status 2	139	1,629	272	117	0	0	6,817	5,442	437	14,853
Status 3	227,969	0	130,187	0	377	0	5,548	505	762	365,348
Status 4	0	0	0	0	0	2,385	54,899	434,166	2,018	493,468
Total	262,176	105,805	130,553	8,135	377	2,385	68,969	440,299	4,720	1,023,418

Song sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	675,795	155,898	95	11,972	0	0	2,770	879	4,939	852,348
Status 2	1,085	631	1,170	0	0	0	19,510	5,832	884	29,113
Status 3	917,375	0	392,109	0	1,681	0	9,967	505	4,883	1,326,521
Status 4	0	0	0	0	0	98,650	194,486	1,879,420	11,258	2,183,814
Total	1,594,256	156,530	393,374	11,972	1,681	98,650	226,734	1,886,636	21,964	4,391,796

Lincoln's sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	663,949	297,820	95	9,084	0	0	1,794	408	5,806	978,956
Status 2	1,034	0	975	0	0	0	8,344	1,286	38	11,677
Status 3	830,463	0	203,827	0	36	0	5,504	505	2,589	1,042,924
Status 4	0	0	0	0	0	42,305	79,362	555,486	4,367	681,520
Total	1,495,446	297,820	204,896	9,084	36	42,305	95,004	557,686	12,800	2,715,077

White crowned sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	319,946	586,829	1,086	17,778	0	0	8,522	459	4,347	938,967
Status 2	317	46	6,957	0	0	0	35,113	7,483	46	49,961
Status 3	699,543	0	3,030,211	0	2,485	0	15,631	6,655	3,876	3,758,401
Status 4	0	0	0	0	0	116,549	434,499	2,878,361	8,242	3,437,652
Total	1,019,806	586,874	3,038,254	17,778	2,485	116,549	493,765	2,892,958	16,511	8,184,981

Appendix 5.2 continued.

Harris' sparrow	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,011	15,921	0	6,798	0	0	65	25	1,422	26,243
Status 2	0	0	0	0	0	0	610	344	5	959
Status 3	7,603	0	19,842	0	160	0	355	505	40	28,507
Status 4	0	0	0	0	0	159	21,639	226,176	2,064	250,038
Total	9,615	15,921	19,842	6,798	160	159	22,670	227,050	3,531	305,746

Dark-eyed junco	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	838,997	903,151	509	12,636	0	0	8,525	3,465	7,041	1,774,325
Status 2	3,355	2,512	3,813	889	0	0	25,444	7,449	450	43,912
Status 3	2,072,597	0	1,136,159	0	5,208	0	13,495	903	5,533	3,233,896
Status 4	0	0	0	0	0	153,334	296,481	1,911,415	6,945	2,368,174
Total	2,914,950	905,664	1,140,481	13,525	5,208	153,334	343,945	1,923,232	19,968	7,420,306

Mccown's longspur	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	219	0	0	788	116	0	1,123
Status 2	49	309	315	0	0	0	6,656	0	63	7,393
Status 3	85,425	0	659,535	0	11,168	0	5,968	0	1,322	763,417
Status 4	0	0	0	0	0	37,223	305,338	2,677,983	2,974	3,023,518
Total	85,474	309	659,850	219	11,168	37,223	318,750	2,678,099	4,359	3,795,451

Lapland longspur	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	764	14,932	0	7,187	0	0	371	0	4	23,257
Status 2	49	0	875	0	0	0	7,518	0	67	8,509
Status 3	13,317	0	272,969	0	1,376	0	1,662	0	698	290,021
Status 4	0	0	0	0	0	7,137	71,478	547,089	477	626,182
Total	14,130	14,932	273,844	7,187	1,376	7,137	81,029	547,089	1,246	947,969

Chestnut-collared longspur	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	30,276	15,291	0	8,504	0	0	1,170	0	66	55,306
Status 2	49	32	307	0	0	0	3,955	0	5	4,348
Status 3	51,237	0	236,113	0	2,161	0	1,707	0	439	291,656
Status 4	0	0	0	0	0	0	231,900	2,337,030	2,910	2,571,841
Total	81,562	15,323	236,420	8,504	2,161	0	238,732	2,337,030	3,419	2,923,152

Appendix 5.2 continued.

Snow bunting	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	707	19,176	0	10,485	0	0	1,326	87	355	32,136
Status 2	0	27	0	473	0	0	7,895	2,186	2	10,583
Status 3	34,961	0	2,010,854	0	1,320	0	8,569	7,073	2,654	2,065,431
Status 4	0	0	0	0	0	72,490	231,570	1,795,280	3,876	2,103,215
Total	35,668	19,203	2,010,854	10,957	1,320	72,490	249,360	1,804,626	6,886	4,211,364

Bobolink	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,558	14,859	48	10,507	0	0	2,928	1,017	312	32,230
Status 2	634	0	2,454	0	0	0	7,209	1,909	12	12,219
Status 3	50,122	0	420,268	0	2,071	0	4,535	4,828	756	482,580
Status 4	0	0	0	0	0	3,205	154,737	1,329,789	1,712	1,489,442
Total	53,314	14,859	422,770	10,507	2,071	3,205	169,409	1,337,544	2,792	2,016,471

Red-winged blackbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	20,867	85,665	50	8,717	0	0	1,259	403	2,603	119,563
Status 2	202	954	226	989	0	0	12,150	2,634	1,248	18,404
Status 3	110,324	0	191,769	0	2,966	0	8,185	517	5,074	318,834
Status 4	0	0	0	0	0	61,275	190,287	2,506,161	13,234	2,770,956
Total	131,393	86,619	192,046	9,706	2,966	61,275	211,880	2,509,715	22,158	3,227,758

Western meadowlark	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	246,020	222,333	1,030	23,792	0	0	11,273	3,717	3,247	511,412
Status 2	1,217	5,296	10,817	1,394	0	0	72,898	9,964	1,408	102,994
Status 3	1,071,020	0	6,732,014	88	13,697	0	38,419	7,644	13,661	7,876,543
Status 4	0	0	0	0	0	587,042	1,375,146	10,369,762	23,013	12,354,962
Total	1,318,256	227,630	6,743,861	25,274	13,697	587,042	1,497,736	10,391,087	41,329	20,845,911

Yellow-headed blackbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,620	33,949	50	7,370	0	0	1,030	0	1,850	49,869
Status 2	8	607	211	989	0	0	9,546	2,439	1,241	15,042
Status 3	48,562	0	117,323	0	1,107	0	5,560	62	3,853	176,466
Status 4	0	0	0	0	0	33,077	100,028	1,482,881	7,413	1,623,399
Total	54,189	34,556	117,584	8,359	1,107	33,077	116,165	1,485,383	14,357	1,864,777

Appendix 5.2 continued.

Brewer's blackbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	387,617	548,004	1,086	26,611	0	0	11,819	2,967	5,288	983,393
Status 2	1,494	4,915	10,821	1,462	0	0	73,488	9,958	1,504	103,642
Status 3	1,367,780	0	6,943,338	88	15,746	0	40,025	7,666	15,912	8,390,554
Status 4	0	0	0	0	0	601,165	1,409,137	10,603,882	28,773	12,642,956
Total	1,756,890	552,919	6,955,246	28,161	15,746	601,165	1,534,469	10,624,473	51,477	22,120,545

Common grackle	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	195,024	141,471	853	20,645	0	0	6,382	2,841	2,613	369,829
Status 2	1,492	4,904	7,117	0	0	0	37,714	5,334	1,196	57,756
Status 3	765,615	0	3,358,399	88	13,926	0	25,894	6,675	8,669	4,179,266
Status 4	0	0	0	0	0	275,469	1,045,144	8,930,727	18,888	10,270,228
Total	962,131	146,374	3,366,370	20,732	13,926	275,469	1,115,134	8,945,577	31,366	14,877,080

Brown-headed cowbird	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	200,788	519,385	982	26,774	0	0	12,306	4,141	3,973	768,349
Status 2	2,158	5,707	10,828	1,462	0	0	74,784	9,721	1,516	106,175
Status 3	1,259,442	0	6,981,755	88	16,022	0	40,616	7,666	14,572	8,320,162
Status 4	0	0	0	0	0	601,114	1,435,699	10,779,052	28,893	12,844,758
Total	1,462,388	525,091	6,993,565	28,324	16,022	601,114	1,563,405	10,800,581	48,953	22,039,443

Orchard oriole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	107	0	2,234	0	0	0	0	0	2,342
Status 2	84	348	6	0	0	0	3,614	0	503	4,553
Status 3	43,897	0	120,719	0	3,491	0	7,970	12	1,872	177,961
Status 4	0	0	0	0	0	48,000	176,236	1,949,943	2,777	2,176,956
Total	43,981	455	120,725	2,234	3,491	48,000	187,820	1,949,954	5,152	2,361,812

Northern oriole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	11,653	24,753	2	8,904	0	0	955	546	1,556	48,369
Status 2	82	2,590	366	889	0	0	3,761	3,063	392	11,143
Status 3	108,391	0	445,527	0	4,096	0	6,949	915	3,079	568,959
Status 4	0	0	0	0	0	50,599	121,652	1,142,985	6,370	1,321,606
Total	120,126	27,342	445,896	9,793	4,096	50,599	133,317	1,147,510	11,398	1,950,077

Appendix 5.2 continued.

Scott's oriole	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	0	0	0	0	0	0	0	0	0	0
Status 2	0	0	0	0	0	0	0	0	0	0
Status 3	20,191	0	484,476	0	0	0	0	0	0	504,666
Status 4	0	0	0	0	0	0	26,077	80,842	1,650	108,569
Total	20,191	0	484,476	0	0	0	26,077	80,842	1,650	613,235

Rosy finch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	545,360	90,861	1,042	23,685	0	0	6,481	1,311	6,929	675,669
Status 2	1,333	79	8,605	1,394	0	0	39,857	6,212	119	57,601
Status 3	783,702	0	3,629,188	88	8,090	0	16,062	7,614	7,224	4,451,967
Status 4	0	0	0	0	0	391,045	552,651	4,125,791	14,344	5,083,831
Total	1,330,395	90,940	3,638,835	25,167	8,090	391,045	615,052	4,140,928	28,616	10,269,068

Pine grosbeak	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	816,832	690,267	339	5,408	0	0	4,745	1,794	5,355	1,524,739
Status 2	1,679	0	859	0	0	0	8,586	3,403	30	14,557
Status 3	1,690,956	0	195,866	0	2,550	0	2,543	505	3,588	1,896,007
Status 4	0	0	0	0	0	118,189	74,608	523,036	2,502	718,334
Total	2,509,467	690,267	197,063	5,408	2,550	118,189	90,481	528,738	11,474	4,153,637

Purple finch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	2,586	98	2	369	0	0	50	0	61	3,166
Status 2	5	0	97	0	0	0	632	0	0	733
Status 3	11,315	0	3,723	0	158	0	612	0	419	16,227
Status 4	0	0	0	0	0	2,774	2,685	58,336	252	64,047
Total	13,905	98	3,822	369	158	2,774	3,979	58,336	731	84,173

Cassin's finch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	726,686	861,905	339	6,155	0	0	5,138	1,819	5,577	1,607,618
Status 2	2,509	2,565	3,942	0	0	0	19,234	7,449	486	36,185
Status 3	1,908,243	0	692,786	0	2,837	0	10,136	900	4,439	2,619,341
Status 4	0	0	0	0	0	113,138	213,659	1,477,469	5,829	1,810,094
Total	2,637,438	864,470	697,067	6,155	2,837	113,138	248,167	1,487,637	16,331	6,073,239

Appendix 5.2 continued.

House finch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	529	5,631	2	4,679	0	0	165	25	764	11,796
Status 2	77	2,883	34	0	0	0	2,458	3,064	390	8,906
Status 3	17,499	0	340,817	0	3,272	0	6,052	903	2,034	370,576
Status 4	0	0	0	0	0	21,970	58,763	677,688	4,358	762,780
Total	18,105	8,514	340,852	4,679	3,272	21,970	67,439	681,680	7,547	1,154,058

Red crossbill	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	811,101	768,526	291	1,051	0	0	3,658	1,712	5,331	1,591,669
Status 2	3,117	70	461	0	0	0	6,446	141	36	10,271
Status 3	1,729,592	0	198,203	0	1,832	0	4,151	0	3,844	1,937,621
Status 4	0	0	0	0	0	118,186	115,692	942,900	3,150	1,179,929
Total	2,543,809	768,596	198,955	1,051	1,832	118,186	129,947	944,753	12,361	4,719,490

White-winged crossbill	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	537,346	351,239	338	1,863	0	0	2,301	122	2,863	896,072
Status 2	148	0	102	0	0	0	1,820	943	0	3,012
Status 3	927,816	0	55,634	0	160	0	522	0	1,721	985,852
Status 4	0	0	0	0	0	93,663	13,025	151,305	1,169	259,161
Total	1,465,310	351,239	56,075	1,863	160	93,663	17,667	152,370	5,752	2,144,098

Common redpoll	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	7,091	40,668	0	17,104	0	0	472	103	2,075	67,512
Status 2	0	0	0	0	0	0	6,012	0	7	6,020
Status 3	49,854	0	732,508	0	5,886	0	8,727	7,308	2,605	806,889
Status 4	0	0	0	0	0	0	117,647	1,166,831	3,244	1,287,722
Total	56,945	40,668	732,508	17,104	5,886	0	132,858	1,174,242	7,931	2,168,142

Pine siskin	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	835,112	902,528	339	6,542	0	0	5,042	1,821	7,382	1,758,766
Status 2	2,995	2,762	3,944	0	0	0	20,040	7,449	484	37,674
Status 3	2,014,280	0	679,090	0	3,599	0	11,337	903	5,677	2,714,886
Status 4	0	0	0	0	0	122,494	215,372	1,512,217	6,686	1,856,769
Total	2,852,387	905,290	683,372	6,542	3,599	122,494	251,790	1,522,390	20,230	6,368,095

Appendix 5.2 continued.

Lesser goldfinch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	5,256	0	0	5,975	0	0	1,334	0	418	12,982
Status 2	984	2,780	493	0	0	0	9,029	1,988	370	15,643
Status 3	59,299	0	193,968	0	1,167	0	5,374	6,616	68	266,491
Status 4	0	0	0	0	0	0	64,035	458,198	1,587	523,819
Total	65,539	2,780	194,461	5,975	1,167	0	79,771	466,802	2,442	818,936

American goldfinch	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	38,921	146,145	252	17,181	0	0	5,180	1,807	2,799	212,284
Status 2	526	708	4,037	0	0	0	31,257	7,137	912	44,578
Status 3	379,159	0	1,802,509	0	8,406	0	19,326	4,911	5,111	2,219,422
Status 4	0	0	0	0	0	163,803	618,444	4,970,081	10,448	5,762,776
Total	418,607	146,853	1,806,798	17,181	8,406	163,803	674,206	4,983,937	19,270	8,239,060

Evening grosbeak	USFS	NPS	BLM	FWS	DOD	Native	State	Private	Water	Total
Status 1	771,820	362,512	339	5,813	0	0	5,643	1,727	4,396	1,152,249
Status 2	3,237	593	990	0	0	0	13,628	2,976	438	21,862
Status 3	1,856,204	0	224,314	0	4,381	0	3,958	5	3,951	2,092,812
Status 4	0	0	0	0	0	121,542	125,094	1,015,323	5,004	1,266,963
Total	2,631,261	363,104	225,642	5,813	4,381	121,542	148,323	1,020,030	13,789	4,533,886

Appendix 5.3. State and federal rankings, area (ha), and percent of potential habitat for 445 terrestrial vertebrate species modeled for Wyoming. Species are sorted by percetange of potential habitat within management status 1 & 2 lands. See end of table for explanation of codes under ranking.

	Rankings				Habitat		
Common name	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Amphibians							
Great plains toad	.	.	.	.	208	399,432	0.05
Plains spadefoot toad	.	.	.	.	33,871	10,138,807	0.33
Bullfrog	.	.	.	.	1,372	292,067	0.47
Woodhouse's toad	.	.	.	.	9,468	1,571,371	0.60
Great Basin spadefoot toad	.	.	.	.	34,898	4,514,003	0.77
Tiger salamander	.	.	R2	.	399,500	14,762,862	2.71
Northern leopard frog	.	.	R2	.	61,232	1,635,833	3.74
Wyoming toad	S1	LE	.	.	1,641	32,382	5.07
Wood frog	S2	.	R2	.	3,810	51,722	7.37
Boreal western toad	S1	C	R2	.	233,009	1,525,953	15.27
Boreal chorus frog	.	.	.	.	783,548	3,884,026	20.17
Spotted frog	.	.	R2 R4	.	184,622	372,778	49.53
Reptiles							
Northern plateau lizard	.	.	.	.	0	599,409	0.00
Northern tree lizard	.	.	.	.	0	517,738	0.00
Northern earless lizard	.	.	.	.	0	347,497	0.00
Northern prairie lizard	.	.	.	.	128	1,225,858	0.01
Ornate box turtle	.	.	.	.	9	63,187	0.02
Northern many-lined skink	.	.	.	.	149	956,147	0.02
Great Basin gopher snake	.	.	.	.	256	1,351,021	0.02
Midget faded rattlesnake	.	.	.	.	141	478,073	0.03
Plains hognose snake	.	.	.	.	4,865	6,410,174	0.08
Red-lipped prairie lizard	.	.	.	.	1,478	914,999	0.16
Black hills redbelly snake	.	.	R2	.	483	272,662	0.18
Prairie lined racerunner	.	.	.	.	596	330,940	0.18
Common snapping turtle	.	.	.	.	1,605	496,021	0.32
Pale milk snake	.	.	R2	.	11,645	2,739,073	0.43
Bullsnake	.	.	.	.	53,387	11,612,898	0.46
Eastern short-horned lizard	.	.	.	.	88,429	16,046,746	0.55
Western plains garter snake	.	.	.	.	998	180,650	0.55
Northern sagebrush lizard	.	.	.	.	123,178	16,588,830	0.74
Prairie rattlesnake	.	.	.	.	146,051	15,000,506	0.97
Eastern yellowbelly racer	.	.	.	.	34,289	3,070,895	1.12
Smooth green snake	.	.	.	.	9,803	856,357	1.14
Western spiny softshell turtle	.	.	.	.	8,412	418,729	2.01
Western painted turtle	.	.	.	.	8,482	373,913	2.27
Wandering garter snake	.	.	.	.	195,290	1,800,758	10.84
Common garter snake	.	.	.	.	45,769	235,027	19.47
Rubber boa	.	.	.	.	147,058	572,211	25.70
Mammals							
Cliff chipmunk	.	.	.	SSC3	0	201,149	0.00
Abert's squirrel	.	.	.	.	0	14,292	0.00
Canyon mouse	.	.	.	SSC3	0	200,444	0.00
Pinyon mouse	.	.	.	SSC3	0	404,643	0.00
Western spotted skunk	.	.	.	.	0	191,362	0.00
Spotted ground squirrel	.	.	.	.	738	1,343,841	0.05
Brazilian free-tailed bat	.	.	.	.	50	91,650	0.06
Silky pocket mouse	.	.	.	.	3,129	4,631,182	0.07

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Hispid pocket mouse	.	.	.	.	4,164	5,939,713	0.07
Plains pocket gopher	.	.	.	.	5,480	4,633,255	0.12
Bear Lodge meadow jumping mouse	S2	.	.	.	1,219	945,424	0.13
Least weasel	.	.	R2	.	576	317,368	0.18
Black-tailed prairie dog	.	.	.	SSC2	14,188	7,035,376	0.20
Eastern mole	.	.	.	.	2,084	1,015,258	0.21
Gray fox	.	.	.	.	16,509	7,613,806	0.22
Black-tailed jack rabbit	.	.	.	.	19,035	8,341,891	0.23
Keen's myotis	SU	.	.	SSC2	978	416,516	0.23
Eastern cottontail					13,585	4,242,956	0.32
Black-footed ferret	S1	LE	.	SSC1	1,966	607,849	0.32
Plains harvest mouse	.	.	.	.	29,847	8,991,187	0.33
Swift fox	.	C	R2	SSC3	53,482	13,985,677	0.38
Wyoming pocket gopher	.	.	R2	.	3,445	851,363	0.40
Hayden's shrew	S2	.	.	.	3,936	964,289	0.41
Plains pocket mouse	.	.	.	.	11,144	2,668,075	0.42
California myotis	.	.	.	.	1,510	346,100	0.44
Pygmy rabbit	.	.	.	SSC3	12,447	2,586,204	0.48
Eastern spotted skunk	.	.	.	.	3,061	616,414	0.50
Western harvest mouse	.	.	.	.	59,464	11,925,638	0.50
Prairie vole	.	.	.	.	73,412	14,192,042	0.52
Preble's meadow jumping mouse	S1	.	R2	.	14,705	2,814,460	0.52
Fringed myotis	.	.	R2	SSC2	31,577	5,736,635	0.55
Olive-backed pocket mouse	.	.	.	.	91,108	16,090,406	0.57
Great Basin pocket mouse	.	.	.	.	8,264	1,382,187	0.60
Ord's kangaroo rat	.	.	.	.	100,260	16,672,160	0.60
Northern grasshopper mouse	.	.	.	.	111,018	18,084,310	0.61
White-footed mouse	.	.	.	.	5,923	896,727	0.66
Thirteen-lined ground squirrel	.	.	.	.	171,473	18,483,532	0.93
Eastern fox squirrel	SE	.	.	.	36,285	3,148,084	1.15
Ringtail	.	.	R2	.	22,077	1,847,238	1.20
White-tailed prairie dog	.	.	.	.	154,332	11,999,018	1.29
Pallid bat	.	.	.	SSC2	231,242	17,892,665	1.29
Sagebrush vole	.	.	.	.	301,596	19,408,177	1.55
Spotted bat	S1	.	R2 R4	SSC2	146,506	9,107,555	1.61
Eastern red bat	.	.	.	.	372,660	20,231,141	1.84
Desert cottontail	.	.	.	.	368,818	19,516,315	1.89
Merriam's shrew	.	.	.	.	363,047	19,152,156	1.90
White-tailed jack rabbit	.	.	.	.	448,747	20,807,711	2.16
Western small-footed myotis	.	.	.	SSC3	510,510	20,050,746	2.55
Pronghorn	.	.	.	.	692,249	21,671,263	3.19
Meadow vole	.	.	.	.	389,567	9,977,459	3.90
Wyoming ground squirrel	.	.	.	.	579,129	13,422,529	4.31
Common raccoon	.	.	.	.	174,984	3,988,414	4.39
Idaho pocket gopher	.	.	.	.	88,975	1,797,222	4.95
Allen's thirteen-lined ground squirrel	S1	.	R2	.	40,787	795,132	5.13
White-tailed deer	.	.	.	.	231,672	4,221,541	5.49
Long-tailed vole	.	.	.	.	1,238,587	21,519,066	5.76
Hoary bat	.	.	.	.	1,383,640	23,323,048	5.93
American badger	.	.	.	.	1,358,810	22,295,391	6.09
Mountain (nuttall's) cottontail	.	.	.	.	1,327,772	21,642,595	6.13
Bobcat	.	.	.	.	1,319,212	20,111,993	6.56
Townsend's big-eared bat	.	.	R2 R4	SSC2	1,358,582	20,195,763	6.73

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Pygmy shrew	S2	.	R2	SSC2	9,042	132,387	6.83
Striped skunk	.	.	.	.	1,729,347	23,096,236	7.49
Cinerus or masked shrew	.	.	.	.	1,472,552	19,236,509	7.65
Little brown myotis	.	.	.	SSC3	1,998,367	24,564,276	8.14
Deer mouse	.	.	.	.	2,062,271	24,772,850	8.32
Big brown bat	.	.	.	SSC3	2,059,652	24,671,101	8.35
American beaver	.	.	.	.	341,211	3,971,499	8.59
Least chipmunk	.	.	.	.	2,034,261	23,131,761	8.79
Bushy-tailed wood rat	.	.	.	.	1,772,458	19,303,704	9.18
Northern pocket gopher	.	.	.	.	2,285,291	24,776,688	9.22
Coyote	.	.	.	.	2,337,373	25,123,698	9.30
Mule or black-tailed deer	.	.	.	.	2,337,373	25,123,698	9.30
Wapiti or elk	.	.	.	.	2,299,550	24,514,422	9.38
Long-tailed weasel	.	.	.	.	2,316,337	24,539,307	9.44
Red fox	.	.	.	.	2,333,857	24,717,812	9.44
Common porcupine	.	.	.	.	2,313,571	23,368,319	9.90
Muskrat	.	.	.	.	304,006	3,032,886	10.02
Mink	.	.	.	.	303,800	3,015,451	10.07
Long-eared myotis	.	.	.	SSC2	2,232,581	21,744,207	10.27
Long-legged myotis	.	.	.	SSC2	2,145,504	20,736,166	10.35
Vagrant shrew	.	.	.	SSC3	1,987,147	17,029,938	11.67
Montane vole	.	.	.	.	1,789,751	14,280,942	12.53
Silver-haired bat	.	.	.	.	1,793,750	12,249,404	14.64
Dwarf shrew	.	.	R2	SSC3	1,746,314	11,538,649	15.13
Ermine	.	.	.	.	2,250,787	12,956,269	17.37
Uinta ground squirrel	.	.	.	.	982,246	5,607,259	17.52
Northern river otter	.	.	.	.	252,580	1,232,559	20.49
Mountain lion	.	.	.	.	2,256,503	10,919,903	20.66
Dusky or montane shrew	.	.	.	.	2,215,891	10,194,959	21.74
Mountain sheep	.	.	.	.	2,272,706	9,860,247	23.05
Black bear	.	.	.	.	2,247,777	9,573,426	23.48
Yellow-bellied marmot	.	.	.	.	2,252,499	8,914,354	25.27
Red squirrel	.	.	.	.	1,714,483	6,150,094	27.88
Southern red-backed vole	.	.	.	.	1,635,233	5,470,100	29.89
Snowshoe hare	.	.	.	.	1,876,264	6,121,516	30.65
Western jumping mouse	.	.	.	.	1,986,780	6,481,938	30.65
Moose	.	.	.	.	2,299,248	7,441,382	30.90
Uinta chipmunk	.	.	.	.	1,802,555	5,512,424	32.70
Golden-mantled ground squirrel	.	.	.	.	2,080,594	6,361,104	32.71
Water shrew	.	.	.	.	875,401	2,279,389	38.41
Heather vole	.	.	.	.	2,116,701	5,366,014	39.45
American marten	.	.	R2	.	2,075,281	4,933,668	42.06
Yellow-pine chipmunk	.	.	.	.	1,664,930	3,767,182	44.20
Water vole	.	.	R2	SSC3	503,285	1,119,252	44.97
Northern flying squirrel	.	.	.	.	1,451,072	3,161,802	45.89
North American wolverine	S1	.	R2 R4	SSC3	2,088,770	4,397,395	47.50
Lynx	S1	.	R2 R4	SSC2	1,562,718	3,109,248	50.26
American pika	.	.	.	.	1,648,852	3,229,854	51.05
Mountain goat	SE	.	.	.	828,085	1,456,751	56.84
Grizzly or brown bear	S1	LT	.	.	1,893,856	3,148,407	60.15
American bison	S2	.	.	.	1,444,652	2,309,372	62.56
Yuma myotis	.	.	.	.	6,171	9,671	63.81
Gray wolf	S1	NE	.	.	1,482,433	2,010,923	73.72

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Fisher	.	.	R2 R4	.	40,191	41,683	96.42
Preble's shrew	S2	.		SSC3	97,054	97,102	99.95
Birds							
Plain titmouse	.	.	.	SSC3	0	231,761	0.00
Scott's oriole	.	.	.	SSC3	0	613,235	0.00
Cassin's kingbird	.	.	.	.	4,908	2,244,257	0.22
Mccown's longspur	.	.	.	.	8,516	3,795,451	0.22
Chimney swift	.	.	.	.	1,093	468,591	0.23
Piping plover	S2N	LELT	.	.	10	4,018	0.24
Sharp-tailed grouse	.	.	.	.	19,838	6,798,489	0.29
Orchard oriole	.	.	.	.	6,895	2,361,815	0.29
Upland sandpiper	S2B,S3N	.	R2	.	20,621	6,579,293	0.31
Ash-throated flycatcher	.	.	.	SSC3	7,585	2,221,354	0.34
Grasshopper sparrow	.	.	.	.	20,152	5,635,972	0.36
Blue-gray gnatcatcher	.	.	.	.	9,336	2,418,349	0.39
Black-throated gray warbler	.	.	.	.	10,164	2,601,988	0.39
Northern mockingbird	.	.	.	.	11,488	2,661,769	0.43
Bushtit	.	.	.	SSC3	1,838	415,124	0.44
Eastern bluebird	.	.	.	.	4,597	1,019,209	0.45
Baird's sparrow	.	.	R2	.	5,471	1,155,207	0.47
Scrub jay	.	.	.	SSC3	11,704	2,335,692	0.50
Northern bobwhite	.	.	.	.	2,013	376,272	0.54
Surf scoter	SA	.	.	.	347	63,136	0.55
Eastern phoebe	.	.	.	.	2,841	505,141	0.56
Gray flycatcher	.	.	.	.	19,120	3,387,683	0.56
Bewick's wren	.	.	.	.	14,648	2,348,269	0.62
Ring-necked pheasant	SE	.	.	.	41,000	6,104,978	0.67
Summer tanager	SA	.	.	.	620	88,726	0.70
Short-eared owl	.	.	.	.	146,453	17,598,442	0.83
Gray partridge	SE	.	.	.	90,735	10,642,216	0.85
Mountain plover	S2B,S2N	C	R2	.	52,848	6,074,413	0.87
Sage grouse	.	.	.	.	159,260	17,081,778	0.93
Sage sparrow	.	.	.	.	69,418	7,339,493	0.95
Eastern screech owl	.	.	.	.	121,616	12,332,726	0.99
Snow bunting	.	.	.	.	42,718	4,211,364	1.01
Blue grosbeak	.	.	.	.	8,023	772,387	1.04
Lark bunting		.	.	.	177,940	16,995,102	1.05
Broad-winged hawk	SA	.	.	.	1,356	129,542	1.05
Common poorwill	.	.	.	.	93,372	8,790,752	1.06
Chukar	SE	.	.	.	68,561	6,427,044	1.07
Yellow-breasted chat	.	.	.	.	14,710	1,274,755	1.15
Cattle egret	SA	.	.	.	16,586	1,423,504	1.17
Burrowing owl	.	.	R2	.	224,076	19,108,349	1.17
Dickcissel	.	.	.	.	20,466	1,669,178	1.23
Field sparrow	.	.	.	.	19,182	1,563,911	1.23
Lark sparrow	.	.	.	.	172,302	13,827,069	1.25
Blackpoll warbler	SA	.	.	.	6,975	515,343	1.35
Sage thrasher	.	.	.	.	233,460	16,978,486	1.38
Lesser golden plover	.	.	.	.	9,024	642,741	1.40
Rough-legged hawk	.	.	.	.	279,846	19,645,326	1.42
Eastern kingbird	.	.	.	.	281,188	19,687,650	1.43
Pinyon jay	.	.	.	.	70,577	4,925,252	1.43

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Long-billed curlew	.	.	R2	SSC3	176,162	10,901,331	1.62
Whimbrel	.	.	.	.	3,090	190,159	1.63
Common barn owl	.	.	.	.	70,350	4,185,191	1.68
Western kingbird	.	.	.	.	282,876	16,700,588	1.69
Green-winged teal	.	.	.	.	277,608	16,379,923	1.69
Ovenbird	.	.	.	.	21,119	1,199,804	1.76
American crow	.	.	.	.	281,053	15,751,488	1.78
House finch	.	.	.	.	20,702	1,154,057	1.79
Ferruginous hawk	.	.	R2	SSC3	371,639	20,393,968	1.82
Say's phoebe	.	.	.	.	358,825	19,636,051	1.83
Lazuli bunting	.	.	.	.	253,864	13,652,165	1.86
Wild turkey	SE	.	.	.	82,266	4,423,192	1.86
Brewer's sparrow	.	.	.	.	367,153	19,440,257	1.89
American tree sparrow	.	.	.	.	99,593	5,169,043	1.93
Columbian sharp-tailed grouse	S1	.	R2 R4	.	6,676	341,370	1.96
Long-eared owl	.	.	.	.	385,135	18,980,569	2.03
Chestnut-collared longspur	.	.	.	.	59,655	2,923,151	2.04
Barn swallow	.	.	.	.	230,601	10,940,350	2.11
Canada goose	.	.	.	.	360,803	16,889,303	2.14
Savannah sparrow	.	.	.	.	317,651	14,767,193	2.15
Bobolink	.	.	.	.	44,449	2,016,480	2.20
Long-billed dowitcher	.	.	.	.	15,202	689,078	2.21
Loggerhead shrike	.	.	R2	.	490,095	21,076,757	2.33
Cliff swallow	.	.	.	.	483,896	20,536,627	2.36
Merlin	S2B,SZN	.	R2	SSC3	605,354	21,679,529	2.79
Common grackle	.	.	.	.	427,585	14,877,101	2.87
Rock wren	.	.	.	.	372,519	12,911,542	2.89
Yellow warbler	.	.	.	.	128,401	4,427,635	2.90
Western meadowlark	.	.	.	.	614,406	20,845,933	2.95
Northern shrike	.	.	.	.	205,031	6,751,860	3.04
Northern oriole	.	.	.	.	59,512	1,950,078	3.05
Rose-breasted grosbeak	.	.	.	.	21,298	686,722	3.10
American goldfinch	.	.	.	.	256,862	8,239,065	3.12
Brown thrasher	.	.	.	.	51,787	1,631,508	3.17
Indigo bunting	.	.	.	.	70,993	2,226,427	3.19
Turkey vulture	.	.	.	.	737,948	22,606,305	3.26
Lapland longspur	.	.	.	.	31,766	947,969	3.35
Common redpoll	.	.	.	.	73,532	2,168,144	3.39
Solitary vireo	.	.	.	.	51,291	1,505,321	3.41
Yellow-headed blackbird	.	.	.	.	64,807	1,864,777	3.48
Lesser goldfinch	.	.	.	.	28,625	818,936	3.50
Western screech owl	.	.	.	.	116,161	3,241,352	3.58
American kestrel	.	.	.	.	820,966	22,204,835	3.70
Clay-colored sparrow	.	.	.	.	111,170	2,895,168	3.84
Catbird	.	.	.	.	73,404	1,864,368	3.94
Red-headed woodpecker	.	.	.	.	155,172	3,914,644	3.96
Brown-headed cowbird	.	.	.	.	874,524	22,039,473	3.97
Rufous-sided towhee	.	.	.	.	236,008	5,888,444	4.01
Black-billed cuckoo	.	.	.	.	29,160	726,978	4.01
Black-throated blue warbler	SA	.	.	.	8,496	206,225	4.12
Northern shoveler	.	.	.	.	165,024	3,995,576	4.13
Common nighthawk	.	.	.	.	941,350	22,154,911	4.25
Northern pintail	.	.	.	.	126,553	2,965,660	4.27

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Black-headed grosbeak	.	.	.	.	79,208	1,854,886	4.27
Snowy plover	S1	.	R2	.	937	21,922	4.27
Red-winged blackbird	.	.	.	.	137,968	3,227,767	4.27
Blue jay	.	.	.	.	44,936	1,032,926	4.35
Cedar waxwing	.	.	.	.	144,861	3,308,628	4.38
Mourning dove	.	.	.	.	984,939	22,021,072	4.47
Yellow-billed cuckoo	S2B	.	R2	SSC2	12,660	282,882	4.48
Greater white-fronted goose	.	.	.	.	13,114	292,907	4.48
Purple finch	.	.	.	.	3,899	84,173	4.63
Pygmy nuthatch	.	.	R2	.	50,572	1,082,624	4.67
White-throated swift	.	.	.	.	278,594	5,951,130	4.68
Northern parula	SA	.	.	.	4,418	94,078	4.70
Brewer's blackbird	.	.	.	.	1,087,035	22,120,568	4.91
Magnolia warbler	SA	.	.	.	4,996	98,159	5.09
Vesper sparrow	.	.	.	.	1,153,128	22,529,646	5.12
Horned lark	.	.	.	.	1,132,912	20,991,442	5.40
Black-chinned hummingbird	.	.	.	.	51,598	952,013	5.42
Black-billed magpie	.	.	.	.	1,232,284	22,726,211	5.42
Bank swallow	.	.	.	.	138,665	2,511,161	5.52
Killdeer	.	.	.	.	230,666	4,174,271	5.53
American bittern	.	.	R2	SSC3	28,689	510,594	5.62
Canyon wren	SA	.	.	.	49,756	864,162	5.76
California gull	S1B	.	.	.	79,191	1,371,782	5.77
Swainson's hawk	.	.	.	.	1,287,669	22,202,547	5.80
American redstart	.	.	.	.	154,060	2,623,709	5.87
Peregrine falcon	S1	LE	.	SSC3	1,411,752	23,146,857	6.10
Virginia's warbler	.	.	.	.	43,450	694,043	6.26
Northern rough-winged swallow	.	.	.	.	195,594	2,980,471	6.56
Red-tailed hawk	.	.	.	.	1,576,483	23,670,950	6.66
Blue-winged teal	.	.	.	.	196,155	2,944,482	6.66
Sandhill crane	.	.	R2	.	238,079	3,449,914	6.90
Ring-billed gull	S1B	.	.	.	77,000	1,096,208	7.02
Golden eagle	.	.	.	.	1,644,246	23,403,065	7.03
Least flycatcher	.	.	.	.	170,542	2,393,342	7.13
Rosy finch	.	.	.	.	733,269	10,269,069	7.14
Great-horned owl	.	.	.	.	1,766,710	24,283,569	7.28
Chipping sparrow	.	.	.	.	1,808,882	24,377,376	7.42
Cinnamon teal	.	.	.	.	165,681	2,180,220	7.60
Wilson's phalarope	.	.	.	.	112,269	1,477,187	7.60
Prairie falcon	.	.	.	.	1,736,608	22,645,843	7.67
House wren	.	.	.	.	722,784	9,358,596	7.72
Mallard	.	.	.	.	448,203	5,724,891	7.83
Black-capped chickadee	.	.	.	.	402,732	5,114,660	7.87
Green-tailed towhee	.	.	.	.	911,578	11,213,302	8.13
Northern harrier	.	.	.	.	2,016,324	24,110,310	8.36
American wigeon	.	.	.	.	159,197	1,890,309	8.42
Gadwall	.	.	.	.	162,652	1,894,518	8.59
Bohemian waxwing	.	.	.	.	155,930	1,790,912	8.71
White-faced ibis	S1B,S2N	.	R2	SSC3	83,379	953,108	8.75
Northern flicker	.	.	.	.	1,759,843	20,104,629	8.75
Mountain bluebird	.	.	.	.	2,167,478	24,599,274	8.81
Harris' sparrow	.	.	.	.	27,202	305,747	8.90
Snow goose	.	.	.	.	111,893	1,226,581	9.12

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Common yellowthroat	.	.	.	.	99,315	1,069,199	9.29
Bald eagle	S1B,S2N	LT	.	SSC2	2,336,154	25,123,583	9.30
Red-eyed vireo	.	.	.	.	48,747	520,911	9.36
American robin	.	.	.	.	1,975,663	20,539,428	9.62
Lesser yellowlegs	.	.	.	.	74,887	765,734	9.78
Sprague's pipit	.	.	.	.	41,521	422,203	9.83
Tennessee warbler	.	.	.	.	121,627	1,203,206	10.11
Willet	.	.	.	.	106,713	1,039,095	10.27
Franklin's gull	.	.	.	.	130,490	1,229,480	10.61
Double-crested cormorant	.	.	.	.	131,916	1,239,838	10.64
Great egret	SA	.	.	.	44,403	409,960	10.83
White-breasted nuthatch	.	.	.	.	319,738	2,927,281	10.92
Orange-crowned warbler	.	.	.	.	282,750	2,501,150	11.30
Wilson's warbler	.	.	.	.	849,238	7,447,815	11.40
Common snipe	.	.	.	.	302,599	2,652,524	11.41
Cordilleran flycatcher	.	.	.	.	399,628	3,494,753	11.44
Great blue heron	.	.	.	.	191,479	1,663,920	11.51
Redhead	.	.	.	.	130,719	1,129,488	11.57
American coot	.	.	.	.	142,631	1,226,815	11.63
Nashville warbler	.	.	.	.	12,042	103,392	11.65
Lesser scaup	.	.	.	.	146,373	1,225,769	11.94
White crowned sparrow	.	.	.	.	988,927	8,184,993	12.08
Willow flycatcher	.	.	.	.	331,420	2,734,183	12.12
Osprey	.	.	R2	.	199,170	1,636,964	12.17
Canvasback	.	.	.	.	114,161	935,543	12.20
Sora	.	.	.	.	131,412	1,035,418	12.69
Black-and-white warbler	.	.	.	.	18,065	139,796	12.92
Western grebe	S2B	.	.	.	130,745	1,010,325	12.94
Common raven	.	.	.	.	2,322,402	16,692,146	13.91
American white pelican	S1B	.	.	SSC3	164,370	1,161,399	14.15
Belted kingfisher	.	.	.	.	284,801	2,002,964	14.22
Downy woodpecker	.	.	.	.	1,158,299	7,860,030	14.74
Calliope hummingbird	.	.	.	.	752,758	4,993,651	15.07
Pied-billed grebe	.	.	.	.	141,824	885,463	16.02
Common merganser	.	.	.	.	246,377	1,535,561	16.04
Fox sparrow	.	.	R2	.	164,601	1,023,419	16.08
Eared grebe	.	.	.	.	146,844	910,355	16.13
Chestnut-sided warbler	SA	.	.	.	8,549	52,184	16.38
Snowy egret	S1	.	.	SSC3	108,552	635,670	17.08
Black necked stilt	.	.	.	.	78,074	454,268	17.19
Bufflehead	.	.	.	.	188,294	1,074,781	17.52
Common goldeneye	.	.	.	.	210,468	1,198,735	17.56
Northern goshawk	S2B,SZN	.	R2	.	2,256,412	12,817,975	17.60
Virginia rail	.	.	.	.	97,361	551,629	17.65
Lewis' woodpecker	.	.	R2	SSC3	551,395	3,033,295	18.18
Sharp-shinned hawk	.	.	.	.	2,097,828	11,519,499	18.21
Cooper's hawk	.	.	.	.	2,101,922	11,532,719	18.23
Tundra swan	.	.	.	.	124,933	685,473	18.23
Spotted sandpiper	.	.	.	.	189,166	1,031,740	18.33
Violet-green swallow	.	.	.	.	868,895	4,697,631	18.50
Black-bellied plover	.	.	.	.	71,188	377,141	18.88
Western wood pewee	.	.	.	.	1,395,710	7,248,455	19.26
Flammulated owl	.	.	R2 R4	.	70,484	365,176	19.30

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Red-naped sapsucker	.	.	.	.	837,657	4,322,637	19.37
Black-crowned night-heron	S2	.	.	SSC3	113,684	584,013	19.47
Marbled godwit	.	.	.	.	92,413	472,174	19.57
Song sparrow	.	.	.	.	881,461	4,391,800	20.07
Dusky flycatcher	.	.	.	.	1,273,778	6,338,302	20.10
Ruddy duck	.	.	.	.	118,350	583,840	20.27
Tree swallow	.	.	.	.	1,132,436	5,440,618	20.81
Macgillivray`s warbler	.	.	.	.	901,040	4,306,894	20.92
Whooping crane	S1N	LE	.	.	115,920	551,204	21.03
Veery	.	.	.	.	568,864	2,683,502	21.20
Wood duck	.	.	.	.	170,578	803,468	21.23
White-tailed ptarmigan	S1	.	.	.	2,183	10,225	21.35
Baird's sandpiper	.	.	.	.	67,263	313,060	21.49
Horned grebe	.	.	.	.	102,557	476,412	21.53
Western tanager	.	.	.	.	1,713,018	7,740,531	22.13
American avocet	.	.	.	.	117,935	530,114	22.25
Northern waterthrush	.	.	.	.	49,733	222,924	22.31
Yellow-rumped warbler	.	.	.	.	1,805,525	8,041,119	22.45
Least sandpiper	.	.	.	.	62,184	276,558	22.48
Blue grouse	.	.	.	.	1,795,596	7,856,074	22.86
Rufous hummingbird	.	.	.	.	2,197,612	9,391,577	23.40
Hairy woodpecker	.	.	.	.	1,156,317	4,935,913	23.43
Barrow's goldeneye	.	.	.	.	214,442	909,465	23.58
Common loon	S2B	.	R2 R4	SSC1	141,132	589,541	23.94
Townsend's solitaire	.	.	.	.	1,856,490	7,653,060	24.26
Ring-necked duck	.	.	.	.	179,263	733,856	24.43
Broad-tailed hummingbird	.	.	.	.	1,432,788	5,862,816	24.44
Dark-eyed junco	.	.	.	.	1,818,237	7,420,319	24.50
Ruby-crowned kinglet	.	.	.	.	1,755,416	6,936,965	25.31
Trumpeter swan	S1B,S2N	.	R2 R4	SSC2	143,609	562,461	25.53
Evening grosbeak	.	.	.	.	1,174,111	4,533,888	25.90
Pectoral sandpiper	.	.	.	.	59,597	226,269	26.34
Red-breasted nuthatch	.	.	.	.	1,751,254	6,516,577	26.87
Swainson's thrush	.	.	.	.	1,413,979	5,249,896	26.93
Cassin's finch	.	.	.	.	1,643,803	6,073,251	27.07
Mountain chickadee	.	.	.	.	1,730,733	6,159,933	28.10
Marsh wren	.	.	.	.	140,070	496,888	28.19
Pine siskin	.	.	.	.	1,796,440	6,368,107	28.21
American dipper	.	.	.	.	229,222	795,478	28.82
Clark's nutcracker	.	.	.	.	2,226,564	7,707,845	28.89
Warbling vireo	.	.	.	.	1,638,235	5,565,364	29.44
Hermit thrush	.	.	.	.	1,536,372	5,209,648	29.49
Steller's jay	.	.	.	.	1,491,962	5,003,885	29.82
Red-breasted merganser	.	.	.	.	107,330	356,442	30.11
Golden-crowned kinglet	.	.	R2	.	1,160,939	3,820,688	30.39
Brown creeper	.	.	.	.	1,704,989	5,492,446	31.04
Herring gull	S1B	.	.	.	44,104	141,022	31.27
Blackburnian warbler	SA	.	.	.	76,486	237,934	32.15
Hooded merganser	.	.	.	.	114,147	352,610	32.37
Townsend's warbler	.	.	.	.	503,395	1,489,434	33.80
Gray jay	.	.	.	.	1,725,422	5,103,343	33.81
Red crossbill	.	.	.	.	1,601,940	4,719,501	33.94
Olive-sided flycatcher	.	.	R2	.	1,908,901	5,443,297	35.07

Appendix 5.3 continued.

Common name	Rankings				Habitat		
	TNC	FWS	USFS	WGFD	Status 1 & 2	Total	%
Hammond's flycatcher	.	.	.	.	1,111,754	3,069,485	36.22
Ruffed grouse	.	.	.	.	1,497,572	4,122,255	36.33
Williamson's sapsucker	.	.	.	.	1,122,684	3,086,266	36.38
Lincoln's sparrow	.	.	.	.	990,633	2,715,089	36.49
Pine grosbeak	.	.	.	.	1,539,297	4,153,649	37.06
Northern saw-whet owl	.	.	.	.	1,596,614	4,138,593	38.58
Northern pygmy-owl	.	.	.	.	1,640,603	4,222,192	38.86
Three-toed woodpecker	.	.	R2 R4	.	1,602,374	3,909,097	40.99
White-winged crossbill	.	.	.	.	899,085	2,144,100	41.93
Boreal owl	S2	.	R2 R4	.	1,589,011	3,482,925	45.62
Great gray owl	.	.	R4	.	1,566,886	3,350,488	46.77
White-winged scoter	SA	.	.	.	66,311	138,016	48.05
Black-backed woodpecker	.	.	R2	.	680,892	1,408,760	48.33
Caspian tern	S1B	.	.	SSC3	60,087	119,159	50.43
Stilt sandpiper	.	.	.	.	12,041	23,790	50.61
Forster's tern	S1	.	.	SSC3	66,695	127,546	52.29
Red-necked phalarope	.	.	.	.	81,845	152,218	53.77
Common tern	.	.	.	.	86,120	150,019	57.41
Western sandpiper	.	.	.	.	36,992	64,169	57.65
Clark's grebe	S2	.	.	.	77,884	134,905	57.73
Black tern	S1	.	R2	SSC3	65,358	112,979	57.85
Greater yellowlegs	.	.	.	.	67,664	115,273	58.70
American (water) pipit	.	.	.	.	993,139	1,645,386	60.36
Semipalmated plover	.	.	.	.	66,272	102,484	64.67
Solitary sandpiper	.	.	.	.	52,078	79,874	65.20
Semipalmated sandpiper	.	.	.	.	48,758	74,170	65.74
Harlequin duck	S2B,S2N	.	R2 R4	SSC3	165,614	250,255	66.18
Sanderling	.	.	.	.	50,891	74,909	67.94
Red-necked grebe	.	.	.	.	98,194	131,099	74.90
Bonaparte's gull	.	.	.	.	57,625	67,743	85.06

TNC rank: S1 and S2 refers to species critically imperiled in the state because of extreme rarity (S1) or rarity (S2). SU is status uncertain; SA is accidential in state; SE is exotic, introduced to the state. B is breeding status, N is non-breeding status (Garber 1995).
FWS rank: LE is listed as endangered; LT is listed as threatened; C is candidate for listing (Garber 1995).
USFS rank: R2 is sensitive species in Region 2; R4 is sensitive species in Region 4 (Garber 1995).
WGFD rank: SSC1 is sensitive species of concern 1-3 with 1 being of highest concern (WGFD 1996).

Appendix 7.1. List of GAP applications.

Specific uses of Wyoming GAP data:

- The Nature Conservancy used the land cover, land stewardship, and predicted species distribution layers to identify potential conservation sites in the Bighorn and Wind River mountain ranges of Wyoming.
- Species locality records compiled by WY-GAP in a spatial database will be used by the U.S. Fish and Wildlife Service in an assessment of the effects of environmental contaminants on species of management concern.
- The land stewardship layer was used as a cartographic layer in the Laramie County Master Planning Document.
- Hexagon-based range maps produced by WY-GAP were used by the Wyoming Game and Fish Department in developing their Nongame Strategic Plan.
- The land cover layer has been used to illuminate the factors underlying the boundaries between upper and lower treeline with alpine and grassland/shrubland types, and for the boundary between shrubland and grasslands.
- The land stewardship layer was used in an emissions study for the Grand Canyon that was funded by several federal agencies making up the Visual Transport Council.
- The USFS Grizzly Bear Recovery Program of Missoula, MT has used the land stewardship layer in identifying and analyzing linkage zones for grizzly bears.
- The U.S. Forest Service's Columbia River Basin Project used the land stewardship layer as part of their ecological assessment of the basin.
- The WY-GAP data was used by NASA to calibrate a model that predicts vegetation types based on climate and soil variables.
- The land cover layer has been used in the Mapped-Plant-Soil-System (MAPSS) model to help predict vegetation change with climate change.
- The Casper District of the Bureau of Land Management has used the land stewardship layer as a visual tool in the consideration of potential disposal and acquisition of BLM lands.
- The land cover layer has been used in a study of land cover resolution scaling effects on estimates of energy and water exhange between land and the atmosphere in Wyoming.
- The land stewardship layer was used by the Wyoming Toad Task Force as a visual tool to identify the ownership of existing and potential habitat for the endangered Wyoming Toad in the Laramie River Basin.
- The Nature Conservancy used the spatially-referenced records produced by WY-GAP from the Wyoming Natural Diversity Database for conservation site planning.
- The Nature Conservancy used WY-GAP's hydrographic and elevation data to explore sampling procedures for a riparian assessment in the Bighorn Basin.
- The Nature Conservancy used the land cover layer to develop a map of ecoregions of Wyoming.
- The Nature Conservancy's Red Canyon Ranch is using the land cover layer as a base layer in their GIS.
- The Wyoming Game and Fish Department's Fish Division used the land stewardship layer in combination with a layer of surficial hydrography to summarize the ownership of important stream reaches in the North Laramie River drainage basin.
- The regional office of the Forest Service has used the land stewardship layer as part of their forest inventory analysis.

Other GAP applications:

<u>Businesses and Non-government Organizations:</u>

- Hughes Corp. is experimenting with the Utah and Nevada GAP digital base maps, simulating images to aid the development of new space-based remote sensing devices.
- Weyerhaeuser Corp. is using the Arkansas GAP data in managing their lands in Arkansas.
- IBM Corp. is funding a project at the University of California, Santa Barbara, that, in part, uses GAP data in the development of visualization software.
- NM-GAP vegetation data is being used for an environmental assessment of a proposed spaceport, a state/private venture.

County and City Planning:

- CA-GAP biological data were combined with the Southern California Association of Governments (SCAG) land ownership data to show which ownerships and jurisdictions were needed for joint conservation planning and management of a particular natural community or species, maximizing efficiency and minimizing the potential for yet another conservation crisis.
- In California county and city planners of several jurisdictions, wildlife agencies, developers of the 4S Ranch property, and the state Natural Communities Conservation Planning program used the GAP regional data, as well as more detailed information, to conserve 1,640 acres of habitat within a 2,900-acre planned development.
- Day-to-day county planning operations in Piute, Grande, and Washington counties, Utah.
- County planners in Piute County, Utah used GAP data to optimize the siting of a proposed sawmill for aspen with respect to the distribution of aspen stands;
- Missoula County, Montana, used the GAP land cover layer of the area as a base map for its comprehensive long-range plan.
- Snohomish County, Washington, used the GAP land cover layer in meeting state requirements for a growth management plan.
- The City of Bainbridge Island, Washington, used GAP data to assist them in development of a watershed planning project.

State Uses:

- The GAP database of species habitats was used by the Tennessee Wildlife Resources Agency (TWRA) to update its book "Species in Need of Management."
- GAP data have been used by the Tennessee Forestry Stewardship Program to help develop a district program for nine conservation planning districts, outlining Best Management Practices (BMPs) for biological conservation on private lands.
- GAP data are being used extensively by TWRA in the preparation of project proposals to the North American Waterfowl Conservation Program. These proposals require that biodiversity issues be addressed in specific detail. The use of GAP data on occurrence of land cover types and terrestrial vertebrates has made this possible.
- The Utah Division of Wildlife Resources and the Bear River Water Conservancy District used the Utah GAP land cover layer in a resource management assessment for mitigating conflicts between a proposed groundwater withdrawal project and the maintenance of an elk calving area in the Uinta Mountains.
- The Utah Division of Wildlife Resources, the Rocky Mountain Elk Foundation, and Sheik Safari International used the Utah GAP land cover layer to identify critical elk habitat. The environmental profile of these areas was then used to identify other similar areas for elk habitat enhancement.
- The Utah Division of Wildlife Resources used the Utah GAP land cover layer for a rapid ecological assessment of the Echo Henefer Wildlife Management Area.
- The Washington Department of Fish and Wildlife used GAP data to develop a breeding bird atlas and an atlas of mammals of Washington State.
- The Washington Department of Fish and Wildlife uses GAP data to operate an integrated landscape management program.
- The Washington Department of Fish and Wildlife uses GAP data from Eastern Washington to assist with an innovative program that brings the forest products industry, state agency biologists, non-government organizations, and tribal biologists together in the field to jointly determine the appropriate management practices for any particular site of concern (Timber, Fish & Wildlife Program).
- The Idaho Department of Fish and Game used GAP data to evaluate the impact from expanded military training activities on public lands in Southern Idaho.
- The Idaho Department of Fish and Game uses GAP data for regional planning efforts on a regular basis.

Appendix 7.1. continued.

Statewide Planning:

- Biodiversity planning programs or projects are now under way in Arizona, California, Colorado, Maine, Missouri, Nevada, Oregon, and Tennessee. It is likely that similar efforts will develop in other states. In some cases, these efforts grew out of the state Gap Analysis project, however in most cases, the GAP data are being used to meet a previously defined need. In all cases, GAP data are central to their development and operations.

Federal Agency Applications:

- GAP data are being supplied to all military installations in the Great Basin ecoregion for integrated management of the natural resources. These installations constitute a very large amount of land area. Much of it is of high value for native species.
- The Ouachita National Forest used the Arkansas GAP data to help them develop an ecosystem management plan.
- The potential contributions to biodiversity conservation of four different options proposed for new wilderness designation in Idaho were quantified by the Idaho Cooperative Fish and Wildlife Research Unit in cooperation with the Park Studies Unit.
- The potential contributions to biodiversity conservation of four different options proposed for new national park designation in Idaho were quantified by the Idaho Cooperative Park Studies Unit.
- The U.S. Forest Service in Booneville, Arkansas, used the Arkansas GAP data land cover maps in a 3-dimensional presentation to provide the public with a visual representation of the region and to enhance the public's involvement with the National Forest planning process.
- The U.S. Fish and Wildlife Service regularly uses the GAP data for Southern California for habitat evaluation and management.
- The U.S. Forest Service, Bureau of Land Management, and National Park Service are using the GAP data for a wide variety of natural resource management operations in Utah. For example, the entire Utah GAP database is directly linked with existing National Park Service databases for use by National Parks.
- The U.S. Forest Service used the Utah GAP data to help assist them in evaluating human-induced impacts to forested lands surrounding ski resorts in central Utah.
- The U.S. Fish and Wildlife Service in Delaware used GAP data to help identify potential habitat for the federally endangered Delmarva fox squirrel. These maps were displayed and served as a catalyst for bringing together people with a stake in the issue.
- The U.S. Fish and Wildlife Service used the Indiana GAP data as part of a biological assessment for the base closure of the Jefferson Proving Grounds and its conversion to a National Wildlife Refuge. This 58,000-acre installation has restricted human access due to unexploded ordinance and contains some of the highest quality natural habitat in Indiana.
- The U.S. Fish and Wildlife Service in Louisiana used GAP data to avoid conflict over the designation of critical habitat of the federally endangered Louisiana black bear.
- The NOAA Coastal Marine Sanctuary in Washington State uses GAP data for an educational display.
- In Washington and New Mexico, digital land cover maps have been distributed to all National Forests.
- The U.S. Natural Resources Conservation Service (NRCS) in New Mexico is using a GAP clustered imagery as a base for their land cover mapping activities.
- The Department of Defense is funding the development of an electronic environmental information system for the Mojave ecoregion, which would use GAP data as a foundation or base layer of information. The system will link 29 DoD installations to a common source of environmental information.