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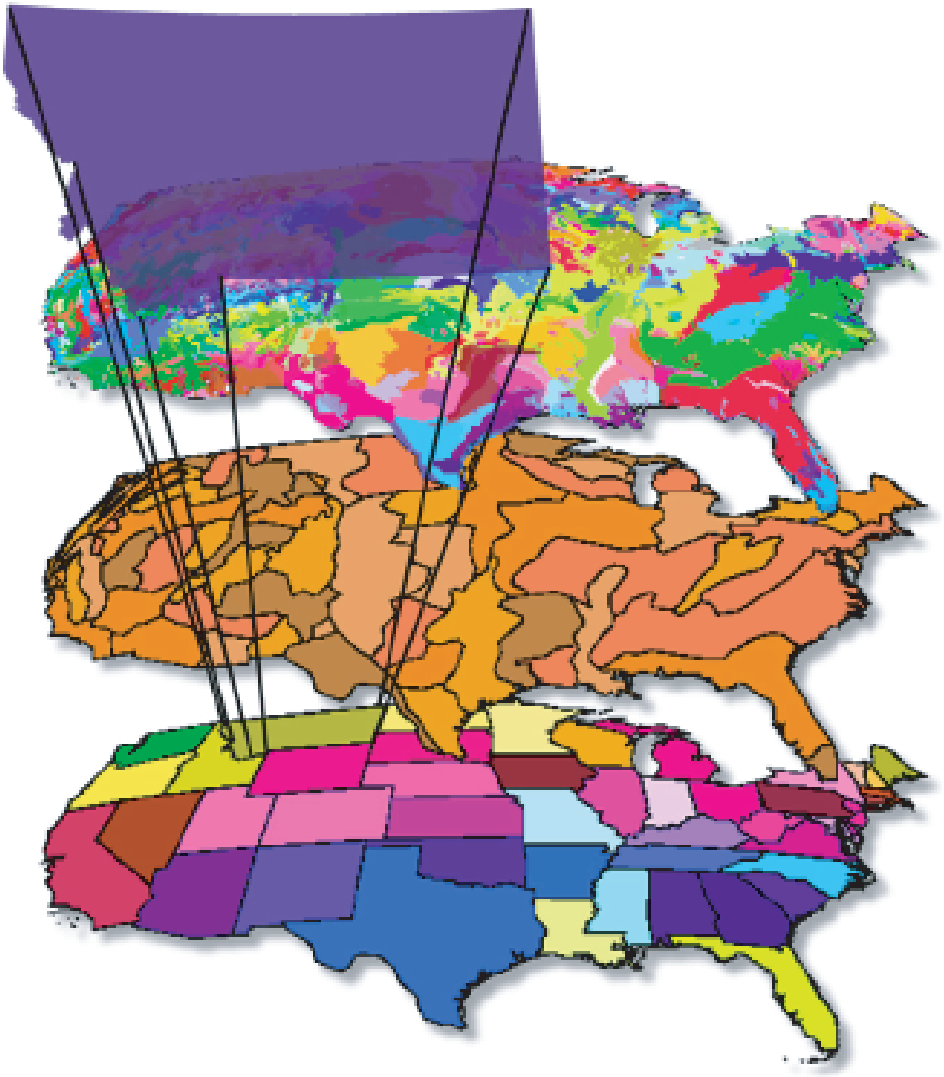
A GAP ANALYSIS OF MONTANA

1998 Final Report



A GEOGRAPHIC APPROACH TO PLANNING FOR BIOLOGICAL DIVERSITY

U.S. Department of the Interior
U.S. Geological Survey

THE MONTANA GAP ANALYSIS PROJECT

FINAL REPORT

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EXECUTIVE SUMMARY

Introduction

The Montana Gap Analysis project (MT-GAP) began in 1991 for the purpose of identifying vegetation types and areas of high vertebrate species richness in the state that may lack adequate protection under existing land ownership and management regimes. Montana is the fourth largest state in the union and one of the least populated. When the project began, there were few statewide datasets available. Consequently, much effort was devoted to building key data layers at sufficiently fine scale and resolution for subsequent analysis. These data layers included: 1) land cover and existing vegetation at a 2 ha minimum map unit (MMU), 2) ownership and management of public lands (1:100,000 scale), and 3) predicted distributions of 425 terrestrial vertebrates that occur in the state. At the completion of the project, these data became freely available, with the intent that they be widely used, not only by those directly responsible for managing the state's valuable natural resources, but also by the public at large, so that everyone can be better informed. With this in mind, we emphasize that these data are dynamic, and in some places, already out-of-date. Nonetheless, the data and analyses which constitute MT-GAP represent an important first step toward planning for the conservation of biodiversity in Montana.

Database Development

Land Cover

The land cover of Montana was mapped by a two-stage, digital classification procedure that was applied independently to 33 Landsat Thematic Mapper (TM) images covering the state. All TM images were "collected" during the growing season (mid-June to early September) between 1991 and 1994. In the first stage, data from TM channels 4, 5, and 3 were combined in an unsupervised classification, and then pixels were merged into raster polygons conforming to designated MMUs on the basis of their spectral similarity. Digital elevation models (7.5 minute wherever available), hydrography, and ground-reference data then were used in supervised classifications to label each mapping unit (raster polygon) according to its land cover type. A total of 50 different land cover types were mapped across the state. The single most abundant type was Low/Moderate Cover Grasslands, which comprised 24.7% of the state; as a group, grasslands covered more than 37% of the state. Twenty-four percent of the state was forested; 19 different forest types were mapped, the most common of which were Mixed Subalpine Forest, Douglas-fir, and Lodgepole Pine. Shrublands comprised another 14%, and riparian types were limited to 3.9% of the state's land area. Urban or Developed Lands occupied less than 1% of this land area, but agricultural lands comprised nearly 15%. Barren types, including rock, snow, or ice, covered 4.3% of the state, and slightly more than 30,000 ha (0.08%) could not be mapped because of cloud cover in the TM imagery.

Thematic accuracy of the land cover map was assessed using a bootstrap method which did not require the collection of an independent set of reference data. Cover type classification accuracies were estimated for 45 types; these averaged 61.4%, and ranged from 4.4% for Western Hemlock to 93.2% for Missouri Breaks. Interpolation of the mean error estimates at each ground reference point allowed us to map the land cover accuracy across the state. Estimated mean accuracy exceeded 80% in the southwest corner (Beaverhead and Madison Counties) and in the western portion of the Highline in Glacier, Toole, and Pondera Counties; lower estimated accuracies were associated with some of the insular mountain ranges in central Montana from Gallatin County north through Cascade and Judith Basin Counties.

Predicted Vertebrate Distributions

Distributions of 425 terrestrial vertebrate species were predicted, including 16 amphibians, 17 reptiles, 290 birds, and 102 mammals. The modeling process involved several steps. First, range limits for each species were delineated on the basis of existing information about the species' presence or absence within either a latilong grid system for birds, or the Environmental Protection Agency's (EPA) hexagon grid system for amphibians, reptiles, and mammals. Next, associations between species and habitat features such as land cover, elevation, and distance to water were researched and summarized in a Wildlife-Habitat Relationships (WHR) database. After preparing the necessary GIS layers to represent these habitat features, a raster-based modeling approach was used to combine the distributional limits and WHR databases into predicted distributions for each species at a resolution of 90 m grid cells. The actual modeling rules and preliminary maps of the predicted distributions were reviewed by nearly 50 biologists from around the state. After review, any necessary changes were made to the range limits and model rules. Once all predicted distributions were complete, species checklists from 14 wildlife refuges and other management units around the state were used to evaluate their accuracy. This involved a comparison between predicted and observed species' presence, not absence. As such, it cannot be considered a complete accuracy assessment, in part because potential sampling errors in the validation data limited our ability to distinguish between commission errors and correct predictions of absence.

Geographic patterns of vertebrate species richness indicated generally higher diversity in the mountainous regions of western Montana, and lower values in eastern Montana. Not surprisingly, the high diversity was observed along ecotones and in riparian areas, where habitat diversity was correspondingly high. Comparisons between predicted and observed species presence at 14 areas around the state indicated relatively low omission error rates (< 10%), but considerably higher rates of commission errors (24-41%). This means that the models were more likely to overpredict species distributions than to underpredict them. In the context of most management decisions, this is desirable for the same reason that Type I statistical errors are more serious than Type II errors. Failure to predict a species' presence in an area where it actually occurs may cause inadvertent harm if land-use decisions are made without that species in mind. If, however, a species is predicted to occur where it has never been recorded, it is more likely that the species will be targeted in future surveys and also considered in subsequent land-use decisions.

Land Stewardship & Management

The term "stewardship" is used in place of "ownership" because legal ownership, especially in the case of public lands, does not necessarily identify the entity responsible for management of the land resource. At the same time, it is necessary to distinguish between stewardship and management status because a single land steward, such as a national forest, may manage portions of its lands differently.

The digital land stewardship layer was created by incorporating various administrative boundaries into a base layer of land ownership obtained from the BLM, Montana State Office. The BLM produced a base layer by scanning the plates from their 1:100,000 scale Surface Management Series maps. We added some additional information to this base layer, but only for lands managed to protect some elements of biodiversity (i.e., Status 1 and 2). Each map unit in the stewardship layer was assigned a management status code. Management plans for public lands were consulted when available; otherwise agency personnel were consulted.

Lands were assigned to one of four management classes based on the relative degree to which land stewards were responsible for maintaining biodiversity values. Status 1 lands reflected the

highest, most permanent level of restrictive management; such lands included National Parks, designated Wilderness Areas, state Wildlife Preserves, Nature Conservancy Preserves, and National Wildlife Refuges where grazing was not permitted. Management could be changed more easily on Status 2 lands, such as Wilderness Study Areas, Wildlife Management Areas, and National Wildlife Refuges where grazing was permitted, but it was still more restrictive than the remaining multiple use public lands, which were assigned to Status 3. Finally, Status 4 included all private lands with no irrevocable easement or mandate to preserve biodiversity values.

Public lands administered by federal and state agencies comprise approximately 35% of Montana. Most federal lands in the western half of the state are managed by the U.S. Forest Service and the National Park Service, whereas most federal lands in the eastern portion of the state are managed by the BLM. Status 1 and 2 lands occupy less than 10% of the state and are generally found at higher elevations. Status 3 and 4 lands occupy more than 90% of the state, and well over half of these are in private ownership.

Analyses

Once the requisite statewide data were assembled, the actual gap analysis involved intersecting the GIS layers of land cover and predicted vertebrate distributions with land stewardship. Generally, the results indicated that high elevation cover types and associated vertebrate species should be relatively well protected under Status 1 and 2 management regimes. But even in these areas, biodiversity elements could be threatened by disease (e.g., white pine blister rust) and the introduction of exotic weeds. Two areas in the state appear to be rich in vertebrate diversity and perhaps in need of a finer filter analysis -- the East Front of the Rocky Mountains and the Bighorn/Powder River basins in southeast Montana. The former is a very scenic area, which is rich in birds and mammals. Much of the non-forest portion of this area is privately owned, and although relatively large areas have been protected by various conservation measures during the past 20 years, more efforts likely will be required to maintain the ecological integrity of the East Front. The second area, the Bighorn and Powder River basins, are rich in mammals and reptiles. Underlying these lands, however, are massive coal deposits which threaten the long-term viability of this area for wildlife habitat. We also note with some surprise that the longest free-flowing river in the Lower 48 states, the Yellowstone, has no formal protection anywhere along its banks.

Conclusions

The land cover and vertebrate distribution data developed for Montana Gap are the most detailed ever produced for the entire state. These data are based on a 90 m^2 statewide grid which contains more than 4.5 million grid cells. One of 50 different land cover types was assigned to each cell, and information pertaining to 425 terrestrial vertebrates was synthesized into rules for predicting species' presence and absence in each cell. The resulting datasets are large and complex, which may complicate their use by state and regional managers, as well as by policy makers. Moreover, we found through the review process that the 90 m resolution was often still too coarse for many wildlife biologists whose day-to-day concerns operate at even finer scale, project levels. This may make product acceptance and use even more difficult.

In spite of these challenges, we point out that the relatively fine scale at which we mapped the state's land cover should make the data useful for considerably more than predicting wildlife distributions. For example, we have already extended this work to the dasymetric mapping of human population density (Holloway et al. 1998), median income, and median age of housing unit across 34 counties in Montana. These results, in turn, could become inputs for improving vertebrate distribution models or predicting where future conflicts are more likely to occur.

With the methodologies and reference data in place, remapping or updating land cover would be a relatively straight-forward process. Although 23,351 ground-truth plots sound adequate, we believe that higher accuracies would result from additional data, especially from certain areas in central and eastern Montana. We do not advocate expensive field surveys, however, but rather consideration by a consortium of state and federal agencies to fund airborne video sampling, at least across areas like the Bighorn and Powder River basins where it may be important to improve land cover mapping and to monitor changes in land use.

Validation of predicted vertebrate distributions also could be expanded by using more extensive datasets, such as those from the Forest Service, Northern Region Landbird Monitoring Program (Hutto 1995). Additional sites in eastern Montana might have to be targeted for future field surveys as well.

The vertebrate distribution models themselves also could be improved in many ways. For example, incorporating interspecific relationships into the models could yield important insights. Although competitors, predators, and brood parasites may not actually limit the distribution of other species, they certainly affect habitat quality. Greene et al. (in press) examined the predicted breeding distribution of Lazuli Buntings in relation to that of Brown-headed Cowbirds in the state; their results indicated that more than 90% of nesting buntings in Montana may be vulnerable to cowbird parasitism. Similar analyses could be carried out for many other host or prey species.

Finally, at the risk of pointing out the obvious, managers of public lands in Montana have more ready opportunities to manage for biodiversity in some landscapes than they do in others. For example, more than 90% of several cover types, including Missouri Breaks and Mixed Whitebark Pine Forest, is managed by federal agencies. Consequently, these types and any associated wildlife species ought to be easier to manage than several of the riparian cover types, the vast majority of which occur on privately owned lands. Thus, it should come as no surprise that conservation of riparian areas, and their associated species, will depend on participation from the private sector. Elected officials at all levels of government can certainly help encourage this participation through enactment of laws which make conservation more appealing than development.

Data Uses and Availability

How To Obtain the Products

It is the goal of the Gap Analysis Program and the USGS Biological Resources Division (BRD) to make the data and associated information as widely available as possible. Use of the data requires specialized software called geographic information systems (GIS) and substantial computing power. Additional information on how to use the data or obtain GIS services is provided below and on the GAP homepage (URL below). Although the most convenient way to obtain and store the data may be on CD-ROM, they also can be downloaded via the Internet either from the national GAP home page (http://www.gap.uidaho.edu/gap) or the Natural Resource Information System at the Montana State Library (http://www.nris.mt.gov/).

Hardware/Software Recommendations

The datasets comprising MT-GAP were created with the ARC/INFO Grid module running on IBM RS/6000 workstation computers (under AIX 4.1) with at least 128 megabytes of RAM and 4 gigabytes of local disk. Although the total dataset is large, most of the individual files are relatively

small; the largest single file is the land cover layer (<50 megabytes), and most files are closer to 5 megabytes in size. Despite the size of the overall dataset, its availability on CD-ROM minimizes the need for large amounts of free disk space. Powerful computers should not be required to process MT-GAP data, but they could only help: queries and analyses should run faster with more memory and faster processors, and when restricted to study areas smaller than the entire state. For users without access to ARC/INFO, display and query should be feasible using the ARC/VIEW Spatial Analyst software.

Disclaimer

Below is the official USGS, Biological Resources Division (BRD) disclaimer as of 29 January 1996, followed by additional disclaimers from GAP. Prior to using the data, you should consult the national GAP home page (see How to Obtain the Products, above) for the current disclaimer.

Although these data have been processed successfully on a computer system at the BRD, 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 BRD 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 Resources 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 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 Resources Division makes no claim as to the data's suitability for other purposes. This is writable data which may have been altered from the original product if not obtained from a designated data distributor identified above.

ACKNOWLEDGMENTS

An effort of this magnitude requires input, assistance, and support from many people. Below we attempt to identify and thank all those as best we can, and we apologize for any omissions along the way.

Several individuals deserve special acknowledgment for their strong commitment to the project from its inception through its completion. First and foremost, we thank Joe Ball, Leader of the Montana Cooperative Wildlife Research Unit, and Mike Scott, Leader of the Idaho Cooperative Fish and Wildlife Research Unit; these two individuals not only initiated the MT-GAP project, but they also helped guide it along its sometimes agonizing and circuitous route to completion. We also extend special thanks to Virginia Johnston, Vanetta Burton, and Pam Tollefson at the Montana Cooperative Wildlife Research Unit, as well as to Ray Murray, Lloyd Chesnut, Ken Hubbard, Pat Bristol, and Sheila Hoffland at the University of Montana's Office of Research and Sponsored Programs. Many friends and colleagues at UM helped us with matters ranging from image analysis to network system administration to integrating maps into relational databases. These individuals include Gary Gooch, Will Gustafson, Jodi Handley, John Hinshaw, Steven Holloway, Ashley Jones, Charlie McGuire, Guy McWethy, Kathy Jurist Novasio, Ron Righter, Desi Rollefson, Dave Schirokauer, Steve Stegman, Claudine Tobalske, Nico Tripcevich, Judy Troutwine, Anne Vander Meer, and Bill Zollinger. Our colleague Jim Schumacher deserves special mention, not only for preparing many of the figures in this report, but also for sharing his considerable cartographic skills and experience with us over the years.

In addition to providing technical advice, moral support, and financial backing, Mike Scott, Mike Jennings, and Patrick Crist were very patient with our efforts over the years; we only hope that they are pleased with the fruits of all our labors. We also are grateful for the assistance provided to the National Gap Analysis Program (and to us) by Kathy Merk, Becky Sorbel, and Elisabeth Brackney. Finally, individuals from the Wyoming Gap Analysis project shared considerable wisdom from the perspective of those who have "been there". Special thanks go to Ken Driese, Margo Herdendorf, Tom Kohley, and Evie Merrill, all of whom not only contributed data to help get us started, but also inspired us by their example of how to get things done.

Land Cover

A number of people were instrumental in getting the land cover mapping process off on the right track. Wendel Hann from the Forest Service, Northern Regional Office had the vision and trust to support our early efforts, not only with much needed funding, but also with valuable field data. Ken Driese from the Wyoming Gap Analysis project generously shared his knowledge and experience about methods and land cover classification systems. Ray Ford took an early interest in many challenges, both computational and administrative, that arise in a project of this scope; over the years he devised and recommended many elegant solutions. Moreover, he further inspired several graduate students in the UM Computer Science Department, notably Jin Guo and Steve Barsness, to develop newer and better "Merge" algorithms which ultimately contributed to the success of our digital mapping process.

Classification and labeling of the 11 TM images in western Montana was funded by the Forest Service, Northern Region. Martin Prather provided the leadership and guidance to see it through to completion; he was assisted by three different Contracting Officers -- Jim Hamilton, Roger Thomas, and Dallas Summerfield. Dave Atkins devoted nearly two years to managing the day-to-day interactions between our respective organizations. Further coordination between Forest Service field crews and this lab was provided by Kristen Loken, Marcy Mahr, and one of us

(Fisher). The sometimes thankless job of data entry was carried out with care by Gerri Deleo and Pat Mikota. Field data then were processed, formatted, and transferred to us by Dave Browder, John Caratti, Mike Jensen, and Rosa Nygaard. Biophysical data related to landform boundaries in Montana were provided by John Nesser. Dick Roullier and Bill Tanke helped us acquire all 7.5 minute DEM's and Cartographic Feature Files available for the state from the Forest Service Geometronics Service Center. A number of other Forest Service personnel also deserve special mention: Art Zack (Idaho Panhandle), Pat Green (Nez Perce), Sonny Castille (Clearwater), Dan Leavell (Kootenai), Maria Mantas (Flathead), Nora Leetch (Lolo), Janet Johnson and Linda Pietarinen (Bitterroot), John Joy (Deer Lodge), Lee Harry and Dan Svoboda (Beaverhead), Lois Olsen (Helena), Tim Horn (Lewis and Clark), Julie Neff-Shea (Gallatin), and Jeff DiBenedetto (Custer).

Processing of the 22 remaining TM images was funded by Montana Fish, Wildife & Parks. We thank Don Childress, Steve Knapp, Glenn Erickson, and Heidi Youmans for supporting this effort. Kathie Jewell and Bill Volk from the BLM, Montana State Office, also helped coordinate and fund several trips to BLM Offices in eastern Montana to gather existing reference data. For their time and assistance, we thank a number of BLM personnel, including Ron Soiseth, Mike Gilkerson, John Grensten, Huey Long, and Roy Taylor from the Phillips Resource Area Office; John Fahlgren, Steve Klesssens, Ray Neumiller, and Dave Waller from the Valley Resource Area Office; Lou Hagner from the Havre Resource Area Office; Larry Rau and Sally Sovey from the Headwaters District Office; and Gerry French, Todd Christensen, Dawn Doran, Louise Demontigny, Kent Bowen, Holger Jensen, Kathy Lehman, Larry Padden, Ken Hanify, and Jay Parks from the Miles City District Office. Additional ground-truth data were transferred to us from the Forest Service by Jeff DiBenedetto (Custer), John Lane (Custer), Kent Houston (Shoshone), and Chris Grove (Black Hills), and by Marty Holko and Doug Harrison from the Natural Resource Conservation Service, NRI Program.

Many other people deserve special mention for actively assisting us with mapping Montana's land cover. These include Carl Key, Laurie Kurth, and Richard Menicke (Glacier National Park); Mike Rabenberg (Medicine Lake National Wildlife Refuge); Steve Fourstar (Bureau of Indian Affairs); Jim Byer, Dan Dupuis, Sam Morigeau, and Art Soukalla (Confederated Salish & Kootenai Tribes); Chuck Finan and Frank Roberts (Coeur d'Alene Tribe); Ray Callaway, Paul Hansen, Bob Pfister, and Anna Sala (University of Montana); and Andy Hansen, Matt Kraska, Robin Patten, and John Wilson (Montana State University). Finally, Brian Steele helped us to develop new techniques for estimating and mapping the thematic accuracy of the land cover classifications.

Vertebrate Modeling

Nearly 50 individuals reviewed drafts of habitat associations, model rules, and the predicted distributions for the 425 terrestrial vertebrates. These reviewers include, in alphabetical order, Kathy Ake, Eric Atkinson, John Carlson, Chuck Carlson, Dan Casey, Jeff Copeland, Steve Corn, Lance Craighead, Pat Dolan, Kristi DuBois, Mike Enk, John Ensign, Charlie Eustace, John Firebaugh, Dennis Flath, Steve Gniadek, Don Godtel, John Grensten, Sallie Hejl, Colin Henderson, Bob Henderson, Paul Hendricks, John Hoffland, Denver Holt, Dick Hutto, Jamie Jonkel, John Malloy, Harriet Marble, Jeff Marks, Steve Martin, Randy Matchett, Bryce Maxell, Clint McCarthy, Terry McEneaney, Ted Nordhagen, Harvey Nyberg, Alison Perkins, Dwain Prellwitz, Mike Rabenberg, Sue Reel, Andy Sheldon, Mike Thompson, Nancy Warren, Kirwin Werner, Vita Wright, and Jock Young. We are immensely grateful to all these individuals for their time and feedback, and we certainly hope their efforts are reflected in the final product.

In addition to providing many essential data, Cedron Jones, Paul Hendricks, Margaret Beer, Pete

Feigley, Kathy Jurist Novasio, and others at the Montana Natural Heritage Program were always willing to assist in many small ways and thereby to ensure that we used the information from their databases properly. As Zoologist for the Montana Natural Heritage Program, the late Jim Reichel made major contributions to populating hexagons, and to developing amphibian and reptile models. For completion of these herptile models, we thank Chuck Peterson, Bryce Maxell, and Paul Hendricks.

Land Stewardship

Development of the land stewardship layer began with an ownership base prepared by the BLM, Montana State Office, from its 1:100,000 scale Surface Management Series maps. This ambitious effort was conceived and directed by Kathie Jewell and Burt Williams; we are also grateful to Corla DeBar at the BLM, Montana State Office, for her willingness and ability to answer many of our questions about the BLM data. Cedron Jones (Montana Natural Heritage Program) deserves special thanks for the innumerable ways in which he helped us transform the BLM files into a final stewardship layer. The BLM data were supplemented with ownership and management information obtained from the following agencies (and individuals): Montana Natural Heritage Program (Cedron Jones, Gerry Daumiller, and John Hinshaw), Montana Fish, Wildlife & Parks (Lydia Bailey, Jeff Hutton, Janet Decker-Hess, and Darlene Edge), U.S. Bureau of Indian Affairs (Steve Fourstar), U.S. Forest Service, Northern Region (Kim Foiles and Kent Nelson), U.S. Bureau of Reclamation (Mark Beatty), Glacier National Park (Jack Potter), Charles M. Russell National Wildlife Refuge (Randy Matchett), and Plum Creek Timber Co. (John Woods). Finally, the dichotomous key developed by Bruce Thompson and Patrick Crist to assign management status codes to public lands in New Mexico was particularly helpful to our efforts as well.

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1. INTRODUCTION

How This Report is Organized

This report is a summation of a complex scientific project. Its organization follows the general chronology of the project, beginning with the production of the individual data layers and concluding with analysis of the data. It departs from standard scientific reporting by mixing results and discussion within individual chapters. This was done to provide users of the data layers with a concise and complete reference for each data and analysis product.

We begin with an overview of the Gap Analysis mission, concept, and limitations, and then describe the state and how its current landscape conditions came to be. Following that are chapters on the individual data layers: mapping land cover, predicting animal distributions and species richness, as well as land stewardship mapping and categorization. Next is an analysis chapter, which reports on the status of the elements of biodiversity (natural community alliances and terrestrial vertebrate species) in Montana. Finally, we describe the management implications of the analytical results and provide information on how to acquire and use the data.

The Gap Analysis Program Mission

The mission of the Gap Analysis Program is to prevent conservation crises by providing conservation assessments of native vertebrate species and their habitats and to facilitate the application of this information to land management activities.

This is accomplished through the following five objectives:

1) Map actual land cover as closely as possible to the Alliance level (Grossman et al. 1998).
2) Map the predicted distribution of those terrestrial vertebrates that spend any important part of their life history in the project area and for which adequate distributional habitats, associations, and mapped habitat variables are available. Map other taxa as cooperative opportunities allow.
3) Document the representation of natural land cover types and animal species in areas managed for the long-term maintenance of biodiversity.
4) Make all GAP Project information available to the public and those charged with land use research, policy, planning, and management.
5) Build institutional cooperation in the application of this information to state and regional management activities.

To meet these objectives, it is necessary that GAP be operated at the state level but maintain consistency with national standards. Within the state, participation by a wide variety of cooperators is necessary and desirable to ensure understanding and acceptance of the data and forge relationships that will lead to cooperative conservation planning.

The Gap Analysis Concept

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, and biodiversity conservation at the state, regional, and national levels. The program seeks to facilitate cooperative development and use of information. Throughout this report we use the terms “GAP” to describe the national program, “GAP Project”

to refer to an individual state or regional project, and “gap analysis” to refer to the gap analysis process or methodology.

Much of the following discussion was taken verbatim from Edwards et al. 1995, Scott et al. 1993, and Davis et al. 1995. The gap analysis process provides an overview of the distribution and conservation status of several components of biodiversity. It uses the distribution of actual vegetation and terrestrial vertebrates and, when available, invertebrate taxa. Digital map overlays in a GIS are used to identify individual species, species-rich areas, and vegetation types that are unrepresented or under represented in existing management areas. It functions as a preliminary step to the more detailed studies needed to establish actual boundaries for potential biodiversity management areas. These data and results are then made available to institutions as well as individual land owners and managers so that by having more complete knowledge about how these elements of biodiversity are managed, they can become more effective land stewards. GAP, by focusing on higher levels of biological organization, is likely to be both cheaper and more likely to succeed than conservation programs focused on single species or populations (Scott et al. 1993).

Biodiversity inventories 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, which has established Natural Heritage Programs in all 50 states, most of which are now operated by state government agencies. The Nature Conservancy employs a fine filter of rare species inventory and protection and a coarse filter of community inventory and protection (Jenkins 1985, Noss 1987). It is postulated that 85-90% of species can be protected by the coarse filter, without having to inventory or plan reserves for those species individually. A fine filter is then applied to the remaining 10-15% of species to ensure their protection. Gap analysis is a coarse filter method because it can be used to quickly and cheaply assess the other 85-90% of species.

The intuitively appealing idea of conserving most biodiversity by maintaining examples of all natural community types has never been applied, although numerous approaches to the spatial identification of biodiversity have been described (Kirkpatrick 1983, Margules and Nicholls 1987, Pressey and Nicholls 1989, Nicholls and Margules 1993). Furthermore, the spatial scale at which organisms use the environment differs tremendously among species and depends on body size, food habits, mobility, and other factors. Hence, no coarse filter will be a complete assessment of biodiversity protection status and needs. However, species that fall through the pores of the coarse filter, such as narrow endemics and wide-ranging mammals, can be captured by the safety net of the fine filter. Community-level (coarse-filter) protection is a complement to, not a substitute for, protection of individual rare species.

Gap analysis is essentially an expanded coarse-filter approach (Noss 1987) to biodiversity protection. The vegetation types mapped in GAP serve directly as a coarse filter, the goal being to assure adequate representation of all types in biodiversity management areas. Landscapes with great vegetation diversity often are those with high edaphic variety or topographic relief. When elevational diversity is very great, a nearly complete spectrum of vegetation types known from a biological region may occur within a relatively small area. Such areas provide habitat for many species, including those that depend on multiple habitat types to meet life history needs (Diamond 1986, Noss 1987). By using landscape-sized samples (Forman and Godron 1986) as an expanded coarse filter, gap analysis searches for and identifies biological regions where unprotected or under represented vegetation types and vertebrate species occur.

A second filter uses combined species distribution information to identify a set of areas in which all, or nearly all, mapped species are represented. There is a major difference between identifying the richest areas in a region (many of which are likely to be neighbors and share essentially the

same list of species) and identifying areas in which all species are represented. The latter task is most efficiently accomplished by selecting areas whose species lists are most different or complementary. Areas with different environments also tend to have the most different species lists for a variety of taxa. As a result, a set of areas with complementary sets of species for one higher taxon (e.g. mammals) often will also do a good job representing most species of other taxa (e.g. trees, butterflies). Species with large home ranges, such as large carnivores, or species with very local distributions may require individual attention. Additional data layers can be used for a more holistic conservation evaluation. These include indicators of stress or risk (e.g. human population growth, road density, rate of habitat fragmentation, distribution of pollutants) and the locations of habitat corridors between wildlands that allow for natural movements of wide-ranging animals and the migration of species in response to climate change. These more detailed analyses were not part of this project, but are areas of research that GAP as a national program is pursuing.

General Limitations

Limitations must be recognized so that additional studies can be implemented to supplement GAP. The following are general project limitations; limitations for the specific data layers are described in the separate sections below.

1. GAP data are derived from remotely-sensed data and modeling procedures to make general assessments about conservation status. Any decisions based on the data must be supported by ground-truthing and more detailed analyses.

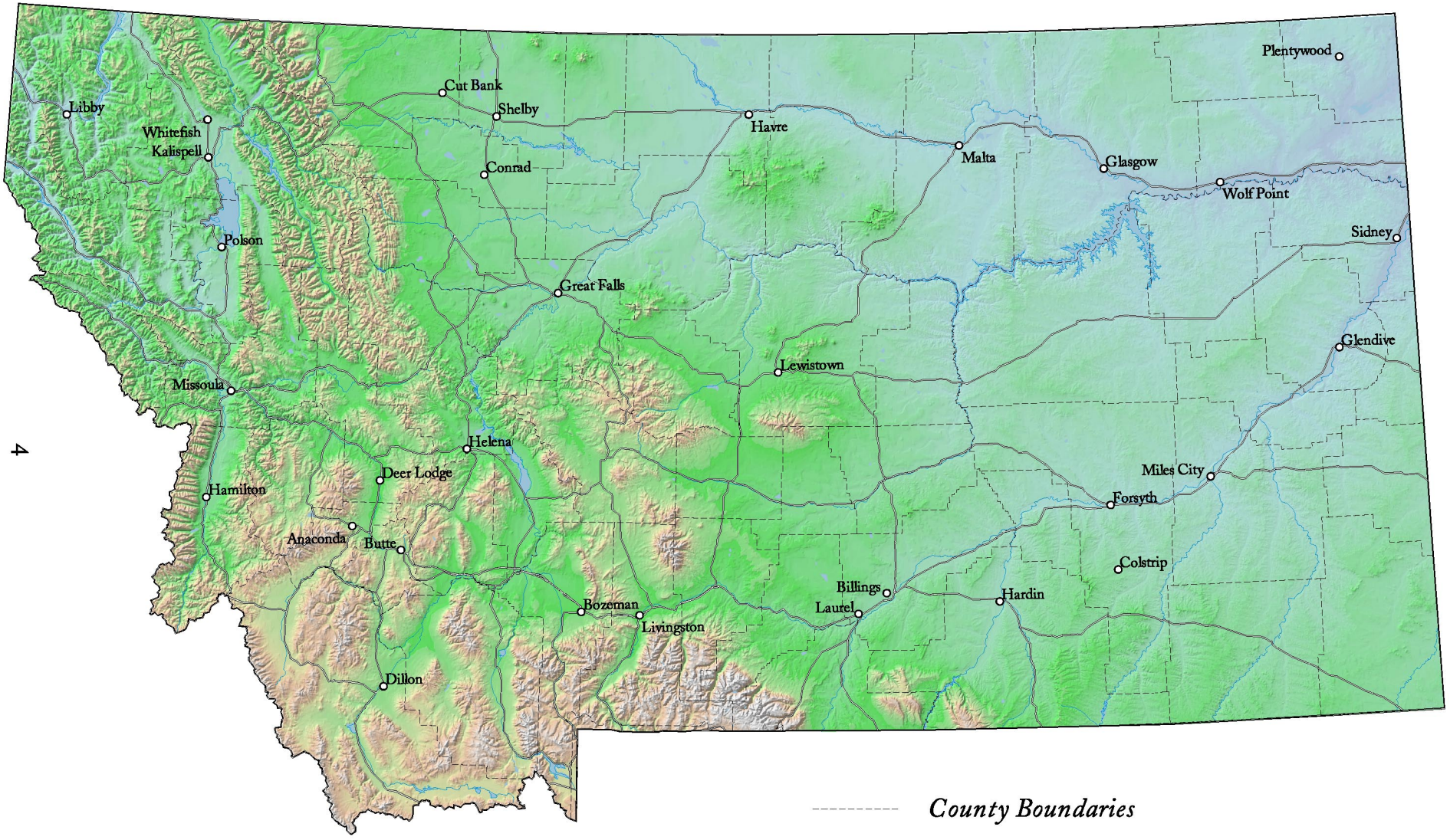
2. GAP is not a substitute for threatened and endangered species listing and recovery efforts. A primary argument in favor of gap analysis is that it is pro-active: it seeks to recognize and manage sites of high biodiversity value for the long-term maintenance of populations of native species and natural ecosystems before individual species and plant communities become critically rare. Thus, it should help to reduce the rate at which species require listing as threatened or endangered. Those species that are already greatly imperiled, however, still require individual efforts to assure their recovery.

3. GAP data products and assessments represent a snapshot in time generally representing the date of the satellite imagery. Updates are planned on a 5-10 year cycle, but users of the data must be aware of the static nature of the products.

4. GAP 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, and provides focus and direction for local, regional, and national efforts to maintain biodiversity (see Appendix 1.1 for examples). The process of improving knowledge in systematics, taxonomy, and species distributions is lengthy and expensive. That process must be continued and expedited, however, in order to provide the detailed information needed for a comprehensive assessment of our nation's biodiversity. Vegetation and species distribution maps developed for GAP can be used to make such surveys more cost-effective by stratifying sampling areas according to expected variation in biological attributes.

The Study Area

As the fourth largest state in the nation, Montana covers approximately 38.1 million hectares (94.1 million acres). It is a vast and structurally complex area that is generally characterized by the Rocky Mountains in the west and the Great Plains in the east (Figure 1.1). These landscapes date



County Boundaries

Major Lakes and Rivers

Major Roads

Major Towns

Figure 1.1. A relief map of Montana showing major towns, highways, lakes, and rivers in relation to county boundaries.

back more than 600 million years when the present-day sandstones, shales, and limestones began to be formed as sedimentary marine deposits. Nearly 100 million years ago, in what was to become the mountainous western portion of the state, these sedimentary formations and their underlying basement rocks (such as those currently found in the Beartooth, Gravelly, and Ruby Ranges), began to be uplifted and folded by tectonic actions associated with the collision of the North American and Pacific plates (Alt and Hyndman 1986). These sedimentary and metamorphic rocks were further uplifted and pushed aside by intrusions of granite, most notably in the Bitterroots and Boulder Mountains. More recent, though still very old volcanic intrusions helped shape other mountains in the state like the Gallatin and Absaroka Ranges in the Greater Yellowstone area, as well as many insular ranges like the Highwood, Bears Paw, Adel, Crazy, and Little Rocky Mountains. The most recently formed mountains like the Little Belts, Judiths, Bridgers, and Big Snowies developed as upthrusts along major fault lines. Finally, the forces of erosion and glaciation have counteracted all the mountain-building events to shape the present Montana landscape.

East of the Rocky Mountains lie the Great Plains. These too were formed by the geologic upheaval to the west and the ensuing processes of sedimentation and erosion. Only in the northeastern part of the state, where large continental glaciers smoothed out the ancestral landscape and created thousands of pothole wetlands, is the terrain relatively flat. Elsewhere, the plains of eastern Montana are arid, eroded landscapes dominated by bluffs, buttes, ridges, and coulees. These forms are most dramatically developed in the Missouri River Breaks in central Montana and Badland formations in the far eastern part of the state.

From the Continental Divide, waters in the state flow predominately west to the Pacific Ocean via the Clark Fork, Flathead, and Kootenai Rivers, and east to the Atlantic via the Missouri and Yellowstone Rivers. A small area in the northeastern portion of Glacier National Park drains north to Hudson Bay via the St. Mary and Belly Rivers. Elevations in the state range from 597 m (1820 ft) above sea level where the Kootenai River flows into Idaho, to nearly 4200 m (12,799 ft) at the summit of Granite Peak in the Beartooth Mountains.

General climate patterns in the state also reflect the topography (Caprio and Nielsen 1992). West of the Continental Divide, maritime conditions from the Pacific prevail; temperatures are less extreme than to the east and precipitation is more plentiful, averaging 50 cm per year in the mountain valleys, and reaching 305 cm/yr at the Grinnell Glacier in Glacier National Park. East of the divide, however, temperatures fluctuate more widely and precipitation is less than to the west. Temperatures in summer often exceed 100 degrees (F) along the lower Yellowstone River and drop below -35 degrees in winter; mean precipitation east of the divide is 33 cm/yr, with the driest area (15 cm/yr) lying in the rain shadow of the Beartooths along the Clarks Fork of the Yellowstone River south of Belfry.

Averaging slightly more than 6 people per mi^2, Montana is one of the least populated states, ranking third behind Alaska and Wyoming. The Census Bureau estimated Montana's 1996 population to be 879,372; most inhabitants reside in or near the cities of Billings, Great Falls, Helena, Butte, Missoula, Bozeman, and Kalispell (Merrill and Jacobson 1997). Since Lewis and Clark charted the way west through the state nearly 200 years ago, people from many different ethnic groups followed to seek their fortunes from furs, gold, land, cattle, timber, minerals, and recreation. Today, the state's population is predominately white (92%); American Indians comprise 6% of the population. These native people represent 11 different tribal groups, and most live on 7 reservations scattered around the state.

Grazing and agriculture predominate almost wherever they are economically viable; the same can be said for lumber, mining, and tourism. Fire represents the largest natural disturbance process operating in the state. Reflecting the variable nature of land ownership patterns in the state, land management practices vary from being relatively simple and straightforward in remote areas of rock, snow, and ice, to being complex and highly controversial in and around places like Yellowstone and Glacier National Parks. Between these extremes, land management tends to be complicated by competing demands for water, grazing, timber, and petroleum resources. Thus the stage is set for a timely gap analysis.

2. LAND COVER CLASSIFICATION AND MAPPING

Introduction

Patterns of natural vegetation are determined by many physical and chemical forces and disturbances which work together to shape the environment of a given land area (Whittaker 1965). In turn, these vegetative patterns often relate directly to patterns of overall biological diversity in an area (Levin 1981, Noss 1990, Franklin 1993). Gap Analysis, in its "coarse filter" approach to conservation (e.g., Jenkins 1985, Noss 1987), relies on maps of dominant natural land cover as the fundamental spatial component for terrestrial analyses and assessments (Scott et al. 1993).

There are three general steps to mapping land cover: 1) adopt or develop a classification system of the types, 2) delineate units or cartographic "objects", and 3) assign a class label to each areal unit. Then, for the map to be most useful, its thematic accuracy must be assessed. How we accomplished each of these steps for MT-GAP is described below.

Land Cover Classification

Land cover classifications must rely on specified attributes, such as the structural features of plants, their floristic composition, or environmental conditions, to consistently differentiate categories (Küchler and Zonneveld 1988). Criteria for a land cover classification system for GAP include: (a) its ability to distinguish among different types of dominant vegetation that occur in a region; (b) the suitability of the classes for modeling vertebrate species habitats; (c) the transportability of the classes within and among different biogeographic regions; (d) how well the classes represent patterns and features that can be delineated and distinguished from Landsat Thematic Mapper (TM) imagery; (e) the capability to link with classification systems used by other organizations and nations to the greatest extent possible; and (f) the capability to fit, both categorically and spatially, with classifications of other themes such as agricultural and built environments.

For GAP, the system that best fits these criteria is the National Vegetation Classification System (Grossman et al. 1998) which is based on the structural characteristics of vegetation derived by Mueller-Dombois and Ellenberg (1974), adopted by the United Nations Educational, Scientific, and Cultural Organization (UNESCO 1973) and later modified for application to the United States by Driscoll et al. (1983, 1984). The basic assumptions and definitions for this system have been described by Jennings (1993) and Grossman et al. (1998).

In 1991, at the outset of MT-GAP, there was no classification system for existing vegetation available for Montana, and by the time our land cover map was completed in 1997, we were aware of no complete list of alliance types for the state. Consequently, we followed the lead of neighbors in Wyoming (Merrill et al. 1996) and developed a classification based on the hierarchical design of Anderson et al. (1975). Land cover types were targeted and defined according to known occurrences in the state and from classifications used for GAP projects in both Idaho (Caicco et al. 1995) and Wyoming (Merrill et al. 1996). We believe these types have been cross-walked to regional and national classification systems at the University of Idaho.

Mapping Standards

No formal standards were in effect at the time MT-GAP began in 1991, although the target resolution was a 100 ha minimum map unit (MMU). Because of resistance from potential

cooperators to this relatively coarse level of resolution, we invested heavily early on to develop an approach that would allow us to map dominant cover types at a considerably smaller MMU, with an acceptable degree of spatial accuracy, and a mean thematic accuracy of 80%. Our final land cover map has a variable MMU, ranging from 0.8 ha (one 90 m^2 pixel) for water, riparian and woody draw cover types, to 100 ha (125 90 m^2 pixels) for clouds and cloud shadows. The intended MMU for all other cover types was 2 ha, the target of our final merge, but because the land cover grid was resampled from 30 m^2 to 90 m^2 pixels after this merge operation, some upland types do remain in the database as single 90 m^2 pixels. Most upland types, however, are found in patches 2.4 ha (three 90 m^2 pixels) or larger.

Methods

The Land Cover Classification Scheme

When we completed a statewide land cover map in 1997, our classification system contained 94 different cover types. For a variety of reasons, however, not all cover types were mapped consistently in each TM scene. Moreover, some cover types were very similar physiognomically, differing only in terms of dominant species composition. Thus to provide better consistency in terms of mapping "habitat" for terrestrial vertebrates in the state, we reduced the final classification system to 50 cover types (Table 2.1). These are illustrated and described in more detail in an accompanying *Montana Land Cover Atlas* (Fisher et al. 1998; see example in Appendix 2.1).

Imagery Used

Data from 33 Landsat TM images were used to map the land cover of Montana (Figure 2.1; Table 2.2). Thirty-one were purchased in a batch of mosaic-quality, terrain-corrected images from Hughes-STX Corporation in 1992; these were acquired during the growing seasons (June through early September) between 1989 and 1992. Later, when imagery from the Multi-resolution Land Characterization (MRLC) archive (EROS Data Center, Sioux Falls, SD) became available, we replaced two images (for P34/R28 and P35/R29) that were collected in 1989 with ones collected in 1993. We also used a third MRLC image to replace one in the northwestern corner of the state (P43/R26) that was quite hazy. Similarly, we substituted better data from a 1994 image purchased from EOSAT Corporation for P34/R27 to improve the map along the eastern edge of the state. All images were obtained in terrain-corrected format, with a final pixel size of 30 m^2, and, except for the MRLC images, in an Albers Equal Area Conic projection based on the following projection parameters:

Units = meters
Spheroid = Clarke 1866
Datum = NAD27
1st Parallel = 46 degrees
2nd Parallel = 48 degrees
Central Meridian = -109.5 degrees
Latitude of Projection's Origin = 44.25 degrees
False Easting = 600,000 meters
False Northing = 0

The MRLC images were reprojected from UTM to the same Albers projection, and manually mosaicked to fit with the adjacent images. The MRLC images also lacked band 6 which normally contains reflectance data from the thermal wavelengths (Loveland and Shaw 1996).

Table 2.1. The land cover classification system used for MT-GAP. These 50 land cover types were mapped across the entire state using Landsat TM imagery and ancillary biophysical data. Each cover type is illustrated, described, and mapped in an accompanying volume (Fisher et al. 1998; see Appendix 2.1).

I. Urban and Agricultural Lands

1100 Urban or Developed Lands
2010 Agricultural Lands - Dry
2020 Agricultural Lands - Irrigated

II. Grasslands

3110 Altered Herbaceous
3130 Very Low Cover Grasslands
3150 Low / Moderate Cover Grasslands
3170 Moderate / High Cover Grasslands
3180 Montane Parklands & Subalpine Meadows

III. Shrublands

3200 Mixed Mesic Shrubs
3300 Mixed Xeric Shrubs
3309 Silver Sage
3310 Salt-Desert Shrub / Dry Salt Flats
3350 Sagebrush
3510 Mesic Shrub - Grassland Associations
3520 Xeric Shrub - Grassland Associations

IV. Forest Lands

4000 Low Density Xeric Forest
4140 Mixed Broadleaf Forest
4203 Lodgepole Pine
4205 Limber Pine
4206 Ponderosa Pine
4207 Grand Fir
4210 Western Red Cedar
4211 Western Hemlock
4212 Douglas-fir
4214 Rocky Mountain Juniper
4215 Western Larch
4216 Utah Juniper
4223 Douglas-fir / Lodgepole Pine
4260 Mixed Whitebark Pine Forest
4270 Mixed Subalpine Forest
4280 Mixed Mesic Forest
4290 Mixed Xeric Forest
4300 Mixed Broadleaf & Conifer Forest
4400 Standing Burnt Forest

V. Water

5000 Water

VI. Riparian Types

6110 Conifer Riparian
6120 Broadleaf Riparian
6130 Mixed Broadleaf & Conifer Riparian
6200 Graminoid & Forb Riparian
6300 Shrub Riparian
6400 Mixed Riparian

VII. Barren Lands

7300 Rock
7500 Mines, Quarries, Gravel Pits
7600 Badlands
7604 Missouri Breaks
7800 Mixed Barren Sites

VIII. Alpine

8100 Alpine Meadows

IX. Perennial Snow & Ice

9100 Snowfields or Ice

X. Other

9800 Clouds
9900 Cloud Shadows

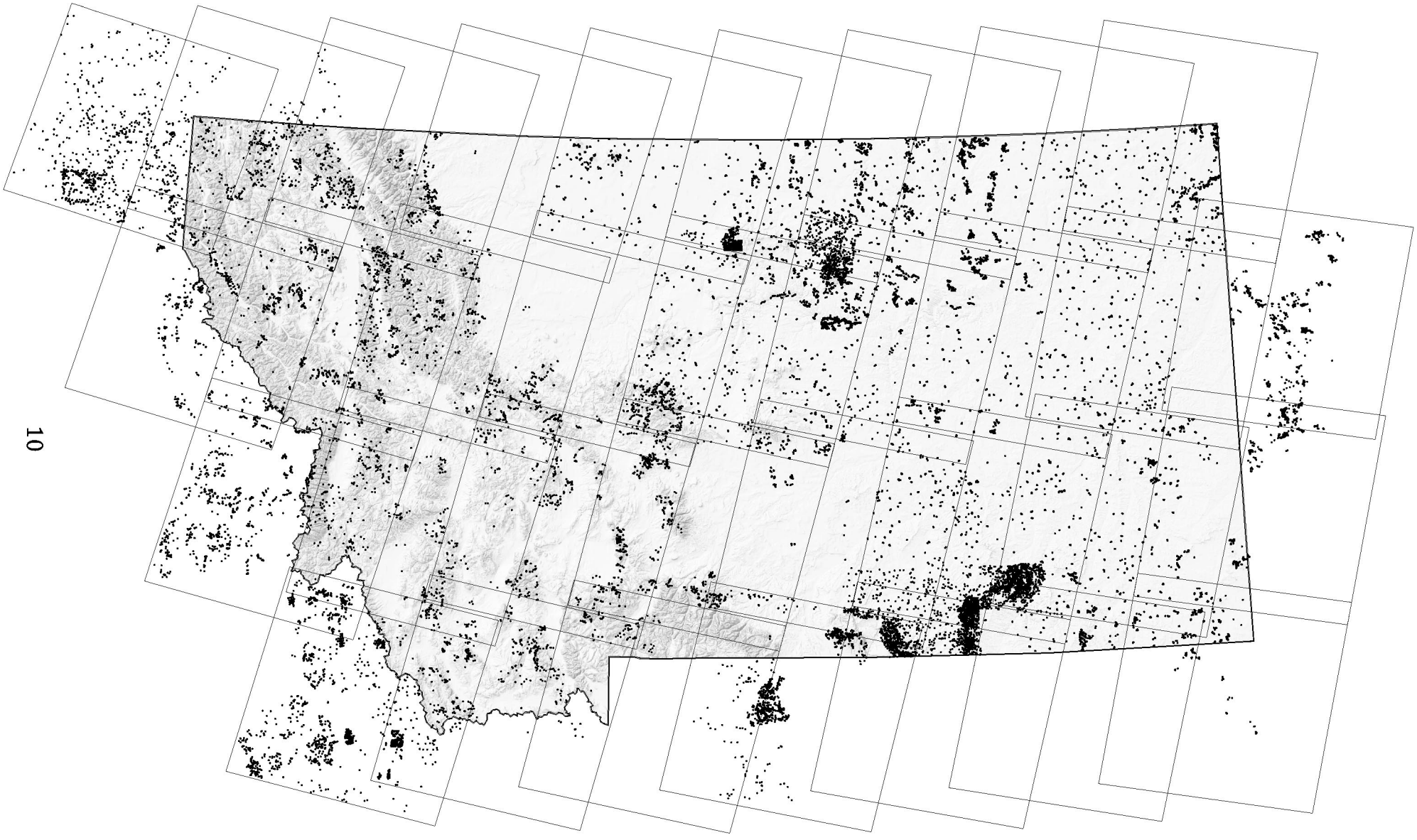


Figure 2.1. Distribution of ground-truth reference data (23,351 points) used to map land cover from 33 Landsat TM images and shown in relation to the TM scene boundaries.

Despite our best attempts, we could not obtain completely cloud-free imagery (Table 2.2). Fortunately, however, most clouds occurred either in areas of overlap between scenes, such that they could be excluded, or outside the state boundary. The patches of cloud and cloud shadow remaining in the final land cover map occurred in a few areas where we had no alternate data with which to replace them.

Map Development

To map existing vegetation and land cover across the state of Montana, we employed a two-stage, digital classification process. In the first stage, land cover patterns were delineated from a false-color composite of Landsat TM channels 4, 5, and 3 (assigned to Red, Green, and Blue, respectively) using an unsupervised classification algorithm (Ma et al. ms1.). Adjacent pixels of the same spectral class then were grouped into contiguous areas greater than or equal to specified map units. These spatial units were brought into ARC/INFO as raster polygons, termed *regions*. The second stage involved a supervised classification to label all regions according to land cover type (Ma et al. ms2). This general process was carried out independently for each TM image, then all 33 images were edge-matched to create a "virtually" seamless raster database, or series of grids, containing cover type attributes for each region. The cover type attribute was extracted from each of the 33 grids, and these were appended together into a single, land cover grid which then was clipped to the state boundary buffered by 10 km to facilitate edge-matching with other states (or provinces). Further details about how this grid was resampled to a final one with 90 m^2 cell size are described below under Processing Steps - Create Statewide Land Cover Grid, page 20.

All processing and analyses were conducted on IBM RS/6000 workstations running AIX (version 4.1). Primary commercial software packages included: ARC/INFO (versions 7.04 and 7.11), ERDAS (version 7.5), and IMAGINE (version 8.1). In addition, for many processing steps, we constructed customized software written in FORTRAN and C, or scripts written in Arc Macro Language (AML).

Mapping Inputs

Landsat TM imagery (described above), digital elevation models (DEMs), digital hydrography, and ground reference plots were the primary data layers incorporated in the mapping process. Data acquisition and database construction are described below.

Digital Elevation Data -- Elevation, slope, and aspect information were derived from digital elevation models (DEMs). U.S. Geological Survey (USGS) 7.5' DEMs were used wherever available (N ~ 1,935). Some quadrangles, however, particularly in eastern Montana, were not available in digital form. Digital elevation data for these quads were patched with three arc-second DEM data from the Defense Mapping Agency (source scale 1:250,000), resampled to 30 m^2 pixels, and co-registered to the TM images either by Hughes STX Corp or the EROS Data Center.

Table 2.2. Landsat path/row, acquisition date, general name, source, cloud cover (%), number of spectral classes, number of regions (raster polygons), and main sponsor for the 33 TM images classified for MT-GAP. Eleven images in western Montana were classified using slightly different methods than the remaining 22; these 11 can be identified in the "sponsor" column by the USFS-R1 distinction.

Path/ Row	Date	Name	Source	% Cl	N Class	N Regions	Sponsor[a]
P43/R26	09/25/93	Priest Lake, ID	MRLC	0	33	359,340	USFS-R1
P42/R26	08/14/92	Lake Koocanusa/Eureka	H-STX	5	30	316,840	USFS-R1
P41/R26	09/06/91	Glacier National Park	H-STX	4	36	294,261	USFS-R1
P40/R26	08/30/91	Sweet Grass Hills/Shelby	H-STX	0	130	659,910	MTFWP
P39/R26	08/07/91	Fresno Reservoir/Goldstone	H-STX	1	128	539,896	MTFWP
P38/R26	07/15/91	Havre/Chinook	H-STX	0	130	617,496	MTFWP
P37/R26	07/24/91	Nelson Reservoir/Malta	H-STX	2	129	522,898	MTFWP
P36/R26	06/15/91	Poplar River/Scobey	H-STX	10	129	707,675	MTFWP
P35/R26	08/13/92	Medicine Lake/Plentywood	H-STX	0	130	681,884	MTFWP
P42/R27	08/14/92	Noxon Res/Thompson Falls	H-STX	0	29	306,632	USFS-R1
P41/R27	07/20/91	Flathead Lake/Missoula	H-STX	2	31	319,117	USFS-R1
P40/R27	07/31/92	East Front/Choteau	H-STX	3	33	319,635	USFS-R1
P39/R27	07/06/91	Highwood Mtns/Great Falls	H-STX	0	27	290,685	USFS-R1
P38/R27	07/31/91	Judith Mtns/Winifred	H-STX	1	129	802,228	MTFWP
P37/R27	07/24/91	CMR West/Winnett	H-STX	0	129	537,547	MTFWP
P36/R27	06/15/91	Fort Peck Reservoir/Circle	H-STX	0	130	777,603	MTFWP
P35/R27	08/13/92	Big Sheep Mtns/Glendive	H-STX	0	128	646,881	MTFWP
P34/R27	07/11/94	Wibaux/Golden Valley, ND	EOSA	1	126	834,119	Custer NF
P41/R28	07/20/91	Selway/Bitterroot	H-STX	2	123	618,008	USFS-R4
P40/R28	07/29/91	Pintlar/Pioneer Mtns	H-STX	3	18	228,308	USFS-R1
P39/R28	07/22/91	Canyon Ferry Lk/Bozeman	H-STX	4	27	274,808	USFS-R1
P38/R28	07/31/91	Crazy Mtns/Big Timber	H-STX	1	130	669,496	MTFWP
P37/R28	08/09/91	Bull Mtns/Billings	H-STX	5	130	737,547	MTFWP
P36/R28	06/15/91	Little Wolf Mtns/Forsyth	H-STX	0	130	845,325	MTFWP
P35/R28	08/11/91	Lower Powder R/Miles City	H-STX	0	130	902,080	MTFWP
P34/R28	08/09/93	Little Missouri R/Ekalaka	MRLC	0	121	804,587	Custer NF
P40/R29	07/31/92	Beaverhead Mtns/Big Hole	H-STX	0	126	583,206	USFS-R4
P39/R29	08/09/92	Centennial Valley	H-STX	1	28	230,176	USFS-R1
P38/R29	07/15/91	Yellowstone National Park	H-STX	7	31	293,545	USFS-R1
P37/R29	07/26/92	Pryor Mtns/Greybull, WY	H-STX	3	130	622,409	MTFWP
P36/R29	06/15/91	Bighorn Mtns/Sheridan, WY	H-STX	0	130	721,102	MTFWP
P35/R29	08/16/93	Powder R/Gillette, WY	MRLC	0	130	814,156	MTFWP
P34/R29	06/17/91	Alzada/Devil's Tower, WY	H-STX	2	130	983,374	MTFWP

[a] USFS-R1 = Forest Service: Northern Region; USFS-R4 = Forest Service: Boise, Payette, Sawtooth, and Salmon/Challis National Forests; Custer NF = Custer National Forest; and MTFWP = Montana Fish Wildlife & Parks.

Digital Hydrography -- USGS 1:100,000 digital line graphs (DLGs) were acquired for the full extent of the state. These were appended together to create a seamless, statewide coverage. When compared to current, corresponding USGS 1:100,000 scale topographic maps, however, many of the DLGs contained inconsistent hydrographic information. These inconsistencies were of concern because the DLG data were to be used, in conjunction with TM imagery, to model riparian and woody draw vegetation, and any inaccuracies would affect the modeling output. After consulting with the USGS, we learned that the recently published hardcopy topographic maps were the most reliable and accurate source for the 1:100,000 scale cartographic information. Thus, we used the hardcopy maps as references when evaluating and editing the DLG data; steps in this process are described below.

1. Check/Verify. Precision of each DLG coverage was verified by direct comparison to a recent version of its 1:100,000 scale USGS topographic map. If inconsistencies were found between the two, the DLG coverage was edited. Generally, the older the preparation date of the DLGs, the more editing was required to make them match the printed reference maps.

2. Edit. In the editing process, all streams and lakes added to a DLG coverage were coded with the standard, appropriate attributes, and also were assigned a supplementary attribute item (in the arc attribute table) that flagged these features as "new" additions to the DLG coverage. Miscoded hydrography was also flagged as such, via the supplementary attribute item. Because the true source of the USGS DLG hydrography is somewhat unclear, the original information was preserved in the form that it was acquired from the USGS: no streams or lakes were physically deleted or changed in shape, and no changes were made to the codes assigned to the standard DLG attributes. However, inconsistencies in the DLG coverages were flagged using new attributes.

3. Create New Coverages for Each TM Scene. Edited DLGs were reprojected to the Albers coordinate system using the Montana parameters described previously and then appended to create scene-wide and statewide coverages.

Ground-truth Data -- Ground reference data (N = 23,351 plots; see Figure 2.1) were acquired from major land management agencies and organizations. These were all cross-walked to a more extensive land cover classification system for the state which contained 94 cover types. ASCII files containing plot information were converted to ARC/INFO point coverages and then sorted and stored as separate coverages for each TM image. Plots falling in areas of overlap between two adjacent images were copied and used as training data for both images.

Processing Steps

Unless otherwise stated, each of the following steps was applied to each of the 33 Landsat TM images independently; they are summarized in Figure 2.2.

Unsupervised Classification of Pixels -- A two-pass, unsupervised classification procedure was designed by Zhenkui Ma to replicate the patterns observed in a false-color composite of TM imagery (channels 4, 5, and 3 assigned to red, green, and blue). Spectral classes were defined based on Euclidean distance according to an algorithm which searched for the shortest distance between points in multivariate space, or in this case, the distance between RGB values for different pixels. Color similarity thus determined spectral class. In the first pass of the unsupervised classification, a color palette file, which mapped spectral values for the three TM channels to RGB values, was created by randomly sampling pixels to represent patterns evident in the color composite and thus to define spectral classes. In the second pass, Euclidean distances were

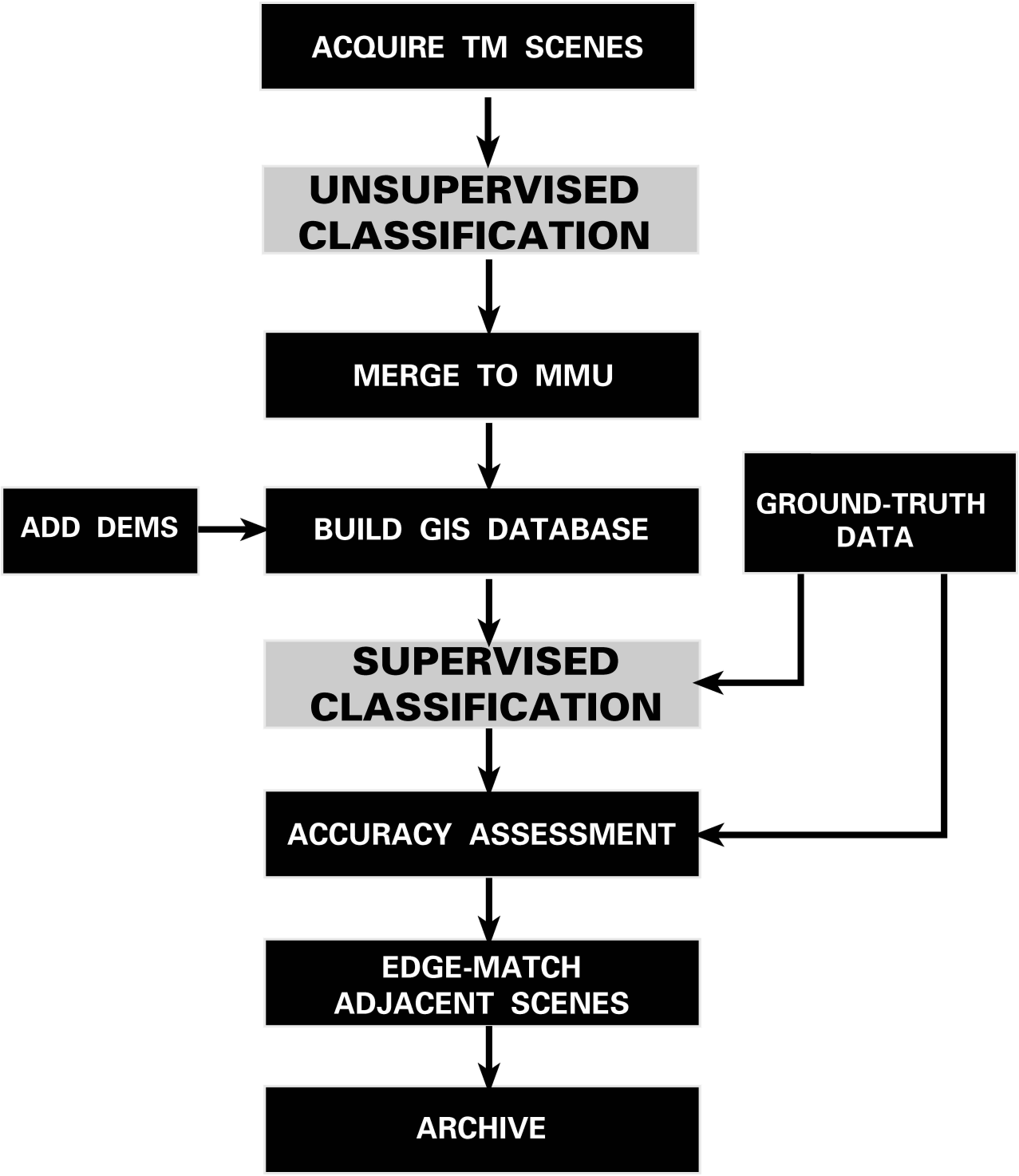


Figure 2.2. Image classification process applied to 33 Landsat TM scenes for Montana.

calculated between pixels in the input image and spectral classes in the color palette; input pixels were assigned to the nearest spectral class as measured by Euclidean distance. Additional details may be found in Ma et al. (ms1).

At the time when the first 11 TM images were classified, our hardware and software capabilities were such that to take the next step of merging pixels to desired map units for full TM scenes (see below), it was necessary to reduce the number of spectral classes by approximately one half (typically from 80 to 40 classes). These first 11 TM images were all in western Montana and are shown in Figure 2.3. Spectral classes were regrouped in each of these images in the following manner. Pixels were clustered in the color palette, and spectral classes combined based on their Euclidean distance positions in RGB color space. The grouped pixels then were used to determine the colors for displaying the classified image. After visually comparing the classified image to the false-color composite (with a 24-bit graphics display), pixel groupings in the color palette were manually adjusted as necessary. Once the grouped color palette produced a satisfactory display, one that maintained patterns in the original classified image, spectral groups in the image were physically regrouped to correspond with the revised color palette. To further reduce data volume, pixels in each of these 11 regrouped images also were filtered using a 3 x 3 majority window.

Unsupervised classifications of the other 22 TM images resulted in the creation of 120-130 spectral classes (Table 2.2), and none of these classes was regrouped or filtered prior to merging.

Merge to Minimum Mapping Units -- After the unsupervised classification, pixels in all 33 TM images were merged to specified minimum mapping units using specially developed software routines. Groups of pixels smaller than these designated MMUs were merged with their most similar neighbor in a rule- and object-based process (Ford et al. 1997). A similarity matrix controlled the incorporation of small patches into larger neighbors. This matrix was built based on the TM channel values for the input spectral groups. The merging process first identified regions smaller than the MMU, then listed neighboring regions and examined similarities between small regions and their neighbors. Finally, small regions were merged with larger neighbors having the most similar spectral values. A single, 2 ha (22 pixel) MMU was used for the first 11 TM images, with pixels representing water preserved at 30 m resolution. For the remaining 22 TM images, a more complex merging process was devised to better delineate cover types occurring in narrow riparian areas (see below).

Build Raster Database -- The supervised classification, where regions were assigned labels based on ground-truth data, required a raster database containing multiple TM and ancillary attributes. Logically, supervised classifications could not take place until such databases (or scene grids) had been constructed for each TM image. Once a classified and merged image was created through the unsupervised classification process, the resultant file was converted from ERDAS GIS to ARC/INFO GRID format, thus maintaining its raster file structure. Each scene grid contained between 228,308 and 983,374 regions (Table 2.2). For each scene grid, a value attribute table (VAT) was built to contain statistics by region for spectral and biophysical (TM and DEM) data. In addition to the mean values for all available TM channels (either 1-7 for H-STX & EOSAT images, or 1-5, + 7 for MRLC images), mean elevation and slope values for each region were calculated and stored in the attribute table. Because mean values were unlikely to offer representative measures for aspect (e.g., when averaged, northeast and northwest slopes would be recorded as south), aspect was grouped into eight classes and stored as majority values for each region. We also calculated a version of modified NDVI (normalized difference vegetation index) adapted from Nemani et al. (1993) as follows:

$$MNDVI = (TM4 - TM3) / (TM4 + TM3 + 1) * (256 / (TM5 + 1)) * 100$$

Spatial attributes (hectares, perimeter length, and x,y coordinates) were also calculated and recorded. The latter two were derived by converting the raster file to vector format; attributes were automatically created in the conversion, and their values were transferred back to the attribute table of the raster file. More information about these attributes can be found in Redmond et al. (1997).

Collect Training Data -- For reasons of cost and efficiency, considerable efforts were expended to obtain and use existing data for training the supervised classifications. Ideally these data came from relatively large, homogeneous stands or areas. Use of existing data from highly heterogenous areas (where two or more different cover types occurred) was avoided. The following criteria were followed to determine the suitability and eventual use of existing plot or reference data for the supervised classifications:

1. Existing data should not be over 10 years old, nor should the site have been disturbed (natural or management induced) since the data were collected.
2. Existing data must represent an area 8 ha or larger (stand versus single plot data) for upland cover types and 0.4-2 ha for riparian or woody draw cover types.
3. Location of the training data plot must be more than 30 m from the edge of an existing stand or patch, and ideally in a representative area near its center.
4. For training data that were interpreted from aerial or orthophotos, the plot location should fall within a large homogeneous stand.

For all newly collected field data we tried to adhere to two criteria. First, the plot should be located near the center of a 2 ha or larger stand and with a differentially-corrected GPS; and second, the stand should be a homogeneous representation of the cover type. We had greater success with the latter than the former, primarily due to failures in obtaining differentially-corrected GPS locations.

Many training data points were checked and verified by personnel from various management agencies who visited The University of Montana to review initial classifications and to help us input additional training data sites from aerial photos and existing maps. Again, emphasis was placed on choosing large areas representing a single cover type. A final source of training data was the Natural Resources Inventory (NRI) dataset from the Natural Resources Conservation Service (NRCS). Because the precise locations of these plots were confidential, we were unable to obtain a points coverage for them. Instead, we sent merged grids for 22 TM images to the NRCS, where the points were overlaid, and our regions attributed accordingly.

Analyze Training Data -- A total of 23,351 unique plots (Figure 2.1) were compiled in the ground-truth database. ARC/INFO point coverages with numerous attributes were created and manipulated to obtain training datasets for each TM scene. Because of the overlap between scenes, individual plots may have been stored in multiple training set coverages. All training data were subjected to a series of positional and ecological checks to ensure their quality and accuracy; for example, checking a plot's assigned cover type label for consistency with its species composition attributes. Plots or points expected to cause problems were identified. If problems could not be resolved, the associated plots were eliminated from the training set. Examples include multiple plots with different cover type labels in a single region, and plots with low or unknown positional accuracy. Generally, plots also were set aside if they represented cover types that were manually rather than digitally labeled; these included urban, agricultural, and water cover types, but the specific set of excluded types varied slightly among the 33 TM images.

Training data analysis did not truly end until all the supervised classifications were complete. To assess the quality of training data at various stages of the process, each training plot was removed sequentially from the dataset, and the remaining plots used to classify it (a "leave-one-out" method; Huberty 1994). A matrix then was generated from the classified output files to evaluate potential

confusion among training plots. Diagonal elements in the 'confusion' matrix represent the number of plots properly classified; misclassified plots (omission and commission errors) were further evaluated, and in some cases, dropped altogether from subsequent analyses.

Supervised Classification of Regions -- Once the raster database and training data sets were in place for a given TM scene, supervised classifications were conducted to assign cover type labels to each region. This proved to be an iterative process. Multiple classifications may have been conducted for a single image, with intermediate modifications to training data, until satisfactory results were obtained and analysts felt that they had exhausted the potential of the training data to yield improvements. The algorithm used to classify regions is a supervised, nonparametric classification called the NEAREST MEMBER of GROUP (NMG). The mathematical description of NMG is:

An unknown region Y belongs to group i if
$ED(Y,X_i) < ED(Y,X_j)$ for $j <> i$

where ED is Euclidean distance, X_i and X_j are supervised training data, and X_i is any one of the known training regions for group i.

With NMG, Euclidean distances were calculated between each unknown (i.e., unsampled) region and every training region in the data set; thus, all training regions were treated independently, and had an equal chance of affecting the assignment of labels. Each region was assigned a label corresponding to the group that contained the training region closest to the unknown region in terms of Euclidean distance.

The first step in each supervised classification was to overlay training plots with regions in the raster database and to extract the necessary attributes from each region for use in the classification. For each training plot, an attribute was added to identify the exact region in which it fell. Attribute tables were then related for the training plot and raster files, and the attribute values desired for each classification were exported into a training data file (ASCII format), sorted by cover type. To classify cover types, we used mean values for all available TM channels (either 1-7, or 1-5, + 7), elevation, and modified NDVI (M_NDVI). Because TM values range from 0-255 (well below typical elevation values in m), elevation was rescaled by dividing the raw value by 25 so that it would not be accorded extra weight in the classification. In addition to creating an ASCII file for training data, a similar file was created by exporting a matching set of attributes for every region in the raster database to be labeled. Using custom software, the file of training data was compared with the file of regions to be labeled, and every region was classified using the NMG algorithm. The NMG algorithm used Euclidean distances derived as follows:

$$(TM1train - TM1unknown)^2 + (TM2train - TM2unknown)^2 + ... (TM7train - TM7unknown)^2 + (ELEtrain - ELEunknown)^2 + (M\_NDVItrain - M\_NDVIunknown)^2$$

Distances between attribute values were squared to avoid mixing positive and negative values, and to magnify the amplitude of distances, thereby helping to distinguish differences among groups. Attribute values thus played the primary role in determining which labels should be assigned to each region; these were the values between which Euclidean distances were calculated.

Three cover type labels were assigned to each region, in decreasing order of likelihood (or rather, in increasing Euclidean distance). Labels were maintained without any modifications in the raster database (as COV_CODE_1, COV_CODE_2, and COV_CODE_3). The actual Euclidean distance values (rescaled by dividing ED by 1000) also were recorded. Smaller values indicated a higher

likelihood of correct classification: even if a cover type proved to be incorrect for a given polygon, a very small ED value would indicate that, based on the training data available, the assigned label offered the best possible fit. These ED values were used in evaluating classification results by looking at the relative differences between all three values for individual regions and at the various combinations of values across regions. ED values were also instrumental in making some modifications to cover type labels. Only the smallest Euclidean distance (COV_PROB_1) was maintained as an attribute for use in manual modifications. After the cover type classification was complete, a new attribute (COVERTYPE) was added and populated with the most likely cover type code (COV_CODE_1); this attribute (COVERTYPE) was later manipulated through manual modifications.

Two general types of manual modifications were used: attribute recoding based on decision rules, and geographic limits which were only defined for certain cover types. All modifications were applied to the COVERTYPE attribute only. As an example of a rule-based modification, elevation, slope, and aspect were used in an ecological limit rule to check the classification of Lodgepole Pine in several images as follows: If COV_CODE_1 = 4203 (Lodgepole Pine), and elevation < 2000 (meters), aspect = 5 (south aspect), and slope > 6 (degrees or 15 percent), then the COV_CODE_1 field was assumed to be incorrect and the COVERTYPE field should be set to COV_CODE_2 (the second most likely cover type label assignment).

Edge-matching -- We employed a simple solution for seamlessly edge-matching classified data from the 33 adjacent TM images once the raster databases had been constructed. This method was designed to preserve the integrity of individual image classifications and to minimize the perception of an 'edge' between adjacent overlapping ones. Rather than physically deleting regions, they are simply flagged to indicate whether or not they should be used. As a result, the original data can always be retrieved, and new edge-matching schemes can be devised and implemented at any time. The scheme is illustrated in Figure 2.3; results are evident in the statewide land cover map (Figure 2.4).

Edge-matching occurred only within overlapping areas for adjacent images. Before edge-matching could occur, each of the 33 overlapping images was evaluated and ranked in descending order of dominance (Table 2.3). Factors such as the distribution of cloud cover, the image acquisition date, and the classification accuracy levels for each scene were carefully weighed in determining the dominance ranking. Once dominance relationships were established, the following processing sequence was implemented to achieve virtual edge-matching:

1. Generally define the portion of each TM image that should be retained after edge-matching by drawing a polygon through the areas of overlap between adjacent scene(s); areas outside the polygon will be eliminated after edge-matching, the polygon should exclude areas with undesirable characteristics like cloud cover.
2. Perform an overlay and masking operation in ARC/INFO to identify all regions contained at least partially within the portion of the scene to be kept; add an attribute, KEEP, to the database and populate with value = 1 for all these regions.
3. Calculate a KEEP grid for each scene database; assign the value of the scene id to each region to be kept (i.e., with KEEP = 1); all other regions in the KEEP grid have no data for this attribute.
4. In order of dominance, merge the KEEP grids into one single grid.

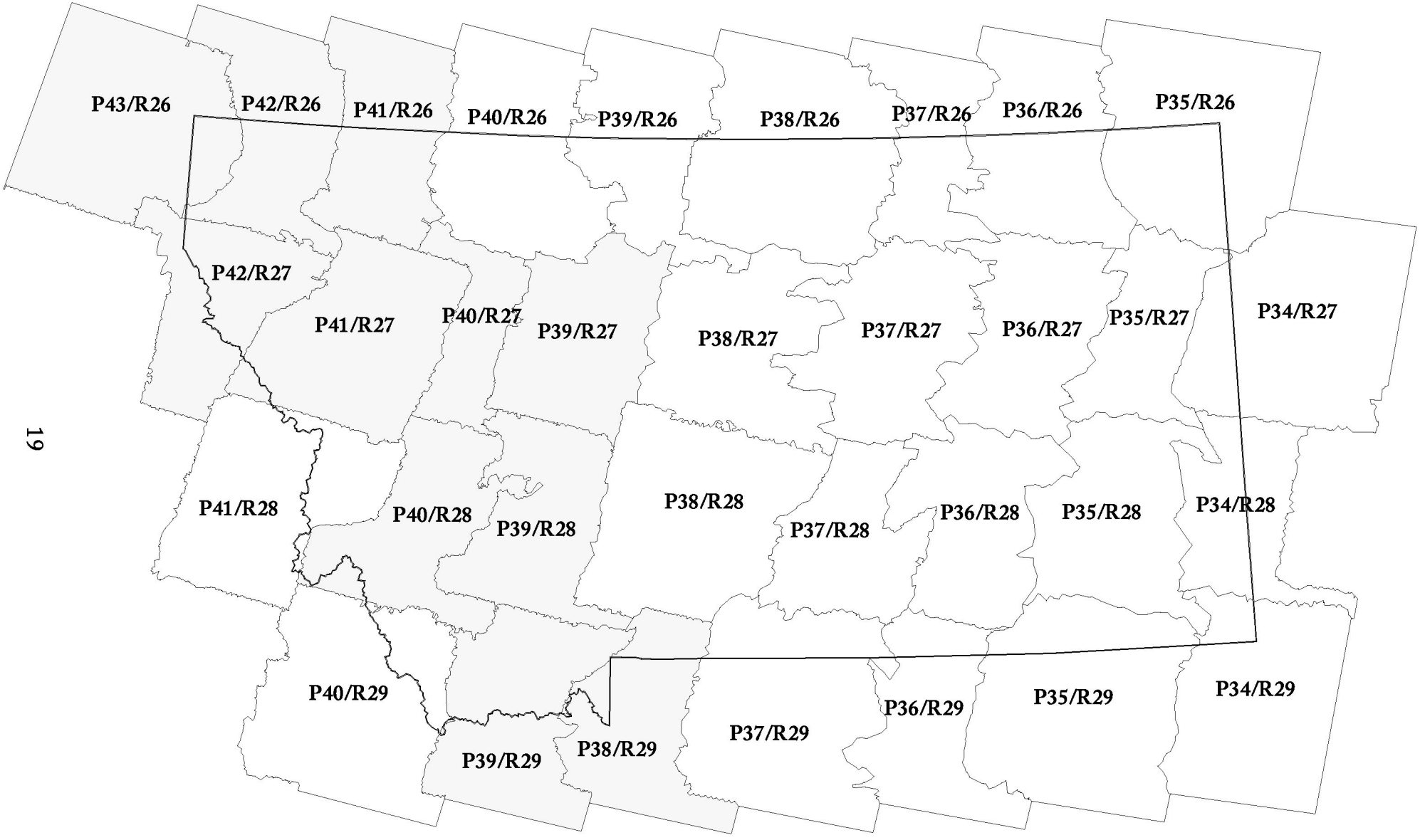


Figure 2.3. Edge-matching scheme for the 33 Landsat TM images classified for Montana; shaded areas show the 11 images classified earlier using slightly different methods (see text).

Create Statewide Land Cover Grid -- Once the supervised classification process was complete for all 33 TM images, the cover type attributes were selected for each region with a KEEP = 1. This produced a single land cover grid (30 m^2 cell size, and 94 classes) for the entire state which we clipped to the state boundary (1:100,000 scale, U.S. Census Bureau, TIGER line file) buffered by 10 km on all sides to facilitate future edge-matching. The 94 cover types then were recombined into 50 types that we felt were adequately and consistently mapped (see Table 2.1). The 30 m^2 resolution of this grid rendered it impractical for modeling wildlife distributions across the entire state. Consequently, we applied a final merge process to remove 1) water and riparian areas smaller than 1 ha, 2) clouds and cloud shadows smaller than 100 ha, and 3) patches of all other cover types smaller than 2 ha. This grid then was resampled to a 90 m^2 cell size. To recover as many of the small water, riparian, and woody draw features that might have been lost in this resampling process, we created a separate statewide "water/riparian" grid by selecting just those cover types (codes 5000-6400) from the 33 individual image grids. This in turn was resampled to 90 m^2 and then combined with the previously merged and resampled grid to produce the final land cover grid for MT-GAP.

Special Feature Mapping

Urban Areas, Mines, Burnt Forest, Clouds, and Cloud Shadows

Owing to the wide range of spectral classes associated with urban and suburban areas, mines, burnt forest, and cloud shadows, visual interpretation was used to help distinguish and map these land cover types. We used digital coverages of existing cities and towns obtained from the Montana State Library, Natural Resource Information System (NRIS; http://www.nris.mt.gov) to locate urban areas in the state. Similarly, for mines and forest fires, we obtained digital coverages from the Interior Columbia Basin Ecosystem Management Project (ICBEMP; http://www.icbemp.gov). These vector coverages were displayed over a false-color composite of TM bands 4, 5, and 3, along with a coverage of the raster polygon boundaries, to identify those polygons obviously associated with urban areas, mines, or fires. These were manually tagged, then, after the supervised classification, an AML script was run to ensure these regions were labeled correctly. We also had trouble with clouds because their shadows were sometimes confused with shadows caused by steep, north-facing slopes. Fortunately the clouds themselves were relatively rare and easy to identify based on spectral class alone. With this information, and using a similar AML to that described above, GIS analysts located clouds and any associated shadows and tagged them for relabeling after the supervised classification.

Agricultural Lands

Agricultural lands presented a problem created by "land use" similar to urban areas in that the range of spectral classes associated with agriculture was too varied for accurate classification with a supervised process. Agricultural lands were classified into two types: irrigated and dryland. Fields in active growth at the time the satellite imagery was acquired were assumed to be irrigated, whereas dryland agriculture included fallow and/or sparsely vegetated fields or pastures. Our methods changed somewhat between classification of the first 11 TM images and the remaining 22. For these first 11, the two agricultural types were manually identified and polygons tagged in a manner similar to that for urban areas and clouds described above. For the 22 other TM images,

Table 2.3. Landsat Path/Row, general name, and dominance rank of the 33 TM images from which the statewide land cover map was derived.

Path/Row	Name	Dominance Rank
P43/R26	Priest Lake, ID	33
P42/R26	Lake Koocanusa / Eureka	31
P41/R26	Glacier National Park	32
P40/R26	Sweet Grass Hills / Shelby	02
P39/R26	Fresno Reservoir / Goldstone	04
P38/R26	Havre / Chinook	05
P37/R26	Nelson Reservoir / Malta	06
P36/R26	Poplar River / Scobey	03
P35/R26	Medicine Lake / Plentywood	01
P42/R27	Noxon Reservoir / Thompson Falls	30
P41/R27	Flathead Lake / Missoula	23
P40/R27	East Front / Choteau	24
P39/R27	Highwood Mountains / Great Falls	29
P38/R27	Judith Mountains / Winifred	19
P37/R27	CMR West / Winnett	13
P36/R27	Fort Peck Reservoir / Circle	12
P35/R27	Big Sheep Mountains / Glendive	10
P34/R27	Wibaux / Golden Valley, ND	11
P41/R28	Selway / Bitterroot	21
P40/R28	Pintlar / Pioneer Mountains	26
P39/R28	Canyon Ferry Lake / Bozeman	25
P38/R28	Crazy Mountains / Big Timber	20
P37/R28	Bull Mountains / Billings	09
P36/R28	Little Wolf Mountains / Colstrip / Forsyth	08
P35/R28	Lower Powder River / Miles City	07
P34/R28	Little Missouri River / Ekalaka	14
P40/R29	Beaverhead Mountains / Big Hole Valley	22
P39/R29	Centennial Valley	27
P38/R29	Yellowstone National Park	28
P37/R29	Pryor Mountains / Greybull, WY	16
P36/R29	Bighorn Mountains / Sheridan, WY	18
P35/R29	Powder River / Gillette, WY	17
P34/R29	Alzada / Devil's Tower, WY	15

we developed a 6-step process for identifying and classifying all agricultural lands that was based on the following four assumptions:

1. They tended to be associated with particular spectral classes.
2. They tended to occur in larger patches (> 25 pixels) than other types.
3. These patches tended to be more homogeneous in term of their spectral composition than other types.
4. They tended to be spatially clumped across entire TM scenes.

Step one involved determining the relationship between the two agricultural types and the 120-130 spectral classes derived from the unsupervised classification. Each spectral class was visually inspected and assigned to one of the following seven groups based on its association with agricultural lands:

0) Never agriculture
1) Occasionally dry agriculture
2) Sometimes dry agriculture
3) Usually dry agriculture
4) Occasionally irrigated agriculture
5) Sometimes irrigated agriculture
6) Usually irrigated agriculture

In the second step, the resulting file was used in conjunction with the unsupervised classification (the u-grid), the merged image (the m-grid), and the full database file (the z-grid) to produce a new output image (the out-grid). An AML assigned output class values to every region based on the following three attributes: agricultural class value (0-6; see above list), the size of the region (number of pixels), and a homogeneity class value based on the spectral similarity of pixels in the u- versus m-grids in 10 percentile groups (see Table 2.4). In other words, if less than 10% of the region was comprised of pixels assigned its own spectral class by the unsupervised classification, then it was assigned to the lowest homogeneity class (1). All regions then were assigned to one of two size classes: small (≤ 25 pixels) or large (> 25 pixels). This size index often helped to distinguish between regions representing narrow, linear riparian areas and actual agriculture. The six possible agricultural classes, each of which could occur in 10 different homogeneity classes and two different sizes, yielded a possible list of 120 agricultural type codes, plus another 10 codes for those that were never agriculture. The AML then assigned one of these 130 output code values to every region in the grid. Referring again to Table 2.4, regions with spectral class 0 were assigned to output classes 1-10, depending on their homogeneity percentile ranking. Regions with spectral classes 1-6 were assigned to output values of 11-70 if they were less than or equal to 25 pixels in size, or 71-130 if they were larger than 25 pixels. A region with an output value of 115 should have a spectral class that sometimes indicated irrigated agriculture, a size greater than 25 pixels, and a 50-60% spectral correspondence between pixels in the u-grid and the m-grid.

In step three, breakpoints and association "rules" to assign agricultural class values (irrigated vs dryland) were determined for each of the seven groupings. This was an interpretive process that involved evaluating the association of each output class with an agricultural type in each image. For example, a classification rule might be based on the following observations: regions with spectral code 6 (indicating "usually irrigated agriculture") were more likely to represent irrigated agriculture when the output class value was between 65 and 70 for small polygons and between 122 and 130 for large polygons.

The next two steps (4 and 5) required that an analyst delineate areas within each TM image where the output rules should be applied, and then apply them there. In other words, the classification of agricultural types was restricted to certain specific areas in each image.

In the sixth step, the final classification of the two agricultural cover types (2010 and 2020) was transferred into the z-grid. Although this method of classifying agricultural lands was more time consuming and somewhat less objective than others, it had the advantage of producing quite accurate results.

Table 2.4. Variables (and their relationships) used to classify irrigated and dryland agriculture for 22 TM scenes in Montana.

Region Size (N pixels)	Spectral Code[a]	Probable Agricultural Class	Frequency of Occurrence	Output Class Values[b]
n/a	0	Non-Agriculture	n/a	1-10
< 26	1	Dry	Occasional	11-20
< 26	2	Dry	Sometimes	21-30
< 26	3	Dry	Usually	31-40
< 26	4	Irrigated	Occasional	41-50
< 26	5	Irrigated	Sometimes	51-60
< 26	6	Irrigated	Usually	61-70
> 25	1	Dry	Occasional	71-80
> 25	2	Dry	Sometimes	81-90
> 25	3	Dry	Usually	91-100
> 25	4	Irrigated	Occasional	101-110
> 25	5	Irrigated	Sometimes	111-120
> 25	6	Irrigated	Usually	121-130

[a] Determined from original 120-130 spectral classes from unsupervised classification.

[b] One value per homogeneity percentile group; i.e., output class 1 = non-agriculture with 10% correspondence between pixels in u- versus m-grids; 2 = non-agriculture with 11-20%, etc.

Nonetheless, after appending all 33 land cover grids together, it became apparent that the distinction between irrigated and dryland agriculture was inconsistent from scene to scene, primarily due to phenological differences related to different acquisition dates among all the images. To rectify this, we reclassified the two agricultural types across the entire state in the following manner. First all regions labeled as agriculture were selected in each scene grid. Their boundaries were converted to vector format and overlayed on the merged grid of the unsupervised classification (m-grid) to identify all regions that would end up being labeled agriculture. These regions then were selected, and a ratio of TM bands 5 to 4 was calculated for each one. Ratios were summarized for each image grid and evaluated prior to selecting a threshold value to distinguish between the irrigated and dryland classes. For all 33 images, threshold ratios ranged between 1 and 1.2. Ratios below the designated threshold indicated a preponderance of green, growing vegetation compared with those above the threshold which indicated browner, senescent vegetation. Using an AML script, all selected polygons with TM 5:4 ratios below the threshold were coded as irrigated agriculture (2020), whereas those with ratios above the threshold were labeled dryland agriculture (2010).

Riparian and Woody Draw Cover Types

Because woody draw and riparian vegetation often occurs in small patches associated with moist soil conditions, much information about their distribution can be lost in the process of aggregating 30 m pixels to larger (2 ha) MMUs. We tried to rectify this situation in two ways. For the first 11 TM images in western Montana (Table 2.2), we classified and labeled woody draw and riparian vegetation using unregrouped spectral values for individual 30 m pixels within a variable-width buffer (riparian zone) around water features (see below). For the other 22 TM images, riparian zones were delineated in a similar manner, but instead of classifying individual 30 m pixels and maintaining a separate grid, we merged them to a smaller (0.4 ha) MMU than the 2 ha one used for pixels outside the zone. All regions in each image then were labeled to cover type in a single supervised classification process, then manual modifications were made to ensure that assignment of riparian codes was limited to regions within the designated zones.

Delineation of Riparian Zones (All 33 TM Images) -- Boundaries of riparian zones near water features were modeled using USGS 7.5' digital elevation models (DEMs), where available, and 1-degree DEMs otherwise (USGS 1993), and USGS 1:100,000 scale digital hydrographic features (USGS 1989). Our goal was to approximate lowlands adjacent to all lakes and streams (both intermittent and perennial).

Given the uncertainty of absolute elevation values in DEMs, we developed a robust yet flexible approach to the zone delineation which included all pixels whose elevation was within 5 m of the surface elevation of all stream or lake shore segments. The process was automated as an AML script which assigned an elevation to each 30 m stream or lake shore segment (from the DEM). Then, extending out perpendicularly from each shoreline pixel, elevation values were compared until a 5 m threshold was reached and the boundary of the zone drawn. We added a perpendicular distance limit to the delineation process for the 22 images in central and eastern Montana because of the flatter terrain there. Specifically, perpendicular distance limits were set at 150 m for perennial streams, 300 m for single-line rivers (DLG code 610), 300 m for pond and lake shore lines (DLG code 200), and 450 m for rivers coded with 2 stream banks in the DLGs (codes 605 and 606). In other words, the zone boundary was set to either the point at which the 5 m threshold for elevation change was met, or the appropriate distance limit for that hydrographic feature, whichever was less. Specific criteria were selected to approximate the farthest distance that riparian zones would typically extend from the hydrographic features in question; estimates were generous to avoid regularly truncating the predicted zones before elevation limits were reached. Another goal in selecting distances was to minimize the misclassification of irrigated agricultural lands adjacent to hydrography. Distance criteria also were reviewed and refined by Jeff DiBenedetto, Ecologist at the Custer National Forest.

Riparian Classification - 11 Western Montana TM Images -- First, riparian spectral classes were selected. Training data based on either field sampling or aerial photo interpretation were acquired from a variety of sources and assigned to a spectral class from the unmerged and unregrouped image. Although we focused more attention on points and spectral classes located within the zone, all riparian training data and their associated spectral classes were used to some extent because we knew that the 1:100,000 scale DLGs did not contain all water features. Moreover, data outside the zone still offered valid information to support decisions made about those within the zone.

Overall, five classes were initially defined: Grass-Forb Riparian/Wetland, Shrub Riparian/ Wetland, Needleleaf Dominated Riparian, Broadleaf Dominated Riparian, and Needleleaf-Broadleaf Riparian. Broad as these classes are, they failed to capture the continuum of riparian vegetation observed in the field. Two more classes were required to reasonably categorize all

selected spectral classes: Mixed Grass-Forb-Shrub Riparian/Wetland, and Mixed Riparian, which could have included trees and any other riparian vegetation class. In practice, it was not realistic to separate analysis of spectral classes by their characteristics from analysis of ground-truth data. The intent was to assign only one riparian class label to one spectral class based on training data, color, and spatial distribution of the class.

Once spectral classes had been selected, it was necessary to distinguish between agricultural and riparian classes. Because color patterns for agricultural areas can be nearly identical to those representing riparian areas, further interpretation was required to reconcile labeling inconsistencies between the 30 m and 2 ha MMU databases. Without this step, riparian vegetation would have been overestimated in agricultural areas for the 11 TM scenes in western Montana. After agricultural lands (> 2 ha) were manually identified and riparian spectral classes selected (see above), riparian areas that overlapped agricultural areas were modified in a two-stage procedure. Much of this process was automated within ARC/INFO using an AML to implement user-defined rules. However, in most cases, analysts made final decisions based on visual interpretation.

In the first stage, individual 2 ha MMU regions labeled as agriculture were flagged for editing if >50% of their area overlapped with 30 m pixels designated as riparian. Typically, the number of regions flagged did not exceed 2500. Selected agricultural regions were then displayed on-screen in a sequence of editing windows. Overlapping areas were outlined; these could be parts of either riparian regions or agricultural polygons. The background view included the agricultural portions of the unregrouped image, so that shifts in color across the agricultural polygons (2 ha) were visible. As additional cues in determining the pattern of predicted riparian cover types, colored label points within the overlapping areas indicated the riparian classes. The boundaries of the predicted riparian zone and hydrographic features were also displayed for reference. As a general rule, if an agricultural region fell within a riparian zone, but no color change was evident near a water feature, then the overlapping riparian pixels were flagged for deletion. If colors did change in association with water features in the zone, then the overlapping pixels were retained and considered to be riparian, unless the color clearly indicated a non-vegetated cover type, e.g., a sand or gravel bar.

The second stage was targeted toward agricultural regions that fell only partly within the predicted riparian zone. For these regions, the proportion inside was compared to the proportion outside the riparian zone. If <10% of the region was inside, the overlap was automatically flagged for removal; if it was >10% but <20%, the area was edited by analysts in a manner similar to that in the first stage.

<u>Riparian Classification - 22 Other TM Images</u> -- Riparian and woody draw cover types were labeled, together with upland cover types, in the supervised classifications for the remaining 22 TM images. However, because no spatial limits were placed on where either of these general types could occur, we ended up with upland types being mapped in obviously riparian settings and vice versa. To rectify this, manual modifications were made to each classification. These modifications were based generally on life-form. All regions inside the designated zones were assigned riparian or woody draw cover type labels (6110-6400). If one of these labels was assigned to a region outside the designated zones, then it was replaced with the upland cover type label closest in terms of life-form and Euclidean distance (e.g., alternate COV_CODE assignments). For example, if the supervised classification assigned a 3100 (Upland Grassland) level code to a region within a designated riparian zone, it would be recoded to 6210

(Graminoid/Forb Dominated Riparian). Similarly a shrub type like 3210 (Mesic Shrub) occurring within a zone would be recoded to 6310 (Shrub Dominated Riparian), 4203-4280 types (coniferous forest) would become 6110 (Conifer Dominated Riparian), and 4300 types (mixed broadleaf conifer) would end up as a 6130 (Mixed Broadleaf/Conifer Riparian) type. This revised approach for labeling riparian and woody draw types allowed us to classify and maintain all cover types in a single database for each of these 22 TM scenes. Because agricultural cover types were labeled first (and care taken to avoid including riparian areas), most of the confusion between agriculture and riparian types was eliminated up front, and there was no need to reconcile differences between two separate classifications.

Results

In all, 50 land cover types were mapped for Montana (Figure 2.4). As mapped, the single most common cover type was Low/Moderate Cover Grasslands which covered 27.4% of the state (Table 2.5), and taken as a group, grasslands (3100 level codes) comprised more than 37% of the state. Forest cover types (4000 level codes) covered 24% of the state. These represented 19 different types, the most common of which were Mixed Subalpine Forest (4270), Douglas-fir (4212), and Lodgepole Pine (4203). Fires of moderate or high intensity were mapped across 139,261 hectares, or 0.37% of the state. Shrublands (3200-3500 codes) comprised another 14%, and riparian types were limited to 3.9% of the state's land area. Urban or Developed Lands occupied less than 1% of land area, but agricultural lands (both dry and irrigated; 2000 codes) comprised nearly 15%. Finally, Rock and barren types (7000 level codes) plus Snowfields or Ice (9100) covered 4.3% of the state, and slightly more than 30,000 ha (0.08%) could not be mapped because of cloud cover.

Accuracy Assessment

Introduction

Land cover is mapped for Gap Analysis to answer the fundamental question: what is the current distribution and management status of the nation's major natural land cover types and wildlife habitats? Yet without an accuracy assessment, users of the land cover map have little information about its overall reliability, particularly with respect to which land cover types and which regions of the map do not meet the program's stated accuracy objectives. It is impossible for image analysts and cartographers, who may create a statewide land cover map, to anticipate all future applications of their work, so an accuracy assessment should provide sufficient information to enable users to evaluate the suitability of the data for their particular purpose. This can be described as the degree to which the data quality characteristics collectively suit an intended application. The information reported include details on the database's spatial, thematic, and temporal characteristics and their accuracy.

The approach currently recommended in the Gap Analysis Handbook for assessing land cover map accuracy (Scott and Jennings 1994) involves collection of an independent set of reference data, ideally after the final land cover map has been created and using a suitable sampling unit and statistical design. In keeping with the research and development mission of the Gap Analysis Program, we developed a new approach to accuracy assessment which does not require the collection of an independent set of reference data. Instead, all reference data are used not only to label raster polygons via the supervised classifications, but also to assess the classification accuracy via a bootstrap procedure (see below). Although the method has withstood peer-review (Steele et al. in press), the results have not been field-tested, and readers may wish to interpret the method and results with caution.

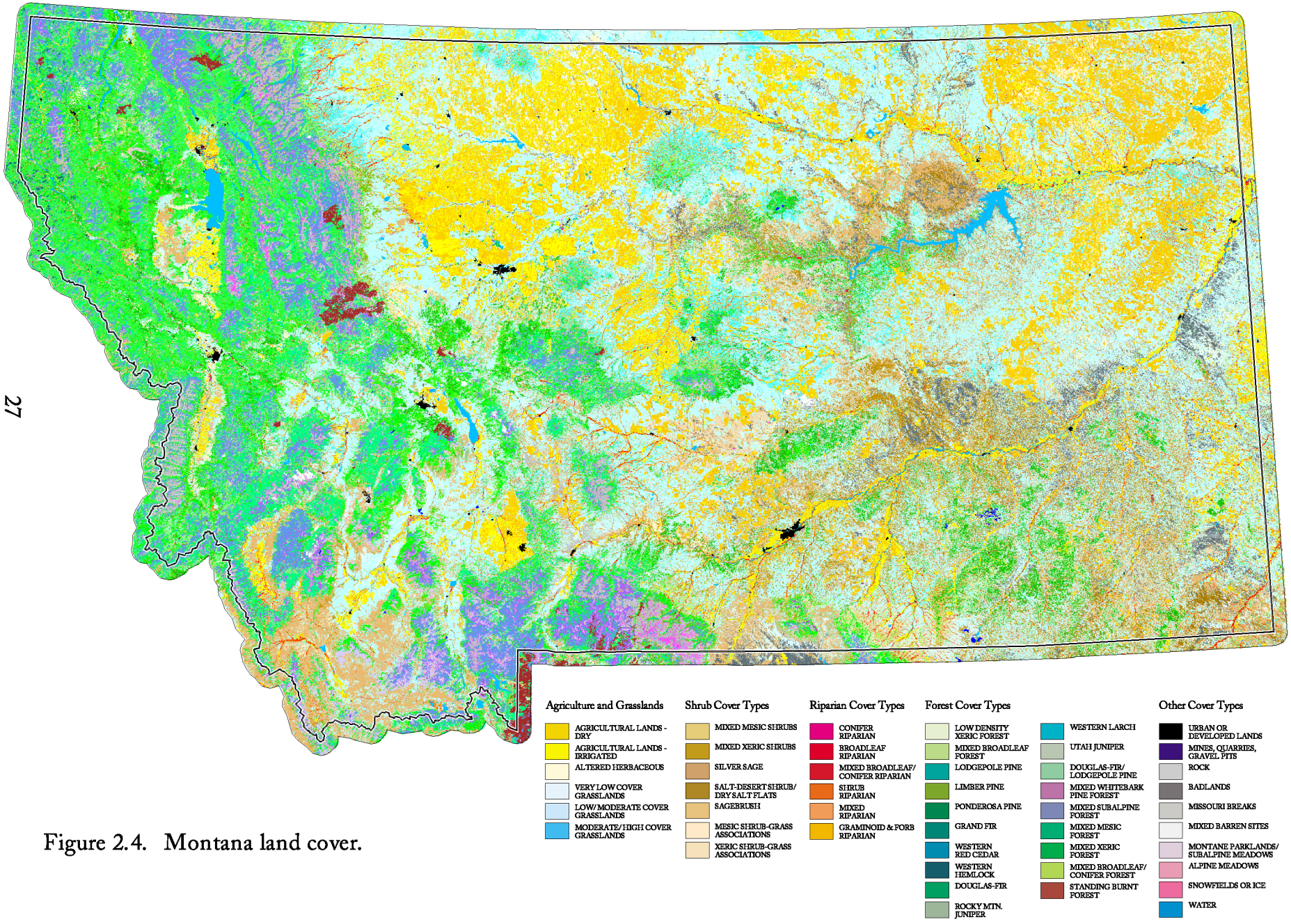


Figure 2.4. Montana land cover.

Table 2.5. Number of patches, total hectares, and percent of the state mapped for 50 land cover types in Montana.

Code	Cover Type	N Patches	N Hectares	% State
1100	Urban or Developed Lands	1,109	63,733	0.17
2010	Agricultural Lands - Dry	96,092	3,632,611	9.54
2020	Agricultural Lands - Irrigated	94,928	1,957,294	5.14
3110	Altered Herbaceous	109,396	1,014,946	2.67
3130	Very Low Cover Grasslands	139,493	1,104,361	2.90
3150	Low / Moderate Cover Grasslands	432,016	10,427,464	27.38
3170	Moderate / High Cover Grasslands	196,470	1,236,660	3.25
3180	Montane Parklands & Subalpine Meadows	59,185	528,201	1.39
3200	Mixed Mesic Shrubs	172,497	949,873	2.49
3300	Mixed Xeric Shrubs	184,013	1,227,852	3.22
3309	Silver Sage	20,022	73,334	0.19
3310	Salt-Desert Shrub / Dry Salt Flats	22,824	131,141	0.34
3350	Sagebrush	220,288	2,145,574	5.63
3510	Mesic Shrub - Grassland Associations	64,714	280,075	0.74
3520	Xeric Shrub - Grassland Associations	79,041	524,061	1.38
4000	Low Density Xeric Forest	63,913	286,187	0.75
4140	Mixed Broadleaf Forest	72,262	357,539	0.94
4203	Lodgepole Pine	98,028	1,286,156	3.38
4205	Limber Pine	22,148	120,372	0.32
4206	Ponderosa Pine	127,272	1,066,130	2.80
4207	Grand Fir	3,328	22,017	0.06
4210	Western Red Cedar	4,551	36,339	0.10
4211	Western Hemlock	1,990	20,940	0.05
4212	Douglas-fir	139,735	1,329,994	3.49
4214	Rocky Mountain Juniper	17,669	80,379	0.21
4215	Western Larch	13,652	90,437	0.24
4216	Utah Juniper	2,686	14,843	0.04
4223	Douglas-fir / Lodgepole Pine	50,494	451,332	1.19
4260	Mixed Whitebark Pine Forest	38,963	394,340	1.04
4270	Mixed Subalpine Forest	83,658	1,582,611	4.16
4280	Mixed Mesic Forest	62,871	1,227,309	3.22
4290	Mixed Xeric Forest	79,625	542,049	1.42
4300	Mixed Broadleaf & Conifer Forest	23,137	99,843	0.26
4400	Standing Burnt Forest	3,431	139,261	0.37
5000	Water	42,576	398,405	1.05
6110	Conifer Riparian	71,033	85,004	0.22
6120	Broadleaf Riparian	91,838	198,372	0.52
6130	Mixed Broadleaf & Conifer Riparian	29,923	34,932	0.09
6200	Graminoid & Forb Riparian	281,322	702,574	1.84
6300	Shrub Riparian	200,240	363,596	0.95
6400	Mixed Riparian	88,540	122,662	0.32
7300	Rock	55,313	591,067	1.55
7500	Mines, Quarries, Gravel Pits	477	11,921	0.03
7600	Badlands	106,929	749,602	1.97
7604	Missouri Breaks	13,487	69,175	0.18
7800	Mixed Barren Sites	38,597	197,051	0.52
8100	Alpine Meadows	6,495	54,664	0.14
9100	Snowfields or Ice	2,157	27,076	0.07
9800	Clouds	138	18,172	0.05
9900	Cloud Shadows	137	12,345	0.03

Methods

Due to the relatively small sample of reference data available for the supervised classifications of the 33 TM images, we devised a method of estimating the probability of misclassification at each reference point using a bootstrap procedure (Efron 1982, Efron and Tibshirani 1993). This procedure simulates the process of sampling and classification many times (with replacement) by a Monte Carlo method, and thereby allows us to estimate the probability that the true cover type is correctly classified at each reference point from the number of times that the reference observation is correctly classified in all the simulations (Steele et al. in press). We ran the bootstrap 100 times with replacement for each reference dataset (1 per TM image). On average, 63% of the reference data were selected in each sample; these were then used as training data to classify the remaining reference data (37%) that were not selected. The remaining 37% of the reference data constitute a new and independent set of test data for each resampling event. For further details regarding the procedure and how the bootstrap classification error matrices were constructed for each TM scene see Steele et al. (in press).

Once misclassification probabilities were calculated for 21,348 reference points representing 45 land cover types for which we could reasonably assess thematic accuracy across all 33 TM images (see below), they were entered into the ARC/INFO (GRID module). Mean thematic accuracy (for the 45 types) then was interpolated to a 1 km statewide lattice using the routine, POINTINTERP (exponential option with neighborhood = 75 km, and decay = 15 km). Finally, lines connecting lattice points of equal mean thematic accuracy were drawn at 5% intervals.

Because the land cover classification scheme was complex (Table 2.1), and some types were quite similar, map accuracy was evaluated using fuzzy sets (Gopal and Woodcock 1994). A fuzzy matrix, derived from two-way tabulation of cover types, was constructed to evaluate the acceptability of various misclassification possibilities (Table 2.6). Acceptability was ranked through scores assigned to each cell in this matrix. For example, confusion between Big Sagebrush (3350) and Xeric Mixed Shrubs (3360) was considered to be less serious than confusion between a High Cover Grass (3170) and Douglas-fir (4212) . Acceptability was rated on a scale from 1 to 5, as outlined by Gopal and Woodcock (1994): 1) absolutely wrong; 2) understandable, but wrong; 3) acceptable; 4) good; 5) perfect match. When evaluating cover types according to this scheme, the following logic was applied:

- If cover type codes matched exactly, a score of 5 was assigned;
- If the codes did not match exactly, but the types shared a dominant species in the cover type name, a score of 4 was given (i.e., 3130 Very Low Cover Grasslands and 3150 Low/Moderate Cover Grasslands were assigned a score of 4);
- If the cover type was a commonly occurring species in a mixed type, it received a score of 3 (i.e., 3350 Sagebrush is a common component of 3300 Xeric Mixed Shrubs, and thus the confusion between these types was scored 3);
- If the cover type fell within the correct lifeform, but was not similar to the species in the label, it was assigned a score of 2 (i.e., 3200 Mixed Mesic Shrubs and 3300 Mixed Xeric Shrubs);
- If the lifeform was mismatched, a score of 1 was given.

By rating acceptability in this manner, accuracy assessments could be conducted at both the acceptable and ideal levels, thus offering more information than traditional approaches.

Table 2.6. Fuzzy matrix used to assess the accuracy of land cover types in Montana, ranging from 1 (worst) to 5 (best match).

	3110	3130	3150	3170	3180	3200	3300	3309	3310	3350	3510	3520	4000	4140	4203	4205	4206	4207	4210	4211	4212	4214	4215	4216	4223	4260	4270	4280	4290	4300	4400	6110	6120	6130	6200	6300	6400	7300	7500	7600	7604	7800	8100	9100
3110	5	4	4	4	4	1	1	1	1	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1
3130	4	5	4	3	3	1	3	2	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	2	1	1	2	1	3	1	3	3	1
3150	4	4	5	4	3	2	3	2	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	3	1	1	1	1	3	1	1	3	1
3170	4	3	4	5	4	3	2	2	1	1	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	2	2	3	2	3	1	1	1	1	1	3	1
3180	4	3	3	4	5	3	1	1	1	1	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	2	2	3	2	3	1	1	1	1	1	4	1
3200	1	1	2	3	3	5	2	3	2	2	4	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	2	1	2	4	4	1	1	1	1	1	2	1
3300	1	3	3	2	1	2	5	4	4	4	2	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1
3309	1	2	2	2	1	3	4	5	3	3	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1
3310	1	3	3	1	1	2	4	3	5	3	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	3	1	1
3350	1	3	3	1	1	2	4	3	3	5	2	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1
3510	3	3	3	3	3	4	2	3	2	2	5	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	1	2	1	3	4	4	1	1	1	1	1	2	1
3520	2	3	3	3	1	2	4	4	3	4	2	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1
4000	2	3	3	3	2	1	1	1	1	1	1	1	5	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1
4140	1	1	1	1	1	2	1	1	1	1	1	1	2	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	4	3	2	2	2	1	1	1	1	1	1	1
4203	1	1	1	1	1	1	1	1	1	1	1	1	2	1	5	3	3	3	2	2	3	2	3	2	4	3	3	4	4	3	2	3	1	2	1	1	1	1	1	1	1	1	1	1
4205	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	5	3	3	2	2	3	3	2	2	3	3	4	3	4	3	2	2	1	2	1	1	1	1	1	1	1	1	1	1
4206	1	1	1	1	1	1	1	1	1	1	1	1	3	1	3	3	5	3	2	2	3	4	3	2	3	2	2	3	4	3	2	2	1	2	1	1	1	1	1	1	1	1	1	1
4207	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	3	3	5	3	3	4	2	3	2	3	2	2	4	3	3	2	3	1	3	1	1	1	1	1	1	1	1	1	1
4210	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	3	5	4	3	2	2	2	2	2	2	4	2	3	2	4	1	3	1	1	1	1	1	1	1	1	1	1
4211	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	3	4	5	3	2	2	2	2	2	2	4	2	3	2	4	1	3	1	1	1	1	1	1	1	1	1	1
4212	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	3	3	4	3	3	5	2	3	2	4	2	3	4	3	3	2	4	1	3	1	1	1	1	1	1	1	1	1	1
4214	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	3	4	2	2	2	2	5	2	4	2	2	2	2	4	3	2	2	1	2	1	1	1	1	1	2	3	1	1	1
4215	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	2	3	3	2	2	3	2	5	2	3	2	4	3	3	3	2	3	1	2	1	1	1	1	1	1	1	1	1	1
4216	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	2	2	2	4	2	5	2	2	2	2	4	3	2	2	1	2	1	1	1	1	1	2	3	1	1	1
4223	1	1	1	1	1	1	1	1	1	1	1	1	2	1	4	3	3	3	2	2	4	2	3	2	5	2	3	4	4	3	2	3	1	3	1	1	1	1	1	1	1	1	1	1
4260	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	3	2	2	2	2	2	2	2	2	2	5	4	3	3	3	2	2	1	2	1	1	1	1	1	1	1	1	1	1
4270	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	4	2	2	2	2	3	2	4	2	3	4	5	4	4	3	2	3	1	3	1	1	1	1	1	1	1	1	1	1
4280	1	1	1	1	1	1	1	1	1	1	1	1	2	1	4	3	3	4	4	4	4	2	3	2	4	3	4	5	3	3	2	4	1	3	1	1	1	1	1	1	1	1	1	1
4290	1	1	1	1	1	1	1	1	1	1	1	1	2	1	4	4	4	3	2	2	3	4	3	4	4	3	4	3	5	3	2	3	1	2	1	1	1	1	1	1	1	1	1	1
4300	1	1	1	1	1	1	1	1	1	1	2	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	3	3	3	4	1	1	2	1	1	1	1	1	1	1
4400	3	3	3	3	3	3	1	1	1	1	3	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	5	1	1	1	1	1	1	1	1	1	1	3	3	1
6110	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	2	2	3	4	4	4	2	3	2	3	2	3	4	3	3	1	5	2	4	1	1	1	1	1	1	1	1	1	1
6120	1	1	1	2	2	2	1	1	1	1	2	1	1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	2	5	4	2	3	3	1	1	1	1	1	1	1
6130	1	1	1	2	2	1	1	1	1	1	1	1	1	3	2	2	2	3	3	3	3	2	2	2	3	2	3	3	2	4	1	4	4	5	2	2	2	1	1	1	1	1	1	1
6200	1	2	3	3	3	2	1	2	1	1	3	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	5	3	4	1	1	1	1	1	1	1
6300	1	1	1	2	2	4	1	3	1	1	4	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	3	5	4	1	1	1	1	1	1	1
6400	1	1	1	3	3	4	1	4	1	1	4	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	3	2	4	4	5	1	1	1	1	1	1	1
7300	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	4	3	3	4	1	1
7500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	5	2	1	3	1	1
7600	1	3	3	1	1	1	3	1	3	3	1	3	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	5	4	3	1	1
7604	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	3	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	4	5	3	1	1
7800	1	3	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	4	3	3	3	5	3	1
8100	1	3	3	3	4	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	3	5	1
9100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5

Producer and user accuracies were assessed both individually (for scores 5, 4, 3, 2, and 1 in 'match matrices') and cumulatively (for scores 5+4+3+2+1 in 'accumulate matrices') for each image classification; for the entire state, however, only the cumulative users' results are provided in Table 2.7. For more information about how to interpret error matrices see Lachowski et al. (1995).

Final accuracy figures were weighted for each cover type using the proportion of the scene mapped as that cover type (as a surrogate for its population size), and results were scaled to a hypothetical population of 1000 units (to make numbers easier to interpret). Thus, the number of these units correctly classified for each cover type was estimated by multiplying the percentage of the scene mapped as that cover type, times the hypothetical population size of 1000, times the cumulative percentage of test plots correctly classified (using scores 5+4+3). These estimates were summed for each cover type, and the results divided by 1000 to yield an overall area-weighted producer's accuracy:

$$\frac{\sum \text{(\% cover type in scene)} * 1000 * \text{(\% correct plots)}}{1000}$$
$$= \sum \text{(\% cover type in scene)} * \text{(\% correct plots)}$$

Note that accuracy was not assessed for all the classes that were mapped. Specifically, classes like urban, agriculture, and clouds were omitted from the accuracy assessment, in part because the available test data were not representative of common occurrences of these classes. Nevertheless, because urban, agriculture, and cloud classes can be readily identified through visual interpretation, their actual accuracy should exceed 80%.

Results

Cover type classification accuracies for 45 types are reported in Table 2.7 at two levels: absolutely right (Level 5), and acceptably right (Level 3). Absolute thematic accuracy averaged 61.4%, ranging from 4.4% for Western Hemlock to 93.2% for Missouri Breaks. At the acceptable level, mean accuracy increased to nearly 89%, and ranged between 51% for Utah Juniper and 98% for Badlands. Absolute thematic accuracy (Level 5), averaged for all 45 cover types, varied spatially across the state (Figure 2.5), with estimates exceeding 80% in the southwest corner (Beaverhead and Madison Counties) and in the western portion of the Highline in Glacier, Toole, and Pondera Counties.

In general, when ample training data were available (N > 100), accuracy estimates exceeded 50% at Level 5 and 80% at Level 3 (Table 2.6). Mixed Mesic Shrubs, Mixed Barren, and Limber Pine were the main exceptions. For the first two classes, we suspect that their "mixed" nature contributed to classification errors. The lower Limber Pine accuracy, especially at Level 3, suggests confusion with other lifeforms like shrub or rangelands. We suspect this could arise from training data collected from very open stands where spectral reflectance was driven more by the understory than the forest canopy (see below). Not surprisingly, Water (5000) and Rock (7300) also classified well (78-90%).

Limitations and Discussion

In general, many factors can influence the accuracy of classifications derived from Landsat TM data (see Congalton 1991, Congalton and Green 1993, Lachowski et al. 1995). These range from limitations associated with input data, including TM imagery or ground-truth data, to errors introduced in the classification process itself. We discuss these below.

Table 2.7. Estimated thematic accuracies (Accumulative Users') of 45 land cover types for MT-GAP.

		Level 5		Level 4		Level 3		Total
Code	Land Cover Type	N	%	N	%	N	%	N
3110	Altered Herbaceous	506	67.6	666	88.9	670	89.5	749
3130	Very Low Cover Grassland	275	65.1	337	79.9	412	97.8	422
3150	Low/Mod Cover Grassland	3631	78.7	3907	84.6	4390	95.1	4616
3170	Mod/High Cover Grassland	455	55.0	592	71.5	733	88.5	828
3180	Montane Parklands/Subalpine	193	56.1	204	59.3	274	79.6	344
3200	Mixed Mesic Shrub	450	53.4	510	60.5	574	68.1	843
3300	Mixed Xeric Shrub	243	44.4	318	58.5	443	81.1	546
3309	Silver Sage	26	29.8	34	38.9	54	61.5	88
3310	Salt Desert Shrub	138	84.6	141	86.8	158	96.9	163
3350	Sagebrush	745	64.8	834	72.5	1045	90.9	1150
3510	Mesic Shrub/Grass	85	31.2	106	38.7	230	83.6	274
3520	Xeric Shrub/Grass	86	45.8	119	62.9	171	90.8	189
4000	Low Density Xeric Forest	103	51.6	103	51.6	153	76.2	200
4140	Mixed Broadleaf Forest	270	59.3	311	68.3	347	76.2	456
4203	Lodgepole Pine	338	43.3	455	58.2	753	96.3	782
4205	Limber Pine	48	31.3	61	39.5	97	63.0	154
4206	Ponderosa Pine	1217	76.0	1305	81.5	1486	92.8	1602
4207	Grand Fir	30	26.5	96	85.6	106	94.5	113
4210	Western Red Cedar	3	18.5	14	73.3	17	88.9	19
4211	Western Hemlock	1	4.4	9	75.3	11	94.8	12
4212	Douglas-fir	814	55.1	1008	68.3	1375	93.1	1477
4214	Rocky Mountain Juniper	29	45.5	45	70.6	48	75.6	64
4215	Western Larch	5	16.0	6	18.3	26	85.2	30
4216	Utah Juniper	5	45.2	6	50.7	6	50.7	11
4223	Douglas-fir/Lodgepole Pine	82	25.4	243	75.3	302	93.8	322
4260	Mixed Whitebark Pine	79	49.5	113	70.8	129	81.3	159
4270	Mixed Subalpine Forest	437	57.0	535	69.8	738	96.2	767
4280	Mixed Mesic Forest	485	59.4	733	89.8	781	95.7	816
4290	Mixed Xeric Forest	158	40.5	269	68.9	351	89.9	390
4300	Mixed Broadleaf/Conifer Forest	89	34.1	90	34.5	227	87.1	260
4400	Standing Burnt Forest	6	53.9	6	54.0	7	59.9	12
5000	Water	216	90.0	216	90.0	216	90.0	240
6110	Conifer Riparian	4	6.8	28	48.3	48	83.8	58
6120	Mixed Broadleaf Riparian	491	67.3	538	73.5	608	83.2	731
6130	Mixed Broadleaf/Conifer Riparian	2	4.8	8	21.1	24	60.9	39
6200	Herbaceous Riparian	219	40.6	225	41.6	403	74.5	540
6300	Shrub Riparian	176	33.7	233	44.6	385	74.0	520
6400	Mixed Riparian	10	31.0	18	54.2	24	73.7	32
7300	Rock	453	77.8	480	82.4	484	83.0	583
7500	Mines/Quarries/Gravel Pits	2	39.0	3	48.2	4	57.9	7
7600	Badlands	289	71.9	289	71.9	394	98.1	402
7604	Missouri Breaks	76	93.2	76	93.7	76	93.7	81
7800	Mixed Barren	100	49.8	121	60.3	138	68.7	201
8100	Alpine Meadow	18	47.3	22	56.9	29	74.7	39
9100	Snow/Ice	16	89.9	16	89.9	16	89.9	18
	TOTALS	13107	61.4	15448	72.4	18963	88.8	21348

TM Data

Given both the spatial and spectral resolutions of TM data, not all vegetation patterns can be delineated or classified accurately. For instance, we typically find variation in the spectral composition of 30 meter pixels representing the same cover type. If variation within a cover type is greater than the variation among different cover types, then these cover types necessarily will be confused spectrally with others. In the case of Limber Pine mentioned above, its spectral signature varied quite widely among the different TM scenes in which it was classified, depending on tree size and density, as well as the presence and amount of understory grass or shrubs. This contributed to spectral overlap between the Limber Pine cover type and certain non-forest types, and undoubtedly led to lower classification accuracies.

Time of year and atmospheric conditions affect the quality of TM data and any resulting classifications. Information about existing vegetation and land cover is best obtained from TM data acquired at certain times of the year. For existing vegetation, acquisition times close to the peak of the growing season are generally best, although to distinguish particular vegetation cover types, such as aspen (4101), spring or fall images might be best. Sun angle and atmospheric conditions also can adversely affect the quality of TM imagery. For example, in September the sun is lower in the sky and casts more shadows in steep terrain than earlier in the season. Similarly, smoke or haze can interfere with spectral reflectance patterns and thereby limit the variation available in TM data. In the western U.S., hazy atmospheric conditions commonly occur in late August and September as a result of wildfires. For all these reasons, mid-summer (late July through mid-August) should be the ideal time to acquire TM data for this project area; we were fortunate to be able to obtain high quality images from this time period and to have them all terrain-corrected.

Reflectance data from the TM thermal channel (band 6) were missing from three images, P43/R26, P40/R29, and P35/R29 obtained from the Multi-Resolution Land Characterization Consortium archive at the USGS EROS Data Center. Because our supervised classification method used mean values for all seven TM channels, the lack of thermal data for these three images hindered our ability to distinguish among general cover types, like water, rock, grass, shrub, and forest, that we know absorb, radiate, and reflect heat differently. For the other 29 TM images, we observed general patterns of association between thermal values and cover classes, such as low values for water, moderate ones for forest, and relatively high ones for grass, shrub, and rock. Similarly, cover types occurring on south and west facing slopes tended to have higher thermal values than cover types on north and east facing slopes. Thus, we feel that the absence of thermal data for the three TM images reduced the power of our classification method and may have reduced the resulting map accuracies as well, at least for those edge portions of the state.

Map Unit Definition

Our unsupervised classification and merging process produced map units of variable size which, in the end were resampled to a 90 m^2 grid cell size. No doubt this resulted in some degradation of patch boundaries, and perhaps some loss of fine scale features as well. Of greatest concern was the loss of linear patterns associated with wetlands, woody draws, and riparian areas. We anticipated this problem prior to resampling and tried to minimize it by creating a separate grid of all regions in the state with a riparian cover type label (codes 6110-6400), resampling this to a 90 m^2 grid (independent of all the other regions), then merging it back into the 90 m^2 statewide land cover grid. The net effect was probably to slightly overestimate the amount of riparian land cover in the state, but we felt that this option was better than losing many smaller patches in a single resampling procedure. Finally,

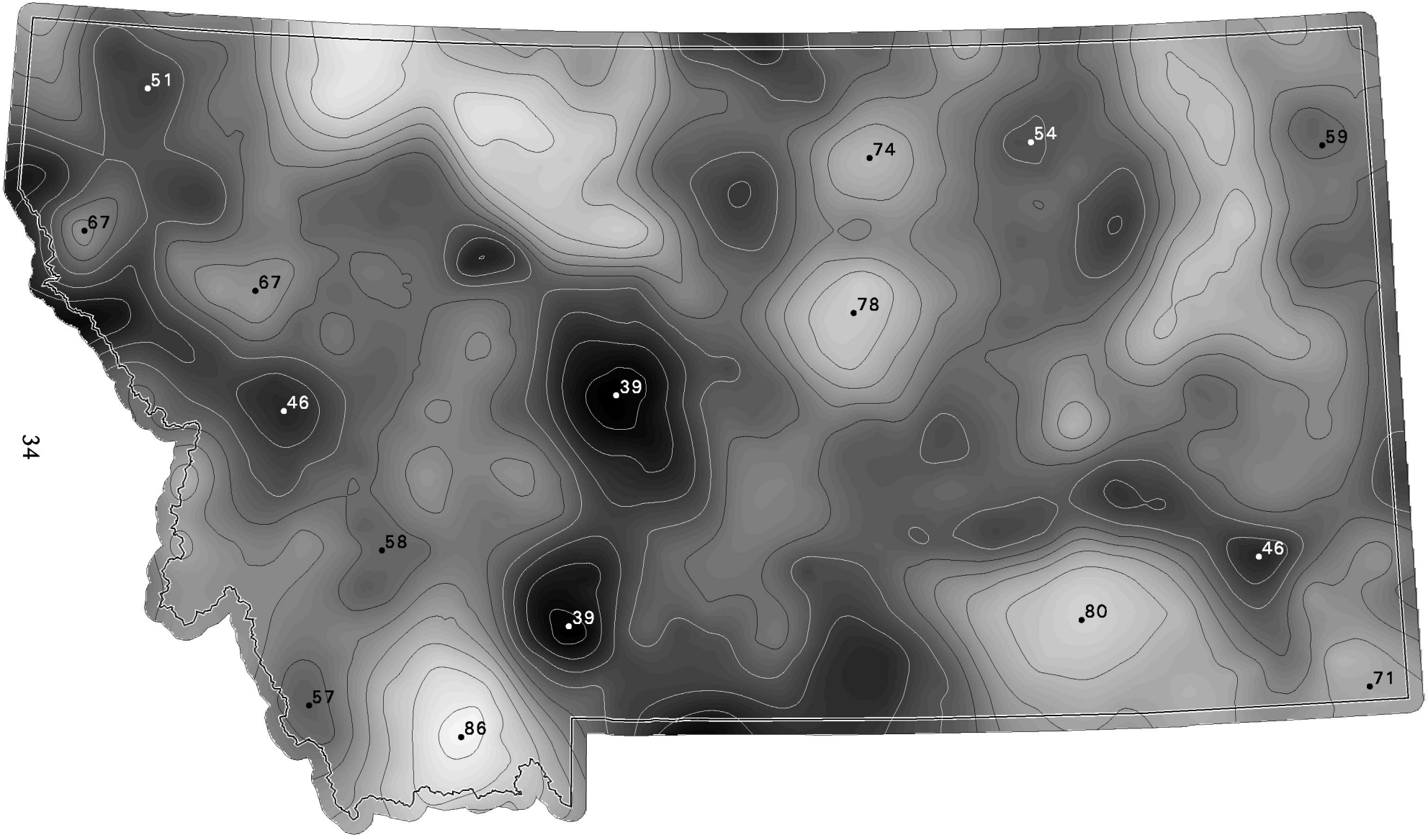


Figure 2.5. Estimated mean thematic accuracy (absolute, Level 5) for 45 of the 50 land cover types mapped in Montana; shown are 5% contour intervals and actual percentages at selected reference points.

because we resampled to an even multiple of the original 30 m^2 pixels, we did not have to contend with any planimetric shift in the patch boundaries.

Ground-truth Data

Much of the reference data used in this project came from existing sources, primarily federal agencies. Very few new data plots were collected in the field, and we made no effort to devise an unbiased sampling methodology. Nonetheless, given the relative abundance of reference data available to label each TM image, as well as the results of the accuracy assessment, we do not believe that the classification results were overly biased in favor of cover types that were sampled or managed by federal agencies, rather than those types occurring either in inaccessible areas, or on privately-owned lands.

We were very selective in our use of training data for each TM classification; but it was not possible to eliminate all possible sources of error. For example, the accuracy of ground-truth plots, both in terms of their location and content, will directly affect classification accuracies. Again, we tried to identify plots with potential errors early in the processing pipeline. If these errors could not be corrected, then the individual plots were eliminated. Undoubtedly, however, some errors were missed. If these ended up in the training data set, they could still be detected by further quality control measures. If they were not detected and used for training, however, their effects would be distributed throughout the classification and result in a lower map accuracy.

It was inevitable that more plots would be available for some scenes than for others (see Figure 2.1). To maximize the use of all available data, we tried to use data from plots that were located on multiple scenes. However, because adjacent scenes were sometimes acquired in different years, and possibly under different environmental or atmospheric conditions, this may not have been appropriate. When these plots were selected for training two or more adjacent image classifications, they were removed if they did not meet certain filtering criteria.

When the locations of riparian training data were examined in relation to the delineated riparian zones, some points fell outside the predicted zones in nearly every image. In some cases, the points were close, but the delineated zones were just too narrow, but in other cases, training data occurred quite far from any zones. The latter was caused at least in part by use of 1:100,000 scale DLGs as a basis for zone delineation; these hydrography data contained fewer water features, especially intermittent streams, than 1:24,000 scale DLGs which were not available in digital form for the state. The net effect here was to underestimate the amount of riparian land cover because only those regions with a majority of their area inside the modeled riparian zone could be assigned a riparian cover type label.

All TM images were acquired between 1991 and 1994, whereas the ground-reference data could have been acquired either before or after the TM imagery. For stable, slow-changing cover types, these temporal differences should not have caused classification problems, unless land use suddenly changed. Again, our training data analysis was designed to catch gross inconsistencies between field and satellite data, but we certainly did not eliminate all errors.

Related to the topics of plot location and patch uniformity, some pre-existing field data were collected for purposes and at scales that do not match the 30 m^2 spatial resolution of TM data. Although single pixels might represent relatively pure cover types on the ground, it is important to remember that we were classifying patches 0.4 ha and larger. Thus, the training data must match this scale as well. Once again, we tried to minimize this potential conflict in the classification process by careful analysis of the training data and removal of plots that sampled inclusions smaller than our mapping units.

Supervised Classification Algorithm

In the supervised classification of each TM image, ground-truth plots were used as training data for assigning cover type labels to unlabeled patches (i.e., raster polygons). Prior to classification, each training plot was assigned to a unique patch based on its x,y coordinates. Because the distribution of mean TM digital numbers and ancillary data for all training patches representing a single cover type was almost certainly multi-modal, a classifier based on a single mean value for each cover type could yield misleading results. We circumvented this problem by treating the mean values for each TM channel and for each attribute independently for every patch in the training set, such that each one could make a unique and equal contribution to the classification. In this sense, the classifier was nonparametric. It was also based on the shortest Euclidean distance between a labeled (training) and an unlabeled patch in multidimensional space (Ma et al. ms2). The algorithm did not take geographic proximity into account, however, in spite of the well-known and obvious fact that the distributions of many land cover types are neither random nor uniform across the landscape (i.e., whitebark pine is only found in mountainous settings and at high elevations). At the time we began this project, contextual methods designed to model spatial dependence were limited in application to pixel classifications (see McLachlan 1992). Since then, we have developed new methods that exploit spatial information in the training data and that are suitable for polygon-type classifications. Preliminary results show considerable improvement in thematic accuracy, especially in physiographically complex areas where vegetation may be more strongly affected by landscape gradients (Steele and Redmond ms.). Because the thematic accuracy of our land cover map was generally lower in the mountainous and forested portions of the state (Figure 2.5), we would expect that using new methods to reclassify the TM images covering these areas would produce substantially better results.

3. PREDICTED ANIMAL DISTRIBUTIONS AND SPECIES RICHNESS

Introduction

All species' range maps are predictions about the occurrence of those species within a particular area (Csuti 1994). Traditionally, the predicted occurrences of most species begin with samples from collections made at individual point locations. Most species range maps are small-scale (e.g., >1:10,000,000) and derived primarily from point data to construct field guides. The purpose of the GAP vertebrate species maps is to provide more precise information about the current predicted distribution of individual native species within their general ranges. With this information, better estimates can be made about the actual amounts of habitat area and the nature of its configuration.

GAP maps are produced at a nominal scale of 1:100,000 or better, and are intended for applications at the landscape or "gamma" scale (homogeneous areas generally covering 1,000 to 1,000,000 hectares and made up of more than one kind of natural community). Applications of these data to site- or stand-level analyses (site: a microhabitat, generally 10 to 100 square meters; stand: a single habitat type, generally 0.1 to 1,000 ha; Whittaker 1977, see also Stoms and Estes 1993) are likely to be compromised by the finer-grained patterns of environmental heterogeneity that are resolved at those levels.

Gap analysis uses the predicted distributions of native vertebrate species to evaluate their conservation status relative to existing land management (Scott et al. 1993). However, the maps of vertebrate species distributions 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 observations and literature that are assembled into databases used to produce the maps.

Prior to this effort no maps were available -- digital or otherwise -- showing the likely present-day distribution of species by habitat type across their ranges. 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 in the context of large geographic regions or in relation to their actual habitats. Their decline because of incremental habitat loss can, and does, result in one threatened or endangered species "surprise" after another. Frequently, the records that do exist for an ordinary species are truncated by state boundaries. Simply creating a consistent spatial framework for storing, retrieving, manipulating, analyzing, and updating the totality of 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.

Mapping Standards

Mapping methods were designed to meet the standards of the Gap Analysis Handbook as of January 1997, at which time a newly-revised version of the vertebrate methods chapter became available. All GIS analyses were conducted in ARC/INFO version 7.0.4 on IBM RS/6000 workstations.

Methods

To predict vertebrate distributions in Montana, we followed an iterative, five-step approach. First, we determined which species would be included in the modeling process. Second, species ranges

were delineated by recording each species' presence or absence within either a latilong grid system for birds, or the Environmental Protection Agency's (EPA) hexagon grid system for amphibians, reptiles and mammals. Third, we developed a Wildlife-Habitat Relationships (WHR) database to document associations between species and habitat features such as land cover, elevation, and distance to water. Fourth, after preparing the necessary GIS layers to represent these habitat features, we used a raster-based modeling approach to combine the known distributions and WHR databases into predicted distributions for each species. Fifth, modeling rules and distribution maps were reviewed by more than 50 biologists from around the state. After review, the necessary changes were made and the entire process was repeated. Once all predicted distributions were complete, species checklists for wildlife refuges and other management units were used to evaluate the accuracy of these maps.

Each species was assigned to one MT-GAP staff member. Amphibians and reptiles were coordinated by Melissa Hart, but were modeled by a group of biologists, including Paul Hendricks (Montana Natural Heritage Program, MTNHP), Bryce Maxell (University of Montana), Chuck Peterson (Idaho State University), and Jim Reichel (MTNHP). Wendy Williams, Poody McLaughlin, Claudine Tobalske, and Melissa Hart were responsible for birds, and mammals were handled by Polly Thornton.

Criteria for Species Selection

Roughly 565 terrestrial vertebrates are known to occur in Montana (MTNHP, Biological Conservation Database 1996). This total includes many rare or accidental migratory birds which have been found in the state only a handful of times, and other species whose occurrence in the state is similarly uncertain. Species included in Montana Gap Analysis were those known to breed within the state, and those that are regularly occurring non-accidentals.

To narrow the list of vertebrates to be included in Montana Gap Analysis, we primarily considered the state ranks assigned by Montana Natural Heritage Program (MTNHP). For birds, we also consulted Wright (1996), as well as Montana Bird Distribution Committee (1996); the latter database was used to evaluate the number of observations per species along with their dates and geographic distribution. Expert opinion was also sought for some species.

We excluded species with the following state ranks: SR (reported in the state, but lacking documentation to accept or reject the report), SP (may potentially occur in the state), and SX (believed extinct). Birds with ranks SAN, SAB/SAN, SAB/SZN, and SZN (accidental occurrences in the breeding or non-breeding seasons) were generally excluded, but these were treated on a case-by-case basis. Similarly, exotic species (SE) were determined individually. All exotic game species were included, and others were added as they were deemed by modelers to have potentially significant influence on other species.

To describe species, we adopted taxonomy and nomenclature from The Nature Conservancy (TNC), as recommended by National GAP standards. Species' common names, scientific names, and element codes (unique identifiers) were last downloaded from the TNC website (*www.tnc.org*) in November 1997. This database contains a few discrepancies where species recently have been split or where names are disputed, as well as some names not commonly used in Montana (e.g., "grizzly or brown bear" instead of "grizzly bear"). For consistency, we maintained TNC data and noted discrepancies in a related report, the *Montana Atlas of Terrestrial Vertebrates* (Hart et al. 1998).

Delineating Species Ranges

Distributional limits are a necessary ingredient of the vertebrate modeling process, because they allow us to place bounds on where a species is predicted to occur. Counties and latilongs (one-degree blocks of latitude and longitude) are units that are commonly used to document species presence or absence across a state. Excluding Yellowstone National Park, Montana's 56 counties average 6786 sq km in size. The 49 latilong blocks within the state average 7977 sq km (calculated in Albers equal-area projection), but offer the advantage of an equal area sampling structure. Use of either unit results in overestimation of a species' distribution where its range extends only partly into a county or latilong. A third option which alleviates this problem is the EPA's hexagon grid system, based on units 635 sq km in size (White et al. 1992); Montana contains all or part of 656 hexagons. Hexagon distribution maps were created for amphibians, reptiles, and mammals. However, because of project constraints, for birds we opted to use an existing, latilong-based system (Montana Bird Distribution Committee 1996). Because of this difference in units, a single bird observation is extrapolated across a larger area than observations for other species (see Figure 3.1), making our predicted bird distribution maps fundamentally different from those for all other species.

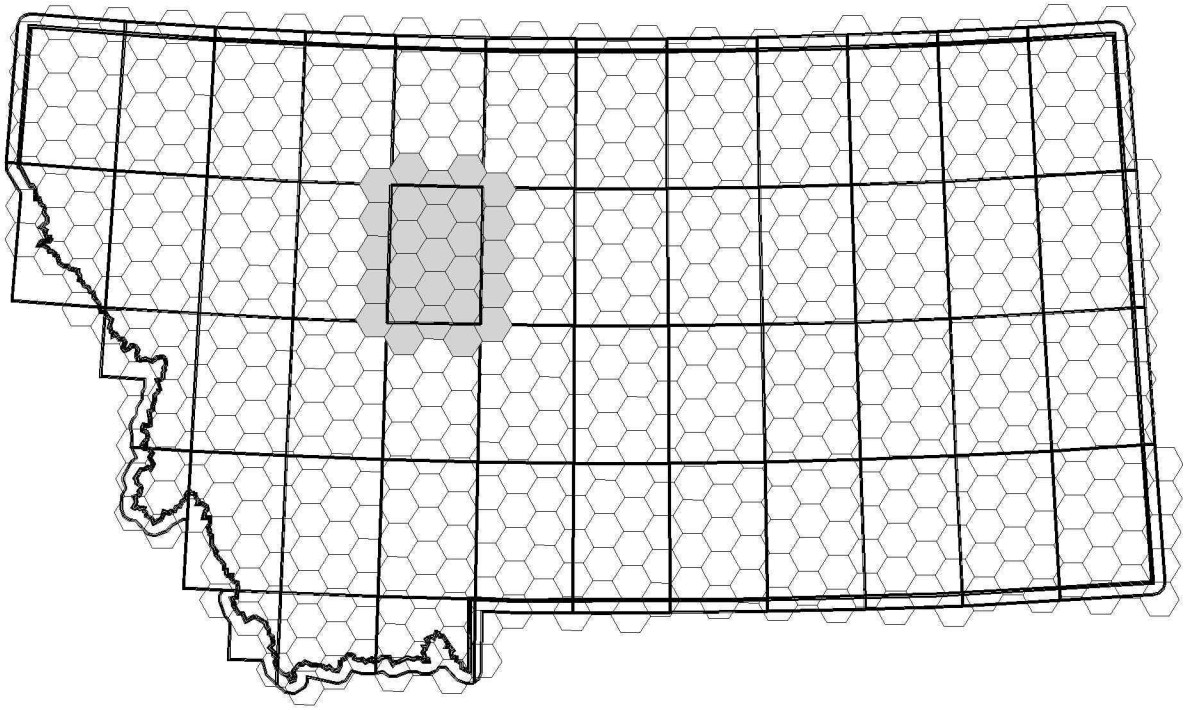


Figure 3.1. Two grid systems used to define distributional limits for native terrestrial vertebrates in Montana: hexagons (n = 656) and latilongs (n = 49). Each latilong is roughly 12 times the size of a hexagon; parts of more than 20 hexagons may be contained in a single latilong.

Amphibians, Reptiles and Mammals by Hexagon -- Distributional limits for amphibians, reptiles, and mammals were mapped using the hexagon grid system (White et al. 1992). The Montana Natural Heritage Program was contracted to compile point locations and populate EPA hexagons as outlined by Master et al. (1994) for each species in these taxonomic groups, and to deliver both in GIS databases: a point coverage for species' observations and a series of INFO tables for species' status within hexagons.

Point observations of these terrestrial vertebrates were compiled from the following sources: museum specimens, published literature, unpublished reports and theses, existing MTNHP databases, wildlife observations recorded by agency and independent biologists, and a U.S. Forest Service database on carnivores. Sources were entered into the MTNHP bibliographic database and given a unique identifier called *sourcecode.* The approximately 16,000 records of herptiles and mammals compiled came from the following sources: ca. 8600 are specimens; ca. 800 are from published accounts; ca. 3000 are from unpublished (gray literature) accounts; ca. 1000 are from other databases; and ca. 2500 are from sightings by individuals.

Species observations were entered into the MTNHP Point Observation Database (POD). This database, currently maintained using Microsoft Access software, stores information on the species, source (*sourcecode*), date, observer, type of record (sighting, specimen, 'heard only', etc.), breeding status, and other details of the observation.

All available locational information was also entered into POD: descriptive, coordinate (UTM or geographic), or Public Land Survey System (PLSS, or township/range/section). The locational information was then assessed to determine (a) how best (most accurately and efficiently) to generate a point feature for that observation and (b) the precision (measured in meters) of the locational information. For example, an observation reported to a quarter section would have a data precision of ca. 500 meters, since a point generated in the center of that quarter section would be at most 500 meters from the actual location. However, an observation with only a descriptive location (e.g., 20 miles south of Fort Musselshell) could have a data precision of as much as 40,000 meters. In every case, the point feature is created in as accurate a location as possible; so, for the above example, MTNHP staff would measure exactly 20 miles due south from their best estimate of Fort Musselshell's location.

Observations with descriptive locations only were mapped onto a mylar overlay of a 1:500,000 scale map of Montana that was mounted on foam board, and the points were later digitized. For observations with PLSS locations, points were digitized on-screen, using the BLM's 1:100,000 scale PLSS coverage to guide placement of the point. For observations with coordinate locations, points were generated in ARC/INFO.

When this work began, the POD system already contained ca. 4700 observations of herptiles and mammals. Many of these had been entered by mapping point locations onto mylar overlays of a 1:1,000,000 map of Montana, or overlays of the various National Forest Visitor Maps that cover parts of Montana. These pre-GAP observations had been assigned to three precision classes, rather than estimating the actual (im)precision in meters. Also, for many observations, the precision with which they were mapped, and the points generated, were worse (a greater distance) than their inherent data precision. For example, a museum specimen card might say "west of Highwood," but also give a PLSS location to the section. That point, mapped on a 1:1,000,000 mylar overlay, would have a mapping precision of ca. 3000 meters, but a data precision of ca. 1000 meters. So at the start of this project, MTNHP staff retrofitted all existing observations with both their data and mapping precisions, and then re-mapped many of those for which the mapping precision was greater (less precise) than the data precision.

After entering the data into POD and creating a unique point feature for all observations, MTNHP staff used an overlay analysis to create an initial hexagon status map for each species. Each point was first buffered by its data precision, then overlayed with the EMAP hexagon coverage. If a certain hexagon contained 95% or more of the area of a buffered point, the species represented by that point was considered 'confirmed' in that hexagon (Table 3.1). If only 80-95% of the area occurred in one hex, that hexagon was coded as 'probable' for that species. For 10-80% overlap, it was coded 'possible', and for less than 10% overlap it was not coded at all. Note that under this scheme a single observation could result in up to seven hexagons being coded as 'possible' for that species. (An observation mapped in roughly the center of a hexagon with a data precision of ca. 40 km would overlay seven hexagons, each containing roughly 14% of its buffered area.)

It is important to keep in mind just what the words 'probable' and 'possible' mean in this context. There are no uncertain records in POD -- observations which are questionable as to species are not entered. The uncertainty, and hence the use of 'probable' and 'possible' vis-a-vis hard (POD) data, relates only to locational accuracy. In the example above, the species was definitely observed (i.e., is confirmed) somewhere in that 7-hexagon area; but one cannot say with certainty in which particular hexagon it occurred.

The result of this analysis was an intermediate data file that contained a record for each POD-point/hexagon overlap. That file was then queried to retrieve the best record ('confirmed' better than 'probable' better than 'possible') for each species in each hexagon, and data from that record were entered into the INFO files *status.data* and *source.data*. Each are matrices of Montana's 656 hexagons (records) by its 148 mammals and herptiles (fields). The *status.data* file was then used to produce draft maps for each species that showed its status in each hexagon. The *source.data* file contained the unique identifier, or *sourcecode*, for the source of the observation that supported that species' status in that hexagon. For game animals, digital distribution data from the Montana Department of Fish, Wildlife & Parks (MTFWP) was also used to create additional species/hexagon overlap records. These records have as their source "DFWP_9705".

The draft hexagon status maps were then subjected to in-house review. Mammals were reviewed by J. Reichel, P. Hendricks, and P. Feigley; amphibians and reptiles by J. Reichel, P. Hendricks, B. Maxell, and C. Peterson. Reviewers used their personal knowledge of the species and published range maps for Montana and adjacent areas to update the hexagon distributions based on professional judgment. For amphibians and reptiles, where documented locations tended to be sparse, the following rules were used (see Appendix 3.1):

1. Extensions of a species' range beyond documented locations were made conservatively unless: a) published records in adjacent states and territories suggested a continuous range to the state border; b) published articles, theses, or dissertations with reliable records suggested a range extension; or c) as a function of computer processing, hexagons adjacent to a confirmed hexagon were included when a modeled habitat type was continuous across the confirmed hexagon and its neighbor (see Modeling Process).
2. Hexagons within the known range of a species were included liberally, even without documented presence. The assumption was made that the modeling process would later eliminate unlikely habitat within the range (e.g., exclusion of a mountain range).

A variety of sources were consulted when editing hexagon maps for mammals, including maps (MTFWP atlas of ungulate and mountain lion distributions) and published information (Hoffmann and Pattie 1968, Banfield 1974, Turner 1974, Hall 1981, Clark and Stromberg 1987, Smith 1989, Pattie and Hoffmann 1992, Buskirk et al. 1994, Groves et al. 1997). Also, for all species, input was sought from knowledgeable individuals (see Appendix 3.2). In addition, T. Kohley (WY-GAP) was consulted on hexagon population for wide-ranging mammals and bats.

Table 3.1. Confidence levels assigned to hexagons for each amphibian, reptile, and mammal.

Status	*Confidence Level*	*Definition*
1	Confirmed	>95% of an observation's buffered area[a] within the hexagon, or professional estimate of greater than 95% probability that the species occurs within the hexagon.
2	Probable	80-95% of an observation's buffered area within the hexagon, or professional estimate of 80-95% probability that the species occurs within the hexagon.
3	Possible	10-80% of an observation's buffered area within the hexagon, or professional estimate of 10-80% probability that the species occurs within the hexagon.
4	Historical	Reported prior to 1950 (status based on that 'historical' report could be 1, 2, or 3).
5	Excluded	Eliminated based on professional judgment. Mostly accidentals: observations likely to be migrating or dispersing individuals; habitat and/or area could not sustain the species. Occasionally, misidentifications detected after initial hexagon population.

[a] 'Buffered area' means the area created by buffering the point location for each observation by its data precision, as expressed in meters (i.e., the more imprecise the data, the larger the precision and the larger the buffered area.)

Hexagons were edited to better reflect species' known or expected distributions. For some wide-ranging mammals, this meant overriding actual location data (see Status 5 definition, Table 3.1). Examples include observations of wolverine (*Gulo gulo*) in the Billings vicinity, and of moose (*Alces alces*) along the Yellowstone River in eastern Montana, near the North Dakota border.

Based on in-house review, additional species/hexagon overlap records were created and stored in a separate data file. These records generally raised the status of a species in a particular hex. For example, suppose species A in hexagon 1 was ranked as 'possible' based on actual observations entered into POD; but the reviewer felt that its status was at least 'probable' in that hex. He or she would create that new record (species A in hexagon 1 = 'probable'), and attach his or her personal *sourcecode* to that record. Occasionally, reviewers wanted to overwrite observation data based on transient, dispersing or migrating individuals. If so, he or she could create a new record as above that would essentially erase POD-based records when generating the hexagon status files.

All of these editing changes were then added to the species/hexagon overlap records generated from POD data and a final query was run to retrieve the best record for each species in each hexagon and appropriately code the *status.data* and *source.data* files. Note that additional observations were being entered into POD, and existing POD data were being remapped, while the review process was occurring. Because of this, in some cases reviewers' records that elevated a 'possible' to 'probable' were in turn superseded by newer POD data that confirmed the species' presence in a hexagon.

Later, these species-hexagon range maps were reviewed for MT-GAP by biologists from around the state (see Appendix 3.2). Reviewers were given the opportunity to make changes to individual hexagon occurrences if they questioned the assigned codes. They were also given the opportunity to add new locations to the database.

Species-hexagon range maps were then ready to be used as inputs to the final vertebrate modeling process. It should be noted that this is the only manner in which these particular maps were used. Maps of species richness within hexagons were created after distributions were predicted, and do not reflect sums based on hexagons at this stage. Rather, the richness sums were calculated by overlaying each species' predicted distribution with the hexagon layer; if any amount of habitat was predicted within a hexagon, the species was coded as Present (1) for that hexagon. In effect, this "extends" the hexagon distributions, because predicted habitat was allowed to extend slightly beyond hexagon boundaries (see Modeling Process below). Thus, when predicted habitat is in turn used to populate hexagons, a species' range is stretched past the original hexagon range limits. This post-prediction approach to richness calculation was selected for consistency across taxonomic groups. We needed to account for bird distributions, which were based on latilongs rather than hexagons, so we chose to calculate richness at the end of the modeling process rather than at the beginning.

Birds by Latilong -- Distributional limits for birds were mapped using an existing latilong grid system, P.D. Skaar's Montana Bird Distribution database (fifth edition, Montana Bird Distribution Committee 1996). We acquired a copy of this database from MTNHP and converted it to GIS format; however, our latilong layer differs from the published version in four ways. First, although the published maps include quarter-latilong observations, we mapped all observations at the coarser latilong level because there weren't sufficient quarter-latilong observations to justify this finer scale. Second, observation types were combined into a new coding scheme devised for MT-GAP. Third, new observations were added by MT-GAP reviewers. Fourth, after the review period, an in-house update was conducted to fill in holes in species' distributions based on professional judgment.

To create a GIS layer, we first converted the dbase files from MTNHP to INFO database format, then created an ARC/INFO coverage with the necessary items to document species' observations per latilong, using TNC element codes as species identifiers. Element codes were updated in the latilong database so that they would match those obtained from TNC. We also collapsed subspecies data to the species level.

Next, we ran queries to populate latilongs with species observations. Initially, quarter-latilong (QLL) observations were distinguished from latilong (LL) observations, and queries were run to select the highest observation type for each species in each QLL or LL, keeping breeding and wintering observations separate. In the Skaar database, the highest possible code for breeding observations is B (direct evidence of breeding), followed by b (indirect or circumstantial evidence of breeding) and t (no evidence of breeding). Wintering observations include W (overwintering) or w (overwintering not yet documented). After queries were run separately for QLL and LL observations, another similar query was run to combine information from each into one database. Here again, we selected for the highest observation type per species per latilong, and kept breeding and wintering data separate.

We then recoded observations to seven classes that were intended to maintain seasonal ranges for birds, but in a condensed form. These seven classes include:

1. Breeding and wintering observations (B + W/w from the Skaar database);
2. Breeding only (B);
3. Possible breeding only (b);
4. Possible breeding and wintering observations (b + W/w);
5. Transient and wintering observations (t + W/w);
6. Transient only (t);
7. Wintering only (W/w).

As part of the overall MT-GAP review process, latilong maps with these codes were circulated among reviewers from around the state (see Appendix 3.2). Reviewers were given the opportunity to make changes to individual latilong occurrences if they questioned the assigned codes, as well as the opportunity to add new locations to the database. After the review process was complete and all changes had been made to the database, we conducted a final in-house review to fill in latilong holes in individual species' distributions. Our intent was conservative. For each latilong in question, we examined species codes for the surrounding latilongs, amount of predicted habitat within the latilong, and biogeographic similarity with neighboring latilongs (e.g., mountains vs. plains). For breeding birds, we assigned code 3 to latilongs where breeding appeared probable. Wintering and migratory birds were assigned codes 5 and 6 respectively. At this point, latilong maps were ready to be incorporated into the final run of the vertebrate modeling process.

Documenting Wildlife-Habitat Relationships

We developed a set of WHR databases for Montana to document wildlife-habitat relationships for 425 terrestrial vertebrates. At the core of this system are: 1) descriptions of habitats with which each species is associated, related references, and also modeling assumptions and caveats; and 2) descriptions of modeling rules per species, and matrices associating each species with land cover types, elevation ranges, hydrographic features, and other data layers. An example is provided in Appendix 3.3; information for all species can be found in Hart et al. (1998).

When MT-GAP began, no WHR existed for the state; however, we were able to capitalize on information available in WHR databases developed for WY-GAP, as well as the TNC's Biological Conservation Database, or BCD, obtained from MTNHP in November 1996. Because our input layers and raster modeling process differed significantly from WY-GAP's, we conducted our own extensive literature review of habitat associations for each species so that models could be tailored accordingly. After WHR materials were subjected to outside review, we incorporated changes suggested by expert reviewers. WHR databases were created and maintained using FileMaker Pro software (Macintosh version 4.0 v1); data were transferred between FileMaker Pro and ARC/INFO in dBase format as needed.

GIS Modeling to Predict Species Habitat and Distribution

Input Layers -- Land cover, topography, and hydrography were the basic input layers for the modeling process (Table 3.2). From these, other specialized layers were developed to refine predicted species distributions. Most of these derived layers incorporate spatial queries that require consideration of each 90 m cell's surroundings, not just its own value. For example, a 500 m buffer might be applied to all lakes and major rivers.

All layers were created in or converted to ARC/INFO grid (raster) format, cell size 90 m. To avoid slivers of missing data, all layers were prepared so that their extent was either larger than the state boundary (typically including the 10 km buffer applied to land cover), or clipped precisely to the state border using the same standard boundary layer as a mask. Further, the cell increment (starting position of rows and columns) was specified to match that of the land cover layer. This "snapgrid" function was needed to avoid sub-cell shifts, and hence potential (albeit nearly undetectable) modeling errors. In all instances, null data values were set to 0 to facilitate the modeling process: when grids were overlayed, areas with null data would have typically been excluded, even if all other layers satisfied the query. For some models, the presence of null data would have yielded unsatisfactory results. Note, however, that the presence of null data does not necessarily indicate problems within the layer; for example, a 500 m buffer layer might be coded 1 within the buffer, and either null data or 0 outside the buffer. Both options represent the same

Table 3.2. GIS layers prepared as inputs to the vertebrate modeling process, all in ARC/INFO grid (raster) format, 90 m cell size. Primary layers in bold, derived layers in italics.

LAYER	SOURCE	DESCRIPTION
Land Cover	Classified Landsat TM data, 30 m resolution. Derived from individual databases per TM scene, including numerous attributes.	50 cover types. Water/riparian types at 90 m minimum mapping unit (MMU), cloud/shadow at 100 ha MMU, all others at 2 ha MMU.
Forest Canopy		3 canopy closure levels. Low (<40%), Medium (40-70%), High (>70%).
Buffers		Buffers could be applied to any single cover type or combination of cover types; for example, 1 km buffer on urban areas. Computationally intensive, thus used conservatively.
Merged Land Cover		Land cover layer merged to 100 ha MMU; largest polygons (>100,000 ha) split using 5th code watersheds. Used to soften hexagon and latilong boundaries.
Topography	7.5' Digital Elevation Models (DEMs) where available, patched with three-arc second data (Defense Mapping Agency, source scale 1:250,000) as needed.	Elevation in meters. Differences between input sources were especially apparent in slope and aspect derivations, thus, these were rarely used.
Elevation Contours		Elevation contoured into 150 m intervals.
Slope		Percent slope, split into 7 classes: flat, 1-10%, 11-20%, 21-40%, 41-60%, 61-80%, >80%.
Aspect		Aspect, split into 9 classes: flat, N, NE, E, SE, S, SW, W, NW.
Hydrography	USGS Digital Line Graphs (DLGs), source scale 1:100,000. Edited in-house to match corresponding published maps.	Lakes, rivers, streams, ditches, and all other features as mapped in standard DLGs. No polygon topology. Differences in line densities apparent among 1:100,00 scale tiles.
All features		Includes all features mapped within the DLGs.
Lakes		All lakes, attributed with size (ha) and presence of islands. Required fairly extensive manual editing to create polygon topology.
Major rivers		Manually selected; includes features coded with left and right shorebanks in the DLGs.
Perennial streams		Perennial streams coded in the DLGs.
Buffers		Buffers could be applied to any combination of the above sets of hydrographic features. Typical buffers include 90 m, 500 m, 1 km, 2 km.

information. Quality control methods were applied to ensure that each layer had been correctly constructed.

Modeling Process -- All modeling was conducted in the ARC/INFO grid environment. Each species was approached individually, yielding the potential for 425 individual models, although we made every effort to simplify the process by developing groups of similar models. In the end, most species were assigned to modeling loops, where the model logic remained the same for each species -- querying the same set of layers, but for different values (e.g., a different set of cover types or a different hexagon distribution). To create predicted distribution grids, five programs were written in Arc Macro Language (AML): one for amphibians and reptiles, one for mammals, and three for birds. Nineteen separate loops were developed, and unique queries were created for 123 species. Models for each species follow the same approach (see Figure 3.2):

1. Create a grid delineating the known distribution based on either hexagons or latilongs.
2. Generalize the edges of the known distribution using land cover polygons merged to 100 ha MMU. Assign each land cover polygon the lowest code (highest probability of occurrence) within its borders so that distributions are effectively extrapolated outward by one polygon, always favoring the lowest code when land cover polygons span hexagons or latilongs.
3. Query layers for predicted habitat based on land cover types and other features. Code all areas selected as habitat using values from the extrapolated hexagon or latilong boundaries. Assign a special code to predicted habitat outside the known distribution to distinguish it from areas not predicted to be habitat.
4. Recode the output of Step 3 to reduce it from a range of values (probabilities of occurrence) to 1/0 values indicating a species' presence or absence. Eliminate areas with lower probability of species occurrence. For amphibians, reptiles, and mammals, keep hexagon codes 1-3 (confirmed-possible). For breeding birds, keep latilong codes 1-4 (breeding and possible breeding); for wintering birds, codes 5 and 7, and for migrating birds, codes 5 and 6.

Outputs of Step 3 were provided to reviewers so that they could see habitats coded by probability of occurrence, as well as predicted habitat outside the known range, and use this extra material in commenting on distribution patterns. Outputs of Step 4 were used in final maps and analyses.

Expert Review of Species Distribution Maps

We conducted a review of vertebrate species distribution maps and their ingredients in January-April 1998. Nearly 50 biologists from around the state participated in this process (see Appendix 3.2). Review was conducted by mail and telephone. We first sent letters to potential reviewers, then followed up with telephone calls to determine whether each could participate within the specified period, and if so, which species they would like to review. We then prepared and mailed review packets for each person, customized to their species list.

Each reviewer received a letter outlining the modeling process and how they could help us improve it; a description of each input data layer; a list of cover type descriptions and a statewide map of land cover; a transparency of the state, with towns, county lines, and rivers, to be overlayed with distribution maps; and a response sheet on which suggested changes per species could be summarized. In addition, for each species, reviewers were provided with a map of the documented range (hexagons or latilongs); a map of the predicted distribution; a summary sheet with modeling rules and all data layers included in each model; and a description of habitat preferences with pertinent references. Upon request, reviewers also received finer-scale maps specific to their area of geographic expertise. Many reams of paper were consumed in this process.

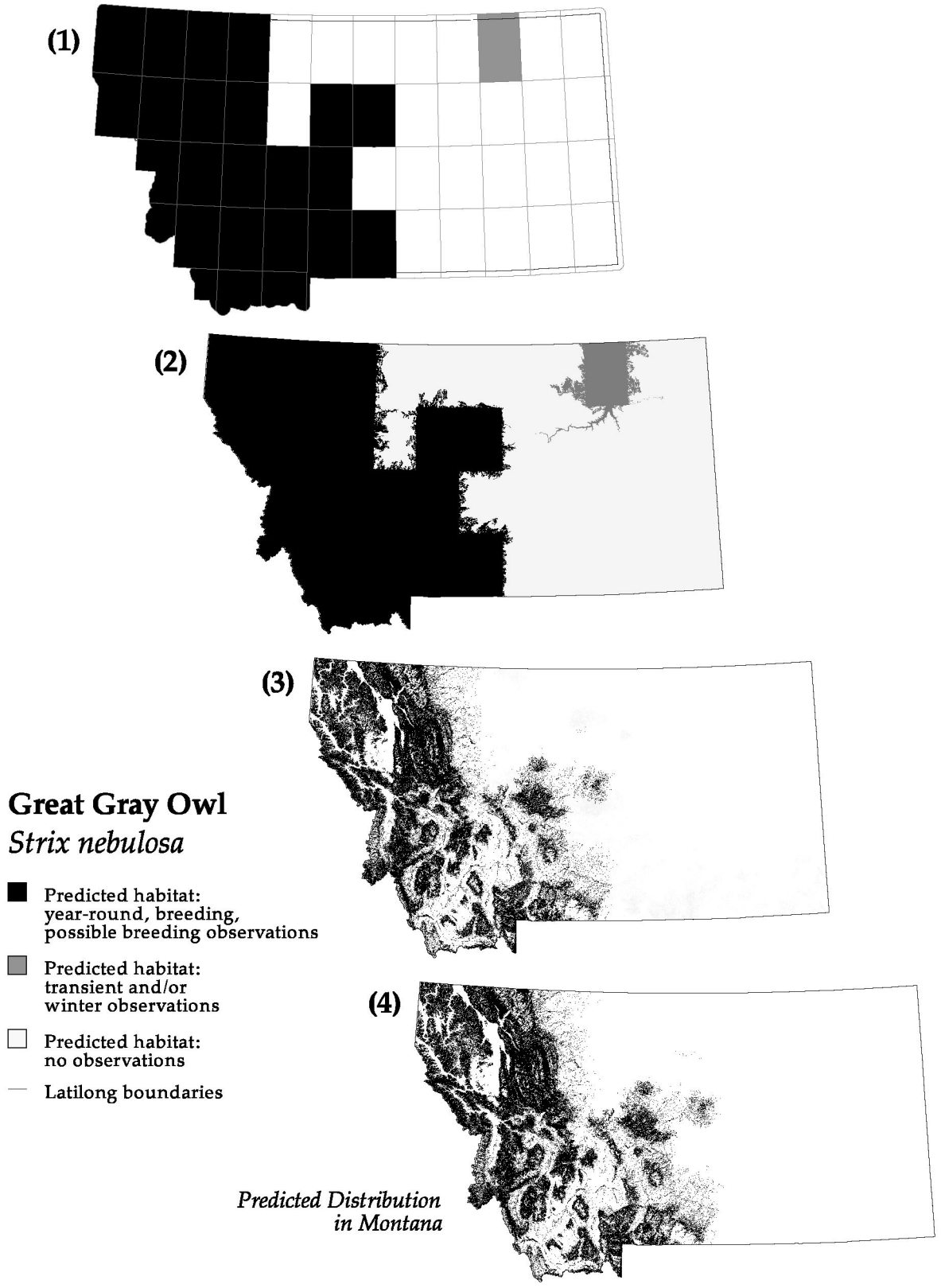


Figure 3.2. Steps in the vertebrate modeling process: 1) delineate known distribution; 2) naturalize distribution boundaries; 3) assign distribution codes to predicted habitat; 4) reduce codes to presence/absence.

Typically, reviewers returned their comments by mail, but many telephone calls were involved as well, especially when comments triggered additional questions. After the review period was completed, we incorporated suggested changes into our databases and re-created the predicted distribution maps.

Every species had at least one reviewer. Our goal was to have each species reviewed by at least three people; we met that target for all but 88 of 425 species (21%). All amphibians and reptiles were reviewed by four or more people. Mammals were the most sparsely reviewed group: 44 had one reviewer; 28 had two, and the remaining 30 had three or more reviewers. Small mammals tended to be reviewed by the fewest people, whereas carnivores and ungulates were well-reviewed. As a group, birds were very well-reviewed: only 16 out of 290 species had less than three reviewers, 93 met the target, and 181 were reviewed by four or more people. Given the short period of time during which the reviews were conducted, response was remarkable.

Results

Distributions of 425 terrestrial vertebrate species were predicted, including 16 amphibians, 17 reptiles, 290 birds, and 102 mammals. Of the 425, 9 were exotic species (1 amphibian and 8 birds). Two others, the Idaho giant salamander (*Dicamptodon aterrimus*) and wood frog (*Rana sylvatica*) have been reported but not confirmed in the state; models were created only to guide future field surveys. Thus, distributions were predicted for 414 native terrestrial vertebrates; these 414 were included in subsequent analyses. Because 68% of the native terrestrial vertebrates are birds (282/414), results of the avian modeling process heavily influence all richness calculations.

Of the 425 species models developed, 136 were based solely on land cover, 73 on land cover and forest canopy, 28 on land cover and elevation, and 9 on land cover, elevation, and canopy. Many of the rest were based on some combination of land cover, canopy, elevation, and buffers on hydrographic features, although additional layers such as slope were used to a limited degree. Associations with water and riparian land cover were established for 339 species. All riparian types except graminoid/forb riparian were predicted to provide habitat for more than 100 species on average, with the highest richness scores assigned to forested riparian areas (Table 3.3). Low/moderate cover grasslands had the highest richness scores of any grassland type, averaging about 78 species. For forest types, those with a broadleaf component were predicted to support the most species (mixed broadleaf - 90 species; mixed broadleaf/conifer - 82 species). Ponderosa pine was the highest-scoring conifer (79 species), perhaps in part because it is the most widely distributed conifer type in the state.

Total predicted richness of native terrestrial vertebrates within hexagons ranged from 16 to 339, with a mean of 265±37 SD. The distribution of vertebrate richness appeared bimodal, with peaks at 221-240 species/hexagon and around 300 species/hexagon (Fig. 3.3). Geographic patterns of richness generally suggest higher diversity in the mountainous regions of western Montana, with the lowest values in northeastern Montana (Fig. 3.4). Not surprisingly, the highest diversity was observed for hexagons along ecotones, where habitat diversity is correspondingly high. Hexagons along the Rocky Mountain Front illustrate this trend, running from peaks to plains. To some degree, boundary effects are also evident, with lower values predicted for hexagons spanning the state border than for their interior neighbors. It is important to recognize, however, that patterns of richness are sharpened, sometimes artificially, when richness counts are combined into classes. Contrast Figure 3.4 with Figure 3.5, which shows actual scores for each hexagon in the state: some patterns appear more “real” than others. It is also important to note that species composition has been only cursorily considered in these calculations.

Table 3.3. Minimum, maximum, and mean predicted richness of native terrestrial vertebrates for 50 land cover types mapped in Montana.

Code	*Cover Type*	*% of State*	*Number of Species*		
			Minimum	*Maximum*	*Mean*
1100	Urban or developed lands	0.17	27	59	42.589
2010	Agricultural lands - dry	9.54	39	98	58.209
2020	Agricultural lands - irrigated	5.14	36	105	57.225
3110	Altered herbaceous	2.67	27	122	65.990
3130	Very low cover grasslands	2.90	40	105	68.077
3150	Low/moderate cover grasslands	27.38	38	127	78.043
3170	Moderate/high cover grasslands	3.25	31	113	71.580
3180	Montane parklands & subalpine meadows	1.39	42	106	61.681
3200	Mixed mesic shrubs	2.49	42	107	63.449
3300	Mixed xeric shrubs	3.22	38	93	74.551
3309	Silver sage	0.19	47	86	60.806
3310	Salt-desert shrub/dry salt flats	0.34	17	58	28.874
3350	Sagebrush	5.63	36	100	73.594
3510	Mesic shrub - grassland associations	0.74	58	109	75.223
3520	Xeric shrub - grassland associations	1.38	62	102	84.789
4000	Low density xeric forest	0.75	38	108	83.410
4140	Mixed broadleaf forest	0.94	41	148	90.238
4203	Lodgepole pine	3.38	24	95	64.972
4205	Limber pine	0.32	27	72	52.675
4206	Ponderosa pine	2.80	25	124	79.413
4207	Grand fir	0.06	46	95	66.558
4210	Western red cedar	0.10	41	89	57.454
4211	Western hemlock	0.05	39	81	51.233
4212	Douglas-fir	3.49	27	114	77.125
4214	Rocky Mountain juniper	0.21	24	82	58.112
4215	Western Larch	0.24	47	99	74.305
4216	Utah juniper	0.04	50	81	69.750
4223	Douglas-fir/lodgepole pine	1.19	26	104	71.892
4260	Mixed whitebark pine forest	1.04	18	57	38.726
4270	Mixed subalpine forest	4.16	24	100	67.143
4280	Mixed mesic forest	3.22	32	115	76.436
4290	Mixed xeric forest	1.42	27	109	75.737
4300	Mixed broadleaf & conifer forest	0.26	34	134	81.991
4400	Standing burnt forest	0.37	37	84	63.421
5000	Water	1.05	2	92	38.471
6110	Conifer riparian	0.22	52	150	113.822
6120	Broadleaf riparian	0.52	89	174	123.154
6130	Mixed broadleaf & conifer riparian	0.09	80	174	133.904
6200	Graminoid & forb riparian	1.84	50	141	71.645
6300	Shrub riparian	0.95	77	195	109.533
6400	Mixed riparian	0.32	69	187	104.193
7300	Rock	1.55	5	30	14.078
7500	Mines, quarries, & gravel pits	0.03	8	23	13.172
7600	Badlands	1.97	30	63	48.223
7604	Missouri breaks	0.18	45	67	54.972
7800	Mixed barren sites	0.52	7	49	17.507
8100	Alpine meadows	0.14	20	50	34.720
9100	Snowfields or ice	0.07	1	18	6.631
9800	Clouds	0.05	0	12	0.633
9900	Cloud shadows	0.03	0	11	0.713

Predicted richness by taxonomic group is presented in Figures 3.6 through 3.11. Amphibian richness ranged from 0 to 9 species per hexagon, out of a maximum of 13 native species modeled. Amphibians were the only taxa not to display a bimodal distribution of species richness, probably at least partly because of their numbers. Although reptile species are also few in number (n = 17), their distribution was bimodal, with peaks at 9 and 12 species per hexagon; richness values ranged from 2 to 14 species per hexagon. Avian richness ranged from 6 to 248 species per hexagon, out of a possible 282. Out of 102 mammals modeled, a minimum of 8 and a maximum of 81 were predicted per hexagon. Patterns of richness tended to be highest in the mountainous areas of Montana for all groups except reptiles; however, amphibians appear to be especially concentrated in ecotonal areas and in the Northern Continental Divide Ecosystem. Birds were more evenly distributed across the state, but a band of the highest values runs along the ranges of the Rocky Mountains. Mammals exhibited a variation on this same trend, but richness values were especially high across southwestern Montana, appearing to radiate outward from that region. Reptiles, on the other hand, tended to be concentrated along the major river corridors in eastern Montana, especially along the Yellowstone and its tributaries in southeastern Montana.

In addition to richness predictions by hexagon, richness was also calculated for each 90 m cell in the state. Totals were much lower; for example, the maximum number of terrestrial vertebrates predicted in any 90 m cell was 195, as compared with 339 for a single hexagon. The mean number of species per hexagon, when calculated by averaging species counts for every 90 m cell in a hexagon, was 69±7 SD, as compared with 265±37 SD above. Patterns of richness at this finer scale highlight the degree of generalization that takes place in summarizing diversity per hexagon (Fig. 3.12). The influence of riparian areas on predicted species richness values is also highlighted at the resolution of 90 m cells.

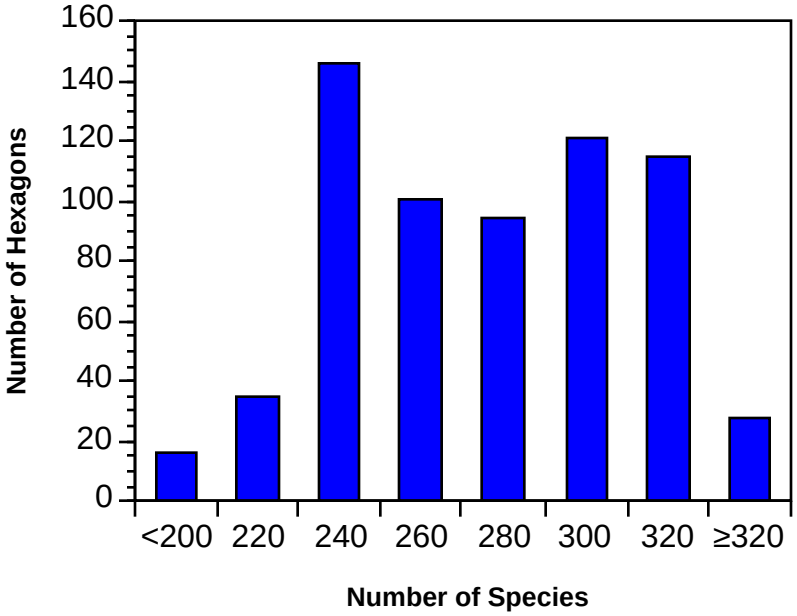


Figure 3.3. Frequency distribution of species richness for 414 native terrestrial vertebrates within 656 equal-area hexagons across Montana.

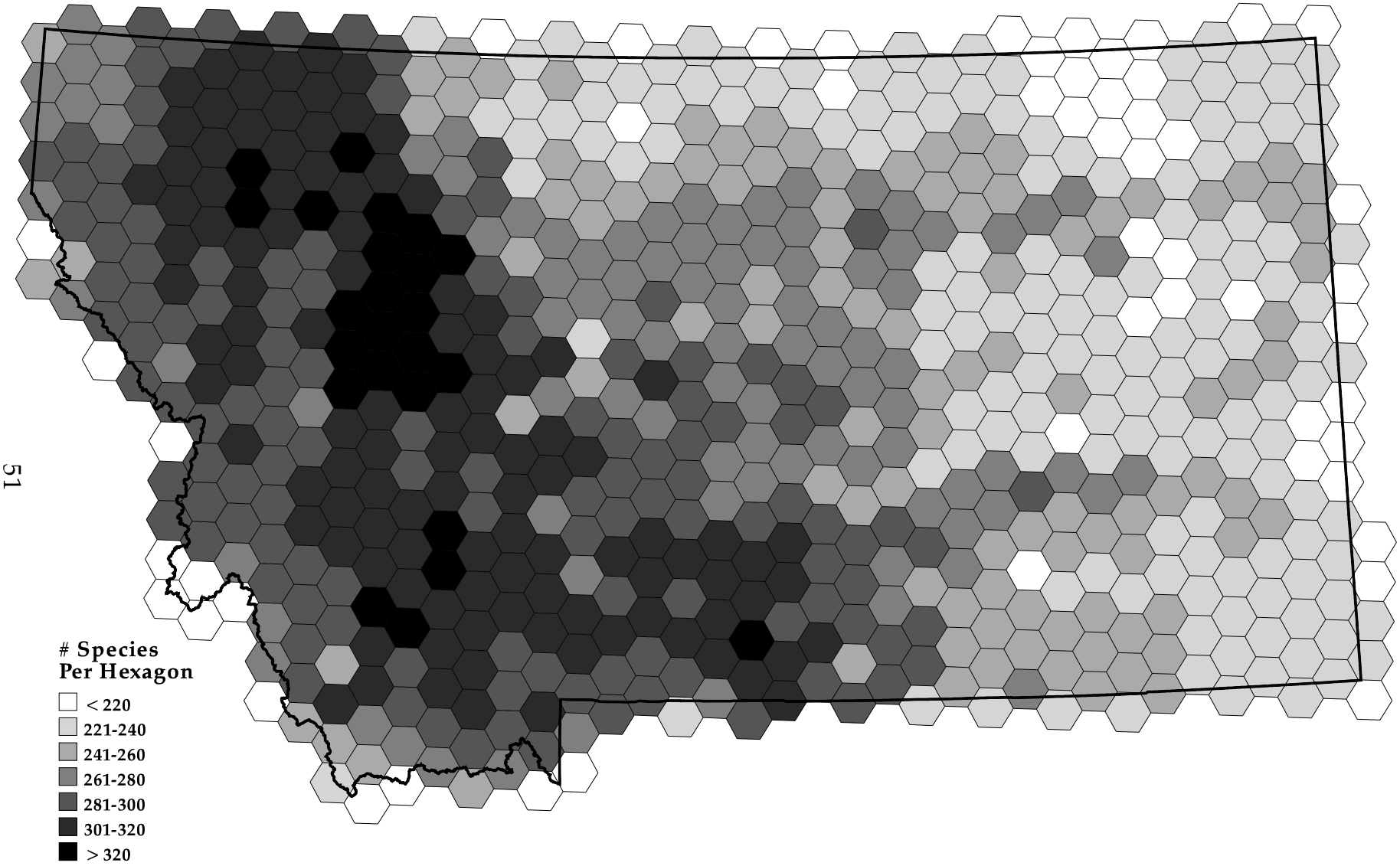


Figure 3.4. Predicted distribution of total native terrestrial vertebrate richness within hexagons across Montana.

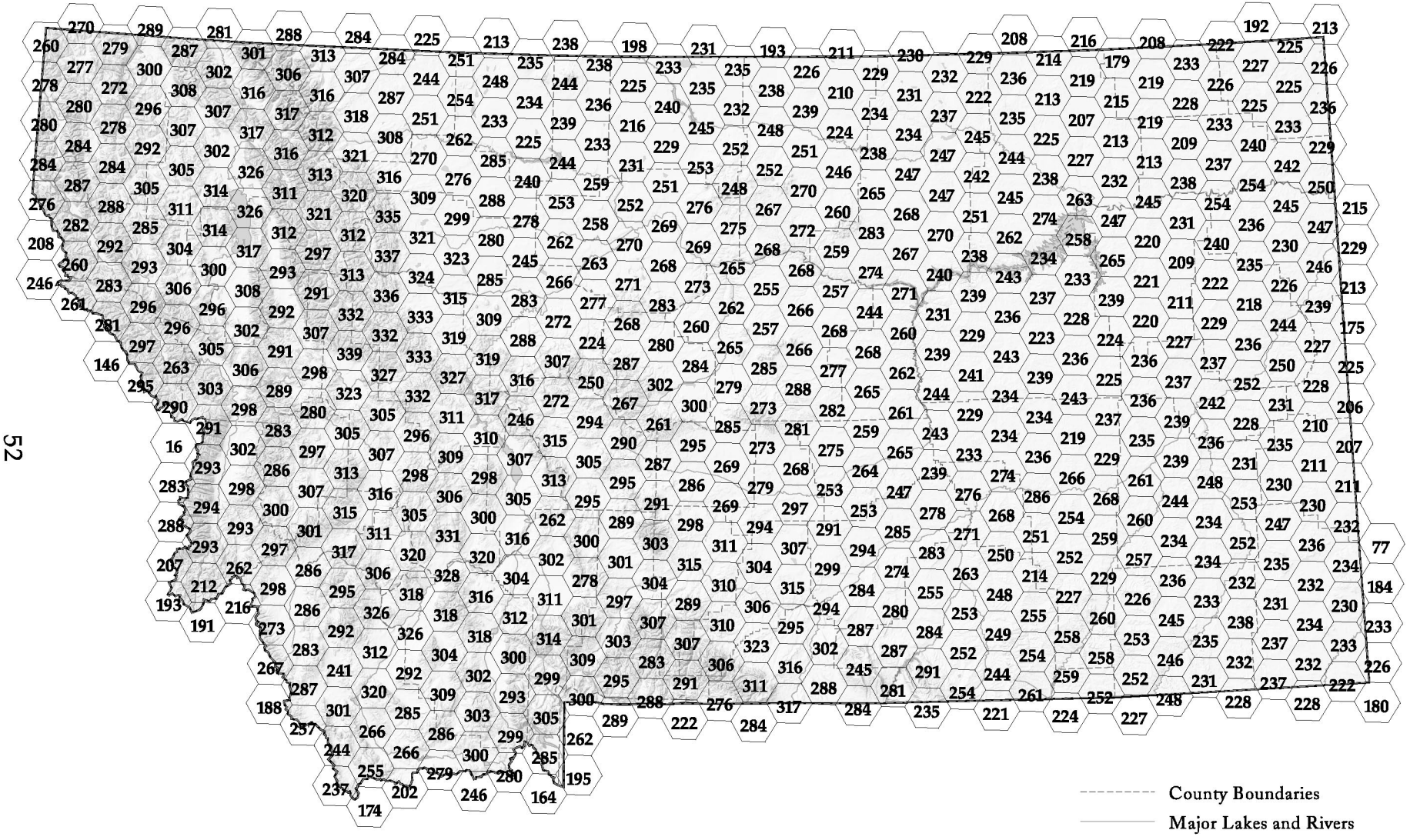


Figure 3.5. Predicted native terrestrial vertebrate richness in Montana (number of species by hexagon). Range is 16-339 out of 414 species modeled.

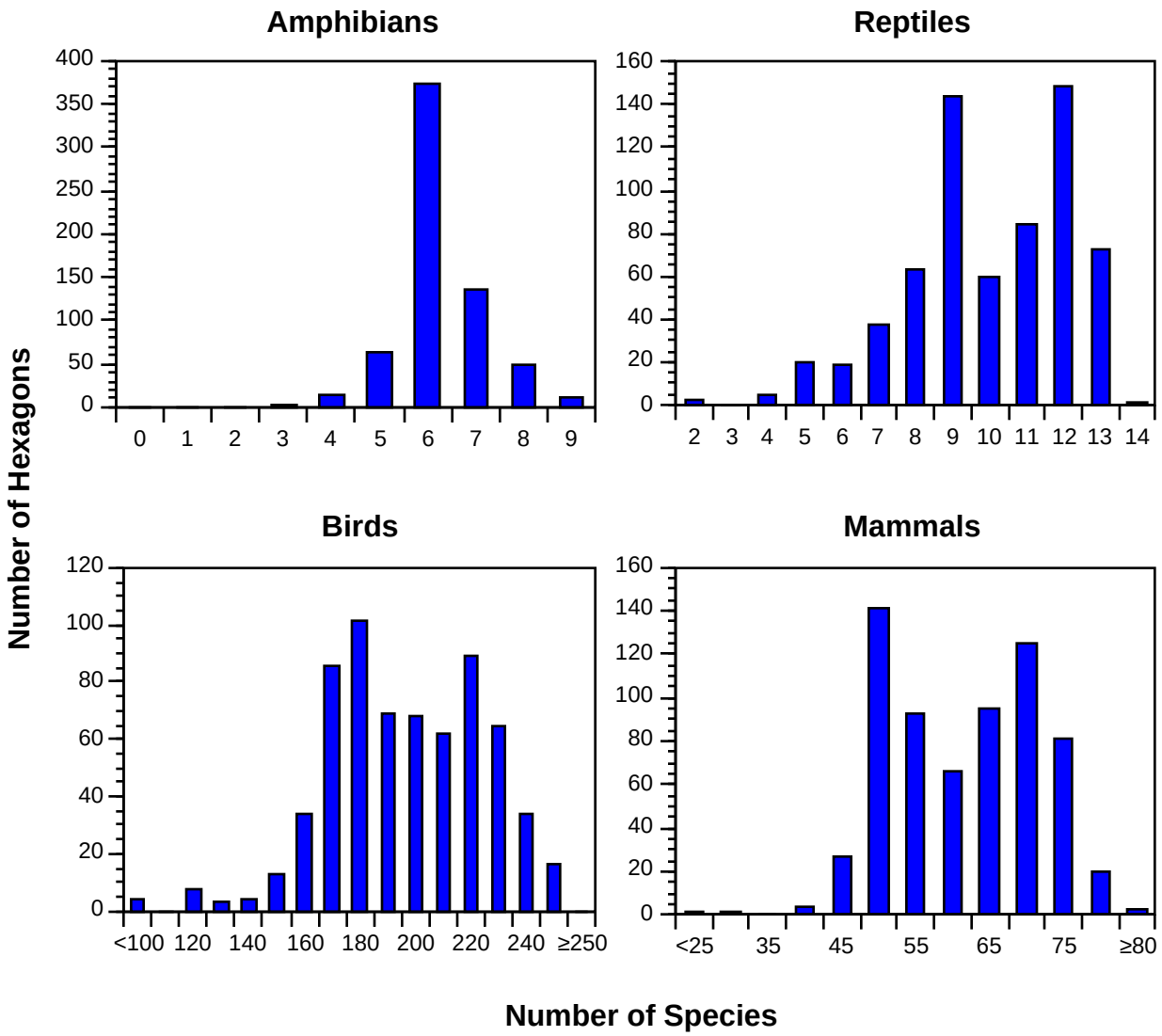


Figure 3.6. Frequency distributions of native species richness for amphibians, reptiles, birds, and mammals within 656 equal-area hexagons in Montana.

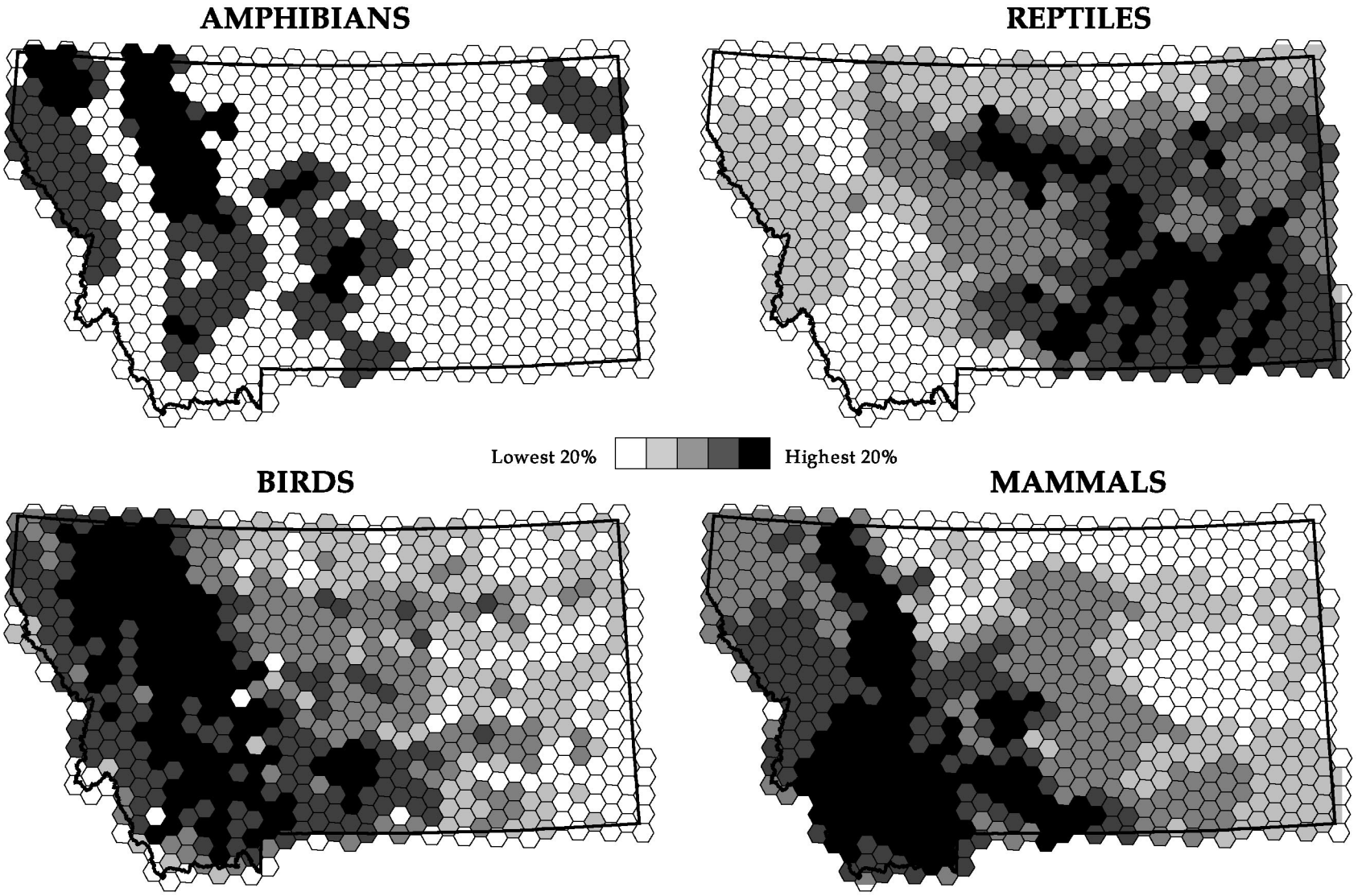


Figure 3.7. Total species richness by hexagon, divided into 5 equal-area classes, for native amphibians, reptiles, birds, and mammals in Montana. (Because the range of amphibian species is small and sharply dominated by one value, 5 equal-area classes were not possible.)

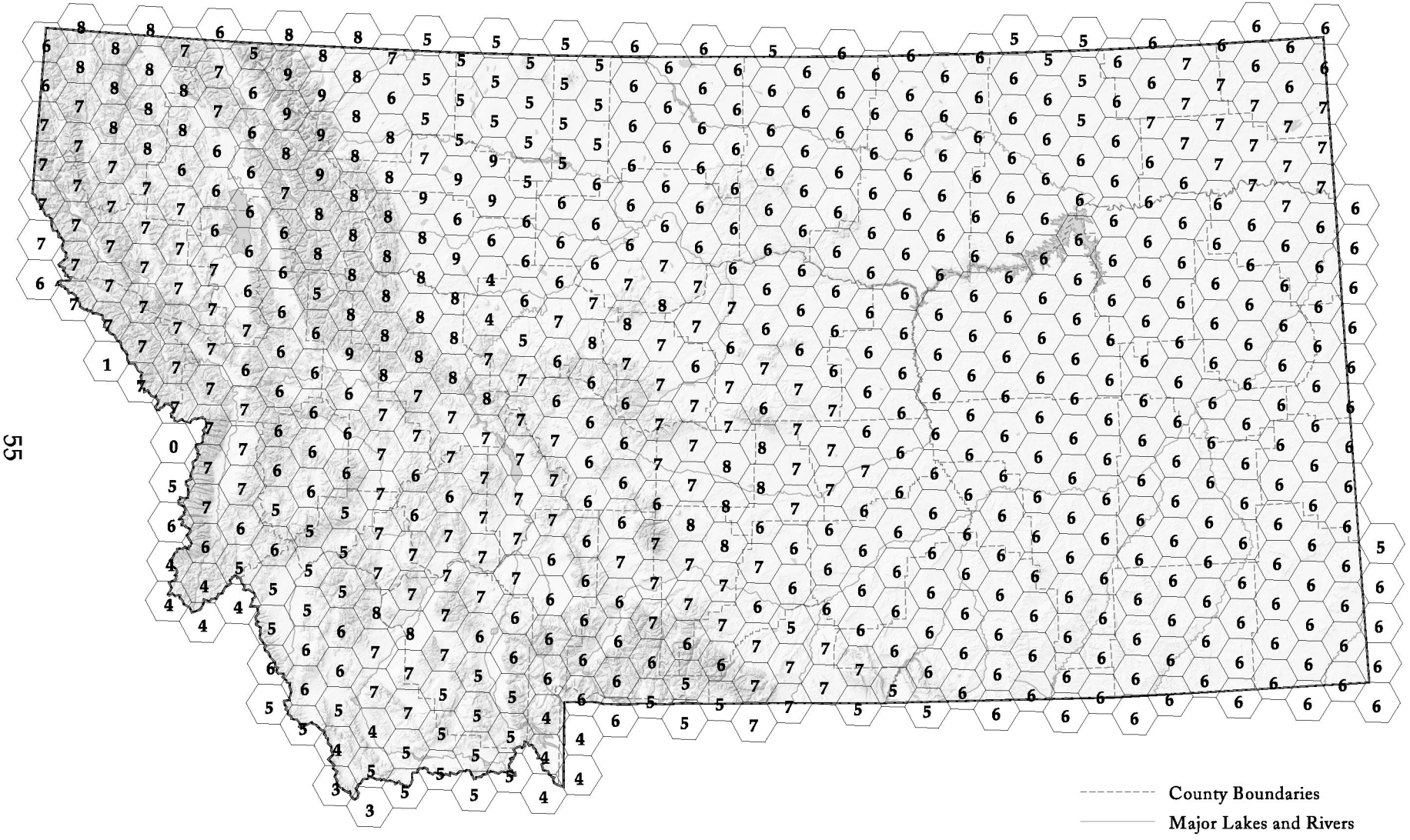


Figure 3.8. Predicted native amphibian richness in Montana (number of species by hexagon). Range is 0-9 out of 13 species modeled.

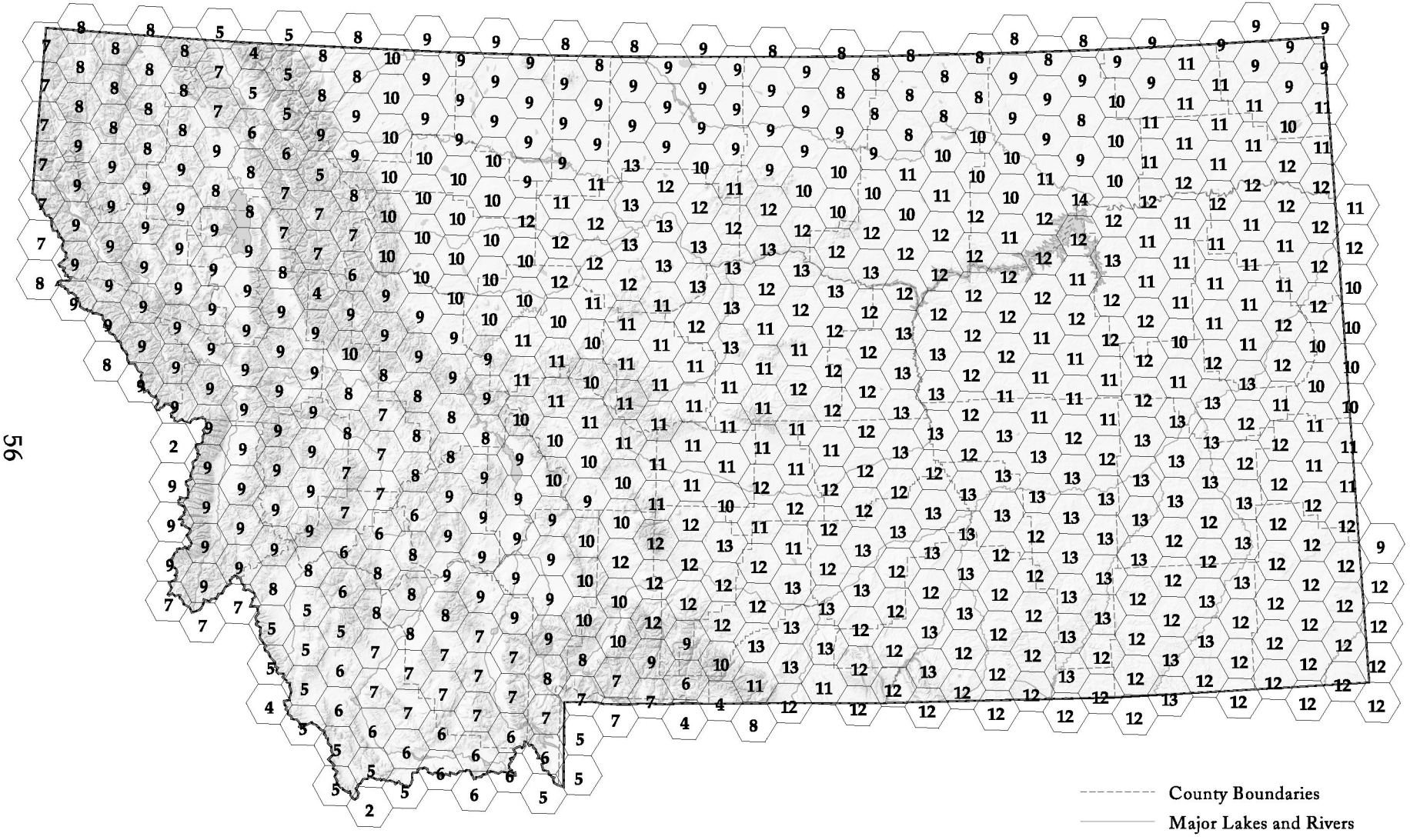


Figure 3.9. Predicted native reptilian richness in Montana (number of species by hexagon). Range is 2-14 out of 17 species modeled.

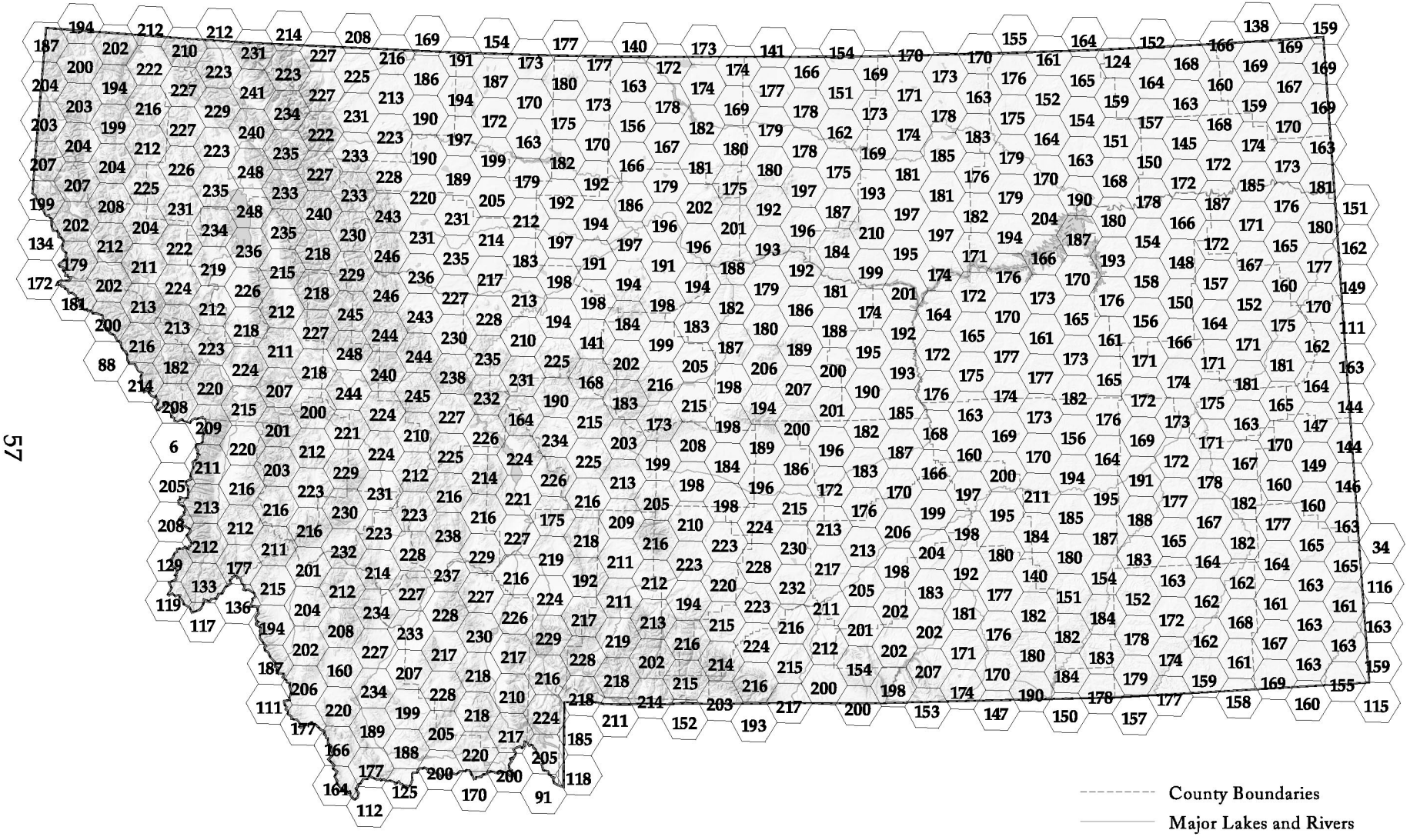


Figure 3.10. Predicted native avian richness in Montana (number of species by hexagon). Range is 6-248 out of 282 species modeled.

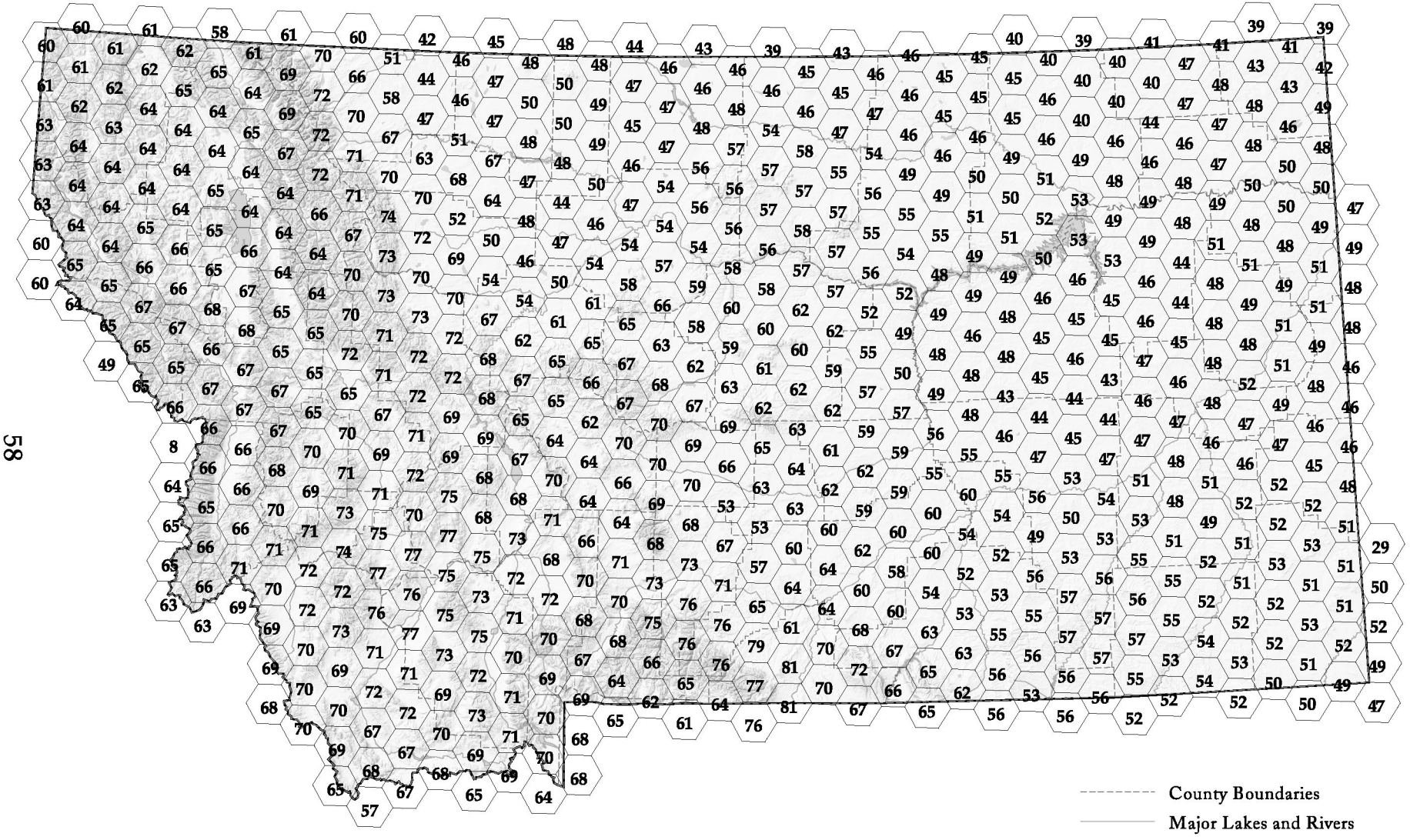


Figure 3.11. Predicted native mammalian richness in Montana (number of species by hexagon). Range is 8-81 out of 102 species modeled.

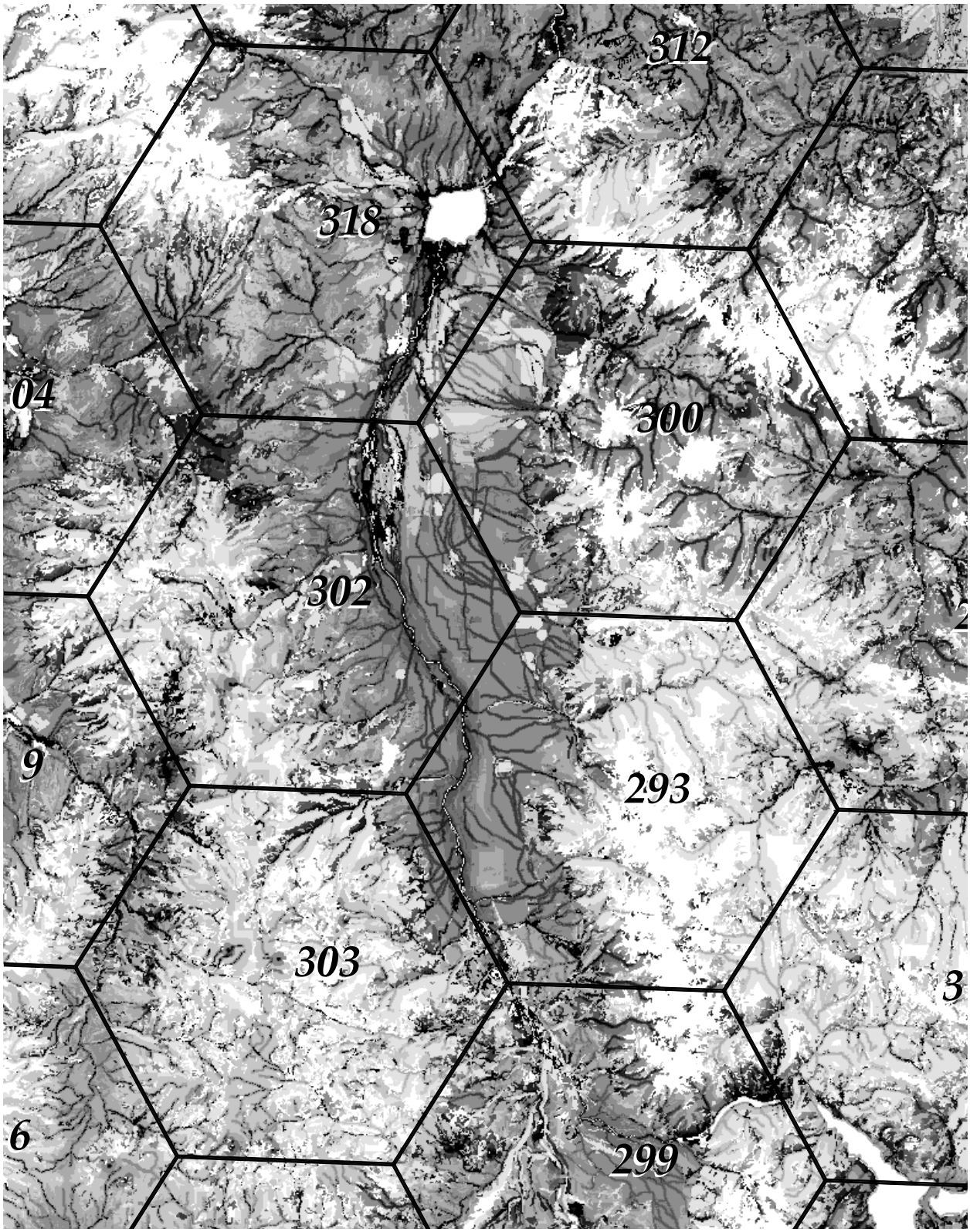


Figure 3.12. Patterns of native terrestrial vertebrate richness underlying total richness values per hexagon, Madison Valley and vicinity.

Accuracy Assessment

Assessing the accuracy of predicted vertebrate distributions is subject to many of the same problems as assessing land cover maps, as well as a host of more serious challenges related to both the behavioral aspects of species and the logistics of detecting them. These are described further in the Background section of the GAP Handbook on the national GAP home page. Despite these challenges, it is necessary to provide some measure of confidence in the results of the gap analysis for each species (comparison to stewardship and management status), and to allow users to judge the suitability of the distribution maps for their own uses. Thus, we have attempted to provide users with a statement about the accuracy of our predicted vertebrate distributions within the limitations of available resources and practicalities of such an endeavor. Distribution maps are never finished products; instead, they are likely to be constantly updated as new information is gathered. However, by assessing the accuracy of their current iteration, we can offer potential users valuable information about map reliability. We especially encourage wildlife biologists and naturalists to treat the predicted distributions as testable hypotheses and to engage the process of validation and iterative modeling. Our goal was to produce maps that predict the distribution of terrestrial vertebrates and from that, total species richness and species content, with an accuracy of at least 80%. Failure to achieve this accuracy indicates the need to refine the data sets and models used for predicting distribution, or, in some cases, the need to collect additional data with which to assess distributional accuracy. The methods for validating and assessing the accuracy of the vertebrate distribution maps, along with the results, are presented below.

Methods

Long-term, systematic field surveys would be necessary to provide the independent data and statistical rigor required to properly assess the accuracy of vertebrate distribution maps. Needless to say, the costs of such an effort would be prohibitive, especially for a state the size of Montana. Working within constraints of personnel, time, and money, we opted to evaluate our predicted distributions in a more practical but limited way by measuring their agreement with species checklists compiled by biologists and naturalists for parks, refuges, and preserves around the state. Species occurrence data from 14 of these "validation" areas were assembled for use in this assessment (Table 3.4, Figure 3.13). These checklists were not used directly to develop any of the vertebrate distribution models, but they could have been referred to by biologists when reviewing some of the preliminary results. The validation areas – one Nature Conservancy preserve, one national park, two wildlife management areas, nine wildlife refuges, and one tribal reservation – were selected based on the reliability of their species checklists and the similarity with which their data were compiled. Of these 14 validation areas, seven provided complete checklists for all taxonomic groups, three had checklists for birds and mammals, and four had checklists only for birds.

Only those species whose presence had been documented and confirmed on one or more checklists were included in the agreement analysis; species listed as "possible" or "suspected" inhabitants of an area were not included. Furthermore, we dealt only with presence; absence from a checklist was not considered synonymous with absence from an area (see below). For amphibians, reptiles, and mammals, all checklists simply listed species as present (or suspected), and thus little interpretation was necessary. More detailed information, however, was provided for birds: checklists from 13 of the 14 validation areas listed species according to the likelihood of their detection (abundant, common, uncommon, occasional, rare, and accidental) as well as by season of occurrence. The checklist from the 14th area, Pine Butte Swamp Preserve, listed birds by presence only. All bird occurrence codes except "accidental" were considered to indicate presence in the validation area. Birds coded as "rare" were considered to be present for two reasons. First,

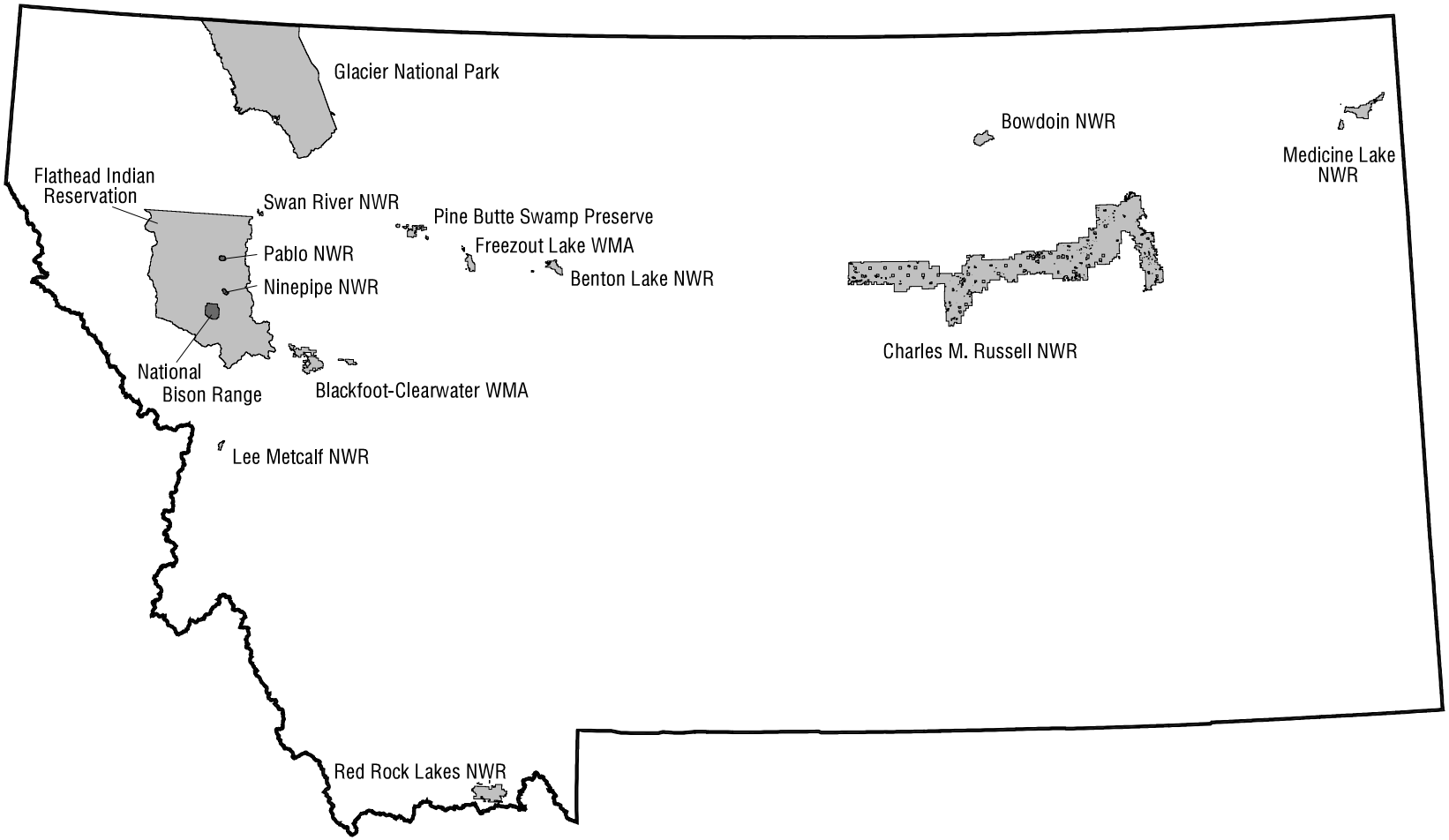


Figure 3.13. Fourteen wildlife areas used to assess the accuracy of predicted vertebrate distributions in Montana. NWR = National Wildlife Refuge, WMA = Wildlife Management Area.

Table 3.4. Size (ha), elevation range (m), and checklist source for 14 validation areas used to assess the agreement of predicted vertebrate distributions in Montana.

Validation Area[a]	***Size***[b]	***Elevation***[c]	***Checklist Source***[d]
Benton Lake NWR	4,773	1080-1165	USFWS (birds 1993, mammals 1996[e], amphibians and reptiles 1995); lists compiled from personnel and visitor observations since 1961.
Blackfoot-Clearwater WMA	16,253	1149-2326	MTFWP (all groups 1995); conducted census to create list in 1991, updated with personnel and visitor observations.
National Bison Range (NWR)	7,497	770-1480	USFWS (birds and mammals 1990); lists compiled from personnel and visitor observations.
Bowdoin NWR	6,459	672-701	USFWS (birds 1992, mammals 1985); lists compiled from personnel and visitor observations.
Charles M. Russell NWR	395,913	613-1009	USFWS (birds 1992, mammals 1996[e], amphibians and reptiles 1979); lists compiled from personnel and visitor observations.
Freezout Lake WMA	4,031	1130-1219	MTFWP, M. Schwitters (birds 1994); list compiled from 10 years of observations by author.
Glacier National Park	402,353	941-3163	National Park Service, Glacier Natural History Association, D. Shea (birds 1990, mammals 1986); list compiled from personnel and visitor observations.
Lee Metcalf NWR	1,081	981-1009	USFWS (birds 1989); list compiled from personnel and visitor observations.
Medicine Lake NWR	12,577	587-640	USFWS (birds 1988; mammals, amphibians and reptiles 1996[e]); bird list compiled from personnel and visitor observations; assume same for mammal, amphibian and reptile lists.
Ninepipe/Pablo NWR	1,857	901-1012	USFWS (birds 1983); assume list compiled from personnel and/or visitor observations.
Red Rock Lakes NWR	16,897	2004-2866	USFWS (birds 1994; mammals, amphibians and reptiles 1996[e]); lists compiled from personnel and visitor observations.
Flathead Indian Reservation	524,434	727-2965	Confederated Salish and Kootenai Tribes (all taxonomic groups 1996[e]); lists compiled from personnel and visitor observations.
Swan River NWR	509	930-990	USFWS (birds 1982); list compiled from personnel and visitor observations since 1974.
Pine Butte Swamp Preserve	5,225	1307-1759	The Nature Conservancy, R. Waldt (birds 1992; mammals, amphibians, reptiles 1995); assume lists compiled from personnel and/or visitor observations.

[a] NWR = National Wildlife Refuge, WMA = Wildlife Management Area.
[b] Hectares; sizes determined from the MT-GAP land stewardship layer.
[c] Meters; elevation ranges determined from a 90 m digital elevation model (DEM).
[d] USFWS = U.S. Fish & Wildlife Service, MTFWP = Montana Fish, Wildlife, & Parks.
[e] Checklist acquired 1996, but date of records uncertain.

we modeled distributions of rare birds in Montana; thus, it made sense to treat rarely occurring species as present. Second, unlike "accidental", "rare" suggests fairly regular occurrence in an area, although rare species might be difficult to detect because of limited activity and/or specific habitat requirements. Further coding decisions were made based on season of occurrence. If the modeling focus for a bird species was breeding habitat, and the only checklist occurrence code listed was "occasional" in the fall season, the species was not considered to be present for that validation area checklist. Similarly, seasonal considerations for checklist presence were made for birds whose distribution models focused on migrating or wintering habitat; that is, occurrence codes for the fall or spring, or winter season, respectively, were used.

A GIS layer (grid format) of the 14 validation areas was populated with presence/absence data from the checklists, and then compared to corresponding grids of predicted distributions for each species. A total of 415 terrestrial vertebrates were included in the assessment. Two amphibians suspected to occur in the state but never recorded (Idaho giant salamander and wood frog) were excluded, along with two birds (Cassin's Kingbird and Blue-gray Gnatcatcher) and six mammals (spotted bat, pallid bat, eastern cottontail, Uinta chipmunk, white-tailed prairie dog, and hispid pocket mouse) not recorded or predicted in any validation area.

When validation areas were overlayed with predicted species distributions, four outcomes were possible:

1. The species was not predicted to occur in an area where it has been recorded (omission error, where N_o is the total number of such errors);
2. The species was predicted to occur where it has not been recorded (commission error, N_c);
3. The species was predicted to occur where it has been recorded (1-1 match, N_m); and
4. The species was not predicted to occur where it has not been recorded (0-0 match).

Instances of the fourth outcome (0-0 matches) were not used to calculate percent agreement because we could not discriminate between situations where these might represent correct predictions of absence, and ones where a checklist might be incomplete or otherwise inaccurate. The same is true for the second outcome, of course, but commission error is a vital component of evaluating predictions (see Limitations and Discussion).

We calculated percent agreement ($\%N_m$) as the number of correct predictions of presence, divided by the total number of species either predicted or documented to occur: $\%N_m = N_m/(N_o+N_c+N_m)$. Agreement and error rates were examined with respect to validation area size; regression analyses were performed (validation area size log transformed) on agreement rates for each taxonomic group. For these analyses, mean agreement and error percentages were calculated for each group within a validation area. For agreement and error percentage within a group, species from all areas were lumped in their respective taxon, and a mean percentage was calculated for each; overall mean agreement and error were similarly calculated from the lumped model agreement percentages of all species, regardless of validation area. This eliminated the weighting biases that would have occurred had we averaged the averages for each group from each validation area. Differences in model agreement between taxonomic groups were evaluated using t-tests after these mean percentages were arcsin transformed.

Results

Agreement and error rates for each taxonomic group in each validation area are presented in Table 3.5. Within taxonomic groups, agreement varied considerably among validation areas for amphibians (28.6-100%) and reptiles (16.7-100%); ranges were somewhat narrower for birds (54.4-89.8%) and mammals (44.6-91.3%). Mean agreement and error rates for each taxonomic group, irrespective of validation area, are presented in Table 3.6. Across all taxa, our mean agreement (%N_m) was 64.0%, and the means for each taxon were not significantly different from each other. Commission errors for mammals and reptiles were significantly higher than for birds; omission error for birds was significantly higher than for amphibians and reptiles; mammal omission error was significantly higher than that for reptiles (see p-values, Table 3.6). Within orders or families, agreement, commission, and omission error rates also varied widely among species (Appendix 3.4). All agreement rates appeared to increase with the size of the validation area; this relationship was significant for birds and mammals (Figure 3.14, Table 3.7).

Error rates between validation areas -- The highest omission rate (23.4%; Table 3.5) for any taxonomic group in a particular validation area was for birds in the National Bison Range. This error, twice that of any other omission error for a taxon in a particular area, can be attributed to the lack of predicted distributions for water-related species in the National Bison Range. Of the 49 omission errors in this area, 43 of those occurred for waterfowl, shorebirds, marshbirds, gulls, and/or terns. Marshes, ponds and streams do occur in this refuge, but apparently most are smaller than our data resolution (2 ha MMU, 90 m cell size), and therefore were not resolved in our land cover map. Water, in fact, was absent altogether and riparian types were rarely mapped. Models for these species relied on the land cover layer for determining presence of these features; the USGS DLG hydrography, used to define buffer zones, might also have been used to supplement water mapped in the land cover layer, but in this case may have yielded overestimates of habitat. With this in mind, it is not surprising that these species were not predicted to occur in the National Bison Range, although they were recorded as “present” on the species checklist.

Commission error rates varied considerably between validation areas for amphibians (0-71.4%) and reptiles (0-83.3%), and were clearly the main contributors to wide ranges in agreement. Reasons for these wide ranges between areas are not entirely clear, but may include differences in observational efforts to compile species checklists as well as the low probability of detecting these species without systematic surveys. Furthermore, hexagon distributions for amphibians and reptiles were constructed more liberally in terms of professional judgment (with many hexagons coded as “possible” occurrence) because of the relative lack of field surveys and hence species’ locations. As a result, commission errors for these taxa are not surprising. Commission error rates appeared consistently high for all taxa in the Blackfoot-Clearwater WMA. This management area consists of several separate tracts of land, which may complicate the logistics of checklist compilation and may lead to inconsistent inventories in this fragmented wildlife management area. Freezout Lake WMA also showed high commission error for birds.

Error rates between taxa -- Omission error rates were relatively low for all taxa, averaging 6.8% (1.2-8.5%, Table 3.6). However, omission error was significantly higher for birds than for other groups, indicating that some of our wildlife-habitat relationship models tended to underpredict bird distributions. Conservative modeling approaches that focused on primary habitat requirements likely contributed to the underestimation of habitat for many birds. For example, for resident species, breeding habitat took precedence over wintering habitat in the models. Consequently, we would expect omission errors to be higher for at least two groups of species -- ones whose ranges vary markedly between seasons and ones with highly restricted nesting habitat, yet much more extensive foraging ranges. Fitting the latter pattern are American White Pelicans, White-throated

Table 3.5. Number of commission errors (N_c), omission errors (N_o), matches (N_m), and percent agreement (N_m/N_t x 100, where $N_t = N_o+N_c+N_m$) of predicted species occurrences in 14 validation areas compared to species occurrence checklists compiled for these same areas.

Taxonomic Group/Validation Area		N_c	$\%N_c$	N_o	$\%N_o$	N_m	$\%N_m/N_t$
Amphibians	Benton Lake NWR	3	50.0	0	0	3	50.0
	Blackfoot-Clearwater WMA	3	50.0	0	0	3	50.0
	Charles M. Russell NWR	0	0	0	0	6	100.0
	Medicine Lake NWR	5	71.4	0	0	2	28.6
	Red Rock Lakes NWR	1	20.0	0	0	4	80.0
	Flathead Indian Reservation	1	11.1	1	11.1	7	77.8
	Pine Butte Swamp Preserve	3	37.5	0	0	5	62.5
	Site Mean		**34.3**		**1.6**		**64.1**
Reptiles	Benton Lake NWR	3	30.0	0	0	7	70.0
	Blackfoot-Clearwater WMA	6	66.7	0	0	3	33.3
	Charles M. Russell NWR	3	21.4	0	0	11	78.6
	Medicine Lake NWR	4	40.0	0	0	6	60.0
	Red Rock Lakes NWR	5	83.3	0	0	1	16.7
	Flathead Indian Reservation	0	0	0	0	9	100.0
	Pine Butte Swamp Preserve	6	60.0	0	0	4	40.0
	Site Mean		**43.1**		**0**		**56.9**
Birds	Benton Lake NWR	50	24.4	22	10.7	133	64.9
	Blackfoot-Clearwater WMA	103	42.2	3	1.2	138	56.6
	National Bison Range (NWR)	31	14.2	51	23.4	136	62.4
	Bowdoin NWR	17	8.7	18	9.2	160	82.1
	Charles M. Russell NWR	35	14.0	7	3.1	189	82.9
	Freezout Lake WMA	100	43.9	4	1.7	124	54.4
	Glacier National Park	52	20.5	3	1.2	199	78.4
	Lee Metcalf NWR	48	21.8	11	5.0	161	73.2
	Medicine Lake NWR	24	12.6	17	8.9	150	78.5
	Ninepipe/Pablo NWR	74	32.0	24	10.4	133	57.6
	Red Rock Lakes NWR	11	4.5	37	15.2	195	80.2
	Flathead Indian Reservation	12	4.5	15	5.7	238	89.8
	Swan River NWR	67	30.3	11	5.0	143	64.7
	Pine Butte Swamp Preserve	59	25.5	12	5.0	172	70.8
	Site Mean		**21.3**		**7.5**		**71.2**
Mammals	Benton Lake NWR	22	45.8	2	4.2	24	50.0
	Blackfoot-Clearwater WMA	35	53.8	1	1.5	29	44.6
	National Bison Range (NWR)	27	41.5	0	0	39	58.5
	Bowdoin NWR	17	34.0	5	10.0	28	56.0
	Charles M. Russell NWR	18	39.0	1	1.6	43	69.4
	Glacier National Park	14	19.2	0	0	59	80.8
	Medicine Lake NWR	14	29.8	2	4.3	31	66.0
	Red Rock Lakes NWR	26	37.1	2	2.9	42	60.0
	Flathead Indian Reservation	4	5.8	2	2.9	63	91.3
	Pine Butte Swamp Preserve	29	40.8	0	0	42	59.2
	Site Mean		**33.7**		**2.7**		**63.6**

Table 3.6. Mean commission rate ($\%N_c$), omission rate ($\%N_o$), and percent agreement ($\%N_m$) for each taxonomic group (415 species total), regardless of validation area. Significantly different values (t-test, $\alpha \leq .05$) are indicated by superscript.

Taxonomic Group	**# Species**	**$\%N_c$**	**$\%N_o$**	**$\%N_m$**
Amphibians	14	39.8	1.2[1]	59.0
Reptiles	17	35.9[2]	0.0[1, 3]	64.1
Birds	288	24.3[1, 2]	8.5[1, 2]	67.2
Mammals	96	41.2[1]	3.8[2, 3]	55.0
Group Mean		**29.2**	**6.8**	**64.0**

[1]$p < .001$; [2]$p = .05$; [3]$p = .02$

Swifts, and Black Swifts; all showed relatively high omission errors (Appendix 3.4). These species all range widely to forage during the breeding season, and they could be easily recorded on checklists from areas where they do not actually nest, and where our models would not predict them to occur. Similarly, models for species whose distributions were predicted based on breeding habitat requirements, but whose nonbreeding distributions are more wide ranging, may also exhibit high omission error. Examples include the American Pipit and Wilson's Warbler.

Conversely, commission error rates were comparatively high for all taxa, averaging 29.2% (24.3-41.2%); that is, our models tended to overpredict species distributions. Mammal commission error was significantly higher than that for the other taxa – in part due to incomplete checklists, particularly for many small mammals like shrews, rodents and bats, which are crepuscular, nocturnal, and /or fossorial, making detection and/or identification difficult. For example, Benton Lake NWR recorded '*Sorex* spp.' and Pine Butte Swamp Preserve recorded '*Sorex* spp. and Chiroptera' as being present on their checklists; rather than considering all species in these groups to be "present" at both sites, we considered them all to be absent. It is not surprising, then, that mammal commission error was comparatively high in these areas (Table 3.5); commission error rates for shrews, bats, and mice/voles were 62%, 60%, and 39%, respectively.

Commission error may arise from errors in model predictions or errors in sampling; we cannot reliably separate the two sources. Difficulty in species detection, and consequent incorrect exclusion from checklists, is probably a major contributor to commission error for all taxa (Appendix 3.4). Commission error for owls was 35%, whereas for waterfowl, a more visible group, commission errors were much lower, averaging 13%. Detectability may be less a function of body size than of the openness of the habitat that a species occupies; for example, Tree Swallows ($\%N_c = 0$), Prairie Falcons ($\%N_c = 7.1$) and long-tailed weasels ($\%N_c = 0$) occupy more open habitats, whereas similarly sized species such as the White-breasted Nuthatch ($\%N_c = 41.7$), Northern Goshawk ($\%N_c = 50.0$) and American marten ($\%N_c = 66.7$) inhabit dense, more forested habitats, and have much higher commission error rates. Similarly, carnivores -- generally more secretive in nature and occurring in lower densities -- had higher commission errors (30.1%) than did ungulates (9.2%). Commission error rates also vary according to habitat specificity:

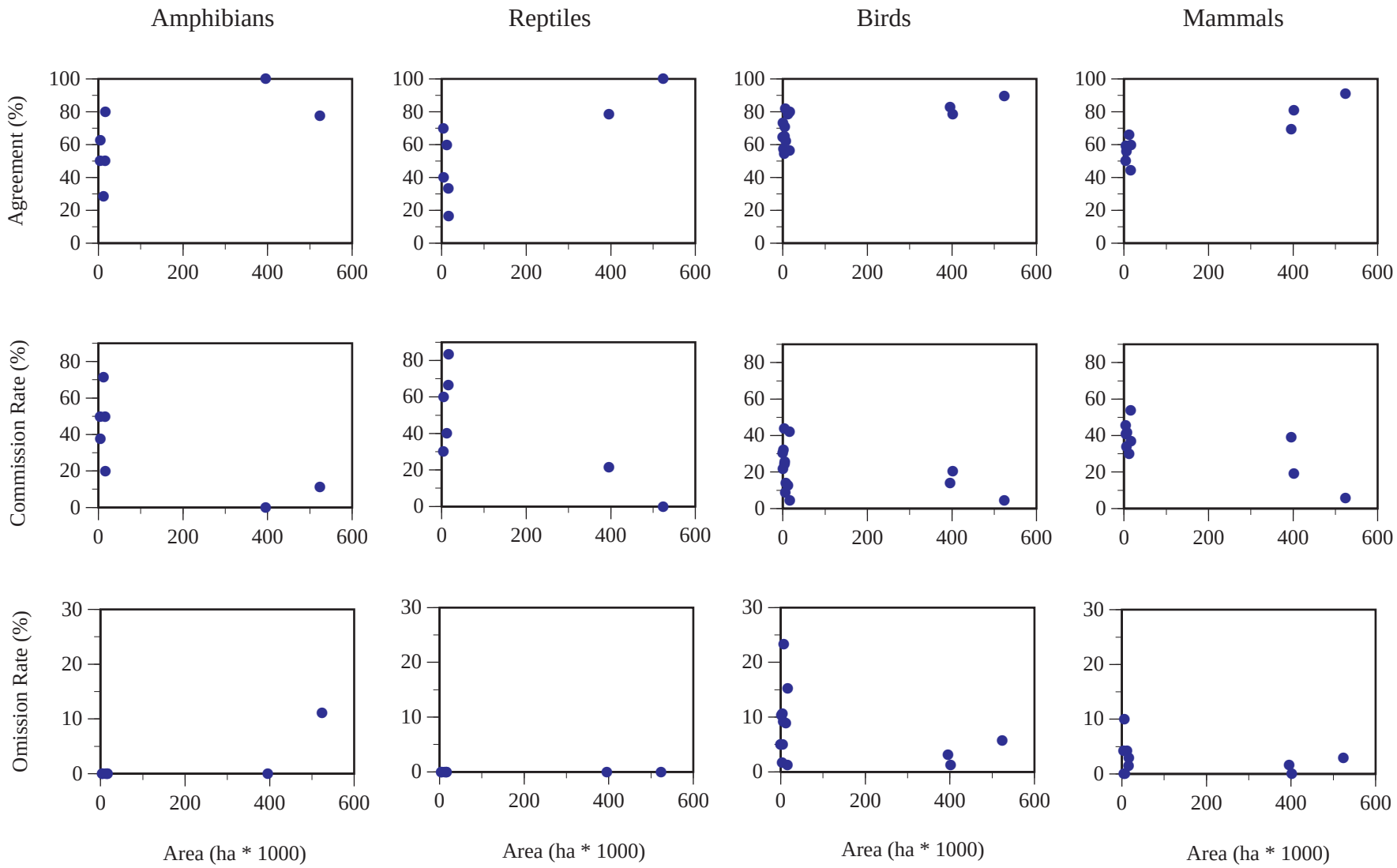


Figure 3.14. Agreement, commission errors, and omission errors for each taxonomic group as a function of validation area size. Agreement = N_m/N_t x 100; commission error = N_c/N_t x 100; omission error = N_o/N_t x 100.

Black-billed Magpies ($\%N_c = 0$) and coyotes ($\%N_c = 0$) are generalists, whereas Clark's Nutcrackers ($\%N_c = 41.7$) and fishers ($\%N_c = 60$) have more narrow habitat requirements. Amphibians and reptiles showed relatively high commission error rates as well, which may be due, in large part, to the methods used to construct their hexagon distributions. Moreover, relatively high commission errors would be expected given that many of these species are poorly studied, cryptic, and/or dependent upon microhabitat features difficult to resolve at a statewide scale. It should be noted, however, that because error rates for many species were calculated from very small sample sizes (see Appendix 3.4), any trends or conclusions should be treated with caution.

We found a positive relationship between agreement and validation area size for all taxa (Figure 3.14), but this relationship was only significant for birds and mammals (Table 3.7), perhaps because of their larger sample sizes. Size of the validation areas ranged widely, from 509 hectares to 524,434 hectares; 11 areas were smaller than 20,000 hectares, and three were greater than 390,000 hectares. The reason for higher agreement in larger areas is probably straightforward: Large validation areas reduce both omission and commission error by increasing the likelihood that more habitat types will occur within their boundaries. Similar comparisons from UT-GAP (Edwards et al. 1995) also showed an apparent relationship between refuge size and accuracy, although WY-GAP (Merrill et al. 1996) found no such relationship.

Table 3.7. Selected results from the regression analysis of % agreement on log validation area.

Taxonomic Group	**# Species**	**Slope**	**p-value**
Amphibians	14	.687	.09
Reptiles	17	.653	.11
Birds	288	.626	.02
Mammals	96	.829	.003

Limitations and Discussion

Our assessment relied on a comparison between predicted and observed species' presence, not absence, for 415 terrestrial vertebrates at 14 validation areas of variable size in Montana. This was not a true accuracy assessment because potential sampling errors in the validation data complicated our interpretation of both commission error and correct prediction of absence. Whereas the former was included in calculations, the latter was ignored altogether (see below). Within these constraints, however, we contend that the predictive accuracy of our models lies somewhere between the conservative measure of overall agreement (e.g., 64.0% for all 415 species), and 1-N_o, which averaged 93.2% for all species. To further clarify this point, we break the likely sources of error into two general groups -- one involving GIS data inputs and our wildlife-habitat relationship models, and the other dealing with deficiencies and biases associated with the validation area checklists.

Availability, accuracy, and resolution of GIS data layers certainly played a major role in the agreement of predicted vertebrate distributions, especially the omission errors. Many microhabitat features important in defining habitat requirements could not be included in wildlife-habitat relationship models. Such features included soils and climate data for fossorial species, as well as forest structure, including stand age, understory characteristics, and litter composition for forest dwelling species. Furthermore, spatial habitat queries, such as patch size or interspersion of cover type patches for area- or edge-sensitive species, often could not be addressed on a broad, statewide scale. Also, when developing the wildlife-habitat relationship models, we focused on primary seasonal habitat requirements, making our approach somewhat conservative. Yet judging by the high commission errors, we still tended to overpredict many species distributions. More detailed natural history information, as well as more specific location data for some sensitive and/or habitat-restricted species (e.g., Peregrine Falcon, Mountain Plover, black-footed ferret), particularly in lieu of microhabitat-scaled GIS layers, would have allowed for improved predictions. Lacking detailed information as guidance, some of us may have been more generous in model construction than others. The tendency for many models to overpredict distributions also may have been related to the generous limits set by liberally populating hexagon and latilong range cells. Overpredictions were especially likely where these cells spanned a variety of landscapes. For example, a single latilong along the East Front of the Rocky Mountains could extend from the Continental Divide to the plains, and a bird typically using riparian habitat within a montane forest matrix could be predicted to occur within riparian areas out on the plains as well.

Another GIS-related factor could be our method for determining a species' predicted presence: if even a single pixel of predicted habitat fell within a validation area, that species was counted as present. In the future, we suggest calculating the percentage of each validation area predicted to provide habitat for each species, rather than simply whether or not any habitat exists. Although percent agreement would not change in absolute terms, this would allow one to apply thresholds (>1% habitat, >10% habitat) and explore how agreement measures differ accordingly.

Other major sources of error were related to biases and deficiencies in the checklists used to validate the predicted distributions. Typically, the validation area checklists were compiled to give visitors a sense of what they might expect to see in an area. For this reason, and as noted previously, they really only tell us what species have been recorded at a site. It is well known that the number of species recorded at a site increases with time and sampling effort (Preston 1960, Dedon et al. 1986, Block et al. 1994, Krohn 1996). It is also doubtful that the 14 checklists used for validation were all based on comparable sampling efforts and time periods. Nonetheless, they were the best information available, and users should bear in mind that additional detections could alter the results of this assessment, either by increasing the omission error or by decreasing the commission error, depending on whether or not any newly recorded species were predicted to occur there.

Because the species checklists are unlikely to be complete, we relied on comparisons between predicted and observed species' presence, not absence. Thus, species which had not been recorded at any validation area were counted in errors of commission if our models predicted them to occur there. But if our models did not predict them to occur where they had never been recorded (0-0 match), there could be no corresponding gain in percent agreement. Inevitably, some of these 0-0 matches may represent true conditions, yet we had no reliable way to discriminate between correctly and incorrectly predicted absences. Hence, 0-0 matches were excluded altogether. Commission errors, however, were kept because they highlight discrepancies between predictions and observations, and thus offer insights on model performance (Edwards et al. 1996, Karl 1998). Arguably, there is a logical contradiction in treating commission error as truth, but not the 0-0 match. Nonetheless, we took this conservative approach to best meet our goal -- a critical evaluation of model performance.

Aside from the issue of sampling error in the checklists, our assessment was probably further biased by the predominance of a few land cover types in the validation areas. For example, the cover type composition of the 11 validation areas that were smaller than 20,000 hectares averaged 19 different cover types, yet 10 of these areas were composed primarily of grassland, agriculture, and water cover types. In contrast, the three largest validation areas averaged 34 cover types, and none of the three was dominated by a single type. Also, the tendency for higher commission errors to occur in smaller validation areas (Fig. 3.14) suggests that the predictive models could be improved by incorporating patch size so as to filter out patches of potentially suitable habitat smaller than a minimum size. Alternatively, species found in smaller, isolated habitats may be underrepresented on validation area checklists, and could actually be present, predicted or not.

Compared with other assessments, our error rates were higher than those reported for UT-GAP (Edwards et al. 1995) and WY-GAP (Merrill et al. 1996), but lower than ones reported for breeding birds in California (Block et al. 1994). These differences are likely related to scale. For example, the minimum map unit used to predict vertebrate distributions in Utah and Wyoming was more than 100 times larger than ours in Montana (100 ha vs 0.81 ha), and at least in Wyoming, the average size of their validation areas was considerably larger as well. Taken together, it is not surprising that their commission errors were much less than ours; at the same time, it is surprising that, with the exception of birds in Utah and mammals in Wyoming, our omission errors were substantially less than theirs. Block et al. (1994) compared point-count records of breeding birds (mostly passerines) in three California oak woodlands with predictions derived from two different WHR databases. Their average rates of both omission and commission errors were considerably higher than ours ($\%N_o$: 18.3 vs. 8.5; $\%N_c$: 35.0 vs. 24.3), but their observations were restricted to 100 m radius plots (~3 ha). Although this spatial unit is larger than the 90 m^2 cell size that we used for modeling, it is considerably smaller than the areas that we used for validation. Had we tested the accuracy of our model predictions with observations from such small areas, no doubt our error rates would have been higher as well.

Keeping the issue of scale in mind, we believe that our models performed reasonably well over large geographic areas (>20,000 ha). For smaller areas, however, model performance is likely to become more uncertain. Despite its limitations, comparing predicted vertebrate distributions with validation area checklists is obviously the most cost-efficient and straightforward way to measure the accuracy of predicted distributions. We can speculate about the accuracy of our models based on their relatively low omission errors, but ultimately, the only way to truly assess the performance of these or any vertebrate distribution models is by thorough and systematic field surveys.

Conclusions

Our predicted distributions are based on a current synthesis of information pertaining to 425 terrestrial vertebrates in Montana. The relatively fine scale at which the models were processed (90 m cell size) means that maps generated from the Montana Gap data are the most detailed ever produced for the entire state. But resolution does not guarantee accuracy; these predicted distributions are not so easily validated. The accuracy of these predicted distributions is not so easy to determine. A crude assessment based on comparisons between predicted and observed species presence at 14 areas around the state indicated relatively low omission error rates (< 10%), but considerably higher rates of commission errors (24-41%). This means that the models were more likely to overpredict species distributions than to underpredict them. In the context of most management decisions, this is desirable for the same reason that Type I statistical errors are more serious than Type II errors. Failure to predict a species' presence in an area where it actually

occurs may create potential for inadvertent harm if land-use decisions are then made without that species in mind. If, however, a species is predicted to occur where it has never been recorded, it is more likely that the species will be targeted in future surveys and also considered in subsequent land-use decisions -- a safer outcome all around.

The most general limitations of the modeling approach relate to species-habitat relationships. For some species, habitat associations are not well-defined because they haven't received much study; others have been well-studied, but not in geographic regions similar to Montana. Still others have been well-studied within the state and vicinity, yet even for these species, habitat associations could not always be well-represented within our GIS. Some habitat features were not included in the modeling process, either because they were unavailable as GIS layers, or because their scale was too coarse. These include soils, forest structure and presence of snags/cavities, and microhabitats such as seeps, springs, caves, and buildings. Stream order was also unavailable, as were other aquatic attributes and features, including stream flow, waterfalls, and rapids. Although querying for streams of specific orders would have simplified some models, coding our hydrography layer with stream order and other attributes was beyond the scope of this project. Human disturbance factors were not assessed; their absence may have led to overpredicted distributions in some instances. Although consideration of human disturbance is not a part of the GAP approach, which focuses on potential habitat, a number of species are undoubtedly limited by such factors. For example, a road density layer may have improved the predicted distribution of grizzly bears (*Ursus arctos*).

Another limitation is the imperfect nature of the known range maps used to restrict predicted distributions for each species. The latilong units used for birds are very large, although they offer the advantage of uniformity in size, unlike counties. Latilongs span a wide variety of habitats and sometimes even geographic regions. As is nearly always the case with pre-existing data sets, the latilong database (Montana Bird Distribution Committee 1996) was not designed for an application like ours, which depends on "complete" distributions. It is basically opportunistic in nature; as observers report bird sightings, they are added to the database, but there has been no organized effort to assess whether or not species occur in the gaps between observations. Hence, the latilongs are likely to be better populated in areas inhabited or frequented by birders; similarly, species that are more easily detected are likely to be documented for more latilongs. As a result, judgment calls were necessary to fill in distributional gaps for some species. Hexagons are much smaller units than latilongs, and they were populated with the specific goal of mapping "complete" species distributions within Montana. However, there still were not enough observations to completely populate ranges for many species without judicious extrapolation between locations. Despite their shortcomings, both hexagons and latilongs offer a distinct improvement over standard coarse-scale range maps, such as those found in field guides.

A fundamental limitation of the vertebrate modeling process is the scale-determined need to operate at 90 m resolution within our GIS environment. Scale is typically discussed in terms of extent (project area size) and grain (resolution, or in a raster environment, cell size) (Turner 1990). In practical terms, the former determines the latter. Our project area covers a broad extent; Montana is the fourth largest state in the union. Thus, from the beginning, the size of the state has presented one of our greatest challenges. In a digital environment, working with an area this large at fine resolution (e.g., 30 m) requires enormous -- and infeasible -- amounts of CPU time and disk storage. We decided to predict vertebrate distributions using a land cover layer with small MMUs (2 ha for most types) rather than merging land cover polygons to larger MMUs like those employed by previous GAP projects in nearby states (ID-GAP, UT-GAP, WY-GAP). Grain, or data resolution, was one cost of maintaining this level of detail. Working at 90 m resolution,

which is still a fairly fine grain, was necessary to limit processing time and output file size to manageable bounds.

At 90 m resolution, there were 47,014,689 cells in each raster layer; values for each cell had to be considered in every habitat query. For our final modeling run, it took roughly 77.25 hours to process 425 species, averaging slightly under 11 minutes per species. The 425 output grids occupy just over 1.15 gigabytes of disk space; intermediate grids used for the review process consumed an additional 2.75 gigabytes of space. Even at 90 m resolution, processing time and storage remained issues. Furthermore, software constraints sometimes became an issue. Most importantly, we were unable to define individual patches in the land cover layer, although we tried in both raster and vector formats and in both ARC/INFO and ERDAS Imagine software. Only when cover types were extracted into their own layers was it possible to obtain counts of the number of patches of each type. As a result, patch sizes and related statistics could not be incorporated into habitat queries. Similarly, we were unable to create a “hypercoverage” combining all input layers and predicted species distributions into one layer. Nonetheless, we feel that larger cells and more diversity between cells, rather than uniform expanses of small cells, yield more useful products overall.

4. LAND STEWARDSHIP AND MANAGEMENT

Introduction

To fulfill the analytical mission of GAP, it is necessary to compare the mapped distribution of elements of biodiversity with their representation in different categories of land ownership and management. As will be explained in the Analysis section, these comparisons do not measure viability, but are a start to assessing the likelihood of future threat to a biotic element through habitat conversion -- the primary cause of biodiversity decline. We use the term "stewardship" in place of "ownership" in recognition that legal ownership does not necessarily equate to the entity charged with management of the resource, and that the mix of ownership and managing entities is a complex and rapidly changing condition not suitably mapped by GAP. At the same time, it is necessary to distinguish between stewardship and management status in that a single category of land stewardship such as a national forest may contain several degrees of management for biodiversity.

The purpose of comparing biotic distribution with stewardship is to provide a method by which land stewards can assess their relative amount of responsibility for the management of a species or plant community, and identify other stewards sharing that responsibility. This information can reveal opportunities for cooperative management of that resource, which directly supports the primary mission of GAP to provide objective, scientific information to decision makers and managers to make informed decisions regarding biodiversity. It also is not unlikely that a steward that has previously borne the major responsibility for managing a species may, through such analyses, identify a more equitable distribution of that responsibility. We emphasize, however, that GAP only identifies private land as a homogenous category and does not differentiate individual tracts or owners, unless the information was provided voluntarily to recognize a long-term commitment to biodiversity maintenance.

After comparison to stewardship, it is also necessary to compare biotic occurrence to categories of management status. The purpose of this comparison is to identify the need for change in management status for the distribution of individual elements or areas containing high degrees of diversity. Such changes can be accomplished in many ways that do not affect the stewardship status. Although it will eventually be desirable to identify specific management practices for each tract, and whether they are beneficial or harmful to each element, GAP currently uses a scale of 1 to 4 to denote relative degree of maintenance of biodiversity for each tract. A status of "1" denotes the highest, most permanent level of maintenance, and "4" represents the lowest level of biodiversity management, or unknown status (Table 4.1). Although the source data are imperfect and nearly all lands are subject to changes in ownership and management, we assigned status codes based on legal and institutional criteria. General characteristics used to determine status were:

- Permanence of protection from conversion of natural land cover to unnatural (human-induced barren, exotic-dominated, arrested succession).
- Relative amount of the tract managed for natural cover.
- Inclusiveness of the management, i.e., single feature or species versus all biota.
- Type of management and degree that it is mandated through legal and institutional arrangements.

Table 4.1. Description of the codes used to designate management status to lands in Montana (after Scott et al. 1993, Edwards et al. 1995, Crist et al. 1995).

Code	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, intensity, and legacy) 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 uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbances.
3	An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense type (e.g., mining). 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. Allows for intensive use throughout the tract. Also includes those tracts for which the existence of such restrictions or sufficient information to establish a higher status is unknown.

Three steps were involved in the development of the Montana land stewardship layer: 1) creating a digital file of the geographic boundaries that delineate tracts of land under different ownership and/or management; 2) coding each mapped land unit with the proper owner/manager information; and 3) assigning a biodiversity management status code, ranging from 1 to 4 (Table 4.1), to these land units.

Methods

Stewardship Mapping

The digital land stewardship layer used by MT-GAP was created by incorporating boundaries of administrative units to a base layer of land ownership, provided by the United States Department of the Interior, Bureau of Land Management (BLM), Montana State Office. We added some additional information to this base layer, but only for land units under management designed to protect some elements of biodiversity. Source and scale of the data added to the BLM base layer are summarized in Table 4.2.

Table 4.2. Source and scale of the digital data added to the BLM land ownership base.

Data	Source	Scale
Wilderness Areas	Bureau of Land Management	1:100,000
Salish-Kootenai Special Management Areas	Confederated Salish-Kootenai Tribes	1:24,000
The Nature Conservancy Preserves	Montana Natural Heritage Program	1:24,000
Conservation leases and easements	Montana Natural Heritage Program	1:24,000
Research Natural, Special Interest, and Public Use Natural Areas	Montana Natural Heritage Program	1:24,000
Upper Missouri National Wild & Scenic River	Montana Natural Heritage Program	1:100,000
Areas of Critical Environmental Concern, Outstanding Natural Areas and Primitive Areas	Montana Natural Heritage Program	1:24,000
Ownership within Tribal Reservations	Bureau of Indian Affairs Billings Area Office	1:24,000
USFS Proposed, Recommended, and Study Wilderness Areas	Forest Service, Region 1	1:24,000
C.M. Russell Proposed Wilderness Areas	C.M. Russell National Wildlife Refuge	1:24,000
Plum Creek Timber Lands	Plum Creek Timberlands Co. Inc.	1:24,000
Montana State Parks	Montana Department of Fish, Wildlife & Parks	1:24,000 and finer

The BLM base layer was obtained in digital form, consisting of 95 separate tiles, corresponding to their 30 x 60 minute, 1:100,000 scale, Surface Management Series maps, and in various projections (Albers, UTM zones 11-13, and State Plane). We acquired tiles that were released on 3/24/96, and users should bear in mind that the BLM continually updates these data. The tiles were reprojected into a common system (Albers), then appended into one layer. Slivers along the tile edges were eliminated to the degree practical, using an automated ARC/INFO procedure, as well as manual deletion whenever a sliver was incidentally encountered. The automated procedure consisted of two stages. First, polygons with a large perimeter-to-area ratios were found and removed; water polygons, which often met these selection criteria due to their narrow, linear nature, were identified beforehand and excluded from this step. The second stage involved several ARC/INFO operations: 1) “cleaning” the coverage with the fuzzy tolerance set at 3 meters; 2) from this “cleaned” coverage, extracting all dangling arcs that were created when arcs ≤3 meters apart were snapped together (in the first step); and 3) using this “dangle” coverage as a background to the original, uncleaned coverage as a means to quickly locate slivers. In this manner we were able to eliminate approximately 600 slivers from the statewide ownership coverage.

Because the Montana state boundary does not coincide with the 30 x 60 minute tile boundaries, the ownership layer had to be completed manually. Along the western border, polygons were digitized and coded using USGS 7.5' paper maps (1:24,000 scale) for the Cabinet (published in 1989), Curley Creek (1983), and Leonia (1983) quadrangles. For the following 30 x 60 minute tiles, missing polygons were added and coded on-screen using the most recently published BLM hard-copy maps for reference: Headquarters, Bighorn Crags, Borah Peak, Ashton, Yellowstone National Park North, Burgess Junction, Sheridan, Recluse, and Devil's Tower. We opted to work on-screen, rather than digitizing directly from the hard-copy maps, because the band of polygons to add to reach the state border was very narrow (about 600 m at the broadest point) and we were concerned about registration errors.

Private ownership within tribal reservation boundaries was differentiated on the BLM tiles for the Flathead Indian Reservation only; for other reservations, private ownership was indicated incompletely, or not at all. Ownership in the other reservations was updated by integrating digital layers obtained from the Bureau of Indian Affairs (BIA), Billings Area Office. Two methods were used. For the Northern Cheyenne Reservation, the ownership pattern from the BIA data was very similar to that displayed on the BLM tiles, so that only a simple update was required. This was done by displaying the BIA map in the background and making all necessary changes (addition, deletion, and recoding of polygons) directly to the BLM coverage. For the Blackfeet, Crow, Fort Belknap, Fort Peck, and Rocky Boy Reservations, the ownership pattern between the two data sets was different enough to require a 'cut-and-paste' approach: ownership within the reservations was 'cut out' from the BLM tiles, and replaced with BIA data. Reservation boundaries were always slightly different between BLM and BIA data; BLM boundaries were usually kept to insure a proper fit with polygons adjacent to the reservations, but some boundary updates also were integrated. Problems were encountered along the southern border of the Fort Peck Reservation, where BLM boundaries differed significantly from those obtained from BIA (sometimes by as much as 1 km). Even though BIA data came from 1:24,000 maps and should have been more accurate, we were reluctant to abandon the BLM boundaries. The positioning of the Missouri River, which serves as the boundary along the southern edge of the reservation, was almost identical between BLM data and 1:100,000 hydrography Digital Line Graph (DLG) data, but it was quite different in the BIA data. Because the hydrography DLG file was used in other parts of MT-GAP (see Predicted Animal Distributions), it was preferable not to alter the location of the Missouri River. Instead, we combined the BLM and BIA data, labeling as 'Unknown' the polygons that fell between the reservation boundary as obtained from BIA and as obtained from BLM. These 'Unknown' polygons were assigned a management status of 4. As a consequence, ownership patterns within a 1 km buffer along the southern edge of the Fort Peck Reservation should be treated with caution. In general, because edge-matching was required between BLM and BIA data, data quality within a 500 m buffer around these reservations is lower.

Even though most water bodies were mapped on the BLM tiles, they were not coded differently from private lands in the original BLM tiles; both received a code of 0. Because the mix of ownership, water rights, and managing entities for water bodies is extremely complex, GAP does not require that owners and managers of lakes and rivers be identified (Scott and Jennings 1994, Crist et al. 1995). Nonetheless, to be able to distinguish between water bodies and private lands, the former were manually recoded after displaying the BLM ownership tiles over the corresponding DLG hydro files to identify the water bodies on screen.

Finally, lands owned by Plum Creek Timberlands Inc. were identified on-screen by displaying, in the background, a 1:24,000 scale digital file obtained from the company in January, 1996. Arcs missing from the BLM data were added, and all polygons representing corporate timberlands were recoded.

Management Areas

Administrative units were obtained from a variety of sources at a variety of scales. In some cases, it was possible to simply recode polygons already present in the land ownership file. This was the case for Wildlife Management Areas and parts of the National Wild and Scenic Rivers, which existed as polygons in the BLM files but were labeled as 'State, county, city, wildlife park & recreation areas' or 'Federal Agency Protective Withdrawal'. National Forest maps and the *Montana Atlas & Gazetteer* (DeLorme Mapping 1994) were used as sources for comparison. Most often though, new files had to be appended, in which case edge-matching was performed to ensure the best possible fit between data from different sources.

Wilderness area boundaries (USFS, USFWS, and BLM) were obtained from the BLM as separate 1:100,000 scale digital files. Proposed, recommended, and study wilderness areas on USFS lands were extracted from digital Management Area files for each National Forest (obtained from the Northern Regional Office). When this file was compared to proposed wilderness boundaries based on a bill drafted by Representative Pat Williams for the 1994-95 Congressional session, little agreement was found. Forest Management Area files were selected over the congressional proposal as the source of data because 1) they presented a more conservative estimate of the amount of land that may be afforded wilderness status, and 2) they are subject to existing management plans, albeit plans that are currently undergoing revision. Proposed wilderness areas for the Charles M. Russell National Wildlife Refuge (USFWS) were obtained from that refuge as a 1:24,000 scale digital file. Finally, the boundaries of the Mission Mountains Tribal Wilderness, the corresponding buffer zone, and the Lozeau and Jocko Tribal Primitive Areas were obtained from the Confederated Salish and Kootenai Tribes at a 1:24,000 scale.

Other special management areas, obtained as digital files and appended to the ownership layer, included: Research Natural Areas, Special Interest Areas, and Public Use Natural Areas (all at 1:24,000 scale); conservation preserves, easements, and leases (1:24,000 scale); Areas of Critical Environmental Concern, Outstanding Natural Areas, and Primitive Areas (1:24,000 scale); the Upper Missouri Wild and Scenic River (1:100,000 scale); and state parks, including primitive state parks (1:24,000 scale or finer). The final stewardship map appears as Figure 4.1.

In compiling summary statistics (e.g., Table 4.4, Appendices 5.1 and 5.2), ownership and stewardship were treated synonymously because, as mapped, there were so few areas in the state where ownership and management differed (<0.01% of the total area). The four discrepancies in our layer included tracts of land: 1) owned by BLM and managed by Montana Fish, Wildlife, and Parks (MTFWP) as a fishing access site (352 ha); 2) owned by Bureau of Reclamation and leased to MTFWP as a state park/recreation area (180 ha); 3) Pablo and Ninepipe National Wildlife Refuges, under tribal ownership but managed by USFWS (693 ha); and 4) state-owned lands under conservation easement managed by The Nature Conservancy (1580 ha). Although these lands were reported according to their owners, managers were also considered in assigning management status.

Management Status

Using the definitions presented in Table 4.1 and described in the GAP Handbook (Scott and Jennings 1994) as well as in a dichotomous key developed by NM-GAP (Crist et al. 1995), each stewardship category was assigned a status code; these are summarized in Table 4.3. Because these assignments were sometimes subjective, three different people participated in the process, and all disagreements were resolved by consensus, often after consulting management plans for the

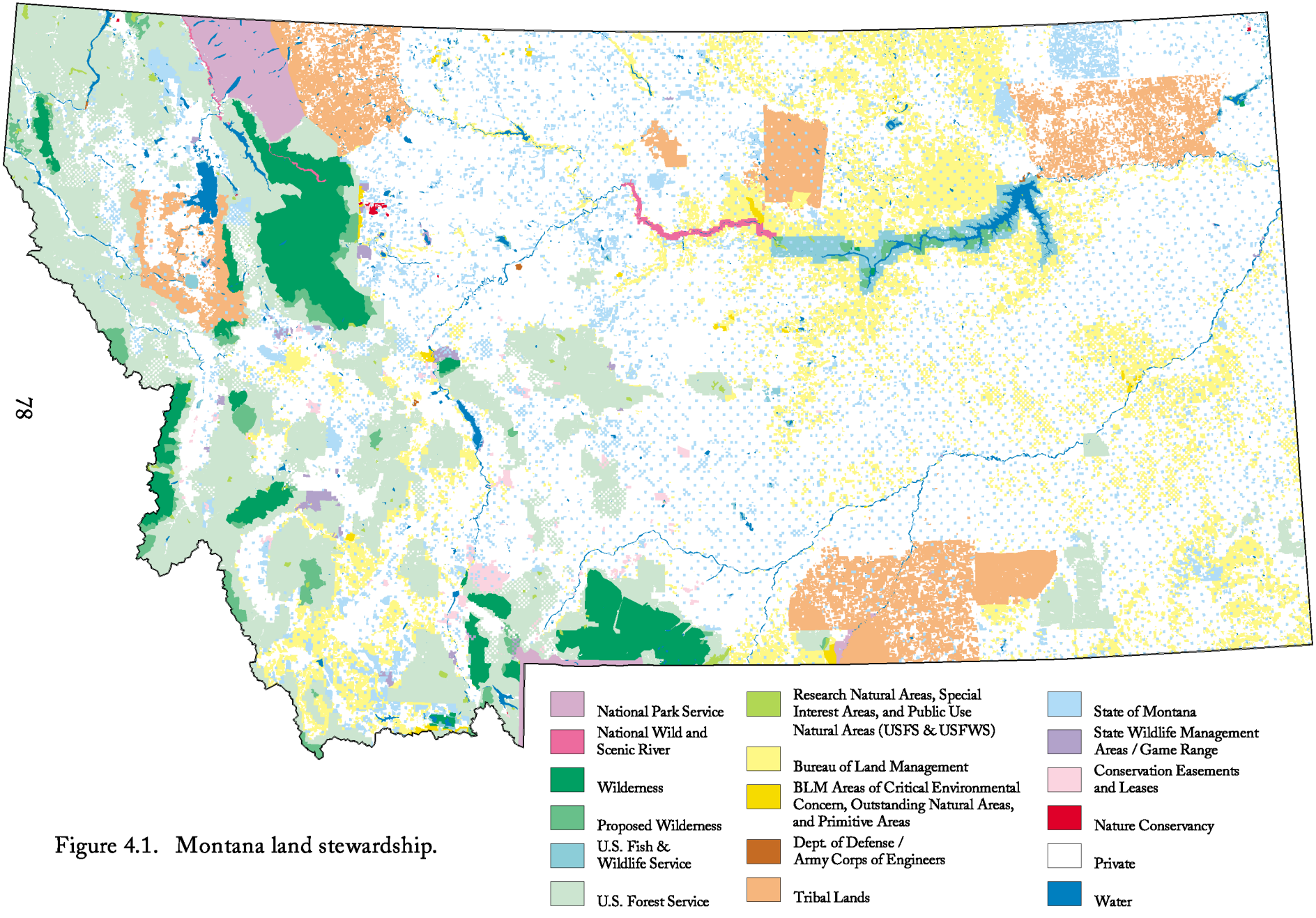


Figure 4.1. Montana land stewardship.

Table 4.3. Management status by land management entity.

Status 1	Status 3
Wilderness Areas	Other BLM
National Parks	Other Forest Service Lands
Research Natural Areas (RNAs)	Other State Lands
Special Interest Areas (SIAs)	Other Department of Agriculture Lands
Some Areas of Critical Environmental Concern (ACECs)	USFWS Waterfowl Production Areas
Outstanding Natural Areas	Bureau of Reclamation
State Wildlife Preserves	Bankhead Jones Land Use Lands
Some National Wildlife Refuges	Department of Defense Lands
The Nature Conservancy Preserves	Tribal Lands
Salish-Kootenai Tribal Primitive Areas	Local Government Lands
Status 2	**Status 4**
Proposed, Recommended and Other BLM Lands	Private Lands (Unprotected)
Wilderness Study Areas	Corporate Timberlands
National Wild & Scenic Rivers	
National Historic Sites	
Proposed RNAs and SIAs	
Public Use Natural Areas	
Some National Wildlife Refuges	
Some ACECs	
Proposed ACECs	
Wildlife Management Areas	
Primitive State Parks	
Salish-Kootenai Tribal Wilderness Buffer Zone	

individual administrative units. In some instances, units in the same stewardship category could not be assigned to a single management status code because specific management practices varied from one land unit to the next. This was the case for National Wildlife Refuges; where grazing was allowed, they were assigned Status 2, where grazing was not allowed, they were assigned Status 1. A comprehensive listing of administrative units assigned a Status of 1 or 2 is found in Appendix 4.1.

Results

Public lands comprise 34.73% of Montana, with 28.90% under federal and 5.83% under state or local governmental jurisdiction (Table 4.4). The federal lands are predominately under USFS administration, and they are concentrated in the western portion of the state (Figure 4.1). Private lands, including those administered by Indian tribes, represent 64.19% of Montana; these private lands are predominate in the eastern part of the state where they are intermixed with lands managed by the BLM and the state.

Status 1 and 2 lands account for 7.63% (2,906,200 ha) of Montana (Tables 4.4, 4.5). Most of these lands are located in the western half of the state (Figure 4.2), which is generally more

Table 4.4. Area and percent (%) of land stewardship categories by management status in Montana. Some categories, generally those assigned Status 3, have been combined into "other" categories. Miscellaneous includes water (Status 5, not reported, but 1.07% of total area) and unknown (Status 4).

	Status 1		Status 2		Status 3		Status 4		Total	
Land Stewardship Category	ha	%	ha	%	ha	%	ha	%	ha	%
Bureau of Land Management (Total)	(13,097)	(0.03)	(77,104)	(0.20)	(3,249,591)	(8.54)	(0)	(0.00)	(3,339,792)	(8.77)
Area of Critical Environmental Concern	4,541	0.01	22,912	0.06	0	0.00	0	0.00	27,453	0.07
Proposed ACEC	0	0.00	8,513	0.02	0	0.00	0	0.00	8,513	0.02
Wilderness Area	2,466	0.01	0	0.00	0	0.00	0	0.00	2,466	0.01
Primitive Area	0	0.00	12,199	0.03	0	0.00	0	0.00	12,199	0.03
Outstanding Natural Area	6,090	0.02	0	0.00	0	0.00	0	0.00	6,090	0.02
Wild/Scenic/Recreation River	0	0.00	33,479	0.09	0	0.00	0	0.00	33,479	0.09
Other BLM	0	0.00	0	0.00	3,249,591	8.54	0	0.00	3,249,591	8.54
U.S. Fish and Wildlife Service (Total)	(24,906)	(0.07)	(314,369)	(0.83)	(18,439)	(0.05)	(0)	(0.00)	(357,714)	(0.94)
National Wildlife Refuge	7,429	0.02	250,828	0.66	0	0.00	0	0.00	258,257	0.68
Research Natural Area (RNA)	3,866	0.01	380	<0.01	0	0.00	0	0.00	4,246	0.01
Wilderness	13,610	0.04	0	0.00	0	0.00	0	0.00	13,610	0.04
Proposed Wilderness	0	0.00	62,979	0.17	0	0.00	0	0.00	62,979	0.17
Public Use Natural Area	0	0.00	182	<0.01	0	0.00	0	0.00	182	<0.01
Other FWS	0	0.00	0	0.00	18,439	0.05	0	0.00	18,439	0.05
National Park Service (Total)	(453,342)	(1.19)	(14,435)	(0.04)	(67)	(<0.01)	(0)	(0.00)	(467,844)	(1.23)
National Historic Site/Monument	585	<0.01	86	<0.01	0	0.00	0	0.00	671	<0.01
National Park	452,757	1.19	0	0.00	0	0.00	0	0.00	452,757	1.19
National Recreation Area	0	0.00	11,581	0.03	0	0.00	0	0.00	11,581	0.03
Wild/Scenic River	0	0.00	2,768	0.01	0	0.00	0	0.00	2,768	0.01
Other NPS	0	0.00	0	0.00	67	<0.01	0	0.00	67	<0.01
U.S. Forest Service (Total)	(1,374,329)	(3.61)	(331,173)	(0.87)	(5,098,939)	(13.39)	(0)	(0.00)	(6,804,442)	(17.87)
Research Natural or Special Interest Area	26,193	0.07	0	0.00	0	0.00	0	0.00	26,193	0.07
Proposed RNA/SIA	0	0.00	18,142	0.05	0	0.00	0	0.00	18,142	0.05
Wilderness	1,348,136	3.54	0	0.00	0	0.00	0	0.00	1,348,136	3.54
Wilderness Study Area	0	0.00	304,998	0.80	0	0.00	0	0.00	304,998	0.80
Wild/Scenic River	0	0.00	8,033	0.02	0	0.00	0	0.00	8,033	0.02
Other FS	0	0.00	0	.00	5,098,939	13.39	0	0.00	5,098,939	13.39
USDA Agricultural Research Station	0	0.00	0	0.00	29,147	0.08	0	0.00	29,147	0.08
Department of Defense	0	0.00	0	0.00	3,661	0.01	0	0.00	3,661	0.01
Bureau of Reclamation	0	0.00	0	0.00	180	<0.01	0	0.00	180	<0.01
Total Federal Lands	**1,865,674**	**4.90**	**737,081**	**1.94**	**8,400,024**	**22.06**	**0**	**0.00**	**11,002,780**	**28.90**

Table 4.4 *continued*. Area and percent (%) of land stewardship categories by management status in Montana. Some categories, generally those assigned Status 3, have been combined into "other" categories. Miscellaneous includes water (Status 5, not reported, but 1.07% of total area) and unknown (Status 4).

	Status 1		Status 2		Status 3		Status 4		Total	
Land Stewardship Category	ha	%	ha	%	ha	%	ha	%	ha	%
Native American Lands										
Tribal Wilderness/Buffer Zone	36,832	0.10	5,220	0.01	0	0.00	0	0.00	42,052	0.11
Primitive Area	34,850	0.09	0	0.00	0	0.00	0	0.00	34,850	0.09
Other Native American	0	0.00	693	<0.01	2,043,235	5.37	0	0.00	2,043,928	5.37
Total Native American Lands	**71,683**	**0.19**	**5,913**	**0.02**	**2,043,235**	**5.37**	**0**	**0.00**	**2,120,830**	**5.57**
State of Montana (Total)	(0)	(0.00)	(89,835)	(0.24)	(2,125,975)	(5.58)	(0)	(0.00)	(2,215,810)	(5.82)
State Parks and Recreation Area	0	0.00	0	0.00	7,053	0.02	0	0.00	7,053	0.02
State Wildlife Preserve	0	0.00	0	0.00	227	<0.01	0	0.00	227	<0.01
Wildlife Management Area/Game Range	0	0.00	80,904	0.21	2	<0.01	0	0.00	80,906	0.21
Primitive State Park	0	0.00	3,459	0.01	0	0.00	0	0.00	3,459	0.01
Wild/Scenic River	0	0.00	3,892	0.01	0	0.00	0	0.00	3,892	0.01
Other State	0	0.00	1,580	<0.01	2,118,693	5.57	0	0.00	2,120,273	5.57
Local Government Lands	0	0.00	0	0.00	4,476	0.01	62	<0.01	4,538	0.01
Total State & Local Lands	**0**	**0.00**	**89,835**	**0.24**	**2,130,451**	**5.59**	**62**	**<0.01**	**2,220,348**	**5.83**
Private										
The Nature Conservancy	6,178	0.02	69,743	0.18	0	0.00	0	0.00	75,921	0.20
Other Land Trust Preserves/Easements	0	0.00	60,094	0.16	0	0.00	0	0.00	60,094	0.16
Corporate Timber	0	0.00	0	0.00	0	0.00	549,070	1.44	549,070	1.44
Other Private	0	0.00	0	0.00	16	<0.01	21,639,900	56.82	21,640,006	56.82
Total Private Lands	**6,178**	**0.02**	**129,837**	**0.34**	**16**	**<0.01**	**22,188,970**	**58.27**	**22,325,001**	**58.62**
Miscellaneous (Water & Unknown)	0	0.00	0	0.00	0	0.00	4,957	0.01	412,939	1.08
Total	**1,943,535**	**5.10**	**962,666**	**2.53**	**12,573,726**	**33.02**	**22,193,989**	**58.28**	**38,081,898**	**100.00**

Table 4.5. Area (ha) and percent of seven elevation ranges (m) by management status categories. Water, assigned status 5, is not reported but accounts for 1.07% of the total land coverage.

	Status 1 & 2		Status 3 & 4		Total
Elevation (m)	(ha)	%	(ha)	%	(ha)
300-815	273,831	0.72	5,434,280	14.27	5,883,309
815-1330	272,301	0.72	18,539,938	48.68	19,000,204
1330-1845	718,989	1.89	6,782,426	17.81	7,524,578
1845-2360	990,715	2.60	3,216,963	8.45	4,224,692
2360-2875	490,810	1.29	761,333	2.00	1,254,899
2875-3390	148,284	0.39	32,776	0.09	182,945
3390-3900	11,267	0.03	NA	NA	11,271
Total	**2,906,200**	**7.63**	**34,767,717**	**91.30**	**37,673,916**

mountainous and forested compared to the plains of eastern Montana. The Charles M. Russell National Wildlife Refuge, a large area along the Missouri River in the east-central part of the state, is a noteworthy exception. In general, Status 1 and 2 lands are comprised of Wilderness Areas, National Parks, National Wildlife Refuges, and other areas under federal, state, or private management, such as The Nature Conservancy (Table 4.4). Most Status 1 and 2 lands occur above elevations of 1330 meters in the state; conversely, nearly 80% of Status 3 and 4 lands occur below 1330 meters (Table 4.5).

Approximately 33% of the land area in Montana (12,573,726 ha) is in the Status 3 management class. These lands are administered by federal and state agencies, as well as by seven reservations representing 11 American Indian tribes (Table 4.4; Figure 4.2). The remaining 58% of the state (22,193,989 ha) is under private ownership with no legally designated management status (Table 4.4). Though widely distributed, these private lands are more prevalent in the central and eastern portions of the state (Figure 4.1) where the terrain is flatter and better suited to agricultural land uses, including ranching.

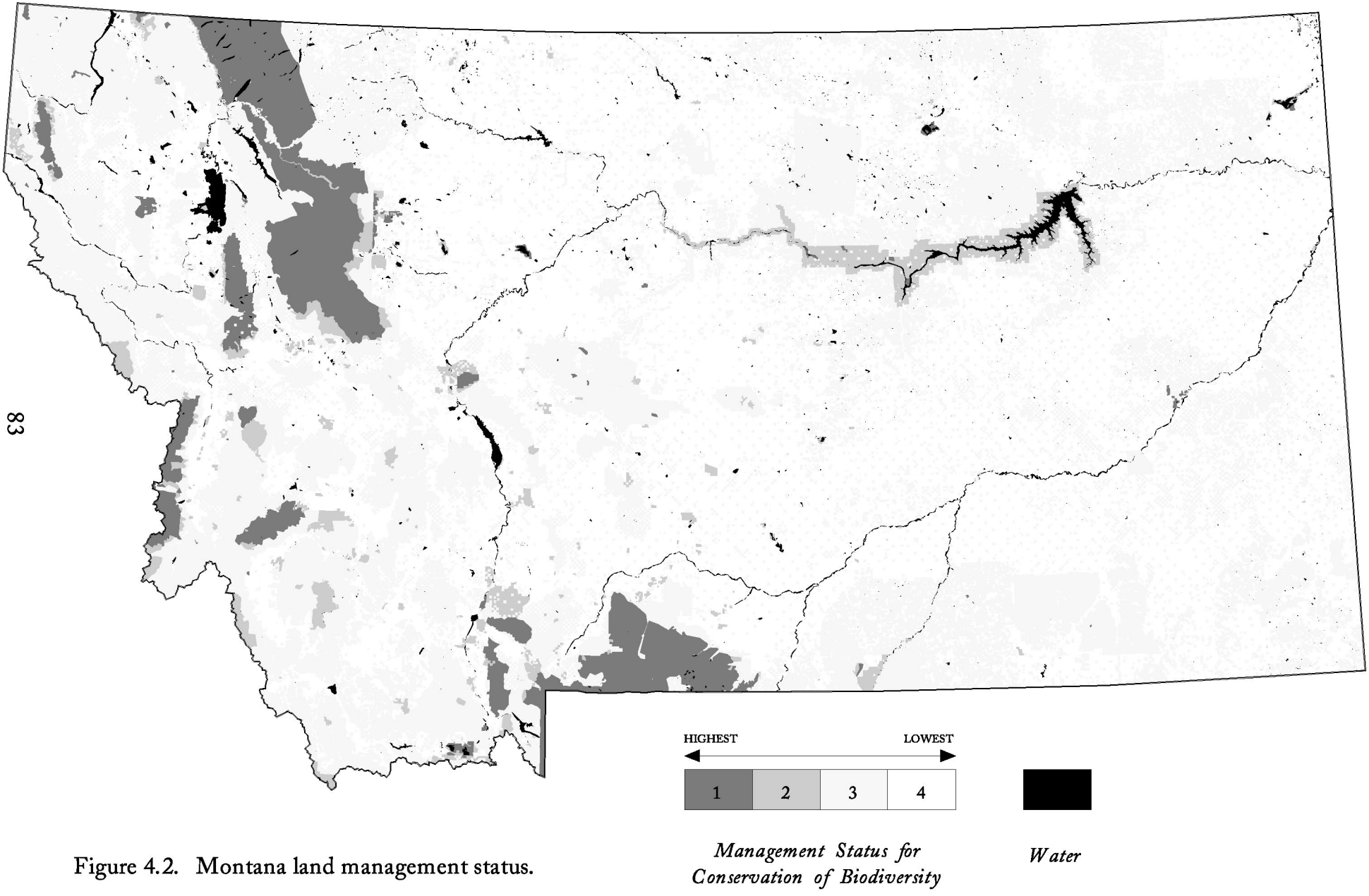


Figure 4.2. Montana land management status.

Limitations and Discussion

The stewardship layer is a compilation of ownership maps provided by a variety of sources. It was created solely for the purpose of conducting the analyses described in this report, and it is not suitable for locating boundaries on the ground or determining precise area measurements of individual tracts. Our ability to check for errors was limited to overlaying the land cover with the stewardship layer and looking for anomalies (e.g., urban or agricultural cover types associated with Status 1 or 2 lands). We made several drafts of the statewide stewardship layer available to people willing to review it and provide feedback. All errors and inconsistencies were resolved and corrected at the University of Montana.

Patterns of land ownership and management are by nature highly dynamic; land tracts are regularly changing from one owner to another, and management plans are undergoing periodic revision. Thus, the land stewardship layer developed by MT-GAP should be regarded as a snapshot in time, only as accurate as the information used to create it. If some piece of digital information entering the layer was based on a map that has not been updated for several years, any change that occurred between the production of that map and the present time will not appear. This is the case with the BLM base layer: tiles date from various years, with some of the maps prepared in the 1970s and possibly not revised since then.

In addition to inaccuracies resulting from temporal changes, the layer may not be free of coding or labeling errors. These already may have been present in the source data, or they may have occurred during the process of appending files. We corrected all labeling errors in the source files that we were aware of (for example, by recoding water in the BLM tiles), and we tried hard to avoid introducing any new errors; nonetheless, there still may be a few mislabeled polygons not attributable to temporal changes in ownership or management.

Combining data at different scales and from various origins is another potential source of error. The match between the BLM base layer and the digital data added to it was seldom perfect, which sometimes resulted in boundary conflicts. These were resolved as accurately as possible, but some errors undoubtedly resulted from appending additional data sources, such as the creation of additional land tracts (slivers). Also, adding a Conservation Easement or a Research Natural Area in the middle of a larger ownership polygon could have introduced error, because the absence of a shared border made it impossible to check the positional accuracy of the newly added polygon. Most data that were added to the BLM base map were at a scale equal to or finer than the 1:100,000 source scale, but some polygons (e.g., Proposed Wilderness Areas from the Forest Service Management Plans) were mapped at a coarser scale (1:126,720 scale), lowering the overall map accuracy. Nonetheless, these polygons were relatively few, and their value to the final stewardship layer made their inclusion necessary.

Finally, some information about land management is simply missing from the stewardship layer in its current form. For example, BLM would not release the location of nine cultural and archeological ACECs in the Big Dry Resource Area (2-8,000 ha) because of their sensitive nature. Other data do not exist in a digital form (e.g., BLM Proposed Wilderness Areas). We also chose not to include National Forest Management Areas in the coverage for the following reasons: 1) the source scale and quality of the digital files varied considerably among the 10 National Forests in the state (e.g., raster data that had been vectorized and generalized); 2) Management Area definitions varied widely among the forests, making it difficult to maintain objectivity and consistency when determining management status; and 3) all the Forest Plans are currently undergoing 10-year revisions, such that both management area boundaries and definitions are likely to change soon. An exception was made for Proposed, Recommended and Study

Wilderness Areas because their definition was consistent from one forest to another, their boundaries are not likely to undergo important modifications, and they represent a substantial amount of land area.

It is not the intent of MT-GAP to produce a land stewardship map that can be used as a legal document, or that is sufficiently detailed and accurate to permit fine-scaled analyses of land ownership patterns. The land stewardship layer is designed to be used at the landscape scale, to identify general trends and highlight areas where land management may not be best for the preservation of important pockets of biodiversity (the "gaps" in the protection network). Once such areas are identified, finer scale analyses can be conducted.

Conclusions

Public lands consisting of federal and state ownership comprise approximately 35% of Montana. Most federal lands in the western half of the state are owned and managed by the Forest Service and the National Park Service, whereas most federal lands in the eastern portion of the state are owned and managed by the BLM. Status 1 and 2 lands occupy less than 10% of the state and are generally found at higher elevations. Status 3 and 4 lands occur over greater than 90% of the state; well over half are in private holdings.

5. ANALYSIS BASED ON STEWARDSHIP AND MANAGEMENT STATUS

Introduction

As described in the general introduction to this report (Chapter 1), the primary objective of GAP is to provide information about the distribution and status of several elements of biological diversity. This is accomplished by producing three general map layers: 1) land cover (see Chapter 2), 2) predicted distributions for selected animal species (see Chapter 3), and 3) land stewardship and management status (see Chapter 4). Intersecting the land stewardship and management map layer with the distribution of land cover and animal species elements allows one to determine the total area (and proportion) of each element in the different land stewardship and management categories. The data are provided below in tables and figures which illustrate the representation of each element in different land stewardship and management categories. The accompanying digital data allow users to make additional queries to suit their own interests or objectives. This forms the basis of GAP's mission to provide land owners and managers with the information necessary to conduct informed policy development, planning, and management for the long-term maintenance of biodiversity.

Although GAP "seeks to identify habitat types and species not adequately represented in the current network of biodiversity management areas" (Scott and Jennings 1994), it is unrealistic to create a standard definition of "adequate representation" for either land cover types or individual plant or animal species (Noss et al. 1995). A practical solution to this problem is to report both percentages and absolute areas of each land cover type in managed areas (as described above) and allow the user to determine which types are adequately represented in areas under active management. Clearly, opinions will differ among users, but this is an issue of policy, not scientific analysis. Thus said, we provide a breakdown along three levels of representation (10%, 20%, and 50%) that have been recommended in the literature (Odum and Odum 1972, Specht et al. 1974, Ride 1975, Noss 1991, Miller 1994, Noss and Cooperrider 1994).

The network of Conservation Data Centers (CDCs) and Natural Heritage Programs (NHPs) established cooperatively by The Nature Conservancy and various state agencies maintain detailed databases on the locations of rare elements of biodiversity. GAP may use these data to develop predicted distributions of potentially suitable habitat for these elements, which in turn may be valuable for identifying future research needs and preliminary considerations for restoration or reintroduction. Conservation of such rare elements, however, is best accomplished through the fine-filter approach of the above organizations. It is not the role of GAP to duplicate or disseminate Heritage Program or CDC Element Occurrence Records. Users interested in more specific information about the location, status, and ecology of populations of such species are directed to their state Heritage Program or CDC.

Currently, land cover types and terrestrial vertebrates are the primary mapping focus of GAP; however, other components of biodiversity, such as aquatic organisms, or selected groups of invertebrates, may be incorporated into future distributional data sets. Where appropriate, GAP data also may be analyzed to identify the location of a set of areas in which most or all land cover types or species are predicted to be represented. The use of "complementarity" analysis, that is, an approach that additively identifies a selection of locations that may represent biodiversity rather than "hot spots of species richness" may prove most effective for guiding biodiversity maintenance efforts. Several quantitative techniques have been developed recently that facilitate this process (see Pressey et al. 1993, Williams et al. 1996, Csuti et al. 1997, for details). These areas become

candidates for field validation and may be incorporated into a system of areas managed for the long-term maintenance of biological diversity.

For MT-GAP, information on the current management status of 50 land cover types and 425 terrestrial vertebrates was derived by intersecting GIS layers of land cover type (see Chapter 2) and predicted vertebrate distributions (see Chapter 3) with land stewardship and management (see Chapter 4). Highlights, along with summary tables of these results, are discussed below, and more detailed summaries are presented in Appendices 5.1 and 5.2. Management implications of these findings are discussed in Chapter 6.

Analysis of Land Cover

Land Cover and Land Stewardship

Forest Types

Forest cover types comprise nearly 25% (9,466,397 ha) of the state; 64% of these lands (6,018,566 ha) are managed by federal agencies, 27% (2,570,294 ha) are privately held, and the remaining 9% are managed by Indian tribes (5.3%; 504,295 ha) and state agencies (3.7%; 351,133 ha) (Table 5.1). Given the general pattern of land ownership and stewardship in Montana (Figure 4.1), substantial portions of the lower elevation forest cover types are found on private lands; in fact, more than half of the following four forest types in the state occur on private lands: Mixed Broadleaf, Ponderosa Pine, Rocky Mountain Juniper, and Broadleaf Riparian (Figure 5.1 and Table 5.1). Indian tribes also tend to manage relatively high proportions of lower elevation forest types, such as Utah Juniper, Very Low Cover Forest, and Broadleaf Riparian Forest (Table 5.1). Management authority for higher elevation forest types usually resides with federal agencies (Table 5.1).

Shrub and Grass Types

More than half of each shrub type, with the exception of Salt-desert Shrub/Dry Salt Flats, occurs on private lands (Table 5.1). Salt-desert Shrub/Dry Salt Flats are restricted to the eastern portion of the state, where they tend to occur on lands administered by the BLM. Grass types also are found predominately on private land, except for both the Montane Parkland and Alpine Meadow types. Montane Parklands and especially Alpine Meadows occur at higher elevations which tend to be managed by federal agencies (Table 5.1).

Unvegetated Types

Rock and Snow, again cover types typically found at high elevations, are mostly under the jurisdiction of federal agencies. Badlands are evenly divided among federal and private ownership. The Missouri Breaks type, however, was defined to distinguish an unusual cover type (separate from Rock) along the Missouri River. This area is mostly under the federal jurisdiction of the Charles M. Russell National Wildlife Refuge and the BLM (Figure 4.1). A very small percentage (0.08%) of the land cover layer was classified as cloud and cloud shadow (Table 5.1), meaning that land cover data were not available for those areas.

Table 5.1. Area and percent land cover within major land stewardship categories. The 'Other' category includes water which is not under any specific jurisdictions and 'Unknown' which is discussed in Chapter 4.

	Federal		Native		State		Private		Other		Total
Cover Types	ha	%	ha	%	ha	%	ha	%	ha	%	ha
Forest Types (Total)	(6,018,566)		(504,295)		(351,133)		(2,570,294)		(22,109)		(9,466,397)
Very Low Cover Forest	70,495	24.63	67,765	23.68	11,801	4.12	135,828	47.46	298	0.11	286,188
Mixed Broadleaf Forest	68,201	19.08	47,723	13.35	15,541	4.35	222,524	62.24	3,550	0.99	357,540
Lodgepole Pine	1,085,645	84.41	30,415	2.36	24,423	1.90	144,955	11.27	718	0.06	1,286,157
Limber Pine	54,123	44.96	8,795	7.31	9,283	7.71	47,951	39.84	220	0.18	120,372
Ponderosa Pine	293,733	27.55	89,566	8.40	55,000	5.16	625,680	58.69	2,152	0.20	1,066,130
Grand Fir	14,761	67.04	1,733	7.87	1,533	6.96	3,983	18.09	9	0.04	22,017
Western Red Cedar	29,874	82.21	518	1.42	1,708	4.70	4,210	11.58	30	0.08	36,339
Western Hemlock	19,459	92.92	28	0.13	235	1.12	1,159	5.54	61	0.29	20,941
Douglas-fir	843,104	63.39	52,488	3.95	60,192	4.53	372,005	27.97	2,206	0.17	1,329,994
Rocky Mtn Juniper	30,027	37.36	1,405	1.75	4,751	5.91	44,037	54.79	160	0.20	80,380
Western Larch	73,211	80.95	3,711	4.10	2,501	2.77	10,962	12.12	53	0.06	90,437
Utah Juniper	6,356	42.82	4,785	32.24	388	2.61	3,296	22.20	18	0.12	14,843
Douglas-fir/Lodgepole	351,415	77.86	8,930	1.98	14,154	3.14	76,645	16.98	187	0.04	451,332
Mixed Whitebark Pine	373,201	94.64	6,300	1.60	4,086	1.04	10,161	2.58	592	0.15	394,340
Mixed Subalpine Forest	1,421,254	89.81	43,233	2.73	29,665	1.87	87,841	5.55	618	0.04	1,582,611
Mixed Mesic Forest	812,087	66.17	74,511	6.07	63,046	5.14	276,669	22.54	995	0.08	1,227,310
Mixed Xeric Forest	236,577	43.64	26,405	4.87	29,098	5.37	248,522	45.85	1,447	0.27	542,050
Broadleaf/Conifer Mix	44,743	44.81	10,682	10.70	4,233	4.24	39,930	39.99	256	0.26	99,844
Standing Burnt Forest	124,258	89.23	770	0.55	4,624	3.32	9,569	6.87	41	0.03	139,262
Conifer Riparian	35,966	42.31	3,385	3.98	4,112	4.84	39,500	46.47	2,042	2.40	85,005
Broadleaf Riparian	16,143	8.14	18,330	9.24	9,104	4.59	148,775	75.00	6,020	3.04	198,372
Mixed Tree Riparian	13,933	39.89	2,817	8.06	1,655	4.74	16,092	46.07	436	1.25	34,933
Shrub Types (Total)	(1,595,181)		(295,857)		(386,633)		(3,519,624)		(20,879)		(5,818,172)
Mesic Shrub	267,223	28.13	85,314	8.98	39,424	4.15	556,217	58.56	1,695	0.18	949,873
Xeric Shrub	279,442	22.76	47,100	3.84	77,432	6.31	820,968	66.86	2,910	0.24	1,227,852
Silver Sage	27,143	37.01	1,670	2.28	4,393	5.99	39,628	54.04	501	0.68	73,335
Salt Shrub/Flats	72,113	54.99	1,381	1.05	6,840	5.22	49,813	37.98	995	0.76	131,141
Sagebrush	725,208	33.80	68,740	3.20	183,730	8.56	1,161,387	54.13	6,510	0.30	2,145,574
Mesic Shrub/Grassland	30,878	11.03	42,382	15.13	15,778	5.63	190,863	68.15	175	0.06	280,075
Xeric Shrub/Grassland	139,967	26.71	7,053	1.35	36,095	6.89	340,110	64.90	837	0.16	524,062
Riparian Shrublands	38,442	10.57	32,578	8.96	16,921	4.65	269,817	74.21	5,838	1.61	363,596
Shrub/Herb Riparian	14,765	12.04	9,639	7.86	6,020	4.91	90,821	74.04	1,418	1.16	122,662
Grass Types (Total)	(2,428,082)		(1,033,630)		(1,177,924)		(10,392,865)		(36,372)		(15,068,872)
Altered Herbaceous	82,014	8.08	52,148	5.14	70,367	6.93	806,728	79.49	3,690	0.36	1,014,946
Very Low-Low Cover	216,984	19.65	45,332	4.10	96,776	8.76	743,222	67.30	2,048	0.18	1,104,361
Low-Moderate Cover	1,493,902	14.33	736,757	7.07	875,133	8.39	7,305,777	70.06	15,895	0.15	10,427,465
Moderate-High Cover	145,559	11.77	126,227	10.21	73,439	5.94	887,675	71.78	3,759	0.30	1,236,660
Montane Parkland	386,135	73.11	10,110	1.91	23,447	4.44	108,350	20.51	160	0.03	528,201
Alpine Meadow	52,997	96.95	43	0.08	113	0.21	1,462	2.68	49	0.09	54,664
Herbaceous Riparian	50,491	7.19	63,013	8.97	38,649	5.50	539,651	76.81	10,771	1.53	702,575
Unvegetated (Total)	(895,686)		(33,023)		(72,139)		(620,009)		(13,117)		(1,633,974)
Rock	445,590	75.39	12,409	2.10	11,164	1.89	117,355	19.86	4,549	0.77	591,068
Snow	24,984	92.27	1,656	6.12	0	0.00	204	0.75	233	0.86	27,077
Badlands	279,894	37.34	11,973	1.60	48,589	6.48	404,160	53.92	4,986	0.67	749,602
Missouri Breaks	57,739	83.47	30	0.04	3,478	5.03	6,329	9.15	1,600	2.31	69,176
Mixed Barren	87,479	44.40	6,955	3.53	8,908	4.52	91,961	46.67	1,749	0.89	197,051
Anthropogenic/Water	(65,268)		(254,025)		(232,517)		(5,222,210)		(320,462)		(6,094,484)
Dry Agriculture	23,415	0.65	160,909	4.43	159,299	4.39	3,284,755	90.42	4,233	0.12	3,632,612
Irrigated Agriculture	6,248	0.32	85,211	4.35	63,448	3.24	1,797,030	91.81	5,357	0.27	1,957,295
Water	17,792	4.47	7,001	1.76	5,941	1.49	57,320	14.39	310,351	77.90	398,406
Mines	2,142	17.96	16	0.14	881	7.39	8,857	74.30	25	0.21	11,922
Urban	1,672	2.62	888	1.39	1,452	2.28	59,297	93.04	424	0.67	63,733
Cloud	7,487	41.20	0	0.00	1,013	5.58	9,611	52.89	61	0.33	18,172
Cloud Shadow	6,512	52.75	0	0.00	483	3.91	5,340	43.25	11	0.09	12,345
Total	11,002,783		2,120,830		2,220,346		22,325,002		412,939		38,081,898

Land Cover and Management Status

Figures 5.1 and 5.2 graphically illustrate the proportions of each forest, grass, and shrub cover type assigned each management status code, and Table 5.2 provides summary amounts for all cover types by management status. Figures 5.3 and 5.4 present elevation ranges for cover types in relation to management status 1 and 2. Along with the following summary, these highlight observed trends and offer insight on general conditions throughout the state.

Land Cover with <10% Representation in Status 1 and 2

A majority of the land cover types mapped for Montana (29 of 50 types) have less than 10% of their areas managed under Status 1 or 2 (Table 5.2).

Forest Types -- Three forest types, Very Low Cover Forest (typically ponderosa pine, juniper, and limber pine savannahs), Ponderosa Pine, and Rocky Mountain Juniper are low-elevation, xeric forest cover types that often come under heavy pressure from human developments. Ponderosa Pine in particular, which has been reduced due to harvest and fire suppression practices (Habeck 1988, 1990; Gruell et al. 1982), could be a target for additional conservation. Mixed Broadleaf is a combination of aspen, green ash, and other deciduous trees or shrubs that typically occurs in small patches that were sometimes difficult to map. This cover type also may represent riparian species that fall outside of our riparian buffer zone. Nonetheless, wildlife biologists are often concerned about species associated with plants comprising this cover type; consequently, the cover type could be considered for additional management and protection.

Finally, three mesic forest types (Grand Fir, Western Red Cedar, and Western Hemlock) each comprise very small portions of the state (< 1%) and have less than 10% of their area managed as Status 1 or 2. These are mid-elevation cover types found in northwestern Montana where maritime climatic conditions prevail (Pfister et al. 1977). Between 67% and 93% of these types are federally owned and mostly under Status 3. Due to their moderate elevation, they are subject to forest management practices which may compromise their future conservation status.

Shrub and Grass Types -- With the exception of Silver Sage, less than 10% of the area of the remaining eight shrub types are managed under Status 1 and 2 in Montana. The large areal distribution of most of these types somewhat mitigates their priority for conservation (Table 5.2). Sagebrush, other xeric shrub species and shrub/grass complexes are well distributed across the mid-to-eastern portion of the state. Nonetheless, sod-busting constitutes an ongoing threat to native rangeland vegetation on both public and private lands, as does overgrazing, albeit to a lesser extent. Riparian shrub types, also widely distributed but in much smaller amounts in the eastern drainages and woody draws, are often subject to heavy grazing and abuse. As mentioned above, riparian cover types are of ecological importance due to the richness of species often present therein. Like the shrub types, most grass types, with the exception of high elevation ones previously mentioned, fall into Status 3 or 4 management; but they are generally so well distributed and abundant that special conservational concern may not be warranted.

Unvegetated Types -- Badlands is the only nonvegetated cover type with less than 10% representation in Status 1 and 2 (Table 5.2). This type is a unique geologic type found almost exclusively on private land in eastern Montana (Table 5.1). A regional assessment, however, might indicate that this type is better protected in the western Dakotas than in Montana.
More details about the total area of each cover type mapped, as well as the amount of each type's total distribution in each management status category can be found in Appendix 5.1.

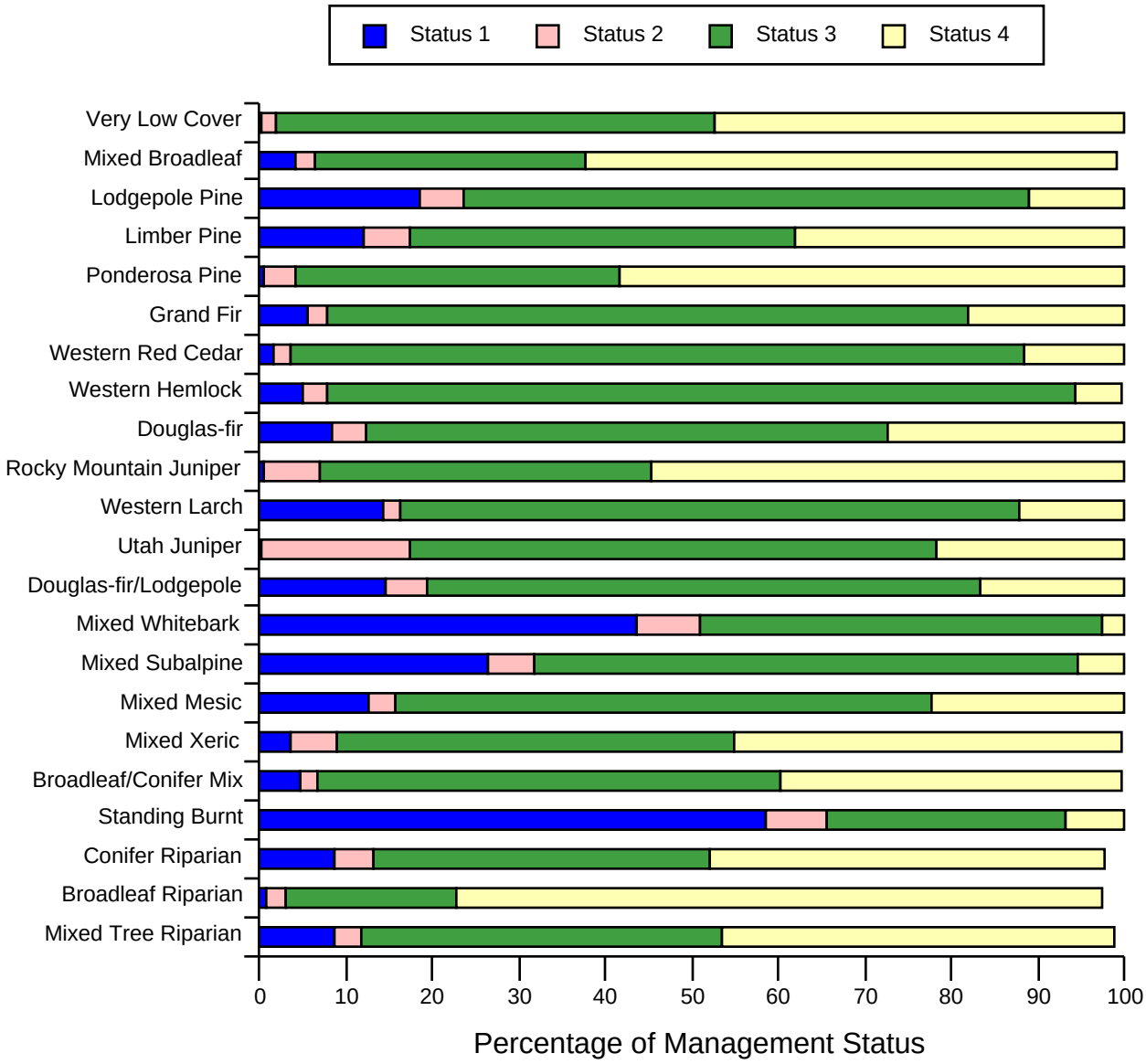


Figure 5.1. Percentage of each forest cover type in management status 1, 2, 3, and 4. Some types do not sum to 100% because they overlap with water bodies mapped in the stewardship layer, which were not assigned one of these status codes.

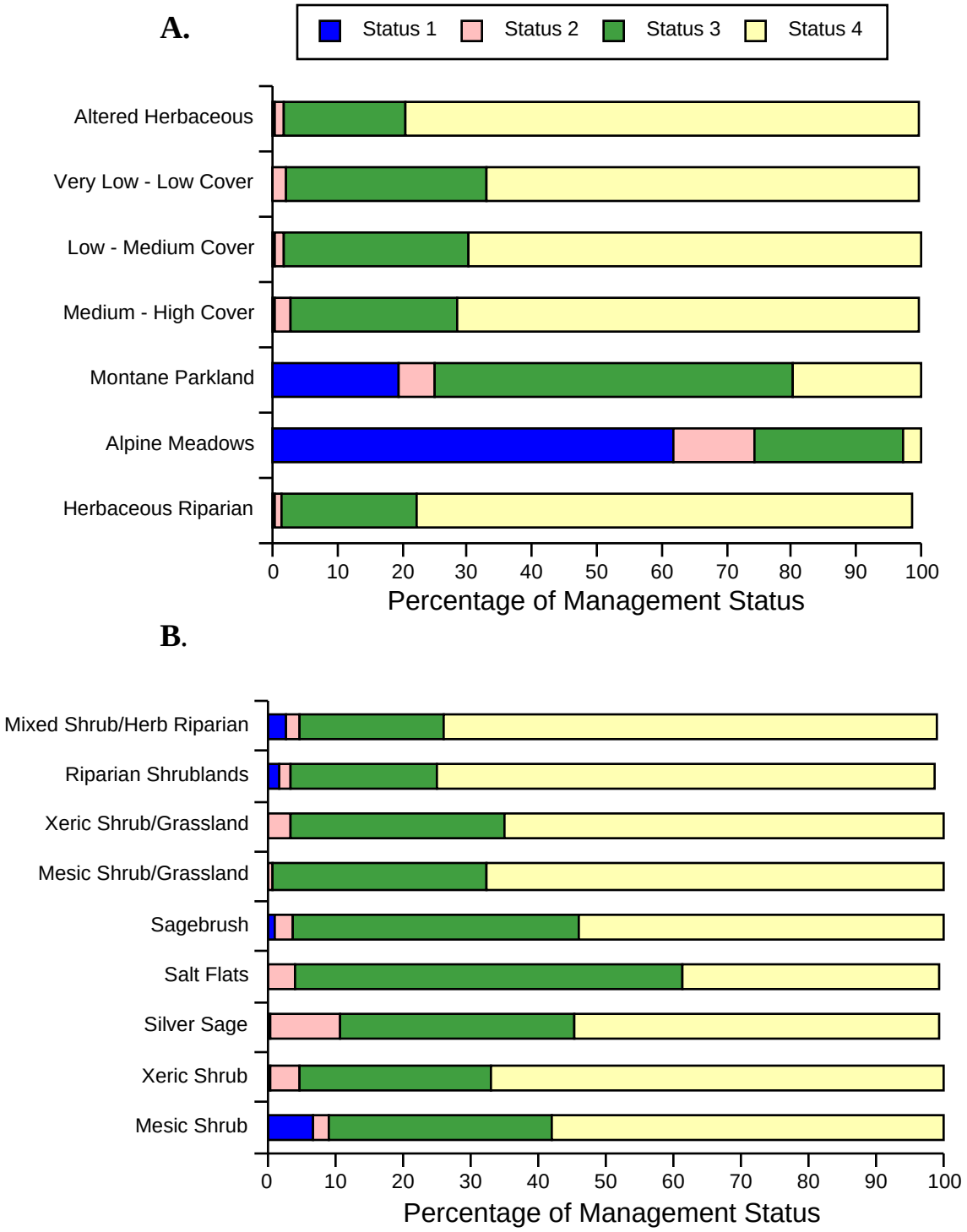


Figure 5.2. Percentage of each grass (A) and shrub (B) cover type in management status 1, 2, 3, and 4. Some types do not sum to 100% because they overlap with water bodies mapped in the stewardship layer, which were not assigned one of these status codes.

Table 5.2. Area (ha) and percent of each land cover type by management status. Management status definitions and accuracy of these numbers are discussed in chapter 4. *Discrepancies in row totals exist because Status 5, water, is counted in totals but not reported in its own column. Cloud and cloud shadow also are not reported. See Appendix 5.1 for more detailed information.

	Status 1		Status 2		Status 3		Status 4		Status 1& 2		Total*
Cover Types	ha	%	ha	%	ha	%	ha	%	ha	%	ha
Forest Types											
Very Low Cover Forest	722	0.25	4,781	1.67	145,192	50.73	135,207	47.25	5,503	1.92	286,188
Mixed Broadleaf Forest	15,103	4.22	8,486	2.37	110,593	30.93	220,078	61.55	23,590	6.60	357,540
Lodgepole Pine[b]	239,615	18.63	62,432	4.86	841,230	65.41	142,161	11.05	302,047	23.49	1,286,157
Limber Pine	14,527	12.07	6,430	5.34	53,342	44.31	45,877	38.11	20,956	17.41	120,372
Ponderosa Pine[b]	5,962	0.56	37,341	3.50	399,635	37.48	621,050	58.25	43,303	4.06	1,066,130
Grand Fir[c]	1,235	5.61	470	2.13	16,330	74.17	3,974	18.05	1,705	7.74	22,017
Western Red Cedar[c]	535	1.47	793	2.18	30,772	84.68	4,210	11.58	1,328	3.65	36,339
Western Hemlock[c]	1,034	4.94	642	3.07	18,045	86.17	1,159	5.54	1,676	8.00	20,941
Douglas-fir[b]	112,518	8.46	48,883	3.68	802,212	60.32	364,206	27.38	161,401	12.14	1,329,994
Rocky Mtn Juniper	279	0.35	5,251	6.53	30,807	38.33	43,883	54.59	5,531	6.88	80,380
Western Larch	12,971	14.34	1,755	1.94	64,736	71.58	10,922	12.08	14,727	16.28	90,437
Utah Juniper[c]	11	0.08	2,603	17.53	8,954	60.32	3,258	21.95	2,614	17.61	14,843
Douglas-fir/Lodgepole	65,369	14.48	21,315	4.72	289,025	64.04	75,436	16.71	86,684	19.21	451,332
Mixed Whitebark Pine[a]	173,835	44.08	27,362	6.94	182,490	46.28	10,062	2.55	201,197	51.02	394,340
Mixed Subalpine Forest[b]	421,509	26.64	83,306	5.26	991,523	62.65	85,656	5.41	504,815	31.90	1,582,611
Mixed Mesic Forest[b]	156,441	12.75	36,185	2.95	758,430	61.80	275,258	22.43	192,626	15.69	1,227,310
Mixed Xeric Forest	18,819	3.47	29,786	5.50	248,319	45.81	243,693	44.96	48,605	8.97	542,050
Broadleaf/Conifer Mix	4,409	4.42	1,999	2.00	53,627	53.71	39,560	39.62	6,408	6.42	99,844
Standing Burnt Forest[a]	80,725	57.97	9,988	7.17	38,941	27.96	9,567	6.87	90,714	65.14	139,262
Conifer Riparian	7,394	8.70	3,759	4.42	32,922	38.73	38,919	45.78	11,153	13.12	85,005
Broadleaf Riparian	1,752	0.89	4,014	2.02	39,083	19.70	148,407	74.81	5,766	2.91	198,372
Mixed Tree Riparian[c]	3,015	8.63	1,046	2.99	14,560	41.68	15,881	45.46	4,061	11.62	34,933
Shrub Types											
Mesic Shrub[b]	62,545	6.59	23,306	2.45	310,072	32.64	552,379	58.15	85,851	9.04	949,873
Xeric Shrub	2,643	0.22	54,891	4.47	347,310	28.29	820,115	66.79	57,534	4.69	1,227,852
Silver Sage	218	0.30	7,640	10.42	25,364	34.59	39,615	54.02	7,858	10.72	73,335
Salt Shrub/Flats	111	0.09	4,981	3.80	75,332	57.44	49,723	37.92	5,092	3.88	131,141
Sagebrush[b]	18,023	0.84	62,100	2.89	905,847	42.22	1,153,093	53.74	80,124	3.73	2,145,574
Mesic Shrub/Grassland	67	0.02	1,711	0.61	88,466	31.59	189,668	67.72	1,778	0.64	280,075
Xeric Shrub/Grassland	447	0.09	16,675	3.18	166,806	31.83	339,297	64.74	17,123	3.27	524,062
Riparian Shrublands	6,669	1.83	5,620	1.54	77,893	21.42	267,958	73.70	12,289	3.38	363,596
Shrub/Herb Riparian	3,389	2.76	2,385	1.94	25,874	21.09	89,605	73.05	5,774	4.71	122,662
Grass Types											
Altered Herbaceous[b]	1,967	0.19	15,367	1.51	188,990	18.62	805,234	79.34	17,335	1.71	1,014,946
Very Low-Low Cover[b]	768	0.07	22,688	2.05	340,330	30.82	738,527	66.87	23,456	2.12	1,104,361
Low-Medium Cover[b]	34,520	0.33	148,696	1.43	2,980,214	28.58	7,248,326	69.51	183,216	1.76	10,427,465
Medium-High Cover[b]	4,217	0.34	29,618	2.40	317,739	25.69	881,389	71.27	33,835	2.74	1,236,660
Montane Parkland	104,204	19.73	27,232	5.16	291,378	55.16	105,227	19.92	131,436	24.89	528,201
Alpine Meadow[a]	34,036	62.26	6,565	12.01	12,552	22.96	1,462	2.68	40,601	74.27	54,664
Herbaceous Riparian	3,512	0.50	7,160	1.02	144,787	20.61	536,615	76.38	10,672	1.52	702,575
Unvegetated											
Rock[a]	277,427	46.94	37,566	6.36	154,584	26.15	116,941	19.78	314,993	53.29	591,068
Snow[ac]	24,741	91.38	181	0.67	1,717	6.34	204	0.75	24,922	92.04	27,077
Badlands	2,570	0.34	29,997	4.00	307,951	41.08	404,104	53.91	32,567	4.35	749,602
Missouri Breaks[a]	198	0.29	37,118	53.66	23,931	34.60	6,329	9.15	37,316	53.94	69,176
Mixed Barren	17,302	8.78	6,370	3.23	80,061	40.63	91,570	46.47	23,671	12.01	197,051
Anthropogenic/Water											
Dry Agriculture[b]	1,187	0.03	3,885	0.11	341,008	9.39	3,282,901	90.37	5,071	0.14	3,632,612
Irrigated Agriculture[b]	207	0.01	5,109	0.26	153,144	7.82	1,794,723	91.69	5,317	0.27	1,957,295
Water	3,807	0.96	3,698	0.93	23,492	5.90	57,423	14.41	7,505	1.88	398,406
Mines	4	0.03	90	0.76	2,945	24.70	8,857	74.30	94	0.79	11,922
Urban	50	0.08	803	1.26	3,140	4.93	59,380	93.17	853	1.34	63,733
Total	1,942,609		960,079		12,561,695		22,179,088		2,902,693		38,051,381

[a] Land Cover Types with 50% of their land assigned Status 1 & 2.
[b] Land Cover Types with greater than 1,000,000 hectares (> 3% of the state).
[c] Land Cover Types with less than 50,000 hectares (< 0.1% of the state).

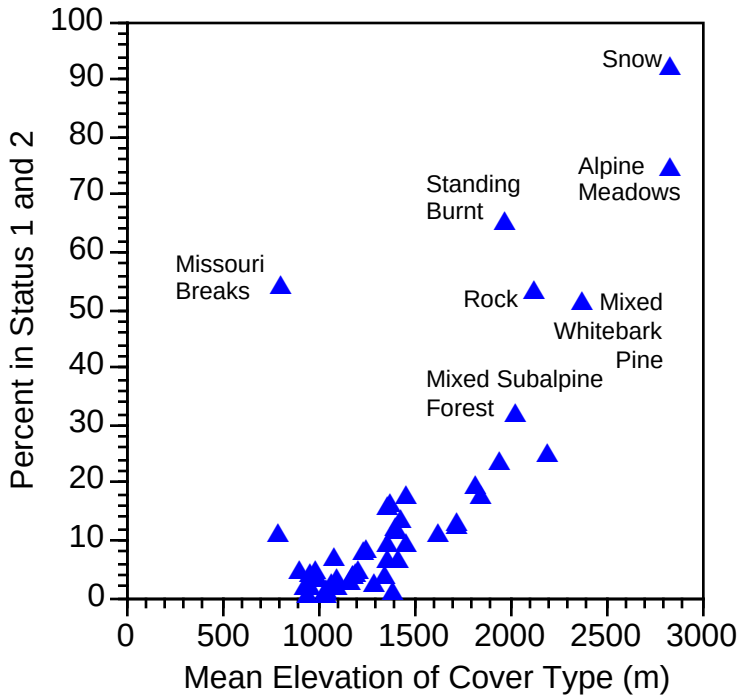


Figure 5.3. For 50 land cover types mapped across Montana, percent of type in management status 1 and 2 in relation to mean elevation (m) of the area occupied by that type.

Land Cover with 10% - 20% Representation in Status 1 and 2

Between 10% and 20% of 10 different land cover types fall under Status 1 or 2 management (Table 5.2). The total land area for most of these types is relatively small (< 1% of the state), but for three forest types (Douglas-fir, Douglas-fir/Lodgepole, and Mixed Mesic Forest), the proportion exceeds 1%. These three forest types are well represented and widespread throughout the state; they tend to be managed by federal agencies under Status 3 conditions. For this reason, their continued viability is likely to depend on their commercial value. Douglas-fir has the highest timber production value in the state (Green et al. 1985). Closed-canopy, coniferous forests have declined by as much as 45% on public, non-wilderness lands in Oregon as a result of timber harvesting practices (Spies et al. 1994). Similar findings have been reported for southeastern Wyoming (Reed et al. 1996), and the same is probably true in Montana.

The other seven cover types, which each comprise less than 1% of the state's total land cover, are: Western Larch, Limber Pine, Utah Juniper, Conifer Riparian, Mixed Tree Riparian, Silver Sage, and Mixed Barren. Western larch is a relatively uncommon forest type in the United States, and according to Green et al. (1985), 44% of this forest is found in western Montana. Three other forest types constitute very small portions of the state's land cover (<1%): Utah Juniper, Limber Pine, and Mixed Tree Riparian. Utah juniper and low elevation limber pine stands appear sparsely throughout the eastern portion of Montana. Because these types are more common in the Great Basin to the south, the need for greater management attention also may reside outside Montana.

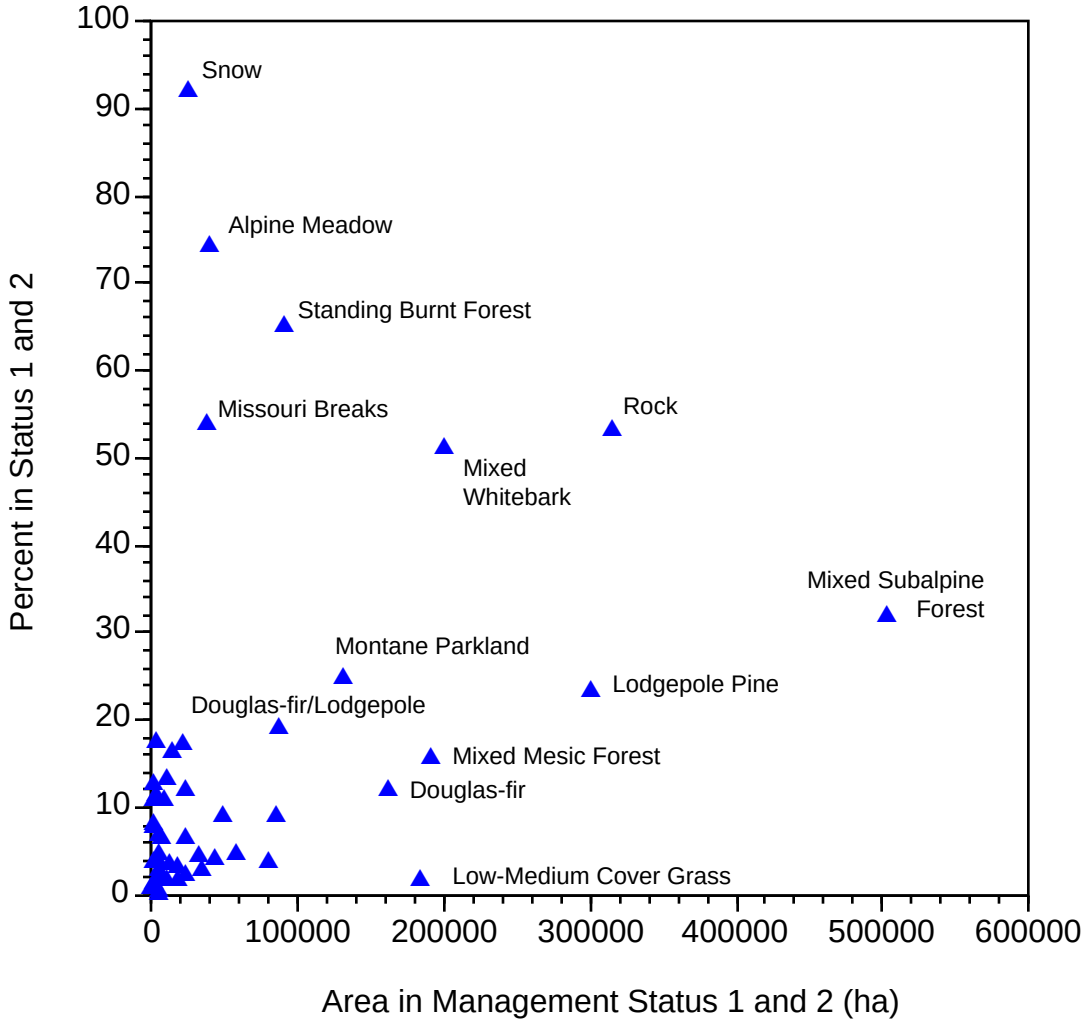


Figure 5.4. For 50 land cover types mapped across Montana, percent of type in management status 1 and 2 versus area of type in management status 1 and 2.

In contrast to these more common types with limited distribution in Montana, riparian cover types are relatively rare throughout the western U.S. The Mixed Tree and Conifer Riparian types both fall within the 10% to 20% representation in Status 1 and 2 lands. Silver Sage, which has 10-20% representation in Status 1 and 2 as well, could also be considered a riparian or intermittent draw cover type found in eastern Montana. These particular cover types are moderately protected due to their association with other forest types that also are moderately protected. Other riparian cover types are less protected and will be discussed later. In general, riparian cover types are of great importance for maintaining biological diversity, especially in arid environments, and their conservation throughout the state should be a high priority (Minshall 1993). The popularity of human settlements along riverine systems is demonstrated by the large proportion of riparian cover types in private land ownership (Table 5.1).

Land Cover with 20-50% Representation in Status 1 and 2

Three land cover types have between 20% and 50% of their area under Status 1 or 2 management. These types, Lodgepole Pine, Mixed Subalpine Forest, and Montane Parkland, are found at middle to high elevations, and they are managed primarily by federal agencies (Table 5.1). Lodgepole Pine is one of the most abundant forest types in the state (Green et al. 1985) and spans a wide elevational range. At higher elevations, lodgepole pine tends to mix with subalpine fir and spruce into the Mixed Subalpine Forest type. Overall, these three cover types appear to be relatively well protected in the state. Figure 5.4 shows that these cover types are not only relatively well protected but also have a large percentage of their overall area within Status 1 and 2 lands.

Land Cover with >50% Representation in Status 1 and 2

Six land cover types have more than half of their land area under Status 1 or 2 management (Table 5.2): Rock, Snow, Alpine Meadow, Mixed Whitebark Pine, Standing Burnt Forest, and Missouri Breaks. The first four types all occur at high elevations (Fig 5.3) which tend to be well protected due to their inaccessibility and lack of potential for commercial or private development. In addition, the overall area represented by these cover types is relatively small (Figure 5.4). The Missouri Breaks type, as noted above, is a small yet unique feature of the landscape along the Missouri River in central Montana. Standing Burnt Forest has a high proportion of area in the Status 1 class (58%; Table 5.2), no doubt because wildfires are more likely to be allowed to burn in designated Wilderness Areas than anywhere else in the state. Also, if ecosystem management policies adopted by federal agencies call for increased burning, it remains to be seen whether Status 1 and 2 lands will bear a disproportionate burden, such that other land cover types begin to decline within these reserves. Although these six land cover types appear to be well protected under current management regimes in Montana, continued study may be justified for existing areas of Standing Burnt Forest to determine whether different successional types develop (Arno 1980). Also, the Mixed Whitebark Pine cover type may warrant additional protection not only because of its importance to grizzly bears and other wildlife dependent on its seed crop, but also because it is highly susceptible to infection to white pine blister rust (Keane and Arno 1993).

Analysis of Predicted Distributions for Terrestrial Vertebrates

Appendix 5.2 provides the area (in hectares) of each species' mapped distribution by land steward and management status, and the amount of the species' total distribution in each category. For example, the entry for the Coeur d'Alene salamander (*Plethodon idahoensis*) indicates that 61,575 ha of its predicted distribution (87,617 ha) occur on lands managed by the U.S. Forest Service. The entry also shows that 5.34% of its predicted distribution occurs on Status 1 and 2 lands. In all, tables are provided for 425 terrestrial vertebrates; however, only the 414 native terrestrial vertebrates are included in most discussions below.

Land Stewardship

In general, when trends were summarized by taxonomic group and major land steward, the average percentage of species' distributions occurring within a stewardship category corresponded reasonably well with the total area managed by that steward (Table 5.3). However, averages across all species suggested that slightly less habitat occurred on private lands than might be expected based on the percentage of the state that is privately owned. On the other hand, more habitat was captured by the miscellaneous category than might be expected; water bodies, which were not assigned to stewardship categories, provide habitat for a number of birds. As a result,

stewardship and management status of these birds has not been well-assessed by this technique. Further examination of stewardship and management around these water bodies is warranted. Over half of the predicted habitat for amphibians and reptiles occurred on privately owned lands (54.4% and 60.95% respectively). Reptiles especially tended to be concentrated in the eastern half of the state, where a high proportion of land is under private ownership. Habitats for birds were fairly equally distributed across the state and among stewards, except for the disproportionate importance of water, as noted above. For mammals, habitats tended to be concentrated under federal stewardship (40.55%).

Interestingly, the nine exotic species that were modeled averaged 76.77% predicted habitat on private lands (see Appendix 5.2). By far the majority of predicted habitat for the Idaho giant salamander (*Dicamptodon aterrimus*) and wood frog (*Rana sylvatica*) occurred on federal lands, mostly those under the jurisdiction of the U.S. Forest Service. These amphibians have been reported but not confirmed in the state; habitat predictions suggest that Forest Service lands would be the best place to begin the search for these species.

Land Management Status

On average, a smaller percent of predicted habitat for amphibians (7.9%) and reptiles (4.4%) occurs on Status 1 and 2 lands than that for either birds (10.3%) or mammals (12.6%). Of 414 native terrestrial vertebrates, 62.6% had ≤10% of their predicted distributions within lands assigned management status 1 or 2 (Table 5.4, Figure 5.5). As a group, reptiles exhibited this trend most sharply; only the rubber boa (*Charina bottae*) had more than 10% of its predicted distribution within Status 1 and 2 lands (Table 5.5). Mammals, on the other hand, tended toward the other end of the spectrum, with 44.1% having more than 10% of their predicted distribution in Status 1 and 2 lands. One trend was consistent among taxonomic groups: species predicted to occur at higher elevations appeared to be better protected (Figures 5.6, 5.7).

Table 5.3. For native terrestrial vertebrates in Montana, average percent of the total predicted distribution (ha) of species within taxonomic groups by major categories of land stewardship. The miscellaneous category is mostly comprised of water, but also includes a small area designated "unknown" because of boundary conflicts. Percent state by land steward indicated in parentheses.

Taxonomic Group	***Average Percent Distribution by Land Stewardship***					***Number of Species***
	Federal (28.89)	Tribal (5.57)	State (5.83)	Private (58.60)	Miscellaneous (1.08)	
Amphibians	32.98	5.99	5.54	54.41	1.07	13
Reptiles	22.90	6.41	5.96	60.88	3.85	17
Birds	29.84	5.60	4.57	46.81	13.18	282
Mammals	40.55	4.91	5.81	48.09	0.63	102
All Species	32.29	5.47	4.96	47.95	9.32	414

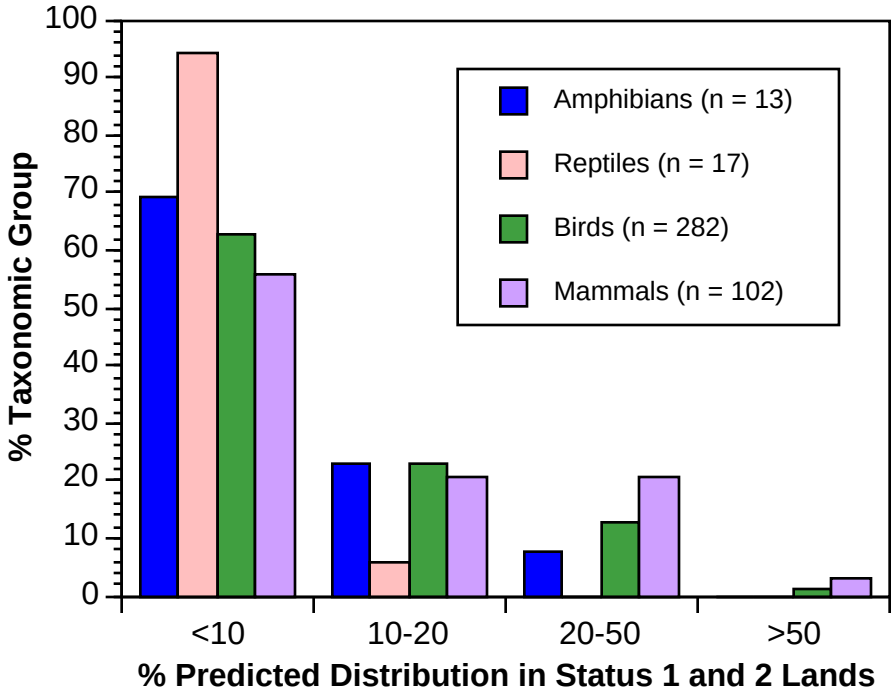


Figure 5.5. Percent of predicted distribution in lands assigned to management status 1 and 2 for native amphibians, reptiles, birds, and mammals in Montana (n = 414).

Table 5.4. Number and percent of native terrestrial vertebrate species according to the percentage of their predicted distribution within lands assigned management status 1 and 2.

Taxonomic Group	***Percent Distribution in Status 1 and 2***										***Total Number of Species***
	<1%		1-10%		10-20%		20-50%		>50%		
	#	%	#	%	#	%	#	%	#	%	
Amphibians	0	0.0	9	69.2	3	23.1	1	7.7	0	0.0	13
Reptiles	2	11.8	14	82.4	1	5.9	0	0.0	0	0.0	17
Birds	8	2.8	169	59.9	65	23.0	36	12.8	4	1.4	282
Mammals	4	3.9	53	52.0	21	20.6	21	20.6	3	2.9	102
All Species	14	3.4	245	59.2	90	21.7	58	14.0	7	1.7	414

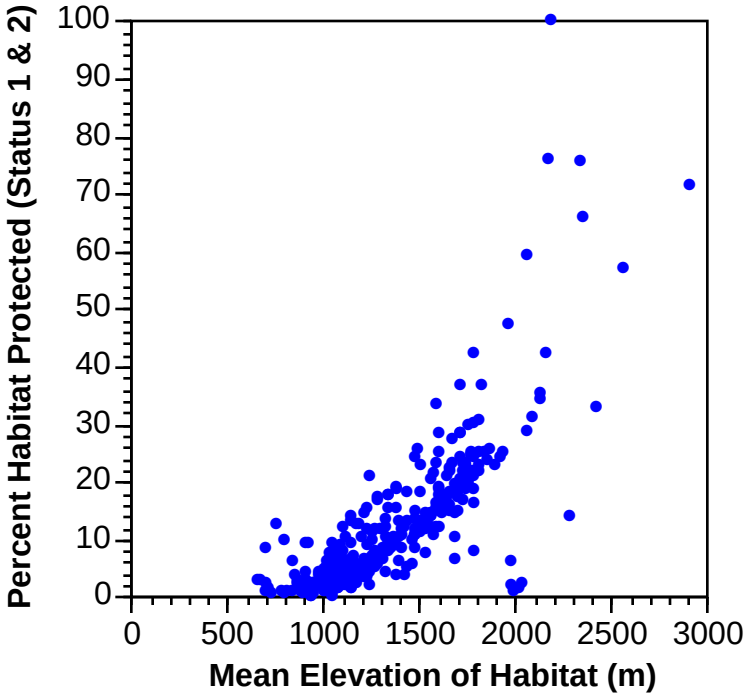


Figure 5.6. For native terrestrial vertebrates in Montana (n = 414), percent of each species' habitat in management status 1 and 2 in relation to its mean elevation (m).

Species with <10% of Predicted Distribution in Status 1 and 2

Out of 414 species, 259 (62.6%) had ≤10% of their predicted distributions within lands assigned management status 1 and 2 (Table 5.4, Figure 5.5), including 9 amphibians, 16 reptiles, 177 birds, and 57 mammals (Table 5.5). Species using a wide range of habitats throughout the state were found within this category, but some trends are evident. Many grassland species or species restricted to eastern Montana had <10% of their distributions in Status 1 and 2 lands, such as the Ferruginous Hawk (*Buteo regalis*), Burrowing Owl (*Athene cunicularia*), Baird's Sparrow (*Ammodramus bairdii*), black-tailed prairie dog (*Cynomys ludovicianus*), swift fox (*Vulpes velox*), and pronghorn (*Antilocapra americana*). Reptiles in particular are concentrated in eastern Montana (see Chapter 3); 16 of 17 reptiles had <10% in Status 1 and 2 lands.

Many species associated with water and riparian features also fell into this category, most notably waterfowl and shorebirds associated with the prairie potholes in eastern Montana or with large lakes and reservoirs. Note that protection of species associated with water is underestimated; because jurisdiction of water bodies is complicated, water features in the stewardship layer were not assigned one of the four status codes. Species that rely on water for a major part of their habitat will be especially underestimated, and will need additional, individual consideration.

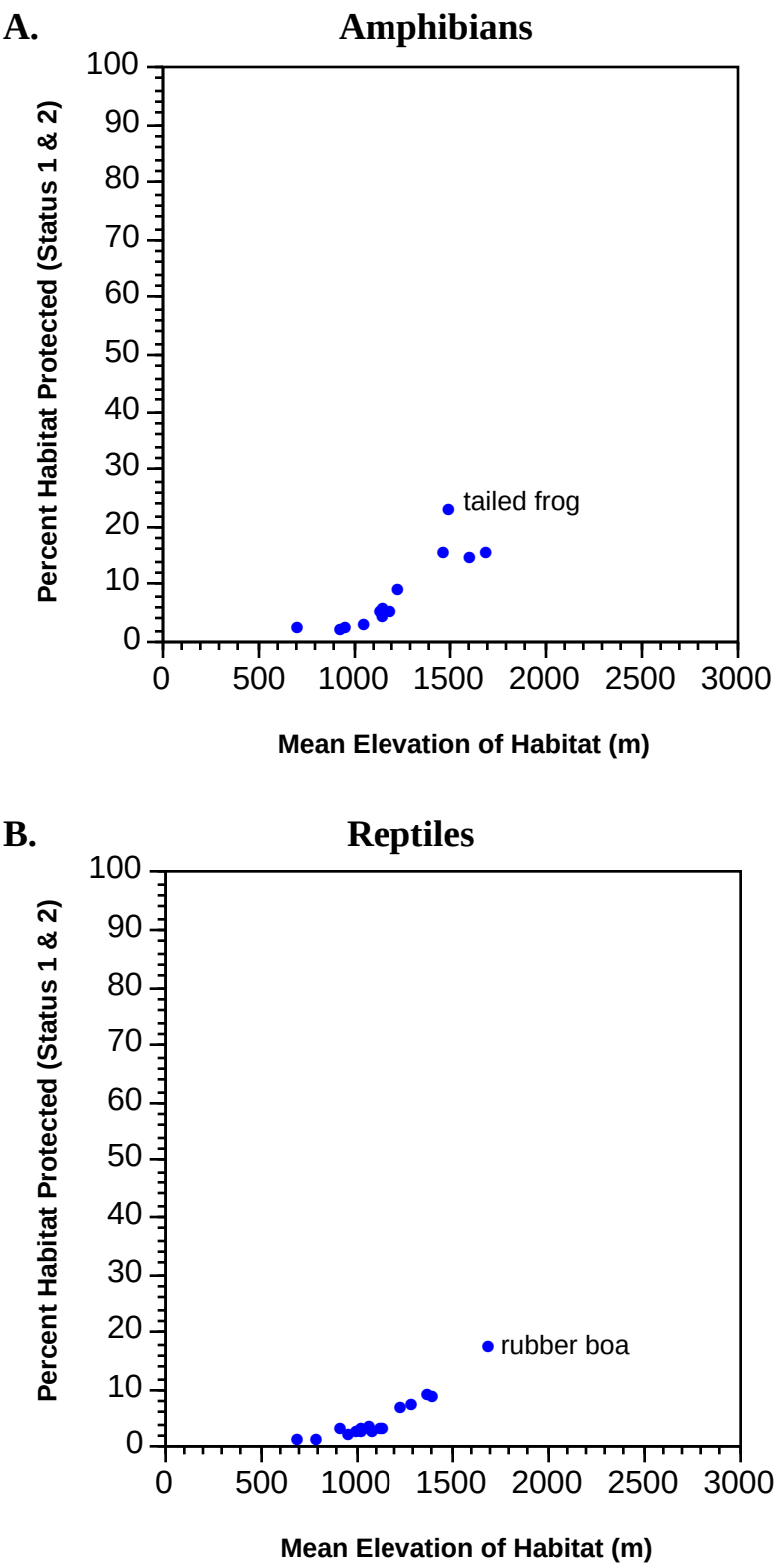
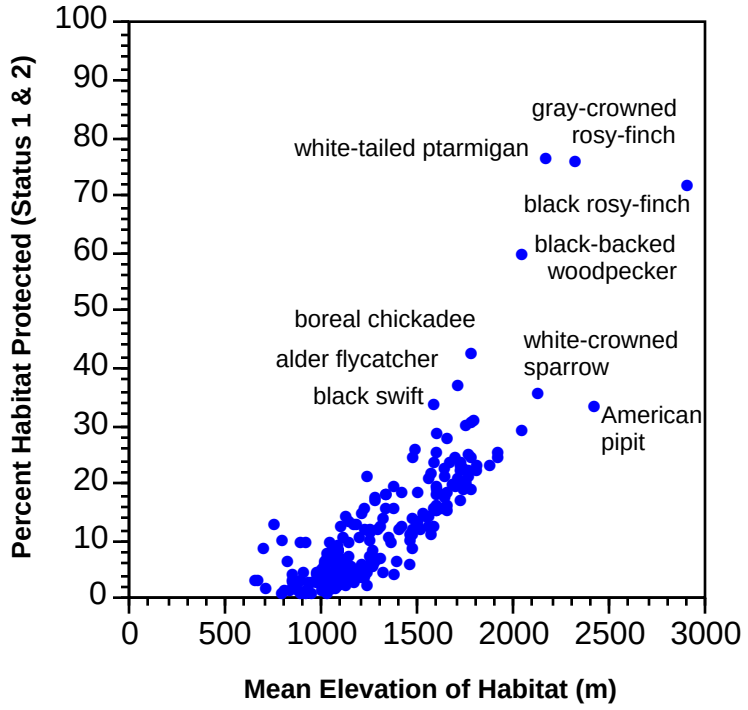


Figure 5.7. Percent of species' habitat in management status 1 and 2 in relation to its mean elevation (m) for: A. amphibians, B. reptiles, C. birds, and D. mammals.

C. **Birds**



D. **Mammals**

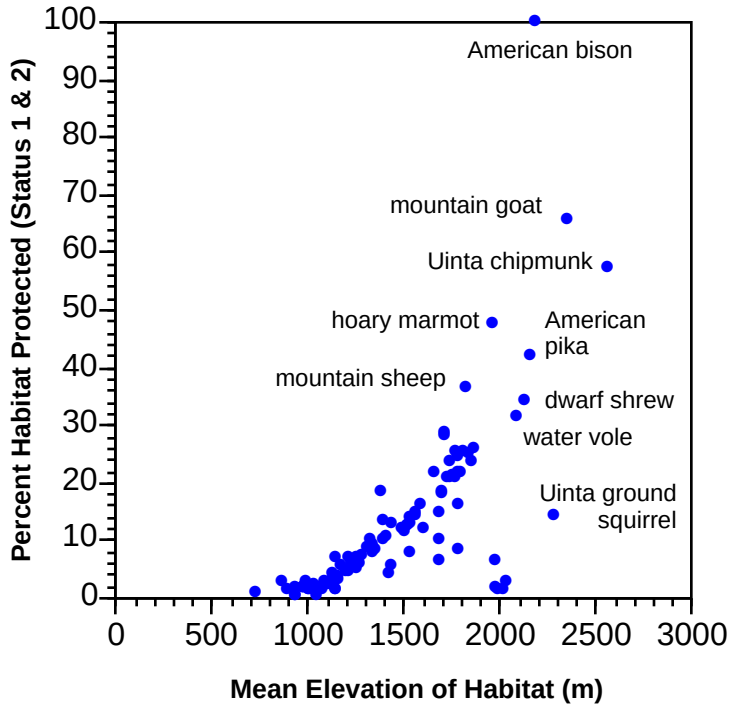


Figure 5.7 continued.

Ten species had ≤1000 ha of their predicted distribution in Status 1 and 2 lands: spiny softshell (*Apalone spinifera*), Clark's Grebe (*Aechmophorus clarkii*), Black-necked Stilt (*Himantopus mexicanus*), Chimney Swift (*Chaetura pelagica*), Ruby-throated Hummingbird (*Archilochus colubris*), Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*), Orchard Oriole (*Icterus spurius*), northern myotis (*Myotis septentrionalis*), eastern cottontail (*Sylvilagus floridanus*), and hispid pocket mouse (*Chaetodipus hispidus*). For the most part, these species are restricted to the eastern edges of the state, exceptions being the spiny softshell (major rivers in eastern Montana), Clark's Grebe (very large lakes and reservoirs throughout the state), and Black-necked Stilt (wetland habitats in north-central and northeastern Montana). In Montana, all but the swift, hummingbird, and oriole are species of special concern or watch species (Reichel 1997).

For six species, predicted distributions totaled <50,000 ha, including the aforementioned spiny softshell, Black-necked Stilt, and Nelson's Sharp-Tailed Sparrow, as well as the Horned Grebe (*Podiceps auritus*), American White Pelican (*Pelecanus erythrorhynchos*), and Yellow Rail (*Coturnicops noveboracensis*). Not only do these species have <10% of their predicted distribution in Status 1 and 2 lands, but their overall distributions are restricted. These species, as well as those with <1000 ha in Status 1 and 2 lands, merit special attention.

Species with 10-20% of Predicted Distribution in Status 1 and 2

Ninety species had 10-20% of their predicted distributions within Status 1 and 2 lands; most of these were birds (65) and mammals (21) (Tables 5.4, 5.5). The three amphibians and lone reptile in this category all are found in western Montana: long-toed salamander (*Ambystoma macrodactylum*), western toad (*Bufo boreas*), Columbia spotted frog (*Rana luteiventris*), and rubber boa (*Charina bottae*). Many of the species in this category are fairly common in the state, such as the Great Blue Heron (*Ardea herodias*), Osprey (*Pandion haliaetus*), Northern Saw-whet Owl (*Aegolius acadicus*), Common Raven (*Corvus corax*), American Robin (*Turdus migratorius*), common porcupine (*Erethizon dorsatum*), black bear (*Ursus americanus*), and elk (*Cervus elaphus*). Others, however, are more restricted in distribution, and may warrant more attention than otherwise might be accorded to species with >10% of their predicted habitat in Status 1 and 2 management. Those with predicted distributions <50,000 ha include: Black-crowned Night-heron (*Nycticorax nycticorax*), White-faced Ibis (*Plegadis chihi*), Common Snipe (*Gallinago gallinago*), Forster's Tern (*Sterna forsteri*), and Blue-gray Gnatcatcher (*Polioptila caerulea*). All except the Common Snipe are species of special concern in Montana (Reichel 1997).

Species with 20-50% of Predicted Distribution in Status 1 and 2

Fifty-eight species had 20-50% of their predicted distributions in Status 1 and 2 lands, including a single amphibian, 36 birds, and 21 mammals (Tables 5.4, 5.5). Of these, most were forest dwellers, like the tailed frog (*Ascaphus truei*), Northern Goshawk (*Accipiter gentilis*), Townsend's Warbler (*Dendroica townsendi*), and southern red-backed vole (*Clethrionomys gapperi*). Some occurred at higher elevations, such as the Boreal Owl (*Aegolius funereus*), American pika (*Ochotona princeps*), and hoary marmot (*Marmota caligata*). Many of the carnivores and ungulates that typically receive a great deal of management attention fell into this category as well, including the gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos*), American marten (*Martes americana*), fisher (*Martes pennanti*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), moose (*Alces alces*), and mountain sheep (*Ovis canadensis*).

Three species had predicted distributions totaling <50,000 ha: Trumpeter Swan (*Cygnus buccinator*), Alder Flycatcher (*Empidonax alnorum*), and northern bog lemming (*Synaptomys borealis*). Although the percentage of their distributions in Status 1 and 2 lands was relatively high, their restricted nature warrants additional attention. All three are species of special concern for Montana (Reichel 1997).

Species with >50% of Predicted Distribution in Status 1 and 2

Only 7 species were predicted to have more than 50% of their distributions within Status 1 and 2 lands (Tables 5.4, 5.5): White-tailed Ptarmigan (*Lagopus leucurus),* Black-backed Woodpecker (*Picoides arcticus*), Black Rosy-finch (*Leucosticte atrata*), Gray-crowned Rosy-finch (*Leucosticte tephrocotis*), Uinta chipmunk (*Tamias umbrinus*), American bison (*Bos bison*), and mountain goat (*Oreamnos americanus*). The ptarmigan, rosy-finches, chipmunk, and mountain goat all occur at relatively high elevations, which explains in large part their high degree of protection (Figure 5.7). Similarly, in Montana the Black-backed Woodpecker is closely associated with recently-burned areas (Hutto 1995), which were largely mapped on Status 1 and 2 lands (about 65%, see Table 5.2). The bison is a special case. Because of the species' closely monitored and highly restricted distribution within the state (see review in Keiter 1997 and Bison Management Plan EIS Team 1998), we limited its predicted distribution to the National Bison Range and Yellowstone National Park. Thus, the tiny fraction of the bison's distribution which is not on Status 1 and 2 lands should be attributed only to mapping error in the overlay process.

Limitations and Discussion

When applying the results of our analyses, consideration of the following limitations is critical: 1) the limitations described for each of the components of the analyses -- land cover, vertebrate distributions, and stewardship; 2) spatial and thematic map accuracy of the components; and 3) suitability of the results for the intended application (see Appropriate and Inappropriate Use in Chapter 7). Problems with the input layers could lead to erroneous conclusions; however, the quality of these layers should be more than adequate to assess general trends and highlight future management opportunities. These are outlined in Chapter 6.

Table 5.5. For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Great Plains Toad	S3S4	watch list	--	251,277	17,566,226	1.43
Woodhouse's Toad	S4	--	--	353,729	16,748,262	2.11
Canadian Toad	S1	special concern	--	6,489	293,396	2.21
Plains Spadefoot	S4?	--	--	688,272	26,537,934	2.59
Northern Leopard Frog	S3S4	special concern	--	245,151	6,208,384	3.95
Tiger Salamander	S5	--	--	1,352,019	28,708,594	4.71
Western Chorus Frog	S5	--	--	1,350,297	28,305,114	4.77
Coeur D'alene Salamander	S2	special concern	--	4,676	87,617	5.34
Pacific Chorus Frog	S4	--	--	235,546	2,747,542	8.57
Columbia Spotted Frog	S4	--	--	459,214	3,220,802	14.26
Long-toed Salamander	S5	--	--	157,411	1,058,998	14.86
Western Toad	S3S4	watch list	--	2,149,756	14,383,499	14.95
Tailed Frog	S4	watch list	--	111,368	492,122	22.63
Spiny Softshell	S3	special concern	--	428	45,450	0.94
Smooth Green Snake	S2S3	special concern	--	2,351	237,290	0.99
Western Hognose Snake	S3?	special concern	--	355,447	19,836,672	1.79
Plains Garter Snake	S5	--	--	437,458	19,925,684	2.20
Short-horned Lizard	S4	--	--	422,518	17,966,952	2.35
Milk Snake	S2	special concern	--	314,097	13,193,266	2.38
Racer	S5	--	--	675,713	25,938,428	2.61
Western Rattlesnake	S4	--	--	753,430	26,853,586	2.81
Pine Or Gopher Snake	S5	--	--	809,272	28,320,450	2.86
Sagebrush Lizard	S3S4	watch list	--	358,244	12,434,258	2.88
Snapping Turtle	S3	special concern	--	37,625	1,269,866	2.96
Painted Turtle	S5	--	--	101,273	3,277,610	3.09
Common Garter Snake	S4	--	--	1,365,654	20,600,474	6.63
Western Skink	S3S4	watch list	--	93,684	1,373,427	6.82
Northern Alligator Lizard	S3	--	--	139,982	1,703,022	8.22
Western Terrestrial Garter Snake	S5	--	--	2,709,452	30,300,028	8.94

TNC State Rank: S1 (critically imperiled, ≤5 occurrences), S2 (imperiled, 6-20 occurrences), S3 (rare and local, 21-100 occurrences), S4 (apparently secure), S5 (demonstrably secure). SU = status uncertain, SA = accidental in Montana; Z indicates ranking not applicable, B refers to breeding status, and N to non-breeding status (Reichel 1997).
State List: species of special concern, or species on the watch list (Reichel 1997).
Federal Status: LE is listed as endangered, LT is listed as threatened, C is candidate for listing, XN is non-essential experimental population, NL is not listed (U.S. Fish & Wildlife Service listings). Multiple listings (e.g., LENL) if status varies within species' range, in which case Montana status listed first.

Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Rubber Boa	S4	--	--	1,730,584	10,133,396	17.08
Rusty Blackbird	SZN	--	--	9,599	3,643,830	0.26
Chimney Swift	S4B,SUN	--	--	862	235,481	0.37
Cassin's Kingbird	S1S3B,SZN	special concern	--	5,161	1,220,336	0.42
Eastern Bluebird	S4B,SZN	--	--	2,786	565,395	0.49
Black-and-white Warbler	S2S3B,SZN	watch list	--	1,076	175,444	0.61
Common Grackle	S5B,SZN	--	--	45,370	6,455,150	0.70
Common Tern	S3B,SZN	special concern	--	1,314	181,650	0.72
Clark's Grebe	S2S4B,SZN	special concern	--	666	76,120	0.88
Baird's Sparrow	S3S4B,SZN	special concern	--	45,230	4,381,104	1.03
Caspian Tern	S2B,SZN	special concern	--	1,723	160,750	1.07
Orchard Oriole	S2S4B,SZN	--	--	1,000	91,214	1.10
Mountain Plover	S2B,SZN	special concern	C	11,097	875,932	1.27
Ruby-throated Hummingbird	SAB,SAN	--	--	755	59,083	1.28
Swainson's Hawk	S4B,SZN	--	--	283,631	22,010,240	1.29
Mccown's Longspur	S4B,SZN	--	--	202,620	15,487,478	1.31
Chestnut-collared Longspur	S5B,SZN	--	--	202,620	15,487,478	1.31
Lapland Longspur	SZN	--	--	258,066	18,333,730	1.41
Snow Bunting	S5N	--	--	289,331	19,036,324	1.52
Bobolink	S4B,SZN	--	--	240,338	15,180,700	1.58
Gyrfalcon	SZN	--	--	317,770	20,000,098	1.59
Grasshopper Sparrow	S4B,SZN	--	--	251,285	15,598,712	1.61
Western Meadowlark	S5B,SZN	--	--	366,114	22,261,588	1.64
Lark Bunting	S4B,SZN	--	--	341,040	20,437,530	1.67
Ferruginous Hawk	S3B,SZN	special concern	--	257,351	15,365,144	1.68
Sprague's Pipit	S4B,SZN	--	--	161,175	9,454,480	1.71
Short-eared Owl	S4	--	--	386,118	21,285,156	1.81
Red-necked Grebe	S4B,SZN	--	--	2,696	148,500	1.82
Brewer's Blackbird	S5B,SZN	--	--	176,444	9,632,509	1.83

TNC State Rank: S1 (critically imperiled, ≤5 occurrences), S2 (imperiled, 6-20 occurrences), S3 (rare and local, 21-100 occurrences), S4 (apparently secure), S5 (demonstrably secure). SU = status uncertain, SA = accidental in Montana; Z indicates ranking not applicable, B refers to breeding status, and N to non-breeding status (Reichel 1997).
State List: species of special concern, or species on the watch list (Reichel 1997).
Federal Status: LE is listed as endangered, LT is listed as threatened, C is candidate for listing, XN is non-essential experimental population, NL is not listed (U.S. Fish & Wildlife Service listings). Multiple listings (e.g., LENL) if status varies within species' range, in which case Montana status listed first.

Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Red-winged Blackbird	S5B,SZN	--	--	73,183	3,981,276	1.84
Barn Swallow	S5B,SZN	--	--	370,385	20,078,894	1.85
Snowy Owl	SZN	--	--	437,051	23,163,184	1.89
Brown Thrasher	S5B,SZN	--	--	203,113	10,757,508	1.89
Barn Owl	SAB,SAN	watch list	--	22,108	1,119,782	1.97
Bullock's Oriole	S5B,SZN	--	--	37,299	1,885,589	1.98
Sharp-tailed Grouse	S4	--	--	459,089	23,180,070	1.98
Burrowing Owl	S3B,SZN	special concern	--	464,979	23,445,126	1.98
Vesper Sparrow	S5B,SZN	--	--	418,805	20,733,112	2.02
Long-billed Curlew	S4B,SZN	--	--	45,507	2,247,573	2.02
Hoary Redpoll	SZN	--	--	136,816	6,581,250	2.08
Lark Sparrow	S5B,SZN	--	--	520,743	24,658,534	2.11
Western Kingbird	S5B,SZN	--	--	238,002	11,142,633	2.14
Red-breasted Merganser	SZN	--	--	7,844	363,292	2.16
Western Grebe	S4B,SZN	--	--	5,690	258,686	2.20
Rough-legged Hawk	S5N	--	--	609,246	26,988,422	2.26
Whooping Crane	SZN	special concern	LE	4,719	208,247	2.27
Eastern Kingbird	S5B,SZN	--	--	155,417	6,715,343	2.31
American Crow	S5B,SZN	--	--	595,363	25,722,576	2.31
Common Loon	S1S2B,SZN	special concern	--	4,763	204,369	2.33
Gray-cheeked Thrush	SAN	--	--	5,604	239,352	2.34
Savannah Sparrow	S5B,SZN	--	--	380,642	16,130,242	2.36
Common Redpoll	S5N	--	--	251,744	10,492,070	2.40
Northern Pintail	S5B,SZN	--	--	178,536	6,955,860	2.57
Northern Harrier	S4B,SZN	--	--	684,171	26,577,332	2.57
Dickcissel	S1S2B,SZN	special concern	--	26,997	1,045,905	2.58
Merlin	S4	--	--	705,913	27,303,208	2.58
Least Tern	S1B,SZN	special concern	LENL	2,680	103,742	2.58
American Tree Sparrow	SZN	--	--	445,413	16,886,334	2.64

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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Nelson's Sharp-tailed Sparrow	S1B,SZN	special concern	--	974	36,545	2.66
American Goldfinch	S5B,SZN	--	--	147,571	5,538,041	2.67
Loggerhead Shrike	S4B,SZN	watch list	--	292,360	10,795,456	2.71
Common Nighthawk	S5B,SZN	--	--	744,293	27,241,728	2.73
Upland Sandpiper	S4B,SZN	--	--	33,521	1,224,907	2.74
Black-billed Magpie	S5	--	--	325,367	11,830,856	2.75
Tundra Swan	SZN	--	--	42,955	1,541,392	2.79
Clay-colored Sparrow	S4B,SZN	--	--	523,531	18,574,880	2.82
Greater White-fronted Goose	SZN	--	--	83,349	2,948,167	2.83
Black-necked Stilt	S2B,SZN	special concern	--	769	26,596	2.89
Eastern Screech-owl	S3S4	watch list	--	15,230	514,275	2.96
Yellow-billed Cuckoo	S3B,SZN	special concern	--	15,414	503,819	3.06
Mourning Dove	S5B,SZN	--	--	864,805	27,618,504	3.13
Red-tailed Hawk	S5B,SZN	--	--	970,547	30,800,128	3.15
Marsh Wren	S5B,SZN	--	--	18,066	548,268	3.29
Greater Scaup	SAN	--	--	6,555	197,310	3.32
Northern Shrike	S5N	--	--	383,946	11,439,243	3.36
Yellow-breasted Chat	S5B,SZN	--	--	27,947	822,687	3.40
Blue Jay	SAB,SZN	--	--	13,533	395,480	3.42
Marbled Godwit	S4B,SZN	--	--	10,185	294,499	3.46
Brown-headed Cowbird	S5B,SZN	--	--	1,165,668	33,224,056	3.51
Prairie Falcon	S4	--	--	782,221	22,220,534	3.52
House Finch	S5	--	--	293,618	8,327,064	3.53
Blackpoll Warbler	SZN	--	--	20,201	540,787	3.74
Ovenbird	S5B,SZN	--	--	24,439	651,345	3.75
Ross's Goose	S4N	--	--	115,386	3,071,919	3.76
Bank Swallow	S5B,SZN	--	--	38,022	1,007,969	3.77
Snow Goose	S4N	--	--	116,993	3,097,657	3.78
Mallard	S5B,S5N	--	--	71,518	1,893,305	3.78

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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Double-crested Cormorant	S5B,SZN	--	--	16,858	442,019	3.81
Sage Thrasher	S5B,SZN	--	--	77,066	2,003,840	3.84
Ring-billed Gull	S5B,SZN	--	--	7,761	199,495	3.89
Common Yellowthroat	S5B,SZN	--	--	71,992	1,842,960	3.90
Indigo Bunting	S2S4B,SZN	--	--	63,344	1,600,610	3.96
Field Sparrow	S4B,SZN	--	--	149,199	3,769,823	3.96
Turkey Vulture	S4B,SZN	--	--	846,316	21,351,170	3.96
American Kestrel	S5B,SZN	--	--	1,200,692	30,216,780	3.97
Northern Rough-winged Swallow	S5B,SZN	--	--	43,368	1,082,658	4.01
Eared Grebe	S5B,SZN	--	--	4,131	103,074	4.01
Ring-necked Duck	S5B,SZN	--	--	8,568	211,393	4.05
Brewer's Sparrow	S4B,SZN	--	--	167,221	4,082,159	4.10
Say's Phoebe	S5B,SZN	--	--	295,478	7,210,112	4.10
Ruddy Duck	S5B,SZN	--	--	16,350	397,414	4.11
Killdeer	S5B,SZN	--	--	89,117	2,149,169	4.15
Cliff Swallow	S5B,SZN	--	--	289,765	6,983,431	4.15
Canvasback	S5B,SZN	--	--	16,394	394,191	4.16
Sage Grouse	S5	--	--	190,415	4,534,810	4.20
Least Flycatcher	S5B,SZN	--	--	36,103	842,523	4.29
Horned Lark	S5B,S5N	--	--	374,080	8,709,608	4.30
American White Pelican	S2B,SZN	special concern	--	1,408	32,451	4.34
Lazuli Bunting	S5B,SZN	--	--	361,535	8,012,091	4.51
Gadwall	S5B,SZN	--	--	66,934	1,453,847	4.60
Mountain Bluebird	S5B,SZN	--	--	607,711	13,159,052	4.62
Greater Yellowlegs	SZN	--	--	13,383	287,339	4.66
Lesser Yellowlegs	SZN	--	--	13,383	287,339	4.66
Willet	S5B,SZN	--	--	18,728	401,945	4.66
Black-billed Cuckoo	S4B,SZN	--	--	111,425	2,368,202	4.71
Long-eared Owl	S5	--	--	427,678	9,081,553	4.71

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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
White-breasted Nuthatch	S4	--	--	82,046	1,694,570	4.84
Harris's Sparrow	SZN	--	--	138,955	2,851,462	4.87
Veery	S4B,SZN	--	--	35,833	726,234	4.93
Gray Catbird	S5B,SZN	--	--	48,956	990,493	4.94
Yellow Warbler	S5B,SZN	--	--	50,344	1,009,928	4.98
Violet-green Swallow	S5B,SZN	--	--	90,249	1,803,317	5.01
Pygmy Nuthatch	S4	--	--	15,899	305,123	5.21
Redhead	S5B,SZN	--	--	56,529	1,083,488	5.22
Canada Goose	S5B,SZN	--	--	161,654	3,071,622	5.26
Cedar Waxwing	S5B,SZN	--	--	40,764	770,909	5.29
Golden Eagle	S4	--	--	1,044,777	19,746,216	5.29
Pinyon Jay	S4	--	--	21,349	397,997	5.37
Common Poorwill	S4B,SZN	--	--	331,544	6,161,076	5.38
Semipalmated Plover	SZN	--	--	20,376	370,124	5.51
Black-headed Grosbeak	S5B,SZN	--	--	63,266	1,139,289	5.55
Yellow-headed Blackbird	S5B,SZN	--	--	56,818	1,010,098	5.62
Red-eyed Vireo	S5B,SZN	--	--	33,417	590,845	5.66
Spotted Towhee	S5B,SZN	--	--	265,256	4,679,436	5.67
Short-billed Dowitcher	SAN	--	--	1,474	25,269	5.84
American Wigeon	S5B,SZN	--	--	91,951	1,567,423	5.87
Pectoral Sandpiper	SZN	--	--	5,486	92,591	5.93
Stilt Sandpiper	SZN	--	--	5,486	92,591	5.93
Least Sandpiper	SZN	--	--	22,674	379,558	5.97
Green-tailed Towhee	S4B,SZN	--	--	155,701	2,597,454	5.99
Columbian Sharp-tailed Grouse	S1	special concern	--	70,182	1,165,422	6.02
Blue-winged Teal	S5B,SZN	--	--	66,903	1,109,453	6.03
Cinnamon Teal	S5B,SZN	--	--	66,903	1,109,453	6.03
Broad-winged Hawk	SZN	--	--	22,712	369,231	6.15
American Coot	S5B,SZN	--	--	7,168	113,040	6.34

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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Song Sparrow	S5B,SZN	--	--	105,615	1,665,788	6.34
Black Tern	S3B,SZN	special concern	--	3,412	53,550	6.37
White-throated Sparrow	SZN	--	--	96,075	1,504,198	6.39
Warbling Vireo	S5B,SZN	--	--	102,933	1,598,732	6.44
Bonaparte's Gull	SZN	--	--	49,638	755,823	6.57
Downy Woodpecker	S5	--	--	50,977	775,693	6.57
American Redstart	S5B,SZN	--	--	41,273	626,791	6.59
Great Horned Owl	S5	--	--	2,514,575	36,968,244	6.80
Solitary Sandpiper	SZN	--	--	11,217	160,163	7.00
Spotted Sandpiper	S5B,SZN	--	--	29,750	419,604	7.09
Green-winged Teal	S5B,SZN	--	--	85,560	1,200,165	7.13
Horned Grebe	S4B,SZN	--	--	3,165	44,192	7.16
Northern Shoveler	S5B,SZN	--	--	100,999	1,396,411	7.23
Wood Duck	S5B,SZN	--	--	68,630	915,898	7.49
Pied-billed Grebe	S5B,SZN	--	--	6,054	78,969	7.67
Semipalmated Sandpiper	SZN	--	--	18,074	228,392	7.91
Western Sandpiper	SZN	--	--	18,074	228,392	7.91
Baird's Sandpiper	SZN	--	--	18,074	228,392	7.91
Long-billed Dowitcher	SZN	--	--	18,074	228,392	7.91
Black-bellied Plover	SZN	--	--	18,460	229,433	8.05
Red-necked Phalarope	SZN	--	--	17,992	223,343	8.06
Yellow Rail	S1B,SZN	special concern	--	1,777	22,004	8.08
Flammulated Owl	S2S3B,SZN	special concern	--	168,051	2,046,150	8.21
Wilson's Phalarope	S4B,SZN	--	--	16,743	203,292	8.24
Lesser Scaup	S5B,SZN	--	--	48,124	559,435	8.60
Le Conte's Sparrow	S1S2B,SZN	special concern	--	29,993	332,661	9.02
Franklin's Gull	S3B,SZN	special concern	--	20,334	225,414	9.02
American Avocet	S5B,SZN	--	--	7,345	81,234	9.04
California Gull	S5B,SZN	--	--	24,072	257,638	9.34

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Lewis's Woodpecker	S4B,SZN	--	--	175,177	1,859,070	9.42
White-rumped Sandpiper	SAN	--	--	9,343	97,448	9.59
House Wren	S5B,SZN	--	--	166,430	1,716,343	9.70
Solitary Vireo	S5B,SZN	--	--	417,417	4,209,718	9.92
Sandhill Crane	S2N,S5B	--	--	5,547	55,087	10.07
Common Snipe	S5B,SZN	--	--	3,972	39,351	10.10
Bald Eagle	S3B,S3N	special concern	LTLE	91,263	880,559	10.37
Peregrine Falcon	S1S2B,SZN	special concern	E/SA	468,343	4,484,385	10.44
Bohemian Waxwing	SHB,S5N	--	--	318,244	2,995,186	10.63
Black-capped Chickadee	S5	--	--	607,707	5,629,317	10.80
Sora	S5B,SZN	--	--	22,407	198,453	11.29
Orange-crowned Warbler	S5B,SZN	--	--	124,729	1,098,072	11.36
White-faced Ibis	S1B,SZN	special concern	--	4,711	41,419	11.38
Purple Finch	SAN	--	--	137,045	1,204,463	11.38
Cooper's Hawk	S4B,SZN	--	--	652,120	5,649,314	11.55
Virginia Rail	S5B,SZN	--	--	6,171	53,376	11.56
Dusky Flycatcher	S5B,SZN	--	--	300,895	2,572,802	11.69
Tree Swallow	S5B,SZN	--	--	227,818	1,930,095	11.81
Ruffed Grouse	S5	--	--	745,532	6,151,654	12.12
Black-crowned Night-heron	S2S3B,SZN	special concern	--	4,816	39,731	12.12
Blue-gray Gnatcatcher	S1B,SAN	special concern	--	3,199	26,336	12.15
Willow Flycatcher	S5B,SZN	--	--	288,128	2,366,173	12.18
Canyon Wren	S4	--	--	29,142	238,629	12.21
Piping Plover	S2B,SZN	special concern	LTLE	7,186	56,912	12.63
Osprey	S5B,SZN	--	--	117,891	933,369	12.63
Great Blue Heron	S4B,SZN	watch list	--	58,537	461,676	12.68
American Bittern	S4B,SZN	--	--	15,321	119,241	12.85
Western Screech-owl	S3S4	watch list	--	41,367	317,674	13.02
Pileated Woodpecker	S4	--	--	373,915	2,817,527	13.27

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Vaux's Swift	S4B,SZN	--	--	313,486	2,342,368	13.38
Forster's Tern	S2B,SZN	special concern	--	2,975	21,653	13.74
Belted Kingfisher	S5B,SZN	--	--	370,994	2,651,508	13.99
American Robin	S5B,SZN	--	--	1,303,808	9,280,971	14.05
Common Goldeneye	S5B,S5N	--	--	130,587	926,765	14.09
Chipping Sparrow	S5B,SZN	--	--	884,875	6,082,896	14.55
Red Crossbill	S5	--	--	943,622	6,426,385	14.68
Dark-eyed Junco	S5B,SZN	--	--	1,424,611	9,599,093	14.84
Common Raven	S5	--	--	1,482,950	9,937,312	14.92
Common Merganser	S5B,SZN	--	--	114,458	759,269	15.08
Northern Waterthrush	S5B,SZN	--	--	94,165	623,913	15.09
Northern Saw-whet Owl	S4	--	--	1,185,663	7,851,196	15.10
Chestnut-backed Chickadee	S4	--	--	189,821	1,248,102	15.21
Macgillivray's Warbler	S5B,SZN	--	--	256,089	1,663,841	15.39
Northern Flicker	S5	--	--	1,047,539	6,600,156	15.87
Evening Grosbeak	S5	--	--	867,391	5,463,931	15.87
Hammond's Flycatcher	S4B,SZN	--	--	672,353	4,094,495	16.42
Bufflehead	S5B,SZN	--	--	96,500	580,411	16.62
Northern Hawk Owl	SAB,SAN	watch list	--	85,206	503,817	16.91
Western Tanager	S5B,SZN	--	--	1,007,137	5,867,760	17.17
Harlequin Duck	S2B,SZN	special concern	--	57,192	325,557	17.57
Williamson's Sapsucker	S4B,SZN	--	--	736,151	4,169,250	17.66
Nashville Warbler	S5B,SZN	--	--	50,190	283,060	17.73
Hairy Woodpecker	S5	--	--	1,220,499	6,878,007	17.74
Pine Siskin	S5	--	--	1,201,542	6,697,871	17.94
Western Bluebird	S4B,SZN	--	--	120,719	671,936	17.97
Barrow's Goldeneye	S5B,SZN	--	--	60,029	333,090	18.02
Swainson's Thrush	S5B,SZN	--	--	1,146,753	6,204,281	18.48
American Dipper	S5	--	--	139,192	752,576	18.50

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Blue Grouse	S5	--	--	663,136	3,573,233	18.56
Red-headed Woodpecker	S4B,SZN	--	--	97,042	514,440	18.86
Cordilleran Flycatcher	S5	--	--	523,676	2,760,164	18.97
Sharp-shinned Hawk	S4B,SZN	--	--	1,123,287	5,918,042	18.98
Yellow-rumped Warbler	S5B,SZN	--	--	1,602,249	8,379,847	19.12
Northern Pygmy-owl	S4	--	--	1,653,644	8,614,200	19.20
Hermit Thrush	S5B,SZN	--	--	1,122,843	5,844,201	19.22
Red-breasted Nuthatch	S5	--	--	1,725,349	8,974,527	19.22
Mountain Chickadee	S5	--	--	1,602,923	8,325,893	19.25
Pine Grosbeak	S5	--	--	1,305,511	6,578,089	19.85
Ruby-crowned Kinglet	S5B,SZN	--	--	1,219,967	6,131,298	19.90
Townsend's Solitaire	S5	--	--	451,303	2,243,358	20.12
Calliope Hummingbird	S5B,SZN	--	--	1,155,573	5,727,225	20.18
Rock Wren	S5B,SZN	--	--	333,351	1,618,770	20.59
Townsend's Warbler	S5B,SZN	--	--	862,056	4,147,977	20.78
Northern Goshawk	S3S4	special concern	--	294,988	1,412,727	20.88
Barred Owl	S4	--	--	903,961	4,289,065	21.08
Great Gray Owl	S3	special concern	--	1,615,683	7,495,960	21.56
Red-naped Sapsucker	S5B,SZN	--	--	1,244,665	5,723,301	21.75
Three-toed Woodpecker	S5	--	--	1,158,622	5,311,485	21.81
Rufous Hummingbird	S5B,SZN	--	--	540,460	2,456,068	22.01
Western Wood-pewee	S5B,SZN	--	--	573,974	2,577,377	22.27
Steller's Jay	S5	--	--	1,157,569	5,149,095	22.48
Cassin's Finch	S5	--	--	274,839	1,216,502	22.59
Lincoln's Sparrow	S5B,SZN	--	--	251,328	1,106,192	22.72
Golden-crowned Kinglet	S5	--	--	353,863	1,546,359	22.89
Spruce Grouse	S4	--	--	540,753	2,337,100	23.14
Varied Thrush	S5B,SZN	--	--	234,670	1,006,124	23.32
White-winged Crossbill	S4	--	--	717,482	2,989,884	24.00

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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Boreal Owl	S3S4	special concern	--	1,187,797	4,932,842	24.08
Winter Wren	S4	--	--	61,055	252,882	24.14
Gray Jay	S5	--	--	782,426	3,238,799	24.16
Brown Creeper	S4	--	--	425,771	1,730,036	24.61
Black-chinned Hummingbird	S4B,SZN	--	--	67,159	270,533	24.82
Trumpeter Swan	S2B,S2N	special concern	--	8,805	35,011	25.15
Hooded Merganser	S4B,SZN	--	--	236,236	937,462	25.20
Clark's Nutcracker	S5	--	--	387,106	1,422,142	27.22
Tennessee Warbler	S3S4B,SZN	watch list	--	111,914	398,394	28.09
Fox Sparrow	S5B,SZN	--	--	518,690	1,821,957	28.47
Olive-sided Flycatcher	S4B,SZN	--	--	401,549	1,363,039	29.46
White-throated Swift	S5B,SZN	--	--	1,228,073	4,074,708	30.14
Wilson's Warbler	S5B,SZN	--	--	139,438	456,654	30.54
American Pipit	S5B,SZN	--	--	150,540	456,316	32.99
Black Swift	S3B,SZN	special concern	--	223,172	666,280	33.50
White-crowned Sparrow	S5B,SZN	--	--	355,804	1,017,411	34.97
Alder Flycatcher	S1B,SZN	special concern	--	18,253	49,697	36.73
Boreal Chickadee	S3S4	--	--	307,878	733,726	41.96
Black-backed Woodpecker	S3	special concern	--	214,802	362,776	59.21
Black Rosy-finch	S3B,S3N	--	--	151,097	211,789	71.34
Gray-crowned Rosy-finch	S3B,S5N	--	--	178,973	237,088	75.49
White-tailed Ptarmigan	S2S3	watch list	--	63,537	83,867	75.76
Hispid Pocket Mouse	S1	special concern	--	92	418,187	0.02
Eastern Cottontail	S2?	watch list	--	288	272,945	0.11
Meadow Jumping Mouse	S2S3	special concern	--	2,796	2,134,775	0.13
Northern Myotis	S2	special concern	--	723	129,005	0.56
Idaho Pocket Gopher	S3	--	--	7,699	766,635	1.00
Black-tailed Prairie Dog	S3S4	special concern	--	107,470	10,318,759	1.04
Swift Fox	S1	special concern	C	209,843	18,696,136	1.12

TNC State Rank: S1 (critically imperiled, ≤5 occurrences), S2 (imperiled, 6-20 occurrences), S3 (rare and local, 21-100 occurrences), S4 (apparently secure), S5 (demonstrably secure). SU = status uncertain, SA = accidental in Montana; Z indicates ranking not applicable, B refers to breeding status, and N to non-breeding status (Reichel 1997).
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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Spotted Bat	S1	special concern	--	18,287	1,624,262	1.13
White-footed Mouse	S4	--	--	20,445	1,717,141	1.19
Hayden's Shrew	S4	--	--	135,708	11,347,449	1.20
Pallid Bat	S1	special concern	--	10,380	824,565	1.26
Great Basin Pocket Mouse	S2S4	special concern	--	7,310	554,785	1.32
Merriam's Shrew	S3	special concern	--	99,009	7,093,489	1.40
Ord's Kangaroo Rat	S4	--	--	153,291	9,472,749	1.62
Prairie Vole	S5	--	--	304,618	18,739,812	1.63
Thirteen-lined Ground Squirrel	S5	--	--	290,703	17,829,084	1.63
Muskrat	S5	--	--	26,668	1,617,998	1.65
Western Harvest Mouse	S5	--	--	238,875	14,427,850	1.66
Olive-backed Pocket Mouse	S4	--	--	189,927	11,425,085	1.66
Pronghorn	S5	--	--	422,134	24,803,872	1.70
Black-tailed Jackrabbit	S2S3	special concern	--	14,591	836,033	1.74
Richardson's Ground Squirrel	S5	--	--	152,133	8,157,820	1.87
Northern Grasshopper Mouse	S5	--	--	285,632	14,822,812	1.93
Least Weasel	S4	--	--	348,633	16,634,760	2.10
Sagebrush Vole	S4	--	--	394,505	17,123,978	2.30
Red Fox	S5	--	--	582,616	25,260,480	2.31
Pygmy Rabbit	S2S3	special concern	--	13,477	565,847	2.38
White-tailed Jackrabbit	S4S5	--	--	519,781	21,619,376	2.40
Desert Cottontail	S5	--	--	334,664	13,873,791	2.41
Black-footed Ferret	SH#	special concern	XNLE	23,307	948,276	2.46
American Badger	S4	--	--	681,442	23,728,920	2.87
Western Small-footed Myotis	S4	--	--	503,647	17,222,362	2.93
Mink	S5	--	--	43,670	1,259,842	3.47
California Myotis	S4	--	--	73,576	1,932,468	3.81
Striped Skunk	S5	--	--	1,124,521	27,570,056	4.08
Common Raccoon	S5	--	--	161,214	3,559,087	4.53

TNC State Rank: S1 (critically imperiled, ≤5 occurrences), S2 (imperiled, 6-20 occurrences), S3 (rare and local, 21-100 occurrences), S4 (apparently secure), S5 (demonstrably secure). SU = status uncertain, SA = accidental in Montana; Z indicates ranking not applicable, B refers to breeding status, and N to non-breeding status (Reichel 1997).
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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Northern Pocket Gopher	S5	--	--	1,020,329	22,485,680	4.54
Mountain Cottontail	S4	--	--	466,413	9,258,887	5.04
White-tailed Prairie Dog	S2	special concern	--	14,944	288,014	5.19
Least Chipmunk	S5	--	--	301,290	5,501,772	5.48
Little Brown Myotis	S5	--	--	1,447,204	26,033,542	5.56
Coyote	S5	--	--	2,003,628	34,488,324	5.81
Big Brown Bat	S4	--	--	1,244,100	21,015,716	5.92
Wyoming Ground Squirrel	S3	--	--	96,601	1,562,425	6.18
Western Spotted Skunk	SU	watch list	--	86,965	1,370,006	6.35
Preble's Shrew	S3	special concern	--	32,656	502,464	6.50
Mule Deer	S5	--	--	1,998,122	30,466,384	6.56
American Beaver	S5	--	--	270,754	4,127,012	6.56
Bobcat	S5	--	--	755,754	11,162,847	6.77
Long-tailed Weasel	S5	--	--	1,938,589	27,814,298	6.97
Columbian Ground Squirrel	S5	--	--	171,261	2,258,177	7.58
Long-tailed Vole	S5	--	--	1,936,452	24,840,330	7.79
Fringed Myotis	S3	special concern	--	369,131	4,661,200	7.92
Meadow Vole	S5	--	--	267,190	3,275,640	8.16
Deer Mouse	S5	--	--	2,091,036	25,013,364	8.36
White-tailed Deer	S5	--	--	707,172	7,744,864	9.13
Yuma Myotis	S3	watch list	--	69,021	692,742	9.96
Montane Vole	S5	--	--	768,543	7,643,749	10.06
Western Jumping Mouse	S5	--	--	447,660	4,393,129	10.19
Long-eared Myotis	S4	--	--	1,931,946	18,435,752	10.48
Wapiti Or Elk	S5	--	--	2,285,997	20,298,284	11.26
Northern River Otter	S4	--	--	227,487	1,949,443	11.67
Masked Shrew	S5	--	--	1,319,167	10,981,895	12.01
Water Shrew	S5	--	--	219,180	1,818,455	12.05
Hoary Bat	S4	--	--	1,642,262	13,232,779	12.41

TNC State Rank: S1 (critically imperiled, ≤5 occurrences), S2 (imperiled, 6-20 occurrences), S3 (rare and local, 21-100 occurrences), S4 (apparently secure), S5 (demonstrably secure). SU = status uncertain, SA = accidental in Montana; Z indicates ranking not applicable, B refers to breeding status, and N to non-breeding status (Reichel 1997).
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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Vagrant Shrew	S4	--	--	369,040	2,887,467	12.78
Townsend's Big-eared Bat	S2S3	special concern	--	1,844,833	14,300,158	12.90
Bushy-tailed Woodrat	S5	--	--	1,128,066	8,673,722	13.01
Common Porcupine	S5	--	--	1,882,783	13,946,154	13.50
Uinta Ground Squirrel	S4	--	--	51,783	371,362	13.95
Silver-haired Bat	S4	--	--	1,544,400	10,853,587	14.23
Ermine	S5	--	--	1,601,027	11,148,174	14.36
Long-legged Myotis	S4	--	--	1,774,891	12,247,939	14.49
Yellow-pine Chipmunk	S5	--	--	968,489	6,038,135	16.04
Mountain Lion	S4	--	--	2,004,418	12,449,033	16.10
Red Squirrel	S5	--	--	1,355,678	7,586,618	17.87
Black Bear	S5	--	--	1,952,605	10,781,597	18.11
Pygmy Shrew	S4	--	--	134,616	729,460	18.46
Gray Wolf	S1	special concern	LEXNLT	1,968,523	9,602,843	20.50
Northern Flying Squirrel	S4	--	--	1,248,554	6,050,723	20.63
Moose	S5	--	--	1,290,440	6,196,028	20.83
Snowshoe Hare	S5	--	--	1,582,760	7,556,324	20.95
Red-tailed Chipmunk	S5	--	--	1,104,222	5,136,957	21.50
Southern Red-backed Vole	S5	--	--	1,583,766	7,346,212	21.56
American Marten	S4	--	--	1,261,219	5,843,622	21.58
Fisher	S2	special concern	--	1,172,549	5,035,902	23.29
Yellow-bellied Marmot	S5	--	--	904,678	3,857,820	23.45
Lynx	S2	special concern	--	1,470,126	6,045,562	24.32
Heather Vole	S5	--	--	1,385,251	5,586,586	24.79
Golden-mantled Ground Squirrel	S5	--	--	672,316	2,678,480	25.10
Dusky Or Montane Shrew	S5	--	--	979,968	3,900,002	25.13
Wolverine	S2	special concern	--	2,026,047	7,902,365	25.64
Northern Bog Lemming	S2	special concern	--	3,006	10,676	28.16
Grizzly Or Brown Bear	S1S2	special concern	LTLENL	1,965,538	6,923,086	28.39

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Table 5.5 *continued.* For Montana, 414 native amphibians, reptiles, birds, and mammals according to the percent of their predicted distributions in management status 1 and 2 lands.

Common Name	TNC State Rank	State List	Federal Status	DISTRIBUTION (ha) Status 1 & 2	DISTRIBUTION (ha) Total	% Status 1 & 2
Water Vole	S4	--	--	167,940	539,573	31.12
Dwarf Shrew	S3	special concern	--	55,376	162,534	34.07
Mountain Sheep	S4	--	--	118,748	325,952	36.43
American Pika	S5	--	--	1,079,668	2,562,153	42.14
Hoary Marmot	S4	--	--	787,421	1,661,062	47.41
Uinta Chipmunk	S3?	special concern	--	239,715	420,428	57.02
Mountain Goat	S5	--	--	535,152	816,273	65.56
American Bison	S3?	--	--	70,781	70,848	99.91

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6. CONCLUSIONS AND MANAGEMENT IMPLICATIONS

Generally, our results indicate that high elevation cover types and associated vertebrate species appear to be relatively well protected under Status 1 and 2 management. But even in these areas, elements of biodiversity could be threatened by disease (e.g., white pine blister rust) and the introduction of exotic weeds. Two areas in the state appear to be rich in vertebrate diversity and perhaps in need of a finer filter analysis -- the East Front of the Rocky Mountains and the Bighorn/Powder River basins in southeast Montana. The former, a very scenic area, is rich in birds and mammals. Much of the non-forest portion of this area is privately owned, and although relatively large areas have been protected by various conservation measures during the past 20 years, more efforts likely will be required to maintain the ecological integrity of the East Front. The second area, encompassing the Bighorn and Powder River basins, is rich in mammals and reptiles. Underlying these lands, however, are massive coal deposits which threaten the long-term viability of this area for wildlife habitat. We also note with some surprise that the longest free-flowing river in the Lower 48 states, the Yellowstone, has no formal protection anywhere along its banks. This may be more important for an aquatic gap analysis, but we thought it worthy of mention here.

Results are only as good as the data on which they rely, and the data inputs could always be improved. Two cases in point would be the DEMs and hydrography. Our mapping of riparian areas and woody draws was particularly dependent on the quality of these input data. In eastern Montana, where topographic relief is more subtle, we had to rely for the most part on coarser, 1 degree DEMs, from which it was difficult to detect and delineate low-lying areas along intermittent and many perennial stream courses. Moreover, the 1:100,000 scale DLGs exhibited considerable inconsistency from quad to quad in terms of stream density. Newer, higher quality data, both for hydrography and topography, should be available soon for the state which would enable more precise land cover mapping and habitat modeling. Ideally, the new hydrography would provide stream order attributes, along with some information about stream flow. Once new hydrography data are available, we recommend that they be combined with water features classified from the TM imagery to ensure the most complete and detailed coverage for the state. Soils and climate data would be other important layers that could substantially improve future mapping and modeling efforts. These could be completed if interested agencies agreed to make them priorities for future funding.

With the methodologies and reference data in place, remapping or updating land cover would be a relatively straightforward process. Although 23,351 ground-truth plots sound adequate, we believe that higher accuracies would result from additional data, especially from certain areas in central and eastern Montana. We do not advocate expensive field surveys, however, but rather consideration by a consortium of state and federal agencies to fund airborne video sampling, at least across areas like the Bighorn and Powder River basins where it may be important to improve land cover mapping for monitoring future changes in land use.

The relatively fine scale at which we mapped the state's land cover will be useful for considerably more than predicting wildlife distributions. We have already extended this work to the dasymetric mapping of human population density (Holloway et al. 1998) and median age of housing units (by decade) across 35 counties in Montana. By mapping human population densities more precisely, these results could become useful inputs for improving vertebrate distribution models.

Validation of predicted vertebrate distributions also could be expanded by using more extensive datasets, such as those from the Forest Service, Northern Region Landbird Monitoring Program

(Hutto 1995). Additional sites in eastern Montana might have to be targeted for future field surveys as well.

Regarding improvements to the vertebrate distribution models, it would be interesting to compare model predictions based on the 90 m^2 land cover versus the original 30 m^2 data, at least for a few selected species and areas in the state. Incorporating interspecific relationships into the models could be yet another refinement. Although competitors, predators, and brood parasites may not actually limit the distribution of other species, they certainly affect habitat quality. Greene et al. (in press) examined the predicted breeding distribution of Lazuli Buntings in relation to that of Brown-headed Cowbirds in the state; their results indicated that more than 90% of nesting buntings in Montana may be vulnerable to cowbird parasitism. Similar analyses could be carried out for many other host or prey species.

Finally, at the risk of pointing out the obvious, managers of public lands in Montana have more ready opportunities to manage for biodiversity in some landscapes than they do in others. For example, more than 90% of several cover types, including Missouri Breaks and Mixed Whitebark Pine Forest, is managed by federal agencies. Consequently, these types, and any associated wildlife species, ought to be easier to manage than several of the riparian cover types, the vast majority of which occur on privately owned lands. Thus, it should come as no surprise that conservation of riparian areas, and their associated species, will depend on participation from the private sector. Elected officials at all levels of government can certainly help encourage this participation through enactment of laws which make conservation more economically appealing than development.

7. PRODUCT USE AND AVAILABILITY

How To Obtain the Products

It is the goal of the Gap Analysis Program and the USGS Biological Resources Division (BRD) to make the data and associated information as widely available as possible. Use of the data requires specialized software called geographic information systems (GIS) and substantial computing power. Additional information on how to use the data or obtain GIS services is provided below and on the GAP homepage (URL below). Although the most convenient way to obtain and store the data may be on CD-ROM, they also can be downloaded via the Internet from the national GAP home page (http://www.gap.uidaho.edu/gap). See also the Natural Resource Information System (NRIS) at the Montana State Library (http://www.nris.mt.gov/).

Over the long term, the national GAP home page will provide information about the status of MT-GAP, future updates, data availability, and contacts (follow the links to "project information" and then to Montana). Within a few months of completion, CD-ROMs of this final report and the accompanying GIS data should be available for a nominal cost; details about how to obtain copies of these CD-ROMs will be posted at both of the home pages referenced above.

Minimum GIS Required For Data Use

The datasets comprising MT-GAP were created with the ARC/INFO Grid module running on IBM RS/6000 workstation computers (under AIX 4.1) with ≥128 megabytes of RAM and 4 gigabytes of local disk. Although the total dataset is large, most of the individual files are relatively small; the largest single file is the land cover layer (<50 megabytes), and most files are closer to 5 megabytes in size. Despite the size of the overall dataset, its availability on CD-ROM minimizes the need for large amounts of free disk space. Powerful computers should not be required to process MT-GAP data, but they could only help: queries and analyses should run faster with more memory and faster processors, and when restricted to portions of the state. For users without access to ARC/INFO, display and query should be feasible using the ARC/VIEW Spatial Analyst software.

Disclaimer

Following is the official Biological Resources Division (BRD) disclaimer as of 29 January, 1996, followed by additional disclaimers from GAP. Prior to using the data, you should consult the GAP home page (see How to Obtain the Products, above) for the current disclaimer.

Although these data have been processed successfully on a computer system at the BRD, 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 BRD 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 Resources 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 intended 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 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 Resources Division makes no claim as to the suitability of the data for other purposes. These are writable data which may have been altered from the original product if not obtained from a designated distributor identified above.

Metadata

Proper documentation of all information sources used to assemble GAP data layers is central to the scientific defensibility of GAP. The information used to describe GAP 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, 1995).

The GAP metadata standards have been closely matched to the FGDC standards to ensure current and future compatibility. 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 (i.e. $x > 0$) are also defined.

Table 7.1. Metadata element categories.

I.	Identification Information	What the dataset is called, file format description.
II.	Data Quality Information	Accuracy, consistency, and data sources.
III.	Spatial Data Organization Information	Data structure—raster, vector, point, etc.
IV.	Spatial Reference Information	Coordinate units, map projection, spatial resolution.
V.	Entity and Attribute Information	Attribute codes and reference citations.
VI.	Distribution Information	How to order the data, on-line access, transfer size.
VII.	Metadata Reference Information	Date of the metadata, contact for metadata updates.
XIII.	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.

For additional information via Internet, see the national GAP home page:
http://www.gap.uidaho.edu/gap

Cogan, C.B. and T.C. Edwards. 1994. Metadata standards for GAP. Gap Analysis Technical Bulletin 3. Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow, Idaho. 28 pp. (A postscript file is available from the GAP web page listed above.)

For a postscript version of the current FGDC Metadata Standards (8 June 1994): waisqvarsa.er.usgs.gov (anonymous ftp, cd to wais/docs, get FGDCmeta6894.ps)

Federal Geographic Data Committee. 1995. Content Standards for Digital Geospatial Metadata workbook (March 24). FGDC. Washington D.C. (Describes the FGDC metadata standards.) http://geochange.er.usgs.gov/pub/tools/metadata/standard/metadata.html

Appropriate and Inappropriate Use of These Data

All information is created 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 the immediate program needs. For GAP, minimum standards were set to meet program objectives (Scott and Jennings 1994). These standards include: scale or resolution (1:100,000 or 100 hectare minimum mapping unit), accuracy (80% accurate at 95% confidence), and format (ARC/INFO coverage tiled to the 30' x 60' USGS quadrangle).

Recognizing, however, that GAP 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 tools to answer that question.

Scale

MT-GAP data were produced with the intent that they be analyzed and applied at the ecoregional level, that is, across geographic areas extending from several hundred thousand to millions of hectares in size. Because not every occurrence of every plant community or animal habitat was mapped in the state, the data are best suited for coarse-filter types of analyses that emphasize context over precise content. For example, if one needed to know precisely how much riparian vegetation occurred in a given county, one might be better off mapping these types from aerial photography. But this could be a costly and time-consuming option. To provide context, and to help justify additional expenses, one could use the land cover data from MT-GAP to compare the estimated abundance of riparian types in the county versus the entire state (or ecoregion).

Appropriate Uses

The above example illustrates two appropriate uses of the data -- as a coarse-scale map for a large area such as a county, and to help justify the future investment in finer-scale spatial data. Specific case-study examples are provided in Appendix 1.1, but following is a general list of applications:

- 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.

Inappropriate Uses

It is far easier to identify appropriate uses than inappropriate ones. However, 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 areal measurements from the data finer than the nearest thousand hectares (minimum mapping unit 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.

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GLOSSARY OF TERMS

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, typically refers to a GIS procedure used to model animal distributions)

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, by the dominant land cover typically described according to the Ander son land cover classification (see "Natural Community Alliance" in Grossman et al. 1995)

alpha diversity – a single within-habitat measure of species diversity regardless of internal pattern, generally over an area of 0.1 to 1,000 hectares (see Whittaker 1960, 1977)

Anderson Level II – the second hierarchical level in the Anderson land cover classification system (see Anderson et al. 1976)

anthropogenic – caused by man

assemblages – a group of ecologically interrelated plant and animal species

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

beta diversity – the change in species diversity among different natural communities of a landscape; an index of between-habitat diversity (see Whittaker 1960, 1977)

biodiversity or *biological diversity* – generally, the variety of life and its interrelated processes

biogeographic – relating to the geographical distribution of plants and animals

cartographic – pertaining to the art or technique of making maps or charts

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

classify or *classification* – to assign objects, features, or areas on an image to spectral classes based upon their appearance, as opposed to *classification* referring to a scheme for describing the hierarchies of vegetation or animal species for an area

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 homogeneous areas on remotely sensed images as visible from differences in tone and texture

delta diversity – the change in species diversity between landscapes along major climatic or physiographic gradients (see Whittaker 1977)

digitization – entering spatial data digitally into a GIS

distribution, species – in a GAP context, refers to a computer-modeled map of a species' potential distribution for a given area, baesd on parameters such as *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

exact set coverage – a basic optimization problem to determine the best method for identifying general areas that, when selected sequentially, would have the greatest positive cumulative impact on attaining adequate representation of any or all biotic elements of interest

extinction – disappearance of a species throughout its entire range

extirpation – disappearance of a species from part of its range

fine filter – see *coarse filter*

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

formation level – the level of land cover categorization between Group and Alliance describing the structural attributes of a land unit, for example, "Evergreen Coniferous Woodlands with Rounded Crowns" (see Jennings 1993b)

gamma diversity – the species diversity of a landscape, generally covering 1,000 to 1,000,000 hectares, made up of more than one kind of natural community (see Whittaker 1977)

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

global positioning system (GPS) – an instrument that utilizes satellite signals to pinpoint its location on the earth's surface

greedy heuristic – an algorithm for exact set cover analysis (see Kiester et al., in press)

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's EMAP hexagonal grid of 635 square kilometer units

hyperclustering – a efficient, interactive method for accurately analyzing and classifying remotely-sensed data that reduces data size and computational requirements while retaining the integrity of the original data

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

merge – refers to the process of aggregating TM pixels (or other units) to larger, user-specified minimum map units

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

neotropics – the zoogeographic region stretching southward from the tropic of Cancer and including southern Mexico, Central and South America, and the West Indies

phenology – the study of periodic biological phenomena, such as flowering, breeding, and migration, especially as related to climate

phenotype – the environmentally and genetically determined observable appearance of an organism, especially as considered with respect to all possible genetically influenced expressions of one specific character

physiognomic – based on physical features

physiographic province – a region having a pattern of relief features or land forms that differ significantly from that of adjacent regions

pixel – the smallest spatial unit in a raster data structure; also may be referred to as a grid cell

polygon – an area enclosed by lines in a vector-based GIS data layer, or a region of contiguous homogeneous pixels in a raster system

preprocessing – those operations that prepare data for subsequent analysis, usually by attempts to correct or compensate for systematic, radiometric, and geometric errors

range – the geographic limit of a species

range unit – a spatial, geographic unit to record and display species geographic range (such as *hexagons* or *latilongs*)

raster format – data stored as rows and columns of cell (pixel) values, where the cell is the fundamental unit for analysis and manipulation in a GIS ; e.g., ARC/INFO GRIDs

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

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

sensitivity analysis – the consideration of a number of factors involved in the mathematical modeling of an ecosystem and its components, including feedback and control, and the stability and sensitivity of the system as a whole to changes in some part of the system; predictions can be made from the analysis

simulated annealing – an algorithm used for set coverage analysis (see Kiester et al., in press)

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

spectral cluster – a group of adjacent pixels that are uniform with respect to their brightness values

supervised classification – the digital process of classifying TM pixels of unknown identity by 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

tessellation – the division of a map into areas of equal and uniform shape, such as the EPA-EMAP hexagon

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

trophic structure – the various levels in a food chain, such as producers (plants), primary consumers (herbivores), and secondary consumers (carnivores)

Universal Transverse Mercator (UTM) – one of several map projections or systems of transformations that enables locations on the spherical earth to be represented systematically on a flat map

Universal Transverse Mercator grid – a geographic reference system used as the basis for worldwide locational coding of information in a GIS or on a map

unsupervised classification – the digital process of defining, identifying, labeling, and mapping of natural groups, or classes, of spectral values within a scene; these spectral classes are reasonably uniform in brightness in several spectral channels

vector format – a data structure that uses polygons, arcs (lines), and points as fundamental units for analysis and manipulation in a GIS

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.

GLOSSARY OF ACRONYMS

ACSM	American Congress on Surveying and Mapping
ADAMAS	Aquatic Database Management System
ADEM	Alabama Department of Environmental Management
AML	ARC/INFO Macro Language
ASPRS	American Society for Photogrammetry & Remote Sensing
AVHRR	Advanced Very High Resolution Radiometer (satellite system)
BCD	Biological Conservation Database (TNC)
BEST	Biomonitoring of Environmental Status and Trends
BLM	Bureau of Land Management
CAFF	Conservation of Arctic Flora and Fauna
C-CAP	Coastwatch Change Analysis Program (NOAA)
CDC	Conservation Data Center
CEC	Council on Environmental Cooperation

CENR	Committee on Environment and Natural Resources
CERES	California Environmental Resources Evaluation System
CIESIN	Consortium for Internat'l Earth Science Information Network
CODA	Conservation Options and Decision Analysis (software)
CRMP	Coordinated Resource Management Plan
CRT	Cathode ray tube
CRUC	Cooperative Research Unit Center
DEM	Digital Elevation Model (USGS)
DLG	Digital line graph (USGS)
DOI	Department of the Interior
ED	Euclidean distance
EDC	EROS Data Center
ECOMAP	National Hierarchical Framework of Ecological Units mapping project, USDA Forest Service
EMAP	Environmental Monitoring & Assessment Program (EPA)
EMAP-LC	EMAP-Landscape Characterization (EPA)
EMSL	Environmental Monitoring & Systems Laboratory (EPA)
EMTC	Environmental Management Technical Center (NBS)
EOS	Earth Observing System
EOSAT	Earth Observation Satellite Company (commercial operator of the Landsat satellite system)
EOSDIS	EOS Data & Information System
EPA	US Environmental Protection Agency
ERL	Environmental Research Laboratory (USEPA; Corvallis, OR)
EROS	Earth Resources Observation Systems (USGS)
ESRI	Environmental Systems Research Institute (Redlands, CA)
ETM+	Enhanced Thematic Mapper plus
FGDC	Federal Geographic Data Committee
FTP	File transfer protocol
FY	Fiscal Year
GAO	General Accounting Office (Congress)
GAP	Gap Analysis Program
GCDIS	Global Change Data and Information System
GIS	Geographic Information System
GLIS	Global Land Information System (USGS)
GLOBE	Global Learning and Observations to Benefit the Environment
GPS	Global Positioning System
GRASS	Geographic Resources Analysis Support System
GRIS	Geographic Resource Information Systems
HRMSI	High Resolution Multispectral Stereo Imager
IALE	International Association of Landscape Ecology
ID-GAP	Idaho Gap Analysis Project
IDRISI	A GIS developed by Clark University
LAPS	Land Acquisition Priority System
LC/LU	Land Cover/Land Use (USGS)
MIPS	Map and Image Processing System
MOU	Memorandum of Understanding
MMU	Minimum mapping unit
MNDVI	Modified normalized difference vegetation index
MRLC	Multi-Resolution Land Characteristics Consortium
MSS	Multi–Spectral Scanner

MTFWP	Montana Department of Fish, Wildlife & Parks
MT-GAP	Montana Gap Analysis Project
MTNHP	Montana Natural Heritage Program (Helena, MT)
MTPE	Mission to Planet Earth
NAFTA	North American Free Trade Agreement
NALC	North American Landscape Characterization (USEPA, USGS)
NAWQA	National Water Quality Assessment (USGS)
NBII	National Biological Information Infrastructure
NBS	National Biological Service
NCCP	Natural Communities Conservation Planning program (in CA)
NDCDB	National Digital Cartographic Data Base
NDVI	Normalized difference vegetation index
NERC	National Ecology Research Center (Ft. Collins, CO)
NMD	National Mapping Division
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRIS	Natural Resource Information System (Montana State Library, Helena, MT)
NSDI	National Spatial Data Infrastructure
NSTC	National Science and Technology Council
NWI	National Wetlands Inventory (USFWS)
OMB	Office of Management and Budget (Administration)
OSIS	Oregon Species Information System
PARC	Public Access Resource Center
PI	Principal Investigator
PLSS	Public Land Survey System
POD	Point Observation Database (MT Natural Heritage Program)
SAB	Science Advisory Board (EPA)
SCICOLL	Scientific Collections Permit Database
SDTS	Spatial Data Transfer Standard
SGID	State Geographic Information Database
SNEP	Sierra Nevada Ecosystem Project
SOFIA	Southern Forest Inventory and Analysis
SPOT	Système Pour l'Observation de la Terre
RMSE	Root mean square error
TIGER	Topologically Integrated Geographic Encoding and Referencing system (US Census)
TM	Landsat Thematic Mapper
TNC	The Nature Conservancy
UNESCO	United Nations Educational, Scientific, and Cultural Organization
URISA	Urban and Regional Information Systems Association.
URL	Universal Resource Locator
USFS	US Forest Service
USGS	US Geological Service
USFWS	US Fish & Wildlife Service
UT-GAP	Utah Gap Analysis Project
UTM	Universal Transverse Mercator
WHR	Wildlife-habitat relationships
WSAL	Wildlife Spatial Analysis Lab (The University of Montana)
WWW	World Wide Web
WY-GAP	Wyoming Gap Analysis Project

Appendix 1.1. List of example GAP applications.

Businesses and Non-government Organizations:

The following are some examples of applications of GAP data by the private sector:

- The Wyoming Natural Heritage Program (a private non-government organization) transformed the endangered and sensitive species database into a spatially referenced digital geographic information system using the GAP digital base map and other GAP spatial data.
- 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.
- The Nature Conservancy used the Wyoming GAP data to develop a map of ecoregions of Wyoming.
- 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:

Some other examples of the use of GAP by local governments are:

- 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 map of the area as a base map for its comprehensive long-range plan.
- Snohomish County, Washington, used the GAP land cover map 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 following are some examples of uses of GAP data by state agencies.

- The GAP database of species habitats was used by the Tennessee Wildlife Resources Agency (TWRA) to update its book "Species in Need of Management."
- Images of land cover derived from GAP TM data are used by TWRA for locating particular habitat types. Information on the locations of these habitat types is provided by TWRA to the public for a wide variety of public service functions, from education to cooperative resource management.
- Early GAP data developed by TWRA were used to help identify an extremely important area of the state with high biodiversity that was subsequently purchased by the state for conservation.
- Preliminary findings from GAP were used by TWRA to develop three resource management initiatives.
- The Tennessee GAP project, which is being carried out primarily by TWRA, is the foundation of a multi-agency, long-term biodiversity program for Tennessee.

- 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 are addressed in specific detail. The use of GAP data on occurrence of land cover types and terrestrial vertebrates has made this possible.
- The Wyoming Department of Fish and Game (WYF&G) used GAP data to assist them in transforming the Wildlife Observation System database into a spatially referenced geographic information system.
- The Utah Division of Wildlife Resources and the Bear River Water Conservancy District used the Utah GAP land cover map 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 map 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 map 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.

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. These activities were the subject of the State Biodiversity Programs meeting discussed on page ? in this report. In some cases, these efforts grew out of the state GAP 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. The goals of each of these programs or projects are presented briefly below.

Federal Agency Applications:

Some examples of applications of GAP data by federal agencies follow:

- 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 Wyoming GAP data were used by NASA to calibrate a model that predicts vegetation types based on climate and soil variables.
- 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 Bureau of Land Management uses the Wyoming GAP data for managing the Buffalo Resource Area.
- 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.

Appendix 2.1. Example of the information presented for each of 50 land cover types in the *Montana Land Cover Atlas* (Fisher et al. 1998).

Montana Land Cover Atlas

3150 Low / Moderate Cover Grasslands

DOMINANT SPECIES

Arrowleaf Balsamroot *(Balsamorhiza sagittata)*
Bluebunch Wheatgrass *(Agropyron spictatum)*
Blue Grama *(Bouteloua gracilis)*
Bluestem *(Andropogon spp.)*
Carex species *(Carex spp.)*
Green Needlegrass *(Stipa viridula)*
Idaho Fescue *(Festuca Idahoensis)*
Lupine *(Lupinus spp.)*
Needle & Thread grass *(Stipa comata)*
Rough Fescue *(Festuca scabrella)*
Timothy *(Poa pratensis)*
Western Wheatgrass *(Agropyron smithii)*

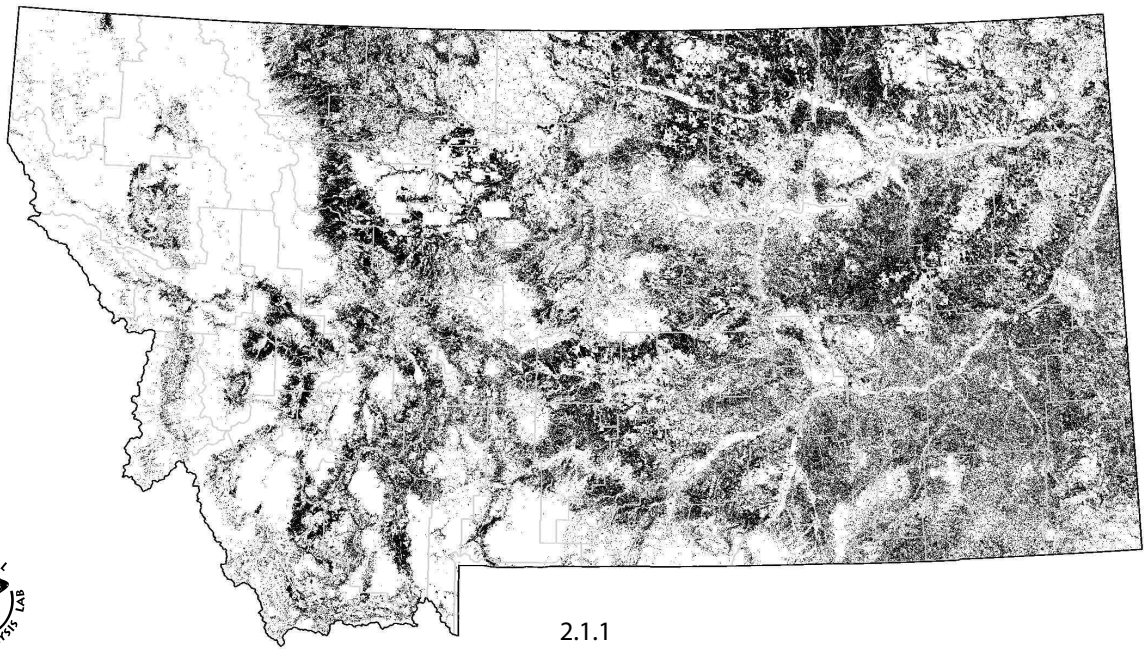
DESCRIPTION

Low to moderate cover grasslands with total grass cover from 20-70%. Dominated by short to medium height grasses and forbs. Grasslands with production ranges from 300-1800 lb/ac. Includes rangelands and non-irrigated pastures.

TOTAL AREA	ELEVATION
10,427,464 hectares	311 - 3266 m range
432,016 patches	1100 m mean
27.38 % of state	

STATE RANGE

Occurs across the state in valleys and foothills. Occurs on middle to high elevation mountain slopes on south aspects.



Appendix 3.1. Remarks on the Construction of Gap Analysis Models for Amphibians and Reptiles. Prepared by Bryce A. Maxell, 5/6/98.

Overview of models

The primary goal in developing gap analysis models for amphibians and reptiles was to indicate potential suitable habitats within the ranges of the various species in Montana at an intermediate spatial scale (1-2 hectares). Although satellite imagery collected information on land cover at a 30 meter spatial resolution, models were limited to 1-2 hectare resolution because 1 hectare minimum mapping units (the minimum unit used for map features) were used for mapping riparian vegetation and 2 hectare minimum mapping units were used for all other vegetation types. It was necessary to use these minimum mapping units because of the data storage and processing time required for statewide models. Therefore, given the minimum mapping unit limitations, the maps are intended to reflect patterns of distribution across the state, not to indicate whether a species can be found at any given location.

Although a number of different layers/coverages were considered for inclusion in the models several layers/coverages had problems with low resolution or uneven accuracy (e.g. coverages for springs and STATSGO soil cover types). When possible these layers were avoided in the final models. Unfortunately, the hydrography layer was one of the layers that was mapped inconsistently (more detailed mapping of hydrography was done in some areas). However, the hydrography layer was extremely important to the modeling of many amphibians and reptiles so it was used despite its inconsistencies; this often shows up as areas of darker shaded squares on the predicted distributions in eastern Montana. Exclusion of the low resolution and low accuracy layers/coverages resulted in fairly simple models that include a maximum of four data layers (digital elevation models (DEMs), hydrography, land cover types and riparian cover types. Thus, models included elevations, land cover types, riparian cover types, and various hydrography (lakes, major rivers, and tributaries) that were appropriate for each species.

Amphibian models are mostly based on the taxa's ties to watery breeding habitats. Therefore, models typically consist of buffering hydrographic features into appropriate cover types (at appropriate elevations) by distances typical of the maximum migration the species is known to undergo between watery breeding habitats and terrestrial feeding, aestivation and hibernation sites. The only exceptions to this were the Plains Spadefoot which breeds in ephemeral rainwater pools, three toad species (Boreal, Woodhouse's and Great Plains toads), and the tiger salamander. We felt that a 2 km buffer around all hydrographic features, should be used for all of these species but the Plains Spadefoot. However, preliminary review of these models revealed that a 2 km buffer around all hydrographic features covered almost the entire state and, where the buffer ended, it left rather artificial boundaries in the predicted species distributions. In order to eliminate these artificial boundary artifacts and decrease computer-processing time, appropriate cover types were simply turned on for these species.

Construction of reptile models was based largely on turning on appropriate habitat types. Buffering hydrography was used for the Painted Turtle, Rubber Boa, Smooth Green Snake and Common Garter Snake. It was felt that a 2 km buffer around all hydrographic features should be used for the Western Terrestrial Garter Snake and Plains Garter Snake as well. However, as with the toad models this created artificial boundaries to predicted species distributions. In order to eliminate these artificial boundary artifacts and decrease computer-processing time, appropriate cover types were simply turned on for these species as well.

In order to avoid inclusion of large water bodies (e.g. Flathead Lake) in predicted species' distributions, water, as a cover type, was excluded in all models if it was larger than 5 hectares. However, water bodies larger than 5 hectares were buffered into, when a buffer was applied, in order to include shallow water breeding habitats.

Initial review of amphibian models was fairly satisfying in regards to model accuracy (i.e. known species locations were mostly within the model's predicted distributions). Model limitations were mostly limited to (1) the inadequacy and, therefore, exclusion of a spring layer, (2) the inability to detect fine scale habitat features for the Coeur d'Alene Salamander, (3) the inadequacy and, therefore, exclusion of a soils layer to model the Plains Spadefoot, and (4) overestimation of several species distributions (in some cases crossing the continental divide) due to propagation of their distribution across continuous habitat outside its likely range during computer-processing.

Initial review of reptile models was not as satisfying as the amphibian models in regards to both model construction and model accuracy. Models constructed on the basis of buffering hydrography were the most satisfying. Lack of knowledge of a species' exact habitat uses in Montana was often a problem in model construction. Other model limitations included (1) the inability to adequately identify forest edges for the Northern Alligator Lizard, (2) the inability to exclude lower order streams for the Snapping Turtle because statewide stream order data are unavailable, (3) the inadequacy of a soils layer for the Short-horned Lizard, Sagebrush Lizard, and Western Hognose Snake, (4) the inability to adequately detect south facing slopes and hogback ridges for most snakes, but especially for the Milk Snake, and (5) overestimation of several species distributions due to propagation of their distribution across continuous habitat outside its likely range during computer-processing.

The modeling process served to identify several areas in Montana that currently lack sufficient surveys for amphibians and reptiles. These areas include: (1) the southwest corner of the state between Butte, the Big Hole Valley and the northeastern edge of the Beartooth Plateau, (2) the area between the Missouri River and a line due east of Billings, (3) the northeast corner of the state (north of the Missouri River and east of Malta), (4) the island mountain ranges in the central part of the state, (5) the north-central part of the state between Havre and the Front Range, (6) the southeastern corner of the state between the Bighorn River and the Custer National Forest and between the Custer National Forest and the state borders with South Dakota and Wyoming, (7) the region around the Upper Clark Fork River upstream of Missoula.

In all cases, models should be tested with new independent data for both omission (predicting a species does not occur in an area when it actually does) and commission (predicting a species occurs in an area when it actually does not) errors. Models should only be tested with data points that are both highly accurate in their collection and in the precision of their mapping. High accuracy spatial data collection should be made with a differentially correctable GPS receiver. However, if a differentially correctable GPS receiver is unavailable then either a non-differentially correctable GPS receiver or best estimates of Universal Trans Mercator (UTM) coordinates should be used. It is preferable to report UTM coordinates over Township, Range and Section (TRS) locations in order to ensure high mapping precision (i.e. field personnel have a better idea of their exact location as compared to a person digitizing a reported TRS description who is forced to digitize a point in the center of section or quarter section).

Development of Models

Development of amphibian and reptile gap models generally involved the following steps:

1. A database spreadsheet was constructed that contains information from field guides, other published accounts and personal knowledge of a species' distribution, elevational limits, habitat use dispersal distances for feeding, breeding, rearing, aestivating and hibernating in Montana and the surrounding states and provinces. This was used as a primary reference during the construction of all models.

2. The extent of a species' range in the state was determined in order to decide the spatial extent to which the models should be applied. To do this a coverage containing hexagons from the EPA's Environmental Monitoring and Assessment Program (EMAP) were "draped" over the state; each of these hexagons covers an area of 635 square kilometers (the distance between any two vertices of a hexagon being 27 kilometers). Hexagons were then coded as confirmed (for hexagons containing a reliable documented occurrence of the species after 1950), probable (for hexagons without documented records, but felt to have an 80% or greater probability of the species occurrence), possible (for hexagons without reliable documented records, but felt to have a 10-80% probability of the species occurrence), historic (for hexagons containing a reliable documented occurrence of the species prior to 1950) and not possible (for hexagons without a reliable documented occurrence and felt to have less than 10% probability of the species occurrence). Models were applied to all confirmed, probable, possible and historic hexagons. The following principles or factors guided decisions of whether to include a hexagon based on professional judgement.
   A. Extensions of a species' range beyond locations documented by the Montana Natural Heritage Program's database were made conservatively with the following exceptions: (1) when published records in adjacent states and territories suggested a continuous range to the state border; (2) when published articles and/or theses/dissertations with reliable records suggested a range extension; (3) as a function of computer processing, hexagons adjacent to a confirmed hexagon were included for modeling when a modeled habitat type was continuous across the confirmed and adjacent hexagon; in some cases this resulted in the inclusion of two or three hexagons past the known range of a species. This may prove informative on the actual range of some species, but may falsely propagate the range for others.
   B. Hexagons within the known range of a species were included liberally even without a species documented presence. It was felt that the models should be able to exclude unlikely habitat within the range (e.g., exclusion of a mountain range).

3. Individual species' models were constructed within two database spreadsheets; one containing information on general modeling strategies and data layers to be included in the model and another containing all land cover types to be included in the model. Within the spreadsheet, data layers/coverages (land cover type, riparian cover type, hydrography, and elevation, were the only data layers used) and modeling strategies (buffering, turning on habitat types, or a combination of the two) were simply checked for inclusion or not. Similarly, land cover types in the land cover type spreadsheet were simply checked for inclusion or not. Maximum elevation levels included in a model were based on records for a species in Montana or a nearby state; elevation limits were not included if the species is known to inhabit higher elevations in nearby states or provinces than are present within the species' range in Montana. With the exception of the Columbia Spotted Frog, which was given an elevational limit 600 meters above documented highs based on documented elevations of a garter snake (a predator that generally relies on the presence of amphibian prey), all elevation limits were 100-270 meters above documented highs in Montana or nearby states.

4. Models were reviewed by comparing each model's predicted species distribution with existing species' point locations in the Montana Natural Heritage Program's database; only point locations having high data and mapping precision (both less than or equal to 600 meters).

5. When the initial models failed to accurately represent a species known distribution models were adjusted. However, all model adjustments had a biological basis and adjustments were not made simply to ensure that predicted model distributions matched known point locations for a species.

Appendix 3.2. Names and affiliations of individuals participating in the 1997 and 1998 review of vertebrate habitat associations and distributions for Montana Gap Analysis, as well as those who provided input on mammal hexagon maps during their preparation by Montana Natural Heritage Program staff.

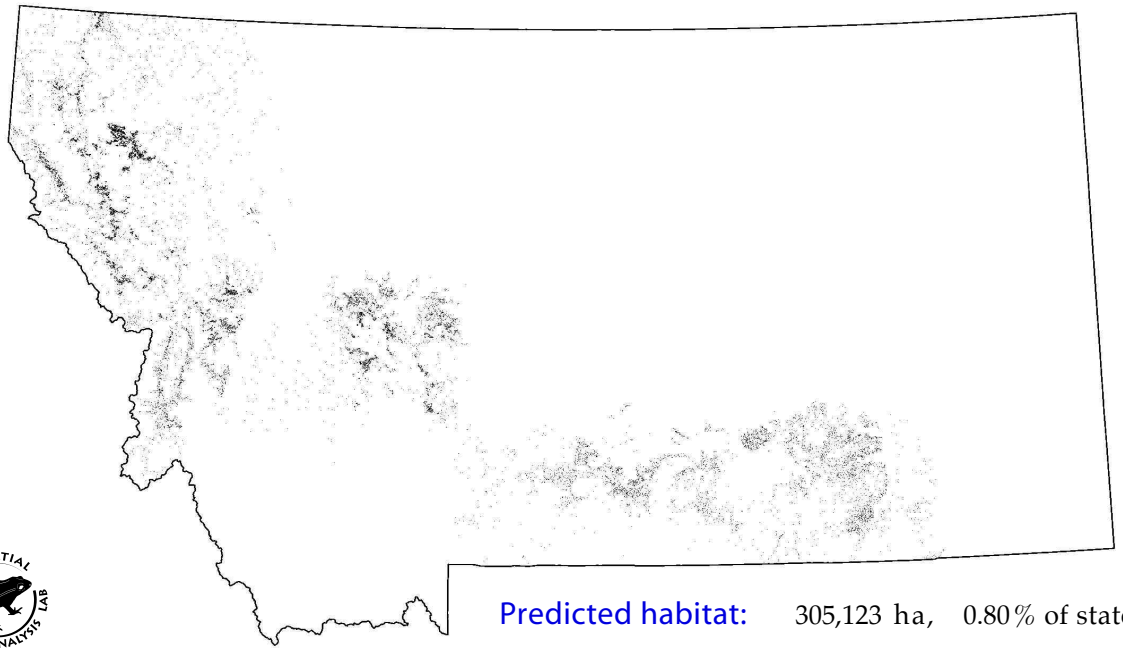
Name	*Affiliation*	*Taxonomic review*
Kathy Ake, Nancy Warren, and other USFS biologists	U.S. Forest Service - Flathead NF	Birds, mammals, reptiles, amphibians
Eric Atkinson	Marmot's Edge Conservation	Birds
John Carlson	Montana State University	Birds
Chuck Carlson	Montana Bird Records Committee	Birds
Quinn Carver	U.S. Forest Service - Helena NF	Carnivore hexagons
Dan Casey	Montana Department of Fish, Wildlife & Parks	Birds
Jeff Copeland	Idaho Fish & Game Department	Mammals
Steve Corn	U.S. Forest Service - Aldo Leopold Wilderness Research Institute	Reptiles, amphibians
Lance Craighead	American Wildlands	Mammals
Pat Dolan	U.S. Forest Service - Lolo NF	Birds
Rick Douglass	Montana Tech of the University of Montana	Rodent hexagons
Kristi DuBois	Montana Department of Fish, Wildlife & Parks	Birds, mammals, reptiles, amphibians
Mike Enk	U.S. Forest Service - Lewis & Clark NF	Reptiles, amphibians
John Ensign	Montana Department of Fish, Wildlife & Parks	Mammals
Glenn Erickson	Montana Department of Fish, Wildlife & Parks	Ungulate hexagons
Charlie Eustace	Montana Department of Fish, Wildlife & Parks	Mammals
Pat Farmer	WESTECH	Rodent, small carnivore hexagons
John Firebaugh	Montana Department of Fish, Wildlife & Parks	Mammals
Dennis Flath	Montana Department of Fish, Wildlife & Parks	Mammals, reptiles, amphibians; rodent, bat, and carnivore hexagons
Brian Giddings	Montana Department of Fish, Wildlife & Parks	Carnivore hexagons
Steve Gniadek	National Park Service	Birds, mammals
Don Godtel	U.S. Forest Service - Lewis & Clark NF	Birds, mammals, reptiles, amphibians
John Grensten	Bureau of Land Management - Phillips Resource Area	Mammals

Name	*Affiliation*	*Taxonomic review*
Sallie Hejl	U.S. Forest Service - Intermountain Research Station	Birds
Colin Henderson	University of Montana	Mammals
Bob Henderson	Montana Department of Fish, Wildlife & Parks	Mammals
Paul Hendricks	Montana Natural Heritage Program	Birds, mammals
John Hoffland	U.S. Forest Service - Northern Region	Birds
Denver Holt	Owl Research Institute	Birds
Richard L. Hutto	University of Montana	Birds
Jamie Jonkel	Montana Department of Fish, Wildlife & Parks	Mammals
Craig Knowles	FaunaWest	Prairie dog hexagons
John Malloy	Montana Cooperative Wildlife Research Unit	Mammals
Harriet Marble	Montana Bird Records Committee	Birds
Jeff Marks	Montana Cooperative Wildlife Research Unit	Birds
Steve Martin	U.S. Fish & Wildlife Service	Birds
Randy Matchett	U.S. Fish & Wildlife Service	Birds, mammals, reptiles, amphibians
Clint McCarthy	U.S. Forest Service - Custer NF	Birds
Terry McEneaney	National Park Service	Birds
Bob Moore	Prof. Emeritus, Montana State University	Rodent hexagons
Ted Nordhagen	Private	Birds
Harvey Nyberg	Montana Department of Fish, Wildlife & Parks	Birds
Alison Perkins	Montana Cooperative Wildlife Research Unit	Birds
Dwain M. Prellwitz	U.S. Fish & Wildlife Service	Birds
Mike Rabenberg	U.S. Fish & Wildlife Service	Birds
Sue Reel	U.S. Forest Service - Lolo NF	Birds
Gregory L. Risdahl	Montana Department of Fish, Wildlife & Parks	Mammals
Andy Sheldon	University of Montana	Reptiles, amphibians
Mike Thompson	Montana Department of Fish, Wildlife & Parks	Mammals
Kirwin Werner	Private	Reptiles, amphibians
Jim Williams	Montana Department of Fish, Wildlife & Parks	Carnivore hexagons
Vita Wright	U.S. Forest Service - Aldo Leopold Wilderness Research Institute	Birds
Jock Young	University of Montana	Birds

PYGMY NUTHATCH

Sitta pygmaea

State rank	S4	Element code	ABPAZ01030
Global rank	G5	Modeled by	P. McLaughlin
MTNHP status	--		



Predicted habitat: 305,123 ha, 0.80% of state.

State range

Breeding confirmed only for northwestern and west-central Montana, but indirect evidence occurs across southern Montana. Seen least frequently from central through eastern Montana. Winter records are primarily for northwestern and west-central Montana (Montana Bird Distribution Committee 1996).

Habitat description

A gregarious resident, the pygmy nuthatch generally is associated with ponderosa pine (Norris 1958, Manolis 1977, Diem and Zeveloff 1980, Ehrlich et al. 1988, Hejl et al. 1995, T. McEneaney, pers. comm.). However, Hejl and Woods (1991) studied bird assemblages in old-growth and rotation-aged Douglas-fir / ponderosa pine stands of western Montana and adjacent Idaho and found no pygmy nuthatches in 32 study sites. In western Montana it is found in cottonwood / ponderosa pine forest types (S. Hejl, pers. comm.). Although there are no confirmed breeding records in the Custer National Forest that is within the Greater Yellowstone Ecosystem, the species may breed in mixed ponderosa pine forest there; it may commonly move locally into and out of the area (Hutto *in* Clark et al. 1989). The pygmy nuthatch prefers mature to old-growth stands that are fairly open: <70% canopy coverage (Aney 1984, Hutto *in* Clark et al. 1989) down to 10% canopy coverage (Norris 1958). Territories are maintained year-round (Ehrlich et al. 1988); their sizes range from 3.2 acres to 4.9 acres (Norris 1958, Hutto *in* Clark et al. 1989). The species relies almost exclusively on live ponderosa pine for foraging during the nonbreeding season (Stallcup 1968), with pine seeds comprising ~65% of its diet in the course of 1 year (Norris 1958). In Arizona, breeding pair and pairs with "helpers" fledged significantly more young in habitats with the greatest floral diversity and structural maturity (basal area, tree

diameter, and tree height) than those in other habitats (Sydeman et al. 1988). Storer (1977) found that pygmy nuthatch nest sites were generally devoid of deciduous undergrowth, except in ravines. Scott (1979) and Scott and Oldemeyer (1983) found that pygmy nuthatch abundance decreased significantly in a forest plot that was selectively harvested, despite the availability of aspen snags. This nuthatch relies heavily on ponderosa pine snags for nest sites. The availability of old-growth ponderosa pine may determine the viability of the pygmy nuthatch population (Diem and Zeveloff 1980, Hutto *in* Clark et al. 1989).

Model assumptions & caveats

The pygmy nuthatch generally nests in dead or decaying ponderosa pine (Bent 1948, McEllin 1979), preferably in large snags, from 45cm DBH to > 50cm DBH (Raphael 1980, Clark et al. 1989). In winter, it roosts communally and relies on the availability of cavities for survival; a single snag is important to a large population (Knorr 1957, Sydeman and Guntert 1983). Neither size class nor snag presence is available for this model. Breeding habitat is modeled, with the assumption that winter habitat is included within model parameters. Low (10-39%) canopy closure is selected for ponderosa pine (4206); mixed forest riparian (6130) is included in its entirety.

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Montana Gap Analysis: Modeling Layers for Birds

P. McLaughlin

Sitta pygmaea

PYGMY NUTHATCH

Element Code ABPAZ01030

Modeled? ☒ Y ☐ N

Primary Layers Used = 2

Model Description

Select cover types; apply canopy closure to 4206 only; include 6130 in entirety.

Model Status breeding

Name of AML bird3model.aml

Name of Loop landcov_canopy.list

Output Grid BPAZ0103

Input Layers

Cover Type	☒ 1
Canopy Closure	☒ 1
< 40% (L)	☒ 1
40-70% (M)	☐ 1
> 70% (H)	☐ 1
Elevation	☐ 1
Aspect	☐ 1
Slope	☐ 1
Hydro Buffer	☐ 1

SELECT

& BUFFER BY

Elevation Contours

FEET		METERS
<1969	0	<600
1970-2461	0	601-750
2462-2953	0	751-900
2954-3445	0	901-1050
3446-3937	0	1051-1200
3938-4429	0	1201-1350
4430-4921	0	1351-1500
4922-5413	0	1501-1650
5414-5906	0	1651-1800
5907-6398	0	1801-1950
6399-6890	0	1951-2100
6891-7382	0	2101-2250
7383-7874	0	2251-2400
7875-8366	0	2401-2550
8367-8858	0	2551-2700
8859-9350	0	2701-2850
9351-9843	0	2851-3000
9844-10335	0	3001-3150
10336-10827	0	3151-3300
10828-11319	0	3301-3450
11320-11811	0	3451-3600
11812-12303	0	3601-3750
12304-12795	0	3751-3900

Land Cover Types

URBAN	1100	0
DRY AGRICULTURE	2010	0
IRRIGATED AGRICULTURE	2020	0
ALTERED HERBACEOUS	3110	0
V. LOW-LOW COVER GRASS	3130	0
LOW-MEDIUM GRASS	3150	0
MEDIUM-HIGH GRASS	3170	0
PARKLAND/MEADOW	3180	0
MESIC SHRUB	3200	0
XERIC SHRUB	3300	0
SILVER SAGE	3309	0
SALT FLATS	3310	0
SAGEBRUSH	3350	0
MESIC SHRUB-GRASSLAND	3510	0
XERIC SHRUB-GRASSLAND	3520	0
LOW COVER FOREST	4000	0
MIXED BROADLEAF	4140	0
LODGEPOLE PINE	4203	0
LIMBER PINE	4205	0
PONDEROSA PINE	4206	1
GRAND FIR	4207	0
WESTERN RED CEDAR	4210	0
WESTERN HEMLOCK	4211	0
DOUGLAS-FIR	4212	0
ROCKY MOUNTAIN JUNIPER	4214	0
WESTERN LARCH	4215	0
UTAH JUNIPER	4216	0
DOUGLAS-FIR/LODGEPOLE	4223	0
MIXED WHITEBARK PINE	4260	0
MIXED SUBALPINE FOREST	4270	0
MIXED MESIC FOREST	4280	0
MIXED XERIC FOREST	4290	0
MIXED BROADLEAF/CONIFER	4300	0
BURN	4400	0
WATER	5000	0
CONIFER RIPARIAN	6110	0
BROADLEAF RIPARIAN	6120	0
MIXED FOREST RIPARIAN	6130	1
GRAMINOID/FORB RIPARIAN	6200	0
SHRUB RIPARIAN	6300	0
MIXED RIPARIAN	6400	0
EXPOSED ROCK	7300	0
MINES & QUARRIES	7500	0
BADLANDS	7600	0
MISSOURI BREAKS	7604	0
MIXED BARREN	7800	0
ALPINE MEADOW	8100	0
SNOW	9100	0

Appendix 3.4. For 423 terrestrial vertebrates, correspondence of predicted distributions with checklists for 14 wildlife areas. M = match, C = commission, O = omission, A = taxonomic group absent from checklist, X = species neither predicted to occur, nor documented for wildlife area. $\%N_c$ = percent commission, $\%N_o$ = percent omission, $\%N_m$ = percent correct.

Element Code ***Scientific Name*** **COMMON NAME**	**BL**	**BC**	**BR**	**BO**	**CR**	**FO**	**GP**	**LM**	**ML**	**NP**	**RR**	**FR**	**SR**	**PB**	**$\%N_c$**	**$\%N_o$**	**$\%N_m$**
AAAAA01080 *Ambystoma macrodactylum* LONG-TOED SALAMANDER	X	M	A	A	X	A	A	A	X	A	X	M	A	C	33.33	0.00	66.67
AAAAA01140 *Ambystoma tigrinum* TIGER SALAMANDER	M	X	A	A	M	A	A	A	M	A	M	O	A	M	0.00	16.67	83.33
AAAAD12270 *Plethodon idahoensis* COEUR D'ALENE SALAMANDER	X	X	A	A	X	A	A	A	X	A	X	M	A	X	0.00	0.00	100.00
AAABA01010 *Ascaphus truei* TAILED FROG	X	C	A	A	X	A	A	A	X	A	X	M	A	C	66.67	0.00	33.33
AAABB01030 *Bufo boreas* WESTERN TOAD	X	M	A	A	X	A	A	A	X	A	M	M	A	M	0.00	0.00	100.00
AAABB01050 *Bufo cognatus* GREAT PLAINS TOAD	C	X	A	A	M	A	A	A	C	A	X	X	A	X	66.67	0.00	33.33
AAABB01080 *Bufo hemiophrys* CANADIAN TOAD	X	X	A	A	X	A	A	A	C	A	X	X	A	X	100.00	0.00	0.00
AAABB01180 *Bufo woodhousii* WOODHOUSE'S TOAD	C	X	A	A	M	A	A	A	C	A	X	X	A	X	66.67	0.00	33.33
AAABC05070 *Pseudacris triseriata* WESTERN CHORUS FROG	M	X	A	A	M	A	A	A	C	A	M	X	A	M	20.00	0.00	80.00
AAABC05100 *Pseudacris regilla* PACIFIC CHORUS FROG	X	C	A	A	X	A	A	A	X	A	X	C	A	X	100.00	0.00	0.00
AAABF02010 *Spea bombifrons* PLAINS SPADEFOOT	C	X	A	A	M	A	A	A	C	A	X	X	A	C	75.00	0.00	25.00
AAABH01070 *Rana catesbeiana* BULLFROG	X	X	A	A	X	A	A	A	X	A	X	M	A	X	0.00	0.00	100.00

BL = Benton Lake National Wildlife Refuge (NWR); BC = Blackfoot-Clearwater Wildlife Management Area (WMA); BR = National Bison Range; BO = Bowdoin NWR; CR = Charles M. Russell NWR; FO = Freezout Lake WMA; GP = Glacier National Park; LM = Lee Metcalf NWR; ML = Medicine Lake NWR; NP = Ninepipe/Pablo NWR; RR = Red Rock Lakes NWR; FR = Flathead Indian Reservation; SR = Swan River NWR; PB = Pine Butte Swamp Preserve. NOTE: Of 425 vertebrates modeled, 2 were not considered for validation because their occurrence in the state has not been confirmed, Idaho giant salamander (*Dicamptodon aterrimus)* and wood frog (*Rana sylvatica*).

Appendix 3.4 *continued*. For 423 terrestrial vertebrates, correspondence of predicted distributions with checklists for 14 wildlife areas. M = match, C = commission, O = omission, A = taxonomic group absent from checklist, X = species neither predicted to occur, nor documented for wildlife area. % N_c = percent commission, % N_o = percent omission, %N_m = percent correct.

Element Code ***Scientific Name*** **COMMON NAME**	**BL**	**BC**	**BR**	**BO**	**CR**	**FO**	**GP**	**LM**	**ML**	**NP**	**RR**	**FR**	**SR**	**PB**	**%N_c**	**%N_o**	**%N_m**
AAABH01170 *Rana pipiens* NORTHERN LEOPARD FROG	M	C	A	A	M	A	A	A	M	A	C	M	A	M	28.57	0.00	71.43
AAABH01290 *Rana luteiventris* COLUMBIA SPOTTED FROG	X	M	A	A	X	A	A	A	X	A	M	M	A	M	0.00	0.00	100.00
ARAAB01010 *Chelydra serpentina* SNAPPING TURTLE	X	X	A	A	M	A	A	A	M	A	X	X	A	X	0.00	0.00	100.00
ARAAD01010 *Chrysemys picta* PAINTED TURTLE	M	M	A	A	M	A	A	A	M	A	X	M	A	C	16.67	0.00	83.33
ARAAG01030 *Apalone spinifera* SPINY SOFTSHELL	X	X	A	A	M	A	A	A	X	A	X	X	A	X	0.00	0.00	100.00
ARACB01010 *Elgaria coerulea* NORTHERN ALLIGATOR LIZARD	X	C	A	A	X	A	A	A	X	A	X	M	A	X	50.00	0.00	50.00
ARACF12030 *Phrynosoma douglasii* SHORT-HORNED LIZARD	M	X	A	A	M	A	A	A	C	A	X	X	A	M	25.00	0.00	75.00
ARACF14030 *Sceloporus graciosus* SAGEBRUSH LIZARD	X	X	A	A	M	A	A	A	X	A	X	X	A	X	0.00	0.00	100.00
ARACH01110 *Eumeces skiltonianus* WESTERN SKINK	X	C	A	A	X	A	A	A	X	A	X	M	A	X	50.00	0.00	50.00
ARADA01010 *Charina bottae* RUBBER BOA	X	M	A	A	X	A	A	A	X	A	C	M	A	C	50.00	0.00	50.00
ARADB07010 *Coluber constrictor* RACER	M	C	A	A	M	A	A	A	C	A	C	M	A	C	57.14	0.00	42.86
ARADB17010 *Heterodon nasicus* WESTERN HOGNOSE SNAKE	C	X	A	A	M	A	A	A	M	A	X	X	A	C	50.00	0.00	50.00

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Appendix 3.4 *continued*. For 423 terrestrial vertebrates, correspondence of predicted distributions with checklists for 14 wildlife areas. M = match, C = commission, O = omission, A = taxonomic group absent from checklist, X = species neither predicted to occur, nor documented for wildlife area. % N_c = percent commission, % N_o = percent omission, %N_m = percent correct.

Element Code *Scientific Name* **COMMON NAME**	**BL**	**BC**	**BR**	**BO**	**CR**	**FO**	**GP**	**LM**	**ML**	**NP**	**RR**	**FR**	**SR**	**PB**	**%N_c**	**%N_o**	**%N_m**
ARADB19050 *Lampropeltis triangulum* MILK SNAKE	C	X	A	A	M	A	A	A	X	A	X	X	A	X	50.00	0.00	50.00
ARADB26010 *Pituophis melanoleucus* PINE OR GOPHER SNAKE	M	C	A	A	M	A	A	A	M	A	C	M	A	M	28.57	0.00	71.43
ARADB36050 *Thamnophis elegans* WESTERN TERRESTRIAL GARTER SNAKE	M	C	A	A	C	A	A	A	X	A	M	M	A	M	33.33	0.00	66.67
ARADB36100 *Thamnophis radix* PLAINS GARTER SNAKE	M	X	A	A	C	A	A	A	M	A	X	X	A	C	50.00	0.00	50.00
ARADB36130 *Thamnophis sirtalis* COMMON GARTER SNAKE	C	M	A	A	M	A	A	A	C	A	C	M	A	M	42.86	0.00	57.14
ARADB47010 *Liochlorophis vernalis* SMOOTH GREEN SNAKE	X	X	A	A	C	A	A	A	M	A	X	X	A	X	50.00	0.00	50.00
ARADE02120 *Crotalus viridis* WESTERN RATTLESNAKE	M	C	A	A	M	A	A	A	C	A	C	M	A	C	57.14	0.00	42.86
ABNBA01030 *Gavia immer* COMMON LOON	O	M	X	M	M	O	M	X	O	M	O	M	M	X	0.00	36.36	63.64
ABNCA02010 *Podilymbus podiceps* PIED-BILLED GREBE	O	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	14.29	85.71
ABNCA03010 *Podiceps auritus* HORNED GREBE	O	C	X	M	M	M	M	O	M	M	O	M	M	C	15.38	23.08	61.54
ABNCA03020 *Podiceps grisegena* RED-NECKED GREBE	O	M	O	X	X	M	M	M	O	M	O	M	M	M	0.00	33.33	66.67
ABNCA03030 *Podiceps nigricollis* EARED GREBE	M	C	O	M	M	M	M	M	M	M	M	M	M	C	14.29	7.14	78.57

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Element Code ***Scientific Name*** **COMMON NAME**	**BL**	**BC**	**BR**	**BO**	**CR**	**FO**	**GP**	**LM**	**ML**	**NP**	**RR**	**FR**	**SR**	**PB**	**%N_c**	**%N_o**	**%N_m**
ABNCA04010 *Aechmophorus occidentalis* WESTERN GREBE	O	C	O	M	M	M	M	M	M	M	M	M	M	C	14.29	14.29	71.43
ABNCA04020 *Aechmophorus clarkii* CLARK'S GREBE	X	X	X	M	X	M	O	X	C	X	O	M	X	X	16.67	33.33	50.00
ABNFC01010 *Pelecanus erythrorhynchos* AMERICAN WHITE PELICAN	O	X	X	M	O	M	X	X	M	O	O	O	X	O	0.00	66.67	33.33
ABNFD01020 *Phalacrocorax auritus* DOUBLE-CRESTED CORMORANT	M	O	O	M	M	M	M	M	M	M	M	M	C	M	7.14	14.29	78.57
ABNGA01020 *Botaurus lentiginosus* AMERICAN BITTERN	M	C	O	M	M	M	M	M	M	M	M	M	M	M	7.14	7.14	85.71
ABNGA04010 *Ardea herodias* GREAT BLUE HERON	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNGA11010 *Nycticorax nycticorax* BLACK-CROWNED NIGHT-HERON	M	X	X	M	O	M	M	C	M	O	M	M	X	M	9.09	18.18	72.73
ABNGE02020 *Plegadis chihi* WHITE-FACED IBIS	O	X	X	M	X	M	X	X	O	O	O	O	X	C	12.50	62.50	25.00
ABNJB02010 *Cygnus columbianus* TUNDRA SWAN	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNJB02030 *Cygnus buccinator* TRUMPETER SWAN	X	C	X	X	X	O	C	X	X	X	M	C	X	C	66.67	16.67	16.67
ABNJB03040 *Anser albifrons* GREATER WHITE-FRONTED GOOSE	M	X	X	M	M	M	M	M	M	M	M	M	X	C	9.09	0.00	90.91
ABNJB04010 *Chen caerulescens* SNOW GOOSE	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86

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ABNJB04020 *Chen rossii* ROSS'S GOOSE	M	C	X	M	M	M	M	M	M	M	M	M	M	C	15.38	0.00	84.62
ABNJB05030 *Branta canadensis* CANADA GOOSE	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNJB09010 *Aix sponsa* WOOD DUCK	M	M	O	M	C	M	M	M	M	M	O	M	M	M	7.14	14.29	78.57
ABNJB10010 *Anas crecca* GREEN-WINGED TEAL	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNJB10060 *Anas platyrhynchos* MALLARD	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNJB10110 *Anas acuta* NORTHERN PINTAIL	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNJB10130 *Anas discors* BLUE-WINGED TEAL	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNJB10140 *Anas cyanoptera* CINNAMON TEAL	M	M	O	M	M	M	M	C	M	M	M	M	M	M	7.14	7.14	85.71
ABNJB10150 *Anas clypeata* NORTHERN SHOVELER	M	M	O	M	M	M	M	C	M	M	M	M	M	M	7.14	7.14	85.71
ABNJB10160 *Anas strepera* GADWALL	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNJB10180 *Anas americana* AMERICAN WIGEON	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNJB11020 *Aythya valisineria* CANVASBACK	M	C	X	M	M	M	C	M	M	M	M	M	M	C	23.08	0.00	76.92

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ABNJB11030 *Aythya americana* REDHEAD	M	M	O	M	M	M	C	M	M	M	M	M	M	C	14.29	7.14	78.57
ABNJB11040 *Aythya collaris* RING-NECKED DUCK	M	M	X	O	X	M	M	C	O	M	M	M	M	M	8.33	16.67	75.00
ABNJB11060 *Aythya marila* GREATER SCAUP	M	C	X	X	X	C	M	M	X	C	M	M	C	C	50.00	0.00	50.00
ABNJB11070 *Aythya affinis* LESSER SCAUP	M	M	X	M	M	M	M	C	M	M	M	M	M	M	7.69	0.00	92.31
ABNJB15010 *Histrionicus histrionicus* HARLEQUIN DUCK	X	C	C	X	X	X	M	C	X	C	X	M	C	M	62.50	0.00	37.50
ABNJB18010 *Bucephala clangula* COMMON GOLDENEYE	M	M	O	M	M	M	M	M	X	M	O	M	M	M	0.00	15.38	84.62
ABNJB18020 *Bucephala islandica* BARROW'S GOLDENEYE	O	M	O	X	X	M	M	C	X	C	M	M	M	M	18.18	18.18	63.64
ABNJB18030 *Bucephala albeola* BUFFLEHEAD	M	M	X	M	M	M	M	M	M	M	M	M	M	C	7.69	0.00	92.31
ABNJB20010 *Lophodytes cucullatus* HOODED MERGANSER	O	M	O	O	X	O	M	M	X	M	C	M	M	X	9.09	36.36	54.55
ABNJB21010 *Mergus merganser* COMMON MERGANSER	M	M	O	C	M	C	M	M	X	M	M	M	M	M	15.38	7.69	76.92
ABNJB21020 *Mergus serrator* RED-BREASTED MERGANSER	O	C	X	M	M	M	M	M	M	M	M	C	M	X	16.67	8.33	75.00
ABNJB22010 *Oxyura jamaicensis* RUDDY DUCK	M	M	O	M	M	M	M	M	M	M	M	M	M	C	7.14	7.14	85.71

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ABNKA02010 *Cathartes aura* TURKEY VULTURE	C	M	M	X	M	C	C	M	O	C	M	M	C	C	46.15	7.69	46.15
ABNKC01010 *Pandion haliaetus* OSPREY	M	M	M	X	M	C	M	M	X	M	M	M	M	M	8.33	0.00	91.67
ABNKC10010 *Haliaeetus leucocephalus* BALD EAGLE	M	M	M	O	C	C	M	M	X	M	M	M	M	M	15.38	7.69	76.92
ABNKC11010 *Circus cyaneus* NORTHERN HARRIER	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNKC12020 *Accipiter striatus* SHARP-SHINNED HAWK	C	M	M	O	M	C	M	M	O	M	M	M	M	M	14.29	14.29	71.43
ABNKC12040 *Accipiter cooperii* COOPER'S HAWK	C	M	M	X	M	C	M	M	X	M	M	M	C	M	25.00	0.00	75.00
ABNKC12060 *Accipiter gentilis* NORTHERN GOSHAWK	X	C	M	X	C	C	M	C	X	X	M	M	C	M	50.00	0.00	50.00
ABNKC19050 *Buteo platypterus* BROAD-WINGED HAWK	X	C	C	M	M	C	C	C	X	C	C	C	C	X	81.82	0.00	18.18
ABNKC19070 *Buteo swainsoni* SWAINSON'S HAWK	M	C	M	M	M	M	M	C	M	M	M	M	C	M	21.43	0.00	78.57
ABNKC19110 *Buteo jamaicensis* RED-TAILED HAWK	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNKC19120 *Buteo regalis* FERRUGINOUS HAWK	M	X	M	M	M	C	M	C	M	M	M	M	C	M	23.08	0.00	76.92
ABNKC19130 *Buteo lagopus* ROUGH-LEGGED HAWK	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00

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ABNKC22010 *Aquila chrysaetos* GOLDEN EAGLE	M	M	M	M	M	C	M	C	M	M	M	M	C	M	21.43	0.00	78.57
ABNKD06020 *Falco sparverius* AMERICAN KESTREL	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNKD06030 *Falco columbarius* MERLIN	M	M	M	C	M	C	M	C	M	C	M	M	M	M	28.57	0.00	71.43
ABNKD06070 *Falco peregrinus* PEREGRINE FALCON	O	C	M	O	C	X	C	M	O	M	M	M	C	M	30.77	23.08	46.15
ABNKD06080 *Falco rusticolus* GYRFALCON	M	C	M	C	M	M	C	C	C	C	M	M	C	M	50.00	0.00	50.00
ABNKD06090 *Falco mexicanus* PRAIRIE FALCON	M	C	M	M	M	M	M	M	M	M	M	M	O	M	7.14	7.14	85.71
ABNLC01010 *Perdix perdix* GRAY PARTRIDGE	M	M	M	M	M	M	C	M	M	M	M	M	X	M	7.69	0.00	92.31
ABNLC03010 *Alectoris chukar* CHUKAR	X	C	C	X	X	X	X	X	X	C	X	M	X	X	75.00	0.00	25.00
ABNLC07010 *Phasianus colchicus* RING-NECKED PHEASANT	O	C	M	M	M	M	C	M	O	M	X	M	M	O	15.38	23.08	61.54
ABNLC09010 *Falcipennis canadensis* SPRUCE GROUSE	X	M	C	X	X	X	M	X	X	X	X	M	X	C	40.00	0.00	60.00
ABNLC09020 *Dendragapus obscurus* BLUE GROUSE	C	M	M	X	X	C	M	X	X	X	M	M	O	M	22.22	11.11	66.67
ABNLC10030 *Lagopus leucurus* WHITE-TAILED PTARMIGAN	X	C	X	X	X	X	M	X	X	X	X	M	X	X	33.33	0.00	66.67

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ABNLC11010 *Bonasa umbellus* RUFFED GROUSE	C	M	M	X	C	C	M	M	X	C	M	M	M	M	33.33	0.00	66.67
ABNLC12010 *Centrocercus urophasianus* SAGE GROUSE	X	X	X	M	M	X	X	X	X	X	M	X	X	X	0.00	0.00	100.00
ABNLC13030 *Tympanuchus phasianellus* SHARP-TAILED GROUSE	M	C	X	M	M	M	C	X	M	X	M	X	C	M	30.00	0.00	70.00
ABNLC13033 *Tympanuchus phasianellus columbianus* COLUMBIAN SHARP-TAILED GROUSE	X	C	C	X	X	X	M	C	X	C	X	M	C	X	71.43	0.00	28.57
ABNLC14010 *Meleagris gallopavo* WILD TURKEY	C	C	C	C	M	C	C	C	X	C	X	M	C	M	75.00	0.00	25.00
ABNLC21020 *Colinus virginianus* NORTHERN BOBWHITE	X	X	C	X	X	X	C	X	X	C	X	C	X	X	100.00	0.00	0.00
ABNME01010 *Coturnicops noveboracensis* YELLOW RAIL	X	X	X	C	X	X	X	X	M	X	O	X	X	X	33.33	33.33	33.33
ABNME05030 *Rallus limicola* VIRGINIA RAIL	M	O	O	M	M	M	C	M	M	M	M	M	X	C	15.38	15.38	69.23
ABNME08020 *Porzana carolina* SORA	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNME14020 *Fulica americana* AMERICAN COOT	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNMK01010 *Grus canadensis* SANDHILL CRANE	O	M	X	M	X	C	C	M	X	X	M	O	C	M	30.00	20.00	50.00
ABNMK01030 *Grus americana* WHOOPING CRANE	X	X	X	C	C	X	X	X	M	X	M	X	X	O	40.00	20.00	40.00

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ABNNB02010 *Pluvialis squatarola* BLACK-BELLIED PLOVER	M	C	O	M	M	M	M	M	M	M	M	M	C	C	21.43	7.14	71.43
ABNNB03060 *Charadrius semipalmatus* SEMIPALMATED PLOVER	M	M	O	M	M	M	C	M	M	M	M	M	C	C	21.43	7.14	71.43
ABNNB03070 *Charadrius melodus* PIPING PLOVER	X	X	X	M	M	X	X	X	M	X	X	X	X	X	0.00	0.00	100.00
ABNNB03090 *Charadrius vociferus* KILLDEER	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNNB03100 *Charadrius montanus* MOUNTAIN PLOVER	X	X	X	C	M	C	X	X	X	X	X	X	X	X	66.67	0.00	33.33
ABNND01010 *Himantopus mexicanus* BLACK-NECKED STILT	M	X	X	M	X	M	X	O	X	X	O	X	X	C	16.67	33.33	50.00
ABNND02010 *Recurvirostra americana* AMERICAN AVOCET	M	C	O	M	M	M	C	M	M	O	M	M	C	C	28.57	14.29	57.14
ABNNF01020 *Tringa melanoleuca* GREATER YELLOWLEGS	M	C	O	M	M	M	M	M	M	M	M	M	M	C	14.29	7.14	78.57
ABNNF01030 *Tringa flavipes* LESSER YELLOWLEGS	M	M	O	M	M	M	M	M	M	M	M	M	M	C	7.14	7.14	85.71
ABNNF01070 *Tringa solitaria* SOLITARY SANDPIPER	M	C	O	M	M	M	M	M	M	M	M	M	M	M	7.14	7.14	85.71
ABNNF02010 *Catoptrophorus semipalmatus* WILLET	M	X	X	M	M	M	M	O	M	O	M	M	C	M	8.33	16.67	75.00
ABNNF04020 *Actitis macularia* SPOTTED SANDPIPER	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86

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ABNNF06010 *Bartramia longicauda* UPLAND SANDPIPER	M	C	C	M	M	M	C	X	M	C	O	M	X	M	33.33	8.33	58.33
ABNNF07070 *Numenius americanus* LONG-BILLED CURLEW	O	M	M	M	M	M	C	M	M	M	O	M	C	O	14.29	21.43	64.29
ABNNF08040 *Limosa fedoa* MARBLED GODWIT	M	X	O	M	M	M	C	O	M	O	M	O	C	M	15.38	30.77	53.85
ABNNF11040 *Calidris pusilla* SEMIPALMATED SANDPIPER	M	C	O	M	M	M	C	M	M	M	M	M	C	C	28.57	7.14	64.29
ABNNF11050 *Calidris mauri* WESTERN SANDPIPER	M	C	X	M	M	M	M	M	M	M	M	M	C	C	23.08	0.00	76.92
ABNNF11100 *Calidris minutilla* LEAST SANDPIPER	M	C	O	M	M	M	M	M	M	M	M	M	M	C	14.29	7.14	78.57
ABNNF11110 *Calidris fuscicollis* WHITE-RUMPED SANDPIPER	X	X	X	M	M	X	X	X	M	X	O	X	X	X	0.00	25.00	75.00
ABNNF11120 *Calidris bairdii* BAIRD'S SANDPIPER	M	C	O	M	M	M	M	M	M	M	M	M	C	C	21.43	7.14	71.43
ABNNF11130 *Calidris melanotos* PECTORAL SANDPIPER	M	C	X	M	M	M	M	M	M	O	M	M	C	C	23.08	7.69	69.23
ABNNF11190 *Calidris himantopus* STILT SANDPIPER	M	C	X	M	M	M	C	M	M	X	C	M	C	C	41.67	0.00	58.33
ABNNF16010 *Limnodromus griseus* SHORT-BILLED DOWITCHER	O	X	X	C	C	C	C	C	M	O	X	C	X	C	70.00	20.00	10.00
ABNNF16020 *Limnodromus scolopaceus* LONG-BILLED DOWITCHER	M	M	O	M	M	M	M	M	M	M	M	M	M	C	7.14	7.14	85.71

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ABNNF18010 *Gallinago gallinago* COMMON SNIPE	M	M	O	M	M	M	C	M	M	O	M	M	M	M	7.14	14.29	78.57
ABNNF20010 *Phalaropus tricolor* WILSON'S PHALAROPE	M	M	O	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABNNF20020 *Phalaropus lobatus* RED-NECKED PHALAROPE	M	C	O	M	M	M	M	M	M	M	M	M	C	C	21.43	7.14	71.43
ABNNM03020 *Larus pipixcan* FRANKLIN'S GULL	M	X	X	M	O	M	M	X	M	O	M	O	C	M	9.09	27.27	63.64
ABNNM03050 *Larus philadelphia* BONAPARTE'S GULL	M	C	X	M	M	M	M	M	M	M	M	M	C	C	23.08	0.00	76.92
ABNNM03100 *Larus delawarensis* RING-BILLED GULL	O	C	O	M	M	M	M	X	M	O	O	M	O	O	7.69	46.15	46.15
ABNNM03110 *Larus californicus* CALIFORNIA GULL	M	X	O	M	M	M	M	X	M	O	M	M	O	O	0.00	33.33	66.67
ABNNM08020 *Sterna caspia* CASPIAN TERN	X	X	X	M	M	M	X	O	M	X	O	M	X	X	0.00	28.57	71.43
ABNNM08070 *Sterna hirundo* COMMON TERN	M	O	O	M	M	M	X	O	M	O	M	M	X	X	0.00	36.36	63.64
ABNNM08090 *Sterna forsteri* FORSTER'S TERN	M	X	O	X	M	M	C	O	M	O	M	M	O	C	16.67	33.33	50.00
ABNNM08100 *Sterna antillarum* LEAST TERN	X	X	X	X	C	X	X	X	C	O	X	X	X	X	66.67	33.33	0.00
ABNNM10020 *Chlidonias niger* BLACK TERN	M	M	O	M	M	M	M	O	M	O	M	M	M	C	7.14	21.43	71.43

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ABNPB01010 *Columbia livia* ROCK DOVE	M	M	C	M	M	M	C	M	M	C	X	M	X	M	25.00	0.00	75.00
ABNPB04040 *Zenaida macroura* MOURNING DOVE	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNRB02010 *Coccyzus erythropthalmus* BLACK-BILLED CUCKOO	M	C	M	M	M	C	C	X	M	C	O	C	C	C	53.85	7.69	38.46
ABNRB02020 *Coccyzus americanus* YELLOW-BILLED CUCKOO	X	X	X	O	X	X	X	X	X	X	C	O	X	X	33.33	66.67	0.00
ABNSA01010 *Tyto alba* BARN OWL	X	X	X	X	X	X	X	C	X	X	X	M	X	X	50.00	0.00	50.00
ABNSB01020 *Otus flammeolus* FLAMMULATED OWL	X	C	C	X	X	C	C	M	X	C	C	M	C	C	80.00	0.00	20.00
ABNSB01030 *Otus asio* EASTERN SCREECH-OWL	C	C	X	M	C	C	X	X	C	X	X	X	X	M	71.43	0.00	28.57
ABNSB01040 *Otus kennicottii* WESTERN SCREECH-OWL	X	C	M	X	X	C	M	M	X	C	M	M	M	C	40.00	0.00	60.00
ABNSB05010 *Bubo virginianus* GREAT HORNED OWL	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNSB06010 *Nyctea scandiaca* SNOWY OWL	M	C	M	M	M	C	M	C	M	M	X	M	C	C	38.46	0.00	61.54
ABNSB07010 *Surnia ulula* NORTHERN HAWK OWL	X	X	X	X	X	X	C	X	X	X	X	C	X	X	100.00	0.00	0.00
ABNSB08010 *Glaucidium gnoma* NORTHERN PYGMY-OWL	C	M	M	X	C	C	M	M	X	C	M	M	M	M	33.33	0.00	66.67

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ABNSB10010 *Athene cunicularia* BURROWING OWL	M	C	M	M	M	M	C	O	M	C	M	M	X	C	30.77	7.69	61.54
ABNSB12020 *Strix varia* BARRED OWL	X	C	M	X	X	X	M	C	X	C	X	M	M	X	42.86	0.00	57.14
ABNSB12040 *Strix nebulosa* GREAT GRAY OWL	X	M	C	X	X	C	M	X	X	X	M	M	X	M	28.57	0.00	71.43
ABNSB13010 *Asio otus* LONG-EARED OWL	M	M	M	M	M	C	M	C	C	C	M	M	C	C	42.86	0.00	57.14
ABNSB13040 *Asio flammeus* SHORT-EARED OWL	M	M	M	M	M	M	M	M	M	M	M	M	C	M	7.14	0.00	92.86
ABNSB15010 *Aegolius funereus* BOREAL OWL	X	C	C	X	X	X	M	X	X	X	C	C	X	C	83.33	0.00	16.67
ABNSB15020 *Aegolius acadicus* NORTHERN SAW-WHET OWL	O	M	M	O	M	C	M	M	X	C	M	C	C	M	30.77	15.38	53.85
ABNTA02020 *Chordeiles minor* COMMON NIGHTHAWK	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABNTA04010 *Phalaenoptilus nuttallii* COMMON POORWILL	X	C	C	X	M	C	X	C	X	C	X	M	X	M	62.50	0.00	37.50
ABNUA01010 *Cypseloides niger* BLACK SWIFT	X	C	M	X	X	X	M	O	X	O	X	M	X	X	16.67	33.33	50.00
ABNUA03010 *Chaetura pelagica* CHIMNEY SWIFT	X	X	X	X	M	X	X	X	X	X	X	X	X	X	0.00	0.00	100.00
ABNUA03020 *Chaetura vauxi* VAUX'S SWIFT	X	C	M	X	X	C	M	M	X	C	X	M	M	M	33.33	0.00	66.67

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ABNUA06010 *Aeronautes saxatalis* WHITE-THROATED SWIFT	X	C	X	X	O	X	C	O	X	X	O	M	O	C	37.50	50.00	12.50
ABNUC45010 *Archilochus colubris* RUBY-THROATED HUMMINGBIRD	X	X	X	M	C	X	X	X	M	X	X	X	X	X	33.33	0.00	66.67
ABNUC45020 *Archilochus alexandri* BLACK-CHINNED HUMMINGBIRD	X	C	M	X	X	X	C	M	X	M	O	M	M	X	25.00	12.50	62.50
ABNUC48010 *Stellula calliope* CALLIOPE HUMMINGBIRD	X	M	M	X	X	C	M	M	X	M	M	M	M	M	10.00	0.00	90.00
ABNUC51020 *Selasphorus rufus* RUFOUS HUMMINGBIRD	X	M	M	X	X	C	M	M	X	M	M	M	M	M	10.00	0.00	90.00
ABNXD01020 *Ceryle alcyon* BELTED KINGFISHER	O	M	M	O	M	X	M	M	M	M	M	M	M	M	0.00	15.38	84.62
ABNYF04010 *Melanerpes lewis* LEWIS'S WOODPECKER	X	M	M	X	C	C	M	M	X	M	M	M	M	M	18.18	0.00	81.82
ABNYF04040 *Melanerpes erythrocephalus* RED-HEADED WOODPECKER	C	C	X	M	M	C	X	X	M	X	M	M	C	C	50.00	0.00	50.00
ABNYF05030 *Sphyrapicus thyroideus* WILLIAMSON'S SAPSUCKER	X	M	C	X	X	C	M	C	X	C	M	M	C	C	60.00	0.00	40.00
ABNYF05040 *Sphyrapicus nuchalis* RED-NAPED SAPSUCKER	C	M	M	X	C	C	C	M	X	C	M	M	C	M	50.00	0.00	50.00
ABNYF07030 *Picoides pubescens* DOWNY WOODPECKER	C	M	M	M	M	C	M	M	C	M	M	M	M	M	21.43	0.00	78.57
ABNYF07040 *Picoides villosus* HAIRY WOODPECKER	C	M	M	M	M	C	M	M	C	C	M	M	M	M	28.57	0.00	71.43

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ABNYF07080 *Picoides tridactylus* THREE-TOED WOODPECKER	X	M	C	X	C	C	M	C	X	C	M	M	C	C	63.64	0.00	36.36
ABNYF07090 *Picoides arcticus* BLACK-BACKED WOODPECKER	X	M	X	X	X	X	M	X	X	X	O	M	X	X	0.00	25.00	75.00
ABNYF10020 *Colaptes auratus* NORTHERN FLICKER	C	M	M	M	M	C	M	M	M	M	M	M	M	M	14.29	0.00	85.71
ABNYF12020 *Dryocopus pileatus* PILEATED WOODPECKER	X	M	M	X	X	C	M	M	X	C	O	M	M	C	30.00	10.00	60.00
ABPAE32010 *Contopus cooperi* OLIVE-SIDED FLYCATCHER	C	M	C	X	C	C	M	M	X	C	M	M	C	M	50.00	0.00	50.00
ABPAE32050 *Contopus sordidulus* WESTERN WOOD-PEWEE	C	M	M	M	M	M	M	M	M	M	M	M	M	M	7.14	0.00	92.86
ABPAE33030 *Empidonax alnorum* ALDER FLYCATCHER	X	C	X	X	X	C	X	X	X	X	X	X	X	M	66.67	0.00	33.33
ABPAE33040 *Empidonax traillii* WILLOW FLYCATCHER	C	M	M	O	M	C	M	M	M	M	M	M	M	M	14.29	7.14	78.57
ABPAE33070 *Empidonax minimus* LEAST FLYCATCHER	C	C	C	M	M	M	M	M	M	C	M	M	C	M	35.71	0.00	64.29
ABPAE33080 *Empidonax hammondii* HAMMOND'S FLYCATCHER	C	C	M	X	C	C	M	C	X	C	M	M	M	M	50.00	0.00	50.00
ABPAE33090 *Empidonax oberholseri* DUSKY FLYCATCHER	C	M	M	X	M	C	M	M	X	C	M	M	M	M	25.00	0.00	75.00
ABPAE33160 *Empidonax occidentalis* CORDILLERAN FLYCATCHER	X	C	M	X	M	X	C	M	X	M	M	M	M	M	20.00	0.00	80.00

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ABPAE35030 *Sayornis saya* SAY'S PHOEBE	M	C	M	M	M	C	M	M	M	C	M	M	C	M	28.57	0.00	71.43
ABPAE52030 *Tyrannus vociferans* CASSIN'S KINGBIRD	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
ABPAE52050 *Tyrannus verticalis* WESTERN KINGBIRD	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPAE52060 *Tyrannus tyrannus* EASTERN KINGBIRD	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPAT02010 *Eremophila alpestris* HORNED LARK	M	C	M	M	M	M	M	C	M	M	M	M	M	C	21.43	0.00	78.57
ABPAU03010 *Tachycineta bicolor* TREE SWALLOW	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPAU03040 *Tachycineta thalassina* VIOLET-GREEN SWALLOW	M	M	M	C	M	M	M	M	C	M	M	M	M	M	14.29	0.00	85.71
ABPAU07010 *Stelgidopteryx serripennis* NORTHERN ROUGH-WINGED SWALLOW	O	C	M	O	M	X	M	M	O	O	M	M	M	O	7.69	38.46	53.85
ABPAU08010 *Riparia riparia* BANK SWALLOW	X	M	M	O	M	O	M	M	O	O	M	M	C	O	7.69	38.46	53.85
ABPAU09010 *Petrochelidon pyrrhonota* CLIFF SWALLOW	O	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	7.14	92.86
ABPAU09030 *Hirundo rustica* BARN SWALLOW	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPAV01010 *Perisoreus canadensis* GRAY JAY	X	C	C	X	X	X	M	C	X	C	M	M	M	M	44.44	0.00	55.56

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ABPAV02010 *Cyanocitta stelleri* STELLER'S JAY	X	C	M	X	X	X	M	X	X	X	M	M	O	M	14.29	14.29	71.43
ABPAV02020 *Cyanocitta cristata* BLUE JAY	C	X	X	M	M	C	C	X	C	X	X	C	X	X	71.43	0.00	28.57
ABPAV07010 *Gymnorhinus cyanocephalus* PINYON JAY	X	X	X	X	M	X	X	X	X	X	C	X	X	X	50.00	0.00	50.00
ABPAV08010 *Nucifraga columbiana* CLARK'S NUTCRACKER	C	C	M	X	M	C	M	M	X	C	M	M	C	M	41.67	0.00	58.33
ABPAV09010 *Pica pica* BLACK-BILLED MAGPIE	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPAV10010 *Corvus brachyrhynchos* AMERICAN CROW	M	M	M	M	M	C	M	M	M	M	M	M	M	M	7.14	0.00	92.86
ABPAV10110 *Corvus corax* COMMON RAVEN	C	M	M	X	M	C	M	M	C	M	M	M	M	M	23.08	0.00	76.92
ABPAW01010 *Poecile atricapillus* BLACK-CAPPED CHICKADEE	C	M	M	M	M	C	M	M	M	M	M	M	M	M	14.29	0.00	85.71
ABPAW01040 *Poecile gambeli* MOUNTAIN CHICKADEE	C	M	M	X	M	C	M	C	X	C	M	M	M	M	33.33	0.00	66.67
ABPAW01060 *Poecile hudsonicus* BOREAL CHICKADEE	X	C	X	X	X	X	M	X	X	X	X	M	X	C	50.00	0.00	50.00
ABPAW01070 *Poecile rufescens* CHESTNUT-BACKED CHICKADEE	X	C	C	X	X	X	M	C	X	C	X	M	M	X	57.14	0.00	42.86
ABPAZ01010 *Sitta canadensis* RED-BREASTED NUTHATCH	M	M	M	O	M	C	M	M	X	C	M	M	M	M	15.38	7.69	76.92

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ABPAZ01020 *Sitta carolinensis* WHITE-BREASTED NUTHATCH	C	M	M	X	C	C	M	M	X	C	O	M	M	C	41.67	8.33	50.00
ABPAZ01030 *Sitta pygmaea* PYGMY NUTHATCH	X	C	M	X	X	X	C	M	X	C	O	M	C	X	50.00	12.50	37.50
ABPBA01010 *Certhia americana* BROWN CREEPER	X	C	M	X	X	C	M	M	O	C	M	M	M	M	27.27	9.09	63.64
ABPBG03010 *Salpinctes obsoletus* ROCK WREN	M	M	M	M	M	C	M	C	C	C	M	M	X	M	30.77	0.00	69.23
ABPBG04010 *Catherpes mexicanus* CANYON WREN	X	C	C	X	X	X	X	C	X	C	O	M	X	X	66.67	16.67	16.67
ABPBG09010 *Troglodytes aedon* HOUSE WREN	M	M	M	M	M	M	M	M	M	M	M	M	C	M	7.14	0.00	92.86
ABPBG09050 *Troglodytes troglodytes* WINTER WREN	X	C	C	X	X	C	M	M	X	C	O	M	M	M	40.00	10.00	50.00
ABPBG10020 *Cistothorus palustris* MARSH WREN	M	M	M	M	M	M	C	M	M	M	M	M	M	M	7.14	0.00	92.86
ABPBH01010 *Cinclus mexicanus* AMERICAN DIPPER	X	M	M	X	O	X	M	M	X	C	M	M	M	M	10.00	10.00	80.00
ABPBJ05010 *Regulus satrapa* GOLDEN-CROWNED KINGLET	X	M	M	X	X	C	M	M	X	C	M	M	M	M	20.00	0.00	80.00
ABPBJ05020 *Regulus calendula* RUBY-CROWNED KINGLET	C	M	M	X	X	C	M	M	X	C	M	M	M	M	27.27	0.00	72.73
ABPBJ08010 *Polioptila caerulea* BLUE-GRAY GNATCATCHER	X	X	X	X	X	X	X	X	X	X	X	X	X	X			

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ABPBJ15010 *Sialia sialis* EASTERN BLUEBIRD	X	X	X	X	M	X	X	X	C	X	X	X	X	X	50.00	0.00	50.00
ABPBJ15020 *Sialia mexicana* WESTERN BLUEBIRD	X	M	C	X	X	C	M	C	X	M	O	M	C	C	50.00	10.00	40.00
ABPBJ15030 *Sialia currucoides* MOUNTAIN BLUEBIRD	C	M	M	M	M	C	M	M	C	M	M	M	M	M	21.43	0.00	78.57
ABPBJ16010 *Myadestes townsendi* TOWNSEND'S SOLITAIRE	C	M	M	X	C	C	M	M	X	C	M	M	C	M	41.67	0.00	58.33
ABPBJ18080 *Catharus fuscescens* VEERY	C	M	M	C	C	C	M	M	M	C	M	M	M	M	35.71	0.00	64.29
ABPBJ18090 *Catharus minimus* GRAY-CHEEKED THRUSH	X	X	X	C	M	X	X	X	C	X	X	X	X	X	66.67	0.00	33.33
ABPBJ18100 *Catharus ustulatus* SWAINSON'S THRUSH	C	C	M	O	M	C	M	C	X	M	M	M	M	M	30.77	7.69	61.54
ABPBJ18110 *Catharus guttatus* HERMIT THRUSH	C	M	M	O	M	C	M	C	X	C	M	M	C	C	46.15	7.69	46.15
ABPBJ20170 *Turdus migratorius* AMERICAN ROBIN	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBJ22010 *Ixoreus naevius* VARIED THRUSH	X	M	C	X	X	C	M	C	X	C	X	M	M	M	44.44	0.00	55.56
ABPBK01010 *Dumetella carolinensis* GRAY CATBIRD	M	C	M	M	M	C	M	M	M	M	M	M	M	M	14.29	0.00	85.71
ABPBK04010 *Oreoscoptes montanus* SAGE THRASHER	X	X	C	C	M	X	X	X	X	C	M	M	X	X	50.00	0.00	50.00

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ABPBK06010 *Toxostoma rufum* BROWN THRASHER	M	C	X	M	M	C	C	X	M	X	X	O	C	C	50.00	10.00	40.00
ABPBM02050 *Anthus rubescens* AMERICAN PIPIT	X	C	X	O	O	X	M	X	X	X	M	M	X	O	14.29	42.86	42.86
ABPBM02060 *Anthus spragueii* SPRAGUE'S PIPIT	M	C	X	M	M	M	M	X	M	X	X	O	X	M	11.11	11.11	77.78
ABPBN01010 *Bombycilla garrulus* BOHEMIAN WAXWING	M	C	M	M	M	C	M	M	M	M	M	M	M	M	14.29	0.00	85.71
ABPBN01020 *Bombycilla cedrorum* CEDAR WAXWING	M	M	M	M	M	M	M	M	C	M	M	M	M	M	7.14	0.00	92.86
ABPBR01020 *Lanius excubitor* NORTHERN SHRIKE	M	M	M	M	M	M	M	M	C	M	O	M	M	M	7.14	7.14	85.71
ABPBR01030 *Lanius ludovicianus* LOGGERHEAD SHRIKE	M	C	O	M	M	C	O	X	M	X	O	O	X	M	18.18	36.36	45.45
ABPBT01010 *Sturnus vulgaris* EUROPEAN STARLING	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBW01160 *Vireo solitarius* SOLITARY VIREO	C	C	M	X	C	C	M	M	X	M	M	M	C	M	41.67	0.00	58.33
ABPBW01210 *Vireo gilvus* WARBLING VIREO	C	M	M	M	M	C	M	M	M	C	M	M	M	M	21.43	0.00	78.57
ABPBW01240 *Vireo olivaceus* RED-EYED VIREO	C	M	M	M	M	C	M	M	M	M	M	M	M	M	14.29	0.00	85.71
ABPBX01040 *Vermivora peregrina* TENNESSEE WARBLER	X	X	C	X	X	X	M	X	X	C	O	M	C	X	50.00	16.67	33.33

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ABPBX01050 *Vermivora celata* ORANGE-CROWNED WARBLER	C	C	M	X	C	C	M	C	O	M	M	M	M	M	38.46	7.69	53.85
ABPBX01060 *Vermivora ruficapilla* NASHVILLE WARBLER	X	C	M	X	X	X	C	M	O	C	X	M	M	O	33.33	22.22	44.44
ABPBX03010 *Dendroica petechia* YELLOW WARBLER	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBX03060 *Dendroica coronata* YELLOW-RUMPED WARBLER	M	M	M	O	M	C	M	M	O	M	M	M	M	M	7.14	14.29	78.57
ABPBX03080 *Dendroica townsendi* TOWNSEND'S WARBLER	X	C	M	X	X	C	M	M	X	C	O	M	M	M	30.00	10.00	60.00
ABPBX03230 *Dendroica striata* BLACKPOLL WARBLER	C	C	X	C	M	C	C	C	M	X	X	M	X	M	60.00	0.00	40.00
ABPBX05010 *Mniotilta varia* BLACK-AND-WHITE WARBLER	X	X	X	X	M	X	X	X	O	X	X	O	X	O	0.00	75.00	25.00
ABPBX06010 *Setophaga ruticilla* AMERICAN REDSTART	X	M	M	X	M	C	M	M	O	M	M	M	M	M	8.33	8.33	83.33
ABPBX10010 *Seiurus aurocapillus* OVENBIRD	C	C	X	X	M	C	M	X	M	X	X	C	C	M	55.56	0.00	44.44
ABPBX10020 *Seiurus noveboracensis* NORTHERN WATERTHRUSH	C	M	M	X	M	C	M	M	X	C	M	M	M	M	25.00	0.00	75.00
ABPBX11040 *Oporornis tolmiei* MACGILLIVRAY'S WARBLER	C	C	M	X	O	C	M	M	O	M	M	M	M	M	23.08	15.38	61.54
ABPBX12010 *Geothlypis trichas* COMMON YELLOWTHROAT	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00

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ABPBX16020 *Wilsonia pusilla* WILSON'S WARBLER	O	C	O	X	X	X	M	X	X	O	M	M	O	M	11.11	44.44	44.44
ABPBX24010 *Icteria virens* YELLOW-BREASTED CHAT	C	C	M	M	M	C	C	C	M	C	O	M	C	C	57.14	7.14	35.71
ABPBX45050 *Piranga ludoviciana* WESTERN TANAGER	C	M	M	X	M	C	M	M	X	M	M	M	M	M	16.67	0.00	83.33
ABPBX61040 *Pheucticus melanocephalus* BLACK-HEADED GROSBEAK	C	M	M	M	M	C	M	M	C	C	M	M	M	M	28.57	0.00	71.43
ABPBX64020 *Passerina amoena* LAZULI BUNTING	C	C	M	M	M	C	M	M	M	M	M	M	M	M	21.43	0.00	78.57
ABPBX64030 *Passerina cyanea* INDIGO BUNTING	X	C	X	X	M	C	X	X	C	X	X	O	X	M	50.00	16.67	33.33
ABPBX65010 *Spiza americana* DICKCISSEL	X	X	X	X	C	X	X	X	M	X	X	O	X	X	33.33	33.33	33.33
ABPBX74010 *Pipilo chlorurus* GREEN-TAILED TOWHEE	X	X	X	X	M	X	X	X	X	X	M	X	X	X	0.00	0.00	100.00
ABPBX74080 *Pipilo maculatus* SPOTTED TOWHEE	C	M	M	M	M	C	M	M	M	C	M	M	M	M	21.43	0.00	78.57
ABPBX94010 *Spizella arborea* AMERICAN TREE SPARROW	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBX94020 *Spizella passerina* CHIPPING SPARROW	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBX94030 *Spizella pallida* CLAY-COLORED SPARROW	M	C	C	M	M	M	M	C	M	C	M	M	C	M	35.71	0.00	64.29

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ABPBX94040 *Spizella breweri* BREWER'S SPARROW	X	C	M	M	M	X	O	X	X	C	M	M	X	M	22.22	11.11	66.67
ABPBX94050 *Spizella pusilla* FIELD SPARROW	X	X	X	C	M	X	X	X	C	X	X	X	X	X	66.67	0.00	33.33
ABPBX95010 *Pooecetes gramineus* VESPER SPARROW	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBX96010 *Chondestes grammacus* LARK SPARROW	M	C	M	M	M	M	C	C	M	M	M	M	C	M	28.57	0.00	71.43
ABPBX98010 *Calamospiza melanocorys* LARK BUNTING	M	C	X	M	M	M	M	X	M	X	O	X	X	C	22.22	11.11	66.67
ABPBX99010 *Passerculus sandwichensis* SAVANNAH SPARROW	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBXA0010 *Ammodramus bairdii* BAIRD'S SPARROW	M	X	X	M	C	M	C	X	M	X	X	O	X	C	37.50	12.50	50.00
ABPBXA0020 *Ammodramus savannarum* GRASSHOPPER SPARROW	M	C	M	M	M	C	C	C	M	C	M	M	M	C	42.86	0.00	57.14
ABPBXA0040 *Ammodramus leconteii* LE CONTE'S SPARROW	X	X	X	O	C	X	M	X	M	X	X	O	X	O	16.67	50.00	33.33
ABPBXA0070 *Ammodramus nelsoni* NELSON'S SHARP-TAILED SPARROW	X	X	X	X	X	X	X	X	M	X	X	X	X	X	0.00	0.00	100.00
ABPBXA2010 *Passerella iliaca* FOX SPARROW	X	M	O	X	X	X	M	X	X	O	M	M	O	M	0.00	37.50	62.50
ABPBXA3010 *Melospiza melodia* SONG SPARROW	M	M	M	M	M	C	M	M	M	M	M	M	M	M	7.14	0.00	92.86

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ABPBXA3020 *Melospiza lincolnii* LINCOLN'S SPARROW	X	C	C	X	X	X	M	X	X	O	M	M	X	M	28.57	14.29	57.14
ABPBXA4020 *Zonotrichia albicollis* WHITE-THROATED SPARROW	X	C	X	X	C	X	M	C	X	X	O	M	C	X	57.14	14.29	28.57
ABPBXA4040 *Zonotrichia leucophrys* WHITE-CROWNED SPARROW	O	M	O	X	X	X	M	X	X	O	M	M	O	M	0.00	44.44	55.56
ABPBXA4050 *Zonotrichia querula* HARRIS'S SPARROW	C	C	M	M	C	C	C	M	C	C	M	M	M	C	57.14	0.00	42.86
ABPBXA5020 *Junco hyemalis* DARK-EYED JUNCO	M	M	M	X	M	C	M	M	X	C	M	M	M	M	16.67	0.00	83.33
ABPBXA6010 *Calcarius mccownii* MCCOWN'S LONGSPUR	M	C	X	M	C	M	C	X	M	X	M	X	X	M	33.33	0.00	66.67
ABPBXA6020 *Calcarius lapponicus* LAPLAND LONGSPUR	M	C	M	M	M	M	C	C	C	C	M	M	C	C	50.00	0.00	50.00
ABPBXA6040 *Calcarius ornatus* CHESTNUT-COLLARED LONGSPUR	M	C	X	M	M	M	C	X	M	X	M	X	X	M	22.22	0.00	77.78
ABPBXA8010 *Plectrophenax nivalis* SNOW BUNTING	M	M	M	M	M	M	C	C	M	M	M	M	M	M	14.29	0.00	85.71
ABPBXA9010 *Dolichonyx oryzivorus* BOBOLINK	M	M	M	M	C	C	M	M	M	M	O	M	M	M	14.29	7.14	78.57
ABPBXB0010 *Agelaius phoeniceus* RED-WINGED BLACKBIRD	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBXB2030 *Sturnella neglecta* WESTERN MEADOWLARK	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00

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ABPBXB3010 *Xanthocephalus xanthocephalus* YELLOW-HEADED BLACKBIRD	M	M	M	M	M	M	C	M	M	M	M	M	M	M	7.14	0.00	92.86
ABPBXB5010 *Euphagus carolinus* RUSTY BLACKBIRD	X	X	X	M	C	X	M	X	C	X	X	M	X	X	40.00	0.00	60.00
ABPBXB5020 *Euphagus cyanocephalus* BREWER'S BLACKBIRD	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBXB6070 *Quiscalus quiscula* COMMON GRACKLE	C	C	C	M	M	M	M	X	M	C	O	C	C	M	46.15	7.69	46.15
ABPBXB7030 *Molothrus ater* BROWN-HEADED COWBIRD	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0.00	0.00	100.00
ABPBXB9070 *Icterus spurius* ORCHARD ORIOLE	X	X	X	C	M	X	X	X	C	X	X	X	X	X	66.67	0.00	33.33
ABPBXB9220 *Icterus bullockii* BULLOCK'S ORIOLE	M	M	M	M	M	C	M	M	M	M	O	M	C	M	14.29	7.14	78.57
ABPBY02010 *Leucosticte atrata* BLACK ROSY-FINCH	X	X	X	X	X	X	X	X	X	X	M	O	X	X	0.00	50.00	50.00
ABPBY02030 *Leucosticte tephrocotis* GRAY-CROWNED ROSY-FINCH	X	X	X	X	X	X	M	X	X	X	X	M	X	X	0.00	0.00	100.00
ABPBY03010 *Pinicola enucleator* PINE GROSBEAK	X	C	M	X	X	C	M	C	X	C	M	M	C	M	50.00	0.00	50.00
ABPBY04020 *Carpodacus purpureus* PURPLE FINCH	X	C	C	C	C	X	C	C	M	C	C	M	C	X	81.82	0.00	18.18
ABPBY04030 *Carpodacus cassinii* CASSIN'S FINCH	X	M	M	X	X	X	M	X	X	O	M	M	O	M	0.00	25.00	75.00

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ABPBY04040 *Carpodacus mexicanus* HOUSE FINCH	C	C	C	C	C	C	C	M	X	C	O	M	C	C	76.92	7.69	15.38
ABPBY05010 *Loxia curvirostra* RED CROSSBILL	M	M	M	X	M	C	M	M	X	C	M	M	M	M	16.67	0.00	83.33
ABPBY05020 *Loxia leucoptera* WHITE-WINGED CROSSBILL	X	C	M	X	X	X	M	C	X	C	C	M	C	C	66.67	0.00	33.33
ABPBY06010 *Carduelis flammea* COMMON REDPOLL	M	C	M	M	M	C	M	M	M	M	C	M	M	M	21.43	0.00	78.57
ABPBY06020 *Carduelis hornemanni* HOARY REDPOLL	C	C	M	M	M	C	M	C	C	C	C	M	C	M	57.14	0.00	42.86
ABPBY06030 *Carduelis pinus* PINE SISKIN	C	M	M	O	M	C	M	M	X	M	M	M	M	M	15.38	7.69	76.92
ABPBY06110 *Carduelis tristis* AMERICAN GOLDFINCH	M	M	M	M	M	M	M	M	M	M	O	M	C	M	7.14	7.14	85.71
ABPBY09020 *Coccothraustes vespertinus* EVENING GROSBEAK	C	M	C	X	C	C	M	M	X	M	M	M	M	M	33.33	0.00	66.67
ABPBZ01010 *Passer domesticus* HOUSE SPARROW	M	C	M	M	M	M	C	M	M	M	M	M	M	M	14.29	0.00	85.71
AMABA01010 *Sorex cinereus* MASKED SHREW	X	C	C	O	M	A	M	A	O	A	M	M	A	C	33.33	22.22	44.44
AMABA01030 *Sorex preblei* PREBLE'S SHREW	X	X	X	X	C	A	X	A	X	A	C	X	A	X	100.00	0.00	0.00
AMABA01070 *Sorex vagrans* VAGRANT SHREW	X	C	M	X	C	A	M	A	X	A	C	M	A	C	57.14	0.00	42.86

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AMABA01080 *Sorex monticolus* DUSKY OR MONTANE SHREW	X	C	C	X	C	A	C	A	X	A	C	M	A	C	85.71	0.00	14.29
AMABA01130 *Sorex nanus* DWARF SHREW	X	X	X	X	C	A	X	A	X	A	X	O	A	X	50.00	50.00	0.00
AMABA01150 *Sorex palustris* WATER SHREW	X	M	C	X	C	A	M	A	X	A	M	M	A	C	42.86	0.00	57.14
AMABA01230 *Sorex merriami* MERRIAM'S SHREW	X	X	X	X	M	A	X	A	X	A	X	X	A	X	0.00	0.00	100.00
AMABA01250 *Sorex hoyi* PYGMY SHREW	X	X	X	X	X	A	C	A	O	A	X	M	A	X	33.33	33.33	33.33
AMABA01280 *Sorex haydeni* HAYDEN'S SHREW	C	X	X	C	C	A	X	A	C	A	X	X	A	X	100.00	0.00	0.00
AMACC01010 *Myotis lucifugus* LITTLE BROWN MYOTIS	M	C	M	M	M	A	M	A	M	A	M	M	A	C	20.00	0.00	80.00
AMACC01020 *Myotis yumanensis* YUMA MYOTIS	X	C	C	X	X	A	C	A	X	A	X	M	A	X	75.00	0.00	25.00
AMACC01070 *Myotis evotis* LONG-EARED MYOTIS	C	C	M	C	M	A	M	A	C	A	C	M	A	C	60.00	0.00	40.00
AMACC01090 *Myotis thysanodes* FRINGED MYOTIS	X	C	C	X	X	A	X	A	X	A	C	C	A	X	100.00	0.00	0.00
AMACC01110 *Myotis volans* LONG-LEGGED MYOTIS	C	C	C	C	C	A	M	A	C	A	C	M	A	C	80.00	0.00	20.00
AMACC01120 *Myotis californicus* CALIFORNIA MYOTIS	X	C	C	X	X	A	C	A	X	A	X	C	A	X	100.00	0.00	0.00

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AMACC01140 *Myotis ciliolabrum* WESTERN SMALL-FOOTED MYOTIS	C	C	C	C	C	A	C	A	C	A	C	M	A	C	90.00	0.00	10.00
AMACC01150 *Myotis septentrionalis* NORTHERN MYOTIS	X	X	X	X	C	A	X	A	C	A	X	X	A	X	100.00	0.00	0.00
AMACC02010 *Lasionycteris noctivagans* SILVER-HAIRED BAT	M	C	M	C	M	A	M	A	M	A	C	M	A	C	40.00	0.00	60.00
AMACC04010 *Eptesicus fuscus* BIG BROWN BAT	C	C	C	M	M	A	M	A	M	A	C	M	A	C	50.00	0.00	50.00
AMACC05030 *Lasiurus cinereus* HOARY BAT	C	C	C	C	M	A	M	A	M	A	C	M	A	C	60.00	0.00	40.00
AMACC07010 *Euderma maculatum* SPOTTED BAT	X	X	X	X	X	A	X	A	X	A	X	X	A	X			
AMACC08010 *Corynorhinus townsendii* TOWNSEND'S BIG-EARED BAT	C	C	C	C	C	A	C	A	X	A	C	M	A	C	88.89	0.00	11.11
AMACC10010 *Antrozous pallidus* PALLID BAT	X	X	X	X	X	A	X	A	X	A	X	X	A	X			
AMAEA01020 *Ochotona princeps* AMERICAN PIKA	X	C	C	X	X	A	M	A	X	A	M	M	A	C	50.00	0.00	50.00
AMAEB01040 *Sylvilagus floridanus* EASTERN COTTONTAIL	X	X	X	X	X	A	X	A	X	A	X	X	A	X			
AMAEB01060 *Sylvilagus nuttallii* MOUNTAIN COTTONTAIL	M	M	M	M	M	A	C	A	M	A	C	M	A	C	30.00	0.00	70.00
AMAEB01070 *Sylvilagus audubonii* DESERT COTTONTAIL	C	X	X	C	C	A	X	A	X	A	X	X	A	M	75.00	0.00	25.00

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AMAEB03010 *Lepus americanus* SNOWSHOE HARE	C	M	M	M	M	A	M	A	C	A	M	M	A	M	20.00	0.00	80.00
AMAEB03040 *Lepus townsendii* WHITE-TAILED JACKRABBIT	M	C	M	M	M	A	C	A	M	A	M	M	A	M	20.00	0.00	80.00
AMAEB03050 *Lepus californicus* BLACK-TAILED JACKRABBIT	X	X	X	X	X	A	X	A	X	A	C	X	A	X	100.00	0.00	0.00
AMAEB04010 *Brachylagus idahoensis* PYGMY RABBIT	X	X	X	X	X	A	X	A	X	A	C	X	A	X	100.00	0.00	0.00
AMAFB02020 *Tamias minimus* LEAST CHIPMUNK	X	O	X	X	M	A	M	A	C	A	M	X	A	X	20.00	20.00	60.00
AMAFB02030 *Tamias amoenus* YELLOW-PINE CHIPMUNK	X	C	M	X	X	A	M	A	X	A	M	M	A	M	16.67	0.00	83.33
AMAFB02130 *Tamias ruficaudus* RED-TAILED CHIPMUNK	X	C	C	X	X	A	M	A	X	A	C	M	A	M	50.00	0.00	50.00
AMAFB02190 *Tamias umbrinus* UINTA CHIPMUNK	X	X	X	X	X	A	X	A	X	A	X	X	A	X			
AMAFB03020 *Marmota flaviventris* YELLOW-BELLIED MARMOT	M	M	M	X	C	A	C	A	X	A	M	M	A	M	25.00	0.00	75.00
AMAFB03040 *Marmota caligata* HOARY MARMOT	X	C	C	X	X	A	M	A	X	A	X	M	A	C	60.00	0.00	40.00
AMAFB05040 *Spermophilus richardsonii* RICHARDSON'S GROUND SQUIRREL	M	X	X	M	M	A	M	A	M	A	X	X	A	M	0.00	0.00	100.00
AMAFB05050 *Spermophilus armatus* UINTA GROUND SQUIRREL	X	X	X	X	X	A	X	A	X	A	C	X	A	X	100.00	0.00	0.00

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AMAFB05070 *Spermophilus columbianus* COLUMBIAN GROUND SQUIRREL	X	M	M	X	X	A	M	A	X	A	X	M	A	M	0.00	0.00	100.00
AMAFB05090 *Spermophilus tridecemlineatus* THIRTEEN-LINED GROUND SQUIRREL	C	X	X	C	M	A	M	A	M	A	X	X	A	C	50.00	0.00	50.00
AMAFB05170 *Spermophilus lateralis* GOLDEN-MANTLED GROUND SQUIRREL	X	C	C	X	X	A	M	A	X	A	M	M	A	M	33.33	0.00	66.67
AMAFB05190 *Spermophilus elegans* WYOMING GROUND SQUIRREL	X	X	X	X	X	A	X	A	X	A	M	X	A	X	0.00	0.00	100.00
AMAFB06010 *Cynomys ludovicianus* BLACK-TAILED PRAIRIE DOG	C	X	X	C	M	A	X	A	C	A	X	X	A	C	80.00	0.00	20.00
AMAFB06020 *Cynomys leucurus* WHITE-TAILED PRAIRIE DOG	X	X	X	X	X	A	X	A	X	A	X	X	A	X			
AMAFB08010 *Tamiasciurus hudsonicus* RED SQUIRREL	X	M	M	X	X	A	M	A	X	A	M	M	A	M	0.00	0.00	100.00
AMAFB09020 *Glaucomys sabrinus* NORTHERN FLYING SQUIRREL	X	M	C	X	X	A	M	A	X	A	M	M	A	M	16.67	0.00	83.33
AMAFC01040 *Thomomys talpoides* NORTHERN POCKET GOPHER	M	C	M	M	M	A	M	A	M	A	M	M	A	M	10.00	0.00	90.00
AMAFC01070 *Thomomys idahoensis* IDAHO POCKET GOPHER	X	X	X	X	X	A	X	A	X	A	C	X	A	X	100.00	0.00	0.00
AMAFD01010 *Perognathus fasciatus* OLIVE-BACKED POCKET MOUSE	X	X	X	C	C	A	X	A	M	A	X	X	A	X	66.67	0.00	33.33
AMAFD01070 *Perognathus parvus* GREAT BASIN POCKET MOUSE	X	X	X	X	X	A	X	A	X	A	C	X	A	X	100.00	0.00	0.00

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AMAFD03010 *Dipodomys ordii* ORD'S KANGAROO RAT	X	X	X	C	M	A	X	A	C	A	X	X	A	X	66.67	0.00	33.33
AMAFD05050 *Chaetodipus hispidus* HISPID POCKET MOUSE	X	X	X	X	X	A	X	A	X	A	X	X	A	X			
AMAFE01010 *Castor canadensis* AMERICAN BEAVER	C	M	C	M	M	A	M	A	M	A	M	M	A	M	20.00	0.00	80.00
AMAFF02030 *Reithrodontomys megalotis* WESTERN HARVEST MOUSE	C	X	X	C	M	A	X	A	C	A	X	X	A	X	75.00	0.00	25.00
AMAFF03040 *Peromyscus maniculatus* DEER MOUSE	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAFF03070 *Peromyscus leucopus* WHITE-FOOTED MOUSE	X	X	X	M	M	A	X	A	M	A	X	X	A	X	0.00	0.00	100.00
AMAFF06010 *Onychomys leucogaster* NORTHERN GRASSHOPPER MOUSE	C	X	X	C	M	A	C	A	M	A	X	X	A	C	66.67	0.00	33.33
AMAFF08090 *Neotoma cinerea* BUSHY-TAILED WOODRAT	C	M	M	M	M	A	M	A	X	A	C	M	A	M	22.22	0.00	77.78
AMAFF09020 *Clethrionomys gapperi* SOUTHERN RED-BACKED VOLE	X	C	C	X	X	A	M	A	C	A	M	M	A	M	42.86	0.00	57.14
AMAFF10010 *Phenacomys intermedius* HEATHER VOLE	X	C	C	X	X	A	M	A	X	A	C	M	A	C	66.67	0.00	33.33
AMAFF11010 *Microtus pennsylvanicus* MEADOW VOLE	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAFF11020 *Microtus montanus* MONTANE VOLE	X	C	M	X	X	A	C	A	X	A	C	M	A	C	66.67	0.00	33.33

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AMAFF11060 *Microtus longicaudus* LONG-TAILED VOLE	C	C	M	C	M	A	M	A	X	A	M	M	A	C	44.44	0.00	55.56
AMAFF11140 *Microtus ochrogaster* PRAIRIE VOLE	C	X	X	M	M	A	X	A	M	A	X	X	A	X	25.00	0.00	75.00
AMAFF11190 *Microtus richardsoni* WATER VOLE	X	C	X	X	X	A	M	A	X	A	C	M	A	C	60.00	0.00	40.00
AMAFF13010 *Lemmiscus curtatus* SAGEBRUSH VOLE	C	X	X	C	M	A	C	A	M	A	C	X	A	C	71.43	0.00	28.57
AMAFF15010 *Ondatra zibethicus* MUSKRAT	M	M	M	M	M	A	M	A	M	A	O	M	A	M	0.00	10.00	90.00
AMAFF17020 *Synaptomys borealis* NORTHERN BOG LEMMING	X	C	X	X	X	A	M	A	X	A	X	C	A	C	75.00	0.00	25.00
AMAFH01010 *Zapus hudsonius* MEADOW JUMPING MOUSE	X	X	X	O	O	A	X	A	X	A	X	X	A	X	0.00	100.00	0.00
AMAFH01020 *Zapus princeps* WESTERN JUMPING MOUSE	C	C	C	M	M	A	M	A	M	A	M	M	A	M	30.00	0.00	70.00
AMAFJ01010 *Erethizon dorsatum* COMMON PORCUPINE	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAJA01010 *Canis latrans* COYOTE	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAJA01030 *Canis lupus* GRAY WOLF	X	C	C	X	X	A	M	A	X	A	M	M	A	C	50.00	0.00	50.00
AMAJA03010 *Vulpes vulpes* RED FOX	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00

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Appendix 3.4 *continued*. For 423 terrestrial vertebrates, correspondence of predicted distributions with checklists for 14 wildlife areas. M = match, C = commission, O = omission, A = taxonomic group absent from checklist, X = species neither predicted to occur, nor documented for wildlife area. % N_c = percent commission, % N_o = percent omission, %N_m = percent correct.

Element Code *Scientific Name* **COMMON NAME**	**BL**	**BC**	**BR**	**BO**	**CR**	**FO**	**GP**	**LM**	**ML**	**NP**	**RR**	**FR**	**SR**	**PB**	**%N_c**	**%N_o**	**%N_m**
AMAJA03030 *Vulpes velox* SWIFT FOX	C	X	X	C	C	A	C	A	C	A	X	X	A	C	100.00	0.00	0.00
AMAJB01010 *Ursus americanus* BLACK BEAR	M	M	M	X	C	A	M	A	X	A	M	M	A	M	12.50	0.00	87.50
AMAJB01020 *Ursus arctos* GRIZZLY OR BROWN BEAR	X	M	C	X	X	A	M	A	X	A	M	M	A	M	16.67	0.00	83.33
AMAJE02010 *Procyon lotor* COMMON RACCOON	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAJF01010 *Martes americana* AMERICAN MARTEN	X	M	C	X	X	A	M	A	X	A	C	C	A	C	66.67	0.00	33.33
AMAJF01020 *Martes pennanti* FISHER	X	C	C	X	X	A	M	A	X	A	X	M	A	C	60.00	0.00	40.00
AMAJF02010 *Mustela erminea* ERMINE	X	C	M	X	X	A	M	A	X	A	M	M	A	M	16.67	0.00	83.33
AMAJF02020 *Mustela nivalis* LEAST WEASEL	M	X	X	M	C	A	M	A	M	A	X	X	A	M	16.67	0.00	83.33
AMAJF02030 *Mustela frenata* LONG-TAILED WEASEL	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAJF02040 *Mustela nigripes* BLACK-FOOTED FERRET	X	X	X	X	C	A	X	A	X	A	X	X	A	X	100.00	0.00	0.00
AMAJF02050 *Mustela vison* MINK	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAJF03010 *Gulo gulo* WOLVERINE	X	C	C	X	X	A	M	A	X	A	M	M	A	M	33.33	0.00	66.67

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Element Code ***Scientific Name*** **COMMON NAME**	**BL**	**BC**	**BR**	**BO**	**CR**	**FO**	**GP**	**LM**	**ML**	**NP**	**RR**	**FR**	**SR**	**PB**	**%N_c**	**%N_o**	**%N_m**
AMAJF04010 *Taxidea taxus* AMERICAN BADGER	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAJF05020 *Spilogale gracilis* WESTERN SPOTTED SKUNK	X	X	X	X	X	A	X	A	X	A	C	X	A	X	100.00	0.00	0.00
AMAJF06010 *Mephitis mephitis* STRIPED SKUNK	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMAJF08010 *Lutra canadensis* NORTHERN RIVER OTTER	C	C	C	X	M	A	M	A	X	A	M	M	A	M	37.50	0.00	62.50
AMAJH01020 *Felis concolor* MOUNTAIN LION	C	M	M	X	C	A	M	A	C	A	M	M	A	M	33.33	0.00	66.67
AMAJH03010 *Lynx canadensis* LYNX	X	M	M	O	X	A	M	A	X	A	M	M	A	M	0.00	14.29	85.71
AMAJH03020 *Lynx rufus* BOBCAT	M	M	C	M	M	A	M	A	C	A	M	M	A	M	20.00	0.00	80.00
AMALC01010 *Cervus elaphus* WAPITI OR ELK	O	M	M	O	M	A	M	A	X	A	M	M	A	M	0.00	22.22	77.78
AMALC02010 *Odocoileus hemionus* MULE DEER	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMALC02020 *Odocoileus virginianus* WHITE-TAILED DEER	M	M	M	M	M	A	M	A	M	A	M	M	A	M	0.00	0.00	100.00
AMALC03010 *Alces alces* MOOSE	O	C	M	O	X	A	M	A	X	A	M	M	A	M	12.50	25.00	62.50
AMALD01010 *Antilocapra americana* PRONGHORN	M	X	M	M	M	A	C	A	M	A	M	M	A	M	11.11	0.00	88.89

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Element Code ***Scientific Name*** **COMMON NAME**	**BL**	**BC**	**BR**	**BO**	**CR**	**FO**	**GP**	**LM**	**ML**	**NP**	**RR**	**FR**	**SR**	**PB**	**%N_c**	**%N_o**	**%N_m**
AMALE01010 *Bos bison* AMERICAN BISON	X	X	M	X	X	A	X	A	X	A	O	O	A	X	0.00	66.67	33.33
AMALE02010 *Oreamnos americanus* MOUNTAIN GOAT	X	C	M	X	X	A	M	A	X	A	C	M	A	C	50.00	0.00	50.00
AMALE04010 *Ovis canadensis* MOUNTAIN SHEEP	X	X	M	X	M	A	M	A	X	A	X	M	A	M	0.00	0.00	100.00

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Appendix 4.1. Administrative units included in the MT-GAP land stewardship database for lands with status 1 or 2.

Agency	Status	Administrative Unit	Source
BLM	2	Acid Shale-Pine Forest Area of Critical Environmental Concern (ACEC)	JVP Resource Management Plan (RMP)
BLM	1	Azure Cave ACEC	JVP RMP
BLM	2	Bear Creek Flats ACEC	Garnet RMP
BLM	2	Big Bend of the Milk River ACEC	JVP RMP
BLM	1	Black Footed Ferret ACEC	Big Dry RMP
BLM	2	Collar Gulch ACEC	JVP RMP
BLM	2	Cow Creek ACEC	West HiLine RMP
BLM	2	Judith Mountains Scenic Area ACEC	JVP RMP
BLM	2	Kevin Rim ACEC	West HiLine RMP
BLM	2	Meeteetse Spires ACEC	Contact: BLM, Billings, MT
BLM	2	Pompeys Pillar ACEC	Billings RMP
BLM	1	Rattler Gulch ACEC	Garnet RMP
BLM	2	Sleeping Giant ACEC	Headwaters RMP
BLM	2	Smoky Butte	Big Dry RMP
BLM	2	Squaw Rock ACEC	Garnet RMP
BLM	2	Sweetgrass Hills ACEC - East Butte	West HiLine RMP
BLM	2	Sweetgrass Hills ACEC - Middle Butte	West HiLine RMP
BLM	2	Sweetgrass Hills ACEC - West Butte	West HiLine RMP
BLM	2	Pryor Mountain Wild Horse Range proposed ACEC	Contact: BLM, Billings, MT
BLM	1	Blind Horse Outstanding Natural Area (ONA)	JVP RMP
BLM	1	Chute Mountain ONA	JVP RMP
BLM	1	Deep Creek/Battle Creek ONA	JVP RMP
BLM	1	Ear Mountain ONA	JVP RMP
BLM	1	Square Butte ONA	JVP RMP
BLM	2	Centennial Mountains Primitive Area	Contact: BLM, Billings, MT
BLM	2	Humbug Spires Primitive Area	Contact: BLM, Billings, MT
BLM	1	Bear Trap Canyon Wilderness	Wilderness Management Plan for the Bear Trap Canyon unit of the Lee Metcalf Wilderness, Montana. 1984. Department of the Interior, BLM.
BLM	2	Upper Missouri National Wild and Scenic River	West HiLine RMP
USFWS	1	Bowdoin National Wildlife Refuge (NWR)	Contact: D.M. Prellwitz, Bowdoin NWR, Malta, MT
USFWS	1	Benton Lake NWR	Contact: J.E. McCollum, Benton Lake NWR, Black Eagle, MT
USFWS	2	Black Coulee NWR	Contact: D.M. Prellwitz, Bowdoin NWR, Malta, MT

Agency	Status	Administrative Unit	Source
USFWS	2	Charles M. Russell NWR	Final Environmental Impact Statement for the management of Charles M. Russell National Wildlife Refuge. 1985. Dept. Of the Interior, USFWS Regional Office, Denver, CO. Contact: M. Hendrick, Charles M. Russell NWR, Lewistown, MT.
USFWS	1	Creedman Coulee NWR	Contact: D.M. Prellwitz, Bowdoin NWR, Malta, MT
USFWS	2	Hailstone NWR	Contact: M. Hendrick, Charles M. Russell NWR, Lewistown, MT.
USFWS	2	Halfbreed Lake NWR	Contact: M. Hendrick, Charles M. Russell NWR, Lewistown, MT.
USFWS	2	Hewitt Lake NWR	Contact: D.M. Prellwitz, Bowdoin NWR, Malta, MT
USFWS	2	Lake Mason NWR	Contact: Mike Getman, USFWS, Charles M. Russell NWR, Lewistown, MT.
USFWS	2	Lake Thibadeau NWR	Contact: D.M. Prellwitz, Bowdoin NWR, Malta, MT
USFWS	2	Lamesteer NWR	Contact: T. Gutzke, Medicine lake, MT
USFWS	2	Lee Metcalf NWR	Contact: P. Gonzales, Lee Metcalf NWR, Stevensville, MT
USFWS	2	Medicine Lake NWR	Contact: T. Gutzke, Medicine lake, MT
USFWS	2	National Bison Range NWR	Contact: D. Wiseman, National Bison Range, Moiese, MT
USFWS	2	Red Rock Lakes NWR	Contact: D. Gomez, Red Rock lakes NWR, Lima, MT
USFWS	2	Smith Lake WPA	Contact: D. Wiseman, National Bison Range,Moiese, MT
USFWS	1	Swan River NWR	Contact: R. Washtak, NW Montana Wildlife Management District, Kalispell, MT
USFWS	2	UL Bend NWR	Contact: M. Hendrick, Charles M. Russell NWR, Lewistown, MT.
USFWS	2	War Horse NWR	Contact: M. Hendrick, Charles M. Russell NWR, Lewistown, MT.
USFWS	2	Rock Creek Peninsula Public Use Natural Area	Contact: C.H. Lobdell, USFWS, Boise, ID
USFWS	1	Big Island Research Natural Area	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Bruces Island RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Dillon Island RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Fourth Ridge RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Grand Island RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	2	Lake Mason RNA	Contact: Mike Getman, USFWS, Charles M. Russell, Lewistown, MT
USFWS	1	Limber Pine RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Manning Corral Prairie Dog Town RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Missouri River Bottomlands RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Mullan Trail RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Prairie Dog Island RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Sheep Mountain RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Spring Creek Bay Coulee RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Tepee Hills RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	Two Calf Douglas Fir Community RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO

Agency	Status	Administrative Unit	Source
USFWS	1	Two Calf Island RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	York Island RNA	Department of the Interior, USFWS Regional Office, Region 6, Denver, CO
USFWS	1	UL Bend Wilderness	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	1	Medicine Lake Wilderness	Contact: Medicine Lake NWR, Medicine Lake, MT
USFWS	1	Red Rock Lakes Wilderness	Contact: Red Rock Lakes NWR, Lima, MT
USFWS	2	Alkali Creek Proposed Wilderness Area	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Antelope Creek Proposed Wilderness Area	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Billy Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Blackfoot PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Burnt Lodgepole PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Crooked Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Mcky Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Sheep Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Wagon Coulee PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	West Beauchamp Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	West Hell Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Wibeau Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	East Beauchamp Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	East Hell Creek PWA	Contact: Charles M. Russell NWR, Lewistown, MT
USFWS	2	Fort Musselshell PWA	Contact: Charles M. Russell NWR, Lewistown, MT
NPS	1	Little Bighorn Battlefield NM	Contact: National Park Service, Denver, CO
NPS	1	Fort Union Trading Post National Historic Site	Contact: National Park Service, Denver, CO
NPS	2	Bears Paw Battlefield National Historic Site	Contact: National Park Service, Denver, CO
NPS	1	Big Hole Battlefield National Monument	Contact: National Park Service, Denver, CO
NPS	1	Glacier National Park	Contact: Glacier National Park, West Glacier, MT
NPS	1	Yellowstone NP	Contact: Yellowstone National Park, WY
NPS	2	Bighorn Canyon National Recreation Area	Statement for Management: Bighorn Canyon National Recreation Area. 1987. USDA National Park Service, Fort Smith, MT.
NPS	2	Flathead NWSR	Contact: Glacier National Park, West Glacier, MT
USFS	2	Flathead NWSR	Environmental Impact Statement, Final: Flathead Wild and Scenic River proposal. 1977. USDA Forest Service, Northern region.
USFS	1	Bartleson Peak RNA	Lewis and Clark Forest Management Plan
USFS	1	Big Creek RNA	Kootenai Forest Management Plan
USFS	1	Bitterroot Mountain Snow Avalanche RNA	Bitterroot Forest Management Plan

Agency	Status	Administrative Unit	Source
USFS	1	Bitterroot River RNA	Bitterroot Forest Management Plan
USFS	1	Boulder Creek RNA	Bitterroot Forest Management Plan
USFS	1	Carlton Ridge RNA	Bitterroot and Lolo Forest Management Plans
USFS	1	Cliff Lake RNA	Beaverhead Forest Management Plan
USFS	1	Coram RNA	Flathead Forest Management Plan
USFS	1	Cottonwood Creek RNA	Beaverhead Forest Management Plan
USFS	1	Council Grove RNA	Lolo Forest Management Plan
USFS	1	East Shore RNA	Flathead Forest Management Plan
USFS	1	Hoskins Lake RNA	Kootenai Forest Management Plan
USFS	1	Line Creek Plateau RNA	Custer and Shoshone Forest Management Plan
USFS	1	Little Bitterroot RNA	Flathead Management Plan
USFS	1	Lost Water Canyon RNA	Custer Forest Management Plan
USFS	1	Lower Lost Horse Canyon RNA	Bitterroot Forest Management Plan
USFS	1	Medicine Point RNA	Bitterroot Management Plan
USFS	1	O'Brien Creek RNA	Lewis and Clark Forest Management Plan
USFS	1	Onion Park RNA	Lewis and Clark Forest Management Plan
USFS	1	Paine Gulch RNA	Lewis and Clark Forest Management Plan
USFS	1	Pete Creek Meadows RNA	Kootenai Forest Management Plan
USFS	1	Petty Creek RNA	Lolo Forest Management Plan
USFS	1	Plant Creek RNA	Lolo Forest Management Plan
USFS	1	Poker Jim RNA	Custer Forest Management Plan
USFS	1	Pyramid Peak RNA	Lolo Forest Management Plan
USFS	1	Sawmill Creek RNA	Bitterroot Forest Management Plan
USFS	1	Sheep Mountain Bog RNA	Lolo Forest Management Plan
USFS	1	Tuchuck RNA	Flathead Forest Management Plan
USFS	1	Ulm Peak RNA	Kootenai Forest Management Plan
USFS	1	Upper Lost Horse Canyon RNA	Bitterroot Forest Management Plan
USFS	1	Wagner Basin RNA	Lewis and Clark Forest Management Plan
USFS	1	Walling Reef RNA	Lewis and Clark Forest Management Plan
USFS	1	Wolf-Weigel RNA	Kootenai Forest Management Plan
USFS	1	Berray Mountain Cedars Botanical Area Special Interest Area (SIA)	Kootenai Forest Management Plan
USFS	1	Big Creek Riparian Ecosystem SIA	Kootenai Forest Management Plan
USFS	1	Devils Gap Geologic Area SIA	Kootenai Forest Management Plan

Agency	Status	Administrative Unit	Source
USFS	1	Elk Meadow Botanical Area SIA	Lolo Forest Management Plan
USFS	1	Mary's Frog Pond Botanical Area SIA	Lolo Forest Management Plan
USFS	1	Northwest Peak Scenic Area SIA	Kootenai Forest Management Plan
USFS	1	Rexford Hoodoos Geologic Area SIA	Kootenai Forest Management Plan
USFS	1	Ross Creek Cedars Scenic Area SIA	Kootenai Forest Management Plan
USFS	1	Shoofly Meadows Botanical Area SIA	Lolo Forest Management Plan
USFS	1	Star Creek Canyon Geologic Area SIA	Kootenai Forest Management Plan
USFS	1	Sunday Creek Falls Geologic Area SIA	Kootenai Forest Management Plan
USFS	1	Ten Lakes Scenic Area SIA	Kootenai Forest Management Plan
USFS	1	Tenmile Talus Geologic Area SIA	Kootenai Forest Management Plan
USFS	1	West Fork Yaak Falls Geologic Area SIA	Kootenai Forest Management Plan
USFS	1	Wood Creek Larch Scenic Area SIA	Kootenai Forest Management Plan
USFS	2	Barktable Ridge proposed RNA	Lolo Forest Management Plan
USFS	2	Basin Creek proposed RNA (pRNA)	Deerlodge Forest Management Plan
USFS	2	Bass Creek pRNA	Bitterroot Forest Management Plan
USFS	2	Bernice pRNA	Deerlodge Forest Management Plan
USFS	2	Big Snowy pRNA	Lewis and Clark Forest Management Plan
USFS	2	Black Butte pRNA	Gallatin Forest Management Plan
USFS	2	Cattle Gulch pRNA	Beaverhead Forest Management Plan
USFS	2	Cave Mountain pRNA	Beaverhead Forest Management Plan
USFS	2	Dexter Basin pRNA	Deerlodge Forest Management Plan
USFS	2	Dry Mountain pRNA	Deerlodge Forest Management Plan
USFS	2	East Fork Bitterroot pRNA	Bitterroot Forest Management Plan
USFS	2	East Fork Mill Creek pRNA	Gallatin Forest Management Plan
USFS	2	Elkhorn Lake pRNA	Beaverhead Forest Management Plan
USFS	2	Goat Flat pRNA	Beaverhead and Deerlodge Forest Management Plans
USFS	2	Granite Butte pRNA	Helena Forest Management Plan
USFS	2	Horse Prairie pRNA	Beaverhead Forest Management Plan
USFS	2	Indian Meadows pRNA	Helena Forest Management Plan
USFS	2	LeBeau pRNA	Flathead and Kootenai Forest Management Plans
USFS	2	Lost Park pRNA	Deerlodge Forest Management Plan
USFS	2	Lower Ross Creek pRNA	Kootenai Forest Management Plan
USFS	2	Minerva Creek pRNA	Lewis and Clark Forest Management Plan
USFS	2	Mount Ellis pRNA	Gallatin Forest Management Plan

Agency	Status	Administrative Unit	Source
USFS	2	Norman-Parmenter pRNA	Kootenai Forest Management Plan
USFS	2	Obsidian Sands pRNA	Gallatin Forest Management Plan
USFS	2	Palace Butte pRNA	Gallatin Forest Management Plan
USFS	2	Passage Creek pRNA	Gallatin Forest Management Plan
USFS	2	Red Mountain pRNA	Helena Forest Management Plan
USFS	2	Sapphire Divide pRNA	Bitterroot and Deerlodge Forest Management Plans
USFS	2	Skull-Odell pRNA	Beaverhead Forest Management Plan
USFS	2	Sliding Mountain pRNA	Gallatin Forest Management Plan
USFS	2	Squaw Creek pRNA	Lolo Forest Management Plan
USFS	2	Swan River pRNA	Flathead Forest Management Plan
USFS	2	Thunderbolt Mountain pRNA	Deerlodge and Helena Forest Management Plans
USFS	2	Wheeler Ridge pRNA	Gallatin Forest Management Plan
USFS	2	Barnum Wetland Botanical Area pSIA	Kootenai Forest Management Plan
USFS	2	Bitterroot Point Botanical Area pSIA	Kootenai Forest Management Plan
USFS	2	Condon Creek Botanical Area pSIA	Flathead Forest Management Plan
USFS	2	French Creek Botanical Area pSIA	Kootenai Forest Management Plan
USFS	2	Hidden Lake Botanical Area pSIA	Kootenai Forest Management Plan
USFS	2	Jumping Creek Botanical Area pSIA	Lewis and Clark Forest Management Plan
USFS	2	West Fork Buttes Botanical Area pSIA	Deerlodge Forest Management Plan
USFS	1	Absaroka-Beartooth Wilderness	Custer and Gallatin Forest Management Plans
USFS	1	Anaconda Pintlar Wilderness	Beaverhead, Bitterroot and Deerlodge Forest Management Plans
USFS	1	Bob Marshall Wilderness	Flathead and Lewis and Clark Forest Management Plans
USFS	1	Cabinet Mountains Wilderness	Kootenai Forest Management Plan
USFS	1	Gates Of The Mountains Wilderness	Helena Forest Management Plan
USFS	1	Great Bear Wilderness	Flathead Forest Management Plan
USFS	1	Lee Metcalf Wilderness	Beaverhead and Gallatin Forest Management Plans
USFS	1	Mission Mountains Wilderness	Flathead Forest Management Plan
USFS	1	Rattlesnake Wilderness	Lolo Forest Management Plan
USFS	1	Scapegoat Wilderness	Helena, Lewis and Clark, and Lolo Forest Management Plans
USFS	1	Selway Bitterroot Wilderness	Bitterroot and Lolo Forest Management Plans
USFS	1	Welcome Creek Wilderness	Lolo Forest Management Plan
USFS	2	Beaverhead NF Recommended Wilderness	Beaverhead Forest Management Plan
USFS	2	Bitterroot NF Recommended Wilderness	Bitterroot Forest Management Plan
USFS	2	Custer NF Recommended Wilderness	Custer Forest Management Plan

Agency	Status	Administrative Unit	Source
USFS	2	Deerlodge NF Recommended Wilderness	Deerlodge Forest Management Plan
USFS	2	Gallatin NF Recommended Wilderness	Gallatin Forest Management Plan
USFS	2	Helena NF Recommended Wilderness	Helena Forest Management Plan
USFS	2	Kootenai NF Recommended Wilderness	Kootenai Forest Management Plan
USFS	2	Lewis and Clark NF Recommended Wilderness	Lewis and Clark Forest Management Plan
USFS	2	Lolo NF Recommended Wilderness	Lolo Forest Management Plan
USFS	2	Ten Lakes Wilderness Study Area	Kootenai Forest Management Plan
State	2	Stillwater Game Preserve	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Blackfoot Clearwater Game Range	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Bear Creek Wildlife Management Area (WMA)	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Beartooth WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Bitterroot/Calf Creek WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Blackleaf WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Blacktail WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Canyon Ferry WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Ear Mountain WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Elk Island WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Fleecer Mountain WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Fox Lake WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Freezeout Lake WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Gallatin Porcupine WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Garrity Mountain WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Haymaker WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Judith River WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Mount Haggin WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Ninepipe WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Pishkun Reservoir WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Rookery WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Seven Sisters WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Sun River WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Threemile WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Wall Creek WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Warm Springs WMA	Contact: Montana Department of Fish, Wildlife and Parks
State	2	Willow Creek WMA	Contact: Montana Department of Fish, Wildlife and Parks

Agency	Status	Administrative Unit	Source
State	2	State owned, The Nature Conservancy (TNC) managed	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
State	2	State owned, TNC managed lease	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
State	2	State owned, TNC managed other	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
State	2	Ackley Lake Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Beaverhead Rock Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Council Grove Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Lost Creek Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Madison Buffalo Jump Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Medicine Rock Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Natural Bridge Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Painted Rocks Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Parker Homestead Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Pirogue Island Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Rosebud Battlefield Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Sluice Boxes Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Thompson Falls Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Wild Horse Island Primitive State Park	Contact: Montana Fish, Wildlife and Parks, Kalispell, MT
State	2	Isaac Homestead	Contact: Candice Coefield, Fish Wildlife and Parks Lands Inventory, 1996, Helena, MT
State	2	Upper Missouri Wild and Scenic River	Contact: Candice Coefield, Fish Wildlife and Parks Lands Inventory, 1996, Helena, MT
MPC	2	Montana Power Company (MPC) owned, NRCS managed	Contact: Natural Resources Conservation Service (NRCS), Bozeman, MT
Private	2	Privately owned, DU managed Conservation Easement (CE)	Contact: Ducks Unlimited (DU) Helena, MT
Private	2	Privately owned, FVLT managed CE	Contact: Five Valleys Land Trust (FVLT), Missoula, MT
Private	2	Privately owned, Montana Land Reliance (MLR) managed	Contact: The Nature Conservancy, Helena, MT
Private	2	Privately owned, MLR managed CE	Contact: The Nature Conservancy, Helena, MT
Private	2	Privately owned, RMEF managed CE	Contact: Rocky Mountains Elk Foundation, Bozeman, MT
Private	2	Privately owned, TNC managed	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
Private	2	Privately owned, TNC managed CE	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
Private	2	Privately owned, TNC managed other	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
Private	2	Privately owned, TNC managed regis	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
TNC	1	Pine Butte Swamp Preserve	Contact: Pine Butte Swamp Preserve, Choteau, MT

Agency	Status	Administrative Unit	Source
TNC	1	Other TNC Preserves	Contact: Montana Chapter of The Nature Conservancy, Helena, MT
Tribal	1	Mission Mountains Tribal Wilderness	Contact: Confederated Salish and Kootenai Tribes, Pablo, MT
Tribal	2	Flathead Tribal Land	Contact: Confederated Salish and Kootenai Tribes, Pablo, MT
Tribal	1	Jocko Primitive Area	Contact: Confederated Salish and Kootenai Tribes, Pablo, MT
Tribal	2	Pablo NWR	Contact: D. Wiseman, Nationl Bison Range, Moiese, MT
Tribal	2	Ninepipe NWR	Contact: D. Wiseman, National Bison Range, Moiese, MT
Tribal	1	Lozeau Primitive Area	Contact: Confederated Salish and Kootenai Tribes, Pablo, MT

Appendix 5.1. Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

1100 Urban or Developed Lands — **%Status 1 & 2: 1.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	50	0	NA	0	NA	0	NA	50	0.08
Status 2	13	0	0	145	NA	0	636	9	NA	803	1.26
Status 3	105	33	0	1	1,324	888	788	0	NA	3,140	4.93
Status 4	NA	NA	NA	NA	NA	NA	28	59,288	64	59,380	93.17
Water	NA	NA	NA	NA	NA	NA	NA	NA	360	360	0.57
Total	118	33	50	146	1,324	888	1,452	59,297	424	63,733	100

2010 Agricultural Lands - Dry — **%Status 1 & 2: 0.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4	0	2	1,068	NA	0	NA	113	NA	1,187	0.03
Status 2	6	178	10	710	NA	57	582	2,342	NA	3,885	0.11
Status 3	857	18,714	0	899	967	160,852	158,718	0	NA	341,008	9.39
Status 4	NA	NA	NA	NA	NA	NA	0	3,282,300	601	3,282,901	90.37
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,632	3,632	0.10
Total	868	18,892	11	2,677	967	160,909	159,299	3,284,755	4,233	3,632,612	100

2020 Agricultural Lands - Irrigated — **%Status 1 & 2: 0.27**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	207	NA	0	NA	0	NA	207	0.01
Status 2	0	42	12	278	NA	275	947	3,555	NA	5,109	0.26
Status 3	774	3,447	0	1,004	483	84,936	62,500	0	NA	153,144	7.82
Status 4	NA	NA	NA	NA	NA	NA	2	1,793,475	1,247	1,794,723	91.69
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,111	4,111	0.21
Total	774	3,489	12	1,490	483	85,211	63,448	1,797,030	5,357	1,957,295	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

3110 Altered Herbaceous — **%Status 1 & 2: 1.71**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,169	4	137	642	NA	12	NA	4	NA	1,967	0.19
Status 2	496	659	2	10,298	NA	15	2,106	1,792	NA	15,367	1.51
Status 3	8,964	57,715	0	1,825	104	52,121	68,261	0	NA	188,990	18.62
Status 4	NA	NA	NA	NA	NA	NA	0	804,932	302	805,234	79.34
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,387	3,387	0.33
Total	10,629	58,378	139	12,764	104	52,148	70,367	806,728	3,690	1,014,946	100

3130 Very Low Cover Grasslands — **%Status 1 & 2: 2.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	130	109	5	512	NA	12	NA	0	NA	768	0.07
Status 2	136	8,515	2,421	5,393	NA	179	1,349	4,695	NA	22,688	2.05
Status 3	5,144	193,431	0	566	623	45,140	95,426	0	NA	340,330	30.82
Status 4	NA	NA	NA	NA	NA	NA	0	738,527	0	738,527	66.87
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,048	2,048	0.19
Total	5,410	202,054	2,426	6,471	623	45,332	96,776	743,222	2,048	1,104,361	100

3150 Low / Moderate Cover Grasslands — **%Status 1 & 2: 1.76**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	15,661	2,825	4,465	7,780	NA	589	NA	3,200	NA	34,520	0.33
Status 2	4,859	7,543	943	56,951	NA	125	23,824	54,451	NA	148,696	1.43
Status 3	231,718	1,144,477	62	8,105	8,511	736,044	851,295	1	NA	2,980,214	28.58
Status 4	NA	NA	NA	NA	NA	NA	14	7,248,126	186	7,248,326	69.51
Water	NA	NA	NA	NA	NA	NA	NA	NA	15,709	15,709	0.15
Total	252,239	1,154,845	5,470	72,836	8,511	736,757	875,133	7,305,777	15,895	10,427,465	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

3170 Moderate / High Cover Grasslands **%Status 1 & 2: 2.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,084	141	1,848	1,123	NA	4	NA	17	NA	4,217	0.34
Status 2	115	1,300	108	20,809	NA	34	921	6,332	NA	29,618	2.40
Status 3	35,089	82,335	0	890	718	126,189	72,518	0	NA	317,739	25.69
Status 4	NA	NA	NA	NA	NA	NA	1	881,326	62	881,389	71.27
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,697	3,697	0.30
Total	36,288	83,776	1,955	22,823	718	126,227	73,439	887,675	3,759	1,236,660	100

3180 Montane Parklands & Subalpine Meadows **%Status 1 & 2: 24.89**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	79,349	716	18,682	992	NA	4,465	NA	0	NA	104,204	19.73
Status 2	19,431	1,469	8	276	NA	1	2,924	3,123	NA	27,232	5.16
Status 3	238,830	24,457	0	0	1,924	5,644	20,523	0	NA	291,378	55.16
Status 4	NA	NA	NA	NA	NA	NA	0	105,227	0	105,227	19.92
Water	NA	NA	NA	NA	NA	NA	NA	NA	160	160	0.03
Total	337,610	26,643	18,690	1,268	1,924	10,110	23,447	108,350	160	528,201	100

3200 Mixed Mesic Shrubs **%Status 1 & 2: 9.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	43,595	1,550	14,270	170	NA	2,420	NA	540	NA	62,545	6.59
Status 2	13,455	137	28	2,596	NA	71	3,594	3,425	NA	23,306	2.45
Status 3	159,620	30,659	0	518	626	82,823	35,826	0	NA	310,072	32.64
Status 4	NA	NA	NA	NA	NA	NA	3	552,252	124	552,379	58.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,571	1,571	0.17
Total	216,670	32,345	14,297	3,285	626	85,314	39,424	556,217	1,695	949,873	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

3300 Mixed Xeric Shrubs — **%Status 1 & 2: 4.69**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	487	667	25	1,251	NA	107	NA	106	NA	2,643	0.22
Status 2	944	8,565	206	43,101	NA	0	1,311	765	NA	54,891	4.47
Status 3	19,887	199,530	0	182	4,597	46,993	76,121	0	NA	347,310	28.29
Status 4	NA	NA	NA	NA	NA	NA	0	820,097	18	820,115	66.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,893	2,893	0.24
Total	21,318	208,761	231	44,535	4,597	47,100	77,432	820,968	2,910	1,227,852	100

3309 Silver Sage — **%Status 1 & 2: 10.72**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	90	3	125	NA	0	NA	0	NA	218	0.30
Status 2	0	392	6	7,143	NA	0	83	15	NA	7,640	10.42
Status 3	69	19,262	0	45	8	1,670	4,311	0	NA	25,364	34.59
Status 4	NA	NA	NA	NA	NA	NA	0	39,612	2	39,615	54.02
Water	NA	NA	NA	NA	NA	NA	NA	NA	498	498	0.68
Total	69	19,744	10	7,313	8	1,670	4,393	39,628	501	73,335	100

3310 Salt-Desert Shrub / Dry Salt Flats — **%Status 1 & 2: 3.88**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	111	NA	0	NA	0	NA	111	0.09
Status 2	0	403	2	4,452	NA	0	34	90	NA	4,981	3.80
Status 3	604	66,405	0	135	0	1,381	6,806	0	NA	75,332	57.44
Status 4	NA	NA	NA	NA	NA	NA	0	49,723	0	49,723	37.92
Water	NA	NA	NA	NA	NA	NA	NA	NA	995	995	0.76
Total	604	66,808	2	4,698	0	1,381	6,840	49,813	995	131,141	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

3350 Sagebrush — **%Status 1 & 2: 3.73**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,103	214	2,993	2,675	NA	5	NA	34	NA	18,023	0.84
Status 2	2,272	4,755	3,588	36,284	NA	1	6,956	8,244	NA	62,100	2.89
Status 3	118,552	538,350	0	1,002	2,419	68,734	176,774	15	NA	905,847	42.22
Status 4	NA	NA	NA	NA	NA	NA	0	1,153,093	0	1,153,093	53.74
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,510	6,510	0.30
Total	132,927	543,319	6,581	39,961	2,419	68,740	183,730	1,161,387	6,510	2,145,574	100

3510 Mesic Shrub - Grassland Associations — **%Status 1 & 2: 0.64**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	32	28	4	2	NA	0	NA	0	NA	67	0.02
Status 2	0	18	21	381	NA	0	85	1,206	NA	1,711	0.61
Status 3	7,906	22,298	0	35	153	42,382	15,693	0	NA	88,466	31.59
Status 4	NA	NA	NA	NA	NA	NA	0	189,657	11	189,668	67.72
Water	NA	NA	NA	NA	NA	NA	NA	NA	164	164	0.06
Total	7,938	22,344	25	418	153	42,382	15,778	190,863	175	280,075	100

3520 Xeric Shrub - Grassland Associations — **%Status 1 & 2: 3.27**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	442	NA	0	NA	5	NA	447	0.09
Status 2	0	3,548	626	11,382	NA	0	311	808	NA	16,675	3.18
Status 3	600	122,441	0	404	523	7,053	35,784	0	NA	166,806	31.83
Status 4	NA	NA	NA	NA	NA	NA	0	339,297	0	339,297	64.74
Water	NA	NA	NA	NA	NA	NA	NA	NA	837	837	0.16
Total	600	125,989	626	12,229	523	7,053	36,095	340,110	837	524,062	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

4000 Low Density Xeric Forest — **%Status 1 & 2: 1.92**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	674	30	15	2	NA	0	NA	0	NA	722	0.25
Status 2	13	170	25	3,431	NA	0	508	634	NA	4,781	1.67
Status 3	40,890	25,208	0	36	0	67,765	11,293	0	NA	145,192	50.73
Status 4	NA	NA	NA	NA	NA	NA	0	135,194	13	135,207	47.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	285	285	0.10
Total	41,577	25,408	41	3,469	0	67,765	11,801	135,828	298	286,188	100

4140 Mixed Broadleaf Forest — **%Status 1 & 2: 6.60**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,208	111	11,026	645	NA	0	NA	113	NA	15,103	4.22
Status 2	1,699	200	134	2,044	NA	0	1,805	2,604	NA	8,486	2.37
Status 3	41,968	6,895	0	63	208	47,723	13,737	0	NA	110,593	30.93
Status 4	NA	NA	NA	NA	NA	NA	0	219,806	271	220,078	61.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,279	3,279	0.92
Total	46,875	7,206	11,160	2,752	208	47,723	15,541	222,524	3,550	357,540	100

4203 Lodgepole Pine — **%Status 1 & 2: 23.49**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	185,475	1,248	45,577	39	NA	7,242	NA	34	NA	239,615	18.63
Status 2	53,701	1,640	208	84	NA	43	3,996	2,760	NA	62,432	4.86
Status 3	761,169	35,942	0	15	545	23,130	20,427	0	NA	841,230	65.41
Status 4	NA	NA	NA	NA	NA	NA	0	142,161	0	142,161	11.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	718	718	0.06
Total	1,000,345	38,831	45,785	139	545	30,415	24,423	144,955	718	1,286,157	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

4205 Limber Pine — **%Status 1 & 2: 17.41**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,037	96	1,558	49	NA	0	NA	787	NA	14,527	12.07
Status 2	1,417	416	130	665	NA	0	2,492	1,310	NA	6,430	5.34
Status 3	27,738	9,918	0	1	99	8,795	6,792	0	NA	53,342	44.31
Status 4	NA	NA	NA	NA	NA	NA	0	45,855	22	45,877	38.11
Water	NA	NA	NA	NA	NA	NA	NA	NA	198	198	0.16
Total	41,192	10,430	1,688	714	99	8,795	9,283	47,951	220	120,372	100

4206 Ponderosa Pine — **%Status 1 & 2: 4.06**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,969	204	43	346	NA	1,383	NA	17	NA	5,962	0.56
Status 2	2,641	3,521	89	23,711	NA	137	2,619	4,623	NA	37,341	3.50
Status 3	168,013	90,530	0	192	473	88,045	52,381	0	NA	399,635	37.48
Status 4	NA	NA	NA	NA	NA	NA	0	621,039	11	621,050	58.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,141	2,141	0.20
Total	174,623	94,256	132	24,249	473	89,566	55,000	625,680	2,152	1,066,130	100

4207 Grand Fir — **%Status 1 & 2: 7.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	35	0	1,094	0	NA	107	NA	0	NA	1,235	5.61
Status 2	314	0	1	0	NA	146	0	9	NA	470	2.13
Status 3	13,317	0	0	0	0	1,480	1,533	0	NA	16,330	74.17
Status 4	NA	NA	NA	NA	NA	NA	0	3,974	0	3,974	18.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	9	9	0.04
Total	13,666	0	1,094	0	0	1,733	1,533	3,983	9	22,017	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

4210 Western Red Cedar — **%Status 1 & 2: 3.65**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	296	0	75	0	NA	164	NA	0	NA	535	1.47
Status 2	711	0	12	0	NA	70	0	0	NA	793	2.18
Status 3	28,772	0	0	3	4	284	1,708	0	NA	30,772	84.68
Status 4	NA	NA	NA	NA	NA	NA	0	4,210	0	4,210	11.58
Water	NA	NA	NA	NA	NA	NA	NA	NA	30	30	0.08
Total	29,780	0	87	3	4	518	1,708	4,210	30	36,339	100

4211 Western Hemlock — **%Status 1 & 2: 8.00**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	494	0	518	0	NA	22	NA	0	NA	1,034	4.94
Status 2	619	0	23	0	NA	0	0	0	NA	642	3.07
Status 3	17,805	0	0	0	0	6	235	0	NA	18,045	86.17
Status 4	NA	NA	NA	NA	NA	NA	0	1,159	0	1,159	5.54
Water	NA	NA	NA	NA	NA	NA	NA	NA	61	61	0.29
Total	18,918	0	541	0	0	28	235	1,159	61	20,941	100

4212 Douglas-fir — **%Status 1 & 2: 12.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	81,338	991	23,120	620	NA	6,174	NA	275	NA	112,518	8.46
Status 2	28,397	3,874	348	939	NA	548	7,220	7,556	NA	48,883	3.68
Status 3	646,592	56,340	1	181	363	45,766	52,969	0	NA	802,212	60.32
Status 4	NA	NA	NA	NA	NA	NA	3	364,173	30	364,206	27.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,176	2,176	0.16
Total	756,327	61,205	23,469	1,740	363	52,488	60,192	372,005	2,206	1,329,994	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

4214 Rocky Mountain Juniper **%Status 1 & 2: 6.88**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	15	10	156	91	NA	0	NA	8	NA	279	0.35
Status 2	77	689	8	4,066	NA	0	264	147	NA	5,251	6.53
Status 3	2,422	22,478	0	15	0	1,405	4,487	0	NA	30,807	38.33
Status 4	NA	NA	NA	NA	NA	NA	0	43,883	0	43,883	54.59
Water	NA	NA	NA	NA	NA	NA	NA	NA	160	160	0.20
Total	2,514	23,177	164	4,172	0	1,405	4,751	44,037	160	80,380	100

4215 Western Larch **%Status 1 & 2: 16.28**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5,242	0	6,937	0	NA	792	NA	0	NA	12,971	14.34
Status 2	1,657	0	10	0	NA	15	34	40	NA	1,755	1.94
Status 3	59,254	90	0	7	14	2,904	2,467	0	NA	64,736	71.58
Status 4	NA	NA	NA	NA	NA	NA	0	10,922	0	10,922	12.08
Water	NA	NA	NA	NA	NA	NA	NA	NA	53	53	0.06
Total	66,154	90	6,947	7	14	3,711	2,501	10,962	53	90,437	100

4216 Utah Juniper **%Status 1 & 2: 17.61**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11	0	0	0	NA	0	NA	0	NA	11	0.08
Status 2	0	671	1,893	0	NA	0	0	38	NA	2,603	17.53
Status 3	822	2,958	0	0	0	4,785	388	0	NA	8,954	60.32
Status 4	NA	NA	NA	NA	NA	NA	0	3,258	0	3,258	21.95
Water	NA	NA	NA	NA	NA	NA	NA	NA	18	18	0.12
Total	833	3,630	1,893	0	0	4,785	388	3,296	18	14,843	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

4223 Douglas-fir / Lodgepole Pine — **%Status 1 & 2: 19.21**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	49,568	425	13,064	45	NA	2,191	NA	76	NA	65,369	14.48
Status 2	17,087	153	26	15	NA	11	2,890	1,133	NA	21,315	4.72
Status 3	254,926	16,024	0	39	44	6,729	11,264	0	NA	289,025	64.04
Status 4	NA	NA	NA	NA	NA	NA	0	75,436	0	75,436	16.71
Water	NA	NA	NA	NA	NA	NA	NA	NA	187	187	0.04
Total	321,581	16,603	13,090	99	44	8,930	14,154	76,645	187	451,332	100

4260 Mixed Whitebark Pine Forest — **%Status 1 & 2: 51.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	140,607	220	29,951	21	NA	3,036	NA	0	NA	173,835	44.08
Status 2	25,927	502	0	0	NA	0	833	99	NA	27,362	6.94
Status 3	174,006	1,403	0	0	564	3,264	3,253	0	NA	182,490	46.28
Status 4	NA	NA	NA	NA	NA	NA	0	10,062	0	10,062	2.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	592	592	0.15
Total	340,540	2,125	29,951	21	564	6,300	4,086	10,161	592	394,340	100

4270 Mixed Subalpine Forest — **%Status 1 & 2: 31.90**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	309,320	816	93,837	483	NA	17,028	NA	26	NA	421,509	26.64
Status 2	68,827	6,596	301	203	NA	23	5,197	2,159	NA	83,306	5.26
Status 3	913,667	24,599	0	4	2,603	26,182	24,468	0	NA	991,523	62.65
Status 4	NA	NA	NA	NA	NA	NA	0	85,656	0	85,656	5.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	618	618	0.04
Total	1,291,814	32,010	94,137	689	2,603	43,233	29,665	87,841	618	1,582,611	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

4280 Mixed Mesic Forest — **%Status 1 & 2: 15.69**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	80,744	208	59,681	139	NA	15,541	NA	128	NA	156,441	12.75
Status 2	27,432	156	1,143	580	NA	3,805	1,781	1,289	NA	36,185	2.95
Status 3	638,180	3,629	0	139	57	55,166	61,259	0	NA	758,430	61.80
Status 4	NA	NA	NA	NA	NA	NA	6	275,253	0	275,258	22.43
Water	NA	NA	NA	NA	NA	NA	NA	NA	995	995	0.08
Total	746,356	3,992	60,824	859	57	74,511	63,046	276,669	995	1,227,310	100

4290 Mixed Xeric Forest — **%Status 1 & 2: 8.97**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	13,305	295	2,907	93	NA	2,146	NA	73	NA	18,819	3.47
Status 2	4,197	3,577	126	14,906	NA	75	2,135	4,771	NA	29,786	5.50
Status 3	147,396	49,586	4	108	78	24,185	26,963	0	NA	248,319	45.81
Status 4	NA	NA	NA	NA	NA	NA	0	243,678	15	243,693	44.96
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,432	1,432	0.26
Total	164,897	53,458	3,037	15,107	78	26,405	29,098	248,522	1,447	542,050	100

4300 Mixed Broadleaf & Conifer Forest — **%Status 1 & 2: 6.42**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	2,918	3	1,142	22	NA	210	NA	113	NA	4,409	4.42
Status 2	1,456	48	12	0	NA	53	167	263	NA	1,999	2.00
Status 3	36,463	2,608	0	66	5	10,419	4,066	0	NA	53,627	53.71
Status 4	NA	NA	NA	NA	NA	NA	0	39,553	6	39,560	39.62
Water	NA	NA	NA	NA	NA	NA	NA	NA	249	249	0.25
Total	40,837	2,659	1,154	87	5	10,682	4,233	39,930	256	99,844	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

4400 Standing Burnt Forest — **%Status 1 & 2: 65.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	60,245	0	20,481	0	NA	0	NA	0	NA	80,725	57.97
Status 2	6,514	66	221	28	NA	0	3,157	2	NA	9,988	7.17
Status 3	36,170	520	0	0	14	770	1,467	0	NA	38,941	27.96
Status 4	NA	NA	NA	NA	NA	NA	0	9,567	0	9,567	6.87
Water	NA	NA	NA	NA	NA	NA	NA	NA	41	41	0.03
Total	102,928	586	20,702	28	14	770	4,624	9,569	41	139,262	100

5000 Water — **%Status 1 & 2: 1.88**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	2,012	52	998	617	NA	119	NA	9	NA	3,807	0.96
Status 2	279	222	198	1,359	NA	121	1,265	254	NA	3,698	0.93
Status 3	2,925	8,682	0	182	266	6,761	4,676	0	NA	23,492	5.90
Status 4	NA	NA	NA	NA	NA	NA	0	57,057	365	57,423	14.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	309,986	309,986	77.81
Total	5,216	8,956	1,196	2,159	266	7,001	5,941	57,320	310,351	398,406	100

6110 Conifer Riparian — **%Status 1 & 2: 13.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,920	56	1,873	292	NA	226	NA	27	NA	7,394	8.70
Status 2	1,973	134	113	373	NA	20	560	586	NA	3,759	4.42
Status 3	23,145	2,910	0	132	45	3,139	3,551	0	NA	32,922	38.73
Status 4	NA	NA	NA	NA	NA	NA	1	38,887	31	38,919	45.78
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,011	2,011	2.37
Total	30,038	3,101	1,985	797	45	3,385	4,112	39,500	2,042	85,005	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

6120 Broadleaf Riparian — **%Status 1 & 2: 2.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	946	3	267	362	NA	114	NA	59	NA	1,752	0.89
Status 2	241	98	12	1,668	NA	26	755	1,215	NA	4,014	2.02
Status 3	6,549	5,711	0	80	207	18,190	8,347	0	NA	39,083	19.70
Status 4	NA	NA	NA	NA	NA	NA	2	147,501	905	148,407	74.81
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,115	5,115	2.58
Total	7,736	5,812	279	2,110	207	18,330	9,104	148,775	6,020	198,372	100

6130 Mixed Broadleaf & Conifer Riparian — **%Status 1 & 2: 11.62**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,183	7	1,726	41	NA	44	NA	14	NA	3,015	8.63
Status 2	432	31	75	6	NA	14	286	202	NA	1,046	2.99
Status 3	9,663	744	0	14	11	2,760	1,369	0	NA	14,560	41.68
Status 4	NA	NA	NA	NA	NA	NA	0	15,877	4	15,881	45.46
Water	NA	NA	NA	NA	NA	NA	NA	NA	432	432	1.24
Total	11,278	782	1,801	61	11	2,817	1,655	16,092	436	34,933	100

6200 Graminoid & Forb Riparian — **%Status 1 & 2: 1.52**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,200	136	383	1,769	NA	5	NA	19	NA	3,512	0.50
Status 2	298	78	108	2,696	NA	9	684	3,287	NA	7,160	1.02
Status 3	9,873	32,237	0	934	778	62,999	37,965	0	NA	144,787	20.61
Status 4	NA	NA	NA	NA	NA	NA	0	536,346	270	536,615	76.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,501	10,501	1.50
Total	11,372	32,451	491	5,399	778	63,013	38,649	539,651	10,771	702,575	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

6300 Shrub Riparian — **%Status 1 & 2: 3.38**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	2,731	186	2,203	1,254	NA	109	NA	186	NA	6,669	1.83
Status 2	949	75	160	990	NA	37	1,354	2,055	NA	5,620	1.54
Status 3	16,569	12,648	0	255	423	32,432	15,566	0	NA	77,893	21.42
Status 4	NA	NA	NA	NA	NA	NA	1	267,576	381	267,958	73.70
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,457	5,457	1.50
Total	20,248	12,909	2,364	2,499	423	32,578	16,921	269,817	5,838	363,596	100

6400 Mixed Riparian — **%Status 1 & 2: 4.71**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,081	28	1,868	241	NA	100	NA	71	NA	3,389	2.76
Status 2	408	23	130	159	NA	0	513	1,153	NA	2,385	1.94
Status 3	7,514	3,059	0	137	118	9,539	5,507	0	NA	25,874	21.09
Status 4	NA	NA	NA	NA	NA	NA	0	89,597	8	89,605	73.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,409	1,409	1.15
Total	9,004	3,109	1,997	536	118	9,639	6,020	90,821	1,418	122,662	100

7300 Rock — **%Status 1 & 2: 53.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	186,117	302	85,506	27	NA	5,454	NA	21	NA	277,427	46.94
Status 2	28,276	1,885	237	4,938	NA	4	1,831	395	NA	37,566	6.36
Status 3	117,068	21,119	0	64	51	6,951	9,331	0	NA	154,584	26.15
Status 4	NA	NA	NA	NA	NA	NA	2	116,939	0	116,941	19.78
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,549	4,549	0.77
Total	331,461	23,306	85,743	5,028	51	12,409	11,164	117,355	4,549	591,068	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

7500 Mines, Quarries, Gravel Pits — **%Status 1 & 2: 0.79**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	4	NA	0	NA	0	NA	4	0.03
Status 2	44	33	0	0	NA	0	13	0	NA	90	0.76
Status 3	827	1,231	0	0	2	16	868	0	NA	2,945	24.70
Status 4	NA	NA	NA	NA	NA	NA	0	8,857	0	8,857	74.30
Water	NA	NA	NA	NA	NA	NA	NA	NA	25	25	0.21
Total	871	1,264	0	4	2	16	881	8,857	25	11,922	100

7600 Badlands — **%Status 1 & 2: 4.35**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,251	946	0	373	NA	0	NA	0	NA	2,570	0.34
Status 2	0	10,111	671	18,457	NA	0	694	62	NA	29,997	4.00
Status 3	2,283	242,931	0	86	2,783	11,973	47,894	0	NA	307,951	41.08
Status 4	NA	NA	NA	NA	NA	NA	0	404,098	6	404,104	53.91
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,980	4,980	0.66
Total	3,534	253,988	671	18,917	2,783	11,973	48,589	404,160	4,986	749,602	100

7604 Missouri Breaks — **%Status 1 & 2: 53.94**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	198	NA	0	NA	0	NA	198	0.29
Status 2	0	4,530	0	32,244	NA	0	344	0	NA	37,118	53.66
Status 3	0	20,768	0	0	0	30	3,134	0	NA	23,931	34.60
Status 4	NA	NA	NA	NA	NA	NA	0	6,329	0	6,329	9.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,600	1,600	2.31
Total	0	25,297	0	32,442	0	30	3,478	6,329	1,600	69,176	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

7800 Mixed Barren Sites — **%Status 1 & 2: 12.01**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	15,477	338	1,081	33	NA	271	NA	102	NA	17,302	8.78
Status 2	4,673	73	37	607	NA	0	691	289	NA	6,370	3.23
Status 3	42,631	22,270	0	75	185	6,684	8,217	0	NA	80,061	40.63
Status 4	NA	NA	NA	NA	NA	NA	0	91,570	0	91,570	46.47
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,749	1,749	0.89
Total	62,781	22,681	1,119	714	185	6,955	8,908	91,961	1,749	197,051	100

8100 Alpine Meadows — **%Status 1 & 2: 74.27**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	32,261	42	1,693	0	NA	40	NA	0	NA	34,036	62.26
Status 2	6,505	9	0	0	NA	0	51	0	NA	6,565	12.01
Status 3	12,323	139	0	0	24	3	62	0	NA	12,552	22.96
Status 4	NA	NA	NA	NA	NA	NA	0	1,462	0	1,462	2.68
Water	NA	NA	NA	NA	NA	NA	NA	NA	49	49	0.09
Total	51,089	190	1,693	0	24	43	113	1,462	49	54,664	100

9100 Snowfields or Ice — **%Status 1 & 2: 92.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	21,107	0	2,082	0	NA	1,553	NA	0	NA	24,741	91.38
Status 2	181	0	0	0	NA	0	0	0	NA	181	0.67
Status 3	1,613	2	0	0	0	103	0	0	NA	1,717	6.34
Status 4	NA	NA	NA	NA	NA	NA	0	204	0	204	0.75
Water	NA	NA	NA	NA	NA	NA	NA	NA	233	233	0.86
Total	22,900	2	2,082	0	0	1,656	0	204	233	27,077	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.1 *continued.* Area (ha) of predicted distribution for 50 land cover types in Montana by stewardship category and management status.

9800 Clouds **%Status 1 & 2: 10.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	437	0	0	0	NA	0	NA	0	NA	437	2.41
Status 2	1,480	0	0	0	NA	0	0	34	NA	1,514	8.33
Status 3	3,830	1,694	0	0	46	0	1,013	0	NA	6,583	36.22
Status 4	NA	NA	NA	NA	NA	NA	0	9,577	0	9,577	52.70
Water	NA	NA	NA	NA	NA	NA	NA	NA	61	61	0.33
Total	5,747	1,694	0	0	46	0	1,013	9,611	61	18,172	100

9900 Cloud Shadow **%Status 1 & 2: 12.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	488	0	0	0	NA	0	NA	0	NA	488	3.96
Status 2	1,022	0	0	0	NA	0	34	15	NA	1,071	8.67
Status 3	3,838	1,163	0	0	0	0	449	0	NA	5,450	44.14
Status 4	NA	NA	NA	NA	NA	NA	0	5,325	0	5,325	43.13
Water	NA	NA	NA	NA	NA	NA	NA	NA	11	11	0.09
Total	5,348	1,163	0	0	0	0	483	5,340	11	12,345	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that cover type. Rounding error applies.

Appendix 5.2. Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AAAAA01080 **LONG-TOED SALAMANDER** ***Ambystoma macrodactylum*** **%Status 1 & 2: 14.86**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	73,689	291	37,370	359	NA	6,017	NA	247	NA	117,972	11.14
Status 2	22,550	893	1,003	1,152	NA	1,081	7,797	4,963	NA	39,439	3.72
Status 3	289,553	28,515	0	751	369	42,482	42,533	0	NA	404,203	38.17
Status 4	NA	NA	NA	NA	NA	NA	6	453,195	0	453,201	42.80
Water	NA	NA	NA	NA	NA	NA	NA	NA	44,183	44,183	4.17
Total	385,792	29,699	38,373	2,262	369	49,580	50,336	458,405	44,183	1,058,998	100

AAAAA01140 **TIGER SALAMANDER** ***Ambystoma tigrinum*** **%Status 1 & 2: 4.71**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	563,647	12,693	155,577	23,761	NA	0	NA	5,949	NA	761,627	2.65
Status 2	82,013	67,364	11,386	299,634	NA	0	36,892	93,103	NA	590,392	2.06
Status 3	1,799,609	2,799,883	67	14,572	31,202	1,845,839	1,752,622	15	NA	8,243,811	28.72
Status 4	NA	NA	NA	NA	NA	NA	0	19,025,062	4,592	19,029,654	66.29
Water	NA	NA	NA	NA	NA	NA	NA	NA	83,111	83,111	0.29
Total	2,445,269	2,879,940	167,030	337,967	31,202	1,845,839	1,789,514	19,124,130	87,703	28,708,594	100

AAAAD12270 **COEUR D'ALENE SALAMANDER** ***Plethodon idahoensis*** **%Status 1 & 2: 5.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,869	0	0	0	NA	391	NA	0	NA	2,260	2.58
Status 2	2,261	0	0	28	NA	0	0	128	NA	2,416	2.76
Status 3	57,446	0	0	0	12	2,134	2,674	0	NA	62,266	71.07
Status 4	NA	NA	NA	NA	NA	NA	0	19,947	0	19,947	22.77
Water	NA	NA	NA	NA	NA	NA	NA	NA	727	727	0.83
Total	61,575	0	0	28	12	2,526	2,674	20,075	727	87,617	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AAAAH01030 **IDAHO GIANT SALAMANDER** ***Dicamptodon aterrimus*** **%Status 1 & 2: 16.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	29,665	0	0	0	NA	0	NA	0	NA	29,665	9.23
Status 2	22,290	0	0	210	NA	0	14	359	NA	22,872	7.11
Status 3	222,915	0	0	0	0	0	3,902	0	NA	226,817	70.54
Status 4	NA	NA	NA	NA	NA	NA	0	41,167	0	41,167	12.80
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,019	1,019	0.32
Total	274,869	0	0	210	0	0	3,916	41,525	1,019	321,539	100

AAABA01010 **TAILED FROG** ***Ascaphus truei*** **%Status 1 & 2: 22.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	58,996	173	25,088	80	NA	4,817	NA	83	NA	89,238	18.13
Status 2	16,547	255	541	303	NA	795	2,508	1,182	NA	22,130	4.50
Status 3	212,636	5,006	0	91	74	18,018	17,502	0	NA	253,327	51.48
Status 4	NA	NA	NA	NA	NA	NA	0	127,253	0	127,253	25.86
Water	NA	NA	NA	NA	NA	NA	NA	NA	174	174	0.04
Total	288,179	5,434	25,629	474	74	23,629	20,010	128,518	174	492,122	100

AAABB01030 **WESTERN TOAD** ***Bufo boreas*** **%Status 1 & 2: 14.95**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,160,908	8,214	363,326	11,125	NA	64,557	NA	5,567	NA	1,613,697	11.22
Status 2	297,669	17,115	2,613	12,195	NA	5,788	76,637	124,041	NA	536,060	3.73
Status 3	4,668,290	595,454	67	4,352	7,781	434,881	699,155	16	NA	6,409,996	44.56
Status 4	NA	NA	NA	NA	NA	NA	60	5,803,918	0	5,803,977	40.35
Water	NA	NA	NA	NA	NA	NA	NA	NA	19,769	19,769	0.14
Total	6,126,868	620,783	366,006	27,672	7,781	505,226	775,852	5,933,542	19,769	14,383,499	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AAABB01050 **GREAT PLAINS TOAD** ***Bufo cognatus*** **%Status 1 & 2: 1.43**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	58	3,578	257	9,484	NA	0	NA	454	NA	13,831	0.08
Status 2	15	29,391	128	197,182	NA	0	5,485	5,246	NA	237,447	1.35
Status 3	129,625	2,146,032	0	13,665	19,538	1,090,115	1,220,636	0	NA	4,619,611	26.30
Status 4	NA	NA	NA	NA	NA	NA	0	12,647,627	1,934	12,649,561	72.01
Water	NA	NA	NA	NA	NA	NA	NA	NA	45,776	45,776	0.26
Total	129,698	2,179,000	385	220,331	19,538	1,090,115	1,226,121	12,653,328	47,710	17,566,226	100

AAABB01080 **CANADIAN TOAD** ***Bufo hemiophrys*** **%Status 1 & 2: 2.21**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	310	NA	0	NA	254	NA	565	0.19
Status 2	0	0	0	5,475	NA	0	343	106	NA	5,924	2.02
Status 3	0	190	0	2,757	0	43,377	16,885	0	NA	63,210	21.55
Status 4	NA	NA	NA	NA	NA	NA	0	219,606	5	219,610	74.85
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,086	4,086	1.39
Total	0	190	0	8,542	0	43,377	17,229	219,966	4,091	293,396	100

AAABB01180 **WOODHOUSE'S TOAD** ***Bufo woodhousii*** **%Status 1 & 2: 2.11**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	671	3,920	313	10,927	NA	0	NA	0	NA	15,831	0.09
Status 2	619	39,923	10,592	269,679	NA	0	6,516	10,570	NA	337,899	2.02
Status 3	231,048	2,117,998	0	7,134	21,972	1,212,921	1,012,541	0	NA	4,603,613	27.49
Status 4	NA	NA	NA	NA	NA	NA	0	11,737,481	4,411	11,741,892	70.11
Water	NA	NA	NA	NA	NA	NA	NA	NA	49,027	49,027	0.29
Total	232,338	2,161,841	10,905	287,740	21,972	1,212,921	1,019,057	11,748,051	53,438	16,748,262	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AAABC05070 **WESTERN CHORUS FROG** ***Pseudacris triseriata*** **%Status 1 & 2: 4.77**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	567,894	12,584	143,517	23,456	NA	0	NA	5,617	NA	753,068	2.66
Status 2	87,350	68,486	11,479	274,753	NA	0	47,990	107,171	NA	597,229	2.11
Status 3	1,979,659	2,896,038	67	15,072	31,836	1,672,002	1,721,960	16	NA	8,316,650	29.38
Status 4	NA	NA	NA	NA	NA	NA	0	18,492,004	4,943	18,496,947	65.35
Water	NA	NA	NA	NA	NA	NA	NA	NA	141,219	141,219	0.50
Total	2,634,903	2,977,107	155,063	313,281	31,836	1,672,002	1,769,950	18,604,808	146,163	28,305,114	100

AAABC05100 **PACIFIC CHORUS FROG** ***Pseudacris regilla*** **%Status 1 & 2: 8.57**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	30,450	8	107,726	509	NA	21,420	NA	241	NA	160,355	5.84
Status 2	38,765	238	2,719	7,280	NA	5,364	8,832	11,993	NA	75,191	2.74
Status 3	1,094,984	9,316	0	1,592	601	127,327	140,367	0	NA	1,374,187	50.02
Status 4	NA	NA	NA	NA	NA	NA	51	1,118,184	0	1,118,235	40.70
Water	NA	NA	NA	NA	NA	NA	NA	NA	19,574	19,574	0.71
Total	1,164,199	9,562	110,445	9,381	601	154,111	149,251	1,130,418	19,574	2,747,542	100

AAABF02010 **PLAINS SPADEFOOT** ***Spea bombifrons*** **%Status 1 & 2: 2.59**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	99,312	8,734	66,614	12,877	NA	0	NA	5,054	NA	192,593	0.73
Status 2	25,961	57,870	11,103	285,348	NA	0	33,259	82,138	NA	495,680	1.87
Status 3	623,412	2,735,974	62	14,919	24,399	1,757,975	1,672,848	0	NA	6,829,587	25.74
Status 4	NA	NA	NA	NA	NA	NA	0	18,935,122	4,445	18,939,567	71.37
Water	NA	NA	NA	NA	NA	NA	NA	NA	80,506	80,506	0.30
Total	748,685	2,802,578	77,779	313,144	24,399	1,757,975	1,706,107	19,022,314	84,951	26,537,934	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AAABH01070 **BULLFROG** ***Rana catesbeiana*** **%Status 1 & 2: 4.80**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	25	0	0	0	NA	0	NA	0	NA	25	0.41
Status 2	9	0	0	75	NA	45	6	133	NA	267	4.39
Status 3	389	36	0	12	14	330	314	0	NA	1,095	17.97
Status 4	NA	NA	NA	NA	NA	NA	0	4,393	0	4,393	72.09
Water	NA	NA	NA	NA	NA	NA	NA	NA	313	313	5.14
Total	423	36	0	87	14	374	320	4,526	313	6,094	100

AAABH01170 **NORTHERN LEOPARD FROG** ***Rana pipiens*** **%Status 1 & 2: 3.95**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	58,681	2,825	16,762	8,834	NA	9,138	NA	1,299	NA	97,540	1.57
Status 2	21,881	12,319	4,084	59,252	NA	2,040	18,282	29,754	NA	147,611	2.38
Status 3	483,367	528,915	17	5,033	6,411	352,240	366,868	11	NA	1,742,862	28.07
Status 4	NA	NA	NA	NA	NA	NA	11	4,045,385	1,594	4,046,990	65.19
Water	NA	NA	NA	NA	NA	NA	NA	NA	173,381	173,381	2.79
Total	563,928	544,059	20,863	73,120	6,411	363,418	385,161	4,076,449	174,975	6,208,384	100

AAABH01200 **WOOD FROG** ***Rana sylvatica*** **%Status 1 & 2: 10.68**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6,835	0	24,686	0	NA	0	NA	0	NA	31,521	6.79
Status 2	13,443	1,777	2,681	0	NA	0	0	168	NA	18,069	3.89
Status 3	292,561	1,723	0	0	249	27,381	18,214	0	NA	340,129	73.27
Status 4	NA	NA	NA	NA	NA	NA	0	69,047	0	69,047	14.87
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,462	5,462	1.18
Total	312,839	3,500	27,367	0	249	27,381	18,214	69,214	5,462	464,227	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AAABH01290 **COLUMBIA SPOTTED FROG** ***Rana luteiventris*** **%Status 1 & 2: 14.26**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	233,316	1,316	86,695	5,480	NA	12,936	NA	535	NA	340,279	10.57
Status 2	55,676	4,466	1,432	4,112	NA	2,083	18,617	32,550	NA	118,936	3.69
Status 3	878,025	124,836	17	1,963	2,574	94,022	150,775	11	NA	1,252,223	38.88
Status 4	NA	NA	NA	NA	NA	NA	11	1,441,306	0	1,441,317	44.75
Water	NA	NA	NA	NA	NA	NA	NA	NA	68,048	68,048	2.11
Total	1,167,018	130,617	88,144	11,555	2,574	109,040	169,403	1,474,402	68,048	3,220,802	100

ARAAB01010 **SNAPPING TURTLE** ***Chelydra serpentina*** **%Status 1 & 2: 2.96**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	62	902	33	756	NA	0	NA	26	NA	1,779	0.14
Status 2	54	3,780	1,703	28,679	NA	0	796	833	NA	35,847	2.82
Status 3	16,151	128,784	0	1,177	3,252	100,238	64,752	0	NA	314,355	24.76
Status 4	NA	NA	NA	NA	NA	NA	0	861,776	1,343	863,119	67.97
Water	NA	NA	NA	NA	NA	NA	NA	NA	54,767	54,767	4.31
Total	16,267	133,466	1,737	30,612	3,252	100,238	65,548	862,635	56,110	1,269,866	100

ARAAD01010 **PAINTED TURTLE** ***Chrysemys picta*** **%Status 1 & 2: 3.09**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	13,187	1,268	11,364	2,330	NA	3,958	NA	691	NA	32,799	1.00
Status 2	8,283	5,323	2,599	30,697	NA	1,022	6,691	13,859	NA	68,473	2.09
Status 3	200,634	241,658	0	3,080	3,651	199,888	183,487	0	NA	832,398	25.40
Status 4	NA	NA	NA	NA	NA	NA	6	2,218,704	1,354	2,220,064	67.73
Water	NA	NA	NA	NA	NA	NA	NA	NA	123,875	123,875	3.78
Total	222,104	248,249	13,964	36,107	3,651	204,868	190,183	2,233,254	125,229	3,277,610	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ARAAG01030 **SPINY SOFTSHELL** ***Apalone spinifera*** **%Status 1 & 2: 0.94**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	66	NA	0	NA	0	NA	66	0.14
Status 2	0	101	0	215	NA	0	46	0	NA	363	0.80
Status 3	0	1,206	0	1	157	722	2,000	0	NA	4,086	8.99
Status 4	NA	NA	NA	NA	NA	NA	0	19,551	37	19,588	43.10
Water	NA	NA	NA	NA	NA	NA	NA	NA	21,348	21,348	46.97
Total	0	1,307	0	282	157	722	2,046	19,551	21,385	45,450	100

ARACB01010 **NORTHERN ALLIGATOR LIZARD** ***Elgaria coerulea*** **%Status 1 & 2: 8.22**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	52,610	0	0	315	NA	21,548	NA	126	NA	74,600	4.38
Status 2	54,836	166	0	2,924	NA	1,176	3,101	3,178	NA	65,382	3.84
Status 3	915,243	3,959	0	781	356	67,251	60,276	0	NA	1,047,865	61.53
Status 4	NA	NA	NA	NA	NA	NA	17	500,799	0	500,816	29.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	14,360	14,360	0.84
Total	1,022,689	4,125	0	4,020	356	89,976	63,394	504,103	14,360	1,703,022	100

ARACF12030 **SHORT-HORNED LIZARD** ***Phrynosoma douglasii*** **%Status 1 & 2: 2.35**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,877	4,904	318	10,305	NA	0	NA	3,200	NA	23,603	0.13
Status 2	2,932	54,590	10,578	265,934	NA	0	20,403	44,478	NA	398,914	2.22
Status 3	338,163	2,501,665	0	11,770	20,721	1,241,257	1,304,525	0	NA	5,418,101	30.16
Status 4	NA	NA	NA	NA	NA	NA	0	12,082,503	613	12,083,116	67.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	43,218	43,218	0.24
Total	345,972	2,561,158	10,895	288,008	20,721	1,241,257	1,324,928	12,130,181	43,832	17,966,952	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ARACF14030 **SAGEBRUSH LIZARD** ***Sceloporus graciosus*** **%Status 1 & 2: 2.88**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,182	4,440	5,695	4,487	NA	0	NA	0	NA	15,804	0.13
Status 2	268	44,382	10,771	260,673	NA	0	7,180	19,165	NA	342,440	2.75
Status 3	263,781	1,678,499	62	7,093	19,672	656,830	816,491	0	NA	3,442,429	27.68
Status 4	NA	NA	NA	NA	NA	NA	0	8,605,304	451	8,605,755	69.21
Water	NA	NA	NA	NA	NA	NA	NA	NA	27,830	27,830	0.22
Total	265,231	1,727,322	16,529	272,253	19,672	656,830	823,671	8,624,469	28,281	12,434,258	100

ARACH01110 **WESTERN SKINK** ***Eumeces skiltonianus*** **%Status 1 & 2: 6.82**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	33,404	6	21	0	NA	10,627	NA	276	NA	44,335	3.23
Status 2	28,587	322	0	6,918	NA	873	6,229	6,421	NA	49,349	3.59
Status 3	479,994	9,494	0	108	481	75,450	61,745	0	NA	627,271	45.67
Status 4	NA	NA	NA	NA	NA	NA	0	650,418	0	650,418	47.36
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,054	2,054	0.15
Total	541,984	9,822	21	7,026	481	86,950	67,974	657,115	2,054	1,373,427	100

ARADA01010 **RUBBER BOA** ***Charina bottae*** **%Status 1 & 2: 17.08**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	901,130	5,461	342,257	10,494	NA	54,456	NA	4,277	NA	1,318,075	13.01
Status 2	229,214	16,019	2,735	10,127	NA	5,156	61,379	87,879	NA	412,509	4.07
Status 3	3,347,965	437,637	67	2,611	7,294	329,355	480,473	16	NA	4,605,420	45.45
Status 4	NA	NA	NA	NA	NA	NA	53	3,752,588	0	3,752,642	37.03
Water	NA	NA	NA	NA	NA	NA	NA	NA	44,751	44,751	0.44
Total	4,478,309	459,118	345,058	23,233	7,294	388,968	541,905	3,844,760	44,751	10,133,396	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ARADB07010 **RACER** ***Coluber constrictor*** **%Status 1 & 2: 2.61**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	68,832	6,434	9,610	22,365	NA	12,216	NA	5,532	NA	124,989	0.48
Status 2	26,672	58,766	11,294	310,734	NA	857	40,495	101,906	NA	550,724	2.12
Status 3	936,779	2,815,554	66	15,042	24,465	1,546,954	1,708,562	0	NA	7,047,422	27.17
Status 4	NA	NA	NA	NA	NA	NA	23	18,132,302	3,251	18,135,577	69.92
Water	NA	NA	NA	NA	NA	NA	NA	NA	79,717	79,717	0.31
Total	1,032,283	2,880,754	20,970	348,140	24,465	1,560,028	1,749,081	18,239,740	82,968	25,938,428	100

ARADB17010 **WESTERN HOGNOSE SNAKE** ***Heterodon nasicus*** **%Status 1 & 2: 1.79**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	81	4,641	257	11,775	NA	0	NA	4,321	NA	21,075	0.11
Status 2	20	46,246	8,395	251,528	NA	0	10,581	17,603	NA	334,373	1.69
Status 3	136,553	2,480,968	0	13,248	21,978	1,298,170	1,350,720	0	NA	5,301,636	26.73
Status 4	NA	NA	NA	NA	NA	NA	0	14,120,100	1,914	14,122,014	71.19
Water	NA	NA	NA	NA	NA	NA	NA	NA	57,576	57,576	0.29
Total	136,654	2,531,855	8,652	276,550	21,978	1,298,170	1,361,301	14,142,023	59,490	19,836,672	100

ARADB19050 **MILK SNAKE** ***Lampropeltis triangulum*** **%Status 1 & 2: 2.38**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,573	3,553	277	5,609	NA	0	NA	0	NA	11,012	0.08
Status 2	211	40,082	10,154	207,774	NA	0	7,449	37,415	NA	303,085	2.30
Status 3	297,803	1,736,013	0	6,128	17,628	672,188	844,007	0	NA	3,573,768	27.09
Status 4	NA	NA	NA	NA	NA	NA	0	9,282,244	119	9,282,363	70.36
Water	NA	NA	NA	NA	NA	NA	NA	NA	23,038	23,038	0.18
Total	299,587	1,779,648	10,431	219,512	17,628	672,188	851,456	9,319,659	23,157	13,193,266	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ARADB26010 **PINE OR GOPHER SNAKE** ***Pituophis melanoleucus*** **%Status 1 & 2: 2.86**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	87,611	9,981	56,598	22,860	NA	17,208	NA	5,728	NA	199,986	0.71
Status 2	43,477	65,413	11,997	311,586	NA	1,352	63,984	111,478	NA	609,286	2.15
Status 3	1,436,960	3,069,411	67	16,960	24,081	1,811,105	1,865,567	16	NA	8,224,167	29.04
Status 4	NA	NA	NA	NA	NA	NA	27	19,196,654	3,275	19,199,956	67.80
Water	NA	NA	NA	NA	NA	NA	NA	NA	87,056	87,056	0.31
Total	1,568,048	3,144,805	68,662	351,406	24,081	1,829,664	1,929,577	19,313,876	90,330	28,320,450	100

ARADB36050 **WESTERN TERRESTRIAL GARTER** ***Thamnophis elegans*** **%Status 1 & 2: 8.94**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,337,769	8,584	450,251	18,192	NA	70,011	NA	5,715	NA	1,890,521	6.24
Status 2	328,179	76,074	14,237	178,173	NA	5,792	87,082	129,393	NA	818,930	2.70
Status 3	5,072,793	2,056,466	67	11,616	31,743	1,635,871	1,638,483	16	NA	10,447,056	34.48
Status 4	NA	NA	NA	NA	NA	NA	62	17,074,494	207	17,074,764	56.35
Water	NA	NA	NA	NA	NA	NA	NA	NA	68,761	68,761	0.23
Total	6,738,740	2,141,124	464,555	207,981	31,743	1,711,674	1,725,628	17,209,618	68,968	30,300,028	100

ARADB36100 **PLAINS GARTER SNAKE** ***Thamnophis radix*** **%Status 1 & 2: 2.20**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	23,614	5,562	608	11,959	NA	0	NA	5,378	NA	47,122	0.24
Status 2	5,631	55,987	11,251	290,769	NA	0	20,543	6,155	NA	390,337	1.96
Status 3	388,487	2,515,134	0	13,542	23,926	1,540,351	1,344,313	0	NA	5,825,753	29.24
Status 4	NA	NA	NA	NA	NA	NA	0	13,587,326	3,960	13,591,286	68.21
Water	NA	NA	NA	NA	NA	NA	NA	NA	71,188	71,188	0.36
Total	417,732	2,576,684	11,859	316,269	23,926	1,540,351	1,364,856	13,598,860	75,148	19,925,684	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ARADB36130 **COMMON GARTER SNAKE** ***Thamnophis sirtalis*** **%Status 1 & 2: 6.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	553,643	8,610	250,885	16,829	NA	47,296	NA	4,504	NA	881,767	4.28
Status 2	150,845	29,402	8,259	136,341	NA	5,441	57,001	96,599	NA	483,888	2.35
Status 3	2,968,609	1,522,287	67	13,809	14,642	1,236,348	1,176,663	6	NA	6,932,431	33.65
Status 4	NA	NA	NA	NA	NA	NA	53	12,161,337	3,911	12,165,301	59.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	137,086	137,086	0.67
Total	3,673,097	1,560,299	259,211	166,978	14,642	1,289,085	1,233,716	12,262,447	140,998	20,600,474	100

ARADB47010 **SMOOTH GREEN SNAKE** ***Liochlorophis vernalis*** **%Status 1 & 2: 0.99**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	5	97	NA	0	NA	41	NA	143	0.06
Status 2	0	0	0	1,980	NA	0	190	38	NA	2,207	0.93
Status 3	0	2,990	0	1,224	40	37,344	13,398	0	NA	54,996	23.18
Status 4	NA	NA	NA	NA	NA	NA	0	166,661	1,678	168,338	70.94
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,606	11,606	4.89
Total	0	2,990	5	3,301	40	37,344	13,588	166,740	13,283	237,290	100

ARADE02120 **WESTERN RATTLESNAKE** ***Crotalus viridis*** **%Status 1 & 2: 2.81**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	91,421	9,870	12,687	20,937	NA	16,689	NA	4,844	NA	156,447	0.58
Status 2	41,704	65,255	11,511	303,654	NA	1,337	60,136	113,385	NA	596,982	2.22
Status 3	1,333,318	3,071,818	67	12,256	23,855	1,600,832	1,736,033	16	NA	7,778,196	28.97
Status 4	NA	NA	NA	NA	NA	NA	0	18,241,078	2,841	18,243,919	67.94
Water	NA	NA	NA	NA	NA	NA	NA	NA	78,041	78,041	0.29
Total	1,466,442	3,146,943	24,265	336,847	23,855	1,618,858	1,796,169	18,359,323	80,882	26,853,586	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNBA01030 **COMMON LOON** ***Gavia immer*** **%Status 1 & 2: 2.33**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	430	0	2,343	391	NA	122	NA	17	NA	3,302	1.61
Status 2	69	0	0	569	NA	185	569	69	NA	1,460	0.72
Status 3	4,773	290	0	122	60	876	899	0	NA	7,019	3.43
Status 4	NA	NA	NA	NA	NA	NA	0	6,775	2	6,776	3.32
Water	NA	NA	NA	NA	NA	NA	NA	NA	185,811	185,811	90.92
Total	5,271	290	2,343	1,082	60	1,182	1,468	6,861	185,812	204,369	100

ABNCA02010 **PIED-BILLED GREBE** ***Podilymbus podiceps*** **%Status 1 & 2: 7.67**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	1,575	15	498	2,454	NA	126	NA	96	NA	4,765	6.03
Status 2	228	2	1	571	NA	3	297	186	NA	1,289	1.63
Status 3	1,990	2,304	0	608	12	2,897	1,695	0	NA	9,506	12.04
Status 4	NA	NA	NA	NA	NA	NA	0	23,193	76	23,269	29.47
Water	NA	NA	NA	NA	NA	NA	NA	NA	40,140	40,140	50.83
Total	3,793	2,322	499	3,633	12	3,026	1,992	23,475	40,216	78,969	100

ABNCA03010 **HORNED GREBE** ***Podiceps auritus*** **%Status 1 & 2: 7.16**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	562	0	525	563	NA	143	NA	163	NA	1,955	4.43
Status 2	55	0	2	899	NA	9	205	40	NA	1,209	2.74
Status 3	577	1,567	0	497	6	2,753	840	0	NA	6,239	14.12
Status 4	NA	NA	NA	NA	NA	NA	0	12,807	78	12,885	29.16
Water	NA	NA	NA	NA	NA	NA	NA	NA	21,904	21,904	49.57
Total	1,194	1,567	527	1,959	6	2,905	1,045	13,009	21,982	44,192	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNCA03020 **RED-NECKED GREBE** ***Podiceps grisegena*** **%Status 1 & 2: 1.82**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	597	1	930	96	NA	88	NA	105	NA	1,818	1.22
Status 2	75	24	2	29	NA	112	526	110	NA	878	0.59
Status 3	1,464	95	0	144	26	1,218	450	0	NA	3,398	2.29
Status 4	NA	NA	NA	NA	NA	NA	0	5,711	0	5,711	3.85
Water	NA	NA	NA	NA	NA	NA	NA	NA	136,695	136,695	92.05
Total	2,137	120	932	270	26	1,418	976	5,927	136,695	148,500	100

ABNCA03030 **EARED GREBE** ***Podiceps nigricollis*** **%Status 1 & 2: 4.01**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	770	14	658	836	NA	40	NA	81	NA	2,398	2.33
Status 2	64	24	0	774	NA	98	584	188	NA	1,733	1.68
Status 3	1,652	1,352	0	540	12	2,610	1,139	0	NA	7,305	7.09
Status 4	NA	NA	NA	NA	NA	NA	0	12,766	75	12,842	12.46
Water	NA	NA	NA	NA	NA	NA	NA	NA	78,797	78,797	76.45
Total	2,486	1,390	658	2,151	12	2,748	1,723	13,035	78,872	103,074	100

ABNCA04010 **WESTERN GREBE** ***Aechmophorus occidentalis*** **%Status 1 & 2: 2.20**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	549	0	663	2,279	NA	22	NA	81	NA	3,595	1.39
Status 2	35	24	0	1,185	NA	97	581	173	NA	2,095	0.81
Status 3	2,295	737	0	326	25	1,937	799	0	NA	6,119	2.37
Status 4	NA	NA	NA	NA	NA	NA	0	9,649	1	9,650	3.73
Water	NA	NA	NA	NA	NA	NA	NA	NA	237,227	237,227	91.71
Total	2,879	761	663	3,791	25	2,056	1,379	9,903	237,228	258,686	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNCA04020 **CLARK'S GREBE** ***Aechmophorus clarkii*** **%Status 1 & 2: 0.88**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	251	NA	0	NA	0	NA	251	0.33
Status 2	0	24	0	178	NA	0	211	1	NA	415	0.55
Status 3	3	140	0	32	0	19	57	0	NA	250	0.33
Status 4	NA	NA	NA	NA	NA	NA	0	1,055	0	1,055	1.39
Water	NA	NA	NA	NA	NA	NA	NA	NA	74,148	74,148	97.41
Total	3	164	0	461	0	19	268	1,056	74,148	76,120	100

ABNFC01010 **AMERICAN WHITE PELICAN** ***Pelecanus erythrorhynchos*** **%Status 1 & 2: 4.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	8	0	0	396	NA	0	NA	0	NA	404	1.25
Status 2	0	0	0	739	NA	0	265	0	NA	1,004	3.09
Status 3	306	181	0	12	0	269	73	0	NA	841	2.59
Status 4	NA	NA	NA	NA	NA	NA	0	787	0	787	2.42
Water	NA	NA	NA	NA	NA	NA	NA	NA	29,416	29,416	90.65
Total	314	181	0	1,147	0	269	338	787	29,416	32,451	100

ABNFD01020 **DOUBLE-CRESTED CORMORANT** ***Phalacrocorax auritus*** **%Status 1 & 2: 3.81**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	2,348	75	3,489	1,543	NA	19	NA	163	NA	7,638	1.73
Status 2	760	306	325	3,977	NA	156	2,466	1,230	NA	9,219	2.09
Status 3	6,386	5,673	0	386	440	14,058	7,236	0	NA	34,179	7.73
Status 4	NA	NA	NA	NA	NA	NA	2	105,865	1,345	107,213	24.26
Water	NA	NA	NA	NA	NA	NA	NA	NA	283,770	283,770	64.20
Total	9,494	6,055	3,814	5,906	440	14,233	9,704	107,259	285,115	442,019	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNGA01020 **AMERICAN BITTERN** ***Botaurus lentiginosus*** **%Status 1 & 2: 12.85**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,627	0	2,078	4,138	NA	252	NA	115	NA	8,211	6.89
Status 2	309	24	6	5,050	NA	158	1,163	400	NA	7,110	5.96
Status 3	4,004	4,276	0	1,985	6	8,116	3,348	0	NA	21,736	18.23
Status 4	NA	NA	NA	NA	NA	NA	0	42,099	188	42,287	35.46
Water	NA	NA	NA	NA	NA	NA	NA	NA	39,897	39,897	33.46
Total	5,940	4,300	2,084	11,174	6	8,526	4,511	42,614	40,085	119,241	100

ABNGA04010 **GREAT BLUE HERON** ***Ardea herodias*** **%Status 1 & 2: 12.68**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	19,076	268	15,239	3,014	NA	2,514	NA	431	NA	40,543	8.78
Status 2	5,452	561	970	4,332	NA	463	3,464	2,752	NA	17,994	3.90
Status 3	60,833	9,057	1	693	645	19,340	17,707	0	NA	108,274	23.45
Status 4	NA	NA	NA	NA	NA	NA	11	180,803	1,345	182,159	39.46
Water	NA	NA	NA	NA	NA	NA	NA	NA	112,705	112,705	24.41
Total	85,361	9,885	16,211	8,039	645	22,317	21,182	183,985	114,050	461,676	100

ABNGA11010 **BLACK-CROWNED NIGHT-HERON** ***Nycticorax nycticorax*** **%Status 1 & 2: 12.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	94	0	112	2,999	NA	0	NA	271	NA	3,475	8.75
Status 2	38	0	2	846	NA	0	447	9	NA	1,341	3.38
Status 3	975	1,491	0	550	0	1,575	835	0	NA	5,427	13.66
Status 4	NA	NA	NA	NA	NA	NA	0	9,989	81	10,070	25.35
Water	NA	NA	NA	NA	NA	NA	NA	NA	19,418	19,418	48.87
Total	1,107	1,491	113	4,394	0	1,575	1,282	10,268	19,499	39,731	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNGE02020 **WHITE-FACED IBIS** ***Plegadis chihi*** **%Status 1 & 2: 11.38**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,689	0	0	1,208	NA	0	NA	336	NA	3,233	7.81
Status 2	90	2	0	347	NA	0	948	91	NA	1,478	3.57
Status 3	893	2,344	0	79	0	15	1,422	0	NA	4,752	11.47
Status 4	NA	NA	NA	NA	NA	NA	0	22,964	0	22,964	55.44
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,992	8,992	21.71
Total	2,672	2,347	0	1,634	0	15	2,369	23,390	8,992	41,419	100

ABNJB02010 **TUNDRA SWAN** ***Cygnus columbianus*** **%Status 1 & 2: 2.79**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	9,926	181	5,708	5,313	NA	821	NA	646	NA	22,594	1.47
Status 2	2,596	70	124	11,557	NA	459	4,061	1,494	NA	20,361	1.32
Status 3	17,181	29,274	0	4,890	325	56,562	52,119	0	NA	160,352	10.40
Status 4	NA	NA	NA	NA	NA	NA	0	1,037,372	1,145	1,038,516	67.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	299,569	299,569	19.44
Total	29,703	29,525	5,832	21,760	325	57,842	56,181	1,039,512	300,713	1,541,392	100

ABNJB02030 **TRUMPETER SWAN** ***Cygnus buccinator*** **%Status 1 & 2: 25.15**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,396	1	467	2,716	NA	1,089	NA	123	NA	7,791	22.26
Status 2	248	0	0	435	NA	0	71	259	NA	1,013	2.89
Status 3	2,661	326	0	0	32	33	278	0	NA	3,330	9.51
Status 4	NA	NA	NA	NA	NA	NA	0	4,103	0	4,103	11.72
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,773	18,773	53.62
Total	6,304	326	467	3,151	32	1,123	349	4,486	18,773	35,011	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB03040 **GREATER WHITE-FRONTED GOOSE** ***Anser albifrons*** **%Status 1 & 2: 2.83**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6,631	618	1,434	12,313	NA	11	NA	1,516	NA	22,523	0.76
Status 2	633	1,128	364	45,020	NA	534	9,023	4,124	NA	60,826	2.06
Status 3	14,503	227,957	0	8,952	761	158,913	175,063	0	NA	586,148	19.88
Status 4	NA	NA	NA	NA	NA	NA	0	1,996,246	1,151	1,997,397	67.75
Water	NA	NA	NA	NA	NA	NA	NA	NA	281,273	281,273	9.54
Total	21,767	229,703	1,797	66,285	761	159,458	184,086	2,001,886	282,424	2,948,167	100

ABNJB04010 **SNOW GOOSE** ***Chen caerulescens*** **%Status 1 & 2: 3.78**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	23,066	621	8,703	13,343	NA	2,473	NA	1,533	NA	49,740	1.61
Status 2	3,789	1,148	374	45,227	NA	535	10,937	5,243	NA	67,253	2.17
Status 3	31,304	230,880	0	8,992	932	168,220	178,391	0	NA	618,719	19.97
Status 4	NA	NA	NA	NA	NA	NA	0	2,044,276	1,154	2,045,431	66.03
Water	NA	NA	NA	NA	NA	NA	NA	NA	316,514	316,514	10.22
Total	58,159	232,649	9,078	67,562	932	171,228	189,329	2,051,053	317,668	3,097,657	100

ABNJB04020 **ROSS'S GOOSE** ***Chen rossii*** **%Status 1 & 2: 3.76**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	21,540	621	8,703	13,343	NA	2,473	NA	1,533	NA	48,214	1.57
Status 2	3,708	1,148	374	45,227	NA	535	10,937	5,243	NA	67,172	2.19
Status 3	29,485	230,880	0	8,992	893	168,220	178,074	0	NA	616,544	20.07
Status 4	NA	NA	NA	NA	NA	NA	0	2,039,305	1,154	2,040,459	66.42
Water	NA	NA	NA	NA	NA	NA	NA	NA	299,529	299,529	9.75
Total	54,733	232,649	9,078	67,562	893	171,228	189,012	2,046,081	300,683	3,071,919	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB05030 **CANADA GOOSE** ***Branta canadensis*** **%Status 1 & 2: 5.26**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	15,535	828	15,608	14,401	NA	2,665	NA	1,919	NA	50,955	1.66
Status 2	3,561	8,558	2,462	72,433	NA	569	14,968	8,149	NA	110,699	3.60
Status 3	45,669	254,895	0	7,373	3,937	163,939	156,400	0	NA	632,213	20.58
Status 4	NA	NA	NA	NA	NA	NA	0	1,925,445	4,175	1,929,620	62.82
Water	NA	NA	NA	NA	NA	NA	NA	NA	348,135	348,135	11.33
Total	64,765	264,280	18,070	94,207	3,937	167,173	171,368	1,935,513	352,309	3,071,622	100

ABNJB09010 **WOOD DUCK** ***Aix sponsa*** **%Status 1 & 2: 7.49**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	16,748	210	25,058	1,912	NA	2,556	NA	518	NA	47,002	5.13
Status 2	5,400	530	1,166	5,087	NA	735	4,672	4,039	NA	21,629	2.36
Status 3	90,511	13,008	0	1,528	1,305	45,188	32,411	0	NA	183,951	20.08
Status 4	NA	NA	NA	NA	NA	NA	9	347,105	2,158	349,272	38.14
Water	NA	NA	NA	NA	NA	NA	NA	NA	314,044	314,044	34.29
Total	112,660	13,747	26,224	8,526	1,305	48,479	37,092	351,662	316,202	915,898	100

ABNJB10010 **GREEN-WINGED TEAL** ***Anas crecca*** **%Status 1 & 2: 7.13**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	16,474	256	13,747	9,880	NA	2,317	NA	1,233	NA	43,907	3.66
Status 2	3,592	467	266	26,518	NA	484	7,194	3,134	NA	41,653	3.47
Status 3	40,285	84,636	0	5,000	525	69,779	61,421	0	NA	261,646	21.80
Status 4	NA	NA	NA	NA	NA	NA	0	538,987	267	539,254	44.93
Water	NA	NA	NA	NA	NA	NA	NA	NA	313,704	313,704	26.14
Total	60,351	85,359	14,013	41,397	525	72,580	68,615	543,354	313,971	1,200,165	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB10060 **MALLARD** ***Anas platyrhynchos*** **%Status 1 & 2: 3.78**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5,029	633	2,654	9,829	NA	125	NA	860	NA	19,131	1.01
Status 2	589	1,767	813	31,573	NA	520	8,622	8,503	NA	52,388	2.77
Status 3	12,762	113,114	53	6,949	2,485	93,120	87,774	0	NA	316,256	16.70
Status 4	NA	NA	NA	NA	NA	NA	13	1,144,052	2,328	1,146,393	60.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	359,138	359,138	18.97
Total	18,380	115,514	3,520	48,351	2,485	93,765	96,409	1,153,416	361,466	1,893,305	100

ABNJB10110 **NORTHERN PINTAIL** ***Anas acuta*** **%Status 1 & 2: 2.57**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	43,940	1,448	16,496	14,080	NA	4,059	NA	2,945	NA	82,968	1.19
Status 2	7,629	3,751	2,228	54,813	NA	617	16,025	10,504	NA	95,568	1.37
Status 3	81,139	591,560	43	10,916	2,338	367,266	446,378	0	NA	1,499,640	21.56
Status 4	NA	NA	NA	NA	NA	NA	2	4,955,058	1,635	4,956,695	71.26
Water	NA	NA	NA	NA	NA	NA	NA	NA	320,990	320,990	4.62
Total	132,709	596,759	18,767	79,808	2,338	371,942	462,405	4,968,507	322,625	6,955,860	100

ABNJB10130 **BLUE-WINGED TEAL** ***Anas discors*** **%Status 1 & 2: 6.03**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	10,617	235	3,915	9,346	NA	1,105	NA	783	NA	26,001	2.34
Status 2	1,686	459	203	29,492	NA	228	6,525	2,309	NA	40,902	3.69
Status 3	13,195	86,322	0	5,726	431	59,935	55,873	0	NA	221,482	19.96
Status 4	NA	NA	NA	NA	NA	NA	0	513,765	228	513,993	46.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	307,076	307,076	27.68
Total	25,498	87,016	4,117	44,564	431	61,268	62,398	516,858	307,303	1,109,453	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB10140 **CINNAMON TEAL** ***Anas cyanoptera*** **%Status 1 & 2: 6.03**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	10,617	235	3,915	9,346	NA	1,105	NA	783	NA	26,001	2.34
Status 2	1,686	459	203	29,492	NA	228	6,525	2,309	NA	40,902	3.69
Status 3	13,195	86,322	0	5,726	431	59,935	55,873	0	NA	221,482	19.96
Status 4	NA	NA	NA	NA	NA	NA	0	513,765	228	513,993	46.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	307,076	307,076	27.68
Total	25,498	87,016	4,117	44,564	431	61,268	62,398	516,858	307,303	1,109,453	100

ABNJB10150 **NORTHERN SHOVELER** ***Anas clypeata*** **%Status 1 & 2: 7.23**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	15,251	296	5,667	10,745	NA	1,333	NA	1,069	NA	34,363	2.46
Status 2	2,475	564	1,759	51,481	NA	274	7,212	2,871	NA	66,636	4.77
Status 3	20,632	138,068	0	6,408	521	69,994	72,641	0	NA	308,263	22.08
Status 4	NA	NA	NA	NA	NA	NA	0	667,069	256	667,325	47.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	319,824	319,824	22.90
Total	38,359	138,928	7,425	68,635	521	71,601	79,853	671,010	320,080	1,396,411	100

ABNJB10160 **GADWALL** ***Anas strepera*** **%Status 1 & 2: 4.60**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	4,657	245	2,113	9,847	NA	125	NA	943	NA	17,930	1.23
Status 2	412	486	514	37,662	NA	520	6,941	2,469	NA	49,003	3.37
Status 3	9,404	101,463	0	6,880	443	70,413	71,009	0	NA	259,613	17.86
Status 4	NA	NA	NA	NA	NA	NA	0	809,398	630	810,028	55.72
Water	NA	NA	NA	NA	NA	NA	NA	NA	317,272	317,272	21.82
Total	14,473	102,194	2,627	54,389	443	71,058	77,950	812,810	317,902	1,453,847	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB10180 **AMERICAN WIGEON** ***Anas americana*** **%Status 1 & 2: 5.87**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	12,706	255	4,099	11,406	NA	1,105	NA	943	NA	30,514	1.95
Status 2	1,724	524	1,301	47,377	NA	521	7,142	2,849	NA	61,437	3.92
Status 3	16,987	126,791	0	6,917	508	72,788	76,234	0	NA	300,224	19.15
Status 4	NA	NA	NA	NA	NA	NA	0	851,789	630	852,419	54.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	322,829	322,829	20.60
Total	31,417	127,570	5,399	65,700	508	74,414	83,376	855,580	323,459	1,567,423	100

ABNJB11020 **CANVASBACK** ***Aythya valisineria*** **%Status 1 & 2: 4.16**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	1,670	3	923	4,133	NA	88	NA	161	NA	6,980	1.77
Status 2	196	75	0	6,826	NA	126	1,801	390	NA	9,414	2.39
Status 3	3,425	9,116	0	1,530	97	7,097	5,717	0	NA	26,982	6.85
Status 4	NA	NA	NA	NA	NA	NA	0	56,535	105	56,640	14.37
Water	NA	NA	NA	NA	NA	NA	NA	NA	294,176	294,176	74.63
Total	5,291	9,194	923	12,489	97	7,312	7,518	57,086	294,281	394,191	100

ABNJB11030 **REDHEAD** ***Aythya americana*** **%Status 1 & 2: 5.22**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	4,602	33	2,115	8,668	NA	125	NA	783	NA	16,326	1.51
Status 2	401	492	654	29,606	NA	265	6,499	2,287	NA	40,204	3.71
Status 3	8,968	88,402	0	5,776	299	61,792	57,616	0	NA	222,852	20.57
Status 4	NA	NA	NA	NA	NA	NA	0	498,442	226	498,668	46.02
Water	NA	NA	NA	NA	NA	NA	NA	NA	305,439	305,439	28.19
Total	13,970	88,927	2,769	44,049	299	62,181	64,115	501,513	305,665	1,083,488	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB11040 **RING-NECKED DUCK** ***Aythya collaris*** **%Status 1 & 2: 4.05**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,865	2	1,580	2,496	NA	190	NA	292	NA	6,426	3.04
Status 2	364	29	2	309	NA	119	1,007	313	NA	2,142	1.01
Status 3	4,949	871	0	457	41	2,415	1,563	0	NA	10,296	4.87
Status 4	NA	NA	NA	NA	NA	NA	0	20,323	0	20,323	9.61
Water	NA	NA	NA	NA	NA	NA	NA	NA	172,206	172,206	81.46
Total	7,178	902	1,582	3,262	41	2,725	2,570	20,928	172,206	211,393	100

ABNJB11060 **GREATER SCAUP** ***Aythya marila*** **%Status 1 & 2: 3.32**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,445	48	983	1,667	NA	88	NA	91	NA	4,322	2.19
Status 2	257	102	92	245	NA	97	724	716	NA	2,232	1.13
Status 3	3,126	1,008	0	186	13	1,571	1,726	0	NA	7,630	3.87
Status 4	NA	NA	NA	NA	NA	NA	1	28,104	0	28,105	14.24
Water	NA	NA	NA	NA	NA	NA	NA	NA	155,021	155,021	78.57
Total	4,828	1,158	1,075	2,098	13	1,756	2,451	28,911	155,021	197,310	100

ABNJB11070 **LESSER SCAUP** ***Aythya affinis*** **%Status 1 & 2: 8.60**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,046	66	5,717	4,981	NA	1,426	NA	424	NA	24,659	4.41
Status 2	2,591	49	109	17,182	NA	195	2,398	941	NA	23,465	4.19
Status 3	14,607	13,379	0	2,563	228	24,582	10,814	0	NA	66,173	11.83
Status 4	NA	NA	NA	NA	NA	NA	0	159,069	256	159,325	28.48
Water	NA	NA	NA	NA	NA	NA	NA	NA	285,814	285,814	51.09
Total	29,243	13,493	5,826	24,725	228	26,204	13,213	160,433	286,070	559,435	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB15010 **HARLEQUIN DUCK** ***Histrionicus histrionicus*** **%Status 1 & 2: 17.57**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	25,021	78	18,909	173	NA	1,051	NA	332	NA	45,564	14.00
Status 2	4,768	40	953	356	NA	371	1,471	3,669	NA	11,628	3.57
Status 3	70,440	1,314	0	196	33	14,879	13,143	0	NA	100,005	30.72
Status 4	NA	NA	NA	NA	NA	NA	2	153,906	0	153,909	47.28
Water	NA	NA	NA	NA	NA	NA	NA	NA	14,450	14,450	4.44
Total	100,229	1,431	19,862	726	33	16,301	14,616	157,908	14,450	325,557	100

ABNJB18010 **COMMON GOLDENEYE** ***Bucephala clangula*** **%Status 1 & 2: 14.09**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	51,507	1,099	39,612	791	NA	6,064	NA	169	NA	99,242	10.71
Status 2	17,607	1,214	1,000	1,450	NA	926	4,454	4,695	NA	31,345	3.38
Status 3	204,578	9,939	0	579	676	31,015	33,668	0	NA	280,456	30.26
Status 4	NA	NA	NA	NA	NA	NA	11	251,820	453	252,284	27.22
Water	NA	NA	NA	NA	NA	NA	NA	NA	263,437	263,437	28.43
Total	273,693	12,252	40,612	2,820	676	38,004	38,134	256,684	263,890	926,765	100

ABNJB18020 **BARROW'S GOLDENEYE** ***Bucephala islandica*** **%Status 1 & 2: 18.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	26,738	2	16,476	2,939	NA	4,375	NA	184	NA	50,713	15.22
Status 2	5,288	77	25	687	NA	651	1,584	1,004	NA	9,316	2.80
Status 3	46,867	1,054	0	262	189	10,318	6,890	0	NA	65,578	19.69
Status 4	NA	NA	NA	NA	NA	NA	0	50,870	0	50,870	15.27
Water	NA	NA	NA	NA	NA	NA	NA	NA	156,613	156,613	47.02
Total	78,892	1,132	16,501	3,887	189	15,344	8,474	52,057	156,613	333,090	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB18030 **BUFFLEHEAD** ***Bucephala albeola*** **%Status 1 & 2: 16.62**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	42,141	81	25,683	2,193	NA	6,003	NA	442	NA	76,543	13.19
Status 2	8,035	380	42	6,434	NA	518	3,199	1,349	NA	19,957	3.44
Status 3	91,110	3,750	0	607	416	13,102	11,636	0	NA	120,622	20.78
Status 4	NA	NA	NA	NA	NA	NA	0	91,421	60	91,481	15.76
Water	NA	NA	NA	NA	NA	NA	NA	NA	271,808	271,808	46.83
Total	141,287	4,211	25,725	9,234	416	19,623	14,835	93,212	271,868	580,411	100

ABNJB20010 **HOODED MERGANSER** ***Lophodytes cucullatus*** **%Status 1 & 2: 25.20**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	117,218	1,126	66,769	528	NA	13,938	NA	175	NA	199,754	21.31
Status 2	23,981	1,439	1,342	497	NA	921	3,434	4,868	NA	36,482	3.89
Status 3	231,339	8,963	5	556	1,222	27,950	33,157	0	NA	303,192	32.34
Status 4	NA	NA	NA	NA	NA	NA	11	233,886	0	233,897	24.95
Water	NA	NA	NA	NA	NA	NA	NA	NA	164,137	164,137	17.51
Total	372,538	11,528	68,116	1,580	1,222	42,809	36,602	238,929	164,137	937,462	100

ABNJB21010 **COMMON MERGANSER** ***Mergus merganser*** **%Status 1 & 2: 15.08**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	50,058	695	28,158	1,279	NA	5,779	NA	121	NA	86,090	11.34
Status 2	11,938	915	1,234	7,079	NA	518	3,318	3,366	NA	28,368	3.74
Status 3	113,973	8,117	5	509	816	18,987	18,754	0	NA	161,162	21.23
Status 4	NA	NA	NA	NA	NA	NA	11	179,686	1,059	180,756	23.81
Water	NA	NA	NA	NA	NA	NA	NA	NA	302,894	302,894	39.89
Total	175,969	9,727	29,397	8,867	816	25,285	22,083	183,172	303,953	759,269	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNJB21020 **RED-BREASTED MERGANSER** ***Mergus serrator*** **%Status 1 & 2: 2.16**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,007	60	1,605	514	NA	92	NA	20	NA	3,298	0.91
Status 2	245	321	286	1,776	NA	129	1,111	679	NA	4,546	1.25
Status 3	5,748	2,522	4	141	327	3,898	4,165	0	NA	16,804	4.63
Status 4	NA	NA	NA	NA	NA	NA	3	46,284	562	46,850	12.90
Water	NA	NA	NA	NA	NA	NA	NA	NA	291,794	291,794	80.32
Total	7,000	2,902	1,895	2,431	327	4,118	5,279	46,983	292,357	363,292	100

ABNJB22010 **RUDDY DUCK** ***Oxyura jamaicensis*** **%Status 1 & 2: 4.11**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,829	22	848	3,847	NA	130	NA	101	NA	6,777	1.71
Status 2	220	75	88	7,105	NA	96	1,652	335	NA	9,573	2.41
Status 3	2,919	9,064	0	1,460	98	7,643	5,548	0	NA	26,732	6.73
Status 4	NA	NA	NA	NA	NA	NA	0	56,046	69	56,115	14.12
Water	NA	NA	NA	NA	NA	NA	NA	NA	298,216	298,216	75.04
Total	4,968	9,161	936	12,412	98	7,870	7,200	56,483	298,285	397,414	100

ABNKA02010 **TURKEY VULTURE** ***Cathartes aura*** **%Status 1 & 2: 3.96**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	214,424	6,415	34,186	14,555	NA	15,899	NA	4,445	NA	289,924	1.36
Status 2	68,966	49,399	10,651	260,024	NA	1,514	57,860	107,979	NA	556,392	2.61
Status 3	1,799,741	2,083,944	67	10,119	21,312	797,792	1,338,965	16	NA	6,051,955	28.34
Status 4	NA	NA	NA	NA	NA	NA	19	14,414,218	195	14,414,433	67.51
Water	NA	NA	NA	NA	NA	NA	NA	NA	38,467	38,467	0.18
Total	2,083,130	2,139,758	44,904	284,697	21,312	815,204	1,396,844	14,526,659	38,662	21,351,170	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNKC01010 **OSPREY** ***Pandion haliaetus*** **%Status 1 & 2: 12.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	32,618	623	35,740	2,140	NA	1,661	NA	530	NA	73,311	7.86
Status 2	11,753	1,994	1,396	17,873	NA	492	5,498	5,574	NA	44,581	4.78
Status 3	185,799	14,128	5	606	711	21,995	35,458	0	NA	258,702	27.72
Status 4	NA	NA	NA	NA	NA	NA	11	277,552	453	278,016	29.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	278,759	278,759	29.87
Total	230,170	16,745	37,140	20,619	711	24,148	40,967	283,656	279,212	933,369	100

ABNKC10010 **BALD EAGLE** ***Haliaeetus leucocephalus*** **%Status 1 & 2: 10.37**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	18,426	641	28,228	2,118	NA	1,209	NA	527	NA	51,147	5.81
Status 2	7,340	1,980	1,261	17,850	NA	489	6,023	5,171	NA	40,115	4.56
Status 3	145,547	14,694	5	613	1,179	22,273	34,928	0	NA	219,240	24.90
Status 4	NA	NA	NA	NA	NA	NA	11	282,183	1,191	283,385	32.18
Water	NA	NA	NA	NA	NA	NA	NA	NA	286,671	286,671	32.56
Total	171,313	17,315	29,494	20,581	1,179	23,971	40,963	287,880	287,862	880,559	100

ABNKC11010 **NORTHERN HARRIER** ***Circus cyaneus*** **%Status 1 & 2: 2.57**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	159,301	6,723	46,902	20,256	NA	7,828	NA	4,295	NA	245,305	0.92
Status 2	43,383	37,466	8,402	202,877	NA	804	48,052	97,883	NA	438,866	1.65
Status 3	902,858	2,530,268	62	16,837	22,976	1,633,316	1,744,081	16	NA	6,850,415	25.77
Status 4	NA	NA	NA	NA	NA	NA	20	18,976,632	3,225	18,979,878	71.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	62,868	62,868	0.24
Total	1,105,541	2,574,457	55,367	239,971	22,976	1,641,948	1,792,153	19,078,826	66,094	26,577,332	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNKC12020 **SHARP-SHINNED HAWK** ***Accipiter striatus*** **%Status 1 & 2: 18.98**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	635,831	3,441	195,873	2,178	NA	45,892	NA	697	NA	883,912	14.94
Status 2	179,153	12,018	1,912	1,059	NA	4,647	22,243	18,342	NA	239,375	4.05
Status 3	3,190,839	128,346	0	519	4,993	147,209	179,596	0	NA	3,651,502	61.70
Status 4	NA	NA	NA	NA	NA	NA	32	1,134,201	36	1,134,269	19.17
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,985	8,985	0.15
Total	4,005,824	143,805	197,785	3,757	4,993	197,749	201,870	1,153,240	9,021	5,918,042	100

ABNKC12040 **COOPER'S HAWK** ***Accipiter cooperii*** **%Status 1 & 2: 11.55**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	284,181	2,475	130,065	2,090	NA	19,975	NA	829	NA	439,615	7.78
Status 2	107,660	12,062	2,151	43,755	NA	1,118	21,220	24,541	NA	212,505	3.76
Status 3	2,124,526	262,192	5	1,004	1,759	311,681	216,692	0	NA	2,917,859	51.65
Status 4	NA	NA	NA	NA	NA	NA	11	2,062,807	96	2,062,914	36.52
Water	NA	NA	NA	NA	NA	NA	NA	NA	16,421	16,421	0.29
Total	2,516,367	276,729	132,221	46,849	1,759	332,773	237,923	2,088,176	16,518	5,649,314	100

ABNKC12060 **NORTHERN GOSHAWK** ***Accipiter gentilis*** **%Status 1 & 2: 20.88**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	165,929	539	64,214	671	NA	11,774	NA	100	NA	243,228	17.22
Status 2	34,388	5,681	175	468	NA	3,349	4,743	2,957	NA	51,761	3.66
Status 3	791,424	34,212	0	31	1,942	61,831	45,969	0	NA	935,409	66.21
Status 4	NA	NA	NA	NA	NA	NA	0	181,369	0	181,369	12.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	961	961	0.07
Total	991,741	40,433	64,389	1,170	1,942	76,954	50,712	184,426	961	1,412,727	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNKC19050 **BROAD-WINGED HAWK** ***Buteo platypterus*** **%Status 1 & 2: 6.15**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,223	234	3,888	1,576	NA	0	NA	78	NA	8,999	2.44
Status 2	1,464	353	464	3,860	NA	29	2,754	4,788	NA	13,712	3.72
Status 3	23,194	15,827	0	365	798	25,027	17,338	0	NA	82,549	22.36
Status 4	NA	NA	NA	NA	NA	NA	3	252,359	1,550	253,912	68.77
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,059	10,059	2.72
Total	27,881	16,414	4,352	5,802	798	25,056	20,095	257,224	11,609	369,231	100

ABNKC19070 **SWAINSON'S HAWK** ***Buteo swainsoni*** **%Status 1 & 2: 1.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6,732	2,946	7,417	18,262	NA	689	NA	3,484	NA	39,530	0.18
Status 2	2,151	12,218	4,026	143,221	NA	603	26,226	55,655	NA	244,101	1.11
Status 3	182,960	2,054,872	32	15,345	19,232	1,330,371	1,478,456	16	NA	5,081,284	23.09
Status 4	NA	NA	NA	NA	NA	NA	18	16,575,949	3,979	16,579,946	75.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	65,381	65,381	0.30
Total	191,844	2,070,036	11,474	176,829	19,232	1,331,664	1,504,700	16,635,104	69,359	22,010,240	100

ABNKC19110 **RED-TAILED HAWK** ***Buteo jamaicensis*** **%Status 1 & 2: 3.15**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	214,521	9,032	70,852	21,972	NA	12,173	NA	5,817	NA	334,367	1.09
Status 2	76,281	62,842	11,956	301,401	NA	1,431	64,938	117,331	NA	636,180	2.07
Status 3	1,831,212	3,016,080	67	17,802	25,224	1,859,773	1,945,379	16	NA	8,695,554	28.23
Status 4	NA	NA	NA	NA	NA	NA	26	21,043,484	4,318	21,047,828	68.34
Water	NA	NA	NA	NA	NA	NA	NA	NA	86,199	86,199	0.28
Total	2,122,014	3,087,955	82,874	341,175	25,224	1,873,378	2,010,343	21,166,648	90,518	30,800,128	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNKC19120 **FERRUGINOUS HAWK** ***Buteo regalis*** **%Status 1 & 2: 1.68**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5,465	3,683	6,415	14,245	NA	595	NA	3,268	NA	33,670	0.22
Status 2	1,524	13,631	3,809	138,703	NA	266	22,441	43,306	NA	223,681	1.46
Status 3	160,401	2,139,744	32	11,257	18,713	936,838	1,201,804	16	NA	4,468,805	29.08
Status 4	NA	NA	NA	NA	NA	NA	0	10,589,252	1,827	10,591,079	68.93
Water	NA	NA	NA	NA	NA	NA	NA	NA	47,910	47,910	0.31
Total	167,391	2,157,058	10,255	164,205	18,713	937,699	1,224,245	10,635,842	49,736	15,365,144	100

ABNKC19130 **ROUGH-LEGGED HAWK** ***Buteo lagopus*** **%Status 1 & 2: 2.26**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	55,784	5,885	29,051	20,614	NA	4,067	NA	4,296	NA	119,697	0.44
Status 2	18,956	52,071	11,321	256,422	NA	829	49,652	100,299	NA	489,549	1.81
Status 3	684,604	2,821,531	66	16,911	23,926	1,593,179	1,788,085	16	NA	6,928,319	25.67
Status 4	NA	NA	NA	NA	NA	NA	19	19,369,848	4,078	19,373,946	71.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	76,913	76,913	0.29
Total	759,343	2,879,488	40,438	293,947	23,926	1,598,075	1,837,756	19,474,460	80,991	26,988,422	100

ABNKC22010 **GOLDEN EAGLE** ***Aquila chrysaetos*** **%Status 1 & 2: 5.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	335,089	5,524	129,072	11,389	NA	16,811	NA	4,016	NA	501,900	2.54
Status 2	75,860	61,115	9,410	254,845	NA	1,148	52,127	88,373	NA	542,877	2.75
Status 3	1,604,504	2,240,520	67	8,908	14,345	1,053,066	1,317,056	15	NA	6,238,481	31.59
Status 4	NA	NA	NA	NA	NA	NA	17	12,431,835	480	12,432,332	62.96
Water	NA	NA	NA	NA	NA	NA	NA	NA	30,627	30,627	0.16
Total	2,015,453	2,307,160	138,549	275,142	14,345	1,071,024	1,369,200	12,524,238	31,107	19,746,216	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNKD06020 **AMERICAN KESTREL** ***Falco sparverius*** **%Status 1 & 2: 3.97**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	381,504	8,661	153,254	19,247	NA	22,200	NA	5,630	NA	590,496	1.96
Status 2	114,883	49,642	12,174	247,672	NA	1,857	69,058	114,910	NA	610,196	2.02
Status 3	2,432,121	2,732,041	67	16,517	23,116	1,787,933	1,893,509	16	NA	8,885,319	29.40
Status 4	NA	NA	NA	NA	NA	NA	31	20,063,826	3,653	20,067,510	66.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	63,261	63,261	0.21
Total	2,928,507	2,790,343	165,495	283,436	23,116	1,811,991	1,962,598	20,184,382	66,914	30,216,780	100

ABNKD06030 **MERLIN** ***Falco columbarius*** **%Status 1 & 2: 2.58**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	128,914	5,820	41,014	18,903	NA	8,446	NA	5,069	NA	208,166	0.76
Status 2	44,091	45,929	9,077	233,431	NA	1,309	56,595	107,316	NA	497,747	1.82
Status 3	1,350,914	2,605,359	67	15,933	20,815	1,635,405	1,778,224	16	NA	7,406,733	27.13
Status 4	NA	NA	NA	NA	NA	NA	22	19,122,374	3,867	19,126,263	70.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	64,298	64,298	0.24
Total	1,523,919	2,657,109	50,158	268,266	20,815	1,645,160	1,834,840	19,234,775	68,165	27,303,208	100

ABNKD06070 **PEREGRINE FALCON** ***Falco peregrinus*** **%Status 1 & 2: 10.44**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	176,191	3,082	99,983	7,368	NA	14,062	NA	3,419	NA	304,105	6.78
Status 2	42,518	9,026	4,936	16,408	NA	1,054	32,003	58,293	NA	164,238	3.66
Status 3	739,845	164,741	66	2,323	2,458	248,723	259,420	1	NA	1,417,578	31.61
Status 4	NA	NA	NA	NA	NA	NA	4	2,590,499	72	2,590,575	57.77
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,889	7,889	0.18
Total	958,554	176,849	104,986	26,099	2,458	263,839	291,427	2,652,212	7,961	4,484,385	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNKD06080 **GYRFALCON** ***Falco rusticolus*** **%Status 1 & 2: 1.59**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	23,000	3,459	10,925	15,040	NA	831	NA	3,615	NA	56,870	0.28
Status 2	6,652	22,130	4,545	112,854	NA	731	32,977	81,012	NA	260,900	1.31
Status 3	305,926	1,523,977	62	15,055	13,212	1,385,071	1,325,597	1	NA	4,568,902	22.84
Status 4	NA	NA	NA	NA	NA	NA	17	15,060,354	3,070	15,063,441	75.32
Water	NA	NA	NA	NA	NA	NA	NA	NA	49,984	49,984	0.25
Total	335,578	1,549,566	15,533	142,950	13,212	1,386,633	1,358,591	15,144,982	53,054	20,000,098	100

ABNKD06090 **PRAIRIE FALCON** ***Falco mexicanus*** **%Status 1 & 2: 3.52**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	205,214	5,942	81,514	16,547	NA	7,880	NA	3,477	NA	320,574	1.44
Status 2	43,473	51,358	8,679	236,183	NA	396	40,084	81,475	NA	461,647	2.08
Status 3	735,482	2,632,352	62	12,215	23,100	1,278,668	1,554,068	16	NA	6,235,964	28.06
Status 4	NA	NA	NA	NA	NA	NA	15	15,158,542	889	15,159,446	68.22
Water	NA	NA	NA	NA	NA	NA	NA	NA	42,904	42,904	0.19
Total	984,169	2,689,652	90,256	264,945	23,100	1,286,944	1,594,166	15,243,509	43,793	22,220,534	100

ABNLC01010 **GRAY PARTRIDGE** ***Perdix perdix*** **%Status 1 & 2: 2.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	52,670	5,335	20,768	12,598	NA	1,421	NA	3,985	NA	96,777	0.49
Status 2	18,328	22,510	1,975	156,802	NA	301	31,878	70,766	NA	302,561	1.55
Status 3	480,478	1,720,430	62	12,933	16,207	1,323,543	1,326,146	1	NA	4,879,800	24.92
Status 4	NA	NA	NA	NA	NA	NA	18	14,270,286	1,320	14,271,624	72.88
Water	NA	NA	NA	NA	NA	NA	NA	NA	32,616	32,616	0.17
Total	551,476	1,748,274	22,806	182,333	16,207	1,325,265	1,358,042	14,345,038	33,937	19,583,378	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNLC03010 **CHUKAR** ***Alectoris chukar*** **%Status 1 & 2: 1.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	557	200	168	0	NA	112	NA	0	NA	1,037	0.12
Status 2	288	2,618	6,346	210	NA	1	1,836	4,187	NA	15,486	1.79
Status 3	52,873	67,587	0	104	0	184,127	37,989	0	NA	342,680	39.61
Status 4	NA	NA	NA	NA	NA	NA	0	503,444	31	503,475	58.20
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,423	2,423	0.28
Total	53,718	70,405	6,514	314	0	184,239	39,825	507,631	2,453	865,100	100

ABNLC07010 **RING-NECKED PHEASANT** ***Phasianus colchicus*** **%Status 1 & 2: 2.09**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,056	2,091	4,375	1,407	NA	0	NA	90	NA	12,019	0.22
Status 2	2,513	11,882	706	23,815	NA	202	17,208	44,920	NA	101,245	1.87
Status 3	48,700	335,852	62	2,300	11,538	382,758	327,129	0	NA	1,108,341	20.45
Status 4	NA	NA	NA	NA	NA	NA	17	4,178,298	2,541	4,180,855	77.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	16,360	16,360	0.30
Total	55,269	349,825	5,144	27,522	11,538	382,960	344,354	4,223,308	18,901	5,418,821	100

ABNLC09010 **SPRUCE GROUSE** ***Falcipennis canadensis*** **%Status 1 & 2: 23.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	297,238	1,239	111,326	0	NA	32,150	NA	107	NA	442,061	18.92
Status 2	85,756	220	638	194	NA	3,481	7,028	1,375	NA	98,692	4.22
Status 3	1,372,458	31,832	0	41	0	58,085	70,701	0	NA	1,533,116	65.60
Status 4	NA	NA	NA	NA	NA	NA	0	262,418	0	262,418	11.23
Water	NA	NA	NA	NA	NA	NA	NA	NA	812	812	0.04
Total	1,755,451	33,292	111,965	234	0	93,715	77,729	263,900	812	2,337,100	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNLC09020 **BLUE GROUSE** ***Dendragapus obscurus*** **%Status 1 & 2: 18.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	371,345	2,309	117,588	589	NA	21,842	NA	405	NA	514,077	14.39
Status 2	111,678	4,718	1,123	389	NA	661	17,285	13,204	NA	149,059	4.17
Status 3	1,879,630	89,247	0	111	1,098	113,213	99,572	0	NA	2,182,872	61.09
Status 4	NA	NA	NA	NA	NA	NA	0	724,990	9	724,999	20.29
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,226	2,226	0.06
Total	2,362,653	96,275	118,711	1,089	1,098	135,716	116,858	738,598	2,235	3,573,233	100

ABNLC10030 **WHITE-TAILED PTARMIGAN** ***Lagopus leucurus*** **%Status 1 & 2: 75.76**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	40,268	323	13,687	0	NA	3,355	NA	0	NA	57,633	68.72
Status 2	5,683	0	0	0	NA	0	221	0	NA	5,904	7.04
Status 3	18,642	39	0	0	0	541	591	0	NA	19,813	23.62
Status 4	NA	NA	NA	NA	NA	NA	0	505	0	505	0.60
Water	NA	NA	NA	NA	NA	NA	NA	NA	11	11	0.01
Total	64,593	362	13,687	0	0	3,896	812	505	11	83,867	100

ABNLC11010 **RUFFED GROUSE** ***Bonasa umbellus*** **%Status 1 & 2: 12.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	355,029	3,562	161,695	3,385	NA	31,557	NA	1,678	NA	556,907	9.05
Status 2	108,850	9,675	2,620	3,521	NA	4,957	28,077	30,925	NA	188,626	3.07
Status 3	2,238,116	159,596	5	1,472	1,081	372,778	243,966	0	NA	3,017,014	49.04
Status 4	NA	NA	NA	NA	NA	NA	15	2,373,618	83	2,373,716	38.59
Water	NA	NA	NA	NA	NA	NA	NA	NA	15,392	15,392	0.25
Total	2,701,995	172,833	164,321	8,378	1,081	409,292	272,059	2,406,222	15,474	6,151,654	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNLC12010 **SAGE GROUSE** ***Centrocercus urophasianus*** **%Status 1 & 2: 4.20**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	12,766	1,909	3,018	4,579	NA	0	NA	2	NA	22,275	0.49
Status 2	2,439	27,359	5,098	116,218	NA	0	7,746	9,280	NA	168,140	3.71
Status 3	120,618	1,115,262	0	1,384	10,259	124,227	326,238	15	NA	1,698,004	37.44
Status 4	NA	NA	NA	NA	NA	NA	0	2,631,050	24	2,631,074	58.02
Water	NA	NA	NA	NA	NA	NA	NA	NA	15,317	15,317	0.34
Total	135,823	1,144,530	8,116	122,181	10,259	124,227	333,984	2,640,348	15,341	4,534,810	100

ABNLC13030 **SHARP-TAILED GROUSE** ***Tympanuchus phasianellus*** **%Status 1 & 2: 1.98**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	30,572	4,290	12,875	17,653	NA	0	NA	3,499	NA	68,889	0.30
Status 2	4,751	40,328	8,135	224,862	NA	0	32,611	79,512	NA	390,200	1.68
Status 3	369,129	2,323,156	62	13,862	19,647	1,405,628	1,563,641	0	NA	5,695,126	24.57
Status 4	NA	NA	NA	NA	NA	NA	0	16,967,744	3,725	16,971,469	73.22
Water	NA	NA	NA	NA	NA	NA	NA	NA	54,386	54,386	0.24
Total	404,452	2,367,774	21,072	256,378	19,647	1,405,628	1,596,252	17,050,755	58,111	23,180,070	100

ABNLC13033 **COLUMBIAN SHARP-TAILED GROUSE** ***Tympanuchus phasianellus columbianus*** **%Status 1 & 2: 6.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	23,808	6	4,172	237	NA	3,448	NA	308	NA	31,980	2.74
Status 2	10,409	1,147	268	5,595	NA	294	9,844	10,646	NA	38,203	3.28
Status 3	147,400	34,691	0	1,857	619	38,750	64,073	0	NA	287,390	24.66
Status 4	NA	NA	NA	NA	NA	NA	20	806,072	0	806,092	69.17
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,757	1,757	0.15
Total	181,617	35,843	4,440	7,690	619	42,493	73,938	817,025	1,757	1,165,422	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNLC14010 **WILD TURKEY** ***Meleagris gallopavo*** **%Status 1 & 2: 5.79**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	19,506	613	14,041	972	NA	3,421	NA	249	NA	38,801	1.96
Status 2	7,514	6,814	348	41,547	NA	196	6,866	12,799	NA	76,084	3.84
Status 3	323,522	147,049	4	386	777	141,635	93,632	0	NA	707,005	35.64
Status 4	NA	NA	NA	NA	NA	NA	2	1,151,232	41	1,151,274	58.03
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,822	10,822	0.55
Total	350,541	154,476	14,393	42,906	777	145,252	100,500	1,164,279	10,863	1,983,987	100

ABNLC21020 **NORTHERN BOBWHITE** ***Colinus virginianus*** **%Status 1 & 2: 2.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	93	0	411	0	NA	696	NA	273	NA	1,473	0.19
Status 2	65	0	9	4,556	NA	394	2,555	6,645	NA	14,224	1.85
Status 3	49,237	3,495	0	597	5	22,207	58,731	0	NA	134,273	17.43
Status 4	NA	NA	NA	NA	NA	NA	15	620,156	0	620,171	80.49
Water	NA	NA	NA	NA	NA	NA	NA	NA	333	333	0.04
Total	49,395	3,495	420	5,153	5	23,297	61,301	627,074	333	770,474	100

ABNME01010 **YELLOW RAIL** ***Coturnicops noveboracensis*** **%Status 1 & 2: 8.08**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	0	0	0	718	NA	0	NA	19	NA	737	3.35
Status 2	0	0	0	996	NA	0	24	19	NA	1,040	4.73
Status 3	0	1,969	0	596	0	1,495	575	0	NA	4,636	21.07
Status 4	NA	NA	NA	NA	NA	NA	0	8,578	6	8,584	39.01
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,007	7,007	31.84
Total	0	1,969	0	2,310	0	1,495	599	8,617	7,013	22,004	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNME05030 **VIRGINIA RAIL** ***Rallus limicola*** **%Status 1 & 2: 11.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,250	19	284	2,694	NA	8	NA	94	NA	4,349	8.15
Status 2	155	26	0	922	NA	97	463	160	NA	1,823	3.42
Status 3	1,104	1,238	0	667	14	1,292	989	0	NA	5,305	9.94
Status 4	NA	NA	NA	NA	NA	NA	0	11,796	93	11,889	22.28
Water	NA	NA	NA	NA	NA	NA	NA	NA	30,011	30,011	56.23
Total	2,509	1,283	284	4,283	14	1,397	1,452	12,050	30,104	53,376	100

ABNME08020 **SORA** ***Porzana carolina*** **%Status 1 & 2: 11.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	8,408	66	3,340	3,790	NA	1,109	NA	165	NA	16,877	8.51
Status 2	1,593	36	7	1,987	NA	147	1,180	578	NA	5,530	2.79
Status 3	7,897	6,887	0	1,292	119	9,279	5,789	0	NA	31,263	15.75
Status 4	NA	NA	NA	NA	NA	NA	0	82,262	181	82,443	41.54
Water	NA	NA	NA	NA	NA	NA	NA	NA	62,341	62,341	31.41
Total	17,898	6,989	3,347	7,069	119	10,535	6,969	83,006	62,521	198,453	100

ABNME14020 **AMERICAN COOT** ***Fulica americana*** **%Status 1 & 2: 6.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	542	17	879	2,357	NA	82	NA	103	NA	3,980	3.52
Status 2	75	27	66	2,026	NA	97	667	229	NA	3,188	2.82
Status 3	2,563	2,703	0	759	32	3,720	2,093	0	NA	11,870	10.50
Status 4	NA	NA	NA	NA	NA	NA	0	26,672	93	26,765	23.68
Water	NA	NA	NA	NA	NA	NA	NA	NA	67,238	67,238	59.48
Total	3,180	2,747	945	5,142	32	3,899	2,760	27,004	67,331	113,040	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNMK01010 **SANDHILL CRANE** ***Grus canadensis*** **%Status 1 & 2: 10.07**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	470	0	156	3,426	NA	0	NA	119	NA	4,171	7.57
Status 2	173	0	6	382	NA	0	394	422	NA	1,376	2.50
Status 3	2,610	2,343	0	304	0	2,924	1,829	0	NA	10,009	18.17
Status 4	NA	NA	NA	NA	NA	NA	0	31,001	7	31,008	56.29
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,523	8,523	15.47
Total	3,252	2,343	161	4,112	0	2,924	2,223	31,542	8,530	55,087	100

ABNMK01030 **WHOOPING CRANE** ***Grus americana*** **%Status 1 & 2: 2.27**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	2	37	18	3,385	NA	0	NA	110	NA	3,553	1.71
Status 2	0	4	0	985	NA	0	45	133	NA	1,166	0.56
Status 3	391	5,633	0	1,073	0	3,885	6,938	0	NA	17,920	8.61
Status 4	NA	NA	NA	NA	NA	NA	0	173,704	156	173,859	83.49
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,748	11,748	5.64
Total	394	5,674	18	5,443	0	3,885	6,983	173,947	11,904	208,247	100

ABNNB02010 **BLACK-BELLIED PLOVER** ***Pluvialis squatarola*** **%Status 1 & 2: 8.05**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,747	28	949	4,325	NA	91	NA	164	NA	7,305	3.19
Status 2	211	75	156	8,467	NA	261	1,546	439	NA	11,155	4.86
Status 3	3,562	11,161	0	1,733	108	9,048	7,516	0	NA	33,128	14.44
Status 4	NA	NA	NA	NA	NA	NA	0	83,015	168	83,184	36.26
Water	NA	NA	NA	NA	NA	NA	NA	NA	94,661	94,661	41.26
Total	5,520	11,265	1,106	14,525	108	9,399	9,062	83,619	94,829	229,433	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNB03060 **SEMIPALMATED PLOVER** ***Charadrius semipalmatus*** **%Status 1 & 2: 5.51**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,881	131	1,106	4,380	NA	91	NA	165	NA	7,755	2.10
Status 2	286	615	289	7,516	NA	259	2,099	1,558	NA	12,621	3.41
Status 3	4,665	15,996	6	1,747	657	13,494	13,296	0	NA	49,861	13.47
Status 4	NA	NA	NA	NA	NA	NA	2	160,816	809	161,627	43.67
Water	NA	NA	NA	NA	NA	NA	NA	NA	138,259	138,259	37.36
Total	6,832	16,742	1,402	13,644	657	13,844	15,397	162,539	139,068	370,124	100

ABNNB03070 **PIPING PLOVER** ***Charadrius melodus*** **%Status 1 & 2: 12.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5	0	0	1,076	NA	0	NA	0	NA	1,081	1.90
Status 2	0	0	0	5,837	NA	0	241	27	NA	6,105	10.73
Status 3	4	2,322	0	639	41	4,329	1,846	0	NA	9,181	16.13
Status 4	NA	NA	NA	NA	NA	NA	0	11,896	547	12,443	21.86
Water	NA	NA	NA	NA	NA	NA	NA	NA	28,101	28,101	49.38
Total	9	2,322	0	7,552	41	4,329	2,087	11,923	28,648	56,912	100

ABNNB03090 **KILLDEER** ***Charadrius vociferus*** **%Status 1 & 2: 4.15**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	7,739	659	2,881	6,054	NA	192	NA	359	NA	17,884	0.83
Status 2	1,544	10,997	1,356	44,673	NA	488	6,808	5,367	NA	71,233	3.32
Status 3	12,192	124,305	0	4,945	2,134	84,788	91,272	0	NA	319,636	14.87
Status 4	NA	NA	NA	NA	NA	NA	31	1,603,167	2,921	1,606,118	74.73
Water	NA	NA	NA	NA	NA	NA	NA	NA	134,298	134,298	6.25
Total	21,475	135,961	4,237	55,672	2,134	85,469	98,110	1,608,893	137,219	2,149,169	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNB03100 **MOUNTAIN PLOVER** ***Charadrius montanus*** **%Status 1 & 2: 1.27**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6	369	0	429	NA	0	NA	1	NA	805	0.09
Status 2	45	2,630	977	5,222	NA	0	646	772	NA	10,292	1.18
Status 3	1,548	158,635	0	465	702	36,200	75,299	0	NA	272,849	31.15
Status 4	NA	NA	NA	NA	NA	NA	0	589,873	0	589,873	67.34
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,112	2,112	0.24
Total	1,599	161,634	977	6,116	702	36,200	75,946	590,645	2,112	875,932	100

ABNND01010 **BLACK-NECKED STILT** ***Himantopus mexicanus*** **%Status 1 & 2: 2.89**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6	0	0	641	NA	0	NA	21	NA	668	2.51
Status 2	0	0	0	41	NA	0	60	0	NA	100	0.38
Status 3	11	2,413	0	250	0	705	847	0	NA	4,227	15.89
Status 4	NA	NA	NA	NA	NA	NA	0	10,922	83	11,005	41.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,595	10,595	39.84
Total	18	2,413	0	932	0	705	907	10,943	10,678	26,596	100

ABNND02010 **AMERICAN AVOCET** ***Recurvirostra americana*** **%Status 1 & 2: 9.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	301	0	211	3,890	NA	0	NA	124	NA	4,525	5.57
Status 2	11	0	153	1,408	NA	0	1,036	211	NA	2,820	3.47
Status 3	1,794	5,600	0	643	0	3,898	2,891	0	NA	14,825	18.25
Status 4	NA	NA	NA	NA	NA	NA	0	30,699	120	30,819	37.94
Water	NA	NA	NA	NA	NA	NA	NA	NA	28,245	28,245	34.77
Total	2,106	5,600	364	5,941	0	3,898	3,927	31,034	28,365	81,234	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNF01020 **GREATER YELLOWLEGS** ***Tringa melanoleuca*** **%Status 1 & 2: 4.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,604	79	1,019	2,819	NA	91	NA	108	NA	5,719	1.99
Status 2	281	425	248	4,100	NA	245	1,298	1,066	NA	7,663	2.67
Status 3	3,998	8,459	0	1,263	529	9,083	8,323	0	NA	31,654	11.02
Status 4	NA	NA	NA	NA	NA	NA	2	115,755	800	116,558	40.57
Water	NA	NA	NA	NA	NA	NA	NA	NA	125,744	125,744	43.76
Total	5,883	8,963	1,267	8,182	529	9,419	9,623	116,929	126,545	287,339	100

ABNNF01030 **LESSER YELLOWLEGS** ***Tringa flavipes*** **%Status 1 & 2: 4.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,604	79	1,019	2,819	NA	91	NA	108	NA	5,719	1.99
Status 2	281	425	248	4,100	NA	245	1,298	1,066	NA	7,663	2.67
Status 3	3,998	8,459	0	1,263	529	9,083	8,323	0	NA	31,654	11.02
Status 4	NA	NA	NA	NA	NA	NA	2	115,755	800	116,558	40.57
Water	NA	NA	NA	NA	NA	NA	NA	NA	125,744	125,744	43.76
Total	5,883	8,963	1,267	8,182	529	9,419	9,623	116,929	126,545	287,339	100

ABNNF01070 **SOLITARY SANDPIPER** ***Tringa solitaria*** **%Status 1 & 2: 7.00**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,805	18	1,191	2,919	NA	125	NA	139	NA	6,197	3.87
Status 2	273	29	68	3,191	NA	250	888	320	NA	5,020	3.13
Status 3	4,131	3,814	0	1,031	49	4,947	3,530	0	NA	17,502	10.93
Status 4	NA	NA	NA	NA	NA	NA	0	49,819	158	49,977	31.20
Water	NA	NA	NA	NA	NA	NA	NA	NA	81,467	81,467	50.87
Total	6,209	3,861	1,259	7,142	49	5,322	4,418	50,278	81,625	160,163	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNF02010 **WILLET** ***Catoptrophorus semipalmatus*** **%Status 1 & 2: 4.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	537	125	446	6,998	NA	0	NA	655	NA	8,760	2.18
Status 2	23	90	636	5,257	NA	0	3,251	710	NA	9,968	2.48
Status 3	3,780	44,339	0	2,764	0	26,943	28,557	0	NA	106,383	26.47
Status 4	NA	NA	NA	NA	NA	NA	0	241,842	342	242,184	60.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	34,650	34,650	8.62
Total	4,341	44,553	1,081	15,018	0	26,943	31,809	243,207	34,992	401,945	100

ABNNF04020 **SPOTTED SANDPIPER** ***Actitis macularia*** **%Status 1 & 2: 7.09**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,787	187	2,385	5,659	NA	251	NA	468	NA	12,737	3.04
Status 2	668	717	402	9,971	NA	188	2,840	2,228	NA	17,013	4.06
Status 3	10,611	16,927	6	2,057	680	15,968	15,330	0	NA	61,579	14.68
Status 4	NA	NA	NA	NA	NA	NA	5	180,224	884	181,113	43.16
Water	NA	NA	NA	NA	NA	NA	NA	NA	147,162	147,162	35.07
Total	15,066	17,831	2,793	17,688	680	16,407	18,175	182,920	148,045	419,604	100

ABNNF06010 **UPLAND SANDPIPER** ***Bartramia longicauda*** **%Status 1 & 2: 2.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,030	141	1,695	1,099	NA	4	NA	14	NA	3,983	0.33
Status 2	91	1,300	107	20,784	NA	34	914	6,309	NA	29,538	2.41
Status 3	33,165	82,279	0	889	718	126,189	72,391	0	NA	315,629	25.77
Status 4	NA	NA	NA	NA	NA	NA	0	872,016	62	872,078	71.20
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,678	3,678	0.30
Total	34,285	83,720	1,802	22,772	718	126,227	73,304	878,339	3,741	1,224,907	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNF07070 **LONG-BILLED CURLEW** ***Numenius americanus*** **%Status 1 & 2: 2.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,095	113	142	1,264	NA	24	NA	4	NA	2,642	0.12
Status 2	467	9,577	2,426	20,142	NA	194	3,489	6,570	NA	42,865	1.91
Status 3	13,636	317,552	0	2,526	727	98,643	170,450	0	NA	603,533	26.85
Status 4	NA	NA	NA	NA	NA	NA	0	1,591,803	302	1,592,105	70.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,427	6,427	0.29
Total	15,198	327,241	2,568	23,933	727	98,860	173,939	1,598,377	6,729	2,247,573	100

ABNNF08040 **MARBLED GODWIT** ***Limosa fedoa*** **%Status 1 & 2: 3.46**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	237	0	63	5,745	NA	0	NA	655	NA	6,700	2.28
Status 2	10	84	0	2,355	NA	0	661	374	NA	3,485	1.18
Status 3	794	39,782	0	2,582	0	20,834	23,876	0	NA	87,868	29.84
Status 4	NA	NA	NA	NA	NA	NA	0	172,760	178	172,938	58.72
Water	NA	NA	NA	NA	NA	NA	NA	NA	23,508	23,508	7.98
Total	1,041	39,866	63	10,682	0	20,834	24,537	173,790	23,686	294,499	100

ABNNF11040 **SEMIPALMATED SANDPIPER** ***Calidris pusilla*** **%Status 1 & 2: 7.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,747	28	949	4,320	NA	91	NA	164	NA	7,300	3.20
Status 2	211	75	156	8,085	NA	261	1,546	439	NA	10,774	4.72
Status 3	3,562	11,054	0	1,733	108	9,041	7,503	0	NA	33,002	14.45
Status 4	NA	NA	NA	NA	NA	NA	0	82,798	168	82,967	36.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	94,350	94,350	41.31
Total	5,520	11,158	1,106	14,139	108	9,393	9,049	83,402	94,519	228,392	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNF11050 **WESTERN SANDPIPER** ***Calidris mauri*** **%Status 1 & 2: 7.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	1,747	28	949	4,320	NA	91	NA	164	NA	7,300	3.20
Status 2	211	75	156	8,085	NA	261	1,546	439	NA	10,774	4.72
Status 3	3,562	11,054	0	1,733	108	9,041	7,503	0	NA	33,002	14.45
Status 4	NA	NA	NA	NA	NA	NA	0	82,798	168	82,967	36.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	94,350	94,350	41.31
Total	5,520	11,158	1,106	14,139	108	9,393	9,049	83,402	94,519	228,392	100

ABNNF11100 **LEAST SANDPIPER** ***Calidris minutilla*** **%Status 1 & 2: 5.97**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	2,219	132	1,225	4,875	NA	138	NA	165	NA	8,753	2.31
Status 2	344	604	301	8,587	NA	261	2,122	1,701	NA	13,921	3.67
Status 3	4,928	16,241	6	1,790	667	14,139	13,535	0	NA	51,307	13.52
Status 4	NA	NA	NA	NA	NA	NA	2	164,598	812	165,413	43.58
Water	NA	NA	NA	NA	NA	NA	NA	NA	140,165	140,165	36.93
Total	7,491	16,978	1,533	15,251	667	14,537	15,660	166,464	140,977	379,558	100

ABNNF11110 **WHITE-RUMPED SANDPIPER** ***Calidris fuscicollis*** **%Status 1 & 2: 9.59**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	0	25	0	1,413	NA	0	NA	23	NA	1,461	1.50
Status 2	0	0	49	7,756	NA	0	51	27	NA	7,882	8.09
Status 3	43	7,596	0	1,026	11	5,179	2,773	0	NA	16,628	17.06
Status 4	NA	NA	NA	NA	NA	NA	0	34,790	168	34,959	35.87
Water	NA	NA	NA	NA	NA	NA	NA	NA	36,517	36,517	37.47
Total	43	7,621	49	10,195	11	5,179	2,824	34,841	36,686	97,448	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNF11120 **BAIRD'S SANDPIPER** ***Calidris bairdii*** **%Status 1 & 2: 7.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,747	28	949	4,320	NA	91	NA	164	NA	7,300	3.20
Status 2	211	75	156	8,085	NA	261	1,546	439	NA	10,774	4.72
Status 3	3,562	11,054	0	1,733	108	9,041	7,503	0	NA	33,002	14.45
Status 4	NA	NA	NA	NA	NA	NA	0	82,798	168	82,967	36.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	94,350	94,350	41.31
Total	5,520	11,158	1,106	14,139	108	9,393	9,049	83,402	94,519	228,392	100

ABNNF11130 **PECTORAL SANDPIPER** ***Calidris melanotos*** **%Status 1 & 2: 5.93**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	199	12	115	3,561	NA	0	NA	139	NA	4,026	4.35
Status 2	25	0	0	715	NA	0	482	238	NA	1,460	1.58
Status 3	1,332	6,278	0	907	0	4,132	4,093	0	NA	16,742	18.08
Status 4	NA	NA	NA	NA	NA	NA	0	44,041	138	44,178	47.71
Water	NA	NA	NA	NA	NA	NA	NA	NA	26,185	26,185	28.28
Total	1,556	6,290	115	5,183	0	4,132	4,575	44,417	26,323	92,591	100

ABNNF11190 **STILT SANDPIPER** ***Calidris himantopus*** **%Status 1 & 2: 5.93**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	199	12	115	3,561	NA	0	NA	139	NA	4,026	4.35
Status 2	25	0	0	715	NA	0	482	238	NA	1,460	1.58
Status 3	1,332	6,278	0	907	0	4,132	4,093	0	NA	16,742	18.08
Status 4	NA	NA	NA	NA	NA	NA	0	44,041	138	44,178	47.71
Water	NA	NA	NA	NA	NA	NA	NA	NA	26,185	26,185	28.28
Total	1,556	6,290	115	5,183	0	4,132	4,575	44,417	26,323	92,591	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNF16010 **SHORT-BILLED DOWITCHER** ***Limnodromus griseus*** **%Status 1 & 2: 5.84**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	34	12	45	648	NA	0	NA	130	NA	869	3.44
Status 2	21	0	0	314	NA	0	177	93	NA	605	2.40
Status 3	147	2,641	0	501	0	1,816	1,029	0	NA	6,133	24.27
Status 4	NA	NA	NA	NA	NA	NA	0	11,541	138	11,679	46.22
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,983	5,983	23.68
Total	203	2,653	45	1,463	0	1,816	1,205	11,764	6,120	25,269	100

ABNNF16020 **LONG-BILLED DOWITCHER** ***Limnodromus scolopaceus*** **%Status 1 & 2: 7.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,747	28	949	4,320	NA	91	NA	164	NA	7,300	3.20
Status 2	211	75	156	8,085	NA	261	1,546	439	NA	10,774	4.72
Status 3	3,562	11,054	0	1,733	108	9,041	7,503	0	NA	33,002	14.45
Status 4	NA	NA	NA	NA	NA	NA	0	82,798	168	82,967	36.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	94,350	94,350	41.31
Total	5,520	11,158	1,106	14,139	108	9,393	9,049	83,402	94,519	228,392	100

ABNNF18010 **COMMON SNIPE** ***Gallinago gallinago*** **%Status 1 & 2: 10.10**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	258	6	102	2,449	NA	0	NA	205	NA	3,020	7.67
Status 2	30	0	0	468	NA	0	276	178	NA	953	2.42
Status 3	1,140	1,422	0	536	0	1,648	1,038	0	NA	5,784	14.70
Status 4	NA	NA	NA	NA	NA	NA	0	13,912	79	13,991	35.56
Water	NA	NA	NA	NA	NA	NA	NA	NA	15,604	15,604	39.65
Total	1,427	1,427	102	3,454	0	1,648	1,315	14,295	15,683	39,351	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNF20010 **WILSON'S PHALAROPE** ***Phalaropus tricolor*** **%Status 1 & 2: 8.24**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	740	27	1,034	4,604	NA	123	NA	162	NA	6,691	3.29
Status 2	90	75	88	7,599	NA	227	1,535	437	NA	10,052	4.94
Status 3	3,170	10,081	0	1,662	105	8,509	6,548	0	NA	30,076	14.80
Status 4	NA	NA	NA	NA	NA	NA	0	70,574	137	70,711	34.78
Water	NA	NA	NA	NA	NA	NA	NA	NA	85,763	85,763	42.19
Total	4,001	10,183	1,123	13,866	105	8,859	8,083	71,173	85,900	203,292	100

ABNNF20020 **RED-NECKED PHALAROPE** ***Phalaropus lobatus*** **%Status 1 & 2: 8.06**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	1,667	28	949	4,320	NA	91	NA	164	NA	7,220	3.23
Status 2	209	75	156	8,085	NA	261	1,546	439	NA	10,772	4.82
Status 3	3,140	11,054	0	1,733	87	9,041	7,477	0	NA	32,534	14.57
Status 4	NA	NA	NA	NA	NA	NA	0	82,266	168	82,435	36.91
Water	NA	NA	NA	NA	NA	NA	NA	NA	90,383	90,383	40.47
Total	5,016	11,158	1,106	14,139	87	9,393	9,023	82,869	90,552	223,343	100

ABNNM03020 **FRANKLIN'S GULL** ***Larus pipixcan*** **%Status 1 & 2: 9.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	1,376	0	940	7,257	NA	0	NA	433	NA	10,005	4.44
Status 2	34	363	0	6,014	NA	0	3,259	659	NA	10,329	4.58
Status 3	2,228	16,616	0	2,758	143	7,582	10,816	0	NA	40,144	17.81
Status 4	NA	NA	NA	NA	NA	NA	0	89,648	74	89,722	39.80
Water	NA	NA	NA	NA	NA	NA	NA	NA	75,213	75,213	33.37
Total	3,639	16,979	940	16,029	143	7,582	14,075	90,739	75,287	225,414	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNM03050 **BONAPARTE'S GULL** ***Larus philadelphia*** **%Status 1 & 2: 6.57**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,226	231	2,113	8,237	NA	9	NA	770	NA	15,585	2.06
Status 2	384	376	175	24,410	NA	463	6,235	2,010	NA	34,052	4.51
Status 3	8,500	58,966	0	3,847	408	26,162	30,811	0	NA	128,694	17.03
Status 4	NA	NA	NA	NA	NA	NA	0	314,443	36	314,478	41.61
Water	NA	NA	NA	NA	NA	NA	NA	NA	263,013	263,013	34.80
Total	13,110	59,573	2,288	36,494	408	26,634	37,046	317,222	263,048	755,823	100

ABNNM03100 **RING-BILLED GULL** ***Larus delawarensis*** **%Status 1 & 2: 3.89**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	102	0	145	701	NA	0	NA	2	NA	949	0.48
Status 2	7	0	0	5,867	NA	0	932	6	NA	6,812	3.42
Status 3	370	1,922	0	149	0	964	744	0	NA	4,149	2.08
Status 4	NA	NA	NA	NA	NA	NA	0	11,462	2	11,464	5.75
Water	NA	NA	NA	NA	NA	NA	NA	NA	176,121	176,121	88.28
Total	480	1,922	145	6,717	0	964	1,675	11,470	176,122	199,495	100

ABNNM03110 **CALIFORNIA GULL** ***Larus californicus*** **%Status 1 & 2: 9.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	31	0	174	3,731	NA	0	NA	2	NA	3,937	1.53
Status 2	7	0	0	17,562	NA	0	2,556	10	NA	20,135	7.82
Status 3	1,035	10,583	0	194	0	2,368	3,006	0	NA	17,187	6.67
Status 4	NA	NA	NA	NA	NA	NA	0	29,657	2	29,658	11.51
Water	NA	NA	NA	NA	NA	NA	NA	NA	186,721	186,721	72.47
Total	1,073	10,583	174	21,487	0	2,368	5,562	29,668	186,723	257,638	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNM08020 **CASPIAN TERN** ***Sterna caspia*** **%Status 1 & 2: 1.07**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	201	NA	0	NA	0	NA	201	0.13
Status 2	0	0	0	1,202	NA	0	319	1	NA	1,522	0.95
Status 3	2	275	0	35	0	19	88	0	NA	420	0.26
Status 4	NA	NA	NA	NA	NA	NA	0	2,151	0	2,151	1.34
Water	NA	NA	NA	NA	NA	NA	NA	NA	156,456	156,456	97.33
Total	2	275	0	1,438	0	19	407	2,152	156,456	160,750	100

ABNNM08070 **COMMON TERN** ***Sterna hirundo*** **%Status 1 & 2: 0.72**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	250	NA	0	NA	0	NA	250	0.14
Status 2	5	0	0	740	NA	0	318	1	NA	1,064	0.59
Status 3	521	258	0	35	0	33	113	0	NA	959	0.53
Status 4	NA	NA	NA	NA	NA	NA	0	2,048	0	2,048	1.13
Water	NA	NA	NA	NA	NA	NA	NA	NA	177,328	177,328	97.62
Total	526	258	0	1,025	0	33	430	2,049	177,328	181,650	100

ABNNM08090 **FORSTER'S TERN** ***Sterna forsteri*** **%Status 1 & 2: 13.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	36	0	61	1,648	NA	0	NA	76	NA	1,820	8.41
Status 2	15	0	0	768	NA	0	368	4	NA	1,155	5.33
Status 3	187	46	0	256	0	850	279	0	NA	1,618	7.47
Status 4	NA	NA	NA	NA	NA	NA	0	2,238	1	2,239	10.34
Water	NA	NA	NA	NA	NA	NA	NA	NA	14,821	14,821	68.45
Total	238	46	61	2,671	0	850	647	2,318	14,821	21,653	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNNM08100 **LEAST TERN** ***Sterna antillarum*** **%Status 1 & 2: 2.58**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	8	0	56	NA	0	NA	0	NA	64	0.06
Status 2	0	0	0	2,397	NA	0	220	0	NA	2,616	2.52
Status 3	0	505	0	16	130	311	1,121	0	NA	2,084	2.01
Status 4	NA	NA	NA	NA	NA	NA	0	3,417	309	3,727	3.59
Water	NA	NA	NA	NA	NA	NA	NA	NA	95,251	95,251	91.82
Total	0	514	0	2,469	130	311	1,341	3,417	95,561	103,742	100

ABNNM10020 **BLACK TERN** ***Chlidonias niger*** **%Status 1 & 2: 6.37**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	93	4	137	1,891	NA	0	NA	29	NA	2,155	4.02
Status 2	16	0	0	770	NA	0	380	92	NA	1,257	2.35
Status 3	555	1,342	0	326	0	1,402	697	0	NA	4,322	8.07
Status 4	NA	NA	NA	NA	NA	NA	0	8,736	1	8,737	16.32
Water	NA	NA	NA	NA	NA	NA	NA	NA	37,079	37,079	69.24
Total	664	1,346	137	2,987	0	1,402	1,076	8,857	37,080	53,550	100

ABNPB01010 **ROCK DOVE** ***Columba livia*** **%Status 1 & 2: 1.39**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	9,151	96	12,301	1,493	NA	680	NA	134	NA	23,856	0.40
Status 2	3,869	6,269	259	38,315	NA	336	2,927	6,238	NA	58,214	0.98
Status 3	32,490	62,368	0	1,968	2,808	252,216	233,658	0	NA	585,509	9.89
Status 4	NA	NA	NA	NA	NA	NA	32	5,234,018	1,912	5,235,962	88.49
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,679	13,679	0.23
Total	45,510	68,733	12,561	41,777	2,808	253,233	236,618	5,240,390	15,591	5,917,221	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNPB04040 **MOURNING DOVE** ***Zenaida macroura*** **%Status 1 & 2: 3.13**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	199,805	8,220	65,642	20,790	NA	11,618	NA	5,483	NA	311,558	1.13
Status 2	56,476	58,865	11,537	262,749	NA	990	57,390	105,238	NA	553,246	2.00
Status 3	1,295,068	2,826,199	66	14,828	27,373	1,647,257	1,768,422	16	NA	7,579,229	27.44
Status 4	NA	NA	NA	NA	NA	NA	50	19,093,456	3,985	19,097,491	69.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	76,981	76,981	0.28
Total	1,551,349	2,893,284	77,246	298,368	27,373	1,659,865	1,825,862	19,204,194	80,966	27,618,504	100

ABNRB02010 **BLACK-BILLED CUCKOO** ***Coccyzus erythropthalmus*** **%Status 1 & 2: 4.71**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	37,833	2,002	30,037	992	NA	1,032	NA	1,064	NA	72,962	3.08
Status 2	7,855	798	471	10,696	NA	221	7,329	11,094	NA	38,464	1.62
Status 3	196,046	106,632	0	900	1,619	316,824	100,475	0	NA	722,497	30.51
Status 4	NA	NA	NA	NA	NA	NA	0	1,514,501	1,754	1,516,255	64.03
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,025	18,025	0.76
Total	241,734	109,433	30,509	12,588	1,619	318,077	107,804	1,526,659	19,779	2,368,202	100

ABNRB02020 **YELLOW-BILLED CUCKOO** ***Coccyzus americanus*** **%Status 1 & 2: 3.06**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6,555	531	1,104	1,388	NA	0	NA	11	NA	9,588	1.90
Status 2	424	111	149	577	NA	0	465	4,100	NA	5,826	1.16
Status 3	27,875	19,745	0	11	1,241	76,571	18,312	0	NA	143,755	28.53
Status 4	NA	NA	NA	NA	NA	NA	0	340,893	22	340,915	67.67
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,735	3,735	0.74
Total	34,853	20,388	1,253	1,976	1,241	76,571	18,777	345,004	3,757	503,819	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNSA01010 **BARN OWL** ***Tyto alba*** **%Status 1 & 2: 1.97**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	3,196	0	0	0	NA	0	NA	0	NA	3,196	0.29
Status 2	1,243	4,504	9,565	1,521	NA	0	472	1,606	NA	18,912	1.69
Status 3	20,095	63,371	0	115	10	179,955	43,578	0	NA	307,124	27.43
Status 4	NA	NA	NA	NA	NA	NA	0	786,994	35	787,029	70.28
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,520	3,520	0.31
Total	24,534	67,876	9,565	1,636	10	179,955	44,050	788,601	3,555	1,119,782	100

ABNSB01020 **FLAMMULATED OWL** ***Otus flammeolus*** **%Status 1 & 2: 8.21**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	52,495	2,014	23,718	854	NA	8,288	NA	783	NA	88,153	4.31
Status 2	27,227	5,364	177	2,164	NA	684	16,103	28,180	NA	79,898	3.91
Status 3	612,376	80,206	0	633	470	87,415	102,407	0	NA	883,508	43.18
Status 4	NA	NA	NA	NA	NA	NA	5	990,494	0	990,499	48.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,092	4,092	0.20
Total	692,098	87,584	23,896	3,651	470	96,387	118,515	1,019,457	4,092	2,046,150	100

ABNSB01030 **EASTERN SCREECH-OWL** ***Otus asio*** **%Status 1 & 2: 2.96**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	5,058	158	836	670	NA	0	NA	155	NA	6,877	1.34
Status 2	1,070	324	115	4,006	NA	0	1,396	1,441	NA	8,353	1.62
Status 3	24,166	12,944	0	103	1,603	49,181	20,964	0	NA	108,960	21.19
Status 4	NA	NA	NA	NA	NA	NA	0	379,656	1,275	380,931	74.07
Water	NA	NA	NA	NA	NA	NA	NA	NA	9,154	9,154	1.78
Total	30,294	13,426	951	4,779	1,603	49,181	22,361	381,252	10,429	514,275	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNSB01040 **WESTERN SCREECH-OWL** ***Otus kennicottii*** **%Status 1 & 2: 13.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11,266	161	15,353	692	NA	594	NA	326	NA	28,392	8.94
Status 2	5,696	159	229	230	NA	113	2,931	3,616	NA	12,975	4.08
Status 3	88,340	5,023	0	250	119	34,800	11,781	0	NA	140,313	44.17
Status 4	NA	NA	NA	NA	NA	NA	2	132,846	0	132,849	41.82
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,145	3,145	0.99
Total	105,302	5,343	15,582	1,172	119	35,507	14,714	136,789	3,145	317,674	100

ABNSB05010 **GREAT HORNED OWL** ***Bubo virginianus*** **%Status 1 & 2: 6.80**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,131,906	12,701	363,063	24,258	NA	64,517	NA	6,148	NA	1,602,593	4.34
Status 2	293,387	74,955	13,999	308,072	NA	5,788	86,641	129,139	NA	911,981	2.47
Status 3	4,956,517	3,215,561	67	18,193	32,598	2,029,400	2,114,052	16	NA	12,366,404	33.45
Status 4	NA	NA	NA	NA	NA	NA	60	21,989,548	4,592	21,994,200	59.49
Water	NA	NA	NA	NA	NA	NA	NA	NA	93,067	93,067	0.25
Total	6,381,810	3,303,217	377,130	350,523	32,598	2,099,705	2,200,752	22,124,851	97,658	36,968,244	100

ABNSB06010 **SNOWY OWL** ***Nyctea scandiaca*** **%Status 1 & 2: 1.89**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	33,860	4,427	12,809	11,180	NA	943	NA	3,732	NA	66,951	0.29
Status 2	7,105	35,403	8,341	193,521	NA	731	35,739	89,258	NA	370,100	1.60
Status 3	313,680	2,176,136	62	16,272	21,633	1,417,319	1,525,980	0	NA	5,471,082	23.62
Status 4	NA	NA	NA	NA	NA	NA	45	17,193,226	3,151	17,196,422	74.24
Water	NA	NA	NA	NA	NA	NA	NA	NA	58,629	58,629	0.25
Total	354,646	2,215,966	21,212	220,974	21,633	1,418,993	1,561,764	17,286,216	61,780	23,163,184	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNSB07010 **NORTHERN HAWK OWL** ***Surnia ulula*** **%Status 1 & 2: 16.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	713	0	74,099	0	NA	441	NA	0	NA	75,253	14.94
Status 2	6,400	0	2,217	0	NA	0	745	590	NA	9,952	1.98
Status 3	191,951	0	0	403	9	68	39,824	0	NA	232,255	46.10
Status 4	NA	NA	NA	NA	NA	NA	12	184,810	0	184,823	36.68
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,534	1,534	0.31
Total	199,064	0	76,316	403	9	509	40,581	185,401	1,534	503,817	100

ABNSB08010 **NORTHERN PYGMY-OWL** ***Glaucidium gnoma*** **%Status 1 & 2: 19.20**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	917,031	6,031	317,790	6,286	NA	58,336	NA	1,665	NA	1,307,140	15.17
Status 2	247,153	12,319	2,564	4,050	NA	5,028	38,057	37,332	NA	346,504	4.02
Status 3	3,987,269	177,761	1	1,426	6,102	215,934	274,673	0	NA	4,663,164	54.14
Status 4	NA	NA	NA	NA	NA	NA	15	2,280,959	0	2,280,975	26.48
Water	NA	NA	NA	NA	NA	NA	NA	NA	16,417	16,417	0.19
Total	5,151,453	196,112	320,355	11,762	6,102	279,299	312,745	2,319,957	16,417	8,614,200	100

ABNSB10010 **BURROWING OWL** ***Athene cunicularia*** **%Status 1 & 2: 1.98**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6,777	5,352	8,197	16,241	NA	795	NA	3,581	NA	40,943	0.17
Status 2	4,128	50,088	8,599	248,269	NA	685	32,291	79,975	NA	424,036	1.81
Status 3	306,420	2,620,617	62	14,700	23,304	1,235,777	1,599,075	0	NA	5,799,953	24.74
Status 4	NA	NA	NA	NA	NA	NA	0	17,127,924	2,500	17,130,424	73.07
Water	NA	NA	NA	NA	NA	NA	NA	NA	49,770	49,770	0.21
Total	317,325	2,676,056	16,859	279,210	23,304	1,237,256	1,631,366	17,211,480	52,270	23,445,126	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNSB12020 **BARRED OWL** ***Strix varia*** **%Status 1 & 2: 21.08**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	473,190	2	230,718	493	NA	50,068	NA	198	NA	754,669	17.60
Status 2	121,511	687	2,350	1,435	NA	4,820	13,821	4,669	NA	149,292	3.48
Status 3	2,176,232	57,592	0	786	177	167,501	153,975	0	NA	2,556,261	59.60
Status 4	NA	NA	NA	NA	NA	NA	12	823,386	0	823,398	19.20
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,445	5,445	0.13
Total	2,770,933	58,280	233,068	2,714	177	222,388	167,808	828,253	5,445	4,289,065	100

ABNSB12040 **GREAT GRAY OWL** ***Strix nebulosa*** **%Status 1 & 2: 21.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	911,611	5,852	311,998	5,266	NA	55,601	NA	1,462	NA	1,291,790	17.23
Status 2	238,749	12,838	1,341	2,516	NA	3,894	34,295	30,261	NA	323,893	4.32
Status 3	3,636,173	164,833	1	289	5,662	192,412	210,058	0	NA	4,209,427	56.16
Status 4	NA	NA	NA	NA	NA	NA	0	1,659,936	0	1,659,936	22.14
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,912	10,912	0.15
Total	4,786,533	183,523	313,340	8,071	5,662	251,907	244,354	1,691,659	10,912	7,495,960	100

ABNSB13010 **LONG-EARED OWL** ***Asio otus*** **%Status 1 & 2: 4.71**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	92,381	3,528	40,901	9,698	NA	6,869	NA	1,386	NA	154,762	1.70
Status 2	31,053	26,337	7,354	147,794	NA	443	23,906	36,028	NA	272,916	3.01
Status 3	817,853	1,170,849	4	4,172	10,664	621,371	525,818	15	NA	3,150,747	34.69
Status 4	NA	NA	NA	NA	NA	NA	6	5,456,590	2,069	5,458,665	60.11
Water	NA	NA	NA	NA	NA	NA	NA	NA	44,463	44,463	0.49
Total	941,286	1,200,714	48,259	161,665	10,664	628,683	549,731	5,494,019	46,532	9,081,553	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNSB13040 **SHORT-EARED OWL** ***Asio flammeus*** **%Status 1 & 2: 1.81**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	66,558	4,988	25,182	14,823	NA	3,239	NA	4,155	NA	118,945	0.56
Status 2	20,586	13,992	2,154	114,392	NA	623	35,003	80,422	NA	267,173	1.26
Status 3	479,554	1,549,292	62	15,051	13,413	1,399,039	1,363,944	1	NA	4,820,356	22.65
Status 4	NA	NA	NA	NA	NA	NA	20	16,024,493	3,195	16,027,708	75.30
Water	NA	NA	NA	NA	NA	NA	NA	NA	50,973	50,973	0.24
Total	566,698	1,568,272	27,398	144,267	13,413	1,402,901	1,398,967	16,109,072	54,168	21,285,156	100

ABNSB15010 **BOREAL OWL** ***Aegolius funereus*** **%Status 1 & 2: 24.08**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	711,026	3,656	193,337	1,646	NA	42,416	NA	636	NA	952,718	19.31
Status 2	186,078	9,415	0	565	NA	441	21,533	17,046	NA	235,079	4.77
Status 3	2,727,633	123,295	1	70	3,595	110,530	102,827	0	NA	3,067,951	62.19
Status 4	NA	NA	NA	NA	NA	NA	0	674,090	0	674,090	13.67
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,003	3,003	0.06
Total	3,624,737	136,367	193,338	2,282	3,595	153,388	124,360	691,772	3,003	4,932,842	100

ABNSB15020 **NORTHERN SAW-WHET OWL** ***Aegolius acadicus*** **%Status 1 & 2: 15.10**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	628,694	5,207	224,204	2,568	NA	43,240	NA	2,252	NA	906,165	11.54
Status 2	183,463	13,359	2,752	3,272	NA	5,033	36,138	35,481	NA	279,499	3.56
Status 3	3,281,478	237,207	5	1,180	3,541	443,497	284,767	0	NA	4,251,675	54.15
Status 4	NA	NA	NA	NA	NA	NA	15	2,402,190	112	2,402,317	30.60
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,541	11,541	0.15
Total	4,093,635	255,772	226,961	7,020	3,541	491,770	320,920	2,439,923	11,653	7,851,196	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNTA02020 **COMMON NIGHTHAWK** ***Chordeiles minor*** **%Status 1 & 2: 2.73**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	132,778	6,097	63,253	20,504	NA	3,286	NA	4,426	NA	230,345	0.84
Status 2	29,688	54,239	11,856	266,546	NA	849	52,243	98,527	NA	513,948	1.89
Status 3	767,471	2,827,291	66	16,880	23,886	1,638,060	1,791,523	16	NA	7,065,193	25.94
Status 4	NA	NA	NA	NA	NA	NA	25	19,349,264	4,082	19,353,371	71.04
Water	NA	NA	NA	NA	NA	NA	NA	NA	78,871	78,871	0.29
Total	929,937	2,887,627	75,175	303,931	23,886	1,642,195	1,843,792	19,452,233	82,952	27,241,728	100

ABNTA04010 **COMMON POORWILL** ***Phalaenoptilus nuttallii*** **%Status 1 & 2: 5.38**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	23,083	2,584	3,728	3,179	NA	2,931	NA	657	NA	36,162	0.59
Status 2	4,712	45,128	9,521	204,445	NA	232	15,491	15,853	NA	295,381	4.79
Status 3	176,774	1,282,447	4	2,660	11,239	284,097	400,312	0	NA	2,157,533	35.02
Status 4	NA	NA	NA	NA	NA	NA	0	3,650,684	92	3,650,776	59.26
Water	NA	NA	NA	NA	NA	NA	NA	NA	21,224	21,224	0.34
Total	204,570	1,330,159	13,253	210,284	11,239	287,259	415,803	3,667,194	21,316	6,161,076	100

ABNUA01010 **BLACK SWIFT** ***Cypseloides niger*** **%Status 1 & 2: 33.50**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	127,050	0	43,081	0	NA	14,263	NA	0	NA	184,395	27.68
Status 2	37,203	160	103	19	NA	555	578	160	NA	38,777	5.82
Status 3	369,183	2,025	0	10	27	8,256	16,096	0	NA	395,596	59.37
Status 4	NA	NA	NA	NA	NA	NA	0	47,425	0	47,425	7.12
Water	NA	NA	NA	NA	NA	NA	NA	NA	87	87	0.01
Total	533,436	2,185	43,184	29	27	23,074	16,673	47,584	87	666,280	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNUA03010 **CHIMNEY SWIFT** ***Chaetura pelagica*** **%Status 1 & 2: 0.37**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	2	2	5	0	NA	0	NA	0	NA	10	0.00
Status 2	0	0	0	365	NA	0	488	0	NA	852	0.36
Status 3	2,488	2,822	0	0	663	14,488	9,548	0	NA	30,008	12.74
Status 4	NA	NA	NA	NA	NA	NA	0	202,541	355	202,896	86.16
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,715	1,715	0.73
Total	2,490	2,824	5	365	663	14,488	10,036	202,541	2,070	235,481	100

ABNUA03020 **VAUX'S SWIFT** ***Chaetura vauxi*** **%Status 1 & 2: 13.38**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	120,057	914	100,039	317	NA	23,688	NA	727	NA	245,740	10.49
Status 2	48,475	342	1,514	1,497	NA	4,833	7,437	3,647	NA	67,746	2.89
Status 3	1,083,426	11,083	0	592	420	122,488	116,725	0	NA	1,334,735	56.98
Status 4	NA	NA	NA	NA	NA	NA	40	689,797	0	689,837	29.45
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,310	4,310	0.18
Total	1,251,958	12,339	101,553	2,406	420	151,009	124,202	694,171	4,310	2,342,368	100

ABNUA06010 **WHITE-THROATED SWIFT** ***Aeronautes saxatalis*** **%Status 1 & 2: 30.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	739,105	3,689	230,504	0	NA	33,837	NA	529	NA	1,007,663	24.73
Status 2	163,409	13,029	10,053	0	NA	4,730	19,673	9,516	NA	220,410	5.41
Status 3	1,851,995	68,186	5	266	508	125,475	88,514	0	NA	2,134,949	52.39
Status 4	NA	NA	NA	NA	NA	NA	0	667,674	0	667,674	16.39
Water	NA	NA	NA	NA	NA	NA	NA	NA	44,012	44,012	1.08
Total	2,754,509	84,903	240,562	266	508	164,042	108,188	677,719	44,012	4,074,708	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNUC45010 **RUBY-THROATED HUMMINGBIRD** ***Archilochus colubris*** **%Status 1 & 2: 1.28**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	5	70	NA	0	NA	1	NA	75	0.13
Status 2	0	1	0	661	NA	0	16	2	NA	680	1.15
Status 3	0	2,349	0	93	92	9,884	3,779	0	NA	16,198	27.42
Status 4	NA	NA	NA	NA	NA	NA	0	39,571	1,245	40,816	69.08
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,315	1,315	2.23
Total	0	2,350	5	824	92	9,884	3,796	39,573	2,560	59,083	100

ABNUC45020 **BLACK-CHINNED HUMMINGBIRD** ***Archilochus alexandri*** **%Status 1 & 2: 24.82**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	43,833	0	6,173	228	NA	4,881	NA	32	NA	55,148	20.39
Status 2	7,675	7	450	127	NA	71	2,822	858	NA	12,011	4.44
Status 3	93,716	1,591	0	187	45	3,475	7,505	0	NA	106,519	39.37
Status 4	NA	NA	NA	NA	NA	NA	2	96,023	0	96,026	35.50
Water	NA	NA	NA	NA	NA	NA	NA	NA	829	829	0.31
Total	145,224	1,598	6,623	543	45	8,427	10,330	96,913	829	270,533	100

ABNUC48010 **CALLIOPE HUMMINGBIRD** ***Stellula calliope*** **%Status 1 & 2: 20.18**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	653,059	4,585	227,198	3,422	NA	35,374	NA	1,562	NA	925,201	16.16
Status 2	157,305	6,609	2,705	3,264	NA	1,187	30,619	28,682	NA	230,372	4.02
Status 3	2,436,538	102,318	1	1,154	3,940	195,215	176,292	0	NA	2,915,459	50.91
Status 4	NA	NA	NA	NA	NA	NA	44	1,643,984	62	1,644,089	28.71
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,104	12,104	0.21
Total	3,246,903	113,512	229,904	7,841	3,940	231,777	206,955	1,674,229	12,165	5,727,225	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNUC51020 **RUFOUS HUMMINGBIRD** ***Selasphorus rufus*** **%Status 1 & 2: 22.01**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	295,106	2,416	114,925	2,714	NA	12,297	NA	1,068	NA	428,526	17.45
Status 2	71,347	3,060	1,194	2,717	NA	326	17,174	16,116	NA	111,933	4.56
Status 3	737,674	49,826	1	856	2,395	94,349	82,100	0	NA	967,201	39.38
Status 4	NA	NA	NA	NA	NA	NA	15	939,920	53	939,987	38.27
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,420	8,420	0.34
Total	1,104,126	55,303	116,120	6,286	2,395	106,972	99,288	957,104	8,473	2,456,068	100

ABNXD01020 **BELTED KINGFISHER** ***Ceryle alcyon*** **%Status 1 & 2: 13.99**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	166,346	1,050	103,109	3,265	NA	8,714	NA	812	NA	283,296	10.69
Status 2	46,285	4,095	2,125	5,173	NA	2,318	14,603	13,099	NA	87,698	3.31
Status 3	939,225	47,579	0	686	2,714	124,652	97,891	0	NA	1,212,747	45.74
Status 4	NA	NA	NA	NA	NA	NA	11	957,481	1,827	959,319	36.18
Water	NA	NA	NA	NA	NA	NA	NA	NA	108,448	108,448	4.09
Total	1,151,856	52,724	105,234	9,124	2,714	135,684	112,504	971,392	110,275	2,651,508	100

ABNYF04010 **LEWIS'S WOODPECKER** ***Melanerpes lewis*** **%Status 1 & 2: 9.42**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	79,328	537	25,435	419	NA	3,464	NA	163	NA	109,346	5.88
Status 2	13,037	7,026	535	24,695	NA	210	9,019	11,309	NA	65,831	3.54
Status 3	375,351	125,358	4	330	431	176,684	80,718	0	NA	758,875	40.82
Status 4	NA	NA	NA	NA	NA	NA	2	919,806	43	919,851	49.48
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,167	5,167	0.28
Total	467,716	132,921	25,974	25,444	431	180,358	89,738	931,278	5,210	1,859,070	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNYF04040 **RED-HEADED WOODPECKER** ***Melanerpes erythrocephalus*** **%Status 1 & 2: 18.86**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	62,682	122	14,198	978	NA	158	NA	186	NA	78,325	15.23
Status 2	7,275	292	38	3,595	NA	19	4,484	3,015	NA	18,717	3.64
Status 3	44,754	11,543	0	45	418	32,473	18,807	0	NA	108,040	21.00
Status 4	NA	NA	NA	NA	NA	NA	0	300,669	971	301,640	58.64
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,718	7,718	1.50
Total	114,711	11,956	14,237	4,619	418	32,650	23,292	303,870	8,689	514,440	100

ABNYF05030 **WILLIAMSON'S SAPSUCKER** ***Sphyrapicus thyroideus*** **%Status 1 & 2: 17.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	360,896	2,742	176,037	690	NA	29,188	NA	753	NA	570,306	13.68
Status 2	113,369	5,063	1,941	1,640	NA	1,058	21,697	21,078	NA	165,846	3.98
Status 3	1,914,032	98,859	5	617	589	132,906	155,241	0	NA	2,302,249	55.22
Status 4	NA	NA	NA	NA	NA	NA	9	1,125,552	0	1,125,561	27.00
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,289	5,289	0.13
Total	2,388,296	106,663	177,983	2,948	589	163,152	176,948	1,147,383	5,289	4,169,250	100

ABNYF05040 **RED-NAPED SAPSUCKER** ***Sphyrapicus nuchalis*** **%Status 1 & 2: 21.75**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	703,164	2,889	254,425	2,952	NA	43,097	NA	846	NA	1,007,374	17.60
Status 2	182,363	9,153	2,572	1,748	NA	4,248	21,824	15,385	NA	237,292	4.15
Status 3	2,805,876	92,897	0	748	3,483	212,116	157,707	0	NA	3,272,827	57.18
Status 4	NA	NA	NA	NA	NA	NA	9	1,193,582	18	1,193,609	20.86
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,199	12,199	0.21
Total	3,691,403	104,940	256,997	5,449	3,483	259,460	179,540	1,209,813	12,217	5,723,301	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNYF07030 **DOWNY WOODPECKER** ***Picoides pubescens*** **%Status 1 & 2: 6.57**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	13,176	181	16,034	1,362	NA	594	NA	326	NA	31,673	4.08
Status 2	5,800	511	347	4,091	NA	113	3,572	4,871	NA	19,305	2.49
Status 3	117,788	18,867	0	355	475	82,230	31,070	0	NA	250,785	32.33
Status 4	NA	NA	NA	NA	NA	NA	2	461,625	1,217	462,845	59.67
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,086	11,086	1.43
Total	136,764	19,559	16,381	5,808	475	82,938	34,645	466,822	12,304	775,693	100

ABNYF07040 **HAIRY WOODPECKER** ***Picoides villosus*** **%Status 1 & 2: 17.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	662,898	3,457	221,987	2,209	NA	32,948	NA	853	NA	924,352	13.44
Status 2	182,009	13,350	2,627	44,002	NA	1,118	27,603	25,440	NA	296,147	4.31
Status 3	2,794,480	253,558	5	1,013	2,990	281,025	230,485	0	NA	3,563,554	51.81
Status 4	NA	NA	NA	NA	NA	NA	11	2,073,777	1,064	2,074,852	30.17
Water	NA	NA	NA	NA	NA	NA	NA	NA	19,102	19,102	0.28
Total	3,639,387	270,364	224,619	47,223	2,990	315,090	258,099	2,100,069	20,167	6,878,007	100

ABNYF07080 **THREE-TOED WOODPECKER** ***Picoides tridactylus*** **%Status 1 & 2: 21.81**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	679,603	3,217	208,324	1,264	NA	45,302	NA	394	NA	938,105	17.66
Status 2	167,938	9,590	1,932	877	NA	4,534	21,735	13,912	NA	220,518	4.15
Status 3	2,978,256	105,584	0	258	3,600	127,185	154,493	0	NA	3,369,376	63.44
Status 4	NA	NA	NA	NA	NA	NA	1	780,147	1	780,148	14.69
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,340	3,340	0.06
Total	3,825,797	118,391	210,256	2,399	3,600	177,021	176,228	794,453	3,340	5,311,485	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABNYF07090 **BLACK-BACKED WOODPECKER** ***Picoides arcticus*** **%Status 1 & 2: 59.21**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	151,716	0	40,391	0	NA	851	NA	0	NA	192,959	53.19
Status 2	16,586	829	363	0	NA	0	3,666	399	NA	21,843	6.02
Status 3	125,121	1,441	0	0	698	1,780	2,337	0	NA	131,377	36.21
Status 4	NA	NA	NA	NA	NA	NA	0	16,489	0	16,489	4.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	107	107	0.03
Total	293,423	2,270	40,754	0	698	2,632	6,003	16,889	107	362,776	100

ABNYF10020 **NORTHERN FLICKER** ***Colaptes auratus*** **%Status 1 & 2: 15.87**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	541,957	3,333	193,085	2,236	NA	30,133	NA	1,639	NA	772,384	11.70
Status 2	156,707	13,263	2,738	44,812	NA	1,111	29,904	26,620	NA	275,155	4.17
Status 3	2,589,826	262,020	5	1,004	3,837	286,903	232,730	0	NA	3,376,325	51.16
Status 4	NA	NA	NA	NA	NA	NA	40	2,156,169	1,150	2,157,359	32.69
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,933	18,933	0.29
Total	3,288,491	278,617	195,827	48,052	3,837	318,147	262,674	2,184,428	20,083	6,600,156	100

ABNYF12020 **PILEATED WOODPECKER** ***Dryocopus pileatus*** **%Status 1 & 2: 13.27**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	167,139	1,121	86,947	314	NA	24,954	NA	625	NA	281,100	9.98
Status 2	64,980	1,339	1,101	625	NA	4,758	12,475	7,537	NA	92,815	3.30
Status 3	1,483,326	38,238	0	445	211	92,747	128,032	0	NA	1,742,999	61.86
Status 4	NA	NA	NA	NA	NA	NA	3	696,792	0	696,795	24.73
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,818	3,818	0.14
Total	1,715,444	40,698	88,048	1,384	211	122,459	140,510	704,954	3,818	2,817,527	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAE32010 **OLIVE-SIDED FLYCATCHER** ***Contopus cooperi*** **%Status 1 & 2: 29.46**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	227,501	877	98,132	569	NA	7,638	NA	333	NA	335,050	24.58
Status 2	48,167	2,070	795	1,000	NA	190	8,213	6,064	NA	66,499	4.88
Status 3	433,939	37,201	5	360	192	49,068	37,147	0	NA	557,913	40.93
Status 4	NA	NA	NA	NA	NA	NA	11	397,787	38	397,836	29.19
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,741	5,741	0.42
Total	709,607	40,148	98,933	1,929	192	56,897	45,371	404,184	5,779	1,363,039	100

ABPAE32050 **WESTERN WOOD-PEWEE** ***Contopus sordidulus*** **%Status 1 & 2: 22.27**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	308,998	1,558	122,372	2,099	NA	12,087	NA	286	NA	447,400	17.36
Status 2	68,021	5,273	977	28,101	NA	220	13,857	10,124	NA	126,574	4.91
Status 3	676,664	114,405	1	594	4,103	104,353	89,430	0	NA	989,550	38.39
Status 4	NA	NA	NA	NA	NA	NA	39	1,000,316	1,051	1,001,405	38.85
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,446	12,446	0.48
Total	1,053,684	121,237	123,350	30,794	4,103	116,660	103,326	1,010,726	13,497	2,577,377	100

ABPAE33030 **ALDER FLYCATCHER** ***Empidonax alnorum*** **%Status 1 & 2: 36.73**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11,977	770	0	0	NA	0	NA	360	NA	13,107	26.37
Status 2	4,357	0	0	0	NA	0	759	30	NA	5,146	10.35
Status 3	9,554	183	0	0	0	0	1,997	0	NA	11,734	23.61
Status 4	NA	NA	NA	NA	NA	NA	0	19,072	0	19,072	38.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	638	638	1.28
Total	25,888	953	0	0	0	0	2,756	19,462	638	49,697	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAE33040 **WILLOW FLYCATCHER** ***Empidonax traillii*** **%Status 1 & 2: 12.18**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	141,220	2,119	61,618	3,099	NA	7,791	NA	966	NA	216,813	9.16
Status 2	39,400	2,053	988	3,929	NA	223	11,042	13,682	NA	71,316	3.01
Status 3	526,089	50,152	0	1,119	2,112	203,634	87,844	0	NA	870,948	36.81
Status 4	NA	NA	NA	NA	NA	NA	12	1,194,087	298	1,194,397	50.48
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,699	12,699	0.54
Total	706,709	54,323	62,606	8,146	2,112	211,647	98,898	1,208,735	12,997	2,366,173	100

ABPAE33070 **LEAST FLYCATCHER** ***Empidonax minimus*** **%Status 1 & 2: 4.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	7,785	266	8,299	2,211	NA	378	NA	459	NA	19,399	2.30
Status 2	3,574	362	264	3,422	NA	82	3,477	5,524	NA	16,705	1.98
Status 3	83,770	23,220	0	409	742	80,500	35,135	0	NA	223,776	26.56
Status 4	NA	NA	NA	NA	NA	NA	2	567,746	1,349	569,097	67.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,546	13,546	1.61
Total	95,129	23,848	8,563	6,043	742	80,960	38,614	573,729	14,895	842,523	100

ABPAE33080 **HAMMOND'S FLYCATCHER** ***Empidonax hammondii*** **%Status 1 & 2: 16.42**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	369,050	2,393	112,035	1,290	NA	23,760	NA	603	NA	509,130	12.43
Status 2	120,923	4,786	1,793	710	NA	954	16,858	17,198	NA	163,222	3.99
Status 3	2,152,649	91,645	0	477	1,533	98,345	130,958	0	NA	2,475,606	60.46
Status 4	NA	NA	NA	NA	NA	NA	3	939,387	23	939,414	22.94
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,122	7,122	0.17
Total	2,642,622	98,824	113,828	2,477	1,533	123,058	147,819	957,188	7,145	4,094,495	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAE33090 **DUSKY FLYCATCHER** ***Empidonax oberholseri*** **%Status 1 & 2: 11.69**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	129,884	1,800	67,719	2,474	NA	6,116	NA	1,032	NA	209,025	8.12
Status 2	30,501	5,274	1,260	24,611	NA	262	13,955	16,007	NA	91,869	3.57
Status 3	443,707	97,821	4	1,283	481	189,672	98,406	0	NA	831,375	32.31
Status 4	NA	NA	NA	NA	NA	NA	12	1,427,133	33	1,427,179	55.47
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,353	13,353	0.52
Total	604,092	104,895	68,983	28,368	481	196,050	112,374	1,444,173	13,386	2,572,802	100

ABPAE33160 **CORDILLERAN FLYCATCHER** ***Empidonax occidentalis*** **%Status 1 & 2: 18.97**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	282,254	1,709	107,888	2,316	NA	15,845	NA	624	NA	410,636	14.88
Status 2	75,927	2,583	2,066	2,846	NA	2,864	14,002	12,751	NA	113,040	4.10
Status 3	1,259,158	45,366	1	373	1,106	74,324	86,642	0	NA	1,466,971	53.15
Status 4	NA	NA	NA	NA	NA	NA	12	761,040	0	761,053	27.57
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,465	8,465	0.31
Total	1,617,339	49,659	109,955	5,536	1,106	93,033	100,656	774,415	8,465	2,760,164	100

ABPAE35030 **SAY'S PHOEBE** ***Sayornis saya*** **%Status 1 & 2: 4.10**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	27,143	2,075	4,885	6,235	NA	136	NA	944	NA	41,418	0.57
Status 2	4,284	42,629	9,572	165,322	NA	194	15,578	16,481	NA	254,061	3.52
Status 3	201,791	1,415,703	0	4,116	11,148	314,796	509,858	15	NA	2,457,428	34.08
Status 4	NA	NA	NA	NA	NA	NA	0	4,433,960	361	4,434,321	61.50
Water	NA	NA	NA	NA	NA	NA	NA	NA	22,883	22,883	0.32
Total	233,218	1,460,408	14,457	175,673	11,148	315,126	525,436	4,451,400	23,245	7,210,112	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAE52030 **CASSIN'S KINGBIRD** ***Tyrannus vociferans*** **%Status 1 & 2: 0.42**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	196	677	32	0	NA	0	NA	0	NA	906	0.07
Status 2	135	942	2,288	378	NA	0	473	39	NA	4,256	0.35
Status 3	43,313	127,270	0	78	4,717	134,351	67,295	0	NA	377,023	30.89
Status 4	NA	NA	NA	NA	NA	NA	0	837,206	53	837,258	68.61
Water	NA	NA	NA	NA	NA	NA	NA	NA	893	893	0.07
Total	43,644	128,889	2,321	456	4,717	134,351	67,768	837,244	946	1,220,336	100

ABPAE52050 **WESTERN KINGBIRD** ***Tyrannus verticalis*** **%Status 1 & 2: 2.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	14,791	927	3,595	6,938	NA	238	NA	330	NA	26,818	0.24
Status 2	3,476	23,906	6,383	143,462	NA	373	14,083	19,501	NA	211,184	1.90
Status 3	194,777	1,017,320	0	5,447	9,300	512,865	605,795	15	NA	2,345,520	21.05
Status 4	NA	NA	NA	NA	NA	NA	3	8,527,475	3,085	8,530,564	76.56
Water	NA	NA	NA	NA	NA	NA	NA	NA	28,547	28,547	0.26
Total	213,044	1,042,153	9,978	155,847	9,300	513,477	619,882	8,547,321	31,632	11,142,633	100

ABPAE52060 **EASTERN KINGBIRD** ***Tyrannus tyrannus*** **%Status 1 & 2: 2.31**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	19,697	667	14,994	6,997	NA	333	NA	374	NA	43,062	0.64
Status 2	4,562	8,859	4,808	58,445	NA	348	12,691	22,642	NA	112,355	1.67
Status 3	219,147	768,784	0	3,948	5,216	412,908	374,289	15	NA	1,784,307	26.57
Status 4	NA	NA	NA	NA	NA	NA	4	4,737,679	2,844	4,740,526	70.59
Water	NA	NA	NA	NA	NA	NA	NA	NA	35,092	35,092	0.52
Total	243,406	778,310	19,802	69,389	5,216	413,589	386,984	4,760,710	37,936	6,715,343	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAT02010 **HORNED LARK** ***Eremophila alpestris*** **%Status 1 & 2: 4.30**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	130,128	2,821	21,625	5,180	NA	4,906	NA	326	NA	164,986	1.89
Status 2	32,192	34,512	3,358	115,538	NA	251	10,086	13,157	NA	209,094	2.40
Status 3	331,523	846,361	0	3,768	11,206	330,823	485,162	0	NA	2,008,844	23.06
Status 4	NA	NA	NA	NA	NA	NA	0	6,304,264	927	6,305,191	72.39
Water	NA	NA	NA	NA	NA	NA	NA	NA	21,493	21,493	0.25
Total	493,843	883,694	24,983	124,486	11,206	335,980	495,249	6,317,746	22,420	8,709,608	100

ABPAU03010 **TREE SWALLOW** ***Tachycineta bicolor*** **%Status 1 & 2: 11.81**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	110,306	433	56,180	1,176	NA	3,043	NA	264	NA	171,402	8.88
Status 2	26,485	1,627	944	9,062	NA	494	9,664	8,139	NA	56,416	2.92
Status 3	262,684	23,685	1	1,328	1,234	91,266	55,356	0	NA	435,554	22.57
Status 4	NA	NA	NA	NA	NA	NA	41	1,248,571	2,232	1,250,844	64.81
Water	NA	NA	NA	NA	NA	NA	NA	NA	15,878	15,878	0.82
Total	399,474	25,746	57,125	11,567	1,234	94,803	65,061	1,256,974	18,111	1,930,095	100

ABPAU03040 **VIOLET-GREEN SWALLOW** ***Tachycineta thalassina*** **%Status 1 & 2: 5.01**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	20,346	410	25,476	1,225	NA	1,984	NA	224	NA	49,665	2.75
Status 2	8,243	2,343	721	11,946	NA	426	6,701	10,204	NA	40,583	2.25
Status 3	184,200	33,519	4	1,322	1,219	108,563	58,224	0	NA	387,050	21.46
Status 4	NA	NA	NA	NA	NA	NA	38	1,307,661	2,232	1,309,930	72.64
Water	NA	NA	NA	NA	NA	NA	NA	NA	16,088	16,088	0.89
Total	212,789	36,271	26,201	14,493	1,219	110,972	64,963	1,318,089	18,320	1,803,317	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAU07010 **NORTHERN ROUGH-WINGED SWALLOW** ***Stelgidopteryx serripennis*** **%Status 1 & 2: 4.01**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	964	1,020	2,279	977	NA	0	NA	21	NA	5,260	0.49
Status 2	633	13,211	642	7,035	NA	0	5,375	11,212	NA	38,108	3.52
Status 3	10,374	60,386	62	1,003	4,029	56,984	52,397	0	NA	185,236	17.11
Status 4	NA	NA	NA	NA	NA	NA	19	796,332	2,503	798,854	73.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	55,201	55,201	5.10
Total	11,971	74,617	2,982	9,014	4,029	56,984	57,791	807,565	57,704	1,082,658	100

ABPAU08010 **BANK SWALLOW** ***Riparia riparia*** **%Status 1 & 2: 3.77**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	868	817	1,381	838	NA	0	NA	21	NA	3,924	0.39
Status 2	488	11,602	509	6,013	NA	0	4,888	10,599	NA	34,098	3.38
Status 3	8,972	51,254	62	780	3,594	52,689	47,705	0	NA	165,055	16.38
Status 4	NA	NA	NA	NA	NA	NA	19	747,911	2,491	750,420	74.45
Water	NA	NA	NA	NA	NA	NA	NA	NA	54,471	54,471	5.40
Total	10,327	63,673	1,952	7,630	3,594	52,689	52,611	758,531	56,962	1,007,969	100

ABPAU09010 **CLIFF SWALLOW** ***Petrochelidon pyrrhonota*** **%Status 1 & 2: 4.15**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	74,113	3,695	27,666	7,620	NA	2,631	NA	2,998	NA	118,723	1.70
Status 2	20,516	19,627	4,851	21,784	NA	424	34,906	68,935	NA	171,043	2.45
Status 3	414,236	334,525	62	4,677	6,186	446,038	388,229	0	NA	1,593,954	22.83
Status 4	NA	NA	NA	NA	NA	NA	50	4,978,295	3,484	4,981,829	71.34
Water	NA	NA	NA	NA	NA	NA	NA	NA	117,883	117,883	1.69
Total	508,866	357,847	32,579	34,081	6,186	449,092	423,185	5,050,228	121,366	6,983,431	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAU09030 **BARN SWALLOW** ***Hirundo rustica*** **%Status 1 & 2: 1.85**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	67,136	5,058	26,905	10,848	NA	3,370	NA	3,317	NA	116,634	0.58
Status 2	20,863	17,515	3,979	90,623	NA	837	35,282	84,651	NA	253,750	1.26
Status 3	490,043	1,497,136	62	10,554	13,559	1,333,974	1,292,383	1	NA	4,637,713	23.10
Status 4	NA	NA	NA	NA	NA	NA	22	15,023,198	3,948	15,027,168	74.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	43,627	43,627	0.22
Total	578,042	1,519,710	30,946	112,025	13,559	1,338,182	1,327,687	15,111,167	47,575	20,078,894	100

ABPAV01010 **GRAY JAY** ***Perisoreus canadensis*** **%Status 1 & 2: 24.16**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	455,252	1,392	146,868	739	NA	33,545	NA	277	NA	638,073	19.70
Status 2	116,965	6,926	1,233	473	NA	3,851	10,047	4,858	NA	144,353	4.46
Status 3	1,844,449	42,348	0	213	3,238	66,950	94,900	0	NA	2,052,099	63.36
Status 4	NA	NA	NA	NA	NA	NA	0	402,050	11	402,060	12.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,213	2,213	0.07
Total	2,416,667	50,666	148,101	1,425	3,238	104,346	104,948	407,185	2,223	3,238,799	100

ABPAV02010 **STELLER'S JAY** ***Cyanocitta stelleri*** **%Status 1 & 2: 22.48**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	691,863	3,451	184,054	1,556	NA	43,555	NA	486	NA	924,964	17.96
Status 2	183,288	10,025	353	679	NA	1,885	20,308	16,067	NA	232,605	4.52
Status 3	2,943,624	119,989	0	79	4,074	106,420	117,014	0	NA	3,291,202	63.92
Status 4	NA	NA	NA	NA	NA	NA	0	697,027	11	697,038	13.54
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,285	3,285	0.06
Total	3,818,776	133,465	184,407	2,314	4,074	151,860	137,323	713,580	3,297	5,149,095	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAV02020 **BLUE JAY** ***Cyanocitta cristata*** **%Status 1 & 2: 3.42**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	72	12	9,116	258	NA	13	NA	6	NA	9,477	2.40
Status 2	822	10	529	687	NA	0	1,724	284	NA	4,056	1.03
Status 3	49,054	23,402	0	198	1,536	36,521	18,317	0	NA	129,029	32.63
Status 4	NA	NA	NA	NA	NA	NA	36	248,975	1,008	250,019	63.22
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,898	2,898	0.73
Total	49,949	23,424	9,645	1,143	1,536	36,534	20,078	249,265	3,907	395,480	100

ABPAV07010 **PINYON JAY** ***Gymnorhinus cyanocephalus*** **%Status 1 & 2: 5.37**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,138	2	743	34	NA	0	NA	0	NA	12,917	3.25
Status 2	701	2,273	2,057	527	NA	0	895	1,980	NA	8,432	2.12
Status 3	67,287	48,694	0	29	85	77,973	14,313	0	NA	208,381	52.36
Status 4	NA	NA	NA	NA	NA	NA	0	167,780	35	167,815	42.17
Water	NA	NA	NA	NA	NA	NA	NA	NA	452	452	0.11
Total	80,125	50,969	2,799	590	85	77,973	15,208	169,760	487	397,997	100

ABPAV08010 **CLARK'S NUTCRACKER** ***Nucifraga columbiana*** **%Status 1 & 2: 27.22**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	216,424	815	80,393	443	NA	6,926	NA	454	NA	305,454	21.48
Status 2	44,275	4,982	2,233	14,915	NA	106	9,906	5,234	NA	81,652	5.74
Status 3	349,746	79,908	1	277	403	47,408	47,790	0	NA	525,533	36.95
Status 4	NA	NA	NA	NA	NA	NA	2	506,220	58	506,280	35.60
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,223	3,223	0.23
Total	610,445	85,705	82,627	15,635	403	54,439	57,699	511,908	3,281	1,422,142	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAV09010 **BLACK-BILLED MAGPIE** ***Pica pica*** **%Status 1 & 2: 2.75**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	35,727	1,847	21,811	7,735	NA	3,451	NA	767	NA	71,338	0.60
Status 2	13,316	27,490	7,006	151,400	NA	477	21,988	32,353	NA	254,030	2.15
Status 3	399,210	1,124,443	4	3,707	10,515	598,355	633,154	15	NA	2,769,403	23.41
Status 4	NA	NA	NA	NA	NA	NA	5	8,701,708	3,437	8,705,150	73.58
Water	NA	NA	NA	NA	NA	NA	NA	NA	30,936	30,936	0.26
Total	448,253	1,153,779	28,821	162,842	10,515	602,283	655,147	8,734,843	34,373	11,830,856	100

ABPAV10010 **AMERICAN CROW** ***Corvus brachyrhynchos*** **%Status 1 & 2: 2.31**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	87,096	5,868	46,623	16,425	NA	4,952	NA	4,219	NA	165,184	0.64
Status 2	27,126	39,057	10,352	213,062	NA	840	46,194	93,549	NA	430,179	1.67
Status 3	766,102	2,511,932	66	15,767	21,407	1,588,495	1,698,334	16	NA	6,602,120	25.67
Status 4	NA	NA	NA	NA	NA	NA	55	18,469,024	3,548	18,472,627	71.82
Water	NA	NA	NA	NA	NA	NA	NA	NA	52,468	52,468	0.20
Total	880,324	2,556,857	57,041	245,253	21,407	1,594,287	1,744,584	18,566,808	56,016	25,722,576	100

ABPAV10110 **COMMON RAVEN** ***Corvus corax*** **%Status 1 & 2: 14.92**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	767,084	4,523	245,390	6,371	NA	37,417	NA	1,686	NA	1,062,471	10.69
Status 2	205,218	24,985	8,906	99,470	NA	1,119	41,036	39,743	NA	420,479	4.23
Status 3	3,203,139	836,291	5	2,416	7,817	423,323	439,640	15	NA	4,912,647	49.44
Status 4	NA	NA	NA	NA	NA	NA	11	3,515,244	307	3,515,562	35.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	26,152	26,152	0.26
Total	4,175,441	865,799	254,301	108,257	7,817	461,860	480,688	3,556,689	26,459	9,937,312	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAW01010 **BLACK-CAPPED CHICKADEE** ***Poecile atricapillus*** **%Status 1 & 2: 10.80**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	251,706	2,063	125,176	2,147	NA	19,178	NA	838	NA	401,108	7.13
Status 2	92,307	13,204	4,061	51,377	NA	1,087	20,220	24,344	NA	206,599	3.67
Status 3	1,921,881	281,678	5	1,025	3,291	340,324	223,174	0	NA	2,771,379	49.23
Status 4	NA	NA	NA	NA	NA	NA	39	2,230,952	1,119	2,232,109	39.65
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,121	18,121	0.32
Total	2,265,894	296,945	129,241	54,549	3,291	360,589	243,433	2,256,134	19,240	5,629,317	100

ABPAW01040 **MOUNTAIN CHICKADEE** ***Poecile gambeli*** **%Status 1 & 2: 19.25**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	893,477	4,664	292,399	2,739	NA	56,261	NA	1,669	NA	1,251,209	15.03
Status 2	238,055	20,816	2,676	24,547	NA	4,945	31,473	29,201	NA	351,713	4.22
Status 3	3,936,033	250,018	5	933	4,744	343,023	264,551	0	NA	4,799,307	57.64
Status 4	NA	NA	NA	NA	NA	NA	10	1,910,828	83	1,910,920	22.95
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,743	12,743	0.15
Total	5,067,565	275,498	295,081	28,219	4,744	404,229	296,033	1,941,699	12,826	8,325,893	100

ABPAW01060 **BOREAL CHICKADEE** ***Poecile hudsonicus*** **%Status 1 & 2: 41.96**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	182,136	782	76,154	0	NA	17,028	NA	26	NA	276,125	37.63
Status 2	30,822	0	301	0	NA	23	584	23	NA	31,753	4.33
Status 3	370,540	565	0	0	2	16,162	18,243	0	NA	405,512	55.27
Status 4	NA	NA	NA	NA	NA	NA	0	20,067	0	20,067	2.74
Water	NA	NA	NA	NA	NA	NA	NA	NA	269	269	0.04
Total	583,498	1,346	76,454	0	2	33,213	18,827	20,116	269	733,726	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAW01070 **CHESTNUT-BACKED CHICKADEE** ***Poecile rufescens*** **%Status 1 & 2: 15.21**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	81,610	0	54,745	164	NA	16,488	NA	65	NA	153,073	12.26
Status 2	28,830	120	903	335	NA	3,999	1,357	1,204	NA	36,748	2.95
Status 3	699,041	2,664	0	172	75	45,646	62,290	0	NA	809,887	64.89
Status 4	NA	NA	NA	NA	NA	NA	1	246,813	0	246,814	19.78
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,580	1,580	0.13
Total	809,481	2,784	55,649	671	75	66,133	63,647	248,083	1,580	1,248,102	100

ABPAZ01010 **RED-BREASTED NUTHATCH** ***Sitta canadensis*** **%Status 1 & 2: 19.22**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	954,932	4,691	314,812	2,901	NA	56,305	NA	1,691	NA	1,335,332	14.88
Status 2	245,091	22,273	4,874	47,159	NA	4,959	36,062	29,600	NA	390,017	4.35
Status 3	4,001,592	323,275	5	979	6,316	352,333	291,270	0	NA	4,975,770	55.44
Status 4	NA	NA	NA	NA	NA	NA	38	2,257,746	98	2,257,882	25.16
Water	NA	NA	NA	NA	NA	NA	NA	NA	15,525	15,525	0.17
Total	5,201,614	350,239	319,691	51,040	6,316	413,597	327,370	2,289,037	15,623	8,974,527	100

ABPAZ01020 **WHITE-BREASTED NUTHATCH** ***Sitta carolinensis*** **%Status 1 & 2: 4.84**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,135	329	13,968	927	NA	1,751	NA	301	NA	29,412	1.74
Status 2	6,271	3,416	323	27,423	NA	230	6,103	8,868	NA	52,634	3.11
Status 3	257,924	100,711	0	356	2,179	151,706	72,905	0	NA	585,781	34.57
Status 4	NA	NA	NA	NA	NA	NA	30	1,015,725	224	1,015,979	59.96
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,764	10,764	0.64
Total	276,331	104,455	14,292	28,706	2,179	153,687	79,037	1,024,895	10,988	1,694,570	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPAZ01030 **PYGMY NUTHATCH** ***Sitta pygmaea*** **%Status 1 & 2: 5.21**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,339	0	1,605	41	NA	1,404	NA	12	NA	7,401	2.43
Status 2	2,182	819	131	304	NA	47	1,567	3,448	NA	8,499	2.79
Status 3	49,949	8,861	0	91	239	17,696	15,390	0	NA	92,227	30.23
Status 4	NA	NA	NA	NA	NA	NA	0	196,265	11	196,276	64.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	721	721	0.24
Total	56,471	9,680	1,737	435	239	19,147	16,957	199,726	731	305,123	100

ABPBA01010 **BROWN CREEPER** ***Certhia americana*** **%Status 1 & 2: 24.61**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	253,086	1,087	73,543	629	NA	20,927	NA	122	NA	349,394	20.20
Status 2	58,186	6,262	280	390	NA	3,667	4,911	2,680	NA	76,377	4.42
Status 3	1,006,899	30,352	0	83	2,174	40,060	49,379	0	NA	1,128,947	65.26
Status 4	NA	NA	NA	NA	NA	NA	1	173,398	0	173,398	10.02
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,920	1,920	0.11
Total	1,318,171	37,701	73,823	1,102	2,174	64,654	54,291	176,199	1,920	1,730,036	100

ABPBG03010 **ROCK WREN** ***Salpinctes obsoletus*** **%Status 1 & 2: 20.59**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	123,308	1,268	83,187	749	NA	3,909	NA	52	NA	212,473	13.12
Status 2	21,228	19,427	3,664	68,155	NA	6	7,339	1,060	NA	120,879	7.47
Status 3	125,762	345,178	0	266	2,982	33,119	76,476	0	NA	583,784	36.06
Status 4	NA	NA	NA	NA	NA	NA	2	688,272	6	688,281	42.52
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,353	13,353	0.83
Total	270,298	365,873	86,851	69,171	2,982	37,035	83,817	689,385	13,359	1,618,770	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBG04010 **CANYON WREN** ***Catherpes mexicanus*** **%Status 1 & 2: 12.21**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	18,703	0	326	0	NA	1,541	NA	3	NA	20,574	8.62
Status 2	3,513	3,347	751	79	NA	6	352	520	NA	8,568	3.59
Status 3	43,524	30,129	0	0	184	8,326	10,088	0	NA	92,250	38.66
Status 4	NA	NA	NA	NA	NA	NA	0	116,121	0	116,121	48.66
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,116	1,116	0.47
Total	65,740	33,476	1,077	79	184	9,874	10,440	116,644	1,116	238,629	100

ABPBG09010 **HOUSE WREN** ***Troglodytes aedon*** **%Status 1 & 2: 9.70**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	63,739	467	34,200	2,646	NA	1,626	NA	390	NA	103,068	6.01
Status 2	11,569	2,988	659	28,348	NA	110	10,123	9,564	NA	63,362	3.69
Status 3	158,192	87,378	0	596	2,566	122,568	71,530	0	NA	442,831	25.80
Status 4	NA	NA	NA	NA	NA	NA	31	1,088,980	1,633	1,090,644	63.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	16,438	16,438	0.96
Total	233,500	90,833	34,859	31,591	2,566	124,305	81,684	1,098,934	18,071	1,716,343	100

ABPBG09050 **WINTER WREN** ***Troglodytes troglodytes*** **%Status 1 & 2: 24.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	33,796	46	13,151	81	NA	3,437	NA	52	NA	50,563	19.99
Status 2	7,953	26	157	102	NA	1,183	692	379	NA	10,493	4.15
Status 3	132,048	1,146	0	80	0	6,699	10,225	0	NA	150,197	59.39
Status 4	NA	NA	NA	NA	NA	NA	1	40,297	0	40,298	15.94
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,332	1,332	0.53
Total	173,797	1,218	13,308	263	0	11,319	10,917	40,728	1,332	252,882	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBG10020 **MARSH WREN** ***Cistothorus palustris*** **%Status 1 & 2: 3.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,281	28	2,804	2,579	NA	187	NA	97	NA	8,977	1.64
Status 2	822	81	304	2,594	NA	87	1,622	3,579	NA	9,089	1.66
Status 3	17,012	14,553	0	1,217	96	56,966	25,834	0	NA	115,679	21.10
Status 4	NA	NA	NA	NA	NA	NA	0	359,504	292	359,796	65.62
Water	NA	NA	NA	NA	NA	NA	NA	NA	54,727	54,727	9.98
Total	21,116	14,663	3,108	6,391	96	57,240	27,456	363,180	55,018	548,268	100

ABPBH01010 **AMERICAN DIPPER** ***Cinclus mexicanus*** **%Status 1 & 2: 18.50**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	74,213	419	29,113	874	NA	2,488	NA	286	NA	107,392	14.27
Status 2	17,553	874	944	503	NA	365	4,915	6,646	NA	31,800	4.23
Status 3	225,145	13,114	0	139	474	21,716	23,991	0	NA	284,579	37.82
Status 4	NA	NA	NA	NA	NA	NA	0	327,473	0	327,473	43.51
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,332	1,332	0.18
Total	316,911	14,407	30,057	1,516	474	24,569	28,906	334,405	1,332	752,576	100

ABPBJ05010 **GOLDEN-CROWNED KINGLET** ***Regulus satrapa*** **%Status 1 & 2: 22.89**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	193,853	171	74,111	1,004	NA	18,892	NA	72	NA	288,102	18.63
Status 2	47,434	6,612	301	505	NA	3,759	4,108	3,042	NA	65,761	4.25
Status 3	892,482	30,356	0	115	2,232	37,612	52,438	0	NA	1,015,235	65.65
Status 4	NA	NA	NA	NA	NA	NA	1	175,178	0	175,179	11.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,083	2,083	0.14
Total	1,133,769	37,139	74,412	1,623	2,232	60,262	56,546	178,292	2,083	1,546,359	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBJ05020 **RUBY-CROWNED KINGLET** ***Regulus calendula*** **%Status 1 & 2: 19.90**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	702,932	3,449	213,377	1,661	NA	46,571	NA	533	NA	968,523	15.80
Status 2	187,018	14,275	2,267	1,017	NA	4,795	24,319	17,753	NA	251,444	4.10
Status 3	3,318,325	137,232	0	482	3,733	175,489	189,108	0	NA	3,824,369	62.37
Status 4	NA	NA	NA	NA	NA	NA	2	1,080,496	23	1,080,521	17.62
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,440	6,440	0.11
Total	4,208,274	154,956	215,645	3,159	3,733	226,855	213,429	1,098,782	6,464	6,131,298	100

ABPBJ08010 **BLUE-GRAY GNATCATCHER** ***Polioptila caerulea*** **%Status 1 & 2: 12.15**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	130	0	0	0	NA	0	NA	0	NA	130	0.49
Status 2	119	934	2,016	0	NA	0	0	0	NA	3,069	11.65
Status 3	2,472	3,294	0	0	0	12,247	472	0	NA	18,486	70.19
Status 4	NA	NA	NA	NA	NA	NA	0	4,603	22	4,625	17.56
Water	NA	NA	NA	NA	NA	NA	NA	NA	27	27	0.10
Total	2,721	4,228	2,016	0	0	12,247	472	4,603	49	26,336	100

ABPBJ15010 **EASTERN BLUEBIRD** ***Sialia sialis*** **%Status 1 & 2: 0.49**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	23	150	5	40	NA	0	NA	19	NA	237	0.04
Status 2	0	0	0	1,540	NA	0	991	19	NA	2,550	0.45
Status 3	33,783	45,341	0	634	1,186	68,408	30,320	0	NA	179,671	31.78
Status 4	NA	NA	NA	NA	NA	NA	0	377,091	1,450	378,541	66.95
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,396	4,396	0.78
Total	33,805	45,490	5	2,214	1,186	68,408	31,311	377,130	5,846	565,395	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBJ15020 **WESTERN BLUEBIRD** ***Sialia mexicana*** **%Status 1 & 2: 17.97**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	61,189	766	27,809	131	NA	7,585	NA	174	NA	97,654	14.53
Status 2	14,230	1,008	215	547	NA	98	4,524	2,443	NA	23,065	3.43
Status 3	180,108	14,130	0	324	301	34,691	24,912	0	NA	254,465	37.87
Status 4	NA	NA	NA	NA	NA	NA	2	294,551	0	294,553	43.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,199	2,199	0.33
Total	255,527	15,904	28,024	1,002	301	42,374	29,438	297,168	2,199	671,936	100

ABPBJ15030 **MOUNTAIN BLUEBIRD** ***Sialia currucoides*** **%Status 1 & 2: 4.62**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	210,919	4,370	84,604	9,683	NA	9,815	NA	3,517	NA	322,907	2.46
Status 2	53,375	16,092	3,660	106,087	NA	313	37,547	67,730	NA	284,803	2.16
Status 3	861,017	1,338,379	67	8,701	11,240	910,451	960,982	1	NA	4,090,838	31.09
Status 4	NA	NA	NA	NA	NA	NA	23	8,433,045	1,156	8,434,224	64.10
Water	NA	NA	NA	NA	NA	NA	NA	NA	26,278	26,278	0.20
Total	1,125,311	1,358,841	88,330	124,471	11,240	920,579	998,552	8,504,293	27,434	13,159,052	100

ABPBJ16010 **TOWNSEND'S SOLITAIRE** ***Myadestes townsendi*** **%Status 1 & 2: 20.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	231,577	1,153	98,495	849	NA	8,880	NA	603	NA	341,557	15.23
Status 2	50,152	7,443	2,776	26,489	NA	198	12,649	10,039	NA	109,746	4.89
Status 3	533,622	141,675	5	594	585	143,891	82,157	0	NA	902,528	40.23
Status 4	NA	NA	NA	NA	NA	NA	9	882,760	79	882,848	39.35
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,679	6,679	0.30
Total	815,350	150,271	101,276	27,932	585	152,968	94,815	893,402	6,759	2,243,358	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBJ18080 **VEERY** ***Catharus fuscescens*** **%Status 1 & 2: 4.93**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,932	118	12,664	2,132	NA	214	NA	359	NA	20,418	2.81
Status 2	2,115	308	307	3,288	NA	63	3,491	5,843	NA	15,414	2.12
Status 3	47,379	12,514	0	382	138	98,052	28,880	0	NA	187,344	25.80
Status 4	NA	NA	NA	NA	NA	NA	2	491,155	1,557	492,714	67.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,343	10,343	1.42
Total	54,426	12,940	12,971	5,802	138	98,329	32,373	497,356	11,900	726,234	100

ABPBJ18090 **GRAY-CHEEKED THRUSH** ***Catharus minimus*** **%Status 1 & 2: 2.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	301	206	349	198	NA	0	NA	2	NA	1,057	0.44
Status 2	147	31	41	724	NA	0	351	3,254	NA	4,547	1.90
Status 3	4,581	12,586	0	160	791	24,099	13,150	0	NA	55,366	23.13
Status 4	NA	NA	NA	NA	NA	NA	0	173,189	1,560	174,749	73.01
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,633	3,633	1.52
Total	5,029	12,822	390	1,082	791	24,099	13,501	176,445	5,193	239,352	100

ABPBJ18100 **SWAINSON'S THRUSH** ***Catharus ustulatus*** **%Status 1 & 2: 18.48**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	645,902	3,559	196,916	2,570	NA	46,685	NA	706	NA	896,338	14.45
Status 2	182,061	14,527	2,018	3,325	NA	4,821	22,593	21,070	NA	250,415	4.04
Status 3	3,315,873	146,695	0	534	3,771	174,269	196,248	0	NA	3,837,389	61.85
Status 4	NA	NA	NA	NA	NA	NA	3	1,209,166	23	1,209,192	19.49
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,948	10,948	0.18
Total	4,143,836	164,781	198,934	6,429	3,771	225,775	218,844	1,230,941	10,971	6,204,281	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBJ18110 **HERMIT THRUSH** ***Catharus guttatus*** **%Status 1 & 2: 19.22**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	640,487	3,482	190,814	1,609	NA	46,321	NA	430	NA	883,145	15.11
Status 2	179,280	14,236	1,922	1,497	NA	4,728	20,729	17,307	NA	239,698	4.10
Status 3	3,248,693	142,187	0	408	3,712	136,368	180,943	0	NA	3,712,311	63.52
Status 4	NA	NA	NA	NA	NA	NA	2	1,003,247	13	1,003,262	17.17
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,785	5,785	0.10
Total	4,068,460	159,905	192,736	3,515	3,712	187,418	201,673	1,020,985	5,798	5,844,201	100

ABPBJ20170 **AMERICAN ROBIN** ***Turdus migratorius*** **%Status 1 & 2: 14.05**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	673,117	5,871	237,154	4,968	NA	37,646	NA	2,440	NA	961,195	10.36
Status 2	192,511	15,166	3,129	52,754	NA	1,276	39,215	38,563	NA	342,613	3.69
Status 3	3,139,162	380,878	5	2,002	7,093	540,986	341,856	0	NA	4,411,982	47.54
Status 4	NA	NA	NA	NA	NA	NA	44	3,534,920	1,896	3,536,860	38.11
Water	NA	NA	NA	NA	NA	NA	NA	NA	28,322	28,322	0.31
Total	4,004,790	401,915	240,288	59,723	7,093	579,907	381,114	3,575,923	30,218	9,280,971	100

ABPBJ22010 **VARIED THRUSH** ***Ixoreus naevius*** **%Status 1 & 2: 23.32**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	132,290	51	46,588	49	NA	16,761	NA	62	NA	195,801	19.46
Status 2	33,404	69	160	152	NA	3,587	981	514	NA	38,869	3.86
Status 3	599,809	6,435	0	78	0	24,049	38,680	0	NA	669,050	66.50
Status 4	NA	NA	NA	NA	NA	NA	1	101,169	0	101,170	10.06
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,234	1,234	0.12
Total	765,503	6,555	46,748	279	0	44,398	39,662	101,745	1,234	1,006,124	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBK01010 **GRAY CATBIRD** ***Dumetella carolinensis*** **%Status 1 & 2: 4.94**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	13,095	408	11,730	2,235	NA	778	NA	515	NA	28,761	2.90
Status 2	4,319	328	464	3,844	NA	119	4,445	6,675	NA	20,195	2.04
Status 3	73,583	30,528	0	665	997	84,687	41,630	0	NA	232,090	23.43
Status 4	NA	NA	NA	NA	NA	NA	2	693,612	1,350	694,965	70.16
Water	NA	NA	NA	NA	NA	NA	NA	NA	14,483	14,483	1.46
Total	90,997	31,264	12,194	6,744	997	85,584	46,078	700,802	15,833	990,493	100

ABPBK04010 **SAGE THRASHER** ***Oreoscoptes montanus*** **%Status 1 & 2: 3.84**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11,504	208	2,993	2,675	NA	5	NA	2	NA	17,387	0.87
Status 2	1,688	3,434	3,588	36,171	NA	1	6,606	8,192	NA	59,679	2.98
Status 3	110,823	508,384	0	1,002	2,419	67,113	165,635	15	NA	855,391	42.69
Status 4	NA	NA	NA	NA	NA	NA	0	1,064,967	0	1,064,967	53.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,416	6,416	0.32
Total	124,014	512,025	6,581	39,847	2,419	67,119	172,241	1,073,177	6,416	2,003,840	100

ABPBK06010 **BROWN THRASHER** ***Toxostoma rufum*** **%Status 1 & 2: 1.89**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	43,742	4,148	29,596	5,668	NA	0	NA	3,789	NA	86,944	0.81
Status 2	8,356	7,458	1,161	57,278	NA	0	16,846	25,070	NA	116,169	1.08
Status 3	224,262	1,104,691	62	7,531	11,005	893,530	806,092	0	NA	3,047,174	28.33
Status 4	NA	NA	NA	NA	NA	NA	0	7,477,474	1,935	7,479,409	69.53
Water	NA	NA	NA	NA	NA	NA	NA	NA	27,812	27,812	0.26
Total	276,361	1,116,297	30,819	70,478	11,005	893,530	822,938	7,506,333	29,747	10,757,508	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBM02050 **AMERICAN PIPIT** ***Anthus rubescens*** **%Status 1 & 2: 32.99**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	99,546	369	16,309	992	NA	3,355	NA	0	NA	120,571	26.42
Status 2	22,962	1,451	0	273	NA	0	2,839	2,445	NA	29,969	6.57
Status 3	201,750	23,509	0	0	1,948	541	17,119	0	NA	244,866	53.66
Status 4	NA	NA	NA	NA	NA	NA	0	60,735	0	60,735	13.31
Water	NA	NA	NA	NA	NA	NA	NA	NA	174	174	0.04
Total	324,258	25,328	16,309	1,265	1,948	3,896	19,958	63,180	174	456,316	100

ABPBM02060 **SPRAGUE'S PIPIT** ***Anthus spragueii*** **%Status 1 & 2: 1.71**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,605	2,928	782	5,364	NA	0	NA	2,913	NA	24,592	0.26
Status 2	2,802	13,798	11	56,453	NA	0	15,623	47,897	NA	136,584	1.45
Status 3	85,537	1,199,409	0	7,610	9,043	506,119	810,126	0	NA	2,617,843	27.69
Status 4	NA	NA	NA	NA	NA	NA	0	6,659,607	128	6,659,735	70.44
Water	NA	NA	NA	NA	NA	NA	NA	NA	15,726	15,726	0.17
Total	100,944	1,216,135	793	69,427	9,043	506,119	825,749	6,710,417	15,854	9,454,480	100

ABPBN01010 **BOHEMIAN WAXWING** ***Bombycilla garrulus*** **%Status 1 & 2: 10.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	119,510	1,482	73,168	1,240	NA	12,603	NA	651	NA	208,654	6.97
Status 2	47,495	8,209	3,599	22,469	NA	957	12,523	14,338	NA	109,590	3.66
Status 3	1,140,886	132,472	5	714	1,996	134,296	129,177	0	NA	1,539,547	51.40
Status 4	NA	NA	NA	NA	NA	NA	40	1,123,616	1,055	1,124,711	37.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,685	12,685	0.42
Total	1,307,891	142,164	76,772	24,423	1,996	147,857	141,739	1,138,605	13,740	2,995,186	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBN01020 **CEDAR WAXWING** ***Bombycilla cedrorum*** **%Status 1 & 2: 5.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	10,967	260	9,015	2,262	NA	582	NA	363	NA	23,450	3.04
Status 2	4,324	411	446	3,515	NA	122	3,538	4,958	NA	17,315	2.25
Status 3	70,924	23,278	0	516	719	66,951	32,103	0	NA	194,491	25.23
Status 4	NA	NA	NA	NA	NA	NA	3	520,354	1,371	521,728	67.68
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,926	13,926	1.81
Total	86,215	23,949	9,462	6,293	719	67,655	35,644	525,675	15,297	770,909	100

ABPBR01020 **NORTHERN SHRIKE** ***Lanius excubitor*** **%Status 1 & 2: 3.36**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	48,930	4,372	35,768	5,935	NA	2,296	NA	3,383	NA	100,684	0.88
Status 2	16,723	23,791	5,509	166,452	NA	458	25,914	44,416	NA	283,263	2.48
Status 3	363,777	1,272,131	0	6,560	14,163	808,647	639,905	0	NA	3,105,183	27.15
Status 4	NA	NA	NA	NA	NA	NA	20	7,903,339	921	7,904,280	69.10
Water	NA	NA	NA	NA	NA	NA	NA	NA	45,834	45,834	0.40
Total	429,430	1,300,293	41,277	178,947	14,163	811,401	665,839	7,951,138	46,755	11,439,243	100

ABPBR01030 **LOGGERHEAD SHRIKE** ***Lanius ludovicianus*** **%Status 1 & 2: 2.71**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	8,446	5,071	1,170	5,440	NA	0	NA	3,230	NA	23,357	0.22
Status 2	3,762	33,617	5,543	175,654	NA	0	18,510	31,916	NA	269,003	2.49
Status 3	182,162	1,474,338	0	5,224	15,968	741,833	644,237	0	NA	3,063,761	28.38
Status 4	NA	NA	NA	NA	NA	NA	0	7,399,673	2,522	7,402,194	68.57
Water	NA	NA	NA	NA	NA	NA	NA	NA	37,141	37,141	0.34
Total	194,370	1,513,026	6,712	186,318	15,968	741,833	662,747	7,434,819	39,662	10,795,456	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBT01010 **EUROPEAN STARLING** ***Sturnus vulgaris*** **%Status 1 & 2: 0.48**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	2,436	11	6,075	1,715	NA	158	NA	186	NA	10,581	0.17
Status 2	1,226	349	109	4,241	NA	372	5,233	7,998	NA	19,528	0.31
Status 3	38,187	35,565	67	2,093	4,065	287,574	250,162	0	NA	617,715	9.78
Status 4	NA	NA	NA	NA	NA	NA	62	5,636,902	2,980	5,639,944	89.30
Water	NA	NA	NA	NA	NA	NA	NA	NA	27,737	27,737	0.44
Total	41,850	35,925	6,252	8,049	4,065	288,104	255,457	5,645,086	30,717	6,315,506	100

ABPBW01160 **SOLITARY VIREO** ***Vireo solitarius*** **%Status 1 & 2: 9.92**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	154,133	2,178	88,852	1,755	NA	14,539	NA	757	NA	262,215	6.23
Status 2	65,296	10,409	1,915	39,023	NA	1,079	16,660	20,820	NA	155,202	3.69
Status 3	1,515,769	202,930	5	903	1,034	215,317	180,949	0	NA	2,116,908	50.29
Status 4	NA	NA	NA	NA	NA	NA	10	1,663,620	65	1,663,695	39.52
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,698	11,698	0.28
Total	1,735,198	215,518	90,772	41,682	1,034	230,935	197,619	1,685,198	11,763	4,209,718	100

ABPBW01210 **WARBLING VIREO** ***Vireo gilvus*** **%Status 1 & 2: 6.44**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	28,402	654	27,897	3,025	NA	1,805	NA	757	NA	62,540	3.91
Status 2	11,598	1,149	829	8,976	NA	262	7,254	10,327	NA	40,393	2.53
Status 3	199,697	49,742	0	987	1,222	142,043	66,596	0	NA	460,287	28.79
Status 4	NA	NA	NA	NA	NA	NA	9	1,012,641	1,620	1,014,270	63.44
Water	NA	NA	NA	NA	NA	NA	NA	NA	21,241	21,241	1.33
Total	239,696	51,544	28,727	12,988	1,222	144,110	73,858	1,023,725	22,861	1,598,732	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBW01240 **RED-EYED VIREO** ***Vireo olivaceus*** **%Status 1 & 2: 5.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5,338	122	13,019	1,047	NA	158	NA	186	NA	19,870	3.36
Status 2	2,371	329	222	3,719	NA	40	2,846	4,021	NA	13,546	2.29
Status 3	58,180	13,349	0	157	425	68,673	23,453	0	NA	164,236	27.80
Status 4	NA	NA	NA	NA	NA	NA	2	383,184	1,180	384,366	65.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,826	8,826	1.49
Total	65,889	13,799	13,241	4,923	425	68,870	26,300	387,391	10,006	590,845	100

ABPBX01040 **TENNESSEE WARBLER** ***Vermivora peregrina*** **%Status 1 & 2: 28.09**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	39,414	0	58,817	11	NA	1,197	NA	16	NA	99,455	24.96
Status 2	11,510	0	500	70	NA	38	196	145	NA	12,459	3.13
Status 3	195,455	0	0	110	27	30,894	11,971	0	NA	238,457	59.86
Status 4	NA	NA	NA	NA	NA	NA	1	47,038	0	47,039	11.81
Water	NA	NA	NA	NA	NA	NA	NA	NA	983	983	0.25
Total	246,379	0	59,316	192	27	32,129	12,168	47,200	983	398,394	100

ABPBX01050 **ORANGE-CROWNED WARBLER** ***Vermivora celata*** **%Status 1 & 2: 11.36**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	42,129	509	35,827	2,836	NA	2,619	NA	761	NA	84,681	7.71
Status 2	14,582	1,216	666	5,560	NA	264	6,885	10,876	NA	40,049	3.65
Status 3	210,124	26,040	4	753	345	68,634	42,342	0	NA	348,242	31.71
Status 4	NA	NA	NA	NA	NA	NA	9	611,168	0	611,177	55.66
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,924	13,924	1.27
Total	266,835	27,765	36,497	9,149	345	71,517	49,236	622,804	13,924	1,098,072	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX01060 **NASHVILLE WARBLER** ***Vermivora ruficapilla*** **%Status 1 & 2: 17.73**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	24,115	0	13,721	212	NA	1,315	NA	35	NA	39,398	13.92
Status 2	6,559	32	436	454	NA	223	1,290	1,800	NA	10,792	3.81
Status 3	74,558	1,376	0	315	147	16,595	9,047	0	NA	102,038	36.05
Status 4	NA	NA	NA	NA	NA	NA	2	128,875	0	128,877	45.53
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,955	1,955	0.69
Total	105,232	1,408	14,157	981	147	18,133	10,339	130,710	1,955	283,060	100

ABPBX03010 **YELLOW WARBLER** ***Dendroica petechia*** **%Status 1 & 2: 4.98**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	13,639	408	11,911	2,247	NA	867	NA	553	NA	29,625	2.93
Status 2	4,661	342	474	3,844	NA	144	4,489	6,765	NA	20,719	2.05
Status 3	80,527	30,942	0	693	1,000	86,135	42,444	0	NA	241,740	23.94
Status 4	NA	NA	NA	NA	NA	NA	2	701,799	1,352	703,153	69.62
Water	NA	NA	NA	NA	NA	NA	NA	NA	14,691	14,691	1.46
Total	98,826	31,692	12,385	6,784	1,000	87,145	46,935	709,117	16,043	1,009,928	100

ABPBX03060 **YELLOW-RUMPED WARBLER** ***Dendroica coronata*** **%Status 1 & 2: 19.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	891,452	4,570	283,100	2,189	NA	56,305	NA	1,570	NA	1,239,186	14.79
Status 2	236,788	20,649	2,617	41,146	NA	4,959	30,104	26,800	NA	363,063	4.33
Status 3	3,920,105	293,671	5	901	4,836	301,647	274,134	0	NA	4,795,299	57.22
Status 4	NA	NA	NA	NA	NA	NA	10	1,970,434	87	1,970,531	23.52
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,768	11,768	0.14
Total	5,048,345	318,890	285,722	44,237	4,836	362,911	304,247	1,998,805	11,855	8,379,847	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX03080 **TOWNSEND'S WARBLER** ***Dendroica townsendi*** **%Status 1 & 2: 20.78**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	469,882	1,935	165,469	257	NA	45,778	NA	514	NA	683,835	16.49
Status 2	152,467	506	1,561	534	NA	4,621	15,176	3,356	NA	178,221	4.30
Status 3	2,358,272	59,500	0	401	125	98,218	143,718	0	NA	2,660,234	64.13
Status 4	NA	NA	NA	NA	NA	NA	2	622,100	0	622,102	15.00
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,585	3,585	0.09
Total	2,980,621	61,942	167,030	1,192	125	148,617	158,896	625,970	3,585	4,147,977	100

ABPBX03230 **BLACKPOLL WARBLER** ***Dendroica striata*** **%Status 1 & 2: 3.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,353	125	3,016	518	NA	0	NA	243	NA	8,254	1.53
Status 2	2,422	305	234	3,621	NA	0	1,720	3,645	NA	11,947	2.21
Status 3	64,741	12,761	0	157	378	45,479	23,752	0	NA	147,269	27.23
Status 4	NA	NA	NA	NA	NA	NA	2	364,015	1,187	365,203	67.53
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,115	8,115	1.50
Total	71,516	13,190	3,250	4,295	378	45,479	25,474	367,903	9,301	540,787	100

ABPBX05010 **BLACK-AND-WHITE WARBLER** ***Mniotilta varia*** **%Status 1 & 2: 0.61**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	23	12	5	2	NA	0	NA	0	NA	42	0.02
Status 2	0	0	0	451	NA	0	582	0	NA	1,034	0.59
Status 3	10,349	7,986	0	9	352	11,534	8,786	0	NA	39,016	22.24
Status 4	NA	NA	NA	NA	NA	NA	0	132,908	965	133,873	76.31
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,479	1,479	0.84
Total	10,373	7,998	5	462	352	11,534	9,368	132,908	2,444	175,444	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX06010 **AMERICAN REDSTART** ***Setophaga ruticilla*** **%Status 1 & 2: 6.59**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,515	433	11,321	1,642	NA	552	NA	437	NA	26,901	4.29
Status 2	4,363	206	456	1,299	NA	85	3,256	4,707	NA	14,372	2.29
Status 3	65,393	14,205	0	369	625	51,100	25,541	0	NA	157,232	25.09
Status 4	NA	NA	NA	NA	NA	NA	1	418,949	355	419,305	66.90
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,981	8,981	1.43
Total	82,270	14,844	11,777	3,310	625	51,737	28,798	424,093	9,336	626,791	100

ABPBX10010 **OVENBIRD** ***Seiurus aurocapillus*** **%Status 1 & 2: 3.75**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5,828	258	5,667	613	NA	391	NA	432	NA	13,189	2.03
Status 2	1,349	253	114	2,439	NA	72	2,512	4,510	NA	11,249	1.73
Status 3	48,171	15,668	0	246	623	87,889	27,308	0	NA	179,905	27.62
Status 4	NA	NA	NA	NA	NA	NA	0	435,446	1,554	437,000	67.09
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,002	10,002	1.54
Total	55,348	16,179	5,781	3,298	623	88,352	29,820	440,388	11,555	651,345	100

ABPBX10020 **NORTHERN WATERTHRUSH** ***Seiurus noveboracensis*** **%Status 1 & 2: 15.09**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	43,120	115	23,592	1,824	NA	3,006	NA	342	NA	71,999	11.54
Status 2	10,817	353	962	1,778	NA	912	3,265	4,078	NA	22,166	3.55
Status 3	166,261	6,926	0	376	149	28,527	23,928	0	NA	226,168	36.25
Status 4	NA	NA	NA	NA	NA	NA	7	294,928	0	294,936	47.27
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,644	8,644	1.39
Total	220,198	7,394	24,554	3,978	149	32,445	27,201	299,348	8,644	623,913	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX11040 **MACGILLIVRAY'S WARBLER** ***Oporornis tolmiei*** **%Status 1 & 2: 15.39**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	131,323	771	51,125	2,351	NA	7,140	NA	859	NA	193,569	11.63
Status 2	36,243	3,025	1,427	1,145	NA	510	8,111	12,059	NA	62,520	3.76
Status 3	526,988	38,704	4	525	748	80,687	58,806	0	NA	706,463	42.46
Status 4	NA	NA	NA	NA	NA	NA	5	688,556	27	688,587	41.39
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,702	12,702	0.76
Total	694,555	42,500	52,556	4,021	748	88,338	66,921	701,474	12,729	1,663,841	100

ABPBX12010 **COMMON YELLOWTHROAT** ***Geothlypis trichas*** **%Status 1 & 2: 3.90**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	20,942	671	11,335	4,324	NA	1,298	NA	496	NA	39,066	2.12
Status 2	6,163	872	503	10,164	NA	130	5,102	9,991	NA	32,926	1.79
Status 3	105,873	78,433	0	2,084	2,102	147,900	90,142	0	NA	426,535	23.14
Status 4	NA	NA	NA	NA	NA	NA	2	1,315,455	1,667	1,317,124	71.47
Water	NA	NA	NA	NA	NA	NA	NA	NA	27,309	27,309	1.48
Total	132,979	79,977	11,838	16,572	2,102	149,329	95,246	1,325,941	28,976	1,842,960	100

ABPBX16020 **WILSON'S WARBLER** ***Wilsonia pusilla*** **%Status 1 & 2: 30.54**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	83,513	456	27,487	1,233	NA	3,245	NA	318	NA	116,252	25.46
Status 2	16,140	1,149	0	424	NA	44	2,854	2,576	NA	23,186	5.08
Status 3	185,500	6,364	0	2	574	9,688	8,346	0	NA	210,475	46.09
Status 4	NA	NA	NA	NA	NA	NA	0	104,689	0	104,689	22.93
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,051	2,051	0.45
Total	285,152	7,969	27,487	1,660	574	12,977	11,200	107,583	2,051	456,654	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX24010 **YELLOW-BREASTED CHAT** ***Icteria virens*** **%Status 1 & 2: 3.40**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,165	272	9,927	816	NA	130	NA	343	NA	14,653	1.78
Status 2	1,643	279	297	4,240	NA	63	2,338	4,432	NA	13,294	1.62
Status 3	33,331	22,887	0	399	740	95,742	35,190	0	NA	188,288	22.89
Status 4	NA	NA	NA	NA	NA	NA	2	591,553	1,557	593,112	72.09
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,341	13,341	1.62
Total	38,138	23,438	10,225	5,455	740	95,936	37,531	596,328	14,898	822,687	100

ABPBX45050 **WESTERN TANAGER** ***Piranga ludoviciana*** **%Status 1 & 2: 17.17**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	529,306	3,123	187,193	1,242	NA	30,343	NA	680	NA	751,887	12.81
Status 2	154,810	12,554	2,480	38,058	NA	1,092	24,441	21,814	NA	255,250	4.35
Status 3	2,586,738	233,469	5	851	1,945	221,414	199,136	0	NA	3,243,558	55.28
Status 4	NA	NA	NA	NA	NA	NA	10	1,607,137	65	1,607,212	27.39
Water	NA	NA	NA	NA	NA	NA	NA	NA	9,854	9,854	0.17
Total	3,270,855	249,145	189,679	40,150	1,945	252,850	223,587	1,629,632	9,918	5,867,760	100

ABPBX61040 **BLACK-HEADED GROSBEAK** ***Pheucticus melanocephalus*** **%Status 1 & 2: 5.55**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	15,907	367	18,237	2,615	NA	702	NA	513	NA	38,341	3.37
Status 2	6,748	586	507	5,081	NA	151	4,926	6,926	NA	24,925	2.19
Status 3	134,356	31,515	0	610	897	114,663	46,636	0	NA	328,678	28.85
Status 4	NA	NA	NA	NA	NA	NA	3	729,201	1,598	730,802	64.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	16,543	16,543	1.45
Total	157,011	32,468	18,744	8,307	897	115,516	51,565	736,639	18,142	1,139,289	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX64020 **LAZULI BUNTING** ***Passerina amoena*** **%Status 1 & 2: 4.51**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	106,492	3,066	49,909	10,328	NA	2,434	NA	1,309	NA	173,538	2.17
Status 2	21,521	15,046	5,054	82,240	NA	318	23,830	39,987	NA	187,997	2.35
Status 3	395,687	848,703	18	6,090	10,768	503,078	494,000	12	NA	2,258,357	28.19
Status 4	NA	NA	NA	NA	NA	NA	8	5,327,205	2,104	5,329,317	66.52
Water	NA	NA	NA	NA	NA	NA	NA	NA	62,882	62,882	0.79
Total	523,700	866,814	54,981	98,659	10,768	505,830	517,839	5,368,513	64,986	8,012,091	100

ABPBX64030 **INDIGO BUNTING** ***Passerina cyanea*** **%Status 1 & 2: 3.96**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	13,541	1,861	991	589	NA	0	NA	1,038	NA	18,021	1.13
Status 2	5,612	1,832	170	29,622	NA	0	4,721	3,367	NA	45,324	2.83
Status 3	64,770	115,976	0	562	1,749	182,232	77,896	0	NA	443,185	27.69
Status 4	NA	NA	NA	NA	NA	NA	0	1,079,932	1,719	1,081,651	67.58
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,429	12,429	0.78
Total	83,922	119,669	1,162	30,773	1,749	182,232	82,617	1,084,337	14,148	1,600,610	100

ABPBX65010 **DICKCISSEL** ***Spiza americana*** **%Status 1 & 2: 2.58**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6	22	4	1,142	NA	0	NA	6	NA	1,181	0.11
Status 2	0	0	81	25,480	NA	0	242	13	NA	25,816	2.47
Status 3	6,200	90,192	0	2,011	810	66,009	66,550	0	NA	231,771	22.16
Status 4	NA	NA	NA	NA	NA	NA	0	782,335	365	782,700	74.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,437	4,437	0.42
Total	6,206	90,214	85	28,634	810	66,009	66,792	782,355	4,802	1,045,905	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX74010 **GREEN-TAILED TOWHEE** ***Pipilo chlorurus*** **%Status 1 & 2: 5.99**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11,250	203	3,176	4,039	NA	0	NA	2	NA	18,671	0.72
Status 2	2,187	19,024	5,719	95,169	NA	0	7,414	7,517	NA	137,030	5.27
Status 3	114,753	528,062	0	645	117	111,221	190,612	15	NA	945,425	36.40
Status 4	NA	NA	NA	NA	NA	NA	0	1,488,466	18	1,488,484	57.31
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,845	7,845	0.30
Total	128,190	547,289	8,895	99,854	117	111,221	198,026	1,496,000	7,863	2,597,454	100

ABPBX74080 **SPOTTED TOWHEE** ***Pipilo maculatus*** **%Status 1 & 2: 5.67**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	17,689	2,318	16,000	4,695	NA	3,214	NA	555	NA	44,471	0.95
Status 2	8,004	33,044	3,998	151,160	NA	114	9,651	14,814	NA	220,785	4.72
Status 3	204,859	758,189	4	1,552	9,357	225,216	263,632	0	NA	1,462,809	31.26
Status 4	NA	NA	NA	NA	NA	NA	2	2,923,375	1,356	2,924,733	62.50
Water	NA	NA	NA	NA	NA	NA	NA	NA	26,638	26,638	0.57
Total	230,551	793,551	20,002	157,406	9,357	228,545	273,285	2,938,744	27,994	4,679,436	100

ABPBX94010 **AMERICAN TREE SPARROW** ***Spizella arborea*** **%Status 1 & 2: 2.64**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	71,453	5,514	34,924	13,353	NA	3,503	NA	4,227	NA	132,974	0.79
Status 2	22,969	22,243	2,465	153,093	NA	322	36,793	74,552	NA	312,438	1.85
Status 3	562,078	1,711,332	62	12,544	17,426	1,244,109	1,203,812	1	NA	4,751,364	28.14
Status 4	NA	NA	NA	NA	NA	NA	49	11,645,330	2,088	11,647,467	68.98
Water	NA	NA	NA	NA	NA	NA	NA	NA	42,091	42,091	0.25
Total	656,500	1,739,089	37,451	178,991	17,426	1,247,934	1,240,654	11,724,110	44,179	16,886,334	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX94020 **CHIPPING SPARROW** ***Spizella passerina*** **%Status 1 & 2: 14.55**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	417,374	3,109	158,775	2,476	NA	25,070	NA	1,635	NA	608,440	10.00
Status 2	115,677	17,938	4,474	84,323	NA	1,100	27,333	25,590	NA	276,435	4.55
Status 3	2,114,469	304,653	5	1,045	1,976	342,536	235,985	0	NA	3,000,668	49.33
Status 4	NA	NA	NA	NA	NA	NA	11	2,176,143	1,099	2,177,253	35.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	20,099	20,099	0.33
Total	2,647,520	325,700	163,255	87,844	1,976	368,706	263,329	2,203,368	21,199	6,082,896	100

ABPBX94030 **CLAY-COLORED SPARROW** ***Spizella pallida*** **%Status 1 & 2: 2.82**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	69,828	5,897	29,863	16,178	NA	2,904	NA	4,225	NA	128,894	0.70
Status 2	19,838	29,691	5,964	218,284	NA	356	39,128	81,376	NA	394,637	2.13
Status 3	593,497	2,197,975	62	13,657	18,656	1,271,199	1,339,496	0	NA	5,434,543	29.26
Status 4	NA	NA	NA	NA	NA	NA	20	12,566,983	2,014	12,569,017	67.67
Water	NA	NA	NA	NA	NA	NA	NA	NA	47,788	47,788	0.26
Total	683,162	2,233,563	35,889	248,120	18,656	1,274,459	1,378,644	12,652,584	49,801	18,574,880	100

ABPBX94040 **BREWER'S SPARROW** ***Spizella breweri*** **%Status 1 & 2: 4.10**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	12,590	970	3,018	4,318	NA	112	NA	140	NA	21,148	0.52
Status 2	3,217	17,662	4,429	102,270	NA	1	8,620	9,875	NA	146,073	3.58
Status 3	139,604	945,166	0	1,569	7,548	124,700	298,673	15	NA	1,517,274	37.17
Status 4	NA	NA	NA	NA	NA	NA	0	2,386,058	18	2,386,076	58.45
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,587	11,587	0.28
Total	155,410	963,799	7,447	108,157	7,548	124,812	307,293	2,396,088	11,605	4,082,159	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX94050 **FIELD SPARROW** ***Spizella pusilla*** **%Status 1 & 2: 3.96**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	122	2,274	8	3,704	NA	0	NA	23	NA	6,132	0.16
Status 2	0	22,907	0	116,759	NA	0	3,376	25	NA	143,067	3.80
Status 3	68,709	692,829	0	2,036	9,477	134,326	228,030	0	NA	1,135,408	30.12
Status 4	NA	NA	NA	NA	NA	NA	0	2,464,783	1,986	2,466,769	65.44
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,447	18,447	0.49
Total	68,831	718,010	8	122,500	9,477	134,326	231,406	2,464,832	20,433	3,769,823	100

ABPBX95010 **VESPER SPARROW** ***Pooecetes gramineus*** **%Status 1 & 2: 2.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	31,383	4,274	8,155	15,551	NA	623	NA	3,383	NA	63,369	0.31
Status 2	7,327	41,447	10,296	181,913	NA	385	37,620	76,449	NA	355,436	1.71
Status 3	408,442	2,421,710	62	13,871	16,709	1,218,903	1,491,370	16	NA	5,571,084	26.87
Status 4	NA	NA	NA	NA	NA	NA	14	14,692,167	1,379	14,693,559	70.87
Water	NA	NA	NA	NA	NA	NA	NA	NA	49,664	49,664	0.24
Total	447,152	2,467,430	18,513	211,335	16,709	1,219,911	1,529,004	14,772,014	51,042	20,733,112	100

ABPBX96010 **LARK SPARROW** ***Chondestes grammacus*** **%Status 1 & 2: 2.11**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	37,200	4,670	20,963	16,530	NA	1,953	NA	3,559	NA	84,875	0.34
Status 2	10,634	45,943	10,538	235,007	NA	744	42,391	90,611	NA	435,868	1.77
Status 3	529,711	2,590,124	62	15,232	18,099	1,496,651	1,658,640	16	NA	6,308,535	25.58
Status 4	NA	NA	NA	NA	NA	NA	18	17,767,934	3,616	17,771,568	72.07
Water	NA	NA	NA	NA	NA	NA	NA	NA	57,688	57,688	0.23
Total	577,545	2,640,737	31,563	266,769	18,099	1,499,348	1,701,049	17,862,120	61,304	24,658,534	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBX98010 **LARK BUNTING** ***Calamospiza melanocorys*** **%Status 1 & 2: 1.67**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	24,856	3,930	6,512	9,444	NA	0	NA	3,173	NA	47,914	0.24
Status 2	3,466	33,604	7,825	163,886	NA	0	19,538	64,807	NA	293,126	1.43
Status 3	202,080	2,057,228	62	11,740	18,206	1,195,963	1,373,485	0	NA	4,858,764	23.77
Status 4	NA	NA	NA	NA	NA	NA	0	15,198,042	2,368	15,200,410	74.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	37,316	37,316	0.18
Total	230,401	2,094,762	14,399	185,070	18,206	1,195,963	1,393,023	15,266,022	39,684	20,437,530	100

ABPBX99010 **SAVANNAH SPARROW** ***Passerculus sandwichensis*** **%Status 1 & 2: 2.36**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	96,565	3,851	25,518	12,516	NA	5,075	NA	3,239	NA	146,764	0.91
Status 2	24,278	11,109	1,202	91,688	NA	458	31,488	73,655	NA	233,879	1.45
Status 3	522,144	1,366,967	62	12,793	12,671	1,110,315	1,128,712	1	NA	4,153,665	25.75
Status 4	NA	NA	NA	NA	NA	NA	16	11,556,114	2,078	11,558,209	71.66
Water	NA	NA	NA	NA	NA	NA	NA	NA	37,726	37,726	0.23
Total	642,987	1,381,926	26,783	116,997	12,671	1,115,848	1,160,217	11,633,009	39,804	16,130,242	100

ABPBXA0010 **BAIRD'S SPARROW** ***Ammodramus bairdii*** **%Status 1 & 2: 1.03**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	1,084	278	1,768	2,275	NA	0	NA	36	NA	5,442	0.12
Status 2	62	2,022	173	32,816	NA	0	1,265	3,451	NA	39,788	0.91
Status 3	32,500	168,318	0	3,853	2,048	307,647	225,782	0	NA	740,147	16.90
Status 4	NA	NA	NA	NA	NA	NA	0	3,573,053	1,881	3,574,933	81.60
Water	NA	NA	NA	NA	NA	NA	NA	NA	20,794	20,794	0.48
Total	33,645	170,618	1,941	38,944	2,048	307,647	227,047	3,576,540	22,674	4,381,104	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXA0020 **GRASSHOPPER SPARROW** ***Ammodramus savannarum*** **%Status 1 & 2: 1.61**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	18,687	3,135	6,836	11,524	NA	610	NA	3,239	NA	44,031	0.28
Status 2	5,451	9,640	1,194	91,412	NA	458	28,564	70,536	NA	207,255	1.33
Status 3	283,576	1,342,509	62	12,793	10,747	1,104,671	1,108,019	1	NA	3,862,379	24.76
Status 4	NA	NA	NA	NA	NA	NA	16	11,445,400	2,078	11,447,495	73.39
Water	NA	NA	NA	NA	NA	NA	NA	NA	37,553	37,553	0.24
Total	307,714	1,355,284	8,093	115,729	10,747	1,105,738	1,136,599	11,519,176	39,632	15,598,712	100

ABPBXA0040 **LE CONTE'S SPARROW** ***Ammodramus leconteii*** **%Status 1 & 2: 9.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	7,741	0	16,388	236	NA	0	NA	4	NA	24,369	7.33
Status 2	168	0	3	5,396	NA	0	46	11	NA	5,625	1.69
Status 3	17,138	4,402	0	1,398	6	28,152	23,884	0	NA	74,981	22.54
Status 4	NA	NA	NA	NA	NA	NA	0	225,915	340	226,255	68.01
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,432	1,432	0.43
Total	25,048	4,402	16,391	7,030	6	28,152	23,931	225,929	1,772	332,661	100

ABPBXA0070 **NELSON'S SHARP-TAILED SPARROW** ***Ammodramus nelsoni*** **%Status 1 & 2: 2.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	38	NA	0	NA	19	NA	57	0.16
Status 2	0	0	0	875	NA	0	24	18	NA	917	2.51
Status 3	0	440	0	456	0	4,658	1,602	0	NA	7,156	19.58
Status 4	NA	NA	NA	NA	NA	NA	0	26,654	18	26,672	72.98
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,744	1,744	4.77
Total	0	440	0	1,369	0	4,658	1,626	26,690	1,762	36,545	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXA2010 **FOX SPARROW** ***Passerella iliaca*** **%Status 1 & 2: 28.47**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	306,078	2,893	88,795	2,706	NA	17,003	NA	157	NA	417,631	22.92
Status 2	76,731	2,365	0	793	NA	0	10,640	10,529	NA	101,059	5.55
Status 3	842,672	41,380	0	6	2,581	36,317	43,151	0	NA	966,108	53.03
Status 4	NA	NA	NA	NA	NA	NA	0	335,054	0	335,054	18.39
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,105	2,105	0.12
Total	1,225,481	46,638	88,795	3,506	2,581	53,320	53,791	345,740	2,105	1,821,957	100

ABPBXA3010 **SONG SPARROW** ***Melospiza melodia*** **%Status 1 & 2: 6.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	28,065	685	27,453	3,055	NA	2,014	NA	755	NA	62,027	3.72
Status 2	11,547	1,432	846	10,606	NA	262	7,770	11,125	NA	43,588	2.62
Status 3	207,063	57,524	4	1,004	1,347	144,065	69,726	0	NA	480,733	28.86
Status 4	NA	NA	NA	NA	NA	NA	9	1,055,649	1,620	1,057,278	63.47
Water	NA	NA	NA	NA	NA	NA	NA	NA	22,162	22,162	1.33
Total	246,674	59,641	28,304	14,666	1,347	146,340	77,504	1,067,529	23,782	1,665,788	100

ABPBXA3020 **LINCOLN'S SPARROW** ***Melospiza lincolnii*** **%Status 1 & 2: 22.72**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	141,673	717	47,354	2,091	NA	5,842	NA	514	NA	198,192	17.92
Status 2	35,288	1,656	160	770	NA	41	6,977	8,246	NA	53,137	4.80
Status 3	429,248	23,726	0	83	1,145	39,347	30,087	0	NA	523,635	47.34
Status 4	NA	NA	NA	NA	NA	NA	0	325,468	12	325,480	29.42
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,749	5,749	0.52
Total	606,209	26,098	47,514	2,944	1,145	45,230	37,063	334,228	5,761	1,106,192	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXA4020 **WHITE-THROATED SPARROW** ***Zonotrichia albicollis*** **%Status 1 & 2: 6.39**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	25,979	215	39,186	184	NA	680	NA	15	NA	66,259	4.40
Status 2	9,768	366	1,048	7,037	NA	62	2,765	8,770	NA	29,816	1.98
Status 3	191,125	35,846	4	667	179	143,619	54,865	0	NA	426,305	28.34
Status 4	NA	NA	NA	NA	NA	NA	38	973,695	27	973,759	64.74
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,059	8,059	0.54
Total	226,872	36,427	40,238	7,889	179	144,361	57,668	982,480	8,085	1,504,198	100

ABPBXA4040 **WHITE-CROWNED SPARROW** ***Zonotrichia leucophrys*** **%Status 1 & 2: 34.97**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	220,538	855	68,614	2,198	NA	6,480	NA	234	NA	298,919	29.38
Status 2	40,918	1,741	34	697	NA	1	7,518	5,975	NA	56,885	5.59
Status 3	353,388	29,091	0	3	2,023	29,107	27,706	0	NA	441,318	43.38
Status 4	NA	NA	NA	NA	NA	NA	0	218,706	2	218,708	21.50
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,581	1,581	0.16
Total	614,843	31,687	68,648	2,898	2,023	35,588	35,224	224,915	1,584	1,017,411	100

ABPBXA4050 **HARRIS'S SPARROW** ***Zonotrichia querula*** **%Status 1 & 2: 4.87**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	50,459	1,813	26,055	2,710	NA	2,756	NA	861	NA	84,654	2.97
Status 2	15,942	1,045	459	17,032	NA	149	9,537	10,136	NA	54,301	1.90
Status 3	209,843	113,590	0	2,877	2,913	215,364	139,310	0	NA	683,898	23.99
Status 4	NA	NA	NA	NA	NA	NA	34	2,008,769	1,793	2,010,597	70.51
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,013	18,013	0.63
Total	276,245	116,448	26,515	22,619	2,913	218,269	148,881	2,019,767	19,806	2,851,462	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXA5020 **DARK-EYED JUNCO** ***Junco hyemalis*** **%Status 1 & 2: 14.84**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	769,950	4,734	249,194	6,762	NA	37,512	NA	1,878	NA	1,070,029	11.15
Status 2	206,335	21,420	8,558	34,691	NA	1,131	41,522	40,926	NA	354,582	3.69
Status 3	3,241,206	650,586	5	1,755	7,623	444,463	417,788	15	NA	4,763,441	49.62
Status 4	NA	NA	NA	NA	NA	NA	11	3,390,086	105	3,390,202	35.32
Water	NA	NA	NA	NA	NA	NA	NA	NA	20,839	20,839	0.22
Total	4,217,490	676,739	257,757	43,209	7,623	483,106	459,321	3,432,905	20,944	9,599,093	100

ABPBXA6010 **MCCOWN'S LONGSPUR** ***Calcarius mccownii*** **%Status 1 & 2: 1.31**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	14,003	2,931	4,437	9,999	NA	0	NA	3,044	NA	34,415	0.22
Status 2	3,596	16,524	3,366	67,663	NA	0	22,124	54,932	NA	168,205	1.09
Status 3	183,055	1,401,647	62	10,362	10,141	961,092	1,140,509	1	NA	3,706,869	23.93
Status 4	NA	NA	NA	NA	NA	NA	0	11,552,816	1,089	11,553,905	74.60
Water	NA	NA	NA	NA	NA	NA	NA	NA	24,084	24,084	0.16
Total	200,655	1,421,102	7,865	88,024	10,141	961,092	1,162,633	11,610,793	25,173	15,487,478	100

ABPBXA6020 **LAPLAND LONGSPUR** ***Calcarius lapponicus*** **%Status 1 & 2: 1.41**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	32,441	3,276	5,689	10,242	NA	884	NA	3,419	NA	55,951	0.31
Status 2	10,170	17,010	3,425	74,237	NA	650	29,499	67,124	NA	202,115	1.10
Status 3	290,089	1,440,055	62	12,474	10,873	1,085,778	1,244,417	1	NA	4,083,748	22.27
Status 4	NA	NA	NA	NA	NA	NA	15	13,958,928	2,336	13,961,279	76.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	30,636	30,636	0.17
Total	332,700	1,460,341	9,177	96,952	10,873	1,087,312	1,273,931	14,029,472	32,972	18,333,730	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXA6040 **CHESTNUT-COLLARED LONGSPUR** ***Calcarius ornatus*** **%Status 1 & 2: 1.31**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	14,003	2,931	4,437	9,999	NA	0	NA	3,044	NA	34,415	0.22
Status 2	3,596	16,524	3,366	67,663	NA	0	22,124	54,932	NA	168,205	1.09
Status 3	183,055	1,401,647	62	10,362	10,141	961,092	1,140,509	1	NA	3,706,869	23.93
Status 4	NA	NA	NA	NA	NA	NA	0	11,552,816	1,089	11,553,905	74.60
Water	NA	NA	NA	NA	NA	NA	NA	NA	24,084	24,084	0.16
Total	200,655	1,421,102	7,865	88,024	10,141	961,092	1,162,633	11,610,793	25,173	15,487,478	100

ABPBXA8010 **SNOW BUNTING** ***Plectrophenax nivalis*** **%Status 1 & 2: 1.52**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	33,468	3,417	7,537	11,365	NA	888	NA	3,436	NA	60,110	0.32
Status 2	10,285	18,310	3,533	95,045	NA	684	29,034	72,329	NA	229,221	1.21
Status 3	282,089	1,462,737	62	13,364	11,590	1,211,967	1,275,759	1	NA	4,257,569	22.37
Status 4	NA	NA	NA	NA	NA	NA	16	14,452,959	2,398	14,455,374	75.94
Water	NA	NA	NA	NA	NA	NA	NA	NA	34,051	34,051	0.18
Total	325,842	1,484,464	11,133	119,775	11,590	1,213,539	1,304,809	14,528,725	36,449	19,036,324	100

ABPBXA9010 **BOBOLINK** ***Dolichonyx oryzivorus*** **%Status 1 & 2: 1.58**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	17,999	3,106	6,397	7,130	NA	610	NA	3,222	NA	38,464	0.25
Status 2	4,715	9,474	1,173	89,616	NA	458	27,203	69,236	NA	201,874	1.33
Status 3	246,521	1,294,630	62	12,758	10,545	1,062,289	1,072,616	0	NA	3,699,422	24.37
Status 4	NA	NA	NA	NA	NA	NA	16	11,202,682	2,067	11,204,765	73.81
Water	NA	NA	NA	NA	NA	NA	NA	NA	36,175	36,175	0.24
Total	269,235	1,307,210	7,633	109,504	10,545	1,063,357	1,099,835	11,275,140	38,242	15,180,700	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXB0010 **RED-WINGED BLACKBIRD** ***Agelaius phoeniceus*** **%Status 1 & 2: 1.84**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6,716	455	6,236	4,709	NA	230	NA	291	NA	18,636	0.47
Status 2	2,117	1,290	517	27,879	NA	370	5,802	16,572	NA	54,547	1.37
Status 3	68,074	145,071	0	4,450	2,230	289,184	181,306	0	NA	690,315	17.34
Status 4	NA	NA	NA	NA	NA	NA	3	3,187,276	2,036	3,189,314	80.11
Water	NA	NA	NA	NA	NA	NA	NA	NA	28,463	28,463	0.72
Total	76,907	146,817	6,753	37,037	2,230	289,784	187,112	3,204,138	30,498	3,981,276	100

ABPBXB2030 **WESTERN MEADOWLARK** ***Sturnella neglecta*** **%Status 1 & 2: 1.64**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	31,071	3,468	9,850	15,836	NA	615	NA	3,391	NA	64,231	0.29
Status 2	7,289	18,683	5,450	150,363	NA	515	37,003	82,580	NA	301,883	1.36
Status 3	441,268	2,066,485	62	15,179	14,665	1,410,745	1,495,062	16	NA	5,443,483	24.45
Status 4	NA	NA	NA	NA	NA	NA	16	16,399,953	2,695	16,402,664	73.68
Water	NA	NA	NA	NA	NA	NA	NA	NA	49,328	49,328	0.22
Total	479,628	2,088,636	15,362	181,377	14,665	1,411,875	1,532,082	16,485,941	52,023	22,261,588	100

ABPBXB3010 **YELLOW-HEADED BLACKBIRD** ***Xanthocephalus xanthocephalus*** **%Status 1 & 2: 5.62**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11,105	166	5,201	6,894	NA	800	NA	962	NA	25,129	2.49
Status 2	1,547	206	663	21,603	NA	353	3,353	3,966	NA	31,690	3.14
Status 3	24,345	47,589	0	2,693	958	73,088	47,422	0	NA	196,096	19.41
Status 4	NA	NA	NA	NA	NA	NA	0	636,157	399	636,556	63.02
Water	NA	NA	NA	NA	NA	NA	NA	NA	120,628	120,628	11.94
Total	36,998	47,961	5,864	31,190	958	74,241	50,775	641,085	121,027	1,010,098	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXB5010 **RUSTY BLACKBIRD** ***Euphagus carolinus*** **%Status 1 & 2: 0.26**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	545	6	803	468	NA	0	NA	115	NA	1,938	0.05
Status 2	165	229	176	982	NA	0	1,230	4,879	NA	7,661	0.21
Status 3	3,877	22,597	0	1,293	531	142,051	165,504	0	NA	335,854	9.22
Status 4	NA	NA	NA	NA	NA	NA	2	3,290,183	510	3,290,695	90.31
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,683	7,683	0.21
Total	4,588	22,833	978	2,743	531	142,051	166,737	3,295,176	8,193	3,643,830	100

ABPBXB5020 **BREWER'S BLACKBIRD** ***Euphagus cyanocephalus*** **%Status 1 & 2: 1.83**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	17,394	525	7,523	6,770	NA	340	NA	468	NA	33,020	0.34
Status 2	3,809	10,751	3,921	89,919	NA	411	14,275	20,337	NA	143,423	1.49
Status 3	154,440	679,707	0	5,248	6,053	429,392	503,891	15	NA	1,778,747	18.47
Status 4	NA	NA	NA	NA	NA	NA	32	7,641,697	3,510	7,645,239	79.37
Water	NA	NA	NA	NA	NA	NA	NA	NA	32,080	32,080	0.33
Total	175,644	690,983	11,444	101,937	6,053	430,143	518,199	7,662,517	35,590	9,632,509	100

ABPBXB6070 **COMMON GRACKLE** ***Quiscalus quiscula*** **%Status 1 & 2: 0.70**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5,434	328	13,828	1,935	NA	124	NA	502	NA	22,151	0.34
Status 2	1,528	539	262	5,342	NA	395	4,278	10,875	NA	23,219	0.36
Status 3	41,834	47,876	0	2,075	3,600	354,504	258,980	0	NA	708,869	10.98
Status 4	NA	NA	NA	NA	NA	NA	0	5,675,273	3,477	5,678,750	87.97
Water	NA	NA	NA	NA	NA	NA	NA	NA	22,161	22,161	0.34
Total	48,796	48,743	14,090	9,352	3,600	355,023	263,258	5,686,650	25,637	6,455,150	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBXB7030 **BROWN-HEADED COWBIRD** ***Molothrus ater*** **%Status 1 & 2: 3.51**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	264,970	12,311	132,625	24,695	NA	14,773	NA	6,055	NA	455,429	1.37
Status 2	98,952	71,758	13,423	308,632	NA	5,614	83,717	128,144	NA	710,239	2.14
Status 3	2,891,567	3,169,214	67	18,202	28,166	1,963,164	2,039,431	16	NA	10,109,828	30.43
Status 4	NA	NA	NA	NA	NA	NA	60	21,606,988	4,957	21,612,005	65.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	336,557	336,557	1.01
Total	3,255,490	3,253,283	146,114	351,529	28,166	1,983,551	2,123,208	21,741,203	341,514	33,224,056	100

ABPBXB9070 **ORCHARD ORIOLE** ***Icterus spurius*** **%Status 1 & 2: 1.10**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	2	5	66	NA	0	NA	0	NA	73	0.08
Status 2	1	16	0	654	NA	0	255	0	NA	927	1.02
Status 3	653	4,430	0	30	193	5,450	4,943	0	NA	15,699	17.21
Status 4	NA	NA	NA	NA	NA	NA	0	70,907	903	71,811	78.73
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,705	2,705	2.97
Total	654	4,449	5	750	193	5,450	5,198	70,907	3,609	91,214	100

ABPBXB9220 **BULLOCK'S ORIOLE** ***Icterus bullockii*** **%Status 1 & 2: 1.98**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	5,096	122	12,783	778	NA	158	NA	171	NA	19,107	1.01
Status 2	2,081	307	234	3,940	NA	315	4,091	7,224	NA	18,192	0.96
Status 3	54,409	14,736	0	937	1,301	127,108	56,941	0	NA	255,430	13.55
Status 4	NA	NA	NA	NA	NA	NA	24	1,577,388	2,279	1,579,691	83.78
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,169	13,169	0.70
Total	61,585	15,164	13,018	5,655	1,301	127,581	61,055	1,584,783	15,448	1,885,589	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBY02010 **BLACK ROSY-FINCH** ***Leucosticte atrata*** **%Status 1 & 2: 71.34**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	132,113	0	774	6	NA	0	NA	0	NA	132,893	62.75
Status 2	17,918	179	0	0	NA	0	106	0	NA	18,203	8.60
Status 3	51,399	598	0	0	35	0	79	0	NA	52,111	24.60
Status 4	NA	NA	NA	NA	NA	NA	0	8,387	0	8,387	3.96
Water	NA	NA	NA	NA	NA	NA	NA	NA	194	194	0.09
Total	201,431	777	774	6	35	0	185	8,387	194	211,789	100

ABPBY02030 **GRAY-CROWNED ROSY-FINCH** ***Leucosticte tephrocotis*** **%Status 1 & 2: 75.49**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	87,201	242	72,662	0	NA	6,002	NA	0	NA	166,107	70.06
Status 2	12,250	0	0	0	NA	0	594	22	NA	12,866	5.43
Status 3	48,524	96	0	0	0	1,273	155	0	NA	50,047	21.11
Status 4	NA	NA	NA	NA	NA	NA	0	7,977	0	7,977	3.37
Water	NA	NA	NA	NA	NA	NA	NA	NA	91	91	0.04
Total	147,975	338	72,662	0	0	7,275	748	7,999	91	237,088	100

ABPBY03010 **PINE GROSBEAK** ***Pinicola enucleator*** **%Status 1 & 2: 19.85**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	721,074	3,597	256,069	1,640	NA	50,853	NA	783	NA	1,034,017	15.72
Status 2	203,640	11,873	1,922	1,901	NA	4,850	25,031	22,276	NA	271,494	4.13
Status 3	3,445,849	135,954	1	623	3,973	162,344	204,512	0	NA	3,953,255	60.10
Status 4	NA	NA	NA	NA	NA	NA	9	1,313,383	0	1,313,392	19.97
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,929	5,929	0.09
Total	4,370,563	151,424	257,991	4,164	3,973	218,048	229,552	1,336,442	5,929	6,578,089	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBY04020 **PURPLE FINCH** ***Carpodacus purpureus*** **%Status 1 & 2: 11.38**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	35,841	33	63,729	1,246	NA	6,276	NA	86	NA	107,211	8.90
Status 2	13,856	433	1,405	4,550	NA	536	4,045	5,008	NA	29,834	2.48
Status 3	366,955	13,625	0	414	635	93,252	53,961	0	NA	528,843	43.91
Status 4	NA	NA	NA	NA	NA	NA	36	527,326	1,072	528,435	43.87
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,140	10,140	0.84
Total	416,652	14,092	65,135	6,209	635	100,064	58,043	532,420	11,213	1,204,463	100

ABPBY04030 **CASSIN'S FINCH** ***Carpodacus cassinii*** **%Status 1 & 2: 22.59**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	152,900	794	62,522	115	NA	4,715	NA	248	NA	221,294	18.19
Status 2	33,565	2,870	54	284	NA	8	7,923	8,842	NA	53,545	4.40
Status 3	333,974	49,237	5	109	68	76,351	37,177	0	NA	496,920	40.85
Status 4	NA	NA	NA	NA	NA	NA	0	442,861	55	442,916	36.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,827	1,827	0.15
Total	520,438	52,900	62,581	508	68	81,074	45,099	451,951	1,882	1,216,502	100

ABPBY04040 **HOUSE FINCH** ***Carpodacus mexicanus*** **%Status 1 & 2: 3.53**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	43,491	2,768	36,704	4,267	NA	8,218	NA	1,556	NA	97,003	1.17
Status 2	23,201	20,632	3,617	107,871	NA	783	16,326	24,184	NA	196,615	2.36
Status 3	717,943	576,038	5	2,229	9,204	501,916	402,604	0	NA	2,209,938	26.54
Status 4	NA	NA	NA	NA	NA	NA	38	5,794,519	117	5,794,674	69.59
Water	NA	NA	NA	NA	NA	NA	NA	NA	28,834	28,834	0.35
Total	784,634	599,437	40,326	114,367	9,204	510,917	418,968	5,820,259	28,950	8,327,064	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBY05010 **RED CROSSBILL** ***Loxia curvirostra*** **%Status 1 & 2: 14.68**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	472,721	3,263	177,752	1,813	NA	30,343	NA	794	NA	686,686	10.69
Status 2	149,928	12,852	2,419	42,483	NA	1,092	23,404	24,758	NA	256,936	4.00
Status 3	2,628,337	267,466	5	958	2,095	323,807	226,866	0	NA	3,449,534	53.68
Status 4	NA	NA	NA	NA	NA	NA	10	2,020,040	80	2,020,130	31.44
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,098	13,098	0.20
Total	3,250,985	283,582	180,176	45,254	2,095	355,243	250,280	2,045,593	13,178	6,426,385	100

ABPBY05020 **WHITE-WINGED CROSSBILL** ***Loxia leucoptera*** **%Status 1 & 2: 24.00**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	394,663	1,002	163,208	644	NA	33,699	NA	267	NA	593,483	19.85
Status 2	100,306	6,488	1,487	782	NA	4,042	7,134	3,760	NA	123,999	4.15
Status 3	1,664,703	28,496	0	215	2,678	81,601	92,823	0	NA	1,870,515	62.56
Status 4	NA	NA	NA	NA	NA	NA	6	399,895	6	399,907	13.38
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,980	1,980	0.07
Total	2,159,671	35,986	164,695	1,641	2,678	119,342	99,962	403,922	1,986	2,989,884	100

ABPBY06010 **COMMON REDPOLL** ***Carduelis flammea*** **%Status 1 & 2: 2.40**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	49,773	2,492	18,574	5,477	NA	2,748	NA	1,026	NA	80,091	0.76
Status 2	16,284	17,944	1,220	105,715	NA	455	12,290	17,745	NA	171,653	1.64
Status 3	263,687	516,519	0	5,297	9,318	587,813	489,191	0	NA	1,871,826	17.84
Status 4	NA	NA	NA	NA	NA	NA	34	8,339,992	2,769	8,342,794	79.52
Water	NA	NA	NA	NA	NA	NA	NA	NA	25,706	25,706	0.25
Total	329,745	536,955	19,794	116,489	9,318	591,016	501,516	8,358,762	28,475	10,492,070	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBY06020 **HOARY REDPOLL** ***Carduelis hornemanni*** **%Status 1 & 2: 2.08**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	44,826	2,492	18,466	3,556	NA	2,748	NA	1,026	NA	73,115	1.11
Status 2	14,392	13,038	1,196	8,484	NA	455	10,696	15,439	NA	63,701	0.97
Status 3	209,958	205,734	0	4,402	7,945	534,990	303,151	0	NA	1,266,180	19.24
Status 4	NA	NA	NA	NA	NA	NA	6	5,162,622	2,705	5,165,332	78.49
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,922	12,922	0.20
Total	269,176	221,264	19,663	16,442	7,945	538,194	313,852	5,179,087	15,627	6,581,250	100

ABPBY06030 **PINE SISKIN** ***Carduelis pinus*** **%Status 1 & 2: 17.94**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	661,627	3,529	212,515	2,388	NA	32,888	NA	865	NA	913,813	13.64
Status 2	180,966	13,124	2,641	38,768	NA	1,124	27,137	23,969	NA	287,729	4.30
Status 3	2,755,285	247,466	5	1,055	4,203	246,873	221,234	0	NA	3,476,122	51.90
Status 4	NA	NA	NA	NA	NA	NA	39	2,005,385	69	2,005,493	29.94
Water	NA	NA	NA	NA	NA	NA	NA	NA	14,715	14,715	0.22
Total	3,597,878	264,119	215,160	42,211	4,203	280,886	248,411	2,030,219	14,784	6,697,871	100

ABPBY06110 **AMERICAN GOLDFINCH** ***Carduelis tristis*** **%Status 1 & 2: 2.67**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	28,776	1,852	30,033	2,553	NA	1,917	NA	1,092	NA	66,223	1.20
Status 2	12,254	2,225	695	35,699	NA	511	9,731	20,232	NA	81,347	1.47
Status 3	235,962	185,132	0	3,108	4,175	456,222	236,989	0	NA	1,121,588	20.25
Status 4	NA	NA	NA	NA	NA	NA	36	4,239,923	3,086	4,243,045	76.62
Water	NA	NA	NA	NA	NA	NA	NA	NA	25,838	25,838	0.47
Total	276,992	189,209	30,728	41,360	4,175	458,650	246,756	4,261,247	28,924	5,538,041	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

ABPBY09020 **EVENING GROSBEAK** ***Coccothraustes vespertinus*** **%Status 1 & 2: 15.87**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	452,563	3,059	156,156	890	NA	29,749	NA	640	NA	643,057	11.77
Status 2	144,513	11,610	2,052	23,067	NA	1,051	21,045	20,995	NA	224,334	4.11
Status 3	2,437,024	195,432	5	678	3,048	208,431	184,158	0	NA	3,028,776	55.43
Status 4	NA	NA	NA	NA	NA	NA	37	1,560,705	61	1,560,803	28.57
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,960	6,960	0.13
Total	3,034,100	210,101	158,212	24,635	3,048	239,231	205,241	1,582,340	7,021	5,463,931	100

ABPBZ01010 **HOUSE SPARROW** ***Passer domesticus*** **%Status 1 & 2: 0.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,164	111	14,960	1,897	NA	0	NA	227	NA	20,359	0.32
Status 2	2,040	414	156	4,440	NA	332	5,945	8,835	NA	22,162	0.35
Status 3	57,794	35,496	67	2,067	4,078	305,274	252,729	0	NA	657,505	10.28
Status 4	NA	NA	NA	NA	NA	NA	62	5,669,002	2,186	5,671,250	88.66
Water	NA	NA	NA	NA	NA	NA	NA	NA	25,595	25,595	0.40
Total	62,997	36,021	15,183	8,405	4,078	305,606	258,736	5,678,064	27,781	6,396,871	100

AMABA01010 **MASKED SHREW** ***Sorex cinereus*** **%Status 1 & 2: 12.01**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	673,114	4,636	226,456	10,207	NA	43,704	NA	2,184	NA	960,300	8.74
Status 2	181,455	20,591	9,261	10,811	NA	4,880	50,102	81,767	NA	358,867	3.27
Status 3	3,201,409	572,493	63	6,459	6,448	518,310	588,586	16	NA	4,893,784	44.56
Status 4	NA	NA	NA	NA	NA	NA	27	4,749,338	54	4,749,419	43.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	19,527	19,527	0.18
Total	4,055,979	597,720	235,780	27,477	6,448	566,894	638,714	4,833,305	19,581	10,981,895	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMABA01030 **PREBLE'S SHREW** ***Sorex preblei*** **%Status 1 & 2: 6.50**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	4,798	0	625	2,007	NA	0	NA	0	NA	7,431	1.48
Status 2	276	62	0	22,656	NA	0	1,954	278	NA	25,225	5.02
Status 3	15,547	116,720	0	2	1	31,055	31,899	0	NA	195,225	38.85
Status 4	NA	NA	NA	NA	NA	NA	0	273,670	0	273,670	54.47
Water	NA	NA	NA	NA	NA	NA	NA	NA	914	914	0.18
Total	20,622	116,782	625	24,665	1	31,055	33,852	273,948	914	502,464	100

AMABA01070 **VAGRANT SHREW** ***Sorex vagrans*** **%Status 1 & 2: 12.78**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	184,475	1,187	70,463	4,676	NA	11,208	NA	487	NA	272,495	9.44
Status 2	47,032	4,486	1,642	3,394	NA	1,741	14,315	23,936	NA	96,545	3.34
Status 3	776,212	80,713	13	1,987	2,169	141,186	134,109	1	NA	1,136,390	39.36
Status 4	NA	NA	NA	NA	NA	NA	11	1,363,286	19	1,363,316	47.22
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,721	18,721	0.65
Total	1,007,719	86,386	72,118	10,057	2,169	154,135	148,436	1,387,709	18,739	2,887,467	100

AMABA01080 **DUSKY OR MONTANE SHREW** ***Sorex monticolus*** **%Status 1 & 2: 25.13**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	574,934	1,402	193,605	3,805	NA	36,242	NA	182	NA	810,171	20.77
Status 2	133,069	7,521	2,049	2,050	NA	3,934	11,203	9,970	NA	169,797	4.36
Status 3	1,808,953	45,355	0	650	3,419	127,981	113,935	0	NA	2,100,292	53.85
Status 4	NA	NA	NA	NA	NA	NA	9	810,244	6	810,259	20.78
Water	NA	NA	NA	NA	NA	NA	NA	NA	9,483	9,483	0.24
Total	2,516,956	54,278	195,655	6,505	3,419	168,157	125,147	820,396	9,490	3,900,002	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMABA01130 DWARF SHREW ***Sorex nanus*** **%Status 1 & 2: 34.07**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	52,892	0	0	120	NA	0	NA	0	NA	53,012	32.62
Status 2	1,656	335	0	365	NA	0	5	5	NA	2,364	1.46
Status 3	45,067	5,383	0	30	0	2,121	3,945	0	NA	56,546	34.79
Status 4	NA	NA	NA	NA	NA	NA	0	49,984	0	49,984	30.75
Water	NA	NA	NA	NA	NA	NA	NA	NA	627	627	0.39
Total	99,615	5,718	0	514	0	2,121	3,950	49,989	627	162,534	100

AMABA01150 WATER SHREW ***Sorex palustris*** **%Status 1 & 2: 12.05**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	107,661	642	41,850	2,911	NA	5,962	NA	220	NA	159,245	8.76
Status 2	25,355	3,924	2,487	3,013	NA	1,012	8,753	15,392	NA	59,934	3.30
Status 3	391,155	76,824	8	1,192	1,218	69,121	85,152	6	NA	624,675	34.35
Status 4	NA	NA	NA	NA	NA	NA	5	921,882	11	921,898	50.70
Water	NA	NA	NA	NA	NA	NA	NA	NA	52,702	52,702	2.90
Total	524,170	81,389	44,345	7,116	1,218	76,095	93,910	937,499	52,713	1,818,455	100

AMABA01230 MERRIAM'S SHREW ***Sorex merriami*** **%Status 1 & 2: 1.40**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	529	0	269	1,043	NA	0	NA	0	NA	1,841	0.03
Status 2	228	31,388	9,798	37,894	NA	0	3,706	14,153	NA	97,168	1.37
Status 3	193,894	840,618	0	4,357	15,903	590,688	459,443	0	NA	2,104,902	29.67
Status 4	NA	NA	NA	NA	NA	NA	0	4,880,731	98	4,880,829	68.81
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,749	8,749	0.12
Total	194,651	872,006	10,067	43,295	15,903	590,688	463,148	4,894,884	8,847	7,093,489	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMABA01250 **PYGMY SHREW** ***Sorex hoyi*** **%Status 1 & 2: 18.46**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	28,079	0	93,420	164	NA	4,099	NA	135	NA	125,897	17.26
Status 2	5,250	0	1,206	0	NA	1,858	173	232	NA	8,720	1.20
Status 3	394,712	8	0	159	2	17,185	49,231	0	NA	461,297	63.24
Status 4	NA	NA	NA	NA	NA	NA	0	132,592	0	132,592	18.18
Water	NA	NA	NA	NA	NA	NA	NA	NA	955	955	0.13
Total	428,040	8	94,626	323	2	23,142	49,404	132,960	955	729,460	100

AMABA01280 **HAYDEN'S SHREW** ***Sorex haydeni*** **%Status 1 & 2: 1.20**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	701	2,522	189	7,295	NA	0	NA	409	NA	11,116	0.10
Status 2	342	15,078	3,641	82,076	NA	0	5,750	17,705	NA	124,592	1.10
Status 3	129,714	1,339,462	0	9,739	10,598	750,762	881,999	0	NA	3,122,275	27.52
Status 4	NA	NA	NA	NA	NA	NA	0	8,052,217	1,847	8,054,063	70.98
Water	NA	NA	NA	NA	NA	NA	NA	NA	35,403	35,403	0.31
Total	130,757	1,357,063	3,830	99,110	10,598	750,762	887,749	8,070,331	37,249	11,347,449	100

AMACC01010 **LITTLE BROWN MYOTIS** ***Myotis lucifugus*** **%Status 1 & 2: 5.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	637,061	7,360	229,154	17,315	NA	35,848	NA	4,476	NA	931,215	3.58
Status 2	183,118	25,308	6,230	135,606	NA	1,776	61,231	102,720	NA	515,989	1.98
Status 3	3,218,554	1,555,463	67	13,052	17,938	1,579,191	1,456,861	1	NA	7,841,127	30.12
Status 4	NA	NA	NA	NA	NA	NA	57	16,368,436	4,261	16,372,754	62.89
Water	NA	NA	NA	NA	NA	NA	NA	NA	372,458	372,458	1.43
Total	4,038,732	1,588,131	235,451	165,973	17,938	1,616,816	1,518,149	16,475,633	376,720	26,033,542	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMACC01020 YUMA MYOTIS *Myotis yumanensis* **%Status 1 & 2: 9.96**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	25,468	2	15,891	222	NA	3,532	NA	92	NA	45,208	6.53
Status 2	9,881	113	553	1,760	NA	558	6,282	4,666	NA	23,813	3.44
Status 3	162,088	7,097	0	744	438	30,085	29,956	0	NA	230,409	33.26
Status 4	NA	NA	NA	NA	NA	NA	7	353,868	0	353,875	51.08
Water	NA	NA	NA	NA	NA	NA	NA	NA	39,436	39,436	5.69
Total	197,438	7,212	16,444	2,726	438	34,176	36,246	358,626	39,436	692,742	100

AMACC01070 LONG-EARED MYOTIS *Myotis evotis* **%Status 1 & 2: 10.48**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	897,529	9,064	303,449	12,731	NA	60,594	NA	2,673	NA	1,286,039	6.98
Status 2	250,691	56,152	10,257	211,860	NA	5,379	52,472	59,095	NA	645,906	3.51
Status 3	4,422,660	1,650,608	5	4,715	19,591	866,529	830,584	15	NA	7,794,707	42.28
Status 4	NA	NA	NA	NA	NA	NA	17	8,646,505	3,370	8,649,892	46.92
Water	NA	NA	NA	NA	NA	NA	NA	NA	59,208	59,208	0.32
Total	5,570,880	1,715,824	313,711	229,305	19,591	932,502	883,073	8,708,289	62,578	18,435,752	100

AMACC01090 FRINGED MYOTIS *Myotis thysanodes* **%Status 1 & 2: 7.92**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	127,210	2,318	7,293	5,926	NA	11,103	NA	28	NA	153,878	3.30
Status 2	89,886	7,940	0	7,395	NA	852	36,538	72,642	NA	215,253	4.62
Status 3	1,339,375	454,607	0	1,186	1,658	22,829	318,940	16	NA	2,138,611	45.88
Status 4	NA	NA	NA	NA	NA	NA	0	2,148,941	0	2,148,941	46.10
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,517	4,517	0.10
Total	1,556,470	464,865	7,293	14,507	1,658	34,785	355,478	2,221,626	4,517	4,661,200	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMACC01110 LONG-LEGGED MYOTIS ***Myotis volans*** **%Status 1 & 2: 14.49**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	976,760	5,639	306,553	7,019	NA	61,097	NA	1,905	NA	1,358,973	11.10
Status 2	258,171	22,466	3,047	47,694	NA	5,307	38,035	41,197	NA	415,918	3.40
Status 3	4,201,147	374,044	5	3,221	10,161	511,208	416,422	0	NA	5,516,209	45.04
Status 4	NA	NA	NA	NA	NA	NA	42	4,915,220	2,993	4,918,255	40.16
Water	NA	NA	NA	NA	NA	NA	NA	NA	38,584	38,584	0.32
Total	5,436,078	402,150	309,605	57,934	10,161	577,613	454,499	4,958,323	41,577	12,247,939	100

AMACC01120 CALIFORNIA MYOTIS ***Myotis californicus*** **%Status 1 & 2: 3.81**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	14,240	6	1,045	300	NA	2,693	NA	326	NA	18,610	0.96
Status 2	9,445	2,800	234	5,436	NA	637	20,910	15,503	NA	54,967	2.84
Status 3	199,510	102,326	0	1,519	1,093	33,225	135,236	0	NA	472,909	24.47
Status 4	NA	NA	NA	NA	NA	NA	46	1,381,694	0	1,381,740	71.50
Water	NA	NA	NA	NA	NA	NA	NA	NA	4,243	4,243	0.22
Total	223,196	105,132	1,279	7,254	1,093	36,555	156,192	1,397,524	4,243	1,932,468	100

AMACC01140 WESTERN SMALL-FOOTED MYOTIS ***Myotis ciliolabrum*** **%Status 1 & 2: 2.93**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	46,759	4,772	9,922	13,613	NA	4,139	NA	3,050	NA	82,255	0.48
Status 2	13,045	48,327	10,485	224,555	NA	550	39,160	85,270	NA	421,393	2.45
Status 3	708,402	2,251,312	66	9,402	17,582	1,070,133	1,272,245	16	NA	5,329,158	30.94
Status 4	NA	NA	NA	NA	NA	NA	0	11,351,398	313	11,351,711	65.91
Water	NA	NA	NA	NA	NA	NA	NA	NA	37,846	37,846	0.22
Total	768,206	2,304,410	20,474	247,571	17,582	1,074,822	1,311,405	11,439,734	38,159	17,222,362	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMACC01150 **NORTHERN MYOTIS** ***Myotis septentrionalis*** **%Status 1 & 2: 0.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	264	5	4	NA	0	NA	0	NA	273	0.21
Status 2	0	0	0	220	NA	0	231	0	NA	450	0.35
Status 3	26	30,606	0	22	1	3,196	10,748	0	NA	44,599	34.57
Status 4	NA	NA	NA	NA	NA	NA	0	81,347	905	82,252	63.76
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,431	1,431	1.11
Total	26	30,870	5	245	1	3,196	10,979	81,347	2,336	129,005	100

AMACC02010 **SILVER-HAIRED BAT** ***Lasionycteris noctivagans*** **%Status 1 & 2: 14.23**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	832,192	5,097	268,283	3,971	NA	57,948	NA	1,700	NA	1,169,191	10.77
Status 2	230,477	21,777	2,779	44,008	NA	5,261	35,150	35,757	NA	375,209	3.46
Status 3	3,996,820	329,413	5	2,123	7,632	418,185	368,875	0	NA	5,123,052	47.20
Status 4	NA	NA	NA	NA	NA	NA	41	4,161,318	2,343	4,163,702	38.36
Water	NA	NA	NA	NA	NA	NA	NA	NA	22,432	22,432	0.21
Total	5,059,489	356,287	271,067	50,102	7,632	481,394	404,066	4,198,774	24,775	10,853,587	100

AMACC04010 **BIG BROWN BAT** ***Eptesicus fuscus*** **%Status 1 & 2: 5.92**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	523,953	7,262	186,366	12,992	NA	40,429	NA	4,218	NA	775,219	3.69
Status 2	163,827	23,841	3,487	122,945	NA	5,166	53,990	95,626	NA	468,881	2.23
Status 3	3,245,545	1,529,683	67	11,157	14,897	1,288,049	1,270,110	1	NA	7,359,509	35.02
Status 4	NA	NA	NA	NA	NA	NA	56	12,365,033	2,841	12,367,930	58.85
Water	NA	NA	NA	NA	NA	NA	NA	NA	44,176	44,176	0.21
Total	3,933,325	1,560,786	189,920	147,094	14,897	1,333,644	1,324,156	12,464,878	47,017	21,015,716	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMACC05030 **HOARY BAT** ***Lasiurus cinereus*** **%Status 1 & 2: 12.41**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	841,801	5,394	284,902	7,049	NA	57,853	NA	1,776	NA	1,198,776	9.06
Status 2	234,116	26,709	6,372	82,178	NA	5,262	43,398	45,452	NA	443,486	3.35
Status 3	4,149,948	871,070	5	3,051	10,141	525,104	553,861	15	NA	6,113,195	46.20
Status 4	NA	NA	NA	NA	NA	NA	41	5,443,849	2,607	5,446,497	41.16
Water	NA	NA	NA	NA	NA	NA	NA	NA	30,825	30,825	0.23
Total	5,225,865	903,173	291,279	92,278	10,141	588,218	597,300	5,491,092	33,432	13,232,779	100

AMACC07010 **SPOTTED BAT** ***Euderma maculatum*** **%Status 1 & 2: 1.13**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	464	0	0	0	NA	0	NA	0	NA	464	0.03
Status 2	293	6,316	10,460	124	NA	0	77	554	NA	17,823	1.10
Status 3	114,319	129,306	0	3,692	0	263,627	83,015	0	NA	593,960	36.57
Status 4	NA	NA	NA	NA	NA	NA	0	1,009,499	23	1,009,522	62.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,493	2,493	0.15
Total	115,077	135,622	10,460	3,816	0	263,627	83,092	1,010,053	2,516	1,624,262	100

AMACC08010 **TOWNSEND'S BIG-EARED BAT** ***Corynorhinus townsendii*** **%Status 1 & 2: 12.90**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	966,349	8,441	303,025	8,852	NA	47,440	NA	2,189	NA	1,336,297	9.35
Status 2	237,148	48,417	5,249	140,173	NA	879	38,776	37,895	NA	508,537	3.56
Status 3	3,368,055	932,183	5	2,151	15,733	570,555	544,998	0	NA	5,433,681	38.00
Status 4	NA	NA	NA	NA	NA	NA	10	6,980,272	1,480	6,981,761	48.82
Water	NA	NA	NA	NA	NA	NA	NA	NA	39,882	39,882	0.28
Total	4,571,552	989,041	308,279	151,177	15,733	618,874	583,784	7,020,355	41,362	14,300,158	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMACC10010 **PALLID BAT** ***Antrozous pallidus*** **%Status 1 & 2: 1.26**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	162	0	0	0	NA	0	NA	0	NA	162	0.02
Status 2	117	3,920	5,739	24	NA	0	23	394	NA	10,218	1.24
Status 3	30,232	64,044	0	2,934	0	110,632	40,003	0	NA	247,845	30.06
Status 4	NA	NA	NA	NA	NA	NA	0	565,651	8	565,659	68.60
Water	NA	NA	NA	NA	NA	NA	NA	NA	680	680	0.08
Total	30,511	67,965	5,739	2,958	0	110,632	40,027	566,045	689	824,565	100

AMAEA01020 **AMERICAN PIKA** ***Ochotona princeps*** **%Status 1 & 2: 42.14**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	689,412	1,351	213,068	510	NA	27,110	NA	46	NA	931,498	36.36
Status 2	128,877	8,132	538	245	NA	28	7,765	2,587	NA	148,171	5.78
Status 3	1,204,144	28,971	0	53	3,242	34,504	33,104	0	NA	1,304,018	50.90
Status 4	NA	NA	NA	NA	NA	NA	2	175,247	0	175,249	6.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,217	3,217	0.13
Total	2,022,433	38,454	213,606	808	3,242	61,642	40,872	177,880	3,217	2,562,153	100

AMAEB01040 **EASTERN COTTONTAIL** ***Sylvilagus floridanus*** **%Status 1 & 2: 0.11**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	0	NA	0	NA	0	NA	0	0.00
Status 2	0	0	0	53	NA	0	235	0	NA	288	0.11
Status 3	4,605	60,868	0	0	0	0	18,367	0	NA	83,840	30.72
Status 4	NA	NA	NA	NA	NA	NA	0	187,927	0	187,927	68.85
Water	NA	NA	NA	NA	NA	NA	NA	NA	889	889	0.33
Total	4,605	60,868	0	53	0	0	18,602	187,927	889	272,945	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAEB01060 **MOUNTAIN COTTONTAIL** ***Sylvilagus nuttallii*** **%Status 1 & 2: 5.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	99,038	3,984	21,164	9,705	NA	8,751	NA	1,136	NA	143,779	1.55
Status 2	33,611	30,191	7,016	190,292	NA	321	24,632	36,571	NA	322,634	3.48
Status 3	771,441	1,216,571	0	3,814	12,357	653,311	547,950	15	NA	3,205,459	34.62
Status 4	NA	NA	NA	NA	NA	NA	6	5,549,672	1,811	5,551,490	59.96
Water	NA	NA	NA	NA	NA	NA	NA	NA	35,525	35,525	0.38
Total	904,090	1,250,747	28,181	203,811	12,357	662,383	572,588	5,587,395	37,336	9,258,887	100

AMAEB01070 **DESERT COTTONTAIL** ***Sylvilagus audubonii*** **%Status 1 & 2: 2.41**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	502	4,380	254	8,933	NA	0	NA	2,509	NA	16,578	0.12
Status 2	254	46,287	10,571	234,067	NA	0	8,904	18,003	NA	318,086	2.29
Status 3	126,245	2,126,518	0	7,318	20,939	773,238	987,431	0	NA	4,041,689	29.13
Status 4	NA	NA	NA	NA	NA	NA	0	9,452,775	1,794	9,454,569	68.15
Water	NA	NA	NA	NA	NA	NA	NA	NA	42,869	42,869	0.31
Total	127,001	2,177,185	10,825	250,318	20,939	773,238	996,336	9,473,287	44,663	13,873,791	100

AMAEB03010 **SNOWSHOE HARE** ***Lepus americanus*** **%Status 1 & 2: 20.95**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	906,776	5,268	295,448	3,451	NA	55,124	NA	607	NA	1,266,674	16.76
Status 2	240,801	12,329	2,547	4,360	NA	4,759	28,369	22,922	NA	316,086	4.18
Status 3	3,675,177	165,958	1	1,371	4,483	249,833	223,174	0	NA	4,319,996	57.17
Status 4	NA	NA	NA	NA	NA	NA	15	1,638,374	1,469	1,639,859	21.70
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,709	13,709	0.18
Total	4,822,754	183,556	297,996	9,181	4,483	309,716	251,558	1,661,903	15,179	7,556,324	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAEB03040 **WHITE-TAILED JACKRABBIT** ***Lepus townsendii*** **%Status 1 & 2: 2.40**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	59,405	5,005	9,849	15,661	NA	757	NA	3,198	NA	93,874	0.43
Status 2	14,343	49,865	8,595	237,308	NA	395	36,390	79,011	NA	425,907	1.97
Status 3	428,725	2,671,076	62	12,349	21,294	1,248,445	1,543,280	16	NA	5,925,248	27.41
Status 4	NA	NA	NA	NA	NA	NA	15	15,129,989	888	15,130,891	69.99
Water	NA	NA	NA	NA	NA	NA	NA	NA	43,457	43,457	0.20
Total	502,473	2,725,946	18,506	265,318	21,294	1,249,597	1,579,685	15,212,214	44,344	21,619,376	100

AMAEB03050 **BLACK-TAILED JACKRABBIT** ***Lepus californicus*** **%Status 1 & 2: 1.74**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	630	0	724	5,259	NA	0	NA	16	NA	6,629	0.79
Status 2	1,190	213	0	2,256	NA	0	3,730	573	NA	7,961	0.95
Status 3	84,981	246,881	0	0	37	0	118,043	16	NA	449,958	53.82
Status 4	NA	NA	NA	NA	NA	NA	0	369,932	0	369,932	44.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,552	1,552	0.19
Total	86,801	247,094	724	7,514	37	0	121,773	370,537	1,552	836,033	100

AMAEB04010 **PYGMY RABBIT** ***Brachylagus idahoensis*** **%Status 1 & 2: 2.38**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	272	0	537	2,330	NA	0	NA	2	NA	3,141	0.56
Status 2	1,240	89	0	1,113	NA	0	6,091	1,802	NA	10,336	1.83
Status 3	71,288	173,901	0	0	8	0	74,663	15	NA	319,875	56.53
Status 4	NA	NA	NA	NA	NA	NA	0	232,029	0	232,029	41.01
Water	NA	NA	NA	NA	NA	NA	NA	NA	466	466	0.08
Total	72,800	173,990	537	3,443	8	0	80,754	233,849	466	565,847	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFB02020 **LEAST CHIPMUNK** ***Tamias minimus*** **%Status 1 & 2: 5.48**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	31,797	2,219	7,093	4,737	NA	0	NA	2	NA	45,848	0.83
Status 2	4,418	38,030	7,365	181,358	NA	0	8,300	15,971	NA	255,442	4.64
Status 3	261,091	1,064,435	4	1,520	10,664	260,694	368,774	15	NA	1,967,197	35.76
Status 4	NA	NA	NA	NA	NA	NA	0	3,216,368	87	3,216,455	58.46
Water	NA	NA	NA	NA	NA	NA	NA	NA	16,830	16,830	0.31
Total	297,306	1,104,684	14,463	187,615	10,664	260,694	377,074	3,232,357	16,917	5,501,772	100

AMAFB02030 **YELLOW-PINE CHIPMUNK** ***Tamias amoenus*** **%Status 1 & 2: 16.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	562,493	3,808	140,890	3,179	NA	25,650	NA	316	NA	736,336	12.20
Status 2	155,482	6,847	334	3,149	NA	926	29,476	35,939	NA	232,152	3.84
Status 3	2,407,280	372,479	5	1,282	2,058	117,653	256,068	15	NA	3,156,840	52.28
Status 4	NA	NA	NA	NA	NA	NA	8	1,905,682	0	1,905,690	31.56
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,116	7,116	0.12
Total	3,125,255	383,133	141,228	7,611	2,058	144,229	285,552	1,941,952	7,116	6,038,135	100

AMAFB02130 **RED-TAILED CHIPMUNK** ***Tamias ruficaudus*** **%Status 1 & 2: 21.50**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	564,282	3,593	247,811	2,764	NA	49,685	NA	542	NA	868,677	16.91
Status 2	189,129	10,031	2,040	2,893	NA	4,638	20,283	6,530	NA	235,545	4.59
Status 3	2,533,734	89,513	0	996	3,886	168,555	177,349	0	NA	2,974,034	57.90
Status 4	NA	NA	NA	NA	NA	NA	13	1,052,651	0	1,052,664	20.49
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,036	6,036	0.12
Total	3,287,144	103,137	249,852	6,653	3,886	222,879	197,645	1,059,723	6,036	5,136,957	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFB02190 **UINTA CHIPMUNK** ***Tamias umbrinus*** **%Status 1 & 2: 57.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	199,806	0	24,775	0	NA	0	NA	0	NA	224,581	53.42
Status 2	11,618	23	0	0	NA	0	2,532	961	NA	15,135	3.60
Status 3	145,567	441	0	0	0	0	923	0	NA	146,931	34.95
Status 4	NA	NA	NA	NA	NA	NA	0	33,560	0	33,560	7.98
Water	NA	NA	NA	NA	NA	NA	NA	NA	222	222	0.05
Total	356,990	465	24,775	0	0	0	3,455	34,521	222	420,428	100

AMAFB03020 **YELLOW-BELLIED MARMOT** ***Marmota flaviventris*** **%Status 1 & 2: 23.45**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	524,993	2,378	125,743	1,944	NA	32,278	NA	250	NA	687,585	17.82
Status 2	125,193	17,105	422	44,034	NA	293	14,731	15,315	NA	217,092	5.63
Status 3	1,485,914	178,581	4	381	5,033	109,626	120,892	0	NA	1,900,431	49.26
Status 4	NA	NA	NA	NA	NA	NA	2	1,043,670	30	1,043,702	27.05
Water	NA	NA	NA	NA	NA	NA	NA	NA	9,009	9,009	0.23
Total	2,136,100	198,064	126,169	46,359	5,033	142,197	135,625	1,059,235	9,039	3,857,820	100

AMAFB03040 **HOARY MARMOT** ***Marmota caligata*** **%Status 1 & 2: 47.41**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	440,909	2,010	206,495	0	NA	31,366	NA	46	NA	680,825	40.99
Status 2	99,660	18	341	33	NA	28	6,222	294	NA	106,596	6.42
Status 3	756,795	1,891	0	23	36	23,719	24,220	0	NA	806,685	48.56
Status 4	NA	NA	NA	NA	NA	NA	2	65,190	0	65,192	3.93
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,764	1,764	0.11
Total	1,297,364	3,919	206,836	56	36	55,113	30,444	65,530	1,764	1,661,062	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFB05040 **RICHARDSON'S GROUND SQUIRREL** ***Spermophilus richardsonii*** **%Status 1 & 2: 1.87**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,570	1,119	2,740	6,129	NA	0	NA	2,944	NA	16,502	0.20
Status 2	2,060	20,910	11	38,898	NA	0	16,275	57,477	NA	135,630	1.66
Status 3	93,092	1,041,105	62	9,528	902	568,516	716,559	0	NA	2,429,764	29.79
Status 4	NA	NA	NA	NA	NA	NA	0	5,558,424	409	5,558,833	68.14
Water	NA	NA	NA	NA	NA	NA	NA	NA	17,090	17,090	0.21
Total	98,721	1,063,135	2,814	54,555	902	568,516	732,834	5,618,844	17,499	8,157,820	100

AMAFB05050 **UINTA GROUND SQUIRREL** ***Spermophilus armatus*** **%Status 1 & 2: 13.95**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	26,206	296	3,575	1,005	NA	0	NA	0	NA	31,081	8.37
Status 2	10,346	2,252	0	282	NA	0	2,581	5,241	NA	20,702	5.57
Status 3	158,898	43,178	4	0	1,924	0	22,626	0	NA	226,629	61.03
Status 4	NA	NA	NA	NA	NA	NA	0	92,572	0	92,572	24.93
Water	NA	NA	NA	NA	NA	NA	NA	NA	377	377	0.10
Total	195,450	45,725	3,579	1,287	1,924	0	25,207	97,812	377	371,362	100

AMAFB05070 **COLUMBIAN GROUND SQUIRREL** ***Spermophilus columbianus*** **%Status 1 & 2: 7.58**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	67,546	1,285	20,009	0	NA	4,856	NA	2,402	NA	96,098	4.26
Status 2	22,649	2,315	9	3,370	NA	395	22,093	24,332	NA	75,162	3.33
Status 3	220,015	113,969	0	1,013	646	168,685	151,976	0	NA	656,303	29.06
Status 4	NA	NA	NA	NA	NA	NA	15	1,428,363	0	1,428,377	63.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,236	2,236	0.10
Total	310,210	117,570	20,018	4,382	646	173,936	174,084	1,455,097	2,236	2,258,177	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFB05090 **THIRTEEN-LINED GROUND SQUIRREL** ***Spermophilus tridecemlineatus*** **%Status 1 & 2: 1.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,169	4,559	1,333	10,519	NA	0	NA	3,412	NA	20,993	0.12
Status 2	621	35,271	2,688	201,121	NA	0	13,634	16,374	NA	269,710	1.51
Status 3	142,637	1,869,610	0	12,522	18,868	1,325,581	1,201,006	0	NA	4,570,224	25.63
Status 4	NA	NA	NA	NA	NA	NA	0	12,916,605	1,861	12,918,466	72.46
Water	NA	NA	NA	NA	NA	NA	NA	NA	49,692	49,692	0.28
Total	144,427	1,909,441	4,022	224,162	18,868	1,325,581	1,214,640	12,936,391	51,553	17,829,084	100

AMAFB05170 **GOLDEN-MANTLED GROUND SQUIRREL** ***Spermophilus lateralis*** **%Status 1 & 2: 25.10**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	383,479	2,846	137,528	1,073	NA	15,539	NA	240	NA	540,706	20.19
Status 2	88,183	5,165	2,630	2,112	NA	236	17,647	15,637	NA	131,610	4.91
Status 3	887,201	82,691	5	671	2,424	96,025	86,387	0	NA	1,155,405	43.14
Status 4	NA	NA	NA	NA	NA	NA	11	846,846	71	846,929	31.62
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,830	3,830	0.14
Total	1,358,863	90,703	140,163	3,856	2,424	111,799	104,046	862,723	3,901	2,678,480	100

AMAFB05190 **WYOMING GROUND SQUIRREL** ***Spermophilus elegans*** **%Status 1 & 2: 6.18**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	14,591	762	2,435	6,251	NA	0	NA	0	NA	24,038	1.54
Status 2	12,958	1,679	0	2,529	NA	0	16,631	38,765	NA	72,562	4.64
Status 3	256,440	303,498	0	66	1,886	0	179,355	16	NA	741,261	47.44
Status 4	NA	NA	NA	NA	NA	NA	0	722,561	0	722,561	46.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,002	2,002	0.13
Total	283,989	305,939	2,435	8,845	1,886	0	195,986	761,342	2,002	1,562,425	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFB06010 **BLACK-TAILED PRAIRIE DOG** ***Cynomys ludovicianus*** **%Status 1 & 2: 1.04**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	84	2,100	156	5,428	NA	0	NA	2,158	NA	9,927	0.10
Status 2	177	6,900	1,461	60,601	NA	0	8,806	19,597	NA	97,543	0.95
Status 3	73,269	1,306,128	0	7,326	9,132	610,721	853,133	0	NA	2,859,707	27.71
Status 4	NA	NA	NA	NA	NA	NA	0	7,332,682	485	7,333,167	71.07
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,415	18,415	0.18
Total	73,530	1,315,129	1,618	73,354	9,132	610,721	861,939	7,354,436	18,901	10,318,759	100

AMAFB06020 **WHITE-TAILED PRAIRIE DOG** ***Cynomys leucurus*** **%Status 1 & 2: 5.19**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	9,862	0	0	0	NA	0	NA	0	NA	9,862	3.42
Status 2	293	3,164	1,625	0	NA	0	0	0	NA	5,082	1.77
Status 3	9,592	57,669	0	0	0	15,480	11,425	0	NA	94,166	32.70
Status 4	NA	NA	NA	NA	NA	NA	0	178,759	0	178,759	62.07
Water	NA	NA	NA	NA	NA	NA	NA	NA	146	146	0.05
Total	19,747	60,833	1,625	0	0	15,480	11,425	178,759	146	288,014	100

AMAFB08010 **RED SQUIRREL** ***Tamiasciurus hudsonicus*** **%Status 1 & 2: 17.87**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	750,845	4,305	253,149	1,524	NA	53,269	NA	519	NA	1,063,612	14.02
Status 2	210,861	16,616	2,617	2,159	NA	4,959	28,323	26,532	NA	292,067	3.85
Status 3	3,746,058	209,635	5	768	4,123	285,604	247,994	0	NA	4,494,186	59.24
Status 4	NA	NA	NA	NA	NA	NA	10	1,728,380	87	1,728,476	22.78
Water	NA	NA	NA	NA	NA	NA	NA	NA	8,277	8,277	0.11
Total	4,707,764	230,557	255,771	4,451	4,123	343,831	276,327	1,755,430	8,364	7,586,618	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFB09020 **NORTHERN FLYING SQUIRREL** ***Glaucomys sabrinus*** **%Status 1 & 2: 20.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	727,192	3,408	211,942	1,963	NA	47,805	NA	437	NA	992,747	16.41
Status 2	195,165	10,576	1,575	1,124	NA	4,821	22,871	19,674	NA	255,807	4.23
Status 3	3,353,454	122,655	0	456	4,308	127,612	185,842	0	NA	3,794,326	62.71
Status 4	NA	NA	NA	NA	NA	NA	3	1,001,420	0	1,001,423	16.55
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,420	6,420	0.11
Total	4,275,811	136,640	213,517	3,543	4,308	180,238	208,716	1,021,531	6,420	6,050,723	100

AMAFC01040 **NORTHERN POCKET GOPHER** ***Thomomys talpoides*** **%Status 1 & 2: 4.54**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	343,599	7,275	89,577	16,239	NA	16,282	NA	4,794	NA	477,766	2.12
Status 2	97,989	45,714	8,514	237,358	NA	608	54,344	98,037	NA	542,563	2.41
Status 3	1,763,315	2,636,569	66	13,924	21,420	1,404,958	1,565,057	16	NA	7,405,325	32.93
Status 4	NA	NA	NA	NA	NA	NA	18	14,017,158	767	14,017,943	62.34
Water	NA	NA	NA	NA	NA	NA	NA	NA	42,082	42,082	0.19
Total	2,204,903	2,689,557	98,157	267,520	21,420	1,421,848	1,619,418	14,120,005	42,849	22,485,680	100

AMAFC01070 **IDAHO POCKET GOPHER** ***Thomomys idahoensis*** **%Status 1 & 2: 1.00**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	1,509	NA	0	NA	0	NA	1,509	0.20
Status 2	608	439	0	467	NA	0	4,161	515	NA	6,190	0.81
Status 3	79,148	229,959	0	0	0	0	119,863	16	NA	428,986	55.96
Status 4	NA	NA	NA	NA	NA	NA	0	328,458	0	328,458	42.84
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,492	1,492	0.20
Total	79,755	230,398	0	1,976	0	0	124,024	328,990	1,492	766,635	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFD01010 **OLIVE-BACKED POCKET MOUSE** ***Perognathus fasciatus*** **%Status 1 & 2: 1.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	414	2,256	205	6,057	NA	0	NA	303	NA	9,235	0.08
Status 2	228	22,051	7,705	131,239	NA	0	4,933	14,535	NA	180,692	1.58
Status 3	101,036	1,781,111	0	9,031	12,128	756,802	883,184	0	NA	3,543,292	31.01
Status 4	NA	NA	NA	NA	NA	NA	0	7,670,541	262	7,670,803	67.14
Water	NA	NA	NA	NA	NA	NA	NA	NA	21,063	21,063	0.18
Total	101,678	1,805,418	7,910	146,327	12,128	756,802	888,117	7,685,379	21,326	11,425,085	100

AMAFD01070 **GREAT BASIN POCKET MOUSE** ***Perognathus parvus*** **%Status 1 & 2: 1.32**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	2,330	NA	0	NA	0	NA	2,330	0.42
Status 2	1,599	63	0	1,113	NA	0	2,169	36	NA	4,981	0.90
Status 3	52,847	191,117	0	0	2	0	75,349	15	NA	319,330	57.56
Status 4	NA	NA	NA	NA	NA	NA	0	227,706	0	227,706	41.04
Water	NA	NA	NA	NA	NA	NA	NA	NA	439	439	0.08
Total	54,446	191,180	0	3,443	2	0	77,519	227,757	439	554,785	100

AMAFD03010 **ORD'S KANGAROO RAT** ***Dipodomys ordii*** **%Status 1 & 2: 1.62**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	360	1,895	202	5,774	NA	0	NA	303	NA	8,533	0.09
Status 2	231	5,870	9,569	127,398	NA	0	1,051	639	NA	144,758	1.53
Status 3	95,188	1,697,011	0	8,094	12,098	714,220	650,880	0	NA	3,177,491	33.54
Status 4	NA	NA	NA	NA	NA	NA	0	6,123,135	260	6,123,395	64.64
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,573	18,573	0.20
Total	95,778	1,704,776	9,770	141,265	12,098	714,220	651,932	6,124,077	18,833	9,472,749	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFD05050 **HISPID POCKET MOUSE** ***Chaetodipus hispidus*** **%Status 1 & 2: 0.02**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	0	0	NA	0	NA	0	NA	0	0.00
Status 2	0	0	0	0	NA	0	92	0	NA	92	0.02
Status 3	17,592	70,302	0	0	0	0	34,823	0	NA	122,717	29.35
Status 4	NA	NA	NA	NA	NA	NA	0	295,179	0	295,179	70.59
Water	NA	NA	NA	NA	NA	NA	NA	NA	198	198	0.05
Total	17,592	70,302	0	0	0	0	34,915	295,179	198	418,187	100

AMAFE01010 **AMERICAN BEAVER** ***Castor canadensis*** **%Status 1 & 2: 6.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	110,129	1,622	43,209	6,882	NA	6,002	NA	740	NA	168,584	4.08
Status 2	26,412	7,166	2,876	32,767	NA	1,026	11,585	20,336	NA	102,169	2.48
Status 3	420,510	279,999	8	3,373	4,698	235,335	212,178	6	NA	1,156,107	28.01
Status 4	NA	NA	NA	NA	NA	NA	6	2,559,383	2,164	2,561,553	62.07
Water	NA	NA	NA	NA	NA	NA	NA	NA	138,598	138,598	3.36
Total	557,052	288,788	46,093	43,022	4,698	242,363	223,769	2,580,465	140,763	4,127,012	100

AMAFF02030 **WESTERN HARVEST MOUSE** ***Reithrodontomys megalotis*** **%Status 1 & 2: 1.66**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	413	3,206	219	7,427	NA	0	NA	316	NA	11,581	0.08
Status 2	288	31,674	7,943	169,330	NA	0	6,131	11,928	NA	227,294	1.58
Status 3	127,244	1,987,292	0	9,942	17,789	923,326	1,045,010	0	NA	4,110,603	28.49
Status 4	NA	NA	NA	NA	NA	NA	0	10,047,131	1,648	10,048,779	69.65
Water	NA	NA	NA	NA	NA	NA	NA	NA	29,594	29,594	0.21
Total	127,945	2,022,172	8,162	186,699	17,789	923,326	1,051,141	10,059,375	31,243	14,427,850	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFF03040 **DEER MOUSE** ***Peromyscus maniculatus*** **%Status 1 & 2: 8.36**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,007,544	9,165	325,483	16,786	NA	57,278	NA	5,248	NA	1,421,505	5.68
Status 2	258,390	53,761	10,099	169,938	NA	5,369	66,485	105,490	NA	669,531	2.68
Status 3	4,373,519	2,213,518	67	12,462	18,990	1,516,183	1,491,714	1	NA	9,626,453	38.49
Status 4	NA	NA	NA	NA	NA	NA	27	13,228,144	2,234	13,230,405	52.89
Water	NA	NA	NA	NA	NA	NA	NA	NA	65,467	65,467	0.26
Total	5,639,453	2,276,443	335,649	199,186	18,990	1,578,829	1,558,225	13,338,883	67,701	25,013,364	100

AMAFF03070 **WHITE-FOOTED MOUSE** ***Peromyscus leucopus*** **%Status 1 & 2: 1.19**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	121	873	39	1,248	NA	0	NA	41	NA	2,322	0.14
Status 2	130	1,016	1,270	14,739	NA	0	929	40	NA	18,123	1.06
Status 3	27,951	207,162	0	1,608	3,511	164,992	105,519	0	NA	510,741	29.74
Status 4	NA	NA	NA	NA	NA	NA	0	1,165,835	1,641	1,167,476	67.99
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,478	18,478	1.08
Total	28,201	209,050	1,309	17,595	3,511	164,992	106,448	1,165,916	20,119	1,717,141	100

AMAFF06010 **NORTHERN GRASSHOPPER MOUSE** ***Onychomys leucogaster*** **%Status 1 & 2: 1.93**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,741	3,373	272	8,739	NA	0	NA	3,069	NA	19,195	0.13
Status 2	2,313	34,753	7,913	178,789	NA	0	15,988	26,682	NA	266,437	1.80
Status 3	184,758	2,082,542	0	9,820	17,465	1,041,943	1,116,837	0	NA	4,453,365	30.04
Status 4	NA	NA	NA	NA	NA	NA	0	10,052,871	280	10,053,151	67.82
Water	NA	NA	NA	NA	NA	NA	NA	NA	30,664	30,664	0.21
Total	190,812	2,120,668	8,185	197,348	17,465	1,041,943	1,132,825	10,082,622	30,944	14,822,812	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFF08090 **BUSHY-TAILED WOODRAT** ***Neotoma cinerea*** **%Status 1 & 2: 13.01**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	524,781	3,549	190,360	7,777	NA	24,570	NA	559	NA	751,595	8.67
Status 2	107,020	41,321	5,617	177,000	NA	262	23,054	22,198	NA	376,471	4.34
Status 3	1,445,302	1,253,175	0	2,208	13,739	377,812	442,801	15	NA	3,535,052	40.76
Status 4	NA	NA	NA	NA	NA	NA	6	3,970,211	1,371	3,971,588	45.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	39,016	39,016	0.45
Total	2,077,102	1,298,044	195,976	186,984	13,739	402,644	465,861	3,992,983	40,387	8,673,722	100

AMAFF09020 **SOUTHERN RED-BACKED VOLE** ***Clethrionomys gapperi*** **%Status 1 & 2: 21.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	912,068	4,222	294,885	3,150	NA	53,038	NA	1,839	NA	1,269,202	17.28
Status 2	239,138	12,755	2,703	2,620	NA	4,811	29,257	23,280	NA	314,564	4.28
Status 3	3,669,335	154,339	1	863	4,111	233,533	213,153	0	NA	4,275,334	58.20
Status 4	NA	NA	NA	NA	NA	NA	12	1,473,448	365	1,473,825	20.06
Water	NA	NA	NA	NA	NA	NA	NA	NA	13,288	13,288	0.18
Total	4,820,541	171,316	297,589	6,632	4,111	291,381	242,422	1,498,567	13,653	7,346,212	100

AMAFF10010 **HEATHER VOLE** ***Phenacomys intermedius*** **%Status 1 & 2: 24.79**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	808,237	3,400	261,303	4,824	NA	47,061	NA	259	NA	1,125,084	20.14
Status 2	203,032	10,224	2,304	2,015	NA	3,988	22,459	16,144	NA	260,166	4.66
Status 3	2,869,985	104,855	0	527	5,321	111,852	151,643	0	NA	3,244,183	58.07
Status 4	NA	NA	NA	NA	NA	NA	6	949,509	0	949,514	17.00
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,637	7,637	0.14
Total	3,881,254	118,479	263,606	7,366	5,321	162,902	174,108	965,912	7,637	5,586,586	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFF11010 MEADOW VOLE ***Microtus pennsylvanicus*** **%Status 1 & 2: 8.16**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	130,153	2,744	40,500	4,956	NA	7,364	NA	889	NA	186,606	5.70
Status 2	35,527	2,320	549	15,915	NA	304	10,278	15,691	NA	80,584	2.46
Status 3	469,910	151,073	0	2,018	4,248	259,918	146,639	0	NA	1,033,806	31.56
Status 4	NA	NA	NA	NA	NA	NA	6	1,947,618	1,705	1,949,328	59.51
Water	NA	NA	NA	NA	NA	NA	NA	NA	25,316	25,316	0.77
Total	635,591	156,137	41,049	22,888	4,248	267,586	156,923	1,964,197	27,021	3,275,640	100

AMAFF11020 MONTANE VOLE ***Microtus montanus*** **%Status 1 & 2: 10.06**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	437,320	3,072	48,521	9,554	NA	22,443	NA	2,561	NA	523,471	6.85
Status 2	83,473	14,127	8,302	10,085	NA	409	40,199	88,477	NA	245,073	3.21
Status 3	1,315,259	528,021	62	6,291	5,401	157,778	514,048	16	NA	2,526,877	33.06
Status 4	NA	NA	NA	NA	NA	NA	15	4,337,306	17	4,337,338	56.74
Water	NA	NA	NA	NA	NA	NA	NA	NA	10,991	10,991	0.14
Total	1,836,051	545,220	56,885	25,931	5,401	180,631	554,263	4,428,361	11,008	7,643,749	100

AMAFF11060 LONG-TAILED VOLE ***Microtus longicaudus*** **%Status 1 & 2: 7.79**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	834,336	11,228	270,456	19,992	NA	40,763	NA	5,489	NA	1,182,264	4.76
Status 2	226,383	62,117	13,710	258,920	NA	1,575	74,331	117,153	NA	754,189	3.04
Status 3	3,687,219	2,531,651	67	11,564	27,272	1,408,321	1,512,836	16	NA	9,178,947	36.95
Status 4	NA	NA	NA	NA	NA	NA	30	13,655,693	535	13,656,258	54.98
Water	NA	NA	NA	NA	NA	NA	NA	NA	68,673	68,673	0.28
Total	4,747,938	2,604,997	284,233	290,476	27,272	1,450,659	1,587,197	13,778,350	69,208	24,840,330	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFF11140 PRAIRIE VOLE ***Microtus ochrogaster*** **%Status 1 & 2: 1.63**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	691	3,540	296	10,504	NA	0	NA	543	NA	15,573	0.08
Status 2	317	35,649	8,102	204,708	NA	0	8,656	31,613	NA	289,045	1.54
Status 3	252,155	2,156,287	0	11,686	19,006	1,199,975	1,274,317	0	NA	4,913,424	26.22
Status 4	NA	NA	NA	NA	NA	NA	0	13,474,473	1,556	13,476,029	71.91
Water	NA	NA	NA	NA	NA	NA	NA	NA	45,741	45,741	0.24
Total	253,162	2,195,475	8,398	226,898	19,006	1,199,975	1,282,973	13,506,629	47,297	18,739,812	100

AMAFF11190 WATER VOLE ***Microtus richardsoni*** **%Status 1 & 2: 31.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	108,158	284	21,968	2,604	NA	3,358	NA	28	NA	136,400	25.28
Status 2	21,319	2,139	0	801	NA	0	3,186	4,095	NA	31,540	5.84
Status 3	200,357	12,084	0	7	1,193	5,549	11,696	0	NA	230,886	42.79
Status 4	NA	NA	NA	NA	NA	NA	0	138,659	0	138,659	25.70
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,088	2,088	0.39
Total	329,834	14,508	21,968	3,413	1,193	8,908	14,881	142,781	2,088	539,573	100

AMAFF13010 SAGEBRUSH VOLE ***Lemmiscus curtatus*** **%Status 1 & 2: 2.30**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	6,167	5,024	2,986	14,375	NA	0	NA	3,077	NA	31,629	0.18
Status 2	5,464	46,062	10,483	199,142	NA	0	32,920	68,805	NA	362,876	2.12
Status 3	332,538	2,577,139	62	9,850	20,286	1,055,863	1,346,826	16	NA	5,342,580	31.20
Status 4	NA	NA	NA	NA	NA	NA	0	11,349,896	287	11,350,183	66.28
Water	NA	NA	NA	NA	NA	NA	NA	NA	36,709	36,709	0.21
Total	344,170	2,628,225	13,531	223,367	20,286	1,055,863	1,379,746	11,421,794	36,996	17,123,978	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFF15010 **MUSKRAT** ***Ondatra zibethicus*** **%Status 1 & 2: 1.65**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,661	401	4,747	1,708	NA	275	NA	365	NA	9,155	0.57
Status 2	1,148	463	708	6,468	NA	227	3,728	4,771	NA	17,512	1.08
Status 3	28,551	60,406	0	1,727	1,720	128,024	68,332	0	NA	288,759	17.85
Status 4	NA	NA	NA	NA	NA	NA	3	989,925	1,957	991,885	61.30
Water	NA	NA	NA	NA	NA	NA	NA	NA	310,687	310,687	19.20
Total	31,359	61,270	5,455	9,903	1,720	128,525	72,062	995,060	312,644	1,617,998	100

AMAFF17020 **NORTHERN BOG LEMMING** ***Synaptomys borealis*** **%Status 1 & 2: 28.16**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,319	6	1,051	0	NA	53	NA	1	NA	2,430	22.76
Status 2	336	2	40	0	NA	0	150	48	NA	576	5.40
Status 3	4,216	110	0	2	0	378	163	0	NA	4,869	45.61
Status 4	NA	NA	NA	NA	NA	NA	0	2,648	0	2,648	24.80
Water	NA	NA	NA	NA	NA	NA	NA	NA	153	153	1.43
Total	5,871	119	1,090	2	0	432	313	2,696	153	10,676	100

AMAFH01010 **MEADOW JUMPING MOUSE** ***Zapus hudsonius*** **%Status 1 & 2: 0.13**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	27	2,056	0	0	NA	0	NA	0	NA	2,083	0.10
Status 2	0	0	0	84	NA	0	629	0	NA	714	0.03
Status 3	73,014	281,617	0	0	9,723	32,805	145,804	0	NA	542,963	25.43
Status 4	NA	NA	NA	NA	NA	NA	0	1,586,792	0	1,586,792	74.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,224	2,224	0.10
Total	73,041	283,673	0	84	9,723	32,805	146,433	1,586,792	2,224	2,134,775	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAFH01020 **WESTERN JUMPING MOUSE** ***Zapus princeps*** **%Status 1 & 2: 10.19**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	210,797	1,368	76,653	7,898	NA	12,412	NA	1,322	NA	310,450	7.07
Status 2	52,978	7,269	2,612	23,965	NA	1,833	17,421	31,132	NA	137,210	3.12
Status 3	853,040	216,761	17	3,753	2,544	256,429	231,307	1	NA	1,563,852	35.60
Status 4	NA	NA	NA	NA	NA	NA	11	2,335,229	1,698	2,336,938	53.20
Water	NA	NA	NA	NA	NA	NA	NA	NA	44,680	44,680	1.02
Total	1,116,815	225,398	79,282	35,617	2,544	270,674	248,739	2,367,683	46,377	4,393,129	100

AMAFJ01010 **COMMON PORCUPINE** ***Erethizon dorsatum*** **%Status 1 & 2: 13.50**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	989,311	6,908	317,978	9,400	NA	59,098	NA	2,601	NA	1,385,295	9.93
Status 2	262,704	27,571	8,725	95,797	NA	5,103	46,778	50,810	NA	497,487	3.57
Status 3	4,345,113	996,963	5	3,975	9,859	741,034	600,351	15	NA	6,697,316	48.02
Status 4	NA	NA	NA	NA	NA	NA	15	5,317,518	2,103	5,319,636	38.14
Water	NA	NA	NA	NA	NA	NA	NA	NA	46,420	46,420	0.33
Total	5,597,128	1,031,441	326,707	109,173	9,859	805,235	647,145	5,370,944	48,523	13,946,154	100

AMAJA01010 **COYOTE** ***Canis latrans*** **%Status 1 & 2: 5.81**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	835,509	11,232	270,602	23,158	NA	40,775	NA	5,943	NA	1,187,220	3.44
Status 2	226,885	67,232	13,732	302,311	NA	1,921	79,447	124,879	NA	816,408	2.37
Status 3	3,730,540	3,082,709	67	17,951	28,847	1,941,100	2,037,192	16	NA	10,838,424	31.43
Status 4	NA	NA	NA	NA	NA	NA	32	21,552,998	4,318	21,557,348	62.51
Water	NA	NA	NA	NA	NA	NA	NA	NA	88,923	88,923	0.26
Total	4,792,934	3,161,174	284,402	343,420	28,847	1,983,797	2,116,671	21,683,836	93,242	34,488,324	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAJA01030 **GRAY WOLF** ***Canis lupus*** **%Status 1 & 2: 20.50**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,130,170	4,939	357,540	11,115	NA	64,274	NA	5,467	NA	1,573,505	16.39
Status 2	267,293	9,891	2,573	11,194	NA	5,442	42,382	56,243	NA	395,018	4.11
Status 3	3,541,460	364,833	67	2,166	5,802	432,960	452,086	16	NA	4,799,390	49.98
Status 4	NA	NA	NA	NA	NA	NA	30	2,820,171	0	2,820,200	29.37
Water	NA	NA	NA	NA	NA	NA	NA	NA	14,731	14,731	0.15
Total	4,938,922	379,663	360,181	24,475	5,802	502,675	494,498	2,881,897	14,731	9,602,843	100

AMAJA03010 **RED FOX** ***Vulpes vulpes*** **%Status 1 & 2: 2.31**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	109,609	5,810	36,213	16,645	NA	3,189	NA	4,133	NA	175,598	0.70
Status 2	25,998	36,030	8,131	200,801	NA	757	44,432	90,869	NA	407,018	1.61
Status 3	683,191	2,464,832	62	15,551	19,965	1,569,954	1,677,922	16	NA	6,431,494	25.46
Status 4	NA	NA	NA	NA	NA	NA	19	18,194,882	2,838	18,197,740	72.04
Water	NA	NA	NA	NA	NA	NA	NA	NA	48,632	48,632	0.19
Total	818,798	2,506,672	44,406	232,997	19,965	1,573,900	1,722,373	18,289,900	51,470	25,260,480	100

AMAJA03030 **SWIFT FOX** ***Vulpes velox*** **%Status 1 & 2: 1.12**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	3,710	2,696	1,048	8,947	NA	0	NA	3,049	NA	19,450	0.10
Status 2	2,113	21,979	4,138	106,425	NA	0	15,791	39,947	NA	190,394	1.02
Status 3	166,823	1,571,727	0	11,812	12,014	1,216,282	1,254,039	0	NA	4,232,697	22.64
Status 4	NA	NA	NA	NA	NA	NA	0	14,219,314	2,412	14,221,726	76.07
Water	NA	NA	NA	NA	NA	NA	NA	NA	31,869	31,869	0.17
Total	172,646	1,596,402	5,186	127,185	12,014	1,216,282	1,269,830	14,262,310	34,281	18,696,136	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAJB01010 BLACK BEAR *Ursus americanus* **%Status 1 & 2: 18.11**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,115,364	6,717	349,959	6,196	NA	63,557	NA	2,525	NA	1,544,317	14.32
Status 2	285,820	19,447	4,054	4,303	NA	5,103	44,032	45,529	NA	408,289	3.79
Status 3	4,496,675	304,112	5	1,633	5,781	551,063	347,100	0	NA	5,706,368	52.93
Status 4	NA	NA	NA	NA	NA	NA	15	3,103,975	104	3,104,094	28.79
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,528	18,528	0.17
Total	5,897,858	330,276	354,018	12,131	5,781	619,724	391,147	3,152,029	18,632	10,781,597	100

AMAJB01020 GRIZZLY OR BROWN BEAR *Ursus arctos* **%Status 1 & 2: 28.39**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,173,263	6,843	446,070	8,193	NA	70,680	NA	820	NA	1,705,869	24.64
Status 2	181,822	9,677	2,606	5,144	NA	5,142	20,488	34,790	NA	259,669	3.75
Status 3	2,657,919	146,148	5	1,342	6,850	287,037	263,105	15	NA	3,362,422	48.57
Status 4	NA	NA	NA	NA	NA	NA	19	1,583,023	0	1,583,041	22.87
Water	NA	NA	NA	NA	NA	NA	NA	NA	12,084	12,084	0.18
Total	4,013,004	162,668	448,681	14,680	6,850	362,859	283,612	1,618,647	12,084	6,923,086	100

AMAJE02010 COMMON RACCOON *Procyon lotor* **%Status 1 & 2: 4.53**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	58,762	2,077	33,127	5,051	NA	3,018	NA	1,012	NA	103,047	2.90
Status 2	18,900	825	765	10,646	NA	406	9,992	16,633	NA	58,167	1.63
Status 3	273,263	98,766	0	2,526	2,641	289,661	145,278	0	NA	812,134	22.82
Status 4	NA	NA	NA	NA	NA	NA	8	2,546,860	2,471	2,549,339	71.63
Water	NA	NA	NA	NA	NA	NA	NA	NA	36,399	36,399	1.02
Total	350,925	101,668	33,893	18,223	2,641	293,085	155,278	2,564,504	38,870	3,559,087	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAJF01010 **AMERICAN MARTEN** ***Martes americana*** **%Status 1 & 2: 21.58**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	738,609	3,353	211,206	2,965	NA	47,055	NA	748	NA	1,003,937	17.18
Status 2	198,284	10,133	2,194	1,567	NA	4,631	21,802	18,672	NA	257,283	4.40
Status 3	3,197,992	115,940	0	535	4,291	132,483	168,490	0	NA	3,619,731	61.94
Status 4	NA	NA	NA	NA	NA	NA	4	955,338	0	955,342	16.35
Water	NA	NA	NA	NA	NA	NA	NA	NA	7,329	7,329	0.13
Total	4,134,885	129,427	213,400	5,067	4,291	184,168	190,296	974,758	7,329	5,843,622	100

AMAJF01020 **FISHER** ***Martes pennanti*** **%Status 1 & 2: 23.29**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	689,190	2,050	210,995	488	NA	47,221	NA	484	NA	950,427	18.88
Status 2	184,404	1,556	1,824	708	NA	4,684	21,390	7,556	NA	222,121	4.41
Status 3	2,735,417	68,995	0	569	156	118,747	154,668	0	NA	3,078,552	61.13
Status 4	NA	NA	NA	NA	NA	NA	4	779,281	0	779,285	15.48
Water	NA	NA	NA	NA	NA	NA	NA	NA	5,517	5,517	0.11
Total	3,609,011	72,601	212,819	1,764	156	170,652	176,062	787,320	5,517	5,035,902	100

AMAJF02010 **ERMINE** ***Mustela erminea*** **%Status 1 & 2: 14.36**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	851,244	6,039	267,620	7,879	NA	40,691	NA	5,340	NA	1,178,813	10.58
Status 2	228,677	13,548	6,639	10,518	NA	1,574	60,616	100,643	NA	422,213	3.79
Status 3	3,358,912	324,718	67	2,500	4,630	522,360	531,535	1	NA	4,744,724	42.56
Status 4	NA	NA	NA	NA	NA	NA	30	4,783,894	100	4,784,024	42.91
Water	NA	NA	NA	NA	NA	NA	NA	NA	18,400	18,400	0.17
Total	4,438,832	344,306	274,326	20,897	4,630	564,625	592,180	4,889,878	18,500	11,148,174	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAJF02020 LEAST WEASEL *Mustela nivalis* %Status 1 & 2: 2.10

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	64,805	4,873	2,711	8,239	NA	0	NA	3,532	NA	84,160	0.51
Status 2	14,682	23,886	3,950	126,280	NA	0	23,648	72,028	NA	264,473	1.59
Status 3	486,693	1,556,761	66	10,187	12,210	1,277,833	1,138,293	0	NA	4,482,042	26.94
Status 4	NA	NA	NA	NA	NA	NA	0	11,749,656	3,354	11,753,010	70.65
Water	NA	NA	NA	NA	NA	NA	NA	NA	51,075	51,075	0.31
Total	566,179	1,585,520	6,727	144,706	12,210	1,277,833	1,161,941	11,825,215	54,430	16,634,760	100

AMAJF02030 LONG-TAILED WEASEL *Mustela frenata* %Status 1 & 2: 6.97

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	834,336	11,228	270,464	21,044	NA	40,763	NA	5,826	NA	1,183,661	4.26
Status 2	226,383	61,823	13,708	258,780	NA	1,575	75,469	117,191	NA	754,928	2.71
Status 3	3,719,945	2,982,065	67	14,223	27,294	1,643,161	1,744,580	16	NA	10,131,350	36.42
Status 4	NA	NA	NA	NA	NA	NA	30	15,665,963	2,168	15,668,161	56.33
Water	NA	NA	NA	NA	NA	NA	NA	NA	76,193	76,193	0.27
Total	4,780,664	3,055,117	284,239	294,047	27,294	1,685,499	1,820,078	15,788,996	78,362	27,814,298	100

AMAJF02040 BLACK-FOOTED FERRET *Mustela nigripes* %Status 1 & 2: 2.46

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha &	%)
Status 1	0	0	0	1,027	NA	0	NA	0	NA	1,027	0.11
Status 2	0	0	15	22,264	NA	0	0	0	NA	22,280	2.35
Status 3	0	188,919	0	0	0	160,702	65,433	0	NA	415,054	43.77
Status 4	NA	NA	NA	NA	NA	NA	0	507,143	0	507,143	53.48
Water	NA	NA	NA	NA	NA	NA	NA	NA	2,773	2,773	0.29
Total	0	188,919	15	23,292	0	160,702	65,433	507,143	2,773	948,276	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAJF02050 **MINK** ***Mustela vison*** **%Status 1 & 2: 3.47**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11,204	346	8,025	2,922	NA	594	NA	339	NA	23,430	1.86
Status 2	3,945	403	376	5,002	NA	102	3,437	6,976	NA	20,240	1.61
Status 3	68,871	49,880	0	1,274	1,370	103,231	61,473	0	NA	286,098	22.71
Status 4	NA	NA	NA	NA	NA	NA	3	906,074	788	906,865	71.98
Water	NA	NA	NA	NA	NA	NA	NA	NA	23,208	23,208	1.84
Total	84,020	50,629	8,401	9,198	1,370	103,927	64,913	913,389	23,996	1,259,842	100

AMAJF03010 **WOLVERINE** ***Gulo gulo*** **%Status 1 & 2: 25.64**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,196,185	5,027	396,211	3,021	NA	64,401	NA	566	NA	1,665,410	21.08
Status 2	283,569	12,148	2,074	2,088	NA	4,778	31,633	24,348	NA	360,637	4.56
Status 3	3,947,367	164,778	1	682	5,312	174,860	222,880	0	NA	4,515,880	57.15
Status 4	NA	NA	NA	NA	NA	NA	14	1,349,342	0	1,349,356	17.08
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,082	11,082	0.14
Total	5,427,120	181,953	398,285	5,792	5,312	244,039	254,526	1,374,256	11,082	7,902,365	100

AMAJF04010 **AMERICAN BADGER** ***Taxidea taxus*** **%Status 1 & 2: 2.87**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	156,850	6,464	53,614	17,629	NA	7,614	NA	4,141	NA	246,311	1.04
Status 2	43,491	39,042	10,005	205,887	NA	482	46,148	90,077	NA	435,131	1.83
Status 3	873,053	2,552,406	62	14,684	21,382	1,430,940	1,636,667	16	NA	6,529,210	27.52
Status 4	NA	NA	NA	NA	NA	NA	18	16,471,115	1,579	16,472,712	69.42
Water	NA	NA	NA	NA	NA	NA	NA	NA	45,557	45,557	0.19
Total	1,073,393	2,597,911	63,681	238,200	21,382	1,439,035	1,682,833	16,565,349	47,136	23,728,920	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAJF05020 **WESTERN SPOTTED SKUNK** ***Spilogale gracilis*** **%Status 1 & 2: 6.35**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	11,954	560	1,516	6,120	NA	0	NA	41	NA	20,191	1.48
Status 2	6,698	465	0	2,658	NA	0	13,549	43,404	NA	66,774	4.87
Status 3	138,345	148,309	0	23	188	13,479	110,517	1	NA	410,862	29.99
Status 4	NA	NA	NA	NA	NA	NA	0	868,782	0	868,782	63.41
Water	NA	NA	NA	NA	NA	NA	NA	NA	3,397	3,397	0.25
Total	156,997	149,333	1,516	8,801	188	13,479	124,066	912,228	3,397	1,370,006	100

AMAJF06010 **STRIPED SKUNK** ***Mephitis mephitis*** **%Status 1 & 2: 4.08**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	356,891	8,618	148,599	19,382	NA	16,821	NA	4,939	NA	555,252	2.01
Status 2	92,420	53,475	6,489	259,775	NA	1,026	55,440	100,644	NA	569,270	2.07
Status 3	1,296,318	2,392,440	67	16,614	24,308	1,685,867	1,706,003	1	NA	7,121,617	25.83
Status 4	NA	NA	NA	NA	NA	NA	31	19,243,636	4,245	19,247,912	69.81
Water	NA	NA	NA	NA	NA	NA	NA	NA	76,005	76,005	0.28
Total	1,745,629	2,454,532	155,155	295,771	24,308	1,703,714	1,761,475	19,349,220	80,250	27,570,056	100

AMAJF08010 **NORTHERN RIVER OTTER** ***Lutra canadensis*** **%Status 1 & 2: 11.67**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	109,291	612	42,788	4,161	NA	6,002	NA	714	NA	163,568	8.39
Status 2	25,833	4,603	2,774	2,293	NA	1,021	10,252	17,141	NA	63,919	3.28
Status 3	373,234	66,392	8	889	1,088	96,317	90,672	6	NA	628,607	32.25
Status 4	NA	NA	NA	NA	NA	NA	6	1,026,836	12	1,026,854	52.67
Water	NA	NA	NA	NA	NA	NA	NA	NA	66,495	66,495	3.41
Total	508,358	71,608	45,571	7,343	1,088	103,341	100,930	1,044,697	66,507	1,949,443	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMAJH01020 **MOUNTAIN LION** ***Felis concolor*** **%Status 1 & 2: 16.10**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,023,037	6,301	330,848	8,657	NA	63,415	NA	2,526	NA	1,434,783	11.53
Status 2	272,847	45,480	5,988	151,451	NA	5,050	44,100	44,719	NA	569,635	4.58
Status 3	4,416,840	672,085	5	1,814	7,149	625,821	461,584	0	NA	6,185,299	49.69
Status 4	NA	NA	NA	NA	NA	NA	15	4,222,056	489	4,222,561	33.92
Water	NA	NA	NA	NA	NA	NA	NA	NA	36,755	36,755	0.30
Total	5,712,723	723,866	336,841	161,922	7,149	694,286	505,700	4,269,301	37,245	12,449,033	100

AMAJH03010 **LYNX** ***Lynx canadensis*** **%Status 1 & 2: 24.32**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	854,501	3,834	281,204	2,784	NA	52,322	NA	951	NA	1,195,596	19.78
Status 2	219,762	10,054	2,019	2,100	NA	4,535	19,839	16,222	NA	274,530	4.54
Status 3	3,166,565	87,269	1	587	3,330	154,308	174,540	0	NA	3,586,600	59.33
Status 4	NA	NA	NA	NA	NA	NA	10	982,617	0	982,626	16.25
Water	NA	NA	NA	NA	NA	NA	NA	NA	6,210	6,210	0.10
Total	4,240,827	101,157	283,224	5,471	3,330	211,165	194,389	999,789	6,210	6,045,562	100

AMAJH03020 **BOBCAT** ***Lynx rufus*** **%Status 1 & 2: 6.77**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	235,181	5,526	84,501	11,012	NA	13,043	NA	1,661	NA	350,924	3.15
Status 2	65,964	45,292	8,580	206,226	NA	991	35,319	42,458	NA	404,831	3.63
Status 3	1,495,062	1,488,373	5	4,449	13,678	639,199	619,900	15	NA	4,260,681	38.17
Status 4	NA	NA	NA	NA	NA	NA	10	6,090,712	2,096	6,092,818	54.58
Water	NA	NA	NA	NA	NA	NA	NA	NA	53,594	53,594	0.48
Total	1,796,207	1,539,190	93,086	221,686	13,678	653,233	655,229	6,134,846	55,690	11,162,847	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMALC01010 **WAPITI OR ELK** ***Cervus elaphus*** **%Status 1 & 2: 11.26**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	1,145,758	8,206	363,448	13,215	NA	64,155	NA	5,485	NA	1,600,268	7.88
Status 2	293,081	48,257	6,847	142,479	NA	5,263	75,691	114,113	NA	685,730	3.38
Status 3	4,865,450	1,391,843	67	8,942	23,355	1,172,456	1,051,953	16	NA	8,514,082	41.94
Status 4	NA	NA	NA	NA	NA	NA	30	9,456,729	183	9,456,942	46.59
Water	NA	NA	NA	NA	NA	NA	NA	NA	41,263	41,263	0.20
Total	6,304,288	1,448,305	370,362	164,637	23,355	1,241,874	1,127,674	9,576,343	41,446	20,298,284	100

AMALC02010 **MULE DEER** ***Odocoileus hemionus*** **%Status 1 & 2: 6.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	866,472	11,162	272,154	21,797	NA	40,791	NA	5,939	NA	1,218,314	4.00
Status 2	232,758	58,025	11,296	286,342	NA	1,452	75,096	114,838	NA	779,808	2.56
Status 3	3,727,981	2,828,255	67	14,556	27,662	1,758,906	1,811,068	16	NA	10,168,511	33.38
Status 4	NA	NA	NA	NA	NA	NA	30	18,217,526	2,769	18,220,325	59.80
Water	NA	NA	NA	NA	NA	NA	NA	NA	79,427	79,427	0.26
Total	4,827,210	2,897,442	283,517	322,695	27,662	1,801,149	1,886,194	18,338,319	82,196	30,466,384	100

AMALC02020 **WHITE-TAILED DEER** ***Odocoileus virginianus*** **%Status 1 & 2: 9.13**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	315,716	2,876	144,029	6,150	NA	27,181	NA	1,075	NA	497,027	6.42
Status 2	95,698	9,032	2,743	37,713	NA	4,901	26,123	33,935	NA	210,145	2.71
Status 3	2,064,164	269,660	1	2,556	5,092	479,559	334,185	0	NA	3,155,217	40.74
Status 4	NA	NA	NA	NA	NA	NA	16	3,843,512	2,582	3,846,110	49.66
Water	NA	NA	NA	NA	NA	NA	NA	NA	36,365	36,365	0.47
Total	2,475,579	281,569	146,772	46,419	5,092	511,641	360,324	3,878,521	38,947	7,744,864	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

AMALC03010 **MOOSE** ***Alces alces*** **%Status 1 & 2: 20.83**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	716,225	3,999	255,064	5,680	NA	44,336	NA	560	NA	1,025,863	16.56
Status 2	187,246	10,657	2,563	3,222	NA	4,615	29,596	26,677	NA	264,577	4.27
Status 3	2,949,761	128,264	1	1,046	5,470	143,999	195,008	0	NA	3,423,548	55.25
Status 4	NA	NA	NA	NA	NA	NA	15	1,470,056	0	1,470,071	23.73
Water	NA	NA	NA	NA	NA	NA	NA	NA	11,968	11,968	0.19
Total	3,853,232	142,920	257,628	9,948	5,470	192,951	224,619	1,497,293	11,968	6,196,028	100

AMALD01010 **PRONGHORN** ***Antilocapra americana*** **%Status 1 & 2: 1.70**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	7,390	5,100	5,443	19,591	NA	0	NA	3,831	NA	41,355	0.17
Status 2	3,197	30,546	5,663	234,316	NA	550	32,923	73,584	NA	380,779	1.54
Status 3	280,986	2,672,437	48	15,126	23,693	1,486,786	1,684,371	16	NA	6,163,462	24.85
Status 4	NA	NA	NA	NA	NA	NA	0	18,147,816	3,218	18,151,034	73.18
Water	NA	NA	NA	NA	NA	NA	NA	NA	67,242	67,242	0.27
Total	291,573	2,708,083	11,154	269,033	23,693	1,487,336	1,717,294	18,225,247	70,460	24,803,872	100

AMALE01010 **AMERICAN BISON** ***Bos bison*** **%Status 1 & 2: 99.91**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	0	0	63,284	0	NA	0	NA	0	NA	63,284	89.32
Status 2	0	0	0	7,497	NA	0	0	0	NA	7,497	10.58
Status 3	0	0	67	0	0	0	0	0	NA	67	0.10
Status 4	NA	NA	NA	NA	NA	NA	0	0	0	0	0.00
Water	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0.00
Total	0	0	63,352	7,497	0	0	0	0	0	70,848	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.

Appendix 5.2 *continued.* Area (ha) of predicted distribution for 425 terrestrial vertebrate species in Montana by stewardship category and management status.

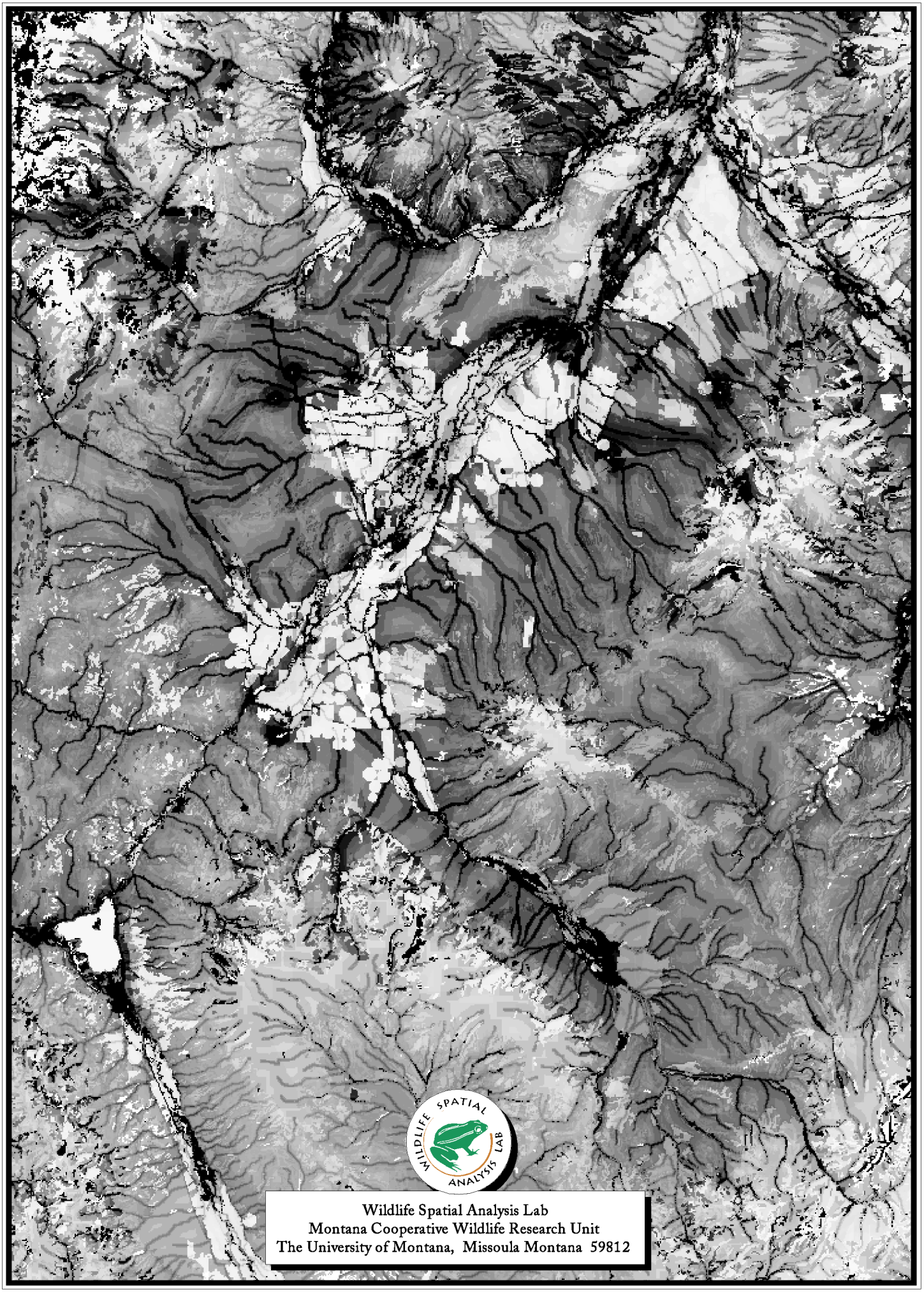
AMALE02010 **MOUNTAIN GOAT** ***Oreamnos americanus*** **%Status 1 & 2: 65.56**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	341,184	761	122,626	22	NA	10,594	NA	26	NA	475,212	58.22
Status 2	56,930	385	0	41	NA	0	2,325	260	NA	59,940	7.34
Status 3	221,699	6,895	0	0	71	3,622	3,711	0	NA	235,998	28.91
Status 4	NA	NA	NA	NA	NA	NA	0	43,703	0	43,703	5.35
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,421	1,421	0.17
Total	619,814	8,040	122,626	62	71	14,216	6,035	43,989	1,421	816,273	100

AMALE04010 **MOUNTAIN SHEEP** ***Ovis canadensis*** **%Status 1 & 2: 36.43**

	USFS	BLM	NPS	FWS	Other Fed	Tribal	State/Local	Private	Water/Unk	Total (ha & %)	
Status 1	67,361	1,614	21,841	0	NA	1,880	NA	86	NA	92,781	28.47
Status 2	16,398	4,306	1,861	342	NA	5	1,280	1,776	NA	25,967	7.97
Status 3	119,045	12,532	0	0	104	8,425	6,405	0	NA	146,510	44.95
Status 4	NA	NA	NA	NA	NA	NA	0	59,591	0	59,591	18.28
Water	NA	NA	NA	NA	NA	NA	NA	NA	1,103	1,103	0.34
Total	202,804	18,451	23,701	342	104	10,310	7,684	61,453	1,103	325,952	100

"Other Fed" includes Dept. of Defense, Dept. of Agriculture, & Bureau of Reclamation; "Water/Unk" includes water bodies mapped in the stewardship layer, and a small area not mapped because of boundary conflicts. To distinguish from zero values, "NA" indicates that a given combination was not observed for that species. Rounding error applies.



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