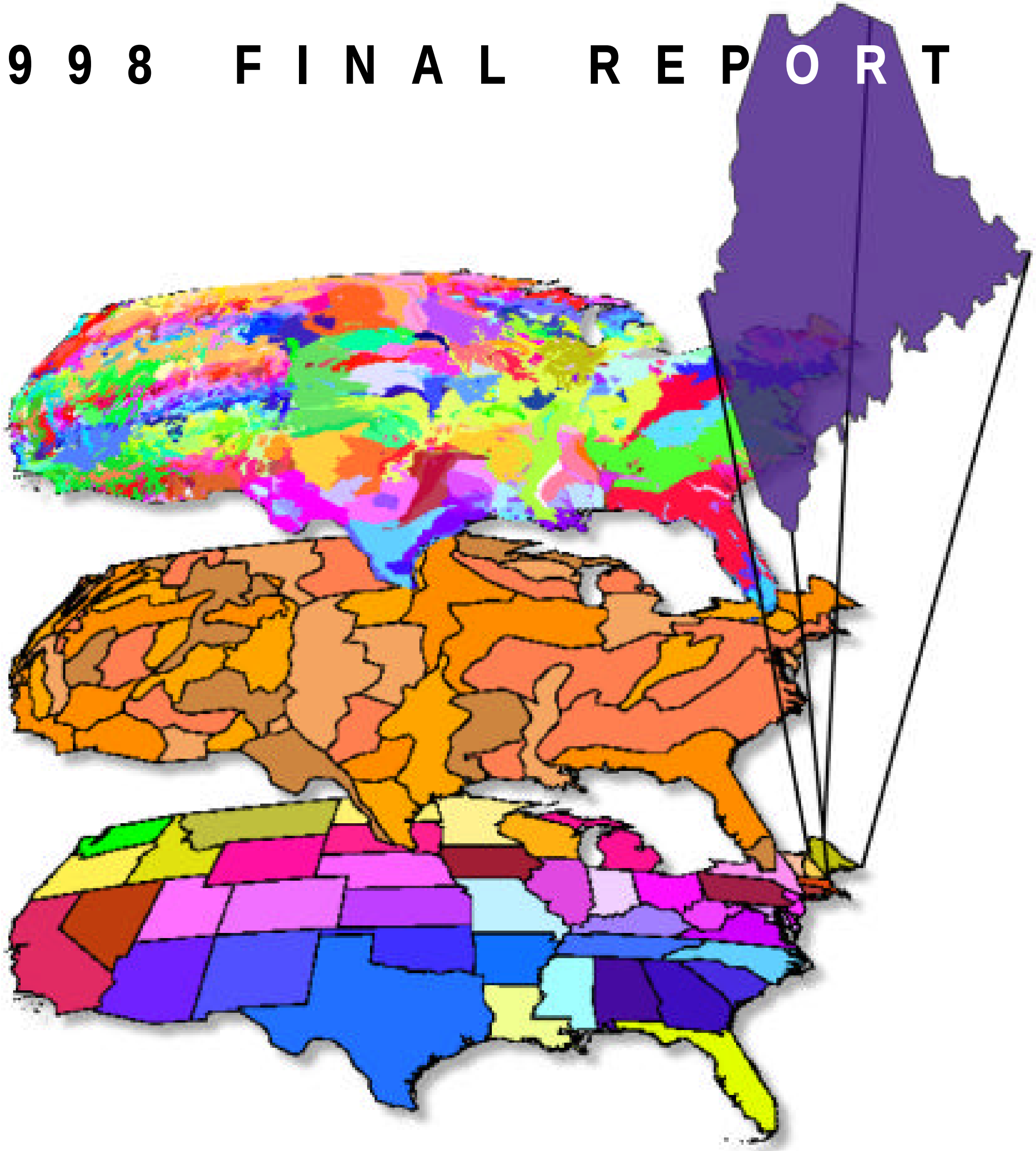
MAINE
GAP ANALYSIS PROJECT

A GEOGRAPHIC APPROACH TO PLANNING FOR BIOLOGICAL DIVERSITY

1998 FINAL REPORT



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United States Geological Survey Biological Resources Division

THE MAINE GAP ANALYSIS PROJECT

FINAL REPORT

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We dedicate this Maine gap analysis to
Henry David Thoreau, who, in an unscientific
yet holistic sense, understood the values
of Maine' s biodiversity.

From this elevation, just on the skirts of the clouds,
we could overlook the country, west and south, for a hundred miles.
There it was, the State of Maine.... Immeasurable forest for the sun
to shine on.... No clearing, no house. It did not look as if a
solitary traveler had cut so much as a walking-stick there.
Countless lakes,...and mountains also, whose names,
for the most part, are known only to the Indians.

Thoreau - The Maine Woods, 1848

EXECUTIVE SUMMARY

The Maine Gap Analysis Project (ME-GAP) was initiated in 1992 as a cooperative effort between the Biological Resources Division of the US Geological Survey (USGS) and state, federal, and private natural resources groups in Maine. The objectives of ME-GAP were to: (1) produce databases for use in Geographic Information Systems (GIS) at a scale of 1:100,000 to describe current land cover, distributions of native species of terrestrial (i.e., non-fish, non-marine) vertebrate species, ownership of conservation and public lands, and land management status; (2) identify land cover types and vertebrate species that currently are not represented or are under-represented in areas managed for long-term maintenance of biodiversity (i.e., identify conservation gaps); and (3) facilitate cooperative development and use of information so that institutions, agencies, and private land owners may be more effective stewards of Maine's biological resources. ME-GAP is a preliminary step toward the more detailed studies and efforts needed for the long-term conservation of biodiversity in Maine.

The system used to classify the land cover consisted of 37 types (19 upland types, 16 wetlands, 2 water). This classification was a compromise between the habitats needed to predict vertebrate distributions and those classes that could be discerned from satellite imagery and ancillary GIS databases. Landsat Thematic Mapper (TM) imagery from 1991 and 1993, in conjunction with aerial videography, was used to identify and map the water and upland types. Wetland polygons came primarily from the US Fish and Wildlife Service's National Wetlands Inventory (NWI). NWI maps of Maine were done at 1:24,000 and based on aerial photographs mostly from the mid- and late-1980s. To facilitate the predicting of vertebrate species' distributions, NWI wetland types, defined largely in terms of physiographic locations on the landscape, were re-labeled so types related to the occurrences of vertebrates in terms of vegetative and structural characteristics. A comparison of vegetation and land cover types mapped from TM data to aerial videography had an overall accuracy of 88.1% at the level of superclasses. For groups of Forestland classes, accuracy levels range from 45% to 80%; accuracy by types also varied geographically across the state as different TM scenes were used in various parts of the state.

A GIS database of private and public conservation lands was assembled in cooperation with the Maine State Planning Office. Conservation lands comprise less than 6% of Maine with public lands consisting of approximately 5.3%. Conservation lands are well distributed throughout the state except for the northwestern portion, which is largely without public conservation lands. In southern Maine, conservation lands are highly scattered and generally smaller than in the rest of the state. Private commercial forestlands (i.e., large blocks in corporate ownership) and Native American lands managed for forestry, encompass approximately 50% of Maine. Lands were denoted as to the degree to which they are managed for maintenance of biodiversity and long-term ecological processes. The Gap Analysis Program requires use of a 1 through 4 scale to denote high to low management for biodiversity maintenance based on legal and management status. While not all lands could be unequivocally classified as to management Category, less than 3% of the state occurs in management Categories 1 and 2, with almost no Category 1 lands in southern Maine (lands owned by the Maine Chapter of The Nature Conservancy are the exception). Category 3 lands made up almost 53% of the state and consist primarily of privately owned or public multiple-use forestlands. Category 4 lands occur mostly in southern Maine, along the coast, and in the northeastern corner of the state. The land ownership map should not be interpreted as a legal document, but as a representation of general ownership patterns.

The number of species (i.e., richness) of native terrestrial vertebrates that regularly breed in Maine (n = 270) is highest in coastal and southern Maine. This pattern is similar to the richness patterns of terrestrial threatened and endangered species and woody plants. In the long term, human occupation of the natural landscape is the driving force underlying habitat loss. The density of Maine’ s human populations in 1990 was highest in the coastal and southern portions of the state. The distribution of Maine’ s human population is changing (like elsewhere in the Nation) with people moving out of population centers into adjacent rural areas; the redistribution of people into rural areas is most extensive in southern Maine. When looking at the distribution of conservation lands by management categories, note few Category 1 areas occur statewide. Southern Maine is clearly the area of highest richness of terrestrial vertebrates, threatened and endangered species, and woody plants, but contains only small and scattered Category 2 and 3 conservation lands. In addition to coastal and southern Maine, the northwestern part of Maine also merits special consideration in conservation planning because this region contains few reserves and provides habitat for northern species at the southern limits of their distributions.

To demonstrate the flexibility of ME-GAP data, two sets of species-specific conservation analyses of terrestrial vertebrates are presented. In set one, data related to the management of a rare forest bird (i.e., Bicknell’ s Thrush[a]) and a common aquatic mammal (American Beaver) were analyzed using predicted distributions from ME-GAP. In set two, analyses were done on actual habitat data collected by Maine’ s Department of Inland Fisheries and Wildlife (MDIFW) for an uncommon wetland species (Bald Eagle) versus a widespread upland mammal (White-tailed Deer). The range of issues covered by these examples clearly shows that this report has barely touched the potential of the data assembled herein to address conservation and management, as well as research, questions.

With the completion of ME-GAP, the long-term maintenance, revision, and application of the GIS databases is a concern. In addition to these data becoming part of the National Biological Information Infrastructure of the USGS Biological Resources Division, these databases will be housed and used by various state agencies. The MDIFW will continue to use the vertebrate data (i.e., range limits and habitat associations) and the vegetation and land cover map; the Maine Image Analysis Laboratory, University of Maine, will store and use the TM and aerial videography data; and the Maine Office of GIS will maintain and distribute the conservation and public lands database created by the SPO and ME-GAP. In the end, the relative success of this project should be judged on how long these databases are revised and reused in the decision-making processes affecting Maine' s biological resources.

ACKNOWLEDGMENTS

Thanks to Amos Eno and the staff of the National Fish and Wildlife Foundation, who funded the early development of the Gap Analysis concept. Thanks to John Mosesso and Doyle Frederick of the USGS' Biological Resources Division (BRD), Office of Inventory and Monitoring, for their support of the National Biological Service and then to the USGS' BRD. We thank Reid Goforth and the staff at the BRD Cooperative Research Units for administering GAP's research and development phase from headquarters. Without those mentioned above, there could not have been a Gap Analysis Program. Thanks also to the staffs of the National Gap Analysis Program, Center for Biological Informatics, and BRD's headquarters. We also acknowledge contributions to this report by Chris Cogan, Patrick Crist, Blair Csuti, Tom Edwards, Mike Jennings, and Mike Scott. Without the above people there would not have been a Gap Analysis Program.

Within Maine, the Maine Gap Analysis Project (ME-GAP) would not have been possible without the continuous support of many cooperators. We especially acknowledge the Maine Department of Inland Fisheries and Wildlife for use of various species databases, and for providing help in reviewing vertebrate range maps and habitat associations. In particular we wish to acknowledge the support by, and interest in, landscape-level Geographic Information System (GIS) analyses by Ken Elowe and Mark Stadler. We gratefully appreciate the work of Dick Kelly, Maine State Planning Office (SPO). Without Dick's cartographic skills and knowledge of Maine's conservation organizations we could not have created a credible database of the state's conservation lands. We thank T. Hoffman and G. Barnes of the Penobscot Indian Nation and Passamaquoddy Indian Tribe, respectively, for providing information on ownership of Native American lands. Richard Sherwood, SPO, was very helpful in introducing us to the intricasies of data from the US Bureau of Census. The State Office of GIS, especially Dan Walters, always responded to our questions regarding data availability or other issues involving GIS databases managed by his office. The Maine Department of Conservation provided funding to assist in the purchase of the 1991 satellite data.

In our work on the distribution of terrestrial vertebrates that regularly breed in Maine, we heavily relied upon the Breeding Bird Survey of the USGS Biological Resources Division, the Maine Breeding Bird Atlas, and the Maine Amphibian and Reptile Atlas; the efforts of hundreds of volunteers involved in these surveys is appreciated. People who reviewed or provided information on terrestrial vertebrate species include: John Albright, Linda Alverson, Dave Capen, Jim Connolly, Patrick Corr, Phillip deMaynadier, Richard DeGraaf, Norm Famous, Lyman Feero, Curt Griffin, John Hagan, Dan Harrison, Malcolm Hunter, Allen Hutchinson, Thomas Kunz, John Litvaitis, Judy Markowski, Mark McCollough, Craig McLaughlin, Kim Morris, Anders Rhodin, Beth Schwartz, Mike Sullivan, Peter Vickery, Ken Williams, and Mariko Yamasaki. Their input is appreciated very much. Within this list, Mark McCollough should be highlighted for his help with review of the vertebrate information and Beth Schwartz for help with the heritage ranking of vertebrates. Help with testing predicted distribution of vertebrates was provided by Ray Varney, Steve Oliveri, Jack Witham and the late Greg Sepik who kindly provided us with habitat information. Mac Hunter and Jack Witham provided survey results for the Holt Research Forest.

Digitizing of the private and public conservation lands database was done by Ross Bartlett and Catherine Hayden. Curt Griffin, Dana Slaymaker, and Kate Jones, University of Massachusetts, and Dave Capen, University of Vermont, were responsible for taking the aerial videography used in this project. Ross Bartlett and Tony Guay, ME-GAP, checked roadside samples of the aerial videography to ensure correct interpretation, and assembled the photo guidebooks to ensure consistent definition and identification of cover types from the aerial videography. All interpretation of the videography was done by Ross Bartlett, a long and tedious job that was done with care and dedication. Michelle Therrien assisted in the testing of the cover map by interpreting aerial photographs of large blocks of Maine's landscape and comparing results to those obtained from the satellite data. Christen Orlando and Dusty Perkins also assisted with Maine Gap in work related to testing the cover map. We greatly appreciated the expertise and help of Arnold Banner, Aram Calhoun, Andy Cutko, Sue Gawler, Tom Hodgman, Jerry Longcore, and Wende Mahaney who reviewed our re-labeling of cover types from the National Wetlands Inventory.

We thank the GAP projects that preceded us, all in the western USA, for blazing the trail and setting tough standards. We would like to especially thank WY-GAP, whose final report (Merrill et al. 1996) made our task of writing this report easier. Finally, we are most grateful to Gary Donovan, Champion International Corporation, Mac Hunter, University of Maine (UM), and George Matula, Maine Department of Inland Fisheries and Wildlife, for reviewing this lengthy manuscript; and to Shirley Moulton, UM, who provided the secretarial skills and support needed to make this report a reality.

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INTRODUCTION

We went by the Avenue Road, which is quite straight and very good,
northwestward toward Moosehead Lake, through more than a dozen flourishing towns,
with almost every one its academy, - not one of which, however, is on my General Atlas,
published, alas! in 1824; so much are they before the age, or I behind it!
The earth must have been considerably lighter to the shoulders of General Atlas then.

Thoreau - The Maine Woods, 1848

Organization of Report

This report is a summation of a scientific project. While we endeavor to make it understandable for as general an audience as practicable, it will reflect the complexity of the project it describes. A Glossary of Terms is provided to aid the reader in its understanding, and for those seeking a detailed understanding of the subjects, the cited literature should be helpful. The organization of this report follows the general chronology of project development, beginning with the production of the individual data layers and concluding with analysis of the data. It diverges from standard scientific reporting by embedding results and discussion sections within individual chapters. This was done to allow the individual data products to stand on their own as testable hypotheses and provide data users with a concise and complete report for each data and analysis product.

We begin with an overview of the Gap Analysis mission, concept, and limitations. We then present a synopsis of how the current biodiversity condition of the project area came to be, followed by land cover mapping, animal species distribution prediction, species richness, and land stewardship mapping and categorization. Data development leads to the Analysis section that reports on the status of the elements of biodiversity (natural community alliances and terrestrial vertebrate species) for this state. Finally, we describe the management implications of the analysis results and provide information on how to acquire and use the data.

GAP Mission

The mission of the Gap Analysis Program (GAP) is to prevent conservation crises by providing conservation assessments of animals 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 (FGDC-VS, 1997).
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 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.

Gap Analysis Concept

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 landowners and managers so that they may become more effective stewards through more complete knowledge of the management status of these elements of biodiversity. 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 species to ensure their protection. Gap analysis is a coarse filter method.

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 (e.g., Kirkpatrick 1983, Margules *et al.* 1988, Pressey and Nicholls 1989, and Pressey *et al.* 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, Forman 1995) as an expanded coarse filter, gap analysis searches for and identifies biological regions where unprotected or under-represented vegetation types and animal 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 tend to also 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 higher 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; specific limitations for the data are described in the sections that describe them:

1. GAP data are derived from remote sensing and modeling 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 proactive: 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. 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.

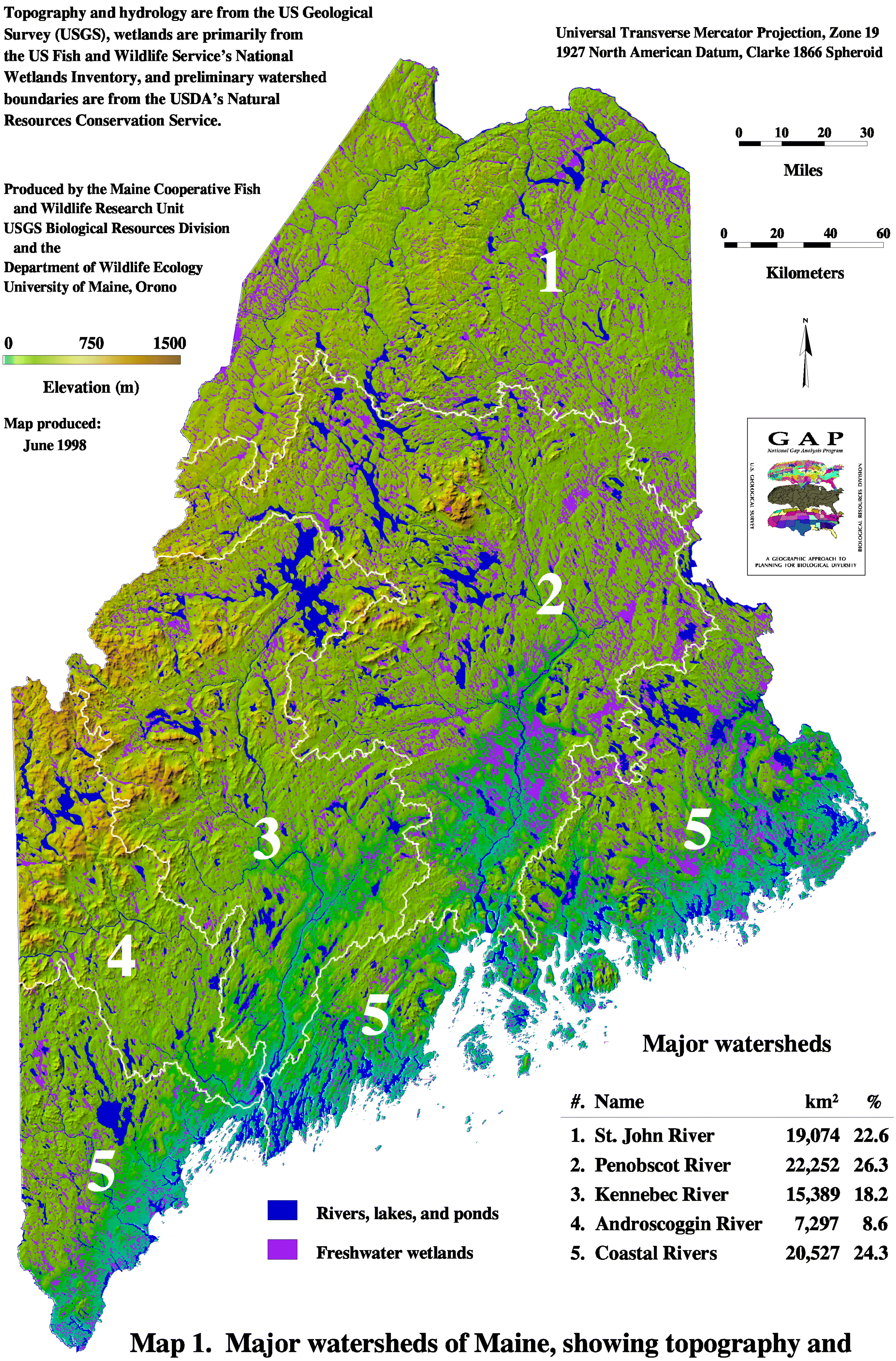
Study Area

The project study area was the entire state of Maine (Map 1). The abundance, composition, and distribution of plants and animals in Maine are affected by a complex sets of interactions within and between abiotic and biotic factors. Interactions, now and in the past, among the geology, climate, and human use of Maine and the state’ s total set of animal and plant life forged the landscape patterns in biodiversity we see today.

Maine’ s southeastern side is bounded by the Atlantic Ocean, which ameliorates the climate adjacent to the coastline as well as providing an assortment of estuarine and marine habitats. Inland, a predominant feature of the Maine landscape is water, both running (i.e., brooks, streams, and rivers) and standing (i.e., ponds, lakes, and a variety of wetlands) (Map 1). This well-watered landscape is the result of the state’ s glacial history (Kendall 1993) as well as its climate (Forbes 1946, Boone 1997).

Glaciers retreated from what is now Maine from 14,000 to 9,000 years ago. As the glaciers retreated, the landscape became vegetated, passing along a continuum of tundra to woodland to forests (Davis and Jacobson 1985). Vegetative assemblages continually changed, with past assemblages not only differing from each other, but also dissimilar to modern forest types (Jacobson *et al.* 1987). Prior to European settlement, disturbance was infrequent and mostly local, and thus the forests were largely in an uneven-aged climax state. In northcentral Maine, an estimated 59% of the forest was in mature climax (i.e., stands with trees >150 years old); 27% of the forest was in an all-aged climax with some trees >300 years old (Lorimer 1977).

(“see Map 1”)



#.	Name	km²	%
1.	St. John River	19,074	22.6
2.	Penobscot River	22,252	26.3
3.	Kennebec River	15,389	18.2
4.	Androscoggin River	7,297	8.6
5.	Coastal Rivers	20,527	24.3

Map 1. Major watersheds of Maine, showing topography and locations of rivers, lakes, and wetlands.

Indians apparently affected vegetation only locally, but some 200 years after European settlement came a low in forestland acreage as the amount of land committed to agriculture peaked in the late 1800s (Black 1950). Agricultural development occurred from the coast and proceeded up the river valleys, spreading throughout southern and central Maine, and into the St. John River Valley in northeastern Maine along the Canada/USA border. The peak of agriculture in Maine occurred in approximately 1880 when 2.7 million ha (6.6 million ac) of land were in farmlands, mostly in the central and southern parts of the state. Today, there are fewer than 364,500 ha (900,000 ac) with the most productive farms located in northeastern Maine (US Department of Commerce, Census of Agriculture). Blueberry (*Vaccinium* spp.) farming, where fields are periodically burned to stimulate berry production, occurs over extensive areas in eastern Maine, and to a lesser extent south along the coast (Yarborough 1996). Statewide, however, agricultural lands have largely reverted to forests and today Maine is the most extensively forested state in the USA.

Currently, most of the Maine forest is in a second or third rotation resulting in much of the state’ s forestlands being comprised of nonmature, shade-intolerant tree species (Griffith and Alerich 1996). Plant assemblages in Maine, due to the state’ s glacial and land use histories, tend to occur in relatively small and highly interspersed patches. Due to historical patterns of land settlement and ownership, the state’ s human population is concentrated in southern Maine and along the coast (Figure 1a). As elsewhere in the USA, humans are redistributing themselves from the cities and larger towns into adjacent rural areas (Figure 1b; O’ Hara 1997).

Krohn *et al.* (1999) used GIS and cluster analyses to divide Maine into thirteen relatively homogeneous regions based on two measures of geomorphology, three climate variables, and two measures of species richness (i.e., woody plants and terrestrial vertebrates). For the purposes of this report, the thirteen biophysical regions were simplified into five regions to condense results (Figure 2). For details on the climatic, geomorphic, and biological characteristics of these regions, see Krohn *et al.* (1999).

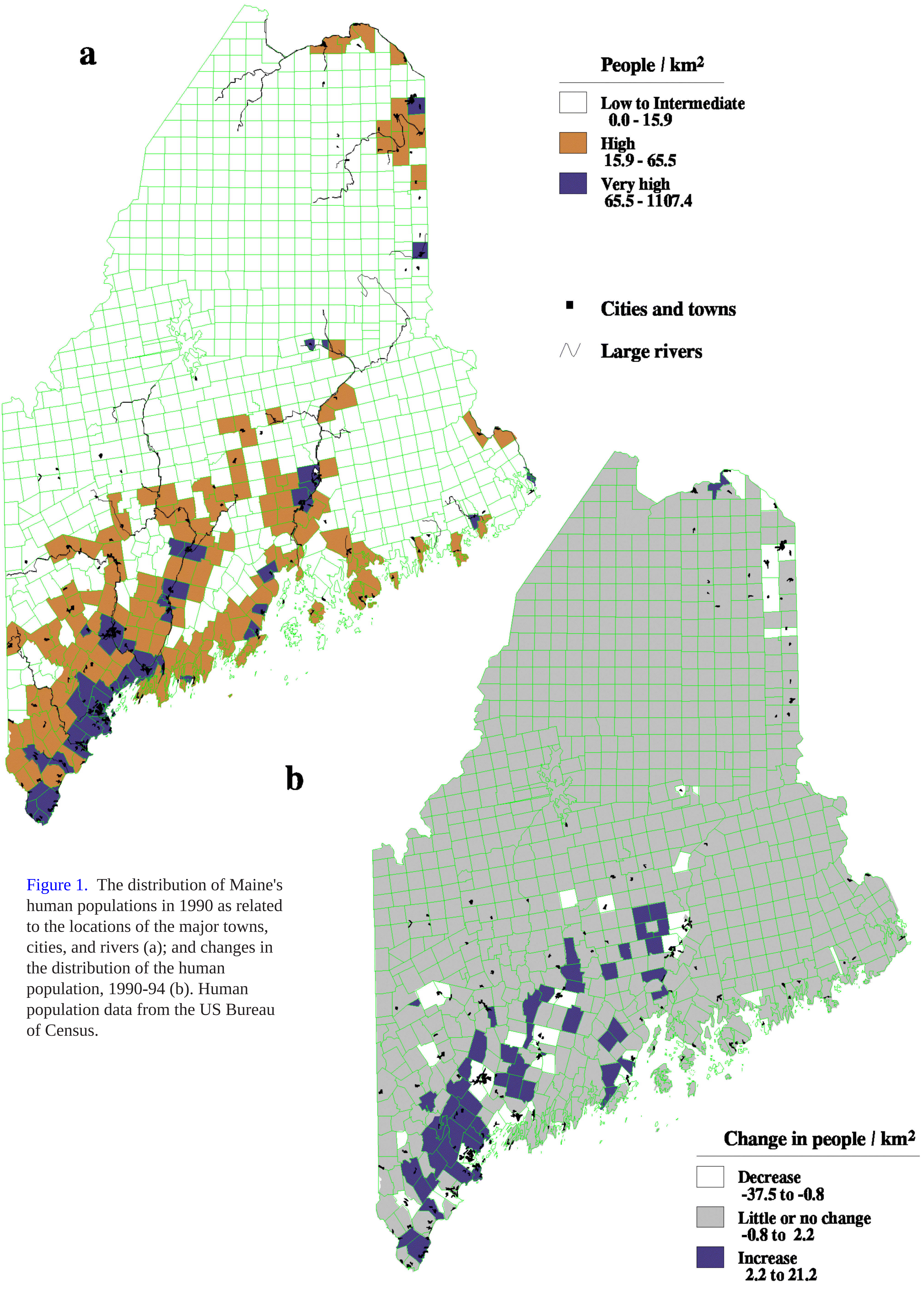
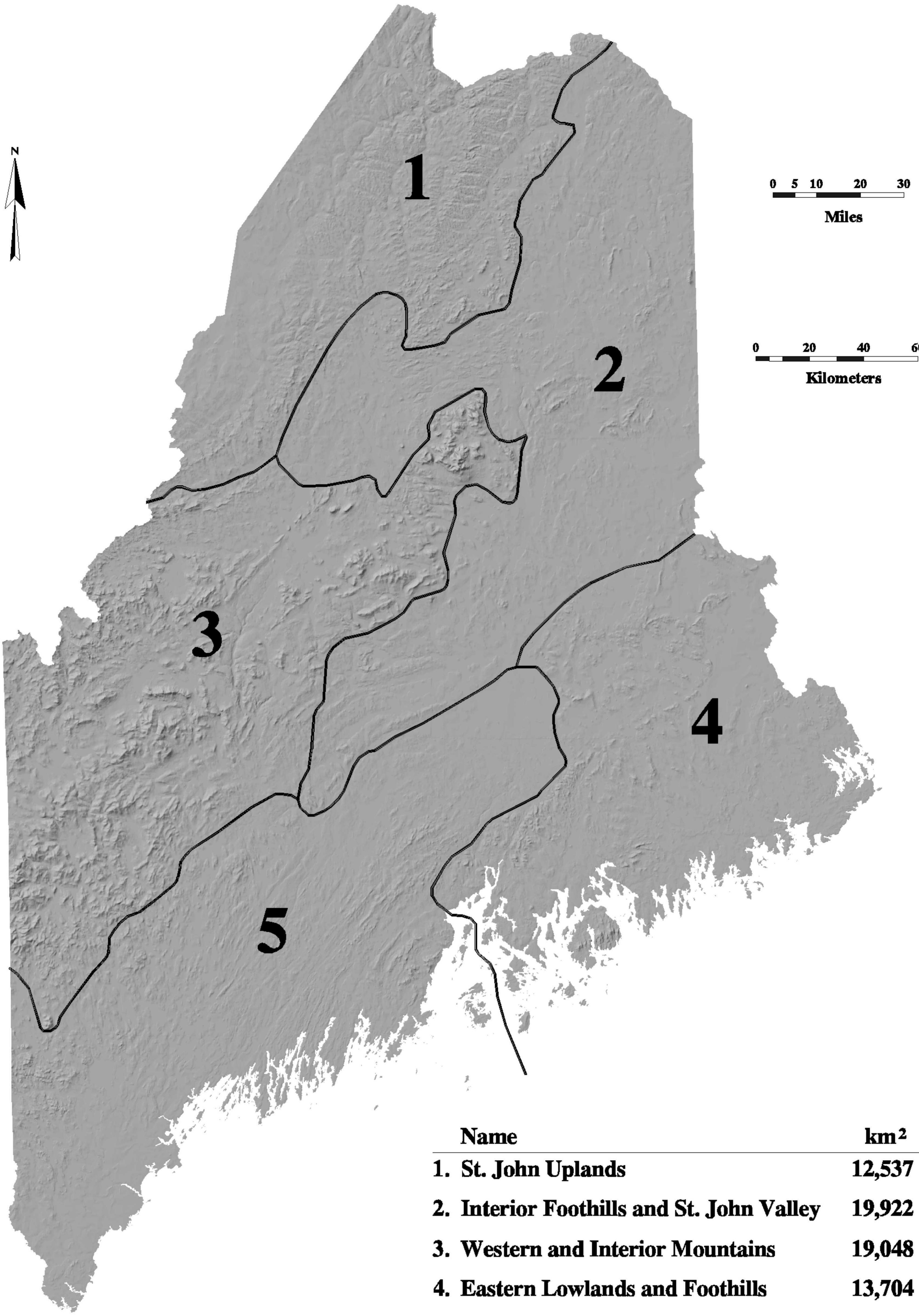


Figure 1. The distribution of Maine's human populations in 1990 as related to the locations of the major towns, cities, and rivers (a); and changes in the distribution of the human population, 1990-94 (b). Human population data from the US Bureau of Census.

Figure 2. The major biophysical regions of Maine as modified from Krohn et al. (In Press). Topographical data from the US Geological Survey.



Name	km²	%
1. St. John Uplands	12,537	15.0
2. Interior Foothills and St. John Valley	19,922	23.6
3. Western and Interior Mountains	19,048	22.6
4. Eastern Lowlands and Foothills	13,704	16.3
5. Coastal Plain and Foothills	18,902	22.5

LAND COVER CLASSIFICATION AND MAPPING

The prevailing wood seemed to be spruce, fir, birch, and rock-maple.
You could easily distinguish the hard wood from the soft,
or " black growth," as it is called, at a great distance, -
the former being smooth, round-topped, and light green,
with a bowery and cultivated look.

Thoreau - The Maine Woods, 1848

Introduction

Mapping natural land cover requires a higher level of effort than the development of data for animal species, agency ownership, or land management, yet it is no more important for gap analysis than any other data layer. Generally, the mapping of land cover is done by adopting or developing a land cover classification system, delineating areas of relative homogeneity (basic cartographic "objects"), then labeling these areas using categories defined by the classification system. More detailed attributes of the individual areas are added as more information becomes available, and a process of validating both polygon pattern and labels is applied for editing and revising the map. This is done in an iterative fashion, with the results from one step causing re-evaluation of results from a previous step. Finally, an assessment of the overall accuracy of the data is conducted. The final assessment of accuracy will show where improvements should be made in the next update (Stoms *et al.* 1994).

In its "coarse filter" approach to conservation biology (e.g., Jenkins 1985, Noss 1987), gap analysis relies on maps of dominant natural land cover types as the most fundamental spatial component of the analysis (Scott *et al.* 1993) for terrestrial environments. For the purposes of GAP, most of the land surface of interest (natural) can be characterized by its dominant vegetation.

Vegetation patterns are an integrated reflection of the biological, chemical, and physical factors that shape the environment of a given land area (Whittaker 1965). They also are determinants for overall biological diversity patterns (Franklin 1993, Levin 1981), and they can be used as a currency for habitat types in conservation evaluations (Specht 1975, Austin 1991). As such, dominant vegetation types need to be recognized over their entire ranges of distribution (Bourgeron *et al.* 1994) for beta-scale analysis (*sensu* Whittaker 1960, 1977). These patterns cannot be acceptably mapped from any single source of remotely sensed imagery; therefore, ancillary data, previous maps, and field surveys are used. The central concept is that the physiognomic and floristic characteristics of vegetation (and, in the absence of vegetation, other physical structures) across the land surface can be used to define biologically meaningful biogeographic patterns. There may be considerable variation in the floristics of subcanopy vegetation layers (community association) that are not resolved when mapping at the level of dominant canopy vegetation types (alliance), and there is a need to address this part of the diversity of nature. As information accumulates from field studies on patterns of variation in understory layers, it can be attributed to the mapped units of alliances.

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). The criteria for a land cover classification system for GAP are: (a) an ability to distinguish areas of different actual dominant vegetation; (b) a utility for modeling animal species habitats; (c) a suitability for use within and among biogeographic regions; (d) an applicability to Landsat Thematic Mapper (TM) imagery for both rendering a base map and from which to extract basic patterns (GAP relies on a wide array of information sources, TM offers a convenient meso-scale base map in addition to being one source of actual land cover information); (e) a framework that can interface with classification systems used by other organizations and nations to the greatest extent possible; and (f) a capability to fit, both categorically and spatially, with classifications of other themes such as agricultural and developed environments.

For GAP, the system that fits best is referred to as the National Vegetation Classification System (NVCS) (FGDC 1997). The origin of this system was referred to as the UNESCO/TNC system (Lins and Kleckner, 1996) because it 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 Nature Conservancy and the Natural Heritage Network (Grossman *et al.* 1994) have been improving upon this system in recent years with partial funding supplied by GAP. The basic assumptions and definitions for this system have been described by Jennings (1993).

For ME-GAP, we developed a classification scheme (Appendix 1) that addressed the state's unique complex of vegetation assemblages and land uses, focusing on what was needed to apply species-habitat models (Boone and Krohn 1998a,b). Our classification scheme is a balance between those habitat types required to apply wildlife-habitat models for terrestrial vertebrates in Maine and those types we felt able to delineate from the available data. Our classification system is based on Jennings (1993) which in turn uses Cowardin *et al.* (1979) for wetlands. The highest levels of our classification, and the nomenclature for nonvegetated and highly disturbed environments, come from Anderson *et al.* (1976). Our habitat and land cover classes readily cross-walk with the types being used by other Gap Analysis Projects in the northeastern states.

Mapping Standards

For ME-GAP, we maintained Landsat TM's original cell resolution of 30 x 30 m (900 m^2) throughout the classification process. All scenes were rectified with less than 15 meter residual mean errors, thereby limiting the spatial errors to less than one-half pixel. A target thematic (classification) accuracy was set at 80% for major vegetation and land cover classes.

Methods

Our methods consisted of a hybrid of supervised and unsupervised classification techniques (Lillesand and Kiefer 1994) of TM imagery (Hepinstall *et al.*, 1999). Polygons of known cover type digitized from aerial videography flown in 1994 were used as training sites and for map update and final accuracy testing (Krohn *et al.* 1995). Along with TM imagery, we used US Fish and Wildlife Service National Wetlands Inventory (NWI) maps to delineate 37 different vegetation and land cover types. The map boundary was determined using 1:24,000 scale township map from Maine Office of GIS. A 10 km buffer was maintained into New Hampshire for state edge-matching as well as along the Atlantic Ocean beyond the furthest offshore islands present in the township map.

The Land Cover Classification

Our initial classification scheme had to be collapsed, as we were unable to distinguish some classes. For example, we initially separated early and late regeneration into hardwood, softwood, and mixed, but were unable to distinguish the variation throughout Maine because of differences in the acquisition dates of TM scenes. Our final classification contains 37 classes, 18 derived in part from re-grouped NWI types (Appendix 1). The method used to convert the physiographic classes of the NWI to the vegetation classes needed for ME-GAP is documented in Appendix 2.

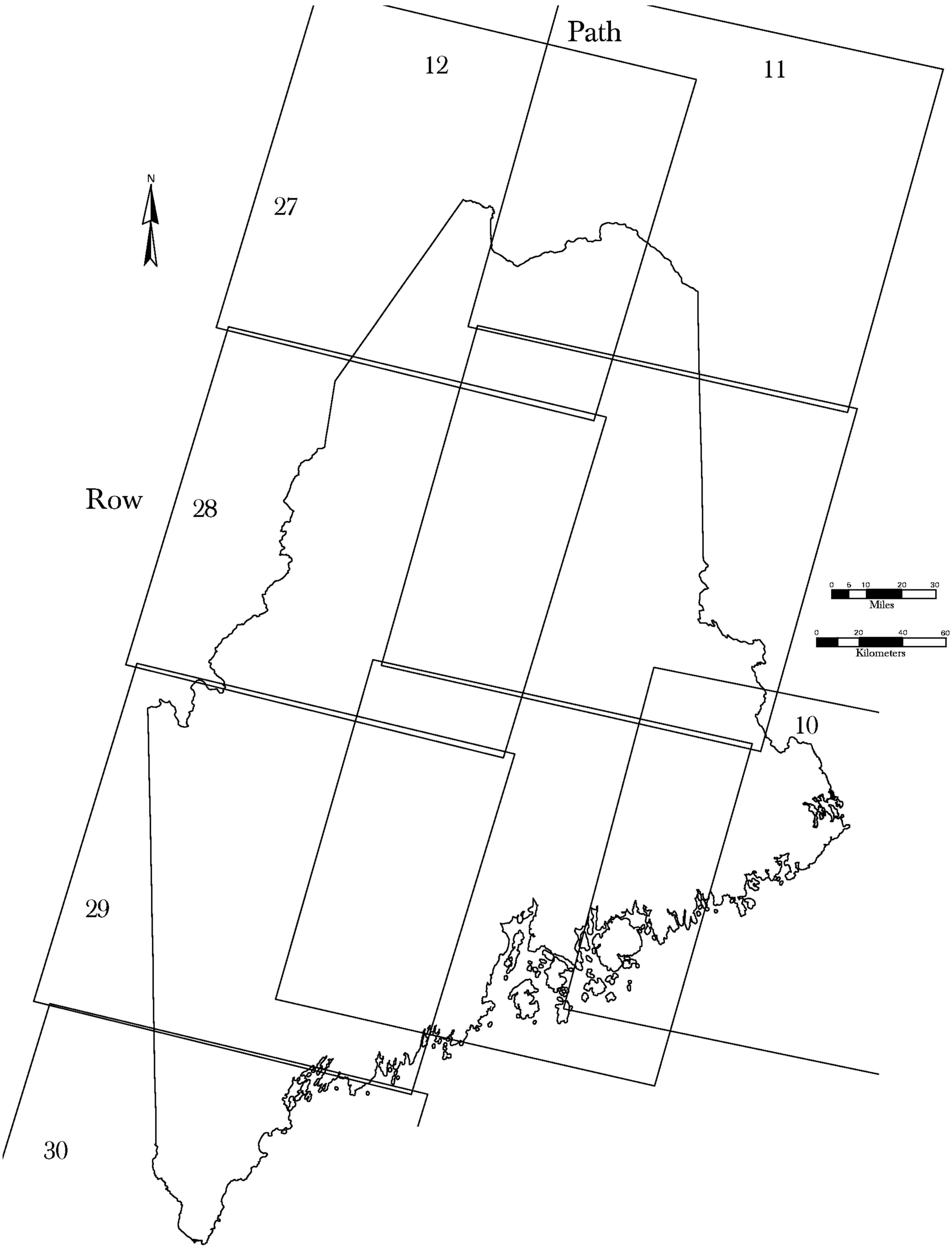
Imagery and Ancillary Data

A total of 8 full TM scenes, and one partial TM scene, were required to obtain statewide coverage (Figure 3). Two years (1991 and 1993) of statewide imagery were obtained with cooperation from the Maine Department of Conservation and the Multi-Resolution Land Characteristics program (Table 1). Imagery from 1991 was geo-referenced (rectified) into Clarke 1866 Spheroid, NAD27 datum, and Universal Transverse Mercator projection with 30-meter pixel resolution. Imagery from 1993 was registered to the 1991 imagery.

Table 1. Acquisition dates of Landsat-TM imagery used in ME-GAP by worldwide path/row reference system.

	Path		
Row	**12**	**11**	**10**
27	06/07/91 09/16/93	8/16/90 10/11/93	NA
28	06/07/91 0916/93	06/16/91 10/11/93	NA
29	06/07/91 09/16/93	07/02/91 10/11/93	06/25/91 10/20/93
30	06/07/91 06/12/93	07/18/91 10/11/93	NA

Figure 3. Landsat-Thematic Mapper (TM) scene coverage for Maine.
Numbers refer to the path and row of the TM imagery (see Table 1 for dates of imagery).



Samples for supervised classification training sites, interim map assessment, and final accuracy assessment were derived from statewide aerial videography flown in June and October 1994. The aerial videography transects were flown between June 9-23 (15 transects, 24 km apart, parallel to the Atlantic coast) and between October 4-12 (18 transects, east/west, 27 km apart) (Figure 4). To approximate plant phenology, spring transects started in the south and progressed north whereas fall flights started in northern Maine and worked south. The videography equipment was described by Slaymaker *et al.* (1996).

Successful use of the aerial videography in training TM data required that we knew the relations between (1) the vegetation on the ground and the aerial videography, and (2) the videography and the TM data as displayed on a computer screen. Thus, a roadside sample of the vegetation types needed for ME-GAP were printed from the videography and visited on the ground. Specifically, in the summer of 1995, 216 vegetation types were field verified at 120 roadside sites across Maine. While the resolution of the aerial videography was inadequate for identifying all plant communities, it was adequate for identifying the vegetation types of interest (Bartlett *et al.* 1995). Once the relationships between the ground and videography were determined, the process of relating what we could see on the videography and in the TM data was relatively straightforward.

Approximately 11 million wide angle (210 ha coverage) and zoom (0.09 ha coverage) images were available from the videography for use in training TM data and testing of the resulting map. Homogeneous areas were identified on the videography and corresponding TM scene, delineated into a polygon file and labeled by type at one minute intervals along the videography flight lines.

Ancillary data sources included aerial videography, NWI maps, wetland polygons from the USGS Land Use/Land Cover Digital Analysis (LUDA) database, the USGS 1:100,000 scale Digital Line Graphs (DLG) for the transportation network and urban areas, and point locations for blueberry fields and hay fields. Blueberry fields are burnt on alternate year schedules, sometimes in the fall and other times in the spring. Thus, this type can exhibit many spectral signatures resulting in confusion with other types (e.g., abandoned farmland). Given the importance of blueberry and other brushland habitats to wildlife, we needed additional data to accurately identify and map abandoned farmland, blueberry fields, and hayfields. In July and August of 1994 we had a person drive dirt and paved roads in eastern Maine. The locations of all fields were noted and classified as to abandoned, blueberry, or hay. A total of 796 areas were identified and mapped. Of these, 335 were classified as blueberry fields, 416 as hayfields, and 45 as abandoned farmlands.

Digital NWI maps were available for most of Maine (Figure 5) and these were used to delineate wetland areas. Digital NWI maps were obtained directly from the USFWS' s web site (*http://www.nwi.fws.gov/*). Approximately 88% of Maine (628 out of 709 1:24,000 USGS quadrangles) was covered by the available NWI maps in digital form. (We had complete state coverage of hard copy NWI maps). Ninety-five percent (n = 744) of the aerial photographs used in the creation of the Maine NWI maps were taken in 1983-86 (range: 1973-1987), with 67% of the photos taken in May (range: March-November). Cross-walking the NWI' s physiographic (i.e., wetland landscape location and structure) classification to the ME-GAP vegetation types was tedious and accomplished (Appendix 2) only after consultation with biologists familiar with both Maine wetlands and the NWI classification (see Acknowledgments).

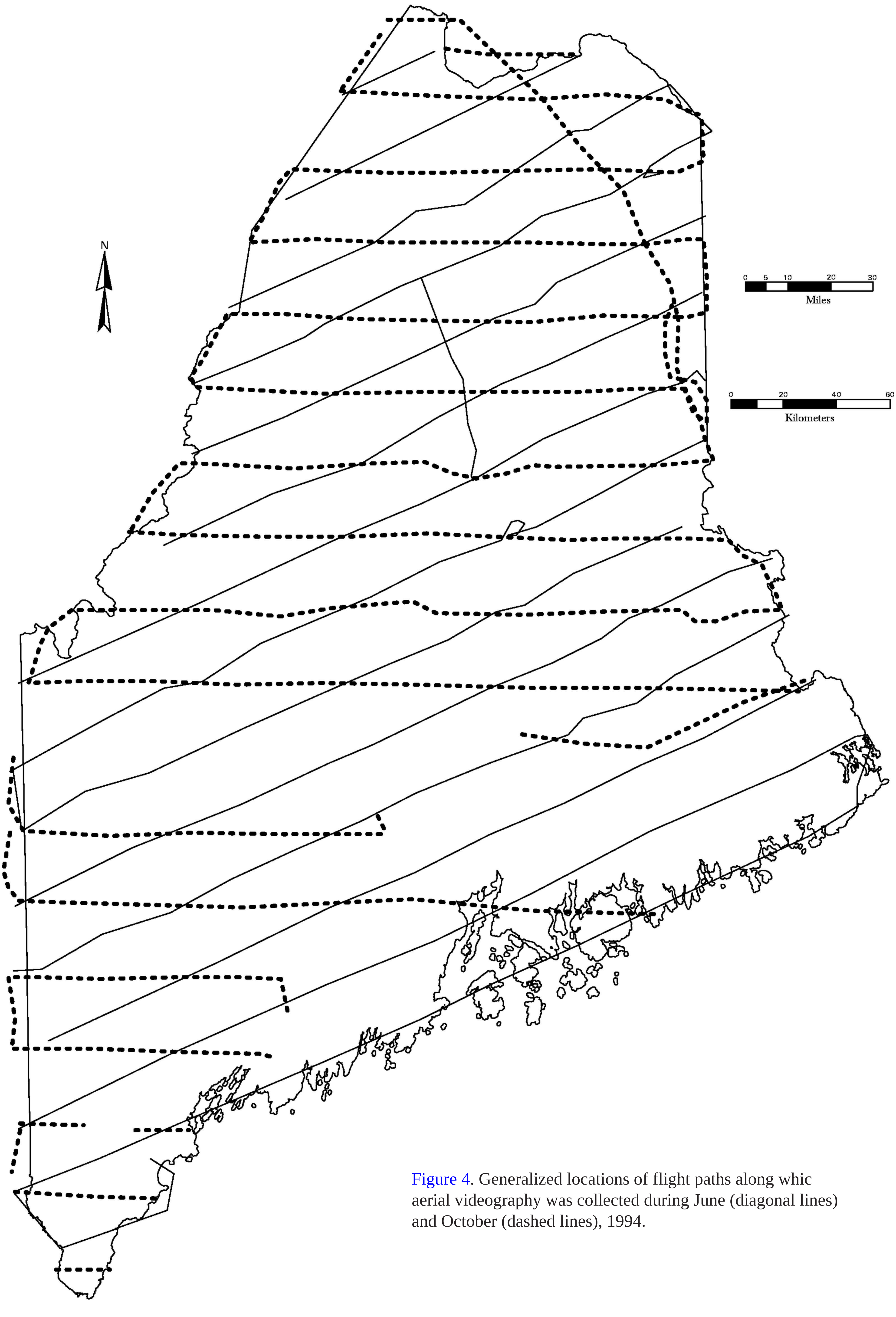


Figure 4. Generalized locations of flight paths along whic aerial videography was collected during June (diagonal lines) and October (dashed lines), 1994.

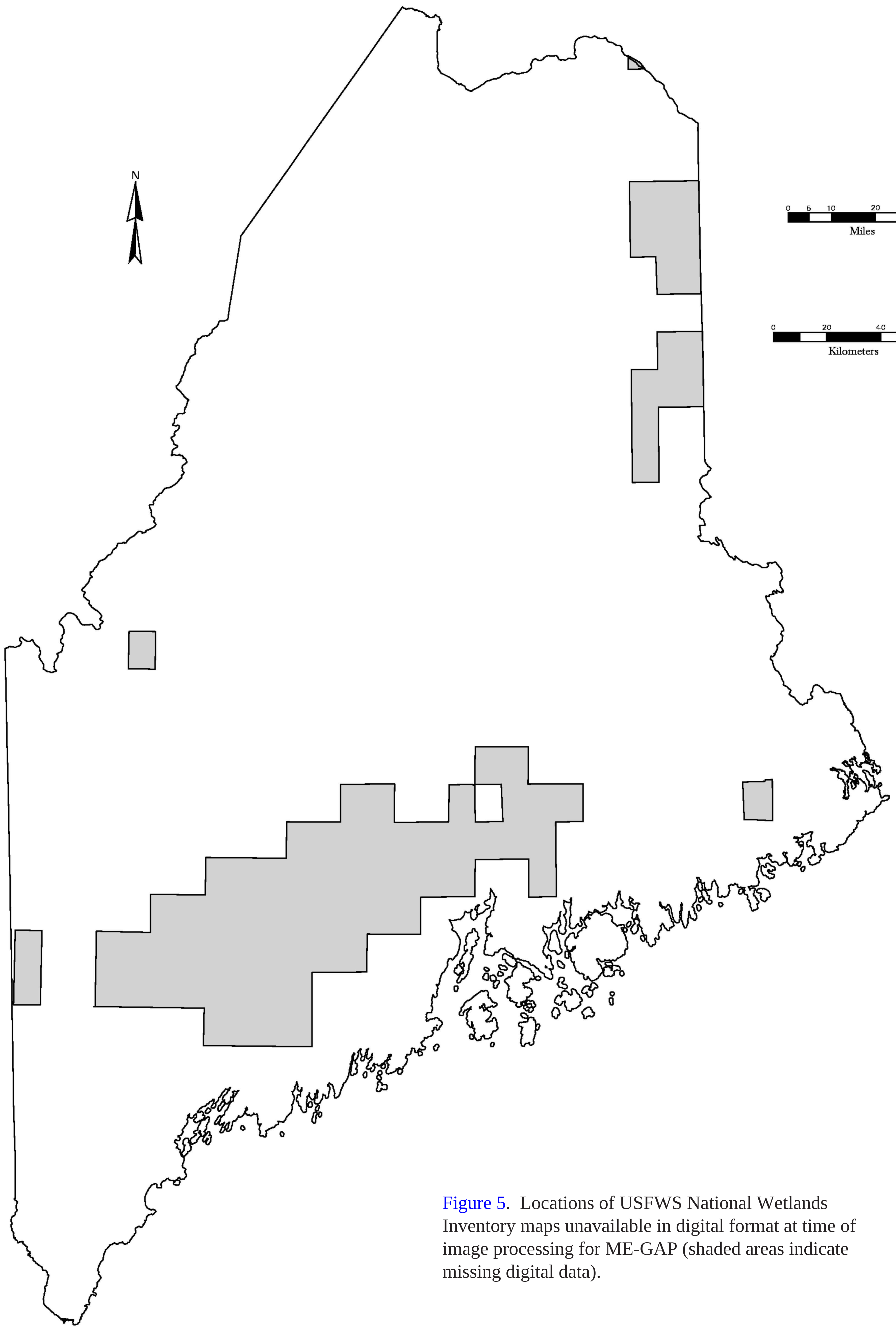


Figure 5. Locations of USFWS National Wetlands Inventory maps unavailable in digital format at time of image processing for ME-GAP (shaded areas indicate missing digital data).

Land Cover Map Development

Ten-band image files were created from the 1991 and 1993 imagery. A radiometrically corrected statewide mosaic of TM bands 3, 4, and 5 was available for 1991 whereas all six nonthermal TM bands were available on a scene-by-scene basis for 1993 imagery. Five themes were used from each year: TM bands 3, 4, 5, and normalized 4/5 and 4/3 ratios for 1991; principal components 1, 2, and 3; and normalized 4/5 and 4/3 ratios for 1993. Principal components analysis was not run on 1991 imagery because only TM bands 3, 4, and 5 were available. The first three principal components for the 1993 data represented 97 percent of the overall variability of the six original bands. The two ratios chosen for each date have been used in vegetation and land cover change detection studies and were useful in discriminating seasonal and annual variation in our data sets (Tucker 1979, Rock *et al.* 1986, Florella and Ripple 1993, Sader 1989, Sader *et al.*1989, Sader 1990).

TM scenes were, by date, cloud-masked and a separate five-band file created from the corresponding cloud-free date. Only one area contained clouds on both dates and this was in the overlap area with New Hampshire and will therefore be filled in by data from the VT/NH-GAP. The cloud area images were classified into 25 to 50 classes using an unsupervised approach, matched with the 10-band supervised classification, and merged into the final scene mosaic.

Statewide classification proceeded on a TM scene-by-scene basis, thereby limiting the effects associated with radiometric scene differences from different acquisition dates. For each scene, the 10-band image was classified using 25 percent of the interpreted videography polygons as training sites in a supervised classification. For each type the spectral variability of the training sites were evaluated to ensure that they were representative. Confused spectral signatures were stratified, masked out from the 10-band imagery, and re-classified into 50 clusters using an unsupervised approach. Unsupervised classifications of the 10-band image were also performed and used as a comparison to the supervised approach.

Special Feature Mapping

Spectral confusion occurred among some types, requiring ancillary GIS data to differentiate these classes. Specific classes that were confused include (1) plowed fields, recent clear cuts, and residential/urban areas; (2) early regeneration, scrub wetlands, and blueberry fields; (3) and different stages of regeneration versus partially harvested areas.

For the portions of the state where NWI maps were unavailable in digital form, wetlands were classified using a supervised procedure with additional training samples obtained from the aerial videography and the paper NWI maps (Hepinstall et al., 1999). Because we expected to receive the complete set of digital NWI maps before the completion of ME-GAP, we underestimated the number and area of wetlands in the above classification procedure. Such underestimating allows the final product to easily be updated when new digital data become available without high levels of commission error.

Point locations for blueberry and hay fields, collected in 1994, were used to discriminate agricultural fields from early regeneration or residential areas. Blueberry fields were also stratified out for two scenes (Path 10 Row 29 and Path 11 Row 29) to conduct a class-specific supervised classification using training sites based on blueberry field locations obtained by roadside surveys. Classes that appeared to capture the majority of known blueberry fields were incorporated into each scene mosaic.

Urban and residential areas were masked out using the DLG transportation vector coverage, and LUDA urban and residential polygons that had been buffered from 25 to100 meters depending on the size of the road. These images were classified into 50 classes using an unsupervised approach. Classes were evaluated and those classes representing any of our four developed lands classes were added to the final scene classification.

Once each scene classification was completed, all scenes were assembled into a statewide map. Slight differences in scene classifications resulted in class seams across scene boundaries. To minimize this effect, class assignments were adjusted in the original scene classifications (Hepinstall et al., 1999, for details).

Once the statewide classification was complete and all TM scenes were assembled together, several majority filters were used to screen out artifacts of the classification and edge-matching process. For example, a majority filter was applied to blueberry fields and the class extent for blueberry fields was limited to the extent of Maine known to grow blueberries (Yarborough 1996).

After applying filters to correct for artifacts in image pre-processing, we applied the program, MegaMerge, version 52 (*http://www.cyberport.net/glacier/gis/*), with a minimum output polygon size of 9 pixels (0.81 ha), although still maintaining the cell resolution of 30 m.

Edge-Matching Polygons

Maine borders only one state, New Hampshire, where gap analysis for is being conducted by personnel of the University of Vermont, with Dr. D. Capen as principal investigator. Several meetings between ME-GAP and VT/NH-GAP have taken place to ensure data layers edge-match. We have provided VT/NH-GAP with that portion of the ME-GAP vegetation and land cover map covering 10 km on each site of the ME-NH border. Because ME-GAP used more classes than VT/NH-GAP, Dr. Capen will fit the polygons from Maine into those for New Hampshire.

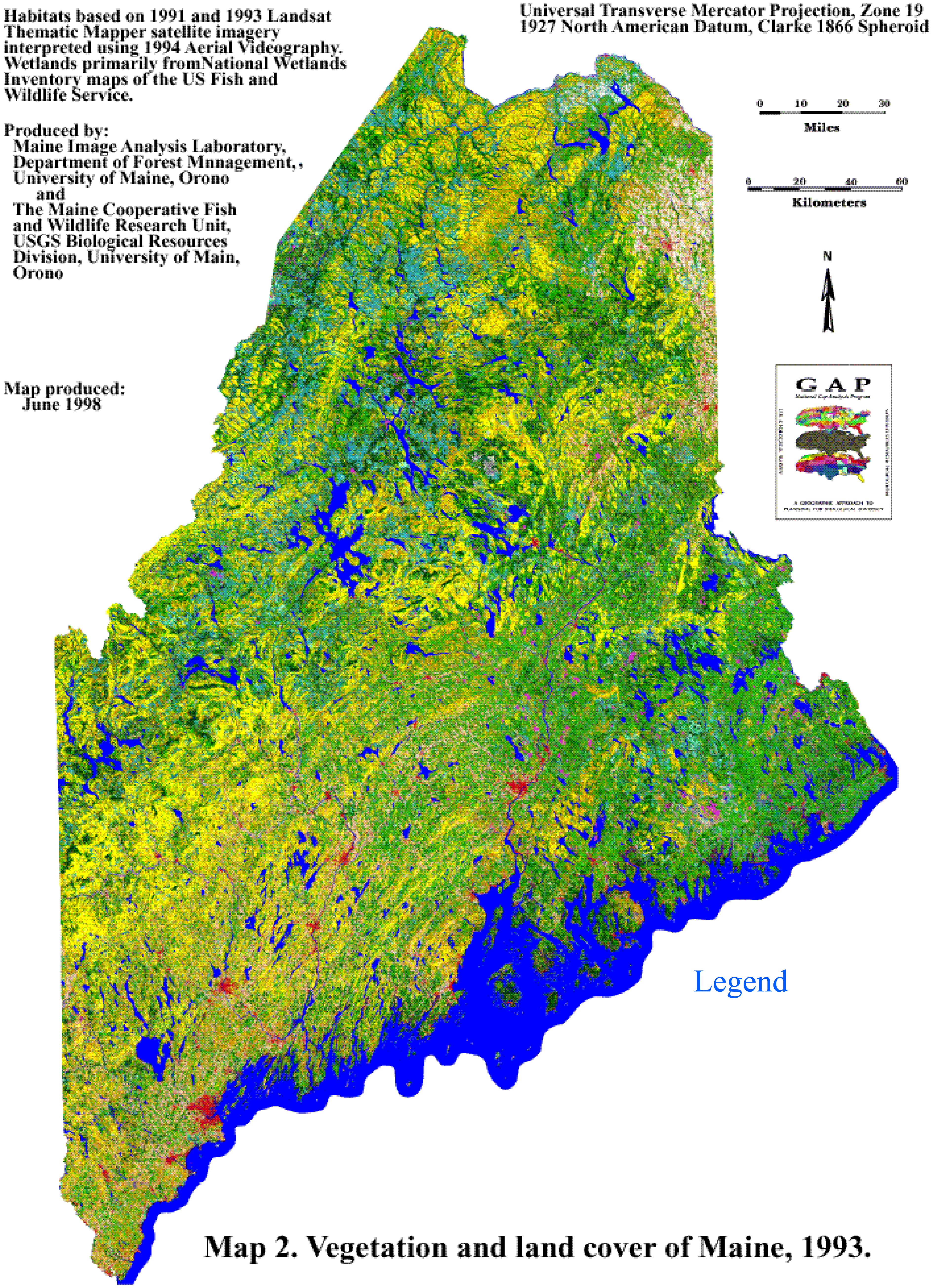
Results

The statewide results of our mapping effort (Map 2) matched well with estimates from the 1995 USDA Forest Service study (Griffith and Alerich 1996). Their study estimated that 71,588 km^2 of Maine was forested, including forested wetlands. This compares well to our estimate of 70,680 km^2. Estimates of nonforested freshwater wetlands were also close between Forest Service and our estimates (1,363 versus 1,380 km^2, respectively). We did differ greatly between

“(see Habitat Map Key on Odd page, and Map 2 on Even page)”

our estimates of agricultural lands (3,402 USFS versus 6,169 km^2 ME-GAP) and developed lands (1,975 USFS versus 1,066 km^2 ME-GAP). These differences are partially accounted for by the different classification schemes used: the Forest Service includes a single-family housing class that would be a combination of low-density residential or grasslands in the ME-GAP classification scheme. In ME-GAP, areas that are mostly lawns were classified as grasslands rather than as low-density residential.

As expected, forested types dominate the state (Table 2). Because the final NWI digital maps were unavailable before completing ME-GAP, we underestimated wetlands in the areas where digital NWI maps were unavailable (Figure 5) so that the digital NWI could be readily added at a later date. Distribution of vegetation and land cover types by biophysical regions are presented in Appendix 3.



Map 2. Vegetation and land cover of Maine, 1993.

Vegetation and Land Cover Types

Agricultural Lands

- Abandoned Field
- Blueberry Field
- Grasslands (hayfield, pastures, lawns, golf courses)
- Crops/Ground (including plowed ground and bare ground)

Developed Lands

- Sparse Residential
- Dense Residential
- Urban/Industrial
- Highways/Runways

Forestlands

- Clearcut
- Early Regeneration
- Late Regeneration
- Light Partial Cut
- Heavy Partial Cut
- Deciduous Forest
- Deciduous/coniferous Forest
- Coniferous/deciduous Forest
- Coniferous Forest

Water & Wetlands

- Deciduous Forested
- Coniferous Forested
- Dead-forest
- Deciduous Scrub-shrub
- Coniferous Scrub-shrub
- Dead Scrub-shrub
- Fresh Aquatic Bed
- Fresh Emergent
- Peatland
- Wet Meadow
- Salt Aquatic Bed
- Salt Emergent
- Mudflat
- Sand Shore
- Gravel Shore
- Rock Shore
- Shallow Water
- Open Water

Other

- Alpine Tundra
- Exposed Rock/Talus

Table 2. Area and percentage of Maine in the 37 vegetation and land cover types mapped by ME-GAP, 1993.

	Area Mapped (km^2)	% of State Area
Agricultural Lands	**6,168.6**	**7.29**
Abandoned Field	201.2	0.24
Blueberry Field	133.6	0.16
Grasslands	4,719.2	5.58
Crops/Ground	1,114.6	1.32
Forestlands	**64,482.9**	**76.19**
Clearcut	1,272.3	1.50
Early Regeneration	5,369.6	6.34
Late Regeneration	2,925.6	3.46
Light Partial Cut	1,137.5	1.34
Heavy Partial Cut	1,536.1	1.81
Deciduous	12,818.7	15.15
Deciduous/coniferous	13,486.4	15.94
Coniferous/deciduous	18,020.3	21.29
Coniferous	7,916.6	9.35
Water & Wetlands	**12,849.9**	**9.69**
Deciduous Forested	736.1	0.87
Coniferous Forested	3,891.0	4.60
Dead-forest	27.9	0.03
Deciduous Scrub-shrub	1,384.1	1.64
Coniferous Scrub-shrub	156.3	0.18
Dead Scrub-shrub	1.2	0.00
Fresh Aquatic Bed	1.4	0.00
Fresh Emergent	718.8	0.85
Peatland	472.8	0.56
Wet Meadow	170.0	0.20
Salt Aquatic Bed	196.9	0.23
Salt Emergent	80.2	0.09
Mudflat	236.1	0.28
Sand Shore	31.5	0.04
Gravel Shore	37.3	0.04
Rock Shore	63.5	0.08
Shallow Water	146.7	0.17
Open Water	4,498.2	5.31
Developed Lands	**1,065.9**	**1.23**
Sparse Residential	690.6	0.82
Dense Residential	352.2	0.42
Urban/Industrial	14.9	0.02
Highways/Runways	8.2	0.01
Other	**65.5**	**0.08**
Alpine Tundra	20.6	0.02
Exposed Rock/Talus	44.9	0.05
Total	**84,630.0**	**100.00**

Accuracy Assessment

Introduction

GAP land cover maps are primarily compiled to answer the fundamental question in gap analysis: what is the current distribution and management status of the nation's major natural vegetation and land cover types? In addition to providing a measure of overall reliability of the land cover map (Congalton 1991, Edwards *et al.* 1998) for state projects, the assessment also identifies which general classes or which regions of the map do not meet the accuracy objectives for the Gap Analysis Program. Thus the assessment identifies where additional effort will be required when the map is updated.

The purpose of accuracy assessment is to allow a potential user to determine the map's "fitness for use" for their application. It is impossible for the original cartographer to anticipate all future applications of a land cover map, so the assessment should provide enough information for the user to evaluate fitness for their unique purpose. This can be described as the degree to which the data quality characteristics collectively suit an intended application. The information reported includes details on the database's spatial, thematic, and temporal characteristics and their accuracy.

Assessment data are valuable for purposes beyond their immediate application to estimating accuracy of a land cover map. The reference data is therefore made available to other agencies and organizations for use in their own land cover characterization and map accuracy assessments (see Data Availability). The data set will also serve as an important training data source for later updates.

Even though we have reached an endpoint in the mapping process where products are made available to others, the gap analysis process should be considered dynamic. We envision that maps will be refined and updated on a regular schedule. The assessment data will be used to refine GAP maps iteratively by identifying where the land cover map is inaccurate and where more effort is required to bring the maps up to accuracy standards applicable to other projects (e.g., fine scale habitat studies). In addition, the field sampling may identify new classes that were not identified at all during the initial mapping process. Overall, we believe that the vegetation and land cover map created is adequate for its designed purpose.

Methods

Aerial videography flown in 1994 was used for preliminary map assessment and final accuracy assessment (Figure 4). Homogeneous areas of the vegetation and cover type were identified on both the wide angle and zoom videography. The corresponding area was located on the TM imagery and on-screen digitizing was used to delineate and type the areas (for details, see Hepinstall *et al.*, 1999).

The preliminary statewide map was tested for class accuracy using approximately 35 percent of the aerial videography polygons not used for supervised classification training sites (n = 1,231; mean = 66 polygons per class). Modifications to the original scene classifications were done according to the above assessment.

The accuracy assessment for the final map was done using the videography polygons not used as input for the supervised classification procedures (n = 2,112; mean of 124 polygons per class) (Congalton 1991, Edwards *et al.* 1998). The accuracy of all wetland classes was estimated as a single class because the classification scheme used in developing the videography polygons differed greatly from the final wetland classification based on re-grouping NWI wetland types.

Results

Although we use the term "accuracy assessment", it should be noted that the video interpretation used as the reference or "truth" is likely not 100% correct, therefore our analysis is really a test of agreement between methods. However, for many years resource managers in the forest

ground truth.

Classification accuracy tables are created through an error matrix where reference classes ("ground truth") are in columns, and map classes are in rows. The overall map accuracy is calculated by adding the values along the matrix diagonal and dividing by the reference total. All non-diagonal entries are errors and can be grouped into errors of omission (areas that should have been classified as one class but were classified as another: column errors) or errors of commission (areas that were classified as one class but were really another class: row errors). Producer accuracy is the percent correct (diagonal) divided by the column (reference data) total. User accuracy is the percent correct (diagonal) divided by the row (map) total (Congalton 1991).

Accuracy assessments are reported in Tables 3, 4, and 5 by superclasses (Agricultural lands; Developed lands; Forestlands; and Wetlands). Overall map accuracy for superclasses is high (88.1%) indicating that at the lowest level of class resolution, our map has high agreement with the interpreted videography. Another measure of agreement which attempts to correct for chance agreement, termed kappa or KHAT (Lillesand and Kiefer 1994), had a high value as well (71%).

Classes making up the majority of the state consistently had high (greater than 75%) overall accuracy than less predominant types (Table 3). Class confusion was as expected, especially between Forestlands and Wetlands. The conservative estimate of wetlands in the areas of our map where we did not have digital NWI maps shows up as a large number of wetland pixels in the videography being classified as forestlands (a 24.8% omission error). The large wetland commission error (35.5%) may indicate a misinterpretation of videography (i.e., forested wetlands missed in video interpretation) rather than errors in the NWI classification. Confusion between Agriculture and Forestlands occurs primarily due to class confusion between low biomass forestland (Clearcut, Early Regeneration, and Heavy Partial Cut) and the low biomass of agricultural lands. Confusion of areas classified as Agricultural Lands in the map and Developed Lands in the videography arise from differences in visual interpretation of the cut-off between Low Density Residential and Grasslands.

Accuracy assessments for a 4 class grouping of the Forestland classes (Low Biomass regenerating forest including Clearcut, Early Regeneration, and Heavy Partial Cut; Deciduous Forest; Mixed Forest including both mixed forest categories, Late Regenerating Forest, and Light Partial Cut; and Coniferous Forest) are presented in Tables 6, 7, and 8. The Forestland breakdown is helpful in understanding the within-superclass confusion of Forestlands, Maine's major land cover type. Class confusion among forest types is higher than desired, but all confusions are expected (e.g., Mixed Forest is confused with Deciduous or Coniferous Forest; Deciduous Forest is confused with Mixed Forest, but not Coniferous Forest and visa versa; Low Biomass Forest is confused with Mixed Forest). Individual class accuracies are reported and discussed in Hepinstall *et al.* (1999).

Table 3. Map superclass (Anderson *et al.* 1976; Level II) error matrix by pixel (diagonal elements represent agreement; off-diagonal elements represent errors).

Map	Videography						%	Class as a
	Ag.	Developed	Forestlands	Wetlands	Other	Total	Correct	% of State
Agricultural Lands	**3,801**	231	631	125	66	4,854	**78.31**	7.29
Developed Lands	124	**492**	56	0	0	672	**73.21**	1.26
Forestlands	705	88	**28,887**	1,044	1	30,725	**94.02**	76.19
Wetlands	112	14	1,683	**3,045**	19	4,873	**62.49**	9.69
Other	0	0	18	0	**138**	156	**88.46**	0.08
Total	4,742	825	31,275	4,214	224	41,280		
% Correct	**80.16**	**59.64**	**92.36**	**72.26**	**61.61**			

Table 4. Comparisons (% of pixels) of mapped superclasses to aerial videography samples (producer accuracy = diagonal; commission errors = off-diagonal cells).

Map	Videography							% of State	SE(%) of Accuracy
	Ag	Developed	Forestlands	Wetlands	Other	State	N	Sampled	Estimate
Agricultural	**78.31**	4.76	13.00	2.58	1.36		4,854	0.71	0.59
Developed	18.45	**73.21**	8.33	0.00	0.00		672	0.57	1.71
Forestlands	2.29	0.29	**94.02**	3.40	0.00		30,725	0.43	0.14
Wetlands	2.30	0.29	34.54	**62.49**	0.39		4,873	0.34	0.69
Other	0.00	0.00	11.54	0.00	**88.46**		156	2.14	2.56
Total						**88.10**	41,280	0.44	0.16

Table 5. Comparisons (% of pixels) of aerial videography samples to mapped superclasses (user accuracy = diagonal; omission errors = off-diagonal cells).

Map	Videography				
	Agriculture	Developed	Forestlands	Wetlands	Other
Agricultural	**80.16**	28.00	2.02	2.97	29.46
Developed	2.61	**59.64**	0.18	0.00	0.00
Forestlands	14.87	10.67	**92.36**	24.77	0.45
Wetlands	2.36	1.70	5.38	**72.26**	8.48
Other	0.00	0.00	0.06	0.00	**61.61**
N	4,742	825	31,275	4,214	224

Table 6. Forestlands class accuracy in number of pixels and percentages. (Totals and % Correct refer to all-class accuracy, not only Forestlands).

Map	Videography						
	Low Biomass[a]	Decid. Forest	Mixed Forest	Conif. Forest	Totals	% Correct	Class as a % of State
Regen. Forest: Low Biomass	**4,499**	103	521	54	5,591	**80.47**	9.66
Deciduous Forest	193	**6,060**	1,264	13	7,782	**77.87**	15.15
Mixed Forest	1,986	2,008	**5,507**	1,880	12,161	**45.28**	42.03
Coniferous Forest	84	40	824	**3,851**	5,191	**74.19**	9.35
Totals	7,374	8,389	8,714	6,798	41,280		
Percent Correct	**61.01**	**72.24**	**63.20**	**56.65**			

[a] - defined as Clearcut, Early Regeneration, and Heavy Partial Cuts.

Table 7. Comparisons (% of pixels) of mapped Forestlands classes to aerial videography samples (producer accuracy = diagonal; commission errors = off-diagonal cells).

Map	Videography					% of State Sampled	SE(%) of Accuracy Estimate
	Low Biomass[a]	Deciduous Forest	Mixed Forest	Coniferous Forest	N		
Regen. Forest.: Low Biomass	**80.47**	1.84	9.32	0.97	5,591	0.62	0.53
Deciduous Forest	2.48	**77.87**	16.24	0.17	7,782	0.55	0.47
Mixed Forest	16.33	16.51	**45.28**	15.46	12,161	0.31	0.45
Coniferous Forest	1.62	0.77	15.87	**74.19**	5,191	0.59	0.61

[a] - defined as Clearcut, Early Regeneration, and Heavy Partial Cuts.

Table 8. Comparisons (% of pixels) of aerial videography samples to mapped Forestlands classes superclasses (user accuracy = diagonal; omission errors = off-diagonal cells).

Map	Videography			
	Low Biomass[a]	Deciduous Forest	Mixed Forest	Coniferous Forest
Regen. Forest: Low Biomass	**61.01**	1.23	5.98	0.79
Deciduous Forest	2.62	**72.24**	14.51	0.19
Mixed Forest	26.93	23.94	**63.20**	27.66
Coniferous Forest	1.14	0.48	9.46	**56.65**
N	7,374	8,389	8,714	6,798

[a] - defined as Clearcut, Early Regeneration, and Heavy Partial Cuts.

Limitations and Discussion

We note that our accuracy assessment is really an agreement assessment, not an absolute assessment of the vegetation and land cover map relative to ground-truth. Specifically, we quantified two types of agreements by comparing the following: (1) aerial videography to the land cover map, and (2) the land cover map to the videography. In both comparisons, the aerial videography was considered to represent ground-truth. If in fact the videography was an absolute measure of what was on the ground, then a comparison of random sets of data from the spring and fall videography should yield the same results (i.e., the composition of types on the ground does not change). In comparing random samples of types from spring ($n = 2,871$) and fall ($n = 2,083$) videography, the frequency of occurrences of types between seasons differed (Chi-square, $P < 0.001$) (Bartlett *et al.* 1997). Some of these differences were due to changes in vegetation characteristics between spring and fall that affected identification. For example, one expects to find more wetlands in the spring versus fall videography due to wetter soils and more open canopy (i.e., less leaf-cover) in spring, increasing visibility to the forest floor. However, other differences in the occurrences of types seemed to be related to seasonal differences in interpretation. For example, what one calls deciduous/coniferous forest in the spring videography could be called a deciduous forest in the fall videography due to the dominance of the bright colors in the fall foliage (Bartlett *et al.* 1997). Thus, readers of our accuracy assessment are cautioned that our standard of comparison was aerial videography, not what was actually on the ground at the time of satellite image acquisition (although field-checks of the videography suggested reasonable agreement to types on the ground [Bartlett 1995 *et al.*]).

Given what is currently known about vertebrate-habitat relations, we believe the vegetation and land cover classes used in ME-GAP were adequate for predicting the potential distributions of the state' s terrestrial vertebrates. However, in terms of identifying gaps in the conservation of plant communities (i.e., Davis *et al.* 1996, Stoms *et al.* 1998), the vegetation and land use classes should be more specific than the ones used here. On-going research at the Maine Image Analysis Laboratory, University of Maine, is assessing the relative importance of different spectral bands, and temporal and spatial resolution of these data, in correctly identifying vegetation types in Maine. Once this research is completed in three to four years, we will have a much better chance to map at least some plant communities to the alliance level, and know the relative cost versus benefit of doing more detailed vegetation mapping.

Not all vegetations and land use classes were mapped with the same level of accuracy. In general, however, we suspect that wetland types were mapped more accurately than upland types because the majority of the later were identified and mapped from aerial photographs (NWI) whereas the former came from TM data. Even in the case of wetlands, however, there is undoubtedly variation in accuracy rates by types. For example, NWI maps are known to be more accurate for unforested (e.g., peatlands) versus forested (e.g., red maple swamp) wetlands (Sader *et al.* 1995, Stolt and Baker 1995). However, at the level of USEPA EMAP hexagons (the analysis unit used by GAP), we doubt the accuracy of any vegetation or land use class was so poor as to cause nonprediction of any species of terrestrial vertebrate that regularly breeds in Maine. Users interested in assessing population viability, in contrast to small-scale presence-absence predictions, must be concerned with small wetlands (and other habitats) being unmapped (e.g., Gibbs 1993).

Slight disagreement is expected even at the superclass level of class resolution due to temporal, spatial, and class differences between the satellite imagery and the videography. Differences in the date of the videography (1994) and the satellite imagery (1991 and 1993) also created some differences in the actual conditions on the ground. Temporal differences would be most likely between different states of forest regeneration, as well as between forest regeneration and agriculture. Spatial differences between the polygon outlines delineated from the videography and the satellite imagery exist given the high level of spatial heterogeneity of the Maine landscape. Class differences between the class scheme used when interpreting the videography and the final class scheme for our map may have lead to inaccuracies when comparing the typed videography and the map output. Visual comparison of all training sites and resulting spectral statistics limited the errors in classification due to mislabeling of videography sites. However, we were unable to conduct a similar comparison of all accuracy assessment sites with the original, unclassified satellite imagery to double check the labeling done by the video interpreter.

The accuracy assessment reported here is based on statewide data. Because the vegetation and land cover map of Maine is based on multiple TM scenes assembled together, these accuracy numbers should not be assumed to be the same among scenes for a number of reasons. First, scenes were taken in different years, seasons, and times of day. Such scene differences result in not all classes being mapped with the same probabilities of correctness. Furthermore, class compromises were made when fitting scenes together. More specifically, to prevent showing scene boundaries, it was often necessary to slightly increase the number of pixels in one class although reducing the number of pixels assigned to that same class in an adjoining scenes. While this resulted in a relatively seamless map, it undoubtedly introduced errors. Users considering applying the ME-GAP vegetation map at a local (i.e., substate) level should be aware that accuracy rates in the area of interest to them may be considerably different (i.e., higher or lower) than the statewide averages reported here. For a more complete discussion of the issue of geographic variations in the map's accuracy, see Hepinstall *et al.* (In Review).

In conclusion, we believe that the vegetation and land cover map produced for ME-GAP was adequate for the intended use of being the major data source for making seamless predictions of the occurrences of native, nonfish vertebrates across Maine. Readers can judge for themselves whether or not this goal was achieved by reviewing the predicted distribution maps for each of the 270 vertebrate species in Boone and Krohn (1998a,b).

PREDICTED ANIMAL DISTRIBUTIONS AND SPECIES RICHNESS

We saw a pair of moose horns on the shore,
and I asked Joe [Thoreau' s Indian guide] *if a moose had shed them;*
but he said there was a head attached to them,
and I knew that they did not shed their heads
more than once in their lives.

Thoreau - The Maine Woods, 1848

Introduction

Range maps are coarse-level predictions about the occurrence of those species across a particular area (Csuti 1994). Traditionally, the ranges of most species are delineated 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.

ME-GAP maps were produced at a nominal scale of 1:100,000, and are intended for applications at the landscape or "gamma" scale (homogeneous areas generally covering 10,000 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 animal species to evaluate their conservation status relative to existing land management (Scott *et al.* 1993). However, maps of 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 species occurrence records and literature that are assembled into databases used to produce the maps.

Previous to this effort there were no maps available, digital or otherwise, showing the likely present-day distribution of species by cover types 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 our knowledge about the status of each animal species is one of the most necessary and basic elements for preventing further erosion of biological resources.

Mapping Standards

Species included in these analyses were native breeding, terrestrial (i.e., non-fish) vertebrates of Maine with some portion of their population breeding inland at least five of the last 10 years. This definition excludes the coastal birds, such as Double-crested Cormorants[a] and Eider Ducks, which should be mapped using different methods than those described here. Also excluded are sea turtles, marine mammals, and seven introduced species (i.e., the Mudpuppy, Black Rat, House Mouse, Rock Dove, European Starling, House Finch, and House Sparrow). Included is the Canada Goose, while not originally a native nester to Maine, it now nests in the state as well as being a native breeder in Quebec.

Whether or not species had been breeding in the state in at least five of the last 10 years was determined by literature review, expert advice, and personal experience. The decision to include or exclude species is not a trivial one -- including too many sporadic breeding species would unduly elevate commission errors (Boone and Krohn, 1999). For example, lists prepared by the Maine Department of Inland Fisheries and Wildlife (MDIFW) show more than 100 species of birds as incidental in Maine.

Methods

Mapping Range Extent

Range maps were developed for each of the terrestrial vertebrate species that were judged to regularly breed in Maine, 1984-1993. For each species, a range map was created that depicted potentially occupied and unoccupied Maine townships. A small map of the species' regional distribution was included as an inset. Initial species ranges for Maine were from smooth-curve maps in DeGraaf and Rudis (1986), and were generalized to townships. Supplemental data used to guide the placement of range boundaries included atlas data for amphibians and reptiles (Hunter *et al.* 1992), and birds (Adamus 1987). Additional data used were observations recorded in the MDIFW Biological Conservation Database of endangered and rare vertebrates, and MDIFW harvest data for game species. Observations were generalized to townships, and overlaid onto the range maps.

Regional species ranges for New England were initially from DeGraaf and Rudis (1986), with additional general references for each group of species (Table 9). Species ranges were modified based upon a literature review, with .107 sources reviewed for amphibians and reptiles, with 10 directly pertinent to ranges, .243 reviewed for mammals, with 20 regarding ranges, and .321 sources for birds, with 35 directly pertinent to range limits.

[a] - Scientific names of wildlife species used in ME-GAP are given in Boone and Krohn (1998a,b).

Table 9. Major references used in ME-GAP to delineate ranges of terrestrial vertebrates that regularly breed in Maine.

Vertebrate Classes	Major Literature Sources
Amphibians and Reptiles	Andrews (1995), Bider and Matte (1994)[b], Bleakney (1958), Conant and Collins (1991), DeGraaf and Rudis (1986), Gilhen (1984), Hunter *et al.* (1992)[a], Klemens (1993), McAlpine (1997), Taylor (1993)[b].
Mammals	Banfield (1974), Burt and Grossenheider (1976), DeGraaf and Rudis (1986), Dilworth (1984)[b], Godin (1977).
Birds	Adamus (1987)[a] , DeGraaf and Rudis (1986), Erskine (1992)[b], Foss (1994)[b], Gauthier and Aubry (1996)[b].

[a] - Maine-specific atlas.
[b] - Atlas from adjacent state or province.

We marked on each Maine range map the range limit we believed appropriate based upon the literature reviewed, Maine atlas and MDIFW data, and atlas observations the adjacent state or provinces. We were fortunate in having excellent atlas coverage in New Hampshire, New Brunswick, and Quebec, especially for breeding birds (Table 9). Maps were placed into volumes by species group (i.e., amphibian and reptile, mammals, passerine birds, and nonpasserine birds), and 34 copies (12 amphibian and reptile, 12 mammal, and 10 bird) of these volumes were distributed to experts for their comments. Based upon feedback from experts, finalized maps were incorporated into a geographic information system (GIS), using ARC/INFO Version 7.0.2 (Unix) and Version 3.4.2 (DOS) (Environmental Systems Research Institute, Redlands, California, USA; use of trade names does not imply endorsement by the US Government). Smooth range maps stored as raster ARC/INFO grids were created from the reviewed maps.

Range limits for birds were reasonably accurate when compared to smoothed empirical data (i.e., USGS Biological Resources Division Breeding Bird Survey (BBS) results, which were not used to develop ranges). Of 80 species with range limits in the state, 47 had adequate BBS data for testing. For species with high quality smoothed BBS maps (n = 18), the median error between ranges and observed data was 8%. When disagreement in area was considered the error was 3.9% for species with high quality kriged maps (Boone 1996), and 4.5% for all 47 species.

Wildlife Habitat Relationships

Relations to Mapped Habitat

A wildlife habitat relationships database specific to Maine had not been created when we began our work, so we had to create one. We used a literature review and a review by experts to assign use (i.e., absent, rarely occurs, occasional occurrence, common, and abundant) by each species to 47 habitats. The matrices included levels of use for breeding (e.g., nest sites built in cavity trees) and feeding (e.g., waste crops fed upon in agricultural areas).

Initial scores (0 = unused to 4 = frequently used) for wildlife habitat relationships were assigned primarily from DeGraaf and Rudis (1986). A paper file was create for each species, and within the file, habitat use was recorded and amended during an extensive literature review. After an initial review of the literature, three page species synopses were created, which included a habitat matrix for each species. These synopses were formed into volumes and were forwarded to regional experts for review (Appendix 4). Their comments were incorporated into finalized species synopses, and the values were digitized to create a wildlife habitat relationships database. The wildlife habitat relationships database was then reformatted by cross-walking the 47 habitats in the database to the 37 types of habitats mapped by ME-GAP, using custom programs and review. For presence/absence modeling in ME-GAP, habitat use scores $ 2 were shown as used, and scores 0 and 1 were shown as unused.

Relations to Ancillary Data Layers

Ancillary layers of information that proved useful in modeling species distributions included elevation, wetland type, and hydrology. Digital Elevation Models (DEMs) from the USGS were acquired from the Maine Office of GIS, and merged into a seamless DEM for the state. This grid has a spatial resolution of 94 m cells, with elevation stored to the nearest meter above mean sea level. Wetland type was a supertype primarily from the USFWS National Wetlands Inventory (NWI) (a portion of the wetlands were mapped from satellite imagery, as explained in Land Cover Classification and Mapping). These coarse wetland types included six classes: palustrine, lacustrine, riverine, estuarine, ocean, and upland. The vegetation map for ME-GAP stored "open water" for example, but the map alone does not define the open water as a pond or ocean. When the wetland type is considered, however, the two are differentiated. Streams and single-line rivers were from the USGS 1:100,000 scale Digital Line Graphs (DLGs) of hydrology. Ponds, lakes, and double-line rivers were primarily from the USFWS NWI. Additional hydrology layers used in modeling included the USGS 1:100,000 scale DLGs of ponds, lakes, and double-line rivers. Whereas the water bodies in the NWI data layer were not divided into types, we had annotated the 1:100,000 scale database to identify 1) ponds and lakes, 2) rivers, and 3) oceans, as well as islands within each of those types. Knowledge of island ecology was useful in modeling nesting Common Tern habitat, for example. Finally, for species that use streams but not larger rivers (e.g., the stream-dwelling salamanders), US EPA River Reach 3 hydrology layers were used. From these layers, which were based upon the same 1:100,000 scale streams and rivers already described, we could identify Maine's low-order (i.e., upper-most in drainage) streams.

Associations of terrestrial vertebrate species with ancillary information (e.g., elevation, hydrology) were identified from the literature. Few wildlife species in Maine have associations to elevations that are strong enough to warrant inclusion in a model of presence and absence. Elevation may affect abundances of species (e.g., Richards 1994), but apparently elevational gradients in Maine are not strong enough to have major effects on the presence of species. For those species where the inclusion of elevation was warranted (e.g., Bicknell's Thrush, Rock Vole) the elevational limits were from the literature.

The strength of association of vertebrates to hydrology was determined from the literature. Often in the literature the distance an animal may travel from water to feed, loaf, or nest was cited. In general, typical distances from water were used; anecdotes of extreme distances were not included in habitat models. Also, some species (e.g., Common Snapping Turtles) may travel long distances to nest. Because we do not believe nesting sites to be limiting in Maine, and because inclusion of such large buffers around water would greatly overestimate occurrence, we did not include such excursions in associations with water. Ancillary data used in conjunction with the vegetation map to predict vertebrate occurrences is shown in Table 10.

Table 10. GIS grids and coverages used in the animal species modeling process. Refer to the metadata accompanying the digital data for more complete descriptions. Where GIS grids contained more than one significant layer used in modeling, both are listed separately (e.g., allnwig, alnwig.wet_int).

Coverage Name	Acquisition Source	Description
*bnd, where * are species codes	ME-GAP product	Coverages containing only tics, defining the boundary of each species' distribution, used to limit analysis windows.
allnwig	USFWS NWI	Wetlands classed using Cowardin *et al.* (1979).
allnwig.wet_int	Generated from USFWS NWI	Major wetland types (i.e., palustrine, lacustrine, estuarine, riverine, sea) and upland.
durbandis	Generated from habmap (see below)	Distance to dense urban and industrial areas.
g*, where * are species codes	ME-GAP product	Grids of species ranges within the state.
habmap	ME-GAP product	Vegetation and land cover map (Map 2).
Habhu	ME-GAP product, NRCS DLG	Vegetation map merged with the US NRCS 11 digit code watershed boundaries.
r*, where * are species codes	ME-GAP product	Ranges of species, generalized to watersheds (see Methods).
reachsf100	Generated from EPA River Reach	Areas within 100 m of terminal streams.
reachsflag	Generated from EPA River Reach	Terminal streams within the 1:100,000 scale DLGs.
streamsg	USGS DLG	Streams and single-line rivers.
strmdis	Generated from USGS DLG	Distance to streams.
urban1km	Generated from habmap (see above)	Areas within 1 km from sparse or dense residential areas.
wateralloc	Generated from USGS DLG	Category of water closest to each cell (i.e., an allocation grid from eucdistance).
waterarea	Generated from habmap (see above)	Area of ponds, lakes, and two-line rivers.
waterdis	Generated from Habmap (see above)	Distance to ponds, lakes, and two-line rivers.
watershore	Generated from habmap (see above)	The distance from water edges *into* the water body.
wbodies	USGS DLG	Water bodies from 1:100,000 scale DLGs.
wetarea	Generated from USFWS NWI	Wetland area.
wetlanddis	Generated from USFWS NWI	Distance to wetlands.
wetlandshore	Generated from USFWS NWI	The distance from wetland edges *into* the wetland.
wetsf100	Generated from USFWS NWI, EPA	Wetlands that include a portion of terminal branches of streams from EPA River Reach.

Distribution Modeling

Overview

We sought to identify areas where each terrestrial vertebrate had a reasonable possibility of occurring. To do that, we selected types from the vegetation and land cover map that were considered suitable for each species, then reduced the habitats shown as potentially occupied using relationships to ancillary data (e.g., distance to nearest water). Habitats that were beyond the range of the species were considered unavailable.

Detailed Methods of Modeling

All species modeling was conducted in GRID, the raster component of ARC/INFO. Using raster modeling techniques allowed very large spatial databases to be overlaid and analyzed relatively quickly. We constructed 277 individual ARC/INFO AMLs (including 7 for exotic species) that merged data sources using the algebraic expressions of GRID. An example AML, modeling the occurrence of Common Snapping Turtles, is shown in Appendix 5.

Species ranges use a sharp line delineating presence and absence, but in reality ranges are essentially probability curves, where the occurrence of a species declines to near zero. To minimize the effect of having predicted distribution stop abruptly at an artificial range boundary, GAP has adopted the practice of identifying as habitat any patch that is judged appropriate for the species, and falls partially within the species' range. In ME-GAP, we anticipated having some very large habitat patches that would extend an inappropriately long distance beyond the range of a species. To limit the extent that habitat patches could extend beyond the range of the species, we did not allow a patch to be identified as habitat unless it was within a watershed that included a portion of the species' range.

A look-up table, in ASCII format, was created for each species that showed use or nonuse for the 37 habitats within the ME-GAP vegetation and land cover map. For each 30 m square cell in the map, the value of the habitat to the species was looked-up within the table (i.e., using RECLASS). This created a spatial database of used and nonused landscape patches for the species in question. Processing time using this highly resolved (30 m) map in successive stages of analysis was prohibitive and beyond the spatial resolution needed, so the use/nonuse database was generalized to 90 m cells, using a block majority algorithm (see Appendix 5, program RECLSER.AML). All subsequent analyses were conducted at 90 m resolution, with all ancillary data used in modeling at their original resolution, which is usually 30 m.

The above process yielded a 90 m resolution spatial database of landscape patches appropriate for the species being modeled. The database included the entire state, but had not been restricted using ancillary information, such as hydrology for example, leaving these steps to be completed in another process. This two-tiered analysis process worked well, allowing the habitat value scores assigned and resampling to 90 m to be done just once, although modeling of predicted occurrence could be done multiple times.

For each species, a complete tabular database of species-habitat associations was maintained, with associations defined at a finer level (47 habitat types). A pointer (i.e., cursor) was defined to allow the values of the table to be queried during species modeling (see Appendix 5). This allowed us to identify relationships to characteristics beyond those defined in the habitat matrix. For example, we had scored species use of shallow flowing streams, so we used the scores when modeling relations to streams and single-line rivers. The program (chsemod.aml) in Appendix 5 includes such a relation.

To conduct the actual modeling, relatively complex if-then-else-endif commands were used in GRID to include only landscape cells that were appropriate for each species. For example, the following program fragment from chsemod.aml (see Appendix 5):

```
1  &sv habget = 'SRW'
2   &call gethab
3   &sv running = %:hab.habscore%
4   &sv habget = 'SSW'
5   &call gethab
6   &sv standing = %:hab.habscore%
7   &sv habget = 'DSW'
8   &call gethab
9   &sv deep = %:hab.habscore%

10  if (../hab/streamsg == 1) habmod90 = %running%
11  else if (../hab/strmdis <= 75) habmod90 = habrec90
12  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/waterdis <= 75) and ~
                                          (../hab/waterdis > 0)) habmod90 = habrec90
13  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/wetlanddis <= 75)) ~
                                          habmod90 = habrec90
14  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/watershore <= 250) and ~
                                   (../hab/watershore > 0)) habmod90 = %standing%
15  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/watershore <= 500) and ~
                                   (../hab/watershore > 250)) habmod90 = %deep%
16  endif
```

sets species-habitat scores for shallow running water (“running”, line #3), shallow standing water (“standing”, #6), and deep standing water (“deep”, #9). It then creates a grid called habmod90 based upon an if-then-else command. In particular, cells in the grid include: all streams (line #10); areas within 75 m of streams (#11); upland areas within 75 m of fresh water (#12); areas within 75 m of wetlands (#13); water within 250 m of shore (#14, assigned a value for shallow water); and water from 250 m to 500 m (#15, assigned a value for deep water). Note how each line includes palustrine, lacustrine, riverine, and upland (allnwig.wet_int in {3,4,5,6}), but excludes open ocean and estuarine areas (allnwig.wet_int = 1 or 2).

After modeling occurrences of species, we found that the typical method used in GAP (described above) to keep predicted distributions from stopping abruptly at range edges had only been partially successful — the habitat patches within the ME-GAP habitat map are extremely small, on average. The predicted distributions of species with range limits in the state did extend beyond range boundaries in some cases, but the range limit was still extremely obvious. An abrupt edge to potential habitat is biologically inaccurate, and visually distracting. To remedy this, we blurred the edges of species ranges.

To blur species ranges, we converted selected cells modeled as used to nonused along the range edge. Within a 3 to 50 km buffer from the range limit (width dependent upon the mobility and rarity of species) we converted cells based upon a stratified-random value, using a linear relation as the edge of the range was approached. In more general terms, randomly selected used cells were converted to nonused — only a few away from the species' range, and many near the species' range limit. The resulting grids where edited, if necessary, to remove cells shown as habitat well beyond the species' range. The resulting grids were final predicted species distributions from ME-GAP. Additional details on smoothing predicted habitats near edges of ranges is given in Boone and Krohn (1998).

Review of Species Distribution Maps

Investigators on the project reviewed the predicted species distributions, and adjustments to species models were made prior to finalizing the predictions. We did not subject our predicted distributions to an external expert review, believing that because this is the first time statewide species predictions have been created for Maine, no one can actually be an expert in such matters. To ask reviewers to comment on the accuracy of predicted distributions with over one million landscape patches would be asking that they confirm the accuracy of some very small percentage they were familiar with; a circumstance we did not deem appropriate. Rather than submit our maps to external review, we have placed additional effort in conducting accuracy assessment and reporting the results rigorously. In addition, predicted distributions of all species, along with information on habitat use and status of individual terrestrial vertebrates, are available in companion documents (Boone and Krohn 1998a,b).

Edge-Matching Species Distributions

Maine borders a single state, New Hampshire, with the gap analysis for that state being conducted by personnel of the University of Vermont, with D. Capen as principal investigator. Several meetings between ME-GAP and VT/NH-GAP have taken place during the duration of our project, in an effort to ensure data layers edge-match. We have provided VT/NH-GAP with range limits for species in northern New England. In a meeting with VT/NH-GAP personnel and experts in regional habitat associations (i.e., R. DeGraaf and M. Yamasaki, USDA Forest Service) the habitat relations used in ME-GAP were reviewed, and found to be essentially consistent across northern New England. Final reports and digital data will be provided to VT/NH-GAP. In an agreement among northeastern states doing gap analyses, those completing projects later will edge-match with those projects completed earlier.

Summary Analysis

The predicted distributions of species were joined spatially with US EPA EMAP hexagons to identify which hexagons contained each species. The occurrence of each species in each hexagon was noted, and placed in a computer file, where custom computer programs were used to tally the number of species (i.e., species richness) for each of the EMAP hexagons. From these, maps and tabulations were made.

Additional tabulations were done on the habitat matrices used in modeling predicted species distributions. The numbers of species using each habitat were tabulated using custom programs. Finally, richness totals at the full resolution of the species models were created by tallying the number of species predicted to use each cell. Richness maps were drawn using custom shading to highlight patterns.

Results

We considered 270 native terrestrial vertebrate species to be regularly breeding in Maine, including 17 amphibians, 16 reptiles, 183 birds, and 54 mammals. Seven introduced species were excluded from analysis. In general, many species (73%) were associated with abandoned fields (Table 11), based upon species-habitat associations. This reflects the general nature of abandoned fields; they may be wet or dry, brushy or with many trees, etc. Few species were associated with other agricultural lands, with the only 26% of Maine' s terrestrial vertebrates predicted to use crops/ground. Many species (56%) are associated with sparse residential areas, which could include areas with few homes, such as the edges of developed lakes. Fewer species (4%) were associated with urban and industrial habitat than with any other (Table 11). Between about 50% and 65% of species were associated with the forest types of Maine, but most species (n = 221; 82%) were associated with some type of forested habitat. Wetlands are extremely influential in determining the distribution of Maine' s vertebrates. Over 200 species where thought to potentially use one of the scrub-shrub habitats, and essentially all species (267) could make use of some type of wetland, when shoreline habitats are included. When shoreline habitats are excluded, 257 species (95%) are still shown as associated with some type of wetland. The tundra and rocky vegetation types were used by relatively few species (< 12%) (Table 11).

Table 11. The number of species using each of the classes within the vegetation and land cover map of ME-GAP. Whether habitats were used or not was taken form the species-habitat matrices used to model occurrence. Not all habitats listed will be included in each of the predicted distributions for species.

Habitat or Land Cover	Amphibians	Reptiles	Birds	Mammals	All Species
Agricultural Lands	**(n = 17)**	**(n = 16)**	**(n = 183)**	**(n = 54)**	**(n = 270)**
Abandoned field	12	15	126	46	199
Blueberry field	1	5	60	12	78
Grasslands	4	15	82	36	137
Crops/Ground	2	6	50	13	71
Developed lands					
Sparse residential	9	10	107	26	152
Dense residential	1	3	39	11	54
Urban/Industrial	0	1	9	1	11
Highways/Runways	2	8	58	18	86
Forestlands					
Clearcut	1	8	96	37	142
Early regeneration	4	9	77	39	129
Late regeneration	8	8	77	40	133
Light partial cut	11	8	105	41	165
Heavy partial cut	7	8	100	43	158
Deciduous forest	14	10	87	48	159
Deciduous/coniferous forest	15	10	102	50	177
Coniferous/deciduous forest	14	8	106	48	176
Coniferous forest	14	8	89	43	154
Water & Wetlands					
Deciduous forest	16	15	105	48	184
Coniferous forest	15	10	117	46	188
Dead forest	16	13	122	48	199
Deciduous scrub-shrub	15	14	135	50	214
Coniferous scrub-shrub	15	13	144	49	221
Dead scrub-shrub	15	14	149	49	227
Fresh aquatic bed	14	11	54	14	93
Fresh emergent	15	12	84	37	148
Peatland	15	16	108	44	180
Wet meadow	15	15	95	43	168
Salt aquatic bed	9	8	51	13	81
Salt emergent	9	10	81	33	133
Mudflat	11	9	83	35	138
Sand shore	10	10	83	32	135
Gravel shore	8	8	47	22	85
Rock shore	8	8	47	22	85
Shallow water	14	11	56	20	101
Open water	2	6	34	12	54
Other					
Alpine tundra	1	0	12	10	23
Exposed rock/Talus	0	5	14	12	31

The total species richness based upon EMAP hexagons varied from 186 to 230 species, with a mean of 213.0 ± 11.4 (Figure 6). Areas of highest richness were in southeastern Maine and southern Maine, whereas areas of lowest richness were in northwestern Maine. The frequency distribution of numbers of hexagons per species count (Figure 7) is fairly broadly distributed, with perhaps three peaks, including one for hexagons with < 200 species, corresponding well with the Moosehead Plateau (Krohn *et al.* 1999). The general patterns of species richness similar to those in Figure 6 have been correlated to geomorphology, woody plants, and climate (Boone and Krohn, In Press). The highest density of species in southeastern Maine appears related to the Atlantic Ocean ameliorated climate and to an elevated number of birds having range limits in the region (Boone 1996).

Amphibian species richness ranges from 12 to 17 species. Patterns are evident in the distribution of amphibians (Figure 8A) but the overarching pattern is essentially one of statewide species. For example, most hexagons in Maine have 15 or 16 amphibians (Figure 8A). In sharp contrast, the species richness of reptiles ranges from 2 to 16 species, with a smooth gradient from southern to northern Maine (Figure 8B). The numbers of hexagons with 2 to 16 species is fairly evenly distributed (Figure 9B), again evidence of the smooth gradient. Associated research found that the general gradient in reptile richness was highly correlated ($r^2 = 0.95$) with variation in woody plant species richness (Boone 1996); the two maps are essentially the same. From these maps, a biogeographer may conclude that the ranges of reptiles are more limited by winter temperatures in Maine than are the ranges of amphibians.

Bird species richness varied from 129 to 159 species, with the highest richness in southeastern and western Maine (Figure 6C). Birds show a peaked distribution of frequencies of hexagon richness (Figure 9C), although again the counts are distributed across the range of values. Bird richness declines notably at the edge of the Moosehead Plateau in northwestern Maine (Figure 8C). Areas of highest richness are theorized to be associated with woody plant transition zones, which pass through the center of the state (see Boone 1996 for details). Mammals are most rich in the southern part of the state and the mountainous regions (Figure 8D), with most hexagons having 42, 43, or 44 species of mammals (Figure 9D). An association of mammals to mountainous regions has been identified previously (e.g., Simpson 1964). Mammals are thought to become specialized along the slopes of mountains, whereas more mobile birds are more closely associated with plant distributions.

When species richness is calculated for the individual 90 m cells of Maine, patterns similar to those in Figures 6 and 8 emerge, but are more subtle. Maps for species richness of vertebrate classes (Map 3) emphasize the fine-grained structure to habitats in Maine. Habitat patches in the state are very small, in general. The patterns of richness for amphibians is more varied than in maps of EMAP hexagon richness (Figure 8A), with coastal plain areas below about 300 m being most rich. As for all vertebrate classes, open water, urban sites, and active agricultural areas had the lowest species richness. Reptiles exhibited a smooth gradient in species richness from southern to northern Maine (Map 3), likely associated with plant and soil patterns as well as climatic effects (Boone and Krohn, In Press). Birds are more evenly distributed across Maine than when depicted using EMAP hexagons, but areas of highest richness are to the east and north. This pattern is opposite that observed when mapped with hexagons (Figure 8C). Related research (Boone 1996) suggests this pattern reflects the abundance of forest specialist birds in Maine -- there are more species of birds occurring in southern Maine, but they use a variety of habitats. There are fewer birds occurring in northern Maine, but there are more habitat specialists, so the species richness within individual 90 m cells is elevated. Highest mammal richness is associated with the wetlands of central Maine and with the foothill region of southern Maine. In general, however, areas of high species richness for mammals are scattered throughout the state, excluding open water; urban and agricultural areas have low richness (Map 3).

Figure 6. Predicted distribution of total vertebrate richness by hexagons.

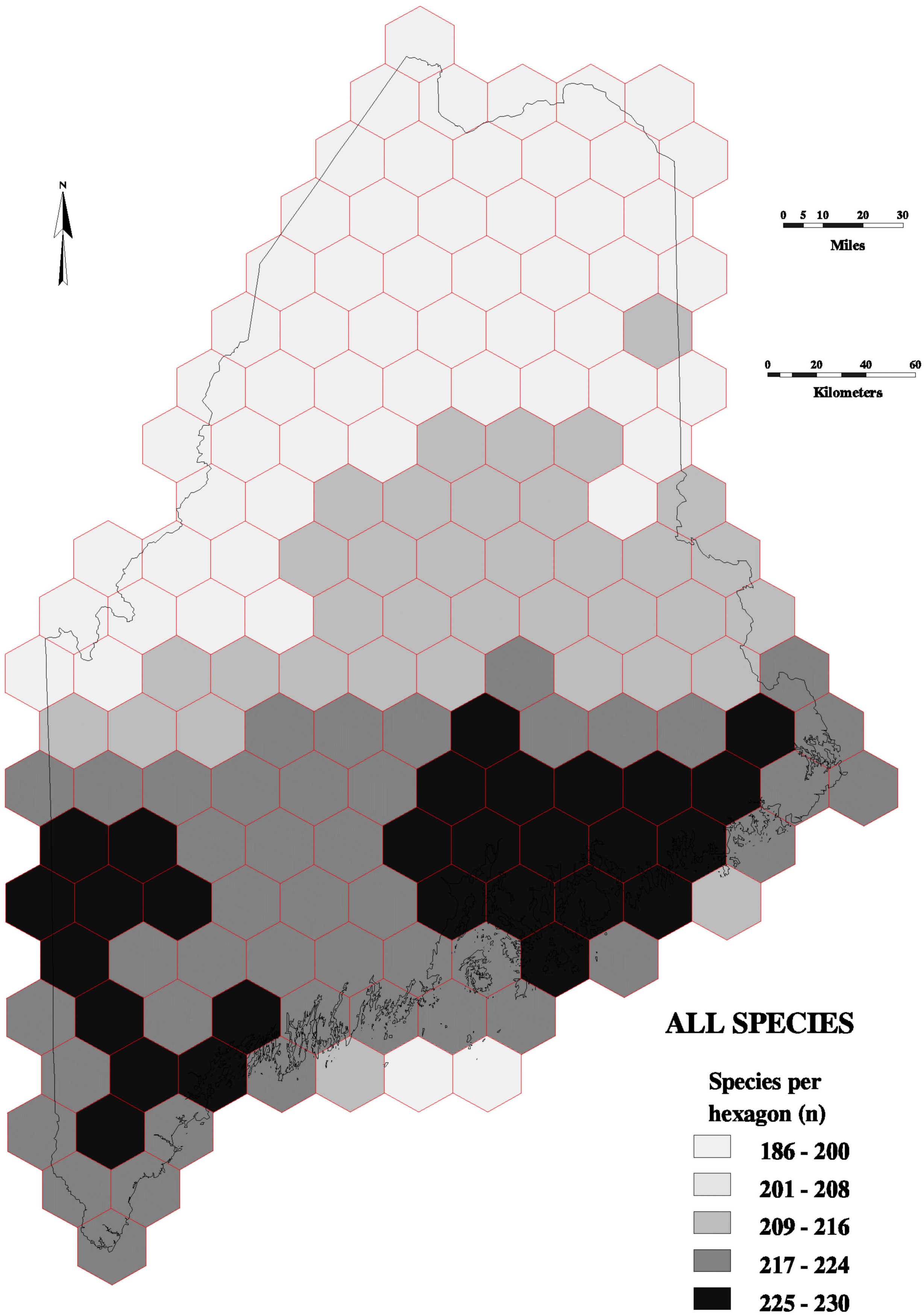


Figure 7. Frequency distribution of total vertebrate richness by hexagons.

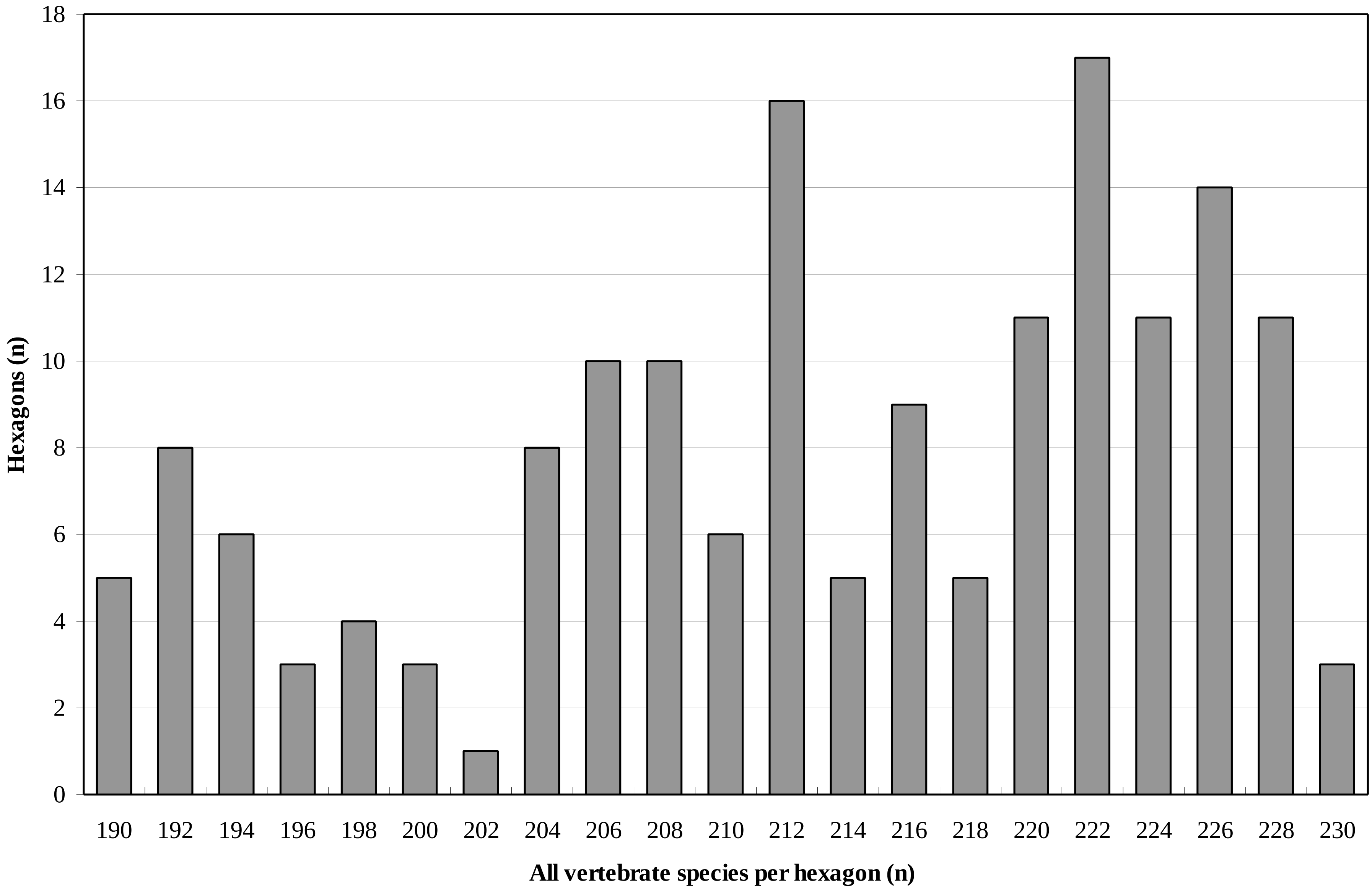
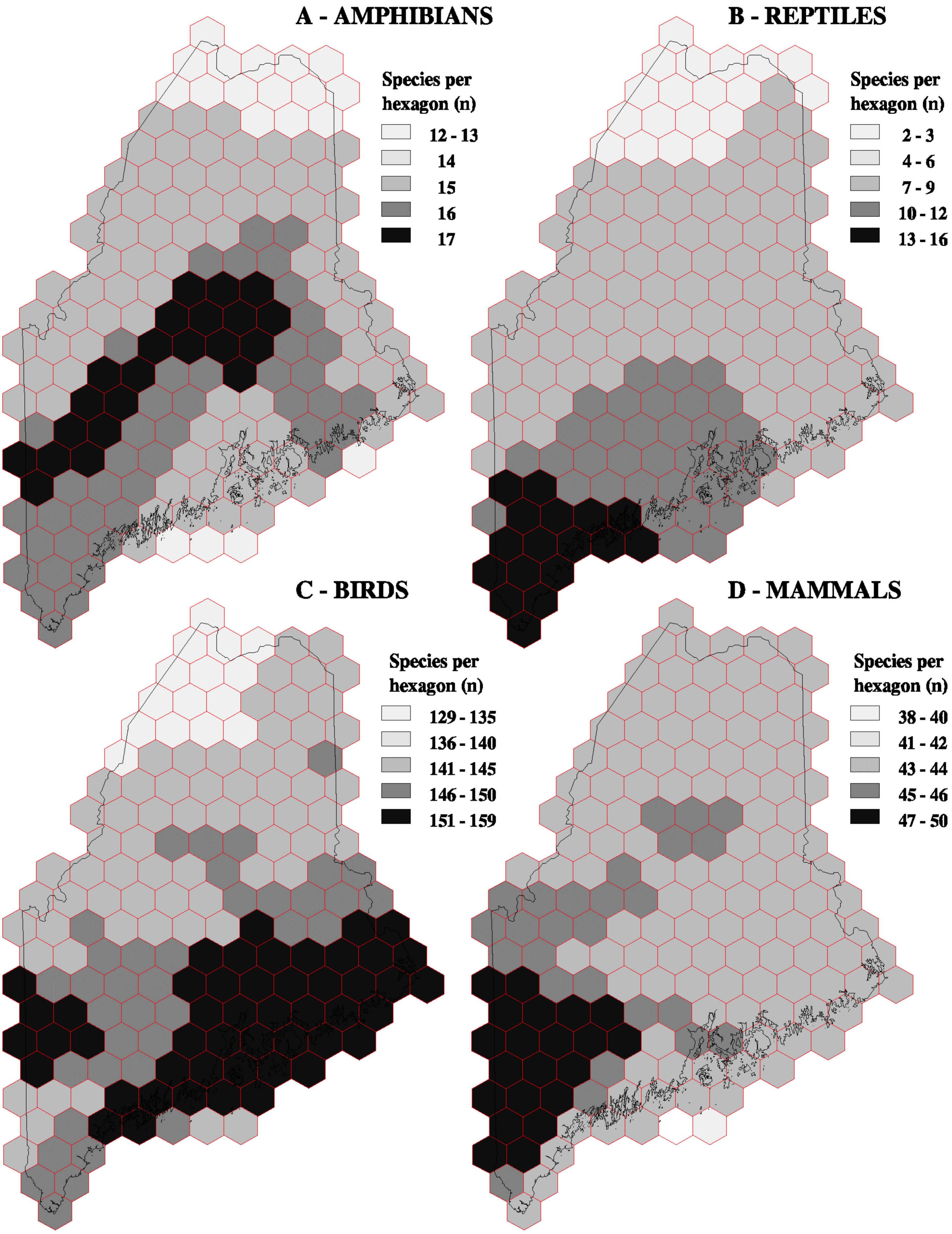


Figure 8. Predicted vertebrate richness by taxonomic classes and hexagons.



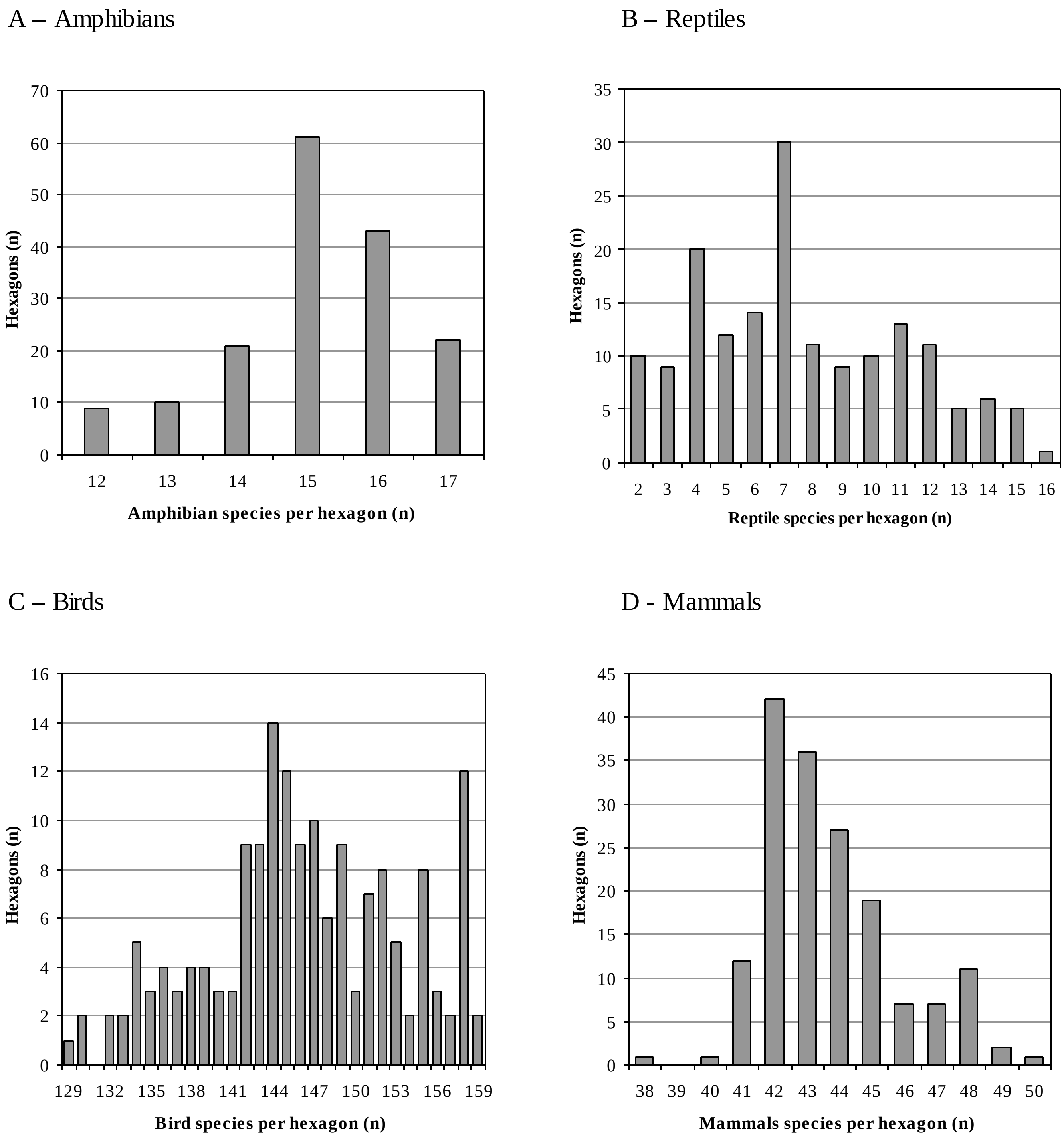
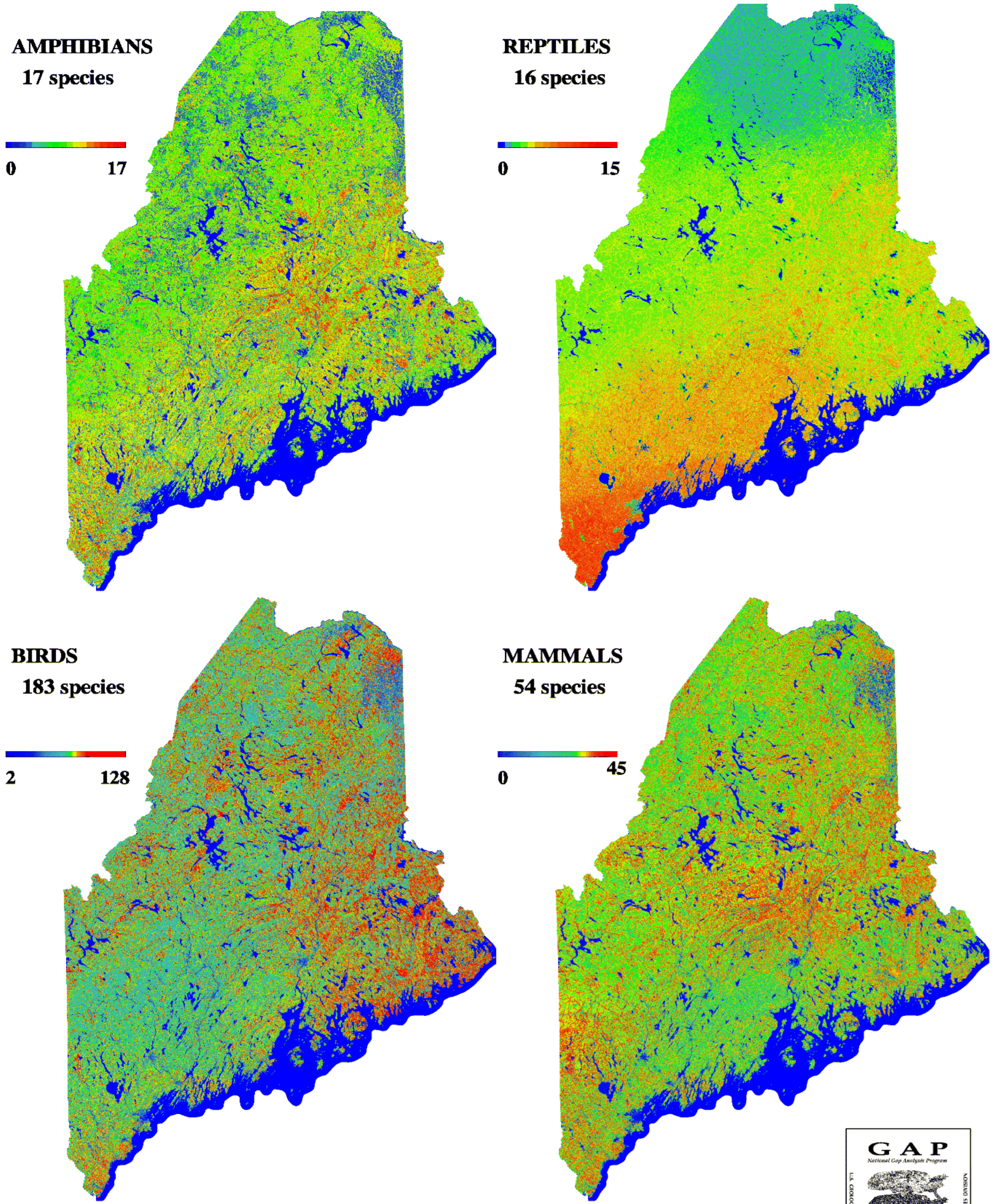


Figure 9. Frequency distribution of vertebrate richness by taxonomic classes and hexagons.

Terrestrial (i.e., non-fish) vertebrate distributions were predicted using habitat relations and geographic ranges. Native species that bred regularly in inland Maine were included. Modeled distributions for species groups were stacked to derive predicted numbers of species (i.e., species richness). Colors were adjusted to best depict each map.

Produced by Maine Cooperative Fish and Wildlife Reasearch Unit, USGS Biological Resources Division, and the Department of Wildlife Ecology, University of Maine, Orono

Map Produced: June 1998



Map 3. Species richness patterns of vertebrates classes in Maine.

“(see Map 3 – previous page)”

Map 4 shows richness for all vertebrates, and like Figure 6, the southern portions of Maine are richest. Areas of high species richness (red colors) are scattered throughout the state however. Open water, urban, and agricultural areas are lowest in richness. Areas of highest richness are large open wetlands (i.e, peatland complexes); central Maine is an extremely wet portion of the state (Maps 1 and 2) and has high species richness. A band of drier, less species rich habitats occur from the western mountains to Penobscot Bay, which is likely partially correct. Note however that the method of mapping wetlands was not consistent throughout the state, and some of the pattern described may be an artifact. Specifically, note the spatial coincidence between that part of Maine where NWI maps in digital form were unavailable (Figure 5) to the richness patterns for mammals (and possible birds) (Map 3) and all terrestrial vertebrates (Map 4). It appears that our underestimation of wetlands from TM data in south central Maine (see Land Cover Classification and Mapping) possibily resulted in an underestimate of the number of vertebrate species in this part of the state. However, we have no way to test for this potential bias until statewide NWI maps in digital form are available. Even if our estimate of vertebrate richness in part of south central Maine is low, this is not a serious shortcoming from a statewide perspective given the relatively small area involved, but could be for certain types of detailed analysis in southern Maine (see Habitat Associations under Limitations and Discussion below).

Accuracy Assessment

Assessing the accuracy of the 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 (*http://www.gap.uidaho.edu/gap/)*. It is, however, 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. We therefore feel it is important to provide users with a statement about the accuracy of GAP predicted vertebrate distributions within the limitations of available resources and practicalities of such an endeavor. We acknowledge that distribution maps are never finished products, but are continually updated as new information is gathered. However, we feel that assessing the accuracy of their current iteration provides useful information about their reliability to potential users. We especially encourage wildlife biologists and amateur naturalists to treat the predicted distributions as testable hypotheses and engage in the process of validation and iterative modeling. Our goal was to produce maps that predict distributions of terrestrial vertebrates and from that, total species richness and species content with an accuracy of 80% or higher. Any failure to achieve this accuracy would indicate the need to refine the data sets and models used for predicting distribution. The methods for validating and assessing the accuracy of the vertebrate distribution maps are presented in the following section along with the results.

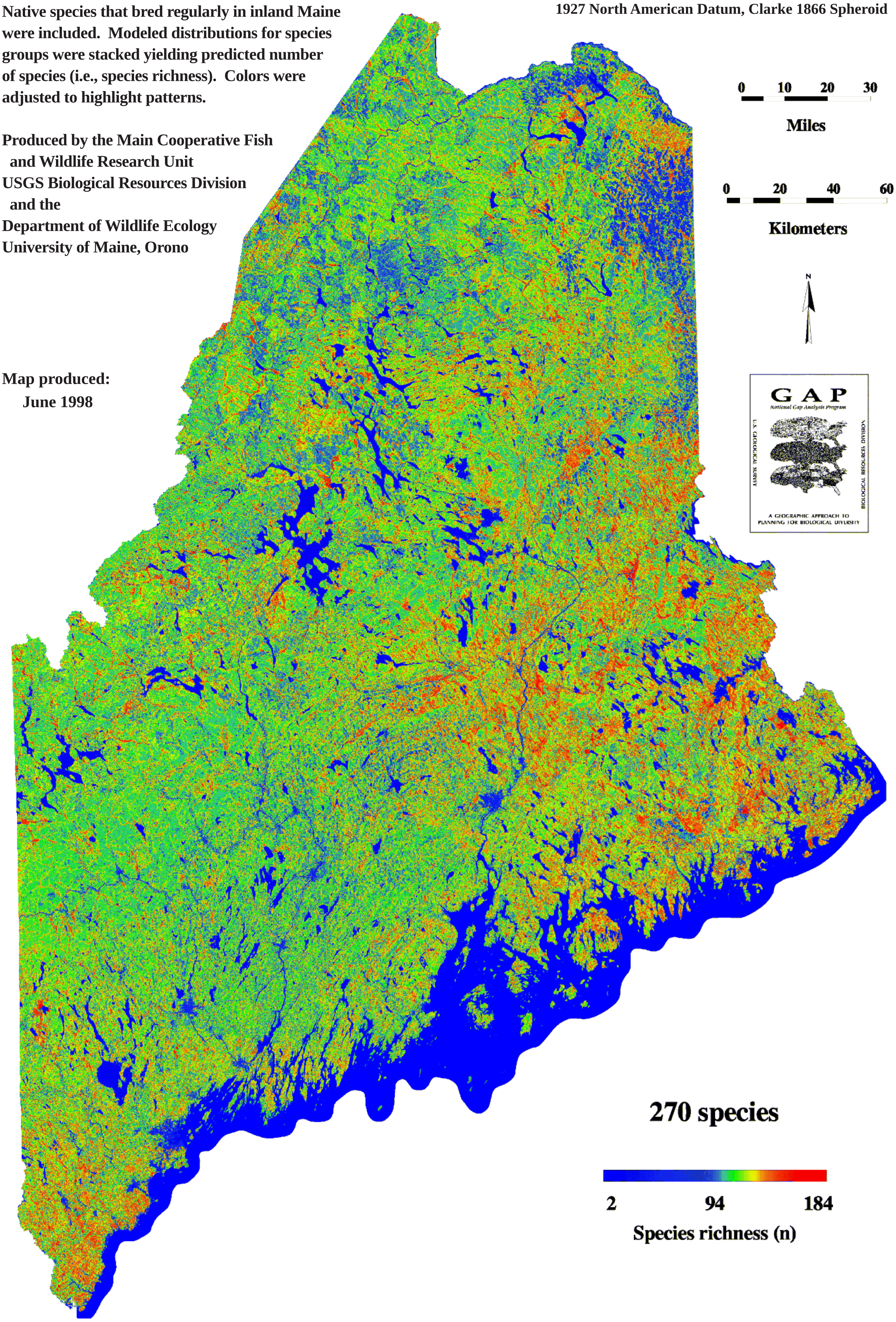
“(see Map 4)”

Terrestrial (i.e., non-fish) verterate distributions were predicted using habitat relations and range limits. Native species that bred regularly in inland Maine were included. Modeled distributions for species groups were stacked yielding predicted number of species (i.e., species richness). Colors were adjusted to highlight patterns.

Produced by the Main Cooperative Fish
and Wildlife Research Unit
USGS Biological Resources Division
and the
Department of Wildlife Ecology
University of Maine, Orono

Map produced:
June 1998

Universal Transverse Mercator Projection, Zone 19
1927 North American Datum, Clarke 1866 Spheroid



Map 4. Species richness patterns of all vertebrates in Maine.

Methods

ME-GAP' s accuracy assessment was conducted for 17 amphibians, 16 reptiles, 182 birds, and 54 mammals for which predictions were generated. Note that the number of birds is one less than used for creating the predictions. The Nelson' s Sharp-tailed sparrow was dropped from the accuracy assessment because it has just recently been split by taxonomists from the Salt Marsh Sharp-tailed Sparrow, making it difficult to determine if the species occurrence records for the Salt Marsh Sharp-tailed Sparrow were for both or just the parent species.

To test the accuracy of the vertebrate predictions we compared lists of predicted species to data available on ten test sites throughout Maine. Sites were well distributed geographically (Figure 10) and included four National Wildlife Refuges and one National Park having checklist data of terrestrial breeding vertebrates, where a checklist is defined as a comprehensive list of breeding and nonbreeding vertebrate species obtained through combining records of individual sightings, long-term field inventory, and research conducted on a given site. Ideally, we would like to know how much time and effort went into the field inventories and research. However, in some cases, especially when working with sites having species checklists (i.e., Moosehorn National Wildlife Refuge, Acadia National Park), these data do not exist. When actual number of years of inventory was unavailable, the number of years in existence was used as a reference for inventory effort. Unfortunately, this may over estimate the length of surveys for some taxonomic classes (i.e., amphibians and reptiles). We also compared lists of predicted species to data obtained from five research projects within all or part of three privately owned areas (Hagan and Grove 1996; Hagan *et al.* 1997; Witham *et al.* 1993), one national forest (D. Capen, Univ. of Vermont, per. comm.), and one state park (Oliveri 1993). In contrast to a checklist (i.e., long-term data), a research project is defined as data obtained from a specific project, usually focused upon a particular group of species, to answer a given question (e.g., relations of forest songbirds to forestry practices). Because we could not objectively partition out what species were and were not the subject of study, we compared ME-GAP predictions for all species to those species encountered by researchers. In most cases research projects encompass a much smaller area than the species checklists, and have less inventory effort. Of the 10 test sites chosen only three sites had data for all vertebrate classes (Mount Desert Island and Acadia National Park, Rachel Carson National Wildlife Refuge, and the Holt Research Forest). The other sites had information only for birds, mammals or both (Table 12).

Figure 10. Locations and names of test sites used to assess the accuracy of predicted species distributions from ME-GAP.

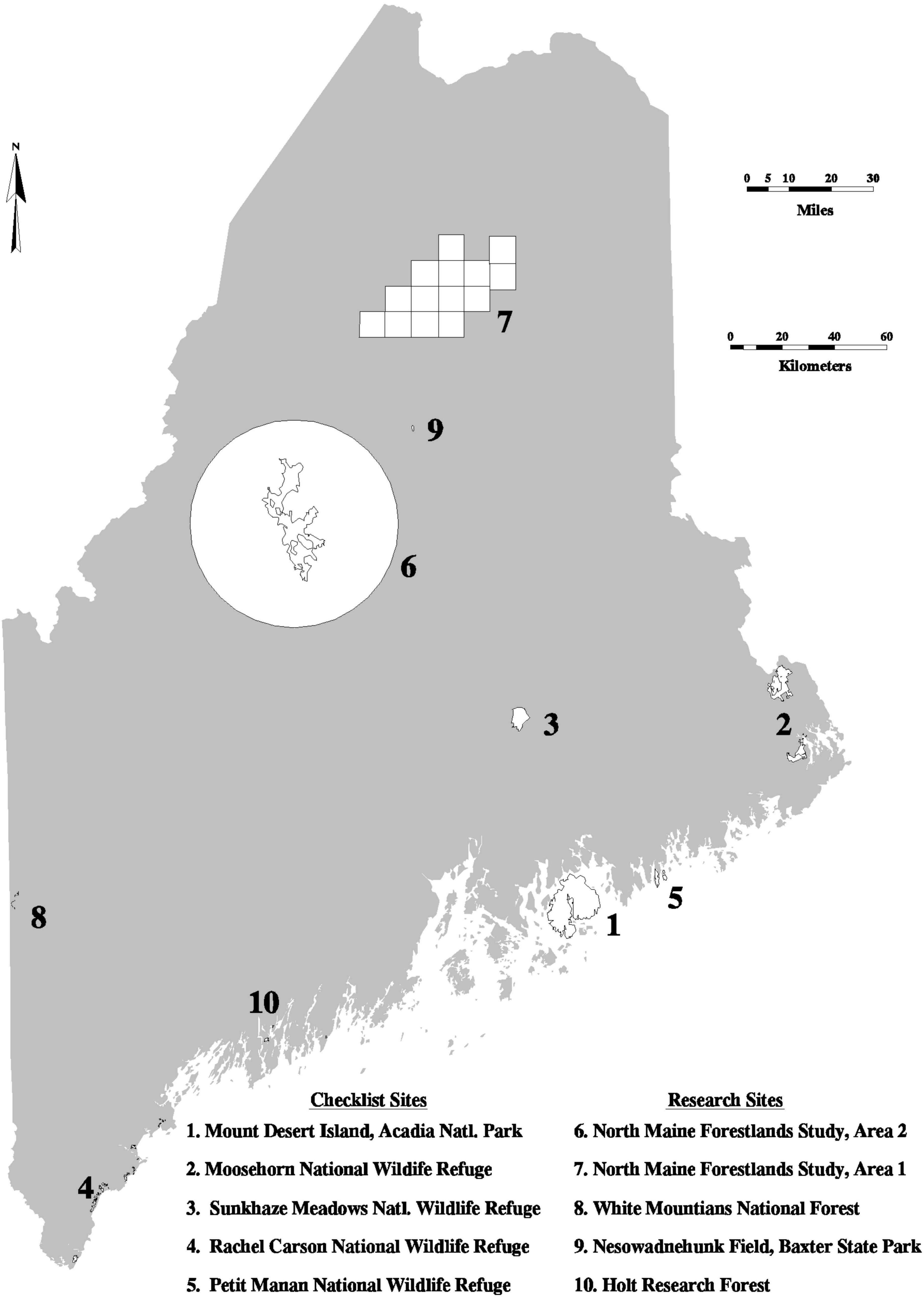


Table 12. Test site names, data type and available information (indicated by an "x") used in the accuracy assessment of ME-GAP vertebrate predictions.

Name of Test Site	Size (ha)	Years in Existence or of Survey	Amphibians	Reptiles	Birds	Mammals
With Checklist						
Mount Desert Island and Acadia National Park	28,033	79	x	x	x	x
Moosehorn National Wildlife Refuge	9,297	61			x	x
Sunkhaze Meadows National Wildlife Refuge	3,833	10			x	
Rachel Carson National Wildlife Refuge	1,768	32	x	x	x	x
Petit Manan National Wildlife Refuge	993	22			x	
Mean ± standard deviation	8,785 ± 11,239	40.8 ± 28.5				
With Research Data						
North Maine Forestlands Study, Area 2[a]	498,753	2			x	
North Maine Forestlands Study, Area 1[b]	138,973	1			x	
White Mountains National Forest	181	5			x	
Nesowadnehunk Field, Baxter State Park	177	3			x	
Holt Research Forest	172	15	x	x	x	x
Mean ± standard deviation	127,651 ± 215,982	5.2 ± 5.7				

[a] - 168 point count stations and 56 belt transects surveyed on an area approximately 498,753 ha.
[b] - 387 point count stations surveyed on an area approximately 138, 973 ha.

Before the accuracy assessment was conducted we recognized that difficult-to-detect species were unlikely to be judged as modeled correctly when compared to existing checklists and research inventories. Even with perfect knowledge of the occurrence of species, our predictions may be judged as incorrect because the species hadn't been observed on-site. Therefore, Likelihood of Occurrence Ranks (LOORs) were assigned to all species. These ranks represent how likely a species is to be observed during a survey, thus giving us a quantitative method to better interpret the results from vertebrate accuracy assessments (Boone 1996; Boone and Krohn 1999). To assign statewide LOORs to amphibians and reptiles, the range of each species was overlaid on updated atlas occurrences (Hunter *et al.* 1992). The total number of townships within the range of a species was divided by the number of townships with observations of that species, yielding a species-specific incidence of occurrence. Incidences for all species were ranked from one to "n" (where "n" equals the maximum number of breeding species), and these ranks were considered LOORs. These LOORs were then used to aggregate the predictions for each test site into three groups, low to high, with roughly an equal number of species in each group, based upon the total number of species predicted to be on a site.

Bird LOORs were calculated using occurrences in the Maine Breeding Bird Atlas (BBA) (Adamus 1987) with methods similar to those used for amphibians and reptiles. Because the BBA for Maine was somewhat outdated (15 years prior), we modeled spatial incidence using a logistic regression of a suite of avian species-specific variables, including data from the USGS BRD Breeding Bird Survey (BBS) during the period of the BBA. We then replaced the outdated BBA data in the model with current data, and generated updated incidences (for details, see Boone and Krohn 1999). These incidences were ranked, like the amphibians and reptiles, to yield the LOORs. The predictions for birds at each site were aggregated into five groups (low to high) with an additional group assigned a "zero" to indicate those species that were too rare or uncommon to assign a rank. Because regular surveys of mammals have not been conducted in Maine, a different method had to be used. To assign mammal LOORs, we ranked all of the mammals in the state from one to "n" based upon our knowledge of their abundance and life histories in Maine, yielding the LOORs. As with the other taxonomic classes mammal predictions were aggregated into five groups, again with roughly equal number of species in each group, based upon the LOORs and the number of species predicted to be at each site.

For each data type (checklist and research), omission error (percentage of species present on a site that were not predicted), commission error (percentage of species predicted but not present on a site), and overall accuracy (%) (see definition below) were calculated for each taxonomic class, as well as all classes, within each test site. Medians, rather than means, were calculated to summarize the errors for each taxonomic class (where possible) because of the small sample sizes, and possibility of having skewed data. The LOORs were incorporated by counting the number of species in each taxonomic class that were omitted (omission), over-predicted (commission), and matched in each group on each site and seeing the relationship. Percent accuracy of the predicted species occurrences was calculated by dividing the number of species that matched on the lists by the sum of the number omitted, the number over-predicted, and the number matched.

Results

Checklist sites had observations covering an average of 40.8 years (range: 10-79) whereas research sites had data spanning only an average of 5.4 (range: 1-15) years (Table 12). Error rates by sites with long-term (i.e., checklist) and short-term (i.e., research) field data are summarized in Tables 13 and 14, respectively. Appendix 6 contains results for individual species by test sites.

Table 13. Results of ME-GAP vertebrate accuracy assessment for areas where checklist data were available. Sites are arranged, from top to bottom, largest to smallest.

Managed area and Taxa	**Present**	**Matches Count**	**Matches Percent**	**Omission Error[a] Count**	**Omission Error[a] Percent**	**Commission Error[a] Count**	**Commission Error[a] Percent**	**Overall Accuracy[b] (%)**
Mount Desert Island and Acadia National Park (28,033 ha)								
Amphibians	15	15	100.0	0	0.0	0	0.0	100.0
Reptiles	10	8	80.0	2	20.0	1	10.0	72.7
Mammals	37	35	94.6	2	5.4	7	18.9	79.6
Birds	135	134	99.3	1	0.7	23	17.4	84.8
Total	197	192	97.5	5	2.6	31	15.7	84.2
Moosehorn National Wildlife Refuge (9,297 ha)								
Amphibians	--	--	--	--	--	--	--	--
Reptiles	--	--	--	--	--	--	--	--
Mammals	33	32	97.0	1	3.0	12	36.4	71.1
Birds	137	133	97.1	4	2.9	25	18.3	82.1
Total	170	165	97.1	5	2.9	37	21.8	79.7
Sunkhaze Meadows National Wildlife Refuge (3,833 ha)								
Amphibians	--	--	--	--	--	--	--	--
Reptiles	--	--	--	--	--	--	--	--
Mammals	--	--	--	--	--	--	--	--
Birds	114	111	97.4	3	2.6	39	34.2	72.5
Total	114	111	97.4	3	2.6	39	34.2	72.5
Rachel Carson National Wildlife Refuge (1,768 ha)								
Amphibians	16	16	100.0	0	0.0	0	0.0	100.0
Reptiles	16	16	100.0	0	0.0	0	0.0	100.0
Mammals	44	39	88.6	5	11.4	5	11.4	79.6
Birds	79	79	100.0	0	0.0	74	93.7	51.6
Total	155	150	96.8	5	3.2	79	51.0	64.1
Petit Manan National Wildlife Refuge (993 ha)								
Amphibians	--	--	--	--	--	--	--	--
Reptiles	--	--	--	--	--	--	--	--
Mammals	--	--	--	--	--	--	--	--
Birds	92	92	100.0	0	0.0	64	69.6	59.0
Total	92	92	100.0	0	0.0	64	69.6	59.0

[a] - See Glossary of Terms for definitions.
[b] - Overall Accuracy = [# matched / (# matched + # omission + # commission)] x 100.

Table 14. Results of ME-GAP vertebrate accuracy assessment for areas where research data were available. Sites are arranged, from top to bottom, largest to smallest.

Managed area and Taxa	Present	Matches Count	Matches Percent	Omission Error[a] Count	Omission Error[a] Percent	Commission Error[a] Count	Commission Error[a] Percent	Overall Accuracy[b] (%)
North Maine Forestlands Study, Area 2 (49,8753 ha)								
Amphibians	--	--	--	--	--	--	--	--
Reptiles	--	--	--	--	--	--	--	--
Mammals	--	--	--	--	--	--	--	--
Birds	72	72	100.0	0	0.0	75	104.1	49.0
Total	72	72	100.0	0	0.0	75	104.1	49.0
North Maine Forestlands Study, Area 1 (13,8973 ha)								
Amphibians	--	--	--	--	--	--	--	--
Reptiles	--	--	--	--	--	--	--	--
Mammals	--	--	--	--	--	--	--	--
Birds	63	63	100.0	0	0.0	77	122.2	45.0
Total	63	63	100.0	0	0.0	77	122.2	45.0
White Mountains National Forest (181 ha)								
Amphibians	--	--	--	--	--	--	--	--
Reptiles	--	--	--	--	--	--	--	--
Mammals	--	--	--	--	--	--	--	--
Birds	74	74	100.0	0	0.0	61	82.4	54.9
Total	74	74	100.0	0	0.0	61	82.4	54.9
Nesowadnehunk Field Bird Survey, Baxter State Park (177 ha)								
Amphibians	--	--	--	--	--	--	--	--
Reptiles	--	--	--	--	--	--	--	--
Mammals	--	--	--	--	--	--	--	--
Birds	55	55	100.0	0	0.0	76	138.2	42.0
Total	55	55	100.0	0	0.0	76	138.2	42.0
Holt Research Forest (172 ha)								
Amphibians	12	12	100.0	0	0.0	3	25.0	80.0
Reptiles	7	7	100.0	0	0.0	4	57.1	63.6
Mammals	28	27	96.4	1	3.6	15	53.6	62.8
Birds	60	57	95.0	3	5.0	81	135.0	40.4
Total	107	103	96.4	4	3.7	103	96.3	49.0

[a] - See Glossary of Terms for definitions.
[b] - Overall Accuracy = [# matched / (# matched + # omission + # commission)] x 100.

On sites with long-term checklist data, omission errors were low, with medians for amphibians, reptiles, mammals, and birds of 0.0 %, 10.0 %, 5.4 %, and 0.7 % respectively. The corresponding commission rates of errors were 0.0 %, 5.0 %, 18.9 %, and 34.2%, respectively (Table 15). The high median commission error for birds (i.e., 34.2 %) suggests some over-prediction for this group. However, commission errors are not as serious as omission error in that commission errors can result from the unreporting of species that are present as well as the absence of the species in the area (more on this below). The high commission error for birds seen on Rachel Carson National Wildlife Refuge and Petite Manan Wildlife Refuge are probably related to the fact that we used "confirmed breeding" rather than "occurs during the breeding season" to create the species lists for each site. Since these areas are small and the surveys are relatively new it is possible that the commission error is inflated because of the limiting of the occurrence list (this question is being further investigated). Considering that the median omission rate on checklist sites for all species classes is less than the national standard of 20% (Table 15), ME-GAP did an excellent job of predicting the occurrence of vertebrates that regularly breed in Maine.

Table 15. Overall results of accuracy assessment of ME-GAP predicted species distributions. Medians and ranges for accuracy's were calculated within taxonomic groups for site with checklist and research data.

	Matches[a] %		**Omission (%)**		**Commission (%)**	
Taxonomic Group (n)	**Median**	**Range**	**Median**	**Range**	**Median**	**Range**
Checklist Sites						
Amphibians (2)	100.0	–	0.0	–	0.0	–
Reptiles (2)	90.0	80.0 - 100.0	10.0	0.0 - 20.0	5.0	0.0 - 10.0
Mammals (3)	94.6	88.6 - 97.0	5.4	3.0 - 11.4	18.9	11.4 - 36.4
Birds (5)	99.3	97.1 - 100.0	0.7	0.0 - 2.9	34.2	17.4 - 69.6
Research Sites						
Birds (5)	100.0	95.0 - 100.0	0.0	0.0 - 5.0	122.2	104.1-138.2

[a] - Species predicted present that were present.

On sites with short-term field inventory data median error rates for amphibians, reptiles, and mammals could not be calculated because the sample sizes were too small (only one site each, Table 14). For theses classes the omission errors were 0.0 %, 0.0 %, and 3.6 % respectively. The corresponding commission errors were 25.0 %, 57.1 %, and 53.6 % respectively (Table 14). The median omission error for birds on research sites was 0.0 % and the median commission error was 122.2 % (Table 15). Commission error is high for birds even though they were checked against five different research sites. This is due to the fact that most of the surveying on these sites focused on forest songbirds (see citations in Methods above) and thus do not completely represent the avian fauna (i.e. raptors and waterbirds undersampled due to field inventory methods used). In fairness to the researchers who reported these data, we note that their study objectives generally centered on forest songbirds, and not on all birds inhabiting an area. However, as mentioned in Methods, we could not, *a priori*, objectively select species they should, and should not, have been inventoried. We also could not determine which species were breeding on sites for four of the research projects, the Holt Research Forest was the exception, for these sites species presence was assumed to indicate breeding on site. Again, note that the median omission rate on research data sites for all species classes is less than the national standard of 20% (Table 14).

While our results, especially for birds, indicates that over-prediction did occur, we believe that the rates of commission reported above must be viewed with caution not only due to large differences between checklist and research sites in commission errors, and the sample sizes on research sites, but also because of the patterns suggested by the LOORs (Appendix 7). Specifically, we know from previous research that it's more difficult to correctly predict the occurrence of species with low versus high LOORs (Boone 1996; Boone and Krohn 1999). Thus, if the high commission errors reported above were serious, then rates of error across species will be more or less constant regardless of LOOR scores. In contrast, if rates of commission error and LOORs were inversely related, than a sizeable part of the high commission error is due to inadequate field inventory (i.e., species present, but due to difficulty in detecting, went unreported). While small sample sizes preclude us from concluding anything about amphibians and reptiles, note that for birds and mammals commission errors decrease with higher LOORs (Appendix 7). This relationship is seen for birds regardless of the data type (Figures 11, 12). The peaking of the commission error curves over the low LOOR classes shows that inadequate field surveys are having an effect on commission error. Also note that the largest checklist sites, having the most years of observations (i.e., Acadia National Park and Moosehorn National Wildlife Refuge), had lower total rates of commission error than the other three sites (Table 13).

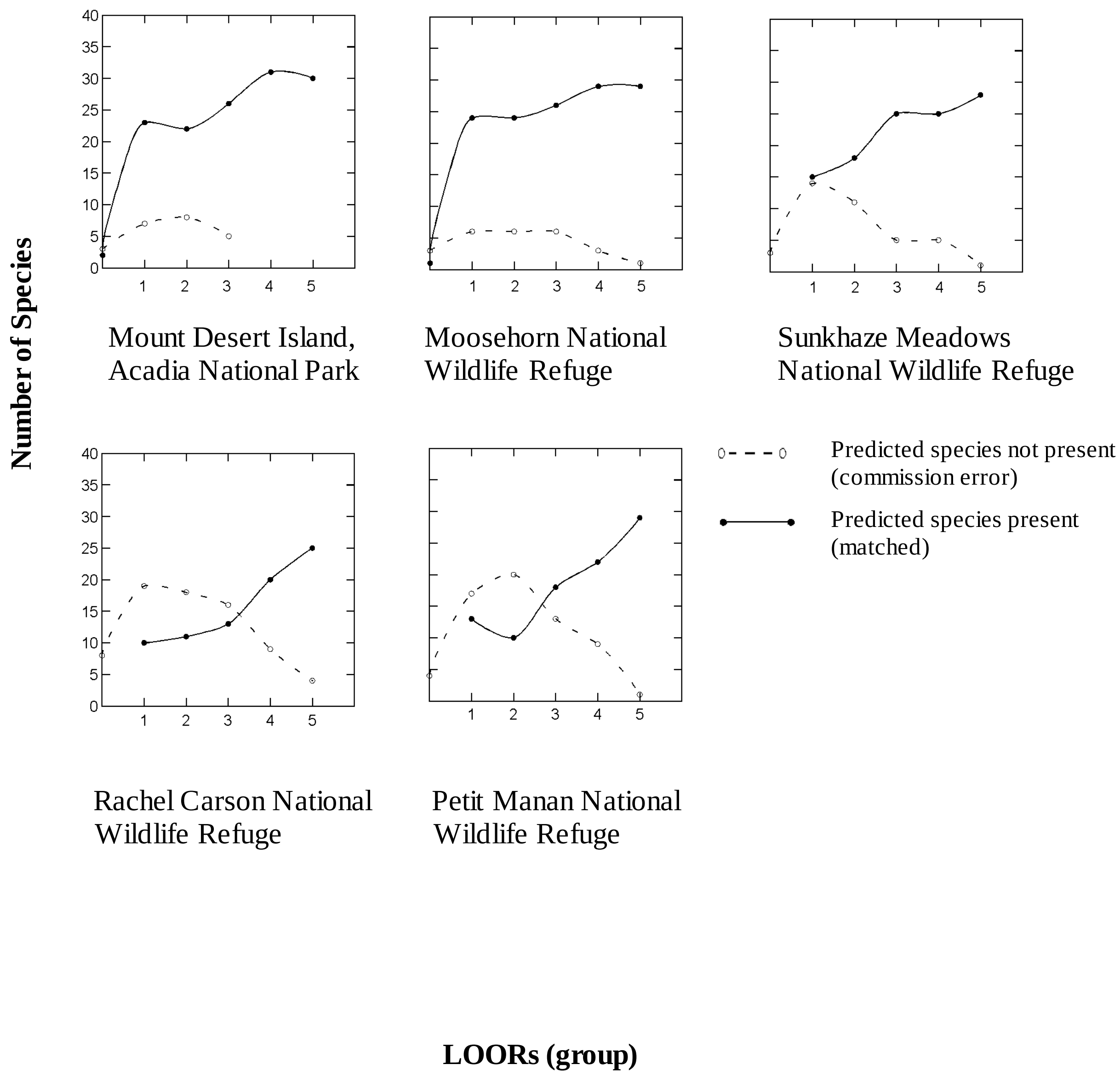


Figure 11. The number of bird species correctly modeled and the number over-predicted (commission error) for checklist sites (long-term data) by Likelihood of Occurrence Ranks (LOORS) (See Glossary of Terms for definition). Sites are ordered left to right by size (largest to smallest).

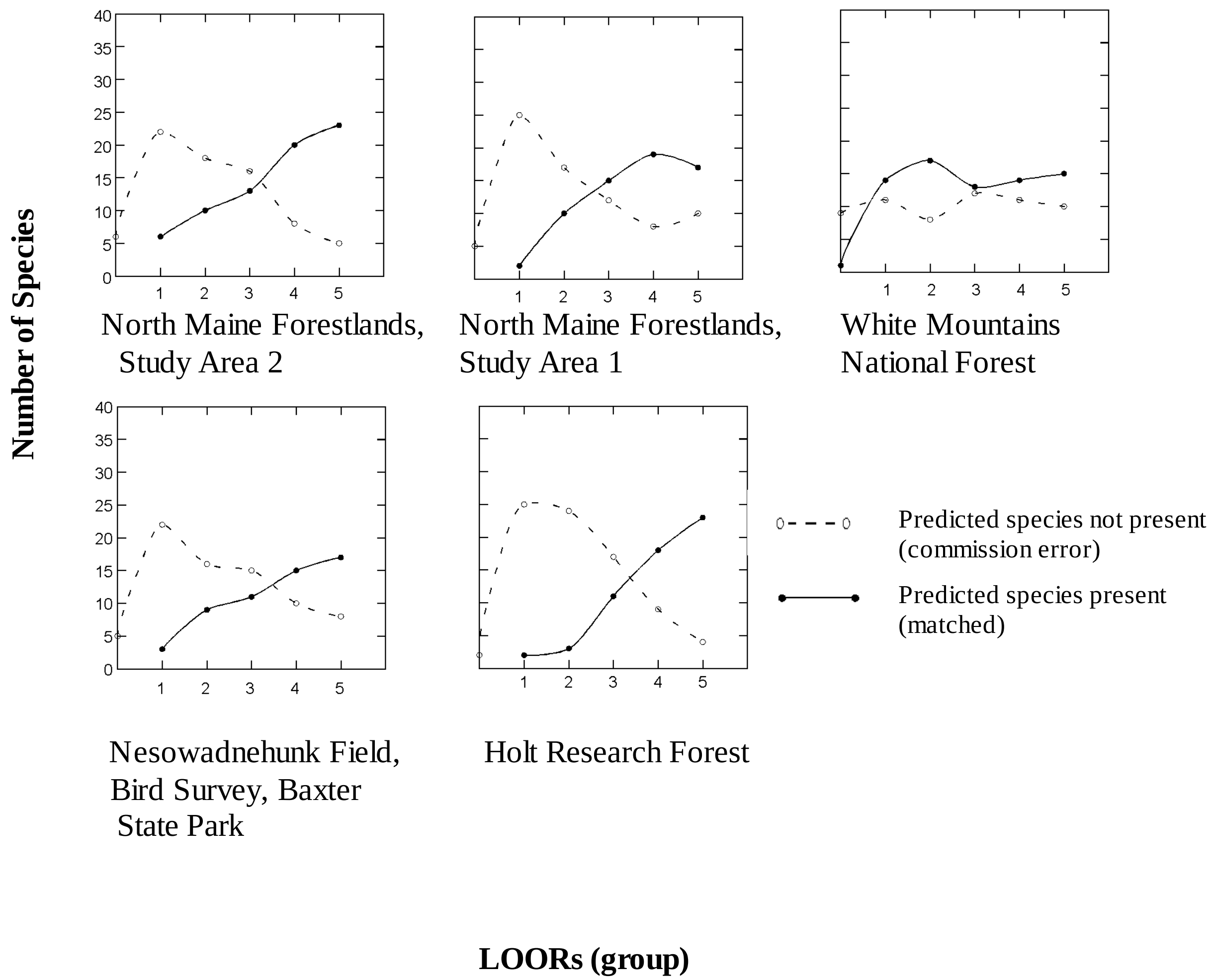


Figure 12. The number of bird species correctly modeled and the number over predicted (commission error) for research sites (short-term data) by Likelihood of Occurrence Ranks (LOORS) (See Glossary of Terms for definition). Sites are ordered left to right by size (largest to smallest).

Limitations and Discussion

Mapping range limits

We had anticipated prior to defining ranges that: 1) species-habitat relationships would generally be broad in Maine, with species associated with many habitats in the state; 2) habitat patches in Maine would be mixed and small, given the complex land-use history and ecology of the state; and 3) relations between species distributions and factors such as elevation and hydrology would be weaker than in western states. Because of these reasons and an interest in the biogeography of Maine' s terrestrial vertebrates, we spent considerable time mapping the ranges of the state' s vertebrates. We explored every source of information available to us to ensure vertebrate ranges were accurate.

We declined to use museum records, believing that the cost in time and effort used to computerize such sources would outweigh the value of the records. We used MDIFW Biological Element Occurrences (what in some other states is Natural Heritage Program observations of rare species), but the number of observations was low for many species (hundreds for Bald Eagles, however). As an extreme example, when information for mammals was compiled (September 1994) there were 22 element records for the 54 mammal species. Finally, we were fortunate in being able to avoid use of the BBS data for mapping the ranges of birds. That allowed us to use the BBS in range assessment, a practice we would recommend to others mapping the broad-scale occurrence of many birds.

By inspecting BBAs from New Hampshire and provinces adjacent to Maine, as well as Maine data, we were able to avoid having species ranges that coincide with areas of highest observation effort. This has important implications for conservation planning — if that bias is strong in species maps, areas near cities (and near observers) tend to show high species richness inappropriately. Also, the ranges of rare species used in ME-GAP were large polygons in most cases (see Boone and Krohn 1998a,b), rather than point locations as in some other gap analyses.

Regardless of effort in mapping, there remain dramatic differences in the amount of distributional information available for vertebrate classes. In general, distributional information was readily available for most bird species in Maine (e.g., Adamus 1987; MDIFW element occurrences; BBS data for assessment), and a recent atlas of amphibians and reptiles had been completed, summarizing five years of observations (Hunter *et al.* 1992). Distribution information was abundant for game mammals (e.g., harvest information from MDIFW). The group with the weakest distribution information, and presumably the greatest error in range maps, was the small mammals (except for Deer and White-Footed Mice). Bat ranges are also poorly documented, being essentially best guesses from a lean literature.

As expected, there were large variations in range information for individual species as well. For example, the distributions of some birds (e.g., Bald Eagle) were very well known, whereas others were poorly known (e.g., American Wigeon). These types of deficiencies are noted in individual species reports (Boone and Krohn 1998a,b).

Habitat Associations

Habitat associations are not known equally for all habitats or all species. In general, forested and wetland habitats have been well studied in Maine. For example, Stockwell (1985) studied the abundance and distribution of amphibians, reptiles and small mammals in Maine peatlands; she also (Stockwell 1994) documented the community organization and habitat selection of breeding birds in peatlands. In contrast, wildlife-habitat relations in agricultural (other than blueberry fields and grasslands) and developed lands have not been intensively studied. In terms of species groups, game and rare species have generally been better studied than the remaining species. For example, until recently (Zimmerman 1998) there had been no studies in Maine on the relationships of bats to their habitats. For details on what literature was available to define the habitat relations for ME-GAP, see Boone and Krohn (1998a,b).

How terrestrial vertebrates relate to saline environments has not often been reported in the literature. Given the extent of the Maine coastline, the variety of habitats occurring along this coastline, and the high diversity of terrestrial vertebrates these habitats support, we would have preferred to have better information on this subject. Relationships have to be inferred from the relation of vertebrates to fresh water, which may or may not be appropriate in the cases of brackish and marine environments.

Another source of error in predicting vertebrate distributions is that some habitats are more difficult to identify and map than others (see Land Cover Classification and Mapping for details). Brushy habitats such as abandoned farm fields, blueberry fields, regenerating forests, shrub wetlands, and peatlands were difficult to distinguish with Landsat TM data mapping. Note that some of the preceding brushlands are wet versus dry, and in general these two brushland types support very different communities of wildlife. Thus, it was critical that two types be properly mapped and we believe that the use of NWI data permitted us to adequately separate wet versus dry brushlands. However, NWI data in digital form were unavailable for southcentral Maine at the time of these analyses and we had to rely on estimating the locations of wetlands from TM data (using adjacent NWI data as a training set). While this approach appeared to have been adequate for statewide analysis, potential users of ME-GAP should be cautious about analyzing predicted vertebrate distributions in more detail for southern Maine (Figure 5). This caution is especially critical if wetlands, or wetland vertebrates, are the focus of analysis.

Habitat models frequently assumed that special habitat features were present even if they could not be identified and mapped. For example, we assumed that forested habitats contained adequate cavities for those species requiring tree cavities for critical life functions such as raising offspring, protection from weather, and feeding. Vernal pools, a critical feature for many amphibians, could not be mapped with TM data, but given the nature of Maine' s glaciated landscape, were assumed to be present in forested areas, especially adjacent to waterbodies and waterways. While these assumptions may be reasonable for the level of detail we worked at, others interested in using predicted species distributions from ME-GAP at a more detailed level need to consider this issue in detail (see Gibbs 1993).

In summary, the reliable predictions of the occurrence of terrestrial vertebrates depend upon many factors (Krohn 1996). However, we believe that for the purposes at hand, the most critical factors are an adequate knowledge of how a species relates to its physical environment as represented by vegetation types, and second an ability to map those habitats at an appropriate scale with adequate resolution. In general, we believe that the level of detail at which habitats were mapped in this study was appropriate given what was available for knowledge on species-habitat relations.

Accuracy Assessment

Because accuracy assessments are dependent upon so many factors, beyond the quality of the models created, care should be used when comparing the assessments of different sets of modeled species (i.e., for from different states). Omission and commission errors may not be directly comparable. We have fewer rare, endemic species in Maine, for example, than in Florida (Dobson *et al.* 1997), and so we should have lower omission error than those doing modeling in Florida, regardless of the quality of models (Boone and Krohn 1999).

Our results indicate that linkage of a species habitat model and a cover map with ancillary GIS data is a fairly reliable method of predicting the occurrence of nonfish vertebrate species. As in other GAP projects (Scott *et al.* 1993, Edwards *et al.* 1996) commission error was much higher than omission error, but because these errors and LOORs were directly related, we suspect that most of the error is occurring in those species that are rare and difficult to find using standard survey methods. In these instances the commission error is a result of incomplete inventory lists rather than a problem with GAP, although over-prediction of rare species undoubtedly occurred (e.g., Wood Turtle, Merlin). In a few cases it was determined that commission and omission errors were a result of incorrect range delineation (Appendix 6). In some of these cases it was evident that the blurring of the ranges to make the line less obvious may be the cause of the error. The relationship of these errors to the distance from the range limit, both blurred and regular, is being further investigated.

When looking at the two different types of available survey data (i.e. checklist and research), overall error rates were similar whenever totals or medians were compared, with low omission errors and high commission error. Commission, a less serious error than omission (Avery and Van Riper 1990, Edwards *et al.* 1996), was related not only to the type of test site, but also to the completeness and the size of the test site. In the sites with research data available the commission errors were extremely high, up to 138% for the birds (Table 14). The extremeness of this error was to be expected because research usually concentrates on a specific species or group of species, and is done for only a few years on a small area, giving an incomplete inventory for all of the species present.

When one compares the results of the checklist data for Moosehorn and Mount Desert Island with Sunkhaze, Rachel Carson and Petit Manan (Table 13, Figure 11) its apparent that size and years of inventory also influence the commission errors. The two larger study sites, with the most complete inventory data (focusing on birds and mammals) were Moosehorn and Mount Desert Island. These two sites exceeded the national standards for GAP for both the omission and commission errors. The other three sites were marginal in terms of the national standards for commission errors for birds or mammals. Overall, for all taxonomic groups, on checklist sites, the median omission error is 0.0 % (ranges from 0.0 to 20.0%) and the median commission error is 17.9 (ranges from 0.0 to 93.7 %). On research sites we exceeded the national standard for omission error of all taxonomic groups (median = 0.0%; range = 0.0-5.0 %), but we failed to met the national standard for all species in commission error (median = 93.3%; range = 25.0-138.2 %) (not serious considering the nature of commission verses omission error).

Although we report overall rates of error (i.e., pooling of omission and commission errors) in Tables 13 and 14, readers should view these pooled rates with caution. When a species is recorded in a field survey but not predicted by gap analysis (i.e., an omission error), this is a real error. However, when gap predicts a species present but it has not been recorded in a field inventory, than there are two possible explanations. First, the species never has and never will occur on the test site (a real error in over-prediction by gap); second, the species occurs on the test sites but has gone undetected by field inventories (the gap prediction of occurrence is in fact correct). Interpretation of commission errors relative to these two explanations, and the contribution of this type of error to overall rates, are difficult to assess. LOORs are an *a priori* measure of the relative likelihood of detecting a species in a field inventory; i.e., species with low LOORs less likely to be detected than species with high LOORS (Boone 1996; Boone and Krohn 1999). Thus, if commission error rates are highest in those species with low LOORs, then one has evidence that undetected species are a major contributing factor to the rate of error (i.e., explanation three above). We reiterate our finding that because LOORs for birds and mammals were inversely related to commission error rates, and that because commission errors were lowest on the largest test sites having been surveyed the longest, much of commission error came from incomplete field surveys (and the definition of "confirmed breeders" for birds on some test sites), although some species were undoubtedly over-predicted (especially some of the rare and uncommon ones). Over-estimation of the distribution of rare species, because these are often of most concern to conservationists, is a serious error. We are continuing research into LOORs and how best to report errors in the prediction of the occurrences of terrestrial vertebrates.

In Maine, there are very few large conservation and management areas with good long term field inventory data available for all taxonomic classes. This is especially true for the amphibians, reptiles, and mammals that had only two to three sites with checklist data available. To obtain a better geographical distribution of study sites, research data was included in this analysis. Using this data type did improve our geographical distribution but it is clear that research data is unreliable for test data because of the small size of the area sampled, the concentration on a particular group of species (most commonly songbirds), and the short survey period.

LAND STEWARDSHIP

What is most striking in the Maine wilderness is the continuousness of the forest,
with fewer open intervals of glades than you had imagined.
Except the few burnt lands, the narrow intervals on the rivers,
the bare tops of the high mountains, and the lakes and streams,
the forest is uninterrupted.

Thoreau - The Maine Woods, 1848

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 threat to a biotic element through habitat conversion- the primary cause of biodiversity decline. We use the term "stewardship" to encompass both land ownership and administration in recognition that ownership alone does not necessarily reflect management policies and practices on the land. Specifically, it is necessary to distinguish between land ownership and management status in that a single category of land ownership, such as a National Wildlife Refuge, may contain several degrees of management for biodiversity (i.e., administrative subunits with different land management objectives).

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 likely 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, at most, a few homogenous categories and does not differentiate individual tracts or owners, unless land management objectives and practices recognize a long-term commitment to biodiversity maintenance (e.g., long-term management of natural vegetative communities on large, contiguous blocks of forestland).

After comparison to ownership, 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. While 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 one to four 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. Assigning Categories is subjective, and we recognize the limitations of this approach, although we maintained certain principles in assigning the land management Categories. Our first principle is that land ownership is not the primary determinant in assigning status. The second principle is that although data are imperfect, and all land is subject to changes in ownership and management, we can use the intent of a land steward as evidenced by legal and institutional factors to assign status. In other words, if a land steward institutes a program backed by legal and institutional arrangements that are intended for biodiversity maintenance, we use that as the guide for assigning status. The characteristics used to assign Categories were as follows:

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

The four status Categories can generally be defined as follows (after Scott *et al.* 1993, Edwards *et al.* 1995, Crist *et al.* 1995):

Category 1: An area having long-term protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, and intensity) are allowed to proceed without interference or are mimicked through management.

Category 2: An area having long-term protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive use or management practices that degrade the quality of existing natural communities (e.g., manipulation of water levels that alter aquatic plant communities).

Category 3: An area where long-term maintenance of natural land cover on the majority of the area is a major management objective, but subject to extractive uses of either a broad, low-intensity type or localized intense type. In ME-GAP, these multiple-use lands were subdivided into public (3a) and private (3b) categories recognizing broad-scale forestry as a major land-use significant in maintaining the state' s biodiversity.

Category 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.

Mapping Standards

The starting point for our identification and mapping of land stewardship was the 1:250,000-scale maps of Maine' s conservation lands published and revised by Kelly (1989, 1993). We re-mapped these land parcels by US Geological Survey (USGS) 1:100,000 quadrangles, adding corrections and new conservation lands up to 1995. In addition to the private land trusts (defined in Glossary of Terms) from Kelly's 1993 edition, additional land trusts were added along with public lands such as cemeteries, golf courses, lighthouses, town parks and school yards. The additions of these nonconservation public lands were not exhaustive, but attempted to identify the major open spaces in and around cities and major towns to help in the creation of the habitat map. This database is referred to as the Conservation and Public Lands Database (CAPLD); details on CAPLD, such as coding and quality controls, are in Krohn and Kelly (1997).

We did not use a standard Minimum Mapping Unit (MMU) as such, although generally parcels of less than 100 hectares (ha) (277 acres) were excluded, meaning that boat launches, playgrounds, small land trusts, and many other parcels of lands were excluded. However, because we were interested in conducting a statewide analysis, the omission of small private and public parcels is not serious. No attempt was made to verify the positional accuracy of land parcels, other than mapping ownership boundaries to the maximum degree possible with coincident features such as townships, roads, waterbodies, and watercourses that were in our GIS.

Methods

Land ownership and administrative units are two central themes underlying gap analysis. Major landowners in Maine include lands held in fee title or easement by the federal government, the State of Maine, Native Americans, and large blocks of forestland generally under corporate ownership (i.e., Commercial Forestland). In Maine, land management status generally corresponds well with land ownership. However, administrative units within the same ownership (e.g., Wilderness Areas within federal lands) had to be identified and mapped as management of these units differed from management on the unit as a whole. Identification of these administrative units is discussed in more detail below.

Ownership Mapping

Land ownership information for Maine was obtained by joining (1) CAPLD, built by the Maine State Planning Office (SPO) and the Maine Cooperative Fish and Wildlife Research Unit (MCFWRU) (Krohn and Kelly 1997); and (2) an outline of commercial forestland ownership modified from a map, "Major Land Ownership, 1995" created by James W. Sewall Company, Old Town, Maine.

In 1989, R.D. Kelly, Maine SPO published the first compilation of maps of state and federal conservation lands in Maine. This compilation was a set of nondigital, 1:250,000-scale color maps with a supporting publication (Kelly 1989). In 1993, revised maps were released. The revisions, along with new documentation, included some municipal and private conservation lands as well as more state and federal conservation areas (Kelly 1993). James W. Sewall Company digitized the 1989 maps and the Maine Office of Geographic Information Systems (MOGIS) made these data available. The 1993 revised maps were not added to the 1989 digital database.

In 1996, the SPO and MCFWRU agreed to revise and digitize the 1993 Kelly maps to build a conservation and public lands database suitable for statewide use at a 1:100,000 scale (i.e., create CAPLD). The SPO was responsible for contacting agencies and organizations to obtain information on the locations of conservation and public lands, and to do the cartographic work on hard copy maps, whereas the MCFWRU was responsible for digitizing the maps and building the attribute database (Krohn and Kelly 1997). The database was created with USGS 1:100,000 quadrangles as building blocks. Township lines, and hydrologic and transportation features were used as boundaries for land parcels wherever appropriate. Township data were obtained from MOGIS, whereas hydrology and transportation data were obtained from the USGS. Hydrology, along with transportation data, are 1:100,000-scale digital line graph (DLG) data which include rivers, streams, brooks, lakes, ponds, coastal waters and transportation data, including roads, railroads, trails, transmission lines, and pipelines.

Each 1:100,000-scale map went through at least two cycles of review and revision between the MCFWRU and the SPO. A final check on parcel name, general location, and ownership was made by comparing our maps to other published information (for details, see Krohn and Kelly 1997). CAPLD was distributed to selected users in 1997 and based on errors found by these groups, especially the Maine Chapter of The Nature Conservancy (TNC) and ourselves, final revisions were made in the spring of 1998. Finally, CAPLD was joined to an outline of the commercial forestland using ArcEdit, a module of ARC/INFO Version 7.1 (Windows NT) (Environmental Systems Research Institute, Redlands, California, USA; use of trade names does not imply endorsement by the US Government). Slivers created from polygons that did not edge-match were removed by joining the commercial forestland ownership to CAPLD (i.e., CAPLD' s detail was retained because it was the finer-scale data).

Management Categorization

Categories and definitions of management status used by ME-GAP were modified from the categories and definitions developed by GAP (see above). To assure consistency, one person (WBK) assigned management Categories to each ownership, and to each appropriate administrative unit within ownerships. Because management objectives for some administrative units were difficult to interpret, land managers for individual land owning agencies and organizations were contacted when needed. Management Categories were not assigned to open, standing water (lakes, ponds, ocean) because water is managed under a different set of laws then land, and because water makes-up a significant portion of Maine. For analytical convenience, however, running water and wetlands were assumed to have the same management status as the lands in which these features are embedded. Example assignments of management Categories by major landowners are shown in Table 16.

Table 16. Example designation of land management Categories in Maine.

Category 1	Category 2	Category 3a	Category 4
Acadia National Park	Scientific forestry area of Baxter State Park	Forestland of the Maine Bureau of Parks and Lands	Agricultural lands
Baxter State Park (excluding scientific forestry area)	Land Trusts with small forestry operations	Non-wilderness areas of National Forests	Most military lands
Maine Chapter of The Nature Conservancy lands	State Wildlife Management Areas (except for coastal islands which were coded "1").	Developed[a] State Parks	Most state historic sites
Wilderness areas of National Wildlife Refuges	Non-wilderness areas of National Wildlife Refuges	**Category 3b**	Most private lands
Land Trust without extensive manipulation of vegetation	Undeveloped[b] State Parks	Commercial forestland[b]	
		Native American Forestland	

[a] - See text below for discussion.
[b] - See Glossary of Terms for a definition.

In some cases, a parcel of land under one ownership had more than one type of management and thus administrative units corresponding to these management differences had to be identified and mapped. For example, the northwestern corner of Baxter State Park is a conservatively managed forest and thus coded as management Category "2" whereas the rest of the park is code "1" (Table 16). Similarly, formally designated Wilderness Areas on federal lands were coded "1" whereas the remaining land under the same ownership, say a National Wildlife Refuge, was designated as "2." State Wildlife Management Areas, because active manipulation of water and vegetation is regularly practiced by the Maine Department of Inland Fisheries and Wildlife (MDIFW), were coded as "2." Coastal islands owned and managed by the MDIFW, because vegetation is not actively managed, received "1" codes. Lands managed by the Maine Bureau of Parks and Lands (MBPL) as multiple-use forestland (i.e., Public Reserved Lands) were coded as "3a," except for those areas within parcels that had specially designated and protected stands of trees (e.g., old-growth conifers), which were coded as "2". State Parks, also managed by MBPL, were especially problematic to categorize. In general, small parks with facilities developed for recreation were coded as "3a"; large, less developed parks were coded "2." Forestland owned and managed by the Penobscot Indian Nation were code "3b" whereas their islands in the Penobscot River north of Old Town, Maine, because little vegetation is removed from these islands (except that fiddlehead ferns are harvested in early spring), are codes "2." High recreational use of the waters around the islands during some times of the year precluded coding these lands as "1." Thus, coding of management Categories required fairly detailed knowledge of management policies and practices not only by agencies and organizations, but also by individual parcels within an ownership.

Results

Only 5.5% of Maine is in conservation ownership with 5.3% of this in public lands and approximately 0.2% in private conservation lands (Table 17). Of the 5.3% in public ownership, approximately 1% is under federal, 0.1% under municipal, and 4.2% under state jurisdiction (Table 17). The large amount of state ownership is largely due to Baxter State Park, almost 0.1% of the state. MBPL, Department of Conservation, manages the largest amount (2.7%) of public land in the state. While most of the MBPL's lands are multiple-use forestland in township-sized blocks (93.2 km^2 [36 mi^2]) in eastern and northern Maine, this agency also manages historic sites and state parks throughout the state (Map 5). Private conservation lands represent approximately 0.2% of Maine, although we estimate this figure to be low by a factor of 2 (see below). Private commercial forest companies own approximately 50% of Maine, and Native Americans own, in forestland, slightly more than 1.2% of the state. The northwestern portion of the state has few conservation lands (Map 5, Appendix 9). The majority of Maine's conservation lands are in parcels **W** 200 ha (554 ac) in size, and this pattern was consistent across federal, state, and private ownerships (Figure 13). With the exceptions of Acadia National Park, Baxter State Park, Big Reed Pond (owned by the TNC), and the Public Reserve Lands of MBPL, there are no conservation lands in Maine in township-sized blocks.

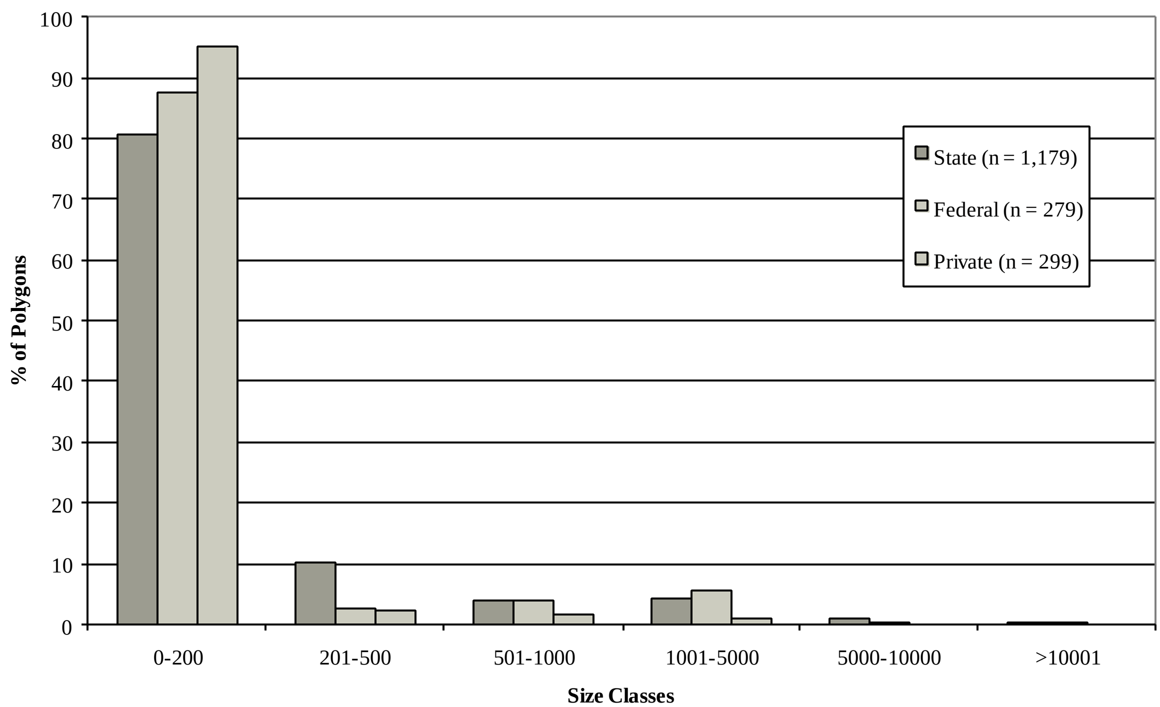


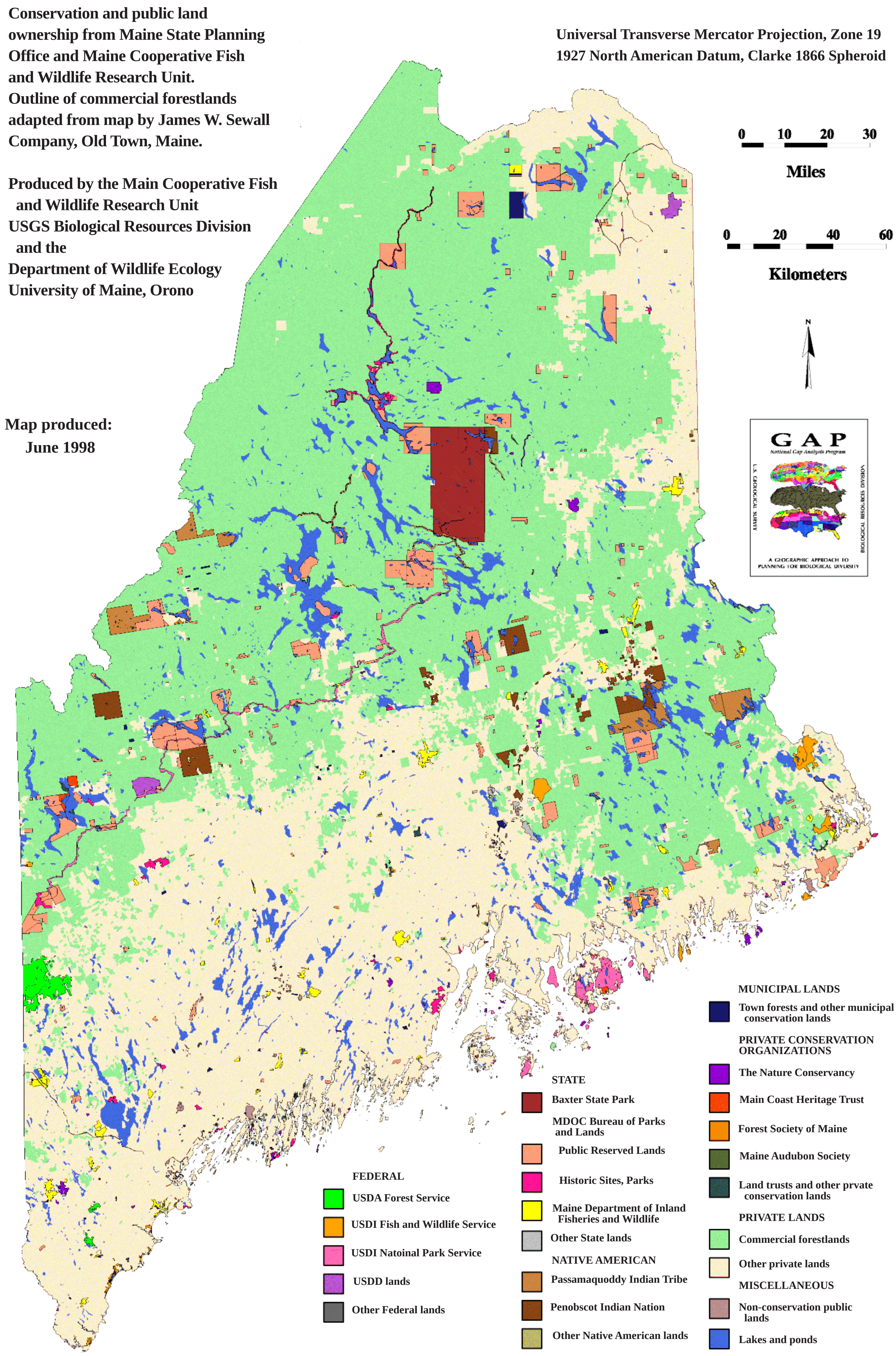
Figure 13. Frequency distribution of sizes (ha) of conservation and public lands in Maine by major land ownership.

Table 17. Number of polygons, total area (ha), percent (%) of total area, and percent (%) of lands in Maine by ownership. The bolded categories represent the broad ownership. The "**Other**" category includes many private lands; however, small land trusts, conservation easements, and municipal lands are also included.

Land Ownership	Number of Polygons	Total Area	% of Maine's Total Area	% of Ownership Type
Federal	**278**	**80,224**	**0.95**	**14.19**
US Department of Agriculture	16	21,322	0.25	3.77
Forest Service	16	21,322	0.25	3.77
US Department of Defense	8	9,542	0.11	2.32
Air Force	6	4,369	0.05	0.90
Navy	2	5,172	0.06	1.42
US Department of the Interior	252	49,360	0.58	8.73
Fish and Wildlife Service	92	17,566	0.21	3.11
National Park Service	160	31,907	0.38	5.64
Others	2	0	0.00	0.03
Native American	**249**	**102,998**	**1.22**	**18.22**
Passamaquoddy Indian Tribe	47	47,998	0.57	8.49
Penobscot Indian Nation	199	54,774	0.65	9.69
Others[b]	3	226	0	.04
State	**1182**	**353,862**	**4.19**	**62.59**
Baxter State Park	30	83,459	0.99	14.76
Maine Department of Conservation	880	230,344	2.72	40.74
Bureau of Parks and Lands	877	230,158	2.72	40.71
Public Reserved Lands	768	209,693	2.48	37.17
Historic Sites, Parks	109	20,465	0.24	3.53
Maine Forest Service	3	186	0	.04
Maine Dept. Inland Fisheries and Wildlife	244	35,466	0.42	6.28
Maine Department of Transportation	7	424	0.01	0.07
University of Maine, Orono	21	4,169	0.05	0.74
Others	0	0	0	0
Municipal	**118**	**10,249**	**0.12**	**1.81**
Private	**299**	**18,042**	**0.21**	**3.19**
Forest Society of Maine	2	388	0.00	0.00
Maine Audubon Society	15	367	0.00	0.06
Maine Coast Heritage Trust	29	3,551	0.04	0.00
National Audubon Society	14	345	0.00	0.06
The Nature Conservancy	139	10,291	0.12	1.82
Others	100	3,100	0.04	0.00
Subtotal	**2126**	**565,375**	**6.69**	**100.00**
Commercial Forestland		**4,228,283**	**49.88**	
Other Lands		**3,244,548**	**38.38**	
Open water[c]		**415,654**	**4.92**	
State Total		**8,453,860**	**100**	

[a] - Administratively, Moosehorn NWR can be counted as one administrative unit but in this analysis counted as 2 parcels (i.e., polygons representing Baring and Edmunds units).
[b] - Houlton Band of Maliseets and Aroostook Band of Micmacs who own little forestland.
[c] - Defined as lakes, ponds and rivers in USGS Digital Line Graph data at 1:100,000 scale.

"(see Map 5)"

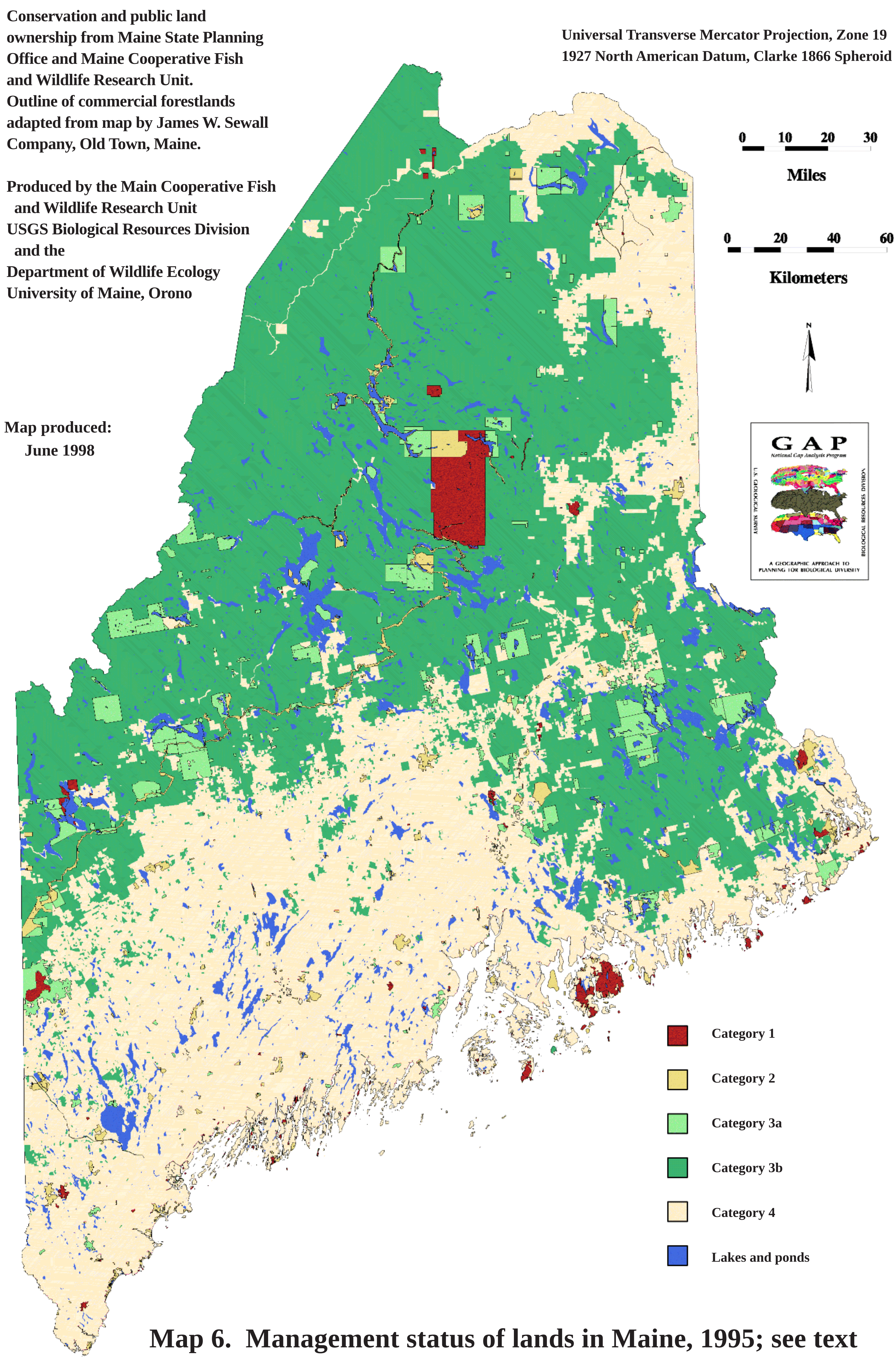


Map 5. Major land ownersihps of Maine, 1995.

Most conservation lands in Maine are unconnected to other conservation lands (with some exceptions of narrow, regulated riparian/shoreline/wetland strips). However, note how the Appalachian Trail connects a variety of federal, state, and private lands from the ME-NH border in the western part of the state to Mount Katahdin in central Maine (Map 5). In addition to this linking function, the Appalachian Trail directly protects many rare ecological communities, especially plants (MNAP 1998). Consideration is being given to extending the trail through Maine northeast into the highlands of the Gaspé Peninsula, Quebec. In general, conservation lands in Maine would become isolated islands if Commercial Forestlands were converted to more intensive land uses (Maps 5 and 6). Thus, a major policy issue is how to keep large blocks of forestland functioning in such a way that they continue to provide biodiversity as well as economic benefits into the future.

Table 18 shows the percent and size (km^2) of each management Category, excluding open water which makes up 4.9% (4,157 km^2) of the state. Less than 3% (2,413 km^2) of the state of Maine falls within Category 1 and 2 lands (Table 18). With the exception of Baxter State Park (835 km^2), these lands are small (**W** 80 km^2) and scattered. The majority of Category 1 land consists of Baxter State Park (1%) and lands managed by the USDI National Park Service (0.2%) (Map 6). Category 2 land consists of lands managed by the state of Maine (mostly MBPL and MDIFW lands), and the federal government (mostly NWR' s and a National Forest), and several other small owners. Category 1 and 2 lands combined include one National Forest, around 45 Wildlife Management Areas, four National Wildlife Refuges, two corridors (i.e. Appalachian Trail Corridor and the Penobscot River Corridor), approximately 25 State Parks, 73 Preserves, one National Park, and many other small conservation areas. In contrast, the state is made-up of over 92% Category 3 and 4 lands (Table 18). Category 3a and 3b make-up approximately 54% of the state and include mainly privately owned commercial forestland (50%), Public Reserved Lands (2.2%), and Native American lands (1.2%). The other 38% of the state is Category 4 in which 0.1% is in public ownership (i.e., historic sites, public lands, and recreational areas) and the rest is in private ownership (Table 18).

"(see Map 6)"



Map 6. Management status of lands in Maine, 1995; see text for definitions of management Categories.

Table 18. Percent (%) and size (km^2) of land management Categories by major ownerships in Maine, 1995.

Land Ownership	Land Management Categories 1		2		3a		3b		4		Total	
	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2
Federal	**0.3**	**224**	**0.4**	**316**	**0.3**	**263**	**0.0**	**0**	**0.0**	**41**	**1.0**	**884**
US Department of Agriculture	0.1	46	0.0	0	0.2	167	0.0	0	0.0	0	0.3	213
Forest Service	0.1	46	0.0	0	0.0		0.0	0	0.0	0	0.1	46
US Department of Defense	0.0	0	0.0	0	0.1	96	0.0	0	0.0	36	0.2	132
Air Force	0.0	0	0.0	0	0.1	44	0.0	0	0.0	0	0.1	44
Navy	0.0	0	0.0	0	0.1	52	0.0	0	0.0	0	0.1	52
US Department of the Interior	0.2	178	0.4	316	0.0	0	0.0	0	0.0	1	0.6	495
Fish and Wildlife Service	0.0	39	0.2	135	0.0	0	0.0	0	0.0	0	0.2	174
National Park Service	0.2	139	0.2	180	0.0	0	0.0	0	0.0	0	0.4	319
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.0	4
Native American[a]	**0.0**	**0**	**0.0**	**19**	**1.2**	**1,011**	**0.0**	**0**	**0.0**	**1**	**1.2**	**1,031**
Passamaquoddy Indian Tribe	0.0	0	0.0	0	0.6	480	0.0	0	0.0	0	0.6	480
Penobscot Indian Nation	0.0	0	0.0	19	0.6	529	0.0	0	0.0	1	0.6	549
State	**0.9**	**753**	**1.1**	**902**	**2.2**	**1,883**	**0.0**	**0**	**0.0**	**18**	**4.2**	**3,556**
Baxter State Park	0.8	714	0.1	120	0.0	1	0.0	0	0.0	0	1.0	835
Maine Department of Conservation	0.0	20	0.5	439	2.2	1,843	0.0	0	0.0	9	2.7	2,311
Bureau of Parks and Lands	0.0	20	0.5	439	2.2	1,841	0.0	0	0.0	8	2.8	2,308
Public Reserved Lands	0.0	19	0.5	420	2.1	1,813	0.0	0	0.0	0	2.7	2,252
Historic Sites, Parks	0.0	1	0.0	19	0.1	28	0.0	0	0.0	1	0.1	49
ME Dept. Inland Fisheries and Wildlife	0.0	9	0.4	341	0.0	4	0.0	0	0.0	1	0.4	355
Maine Department of Transportation	0.0	0	0.0	1	0.0	3	0.0	0	0.0	3	0.0	7
University of Maine, Orono	0.0	10	0.0	0	0.0	31	0.0	0	0.0	4	0.1	45
Other	0.0	0	0.0	1	0.0	1	0.0	0	0.0	1	0.0	3
Municipal	**0.0**	**1**	**0.0**	**18**	**0.1**	**84**	**0.0**	**0**	**0.0**	**14**	**0.1**	**117**
Private	**0.2**	**156**	**0.0**	**24**	**0.0**	**1**	**0.0**	**0**	**0.0**	**0**	**0.2**	**181**
Forest Society of Maine	0.0	0	0.0	4	0.0	0	0.0	0	0.0	0	0.0	4
Maine Audubon Society	0.0	3	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3
Maine Coast Heritage Trust	0.0	34	0.0	1	0.0	0	0.0	0	0.0	0	0.0	35
National Audubon Society	0.0	2	0.0	1	0.0	0	0.0	0	0.0	0	0.0	3
The Nature Conservancy	0.1	101	0.0	2	0.0	0	0.0	0	0.0	0	0.1	103
Others	0.0	14	0.0	14	0.0	1	0.0	0	0.0	0	0.0	29
Subtotal	**1.3**	**1,134**	**1.5**	**1,279**	**3.8**	**3,242**	**0.0**	**0**	**0.1**	**74**	**6.8**	**5,729**
Commercial Forestland	0.0	0	0.0	0	0.0	0	50.0	42,283	0.0	0	50.0	42,283
Other Lands	0.0	0	0.0	0	0.0	0	0.0	0	38.3	32,370	38.3	32,370
Total (km^2)	**1.3**	**1,134**	**1.5**	**1,279**	**3.8**	**3,242**	**50.0**	**42,283**	**38.4**	**32,444**	**95.1[b]**	**80,381**

[a] - Excludes Houlton Band of Maliseets and Aroostook Band of Micmacs who own little forestland.
[b] - Excluding open water [415,654 km^2 (Table 17)] which is not a land management Category.

The distribution of lands in Maine by elevation and management Categories is as follows:

Table 19. Area (km^2) and percent (%) of five elevation ranges (m) across land management Categories.

Elevation (m)	**Categories 1 & 2**		**Categories 3a & 3b**		**Category 4**		**Open Water**		**Total**	
	km^2	%	km^2	%	km^2	%	km^2	%	**km^2**	**%**
1 - 200	947	1.1	13,527	16.0	27,333	32.3	2,277	2.7	**44,084**	**51.6**
201 – 500	1,005	1.2	26,090	30.8	6,131	7.3	1,508	1.8	**34,734**	**41.1**
501 – 700	232	0.3	3,886	4.6	222	0.8	33	.04	**4,373**	**5.7**
701 – 1000	171	0.2	1,111	1.3	13	0.0	3	0.0	**1,298**	**1.5**
> 1000	49	0.1	0	0.0	0	0.0	0	0.0	**49**	**0.1**
Total (km^2)	**2,404**	**2.9**	**44,614**	**52.7**	**33,699**	**39.8**	**3,821**	**4.5**	**84,538**	**100**

Approximately, 4.5% of Maine is open water; of the remaining land area, less than 3% is in management Category 1 and 2, almost 53% in Category 3, and the remainder in Category 4 (Table 19). Of the 2.9% in Category 1 and 2, most of this land (2.3%) area is at or below 500 m above mean sea level and, multiple-use lands (i.e., Category 3) are also mostly at or below 500 m (46.8 of 52.7%) (Table 19).

Accuracy Assessment

No formal accuracy assessment was performed of the land ownership or of the land management databases. However, CAPLD was built with a rigorous quality control procedure and compared to published sources, as well as given exposure to users for a year and then revised based on user comments.

Limitations and Discussion

In addition to not mapping small (< 40.5 ha [100 ac]) ownerships of private and public conservation lands, and not all public lands (e.g.; schools, universities, municipal and state facilities) were mapped. Also, we made no attempt to identify and map quasi-government lands such as water district lands. Obviously, small parcels of conservation lands and water district lands, and even some nonconservation public lands, do help to conserve biodiversity, especially in the more developed portions of Maine. However, these small parcels are inconsequential in a statewide analysis.

In 1995, Maine had 72 land trusts that conserved a total of 36,557 ha (90,332 ac) in 720 parcels (40% in 344 parcels that were owned; 60% in 376 parcels in easements) (MCHT and MLTN 1998). In comparison, CAPLD contained 35 land trusts totaling only 18,042 ha (44,582 ac) in 299 parcels (Table 17). Thus, ME-GAP captured approximately 50% of the lands under trusts in Maine. In addition, not all conservation easements managed by private and public organizations were mapped; the state is currently creating an easement database. Finally, although we believe the Native American reservation and trust lands (i.e., title held by the federal government) managed for forestry to be relatively complete, not all fee title lands owned by Native Americans (versus title held by the federal government) were mapped, mainly due to rapidly changing ownerships. However, the preceding limitations are not serious for the statewide analyses at hand, given the small sizes of the parcels not included.

Maintaining and updating the land ownership map of recent land acquisitions, consolidations, and exchanges within the state is not one of the goals of ME-GAP. Our purpose was to produce, as accurate as possible, a snapshot of major land ownership and management status in Maine during 1995. Information on land ownership and administrative units are expected to be as accurate and current as the sources upon which they were based. However, boundary information was not readily accessible for some small parcels, and even when available, positional accuracy of land parcels was not assessed. Thus, these data on land ownership and management status should in no way be considered as legal documentations, but are adequate for the purpose at hand (i.e., statewide biodiversity assessment).

ANALYSIS BASED ON OWNERSHIP AND MANAGEMENT CATEGORIES

We have an account in the newspapers of every cow and calf that is run over,
but not of the various wild creatures... It may be many generations
before the partridges learn to give the cars a sufficiently wide berth.

Thoreau - Journal, 1858

Introduction

As described in the Introduction of this report, the primary objective of GAP is to provide information on the distribution and status of several elements of biological diversity. This is accomplished by first producing: maps of land cover, predicted distributions for selected animal species, and land ownership and management (see previous chapter for details). Intersecting the land ownership and management maps with the distribution of the elements results in tables that summarize the area and percent of total mapped distribution of each element in different land stewardship and management Categories. The data are provided in a format that allows users to carry out inquires about the representation of each element in different land ownership and management Categories as appropriate to their own management objectives. This forms the basis of GAP' s mission, which is to provide land owners and managers with the information necessary to conduct informed policy development, planning, and management for biodiversity maintenance.

Although GAP "seeks to identify habitat types and species not adequately represented in the current network of biodiversity management areas" (GAP Handbook), it is unrealistic to create a standard definition of "adequate representation" for either land cover types or individual vertebrate species (Noss *et al.* 1995). A practical solution to this problem is to report both percentages and absolute area of each type or species in biodiversity management areas and allow the user to determine which types are adequately represented in natural areas. There are many other factors that should be considered in such determinations such as (a) historic loss or gain in distribution, (b) nature of the spatial distribution, (c) immediate versus long term risk, and (d) degree of local adaptation among populations of the biotic elements that are worthy of individual conservation consideration. Such analyses are beyond the scope of this project, but we encourage their application coupled with field confirmation of the mapped distributions. As a coarse indicator of the status of the elements, gap analyses traditionally provide breakdowns along three levels of representation (10%, 20%, and 50%) that have been recommended in the literature as necessary amounts of conservation (Noss and Cooperider 1994, Noss 1991, Odum and Odum1972, Specht *et al.* 1974).

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. In Maine, data on rare plants is maintained by the Natural Areas Program, Maine Department of Conservation (MDOC), and rare animal data is maintained by the Maine Department of Inland Fisheries and Wildlife (MDIFW). GAP cooperatively uses these data to develop predicted distributions of potentially suitable habitat for these elements (e.g., Appendix 8), which may be valuable for identifying research needs and preliminary considerations for restoration or reintroduction. Conservation of such 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 MDOC (for plants) and MDIFW (for animals).

Currently, land cover types and terrestrial vertebrates are the primary focus of GAP's mapping efforts; however, other components of biodiversity, such as aquatic organisms or selected groups of invertebrates may be incorporated into GAP distributional data sets. Where appropriate, GAP data may also 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" (i.e., an approach that additively identifies a selection of locations that may represent biodiversity) and "representational" (i.e., an approach that statistically compares factors of importance to biodiversity on and off conservation lands to see how well conservation lands represent an area's landscape) analyses, rather than "hot spots of species richness" may prove more effective for guiding biodiversity maintenance efforts (Kiester *et al.* 1996, Pressey *et al.* 1993, Williams *et al.* 1996, Csuti *et al.*1997).

Land Cover Analysis

All anthropogenic types of land cover mapped in ME-GAP are included in Agricultural and Developed lands. Agricultural Lands, namely Blueberry Fields, Grasslands (pastures, hayfields, and lawns), and Abandoned Fields, although important wildlife habitats in Maine, are highly modified habitats, and in the case of Abandoned Fields, are transitory (i.e., without management they quickly grow into forests). Developed Lands are also clearly not natural plant communities, and approximately 98 % of these lands occur on nonconservation private ownerships (Tables 20 and 21). Clearcuts and other types of managed forests, although the result of human activities (i.e., forest management), must be included in habitat analyses because they are successional stages, or special structural types (e.g., partial cuts have lower stems densities than unmanaged forests of the same cover type), of natural communities. Standing water (mostly lakes and ponds), although constituting a significant part of Maine's area (4.5 %; Table 19), is managed under different laws and regulations than land, and hence is excluded from analysis in this report (although conservation analysis of aquatic habitats is an important conservation need). Wetlands, another significant part of the Maine landscape (9.7%, Table 2), although managed under different laws and regulations than upland habitats (i.e., state and federal wetland regulations), are included in this analysis due to their importance to the vertebrates mapped in ME-GAP.

Note that the percentages of vegetation and land cover types across major land ownerships in Tables 20 and 21 each total to 100 %. Tabulation by rows is useful when showing how habitats are distributed across ownerships. However, one may also be interested in distribution of habitats within ownership types. Tabulation by column uses the same area figures of Tables 20 and 21, but in this case, percentages are calculated down the table (Tables 22 and 23). Note that in Tables 20 through 23 the amount of Open Water differs when totaled across versus down the table. These differences are small and are due to the horizontal (i.e., row) data being based on

USGS DLGs whereas the vertical (i.e., column) data are from Landsat TM. Because TM does an excellent job of mapping open water (i.e., very low reflectance and hence a very distinctive class), and because the TM data were more recent and a finer resolution than the 1:100,000 scale DLGs, we believe that the TM data to be the more accurate of the two sets of Open Water data. However, because the Conservation and Public Lands Database was built with coincident features from the USGS DLGs (Krohn and Kelly 1997), tabulations of land areas where Open Water is excluded (e.g., Table 18) are all based on the Open Water (i.e., lakes, ponds, and rivers) as defined by the USGS DLGs.

Description of Land Cover Analysis

Appendix 10 provides the area in km^2 of each vegetation and land cover type by land management Categories and land ownerships. A gap analysis typically assumes that the higher the percentage of a plant communities' distribution that is on Category 1 and 2 lands, the more secure that plant community is from a conservation perspective. Unfortunately, this typical gap analysis has limited application under Maine conditions for three reasons. First, as documented under Land Stewardship, only 2.8 % of the state' s area is in Category 1 and 2 lands, making essentially all vegetation and land cover types very poorly represented on lands in these two management Categories. Second, upland types are so broadly defined as to have limited merit in terms of conservation planning. For example, Deciduous Forests include many types of plant communities, including Beech Forests, Beech Maple Forests, and Northern Deciduous Forests. Even within the Northern Hardwood Forest type, recent field studies have demonstrated significant geographical variation across Maine that is of conservation interest [see Appendix C by S. C. Gawler in McMahon (1998)]. In terms of Wetlands, again geographic variation of conservation significance is suggested by an analysis of the Dwarf Shrub Bog type (an even more specific types than used by ME-GAP) (McMahon 1998: Appendix C). In addition, gap analysis of water and wetlands by land management Categories 1 and 2 are not very informative given that wetlands, as well as shorelands, come under a complex set of federal, state and local regulations distinct from what is applicable to upland types.

While we believe that the data in Appendix 10 are not widely useful for gap analyses of plant communities, they are useful for answering other habitat questions. For example, Abandoned Field is an important habitat for many game species (e.g., American Woodcock, Ruffed Grouse, White-tailed Deer). This habitat type is a successional stage of forestlands and without active management (e.g., clearcutting to stimulate re-growth) quickly grows to pole-sized forests used by some other species of wildlife. Assuming that Category 1 lands can not be actively managed (i.e., clearcut), a question that can be answered by Appendix 10 is how much Abandoned Field can be potentially managed on private versus public lands? A quick look at the Abandoned Field data in Appendix 10:2 clearly shows that management of this type must involve the active cooperative of private landowners. Similarly, Fresh Emergent Wetland supports Maine' s rarest waterbirds and high densities of nongame as well as game species (especially aquatic furbearers and waterfowl). As can be seem in Appendix 10:7, although 4.6 % (33 km^2) of this type occurs on Category 1 and 2 lands, approximately 50 % (357.8 km^2) is on Commercial Forestlands, again pointing to the need for cooperative management with private landowners.

Table 20. Percent (%) and area (km^2) of vegetation and land cover types across major land ownerships.

Cover Type	Federal %	Federal km^2	Native American %	Native American km^2	State %	State km^2	Private Conservation %	Private Conservation km^2	Commercial Forestland %	Commercial Forestland km^2	Other Private and Municipal %	Other Private and Municipal km^2	Open Water[a] %	Open Water[a] km^2	Total %	Total km^2
Agricultural Lands	**0.5**	**29.0**	**0.2**	**11.1**	**0.7**	**44.0**	**0.1**	**7.3**	**6.5**	**399.5**	**91.8**	**5,665.5**	**0.2**	**12.4**	**100**	**6,168.6**
Abandoned Field	2.2	4.5	0.2	0.3	1.8	3.6	0.1	0.2	17.9	36.1	77.6	156.2	0.1	0.3	100	201.2
Blueberry Field	1.8	2.4	0.5	0.6	3.5	4.7	0.8	1.1	35.0	46.8	58.2	77.8	0.1	0.1	100	133.6
Grasslands	0.3	15.3	0.1	6.0	0.6	27.8	0.1	5.1	5.2	245.9	93.5	4,413.2	0.1	5.8	100	4,719.2
Crops/Ground	0.6	6.8	0.4	4.1	0.7	7.7	0.1	0.9	6.3	70.6	91.4	1,018.3	0.5	6.1	100	1,114.6
Forestlands	**1.0**	**644.2**	**1.3**	**868.0**	**4.6**	**2,979.7**	**0.2**	**122.9**	**56.3**	**36,330.4**	**36.3**	**23,428.8**	**0.2**	**108.8**	**100**	**64,482.9**
Clearcut	0.3	4.1	0.9	11.2	1.6	20.4	0.2	2.4	68.3	868.4	28.5	363.0	0.2	2.6	100	1,272.3
Early Regeneration	0.2	9.3	1.2	66.9	1.8	94.3	0.1	3.6	80.0	4,296.3	16.7	894.8	0.1	4.3	100	5,369.6
Late Regeneration	0.5	13.3	1.7	48.8	2.5	73.8	0.2	4.5	65.5	1,916.7	29.6	864.6	0.1	4.0	100	2,925.6
Light Partial Cut	0.9	10.1	1.0	11.2	4.4	50.6	0.1	1.2	59.8	680.0	33.7	382.9	0.1	1.4	100	1,137.4
Heavy Partial Cut	0.4	6.6	1.3	20.4	2.3	35.6	0.2	2.5	64.5	990.1	31.2	479.4	0.1	1.3	100	1,536.1
Deciduous Forest	1.2	159.3	1.6	200.5	5.1	649.0	0.1	14.2	55.1	7,066.7	36.8	4,717.1	0.1	11.8	100	12,818.7
Decid./conif. Forest	0.8	112.5	1.0	133.2	4.9	655.6	0.2	23.0	50.8	6,846.6	42.3	5,698.6	0.1	16.8	100	13,486.3
Conif./decid. Forest	1.0	171.2	1.4	256.6	4.9	875.4	0.2	31.5	50.2	9,037.6	42.2	7,608.9	0.2	39.1	100	18,020.3
Coniferous Forest	2.0	157.7	1.5	119.2	6.6	524.9	0.5	40.0	58.5	4,628.0	30.6	2,419.6	0.3	27.3	100	7,916.6
Water & Wetlands	**0.8**	**103.8**	**1.1**	**145.6**	**3.6**	**461.8**	**0.4**	**47.8**	**35.8**	**4,599.3**	**29.1**	**3,736.9**	**29.2**	**3,754.8**	**100**	**12,850.0**
Deciduous Forested	1.0	7.5	1.0	7.2	4.0	29.5	0.3	2.0	26.5	194.7	66.6	490.5	0.6	4.7	100	736.1
Coniferous Forested	0.8	30.2	1.8	69.5	4.3	168.4	0.5	18.0	65.3	2,539.1	27.1	1,055.2	0.3	10.6	100	3,891.0
Dead-forest	1.7	0.5	0.4	0.1	7.1	2.0	0.3	0.1	41.9	11.7	47.0	13.1	1.6	0.5	100	27.9
Decid. Scrub-shrub	1.3	18.5	1.7	23.8	5.7	78.6	0.4	5.9	51.2	708.9	37.3	515.6	2.4	32.8	100	1,384.1
Conif. Scrub-shrub	0.8	1.2	1.6	2.5	7.3	11.5	0.5	0.7	55.7	87.1	31.9	49.8	2.2	3.4	100	156.3
Dead Scrub-shrub	0.7	0.0	0.0	0.0	1.0	0.0	0.0	0.0	46.2	0.5	49.8	0.6	2.4	0.0	100	1.2
Fresh Aquatic Bed	6.1	0.1	0.0	0.0	2.3	0.0	0.0	0.0	0.6	0.0	52.1	0.7	39.0	0.6	100	1.4
Fresh Emergent	1.0	7.4	2.0	14.6	5.6	40.4	0.3	2.0	49.9	358.3	36.8	264.3	4.4	31.8	100	718.8
Peatland	1.7	8.0	1.7	8.1	6.3	29.5	1.8	8.4	61.3	289.9	25.9	122.3	1.4	6.5	100	472.7
Wet Meadow	3.1	5.3	2.2	3.7	9.0	15.3	0.2	0.4	41.6	70.7	34.3	58.3	9.6	16.4	100	170.0
Salt Aquatic Bed	2.2	4.2	0.0	0.0	1.2	2.4	1.4	2.8	0.1	0.3	95.0	187.1	0.0	0.0	100	196.9
Salt Emergent	11.2	9.0	0.0	0.0	12.5	10.1	2.2	1.8	0.0	0.0	70.5	56.5	3.6	2.9	100	80.2
Mudflat	0.5	1.1	0.0	0.0	0.7	1.6	0.2	0.4	0.5	1.2	96.1	226.8	2.1	5.0	100	236.1
Sand Shore	1.3	0.4	0.0	0.0	1.1	0.4	0.3	0.1	0.2	0.1	97.0	30.5	0.1	0.0	100	31.5
Gravel Shore	0.0	0.0	0.1	0.0	16.9	6.3	0.0	0.0	14.3	5.3	25.9	9.6	42.8	16.0	100	37.3
Rock Shore	3.5	2.2	0.0	0.0	6.5	4.1	2.6	1.6	9.2	5.8	42.1	26.8	36.1	22.9	100	63.5
Shallow Water	1.1	1.7	1.2	1.7	4.2	6.2	0.3	0.5	38.7	56.8	25.8	37.9	28.6	42.0	100	146.7
Open Water[a]	0.1	6.5	0.3	14.4	1.2	55.5	0.1	3.1	6.0	268.9	13.1	591.0	79.1	3,558.8	100	4,498.2
Developed Lands	**0.9**	**10.1**	**0.3**	**3.5**	**0.5**	**5.0**	**0.1**	**0.9**	**12.2**	**130.0**	**85.8**	**914.6**	**0.2**	**1.9**	**100**	**1,066.0**
Sparse Residential	0.8	5.7	0.5	3.3	0.6	4.4	0.1	0.7	17.3	119.6	80.4	555.5	0.2	1.5	100	690.6
Dense Residential	1.2	4.4	0.0	0.2	0.2	0.6	0.0	0.2	2.8	9.9	95.6	336.5	0.1	0.4	100	352.2
Urban/Industrial	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	99.6	14.9	0.1	0.0	100	14.9
Highways/Runways	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	5.8	0.5	93.7	7.7	0.2	0.0	100	8.2
Other	**20.8**	**13.6**	**0.0**	**0.0**	**58.5**	**38.3**	**0.2**	**0.1**	**3.8**	**2.5**	**16.3**	**10.7**	**0.3**	**0.2**	**100**	**65.5**
Alpine Tundra	3.8	0.8	0.0	0.0	88.9	18.4	0.0	0.0	7.2	1.5	0.0	0.0	0.1	0.0	100	20.6
Exposed Rock/Talus	28.6	12.9	0.0	0.0	44.5	20.0	0.3	0.1	2.3	1.0	23.8	10.7	0.5	0.2	100	44.9

[a] - Open Water (cover type) and Open Water (ownership) classes do not correspond exactly due to differences in data sources (i.e., TM vertically vs. USGS horizontally), class definitions, and data resolution.

Table 21. Percent (%) and area (km^2) of vegetation and land cover types across land management Categories.

	Category 1		Category 2		Category 3a		Category 3b		Category 4		Open Water[a]		Total	
Cover Type	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2
Agricultural Lands	**0.3**	**19.2**	**0.6**	**36.9**	**0.6**	**38.4**	**6.5**	**399.6**	**91.8**	**5,663.4**	**0.2**	**11.1**	**100**	**6,168.6**
Abandoned Field	0.4	0.8	2.6	5.3	1.3	2.6	18.0	36.2	77.6	156.2	0.1	0.1	100	201.2
Blueberry Field	1.4	1.9	2.3	3.1	2.5	3.4	35.0	46.8	58.7	78.4	0.0	0.1	100	133.6
Grasslands	0.3	13.0	0.5	23.4	0.4	20.8	5.2	246.0	93.5	4,411.0	0.1	5.0	100	4,719.2
Crops/Ground	0.3	3.5	0.5	5.1	1.0	11.6	6.3	70.7	91.3	1,017.8	0.5	5.9	100	1,114.6
Forestlands	**1.5**	**942.7**	**1.5**	**938.2**	**4.3**	**2,793.5**	**56.3**	**36,333.6**	**36.3**	**23,391.1**	**0.1**	**83.8**	**100**	**64,482.9**
Clearcut	0.6	7.7	0.7	9.2	1.7	22.1	68.3	868.5	28.5	362.6	0.2	2.3	100	1,272.3
Early Regeneration	0.6	34.2	0.4	24.0	2.2	118.8	80.0	4,297.0	16.6	892.6	0.1	3.0	100	5,369.6
Late Regeneration	0.6	16.7	0.9	25.5	3.4	100.3	65.5	1,916.9	29.5	863.1	0.1	3.1	100	2,925.6
Light Partial Cut	1.1	12.9	1.7	19.3	3.7	42.2	59.8	680.2	33.6	381.9	0.1	1.0	100	1,137.4
Heavy Partial Cut	0.4	5.6	0.7	10.9	3.3	50.6	64.5	990.2	31.1	478.0	0.1	0.9	100	1,536.1
Deciduous Forest	1.5	188.0	1.3	169.4	5.3	683.9	55.1	7,066.8	36.7	4,704.4	0.0	6.1	100	12,818.7
Decid./conif. Forest	1.5	199.6	1.2	166.3	4.3	575.6	50.8	6,847.0	42.2	5,686.3	0.1	11.5	100	13,486.3
Conif./Decid. Forest	1.4	244.6	1.6	282.5	4.5	817.2	50.2	9,038.7	42.2	7,604.8	0.2	32.6	100	18,020.3
Coniferous Forest	2.9	233.4	2.9	231.2	4.8	382.9	58.5	4,628.3	30.5	2,417.4	0.3	23.3	100	7,916.6
Water & Wetlands	**0.9**	**114.0**	**2.3**	**290.7**	**2.9**	**366.5**	**35.8**	**4,601.2**	**29.2**	**3,756.6**	**29.0**	**3,721.0**	**100**	**12,850.0**
Deciduous Forested	0.5	4.0	3.1	23.0	2.7	20.0	26.5	194.9	66.7	490.7	0.5	3.6	100	736.1
Coniferous Forested	1.1	42.5	1.7	66.5	4.8	185.8	65.3	2,539.4	26.9	1,047.5	0.2	9.3	100	3,891.0
Dead-forest	0.6	0.2	5.7	1.6	3.2	0.9	41.9	11.7	47.1	13.1	1.5	0.4	100	27.9
Decid. Forested	1.3	18.5	3.9	53.9	4.0	55.9	51.2	709.1	37.3	515.8	2.2	30.9	100	1,384.1
Conif. Scrub-shrub	2.2	3.4	4.2	6.5	3.8	5.9	55.7	87.1	32.0	50.0	2.1	3.3	100	156.3
Dead Scrub-shrub	0.7	0.0	0.8	0.0	0.2	0.0	46.2	0.5	49.8	0.6	2.4	0.0	100	1.2
Fresh Aquatic Bed	6.1	0.1	0.3	0.0	2.0	0.0	0.6	0.0	53.0	0.8	38.1	0.5	100	1.4
Fresh Emergent	1.2	8.6	3.4	24.1	4.4	31.4	49.9	358.4	37.0	265.7	4.2	30.5	100	718.8
Peatland	2.2	10.3	5.2	24.7	4.1	19.2	61.3	289.9	25.9	122.4	1.3	6.3	100	472.7
Wet Meadow	1.8	3.0	8.0	13.6	5.1	8.7	41.6	70.7	34.1	57.9	9.4	16.0	100	170.0
Salt Aquatic Bed	2.8	5.4	2.0	3.9	0.0	0.0	0.1	0.3	95.1	187.2	0.0	0.0	100	196.9
Salt Emergent	2.8	2.2	23.3	18.7	0.2	0.1	0.0	0.0	72.3	58.0	1.4	1.1	100	80.2
Mudflat	0.3	0.7	1.0	2.3	0.0	0.1	0.5	1.2	96.8	228.6	1.3	3.1	100	236.1
Sand Shore	0.7	0.2	2.0	0.6	0.0	0.0	0.2	0.1	97.0	30.6	0.1	0.0	100	31.5
Gravel Shore	0.3	0.1	16.5	6.2	0.2	0.1	14.4	5.4	26.7	10.0	41.9	15.6	100	37.3
Rock Shore	4.5	2.9	7.7	4.9	0.3	0.2	9.2	5.8	42.6	27.1	35.7	22.7	100	63.5
Shallow Water	1.5	2.1	2.0	2.9	3.4	5.0	38.7	56.8	26.1	38.4	28.3	41.6	100	146.7
Open Water[a]	0.2	9.6	0.8	37.4	0.7	33.1	6.0	269.9	13.6	612.2	78.6	3,536.0	100	4,498.2
Developed Lands	**0.4**	**4.1**	**0.5**	**5.4**	**1.1**	**12.0**	**12.2**	**130.0**	**85.7**	**913.1**	**0.1**	**1.2**	**100**	**1,066.0**
Sparse Residential	0.6	3.9	0.6	4.5	0.9	6.0	17.3	119.6	80.5	555.7	0.1	0.9	100	690.6
Dense Residential	0.1	0.2	0.3	0.9	1.7	5.9	2.8	9.9	95.1	335.0	0.1	0.3	100	352.2
Urban/Industrial	0.0	0.0	0.3	0.0	0.9	0.1	0.0	0.0	98.7	14.7	0.1	0.0	100	14.9
Highways/Runways	0.0	0.0	0.3	0.0	0.2	0.0	5.8	0.5	93.6	7.7	0.0	0.0	100	8.2
Other	**77.2**	**50.6**	**2.3**	**1.5**	**0.1**	**0.1**	**3.8**	**2.5**	**16.4**	**10.8**	**0.1**	**0.0**	**100**	**65.5**
Alpine Tundra	88.9	18.4	3.8	0.8	0.0	0.0	7.2	1.5	0.0	0.0	0.1	0.0	100	20.6
Exposed Rock/Talus	71.9	32.2	1.6	0.7	0.2	0.1	2.3	1.0	24.0	10.8	0.1	0.0	100	44.9

[a] - Open Water (cover type) and Open Water (ownership) classes do not correspond exactly due to differences in data sources (i.e., TM vertically vs. USGS horizontally), class definitions, and data resolution.

Table 22. Percent (%) and area (km^2) of vegetation and land cover types within major land ownerships.

Cover Type	Federal		Native American		State		Private Conservation		Commercial Forestland		Other Private and Municipal		Open Water[a]	
	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2
Agricultural Lands	**3.6**	**29.0**	**1.1**	**11.1**	**1.2**	**44.0**	**4.1**	**7.3**	**1.0**	**399.5**	**16.8**	**5,665.5**	**0.3**	**12.4**
Abandoned Field	0.6	4.5	0.0	0.3	0.1	3.6	0.1	0.2	0.1	36.1	0.5	156.2	0.0	0.3
Blueberry Field	0.3	2.4	0.1	0.6	0.1	4.7	0.6	1.1	0.1	46.8	0.2	77.8	0.0	0.1
Grasslands	1.9	15.3	0.6	6.0	0.8	27.8	2.9	5.1	0.6	245.9	13.1	4,413.2	0.1	5.8
Crops/Ground	0.9	6.8	0.4	4.1	0.2	7.7	0.5	0.9	0.2	70.6	3.0	1,018.3	0.2	6.1
Forestlands	**80.5**	**644.2**	**84.4**	**868.0**	**84.4**	**2,979.7**	**68.6**	**122.9**	**87.6**	**36,330.4**	**69.4**	**23,428.8**	**2.8**	**108.8**
Clearcut	0.5	4.1	1.1	11.2	0.6	20.4	1.3	2.4	2.1	868.4	1.1	363.0	0.1	2.6
Early Regeneration	1.2	9.3	6.5	66.9	2.7	94.3	2.0	3.6	10.4	4,296.3	2.7	894.8	0.1	4.3
Late Regeneration	1.7	13.3	4.7	48.8	2.1	73.8	2.5	4.5	4.6	1,916.7	2.6	864.6	0.1	4.0
Light Partial Cut	1.3	10.1	1.1	11.2	1.4	50.6	0.7	1.2	1.6	680.0	1.1	382.9	0.0	1.4
Heavy Partial Cut	0.8	6.6	2.0	20.4	1.0	35.6	1.4	2.5	2.4	990.1	1.4	479.4	0.0	1.3
Deciduous Forest	19.9	159.3	19.5	200.5	18.4	649.0	7.9	14.2	17.0	7,066.7	14.0	4,717.1	0.3	11.8
Decid./conif. Forest	14.0	112.5	13.0	133.2	18.6	655.6	12.9	23.0	16.5	6,846.6	16.9	5,698.6	0.4	16.8
Conif./decid. Forest	21.4	171.2	25.0	256.6	24.8	875.4	17.6	31.5	21.8	9,037.6	22.5	7,608.9	1.0	39.1
Coniferous Forest	19.7	157.7	11.6	119.2	14.9	524.9	22.3	40.0	11.2	4,628.0	7.2	2,419.6	0.7	27.3
Water & Wetlands	**13.0**	**103.8**	**14.2**	**145.6**	**13.1**	**461.8**	**26.7**	**47.8**	**11.1**	**4,599.3**	**11.1**	**3,736.9**	**96.8**	**3,754.8**
Deciduous Forested	0.9	7.5	0.7	7.2	0.8	29.5	1.1	2.0	0.5	194.7	1.5	490.5	0.1	4.7
Coniferous Forested	3.8	30.2	6.8	69.5	4.8	168.4	10.1	18.0	6.1	2,539.1	3.1	1,055.2	0.3	10.6
Dead-forest	0.1	0.5	0.0	0.1	0.1	2.0	0.0	0.1	0.0	11.7	0.0	13.1	0.0	0.5
Decid. Scrub-shrub	2.3	18.5	2.3	23.8	2.2	78.6	3.3	5.9	1.7	708.9	1.5	515.6	0.8	32.8
Conif. Scrub-shrub	0.1	1.2	0.2	2.5	0.3	11.5	0.4	0.7	0.2	87.1	0.1	49.8	0.1	3.4
Dead Scrub-shrub	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.0
Fresh Aquatic Bed	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.6
Fresh Emergent	0.9	7.4	1.4	14.6	1.1	40.4	1.1	2.0	0.9	358.3	0.8	264.3	0.8	31.8
Peatland	1.0	8.0	0.8	8.1	0.8	29.5	4.7	8.4	0.7	289.9	0.4	122.3	0.2	6.5
Wet Meadow	0.7	5.3	0.4	3.7	0.4	15.3	0.2	0.4	0.2	70.7	0.2	58.3	0.4	16.4
Salt Aquatic Bed	0.5	4.2	0.0	0.0	0.1	2.4	1.6	2.8	0.0	0.3	0.6	187.1	0.0	0.0
Salt Emergent	1.1	9.0	0.0	0.0	0.3	10.1	1.0	1.8	0.0	0.0	0.2	56.5	0.1	2.9
Mudflat	0.1	1.1	0.0	0.0	0.0	1.6	0.2	0.4	0.0	1.2	0.7	226.8	0.1	5.0
Sand Shore	0.1	0.4	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.1	0.1	30.5	0.0	0.0
Gravel Shore	0.0	0.0	0.0	0.0	0.2	6.3	0.0	0.0	0.0	5.3	0.0	9.6	0.4	16.0
Rock Shore	0.3	2.2	0.0	0.0	0.1	4.1	0.9	1.6	0.0	5.8	0.1	26.8	0.6	22.9
Shallow Water	0.2	1.7	0.2	1.7	0.2	6.2	0.3	0.5	0.1	56.8	0.1	37.9	1.1	42.0
Open Water[a]	0.8	6.5	1.4	14.4	1.6	55.5	1.7	3.1	0.6	268.9	1.8	591.0	91.8	3,558.8
Developed Lands	**1.3**	**10.1**	**0.3**	**3.5**	**0.1**	**5.0**	**0.5**	**0.9**	**0.3**	**130.0**	**2.7**	**914.6**	**0.0**	**1.9**
Sparse Residential	0.7	5.7	0.3	3.3	0.1	4.4	0.4	0.7	0.3	119.6	1.6	555.5	0.0	1.5
Dense Residential	0.5	4.4	0.0	0.2	0.0	0.6	0.1	0.2	0.0	9.9	1.0	336.5	0.0	0.4
Urban/Industrial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9	0.0	0.0
Highways/Runways	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	7.7	0.0	0.0
Other	**1.7**	**13.6**	**0.0**	**0.0**	**1.1**	**38.3**	**0.1**	**0.1**	**0.0**	**2.5**	**0.0**	**10.7**	**0.0**	**0.2**
Alpine Tundra	0.1	0.8	0.0	0.0	0.5	18.4	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0
Exposed Rock/Talus	1.6	12.9	0.0	0.0	0.6	20.0	0.1	0.1	0.0	1.0	0.0	10.7	0.0	0.2
Total	**100**	**800.6**	**100**	**1,028.2**	**100**	**3,528.9**	**100**	**179.1**	**100**	**41,461.7**	**100**	**33,756.4**	**100**	**3,878.2**

[a] - Open Water (cover type) and Open Water (ownership) classes do not correspond exactly due to differences in data sources (i.e., TM vertically vs. USGS horizontally), class definitions, and data resolution.

Table 23. Percent (%) and area (km^2) of vegetation and land cover types within land management Categories.

Cover Type	Category 1 %	Category 1 km^2	Category 2 %	Category 2 km^2	Category 3a %	Category 3a km^2	Category 3b %	Category 3b km^2	Category 4 %	Category 4 km^2	Open Water[a] %	Open Water[a] km^2
Agricultural Lands	**1.6**	**19.2**	**2.9**	**36.9**	**1.2**	**38.4**	**1.0**	**399.6**	**16.8**	**5,663.4**	**0.3**	**11.1**
Abandoned Field	0.0	0.8	0.4	5.3	0.1	2.6	0.1	36.2	0.5	156.2	0.0	0.1
Blueberry Field	0.2	1.9	0.2	3.1	0.1	3.4	0.1	46.8	0.2	78.4	0.0	0.1
Grasslands	1.1	13.0	1.8	23.4	0.6	20.8	0.6	246.0	13.1	4,411.0	0.1	5.0
Crops/Ground	0.3	3.5	0.4	5.1	0.4	11.6	0.2	70.7	3.0	1,017.8	0.2	5.9
Forestlands	**83.4**	**942.7**	**73.7**	**938.2**	**87.0**	**2,793.5**	**87.6**	**36,333.6**	**69.3**	**23,391.1**	**2.2**	**83.8**
Clearcut	0.7	7.7	0.7	9.2	0.7	22.1	2.1	868.5	1.1	362.6	0.1	2.3
Early Regeneration	3.0	34.2	1.9	24.0	3.7	118.8	10.4	4,297.0	2.6	892.6	0.1	3.0
Late Regeneration	1.5	16.7	2.0	25.5	3.1	100.3	4.6	1,916.9	2.6	863.1	0.1	3.1
Light Partial Cut	1.1	12.9	1.5	19.3	1.3	42.2	1.6	680.2	1.1	381.9	0.0	1.0
Heavy Partial Cut	0.5	5.6	0.9	10.9	1.6	50.6	2.4	990.2	1.4	478.0	0.0	0.9
Deciduous Forest	16.6	188.0	13.3	169.4	21.3	683.9	17.0	7,066.8	13.9	4,704.4	0.2	6.1
Decid./conif. Forest	17.7	199.6	13.1	166.3	17.9	575.6	16.5	6,847.0	16.9	5,686.3	0.3	11.5
Conif./Decid. Forest	21.6	244.6	22.2	282.5	25.5	817.2	21.8	9,038.7	22.5	7,604.8	0.9	32.6
Coniferous Forest	20.6	233.4	18.2	231.2	11.9	382.9	11.2	4,628.3	7.2	2,417.4	0.6	23.3
Water & Wetlands	**10.1**	**114.0**	**22.8**	**290.7**	**11.4**	**366.5**	**11.1**	**4,601.2**	**11.1**	**3,756.6**	**97.5**	**3,721.0**
Deciduous Forested	0.4	4.0	1.8	23.0	0.6	20.0	0.5	194.9	1.5	490.7	0.1	3.6
Coniferous Forested	3.8	42.5	5.2	66.5	5.8	185.8	6.1	2,539.4	3.1	1,047.5	0.2	9.3
Dead-forest	0.0	0.2	0.1	1.6	0.0	0.9	0.0	11.7	0.0	13.1	0.0	0.4
Decid. Forested	1.6	18.5	4.2	53.9	1.7	55.9	1.7	709.1	1.5	515.8	0.8	30.9
Conif. Scrub-shrub	0.3	3.4	0.5	6.5	0.2	5.9	0.2	87.1	0.1	50.0	0.1	3.3
Dead Scrub-shrub	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.0
Fresh Aquatic Bed	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.5
Fresh Emergent	0.8	8.6	1.9	24.1	1.0	31.4	0.9	358.4	0.8	265.7	0.8	30.5
Peatland	0.9	10.3	1.9	24.7	0.6	19.2	0.7	289.9	0.4	122.4	0.2	6.3
Wet Meadow	0.3	3.0	1.1	13.6	0.3	8.7	0.2	70.7	0.2	57.9	0.4	16.0
Salt Aquatic Bed	0.5	5.4	0.3	3.9	0.0	0.0	0.0	0.3	0.6	187.2	0.0	0.0
Salt Emergent	0.2	2.2	1.5	18.7	0.0	0.1	0.0	0.0	0.2	58.0	0.0	1.1
Mudflat	0.1	0.7	0.2	2.3	0.0	0.1	0.0	1.2	0.7	228.6	0.1	3.1
Sand Shore	0.0	0.2	0.0	0.6	0.0	0.0	0.0	0.1	0.1	30.6	0.0	0.0
Gravel Shore	0.0	0.1	0.5	6.2	0.0	0.1	0.0	5.4	0.0	10.0	0.4	15.6
Rock Shore	0.3	2.9	0.4	4.9	0.0	0.2	0.0	5.8	0.1	27.1	0.6	22.7
Shallow Water	0.2	2.1	0.2	2.9	0.2	5.0	0.1	56.8	0.1	38.4	1.1	41.6
Open Water[a]	0.9	9.6	2.9	37.4	1.0	33.1	0.7	269.9	1.8	612.2	92.6	3,536.0
Developed Lands	**0.4**	**4.1**	**0.4**	**5.4**	**0.4**	**12.0**	**0.3**	**130.0**	**2.7**	**913.1**	**0.0**	**1.2**
Sparse Residential	0.3	3.9	0.4	4.5	0.2	6.0	0.3	119.6	1.6	555.7	0.0	0.9
Dense Residential	0.0	0.2	0.1	0.9	0.2	5.9	0.0	9.9	1.0	335.0	0.0	0.3
Urban/Industrial	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	14.7	0.0	0.0
Highways/Runways	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	7.7	0.0	0.0
Other	**4.5**	**50.6**	**0.1**	**1.5**	**0.0**	**0.1**	**0.0**	**2.5**	**0.0**	**10.8**	**0.0**	**0.0**
Alpine Tundra	1.6	18.4	0.1	0.8	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0
Exposed Rock/Talus	2.9	32.2	0.1	0.7	0.0	0.1	0.0	1.0	0.0	10.8	0.0	0.0
Total	**100**	**1,130.6**	**100**	**1,272.7**	**100**	**3,210.4**	**100**	**41,466.9**	**100**	**33,735.0**	**100**	**3,817.3**

[a] - Open Water (cover type) and Open Water (ownership) classes do not correspond exactly due to differences in data sources (i.e., TM vertically vs. USGS horizontally), class definitions, and data resolution.

Limitations and Discussion

The rarity of old-growth forests in Maine (Gawler *et al.* 1996), and the eastern USA (Davis 1996), is a major conservation concern. However, we were unable to address this issue given the limitations of TM imagery to identify Maine plant communities. In addition, given the general level at which vegetation and land covers types were mapped in Maine, and the fact that so little of the state is in Category 1 and 2 lands, we could not do detailed gap analyses of plant communities in Maine as has been done elsewhere (e.g.; Caicco *et al.* 1995, Davis *et al.* 1995, and Stoms *et al.* 1998). Nevertheless, the vegetation and land cover data presented in this report is amenable to many types of analyses in addition to which have been presented in this report.

Predicted Vertebrate Distributions Analysis

Description of Vertebrate Distributions Analysis

Appendix 11 provides the area in km^2 of each species' habitat by land management Category and major ownerships. Similar to plant communities, a gap analysis typically assumes that the more habitat a species has in the state, or the higher the percent of an animal's predicted distribution that is on Category 1 and 2 lands, the more secure that species is from extinction. Specifically, the two criteria used in gap analyses to define protected versus unprotected breeding vertebrates are (1) the percent of a species' predicted habitats within a state that are on land management Categories 1 and 2, and (2) the total amount of predicted habitat in the state. For example, if < 10 % of a species' habitat is in Category 1 and 2 lands, or it has less than 50,000 ha of habitat in a state, it would be considered unprotected and thus a conservation risk. In Maine, the vast majority of terrestrial vertebrates have only 2-5 % of their habitats on Category 1 and 2 lands (Figure 14).

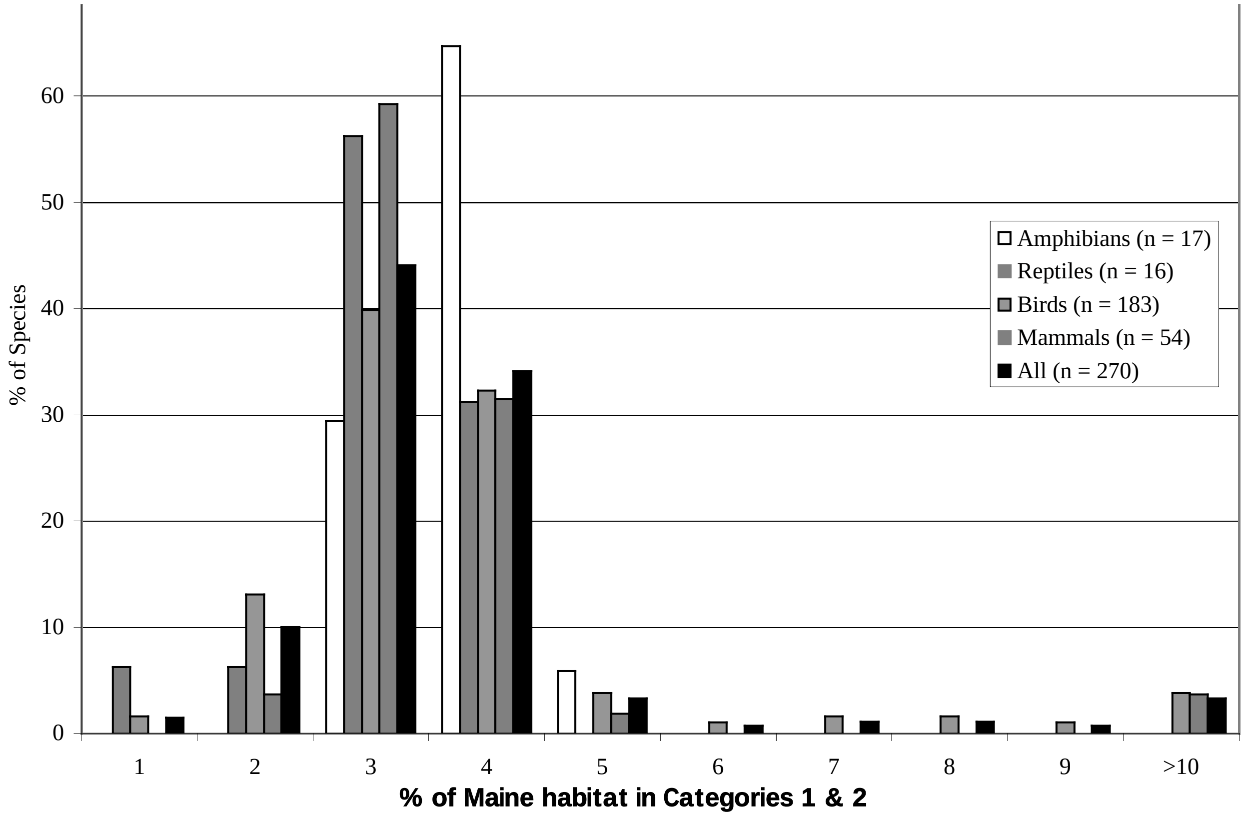


Figure 14. Frequency distribution of the percent of vertebrates by the percent of their Maine habitat in land management Categories 1 and 2. Data for individual species from Appendix 8.

If in fact conservation risk and Criteria 1 are related, then one would predict that the majority of the Threatened and Endangered (T&E) species in Maine would have < =1 % of their habitats in Category 1 and 2 lands, (i.e., occur on the left side of Figure 14). In fact, the 13 T&E species listed by the MDIFW span Figure 14, averaging 19.2 % (range: 0.89 - 100%) of their habitats in Categories 1 and 2, as can be seen in Table 24 below:

Table 24. Conservation threshold criteria (i.e., Total Habitat, % of Habitat in Category 1 & 2) used to define protected/unprotected as applied to endangered and threatened species listed by the Maine Department of Inland Fisheries and Wildlife. Data is from Appendix 8.

Species	Endangered (E) or Threatened (T)	Total Habitat (km^2) in Maine	% of Maine habitat in land management Categories 1 & 2
Black Tern	E	58	1.95
American Pipit (Anthus rubescens)	E	10	100
North. Bog Lemming	T	156	79.80
Spotted Turtle	T	175	2.98
East. Box Turtle	E	321	2.72
Golden Eagle	E	461	7.16
Sedge Wren	E	567	7.74
Bald Eagle	T	1,073	8.03
Grasshopper Sparrow	E	1,233	0.89
Blanding's Turtle	E	1,441	2.58
Peregrine Falcon	E	2,404	29.30
Racer	E	2,912	2.21
Upland Sandpiper	T	4,127	2.97
Mean		**1,149**	**19.2**
Range		**10 - 4,127**	**0.89 – 100**

Furthermore, going beyond T&E species, some of the birds and mammals of highest conservation concern in Maine have the highest fraction of their habitats in Category 1 and 2 lands. Note that of the four birds with the highest percent of their Maine habitats in Category 1 and 2 lands (Peregrine Falcon, Bicknell's Thrush, Saltmarsh Sharp-tailed Sparrow, and American Pipit; Appendix 8:7), all but the sparrow (and it's status is uncertain) are of high concern. Similarly, the two mammals with the highest percent of their Maine habitats in Category 1 and 2 (Rock Vole = 15 % and Northern Bog Lemming = 80 %, Appendix 8:8) also are of interest to Maine conservationists.

Figure 15 shows, on a log scale, the amount of predicted habitat in Maine relative to the number of species by taxonomic classes.

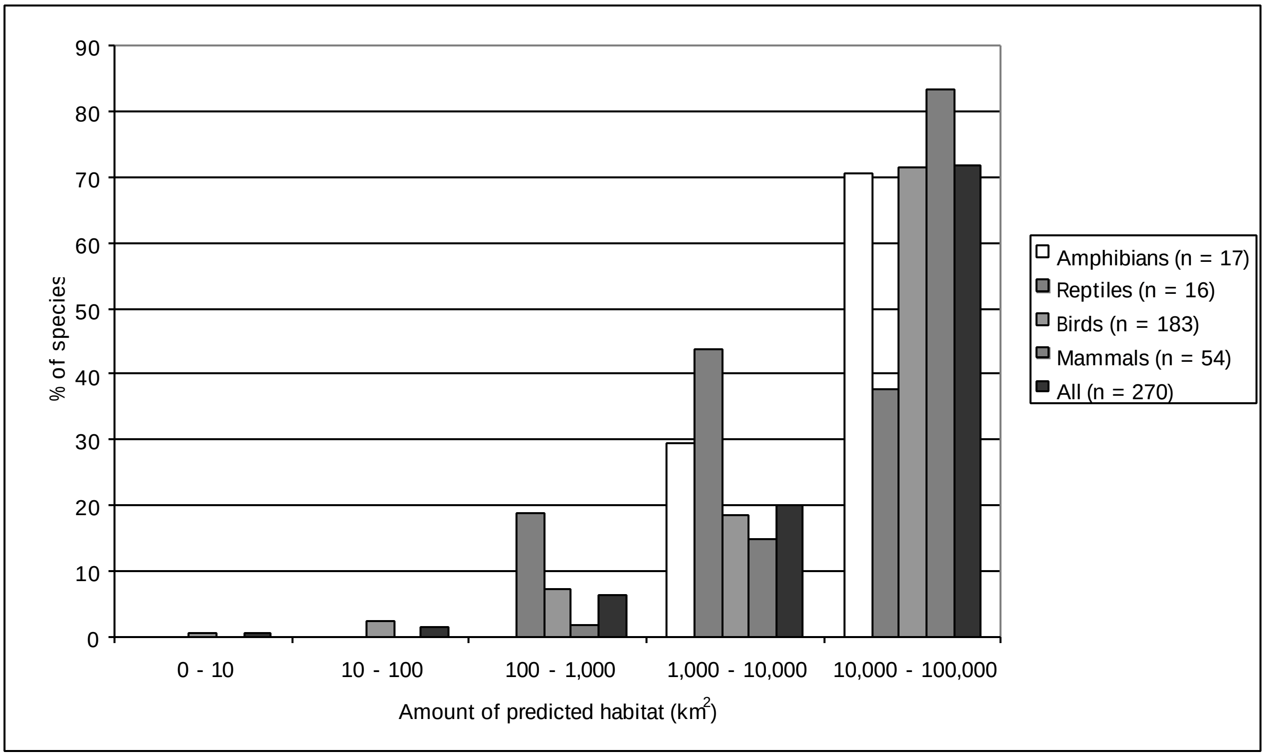
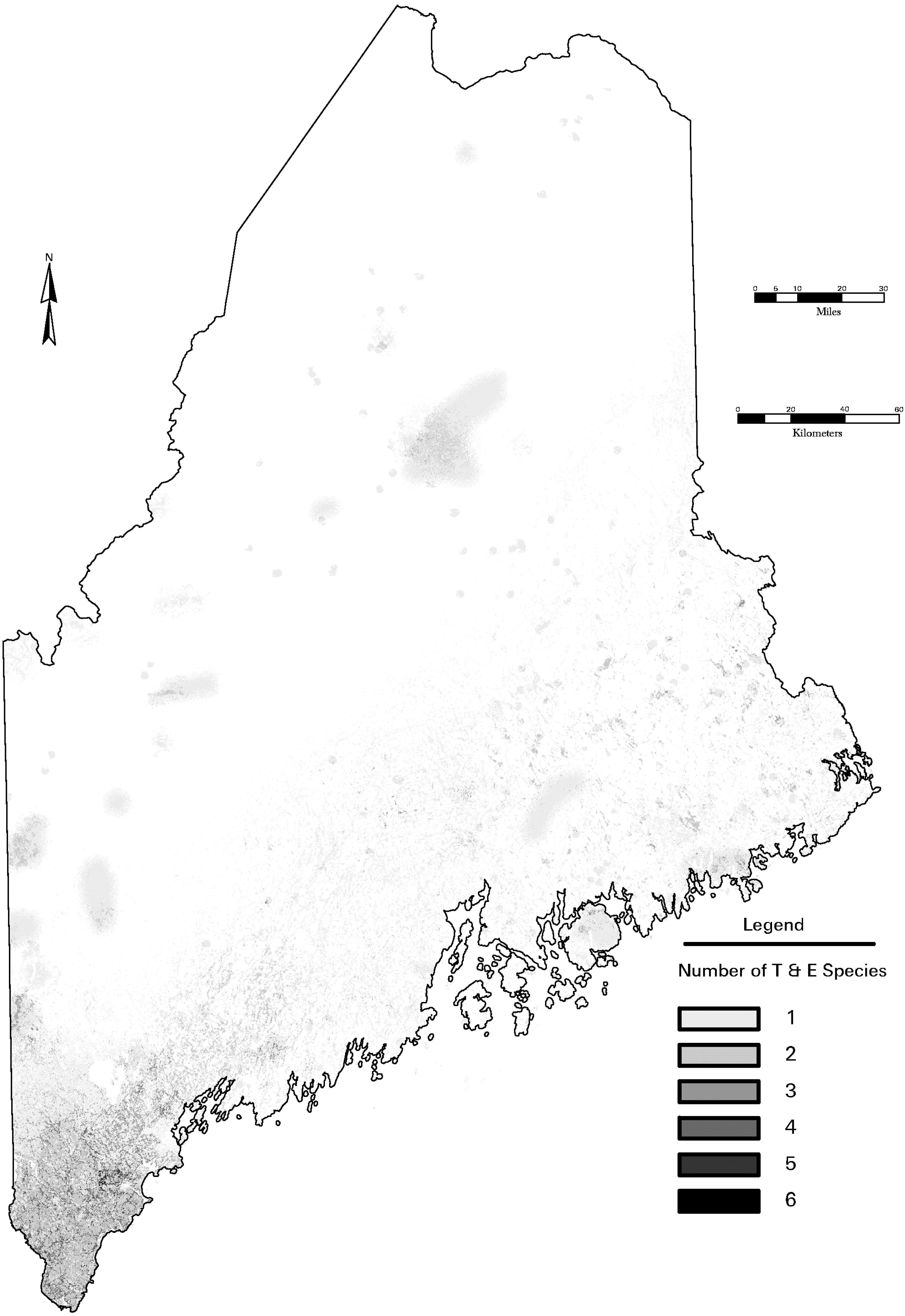


Figure 15. Frequency distribution of the total amount (km^2) of predicted habitat of vertebrate species breeding in Maine. Data for individual species from Appendix 8.

In terms of defining protected/unprotected species, the above figure suggests that species with < 1,000 km^2 of habitat in Maine would be at risk. Again looking at the data for those species listed by the MDIFW as T&E species in Maine, seven fall below this threshold and six above (Table 24), suggesting that total amount of habitat is not a good predictor of conservation risk in Maine. In looking at species of conservation concern other than T&E, some have small amounts of habitat in Maine (e.g., New England Cottontail = 1,723 km^2, Appendix 8:7) whereas others have relative large amounts (Lynx = 16,598 km^2, Appendix 8:7). While there appears to be little, if no relation between current risk to endangerment and threshold criteria 1 and 2, there is a more robust approach that can be taken to identify areas of conservation concern.

We used a GIS to overlay the predicted distributions of the 13 T&E species listed by the MDIFW and found that most occur in the southern-most portion of the state (Figure 16). Because of the high overall vertebrate richness in southern Maine (Map 4), a relatively dense human population that is redistributing itself from cites and towns to the rural parts of southern Maine (Figure 1), and because this is a region with only small and scattered conservation lands (Map 5) and essentially no Category 1 lands (Map 6), we argue that southern Maine is a priority for conservation planning.

Figure 16. Richness patterns of 13 species of terrestrial vertbrates listed by the Maine Department of Inland Fisheries and Wildlife as Threatened or Endangered.



Analysis of Special Species

A major advantage of doing gap analyses on a state-by-state basis is that the analyses can be customized to met specific state needs. To illustrate the kinds of species-specific analyses that are possible with data from ME-GAP, and are of interest to wildlife resource managers in Maine, we selected four species: Bicknell' s Thrush, American Beaver, Bald Eagle, and White-tailed Deer.

Bicknell's Thrush: Endemic (i.e., distribution limited to Maine) vertebrates are nonexistent in Maine, probably due to the relatively recent glaciation providing too little time for highly specialized species to evolve (also note the patterns in Fig. 1 of Dobson *et al.* 1997). However, Bicknell' s is as close to an endemic vertebrate as Maine has, although the species is distributed at higher elevations in New York, New England, and eastern Canada (recent research in Canada is also finding the species in managed forests at lower elevations). Bicknell' s has only recently been recognized as a species and because of its limited distribution and apparently narrow ecological niche (i.e., stunted spruce-fir forests), it is of concern to both federal and state management authorities. The predicted distribution for this species is shown on page 223 of Boone and Krohn (1998b). Table 25, constructed with data from Appendix 11:37, shows the distribution of Bicknell' s predicted habitats by land management Categories and major land ownerships:

Table 25. Percent (%) and area (km^2) of the predicted distribution of Bicknell' s Thrush in Maine by land management Categories and major land ownerships.

Major Land Ownerships	Land Management Categories									
	1		2		3		4		Total	
	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2
Federal	0.0	0.0	7.4	15.3	1.2	2.5	0.0	0.0	8.6	17.8
Native	0.0	0.0	0.0	0.0	0.9	1.8	0.0	0.0	0.9	1.8
State	13.2	27.4	8.8	18.4	3.0	6.2	0.0	0.0	25.0	52.0
Private Conservation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commercial Forest	0.0	0.0	0.0	0.0	65.3	135.9	0.0	0.0	65.3	135.9
Other Private and Municipal	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.2	0.5
Total	13.2	27.4	16.2	33.7	70.4	146.4	0.2	0.5	100.0	208.0

Table 26. Comparison of habitats predicted to be used by Bicknell' s Thrush to habitats available in Western Maine. (See Figure 2 for the location of this region).

Habitats and Land Cover Types	Predicted Habitat		Available Habitat	
	%	km^2	%	km^2
Agricultural Lands	**0.1**	**0.2**	**2.3**	**446.4**
Abandoned Field	0.1	0.1	0.1	14.3
Blueberry Field	0.0	0.0	0.0	0.0
Grasslands	0.0	0.1	2.1	408.4
Crops/Ground	0.0	0.0	0.1	23.7
Forestlands	**91.0**	**189.0**	**85.6**	**16,306.2**
Clearcut	0.5	1.1	1.6	300.6
Early Regeneration	3.5	7.3	6.7	1278.0
Late Regeneration	8.9	18.4	3.6	683.7
Light Partial Cut	9.2	19.0	1.6	307.1
Heavy Partial Cut	1.1	2.3	3.0	566.2
Deciduous	0.8	1.6	25.9	4932.8
Deciduous/coniferous	5.6	11.5	18.4	3510.6
Coniferous/deciduous	14.3	29.7	16.6	3171.2
Coniferous	47.1	97.9	8.2	1556.1
Water & Wetlands	**0.4**	**0.8**	**11.5**	**2,199.0**
Deciduous Forested	0.0	0.0	0.5	104.0
Coniferous Forested	0.0	0.0	2.5	476.5
Dead-forest	0.0	0.0	0.0	3.6
Deciduous Scrub-shrub	0.0	0.0	1.2	223.5
Coniferous Scrub-shrub	0.0	0.0	0.1	28.1
Dead Scrub-shrub	0.0	0.0	0.0	0.7
Fresh Aquatic Bed	0.0	0.0	0.0	0.2
Fresh Emergent	0.0	0.0	0.6	116.6
Peatland	0.0	0.0	0.2	34.8
Wet Meadow	0.0	0.0	0.1	25.7
Salt Aquatic Bed	0.0	0.0	0.0	0.0
Salt Emergent	0.0	0.0	0.0	0.0
Mudflat	0.0	0.0	0.0	1.8
Sand Shore	0.0	0.0	0.0	0.0
Gravel Shore	0.0	0.0	0.0	6.9
Rock Shore	0.0	0.0	0.0	5.1
Shallow Water	0.0	0.1	0.2	37.8
Open Water	0.3	0.7	6.0	1,133.8
Developed Lands	**0.1**	**0.2**	**0.3**	**57.5**
Sparse Residential	0.1	0.2	0.2	36.8
Dense Residential	0.0	0.0	0.1	20.3
Urban/Industrial	0.0	0.0	0.0	0.0
Highways/Runways	0.0	0.0	0.0	0.3
Other	**8.5**	**17.6**	**0.2**	**41.6**
Alpine Tundra	7.7	15.9	0.1	20.6
Exposed Rock/Talus	0.8	1.6	0.1	20.9
Totals	**100.0**	**207.8**	**100.0**	**19,050.7**

Potential habitat for Bicknell's Thrush is very limited in Maine, comprising only 0.25 % (= 208/84,633 km^2) of the state (Tables 25 and 26). Of the approximately 208 km^2 of habitat, over 29 % is on Category 1 and 2, and more than 70 % on Category 3 lands (Table 25). Clearly, habitat conservation for this species in Maine requires not only working with state and federal land managers (see Appendix 11:37 for specific agencies), but also owners of Commercial Forestlands in western and northern Maine. The relatively high altitude spruce-fir forests inhabited by this species can be harvested, and depending on location could involve restrictions from the Land Use Regulations Commission, MDOC. Not only does the above table give wildlife managers a quantitative (and spatially explicit, see Boone and Krohn 1998b:223) estimate of potential habitats for Bicknell's Thrush, but also the above analysis quickly identifies the key agencies and organizations that must be involved and coordinated for the successful conservation of this rare species' habitat.

American Beaver: In contrast to the Bicknell's Thrush, the American Beaver is a common, year-round resident widely distributed throughout Maine (Boone and Krohn 1998a:119). Interest in this species is that its presence greatly influences the abundance and distribution of other species including River Otter (Dubuc *et al.* 1990, 1991) and other mammals (e.g., Mink and Muskrats), numerous waterbirds (Gibbs *et al.* 1991, McCall *et al.* 1996), various amphibians and reptiles, and fishes (e.g., Brook Trout). In addition, beavers are harvested for fur and can cause considerable damage by flooding roads and cutting ornamental trees. Table 27 below, summarized from Appendix 11:62, shows the species' predicted distribution by land management Categories and major land ownership, whereas Table 28 shows the distributions of predicted habitats by regions.

Table 27. Percent (%) and area (km^2**)** of predicted distribution of American Beaver in Maine by land management Categories and major land ownerships**.**

Major Land Ownerships	**Land Management Categories**									
	1		**2**		**3**		**4**		**Total**	
	%	**km^2**	**%**	**km^2**	**%**	**km^2**	**%**	**km^2**	**%**	**km^2**
Federal	0.2	74.7	0.4	137.1	0.3	82.2			1.0	294.0
Native			0.1	15.7	1.5	454.6			1.5	470.3
State	0.8	248.2	1.5	453.5	2.3	702.5		9.3	4.6	1,413.5
Private Conservation	0.3	76.8		11.2		0.3			0.3	88.3
Commercial Forest					52.2	16,005.9			52.2	16,005.9
Other Private and Municipal	0.0	0.1		7.3	0.1	38.1	40.3	12,348.5	40.4	12,394.0
Total	**1.3**	**399.8**	**2.0**	**624.8**	**56.4**	**17,283.6**	**40.3**	**12,357.8**	**100.0**	**30,666.0**

Table 28. Distribution of habitats predicted to be used by American Beaver by biophysical regions of Maine.[a]

Habitats and Land Cover Types	St. John Uplands		St John Valley Interior Foothills		Western & Interior Mountains		Eastern Lowlands & Foothills		Coastal Plains & Foothills	
	%	**km²**	**%**	**km²**	**%**	**km²**	**%**	**km²**	**%**	**km²**
Agricultural Lands	**0.4**	**16.4**	**2.7**	**225.6**	**1.7**	**99.1**	**2.8**	**176.0**	**9.4**	**690.1**
Abandoned Field	0.0	0.3	0.1	7.7	0.1	5.1	0.8	47.2	0.4	30.8
Blueberry Field	0.0	0.0	0.0	0.0	0.0	0.0	0.5	34.0	0.0	2.0
Grasslands	0.2	8.0	1.9	158.6	1.5	86.6	1.2	72.8	7.8	573.3
Crops/Ground	0.2	8.0	0.7	59.4	0.1	7.4	0.4	22.0	1.1	84.1
Forestlands	**77.5**	**3,183.0**	**66.7**	**5,587.5**	**76.1**	**4,437.5**	**66.7**	**4,171.5**	**66.1**	**4,844.5**
Clearcut	1.3	54.5	0.8	63.8	1.1	65.2	1.2	77.2	1.1	77.1
Early Regeneration	16.7	686.7	6.7	558.7	7.7	448.1	4.7	297.1	1.6	118.3
Late Regeneration	5.5	224.6	2.6	220.7	4.5	259.5	4.5	282.0	3.2	230.9
Light Partial Cut	1.9	76.9	0.9	71.8	1.6	92.3	1.3	78.7	1.5	113.5
Heavy Partial Cut	2.6	107.4	1.1	94.9	2.7	155.9	1.1	71.3	1.4	104.4
Deciduous	8.2	335.5	7.5	624.5	16.2	947.1	3.7	230.5	9.5	695.2
Deciduous/coniferous	14.3	586.3	12.7	1065.6	17.1	994.1	8.0	502.2	17.4	1275.4
Coniferous/deciduous	18.8	770.8	25.5	2135.1	18.9	1103.8	33.7	2108.1	24.6	1805.7
Coniferous	8.3	340.2	9.0	752.4	6.4	371.6	8.4	524.5	5.8	424.0
Water & Wetlands	**22.0**	**904.2**	**30.1**	**2,522.4**	**21.9**	**1,275.7**	**29.5**	**1,842.9**	**23.2**	**1,702.8**
Deciduous Forested	0.4	16.8	1.3	111.7	1.5	88.3	1.3	84.1	4.2	308.2
Coniferous Forested	11.4	470.1	15.2	1269.0	6.9	403.7	10.5	657.5	6.2	454.2
Dead-forest	0.0	2.0	0.1	5.3	0.1	3.1	0.1	6.7	0.1	6.6
Deciduous Scrub-shrub	2.8	116.0	4.0	338.5	3.4	196.4	4.4	273.6	3.4	251.6
Coniferous Scrub-shrub	0.2	9.7	0.5	43.0	0.4	24.2	0.5	28.8	0.4	26.8
Dead Scrub-shrub	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.1
Fresh Aquatic Bed	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.5	0.0	0.4
Fresh Emergent	1.7	70.0	1.6	137.4	1.7	100.0	2.5	156.1	1.9	141.2
Peatland	0.9	36.5	1.4	119.8	0.5	30.3	2.6	160.7	1.0	75.5
Wet Meadow	0.2	8.2	0.4	31.3	0.4	22.6	0.8	50.1	0.5	34.5
Salt Aquatic Bed	0.0	0.0	0.0	0.0	0.0	0.0	0.2	10.0	0.1	4.2
Salt Emergent	0.0	0.0	0.0	0.0	0.0	0.0	0.1	6.0	0.3	24.9
Mudflat	0.0	0.0	0.0	0.0	0.0	1.5	0.1	7.3	0.1	5.1
Sand Shore	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.7
Gravel Shore	0.1	4.6	0.1	4.8	0.1	3.0	0.0	1.0	0.0	0.6
Rock Shore	0.0	0.3	0.2	15.2	0.0	2.5	0.0	2.6	0.0	0.8
Shallow Water	0.3	14.3	0.3	27.5	0.5	30.4	0.4	23.1	0.3	19.7
Open Water	3.8	155.7	5.0	418.6	6.3	369.2	6.0	373.5	4.7	347.7
Developed Lands	**0.1**	**4.0**	**0.4**	**37.1**	**0.2**	**14.6**	**1.0**	**61.7**	**1.2**	**86.9**
Sparse Residential	0.1	3.2	0.4	33.4	0.2	11.4	0.9	58.0	0.8	56.8
Dense Residential	0.0	0.9	0.0	3.5	0.1	3.1	0.1	3.3	0.4	28.2
Urban/Industrial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Highways/Runways	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.0	1.0
Other	**0.0**	**0.3**	**0.0**	**0.0**	**0.0**	**1.2**	**0.0**	**1.5**	**0.0**	**1.1**
Alpine Tundra	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Exposed Rock/Talus	0.0	0.3	0.0	0.0	0.0	0.6	0.0	1.5	0.0	1.1
Totals	**100**	**4,109.2**	**100**	**8,372.9**	**100**	**5,828.1**	**100**	**6,255.7**	**100**	**7,328.8**

[a] – see Figure 2 for locations of Regions.

Almost 93 % of the potential habitat for this species is on private land, and this may be no accident. Forestlands in Maine by small as well large landowners (i.e., Commercial Forestlands in the above table) are intensively managed, with clear-cutting a common and widespread forestry practice. Regenerating hardwoods provide food and building material to beavers whereas culverts resulting from road building associated with the tree harvesting provide potential sites for dams. Thus, the combination of extensive stands of regenerating hardwoods in close proximity to high quality dam sites, provides ideal conditions for the American Beaver. Correlations between beaver populations and forest harvesting activities can be explored in more detail with ME-GAP habitat data and beaver occurrence records from field surveys.

Bald Eagle: The above two examples deal with predicted habitats of species. Following are two species were gap-type analyses are done with habitats identified from field inventories (i.e., actual versus predicted habitats). The first species, the Bald Eagle is managed by the MDIFW. Under Maine' s Endangered Species Act, MDIFW has the authority to declare Essential Habitats for endangered species and in the case of Bald Eagles, has defined this as a 0.40 km (0.25 mi) buffer around known nest sites (MDIFW 1998). Locations of eagle nests are well known in Maine due to long-term monitoring (Owen *et al.* 1991). In comparing habitats used by breeding eagles to what is available statewide, it' s apparent that Bald Eagles in Maine, as elsewhere, are closely associated with Water and Wetlands (Table 29). When habitat use is looked at on a regional basis, however, inland nests are more associated with Forestlands than coastal nests, but throughout the state Bald Eagles are closely associated with Water and Wetlands (Table 30). We looked at ownership of eagle Essential Habitats by (1) nest sites, and (2) buffers. Approximately 33 % and 23 % of the coastal and inland nest sites, respectively, occurred on conservation and Indian lands whereas the remaining nests were on private lands (Table 31). Note that of the 158 coastal nests, 13 % (n = 21) were on lands owned by the Maine Chapter of The Nature Conservancy. We caution, however, that the ownership map for ME-GAP (i.e., CAPLD) is at a 1:100,000 scale and thus these figures are only approximations. In terms of the habitats within the buffers, approximately 13 % and 16 % of the coastal and inland Essential Habitats, respectively, were on conservation and Indian lands (Table 31). Again, the importance of private landowners, both large and small, in the conservation of a species is apparent.

Table 29. Percent (%) and area (km^2) of Essential Habitats for Bald Eagles compared to habitats available statewide.

Habitats and Land Cover Types	Essential Habitat[a]		Statewide Habitat	
	%	km^2	%	km^2
Agricultural Lands	**2.5**	**3.7**	**7.3**	**6,168.6**
Abandoned Field	0.2	0.2	0.2	201.2
Blueberry Field	0.2	0.3	0.2	133.6
Grasslands	1.8	2.6	5.6	4719.2
Crops/Ground	0.4	0.6	1.3	1114.6
Forestlands	**34.4**	**51.6**	**76.2**	**64,482.9**
Clearcut	0.4	0.7	1.5	1272.3
Early Regeneration	2.2	3.2	6.3	5369.6
Late Regeneration	1.5	2.2	3.5	2925.6
Light Partial Cut	0.4	0.6	1.3	1137.5
Heavy Partial Cut	0.3	0.4	1.8	1536.1
Deciduous	2.5	3.7	15.2	12818.7
Deciduous/coniferous	3.4	5.1	15.9	13486.4
Coniferous/deciduous	13.4	20.2	21.3	18020.3
Coniferous	10.3	15.5	9.4	7916.6
Water & Wetlands	**62.6**	**94.1**	**9.7**	**12,849.9**
Deciduous Forested	0.8	1.2	0.9	736.1
Coniferous Forested	1.8	2.7	4.6	3891.0
Dead-forest	0.2	0.2	0.0	27.9
Deciduous Scrub-shrub	1.8	2.7	1.6	1384.1
Coniferous Scrub-shrub	0.2	0.3	0.2	156.3
Dead Scrub-shrub	0.0	0.0	0.0	1.2
Fresh Aquatic Bed	0.0	0.0	0.0	1.4
Fresh Emergent	1.3	2.0	0.9	718.8
Peatland	0.4	0.5	0.6	472.8
Wet Meadow	0.8	1.3	0.2	170.0
Salt Aquatic Bed	4.2	6.3	0.2	196.9
Salt Emergent	0.5	0.7	0.1	80.2
Mudflat	3.7	5.6	0.3	236.1
Sand Shore	0.1	0.2	0.0	31.5
Gravel Shore	0.1	0.2	0.0	37.3
Rock Shore	0.9	1.4	0.1	63.5
Shallow Water	0.1	0.2	0.2	146.7
Open Water	24.0	36.0	5.3	4498.2
Salt Water	21.6	32.5	NA[b]	NA[b]
Developed Lands	**0.5**	**0.8**	**1.2**	**1,065.9**
Sparse Residential	0.5	0.8	0.8	690.6
Dense Residential	0.0	0.0	0.4	352.2
Urban/Industrial	0.0	0.0	0.0	14.9
Highways/Runways	0.0	0.0	0.0	8.2
Other	**0.0**	**0.0**	**0.1**	**65.5**
Alpine Tundra	0.0	0.0	0.0	20.6
Exposed Rock/Talus	0.0	0.0	0.1	44.9
Totals	**100.0**	**150.3**	**100.0**	**84,632.9**

[a] – Defined by state regulations as a 0.25 mi. buffer around nest sites.
[b] – Not Applicable in that boundary for Atlantic Ocean was arbitrary.

Table 30. Percent (%) and area (km^2) of Essential Habitats[a] for Bald Eagles (n = 322) in Maine by biophysical regions and habitat types. Locations of regions shown in Figure 2.

Habitats and Land Cover Types	St. John Uplands		St John Valley Interior Foothills		Western & Interior Mountains		Eastern Lowlands & Foothills		Coastal Plains & Foothills		Coastal	
	%	**km^2**	**%**	**km^2**	**%**	**km^2**	**%**	**km^2**	**%**	**km^2**	**%**	**km^2**
Agricultural Lands	**1.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**3.0**	**1.7**	**10.3**	**1.8**	**0.3**	**0.2**
Abandoned Field	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.1	0.0	0.0	0.0
Blueberry Field	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.0	0.0	0.0	0.0
Grasslands	1.0	0.0	0.1	0.0	0.0	0.0	1.6	0.9	8.9	1.6	0.3	0.1
Crops/Ground	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3	1.3	0.2	0.1	0.0
Forestlands	**59.1**	**2.1**	**46.2**	**8.2**	**51.0**	**4.4**	**51.5**	**28.9**	**39.6**	**7.0**	**2.1**	**1.0**
Clearcut	0.5	0.0	0.7	0.1	0.7	0.1	0.6	0.3	0.5	0.1	0.1	0.0
Early Regeneration	26.3	0.9	2.7	0.5	4.6	0.4	2.0	1.1	1.4	0.2	0.1	0.1
Late Regeneration	4.7	0.2	1.5	0.3	1.1	0.1	2.3	1.3	2.0	0.4	0.0	0.0
Light Partial Cut	1.4	0.1	0.6	0.1	1.3	0.1	0.5	0.3	0.2	0.0	0.0	0.0
Heavy Partial Cut	0.9	0.0	0.5	0.1	0.3	0.0	0.4	0.2	0.3	0.1	0.0	0.0
Deciduous	4.6	0.2	2.2	0.4	10.7	0.9	1.9	1.1	6.5	1.2	0.1	0.0
Deciduous/coniferous	4.4	0.2	8.1	1.4	5.0	0.4	3.2	1.8	6.8	1.2	0.1	0.1
Coniferous/deciduous	8.2	0.3	19.4	3.5	18.3	1.6	22.9	12.9	10.6	1.9	0.3	0.2
Coniferous	8.1	0.3	10.4	1.9	9.0	0.8	17.7	10.0	11.4	2.0	1.3	0.6
Water & Wetlands	**39.9**	**1.4**	**53.4**	**9.5**	**49.0**	**4.2**	**44.7**	**25.1**	**48.6**	**8.7**	**97.5**	**45.2**
Deciduous Forested	0.0	0.0	0.1	0.0	1.3	0.1	1.1	0.6	2.8	0.5	0.0	0.0
Coniferous Forested	1.8	0.1	7.1	1.3	1.2	0.1	1.5	0.8	2.3	0.4	0.0	0.0
Dead-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.1	0.0	0.0	0.0
Deciduous Scrub-shrub	2.0	0.1	3.1	0.5	1.9	0.2	2.9	1.6	1.7	0.3	0.0	0.0
Coniferous Scrub-shrub	0.0	0.0	0.3	0.1	0.3	0.0	0.4	0.2	0.0	0.0	0.0	0.0
Dead Scrub-shrub	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fresh Aquatic Bed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fresh Emergent	1.0	0.0	1.1	0.2	3.0	0.3	2.0	1.1	2.3	0.4	0.0	0.0
Peatland	0.0	0.0	0.8	0.1	0.1	0.0	0.7	0.4	0.0	0.0	0.0	0.0
Wet Meadow	0.0	0.0	0.1	0.0	2.2	0.2	1.8	1.0	0.4	0.1	0.0	0.0
Salt Aquatic Bed	0.0	0.0	0.0	0.0	0.0	0.0	2.3	1.3	1.1	0.2	10.3	4.8
Salt Emergent	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	1.3	0.2	0.7	0.3
Mudflat	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.4	3.2	0.6	10.0	4.6
Sand Shore	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.3	0.1
Gravel Shore	0.4	0.0	0.5	0.1	0.0	0.0	0.1	0.0	0.5	0.1	0.0	0.0
Rock Shore	0.0	0.0	1.3	0.2	0.2	0.0	0.8	0.5	0.1	0.0	1.4	0.7
Shallow Water	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.1	0.2	0.0	0.0	0.0
Open Water	34.7	1.2	39.0	7.0	38.8	3.3	28.7	16.2	30.9	5.5	6.2	2.9
Salt Water	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.4	1.5	0.3	68.7	31.8
Developed Lands	**0.0**	**0.0**	**0.3**	**0.0**	**0.0**	**0.0**	**0.9**	**0.5**	**1.4**	**0.2**	**0.0**	**0.0**
Sparse Residential	0.0	0.0	0.3	0.0	0.0	0.0	0.8	0.5	1.2	0.2	0.0	0.0
Dense Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Urban/Industrial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highways/Runways	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**
Alpine Tundra	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exposed Rock/Talus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Totals	**100**	**3.5**	**100**	**17.9**	**100**	**8.6**	**100**	**56.2**	**100**	**17.8**	**100**	**46.4**

[a] – A 0.25 mile buffer around the eagle nest site.

Table 31. Percent (%) and number (n) of Essential Habitats for Bald Eagles[a] in Maine by major land ownerships, 1998.

Land Ownership	Coastal Sites (n = 158)				Inland Sites (n = 164)			
	Nests		Buffers		Nests		Buffers	
	%	N	%	km^2	%	N	%	km^2
Federal								
US Department of the Interior								
Park Service	4.43	7	2.04	1.51	0.61	1	0.03	0.02
Fish and Wildlife Service	2.53	4	1.48	1.09	1.83	3	1.53	1.18
US Department of Agriculture								
Forest Service								0.00
Others	0.63	1	0.08	0.06				0.00
Native American[b]								
Passamaquoddy Indian Tribe					4.27	7	1.88	1.45
Penobscot Indian Nation					2.44	4	0.65	0.50
State								
Maine Department of Conservation	5.70	9	1.49	1.10	7.32	12	6.71	5.16
Maine Department of Inland Fisheries and Wildlife	4.43	7	1.54	1.13	4.88	8	3.99	3.07
Baxter State Park					1.83	3	1.48	1.14
Private								
The Nature Conservancy	13.29	21	4.22	3.11				
National Audubon Society	0.63	1	0.40	0.29				
Maine Coast Heritage Trust	0.63	1	0.32	0.24			0.09	0.07
Maine Audubon Society								
The Island Institute	0.63	1	0.29	0.21				
Freeport Conservation Trust			0.06	0.04				
Others			1.09	0.80				
Subtotal	**32.91**		**13.00**	**9.59**	**23.17**	**38**	**16.36**	**12.57**
Commercial Forestlands	**0.63**	**1**	**0.99**	**0.73**	**34.15**	**56**	**24.64**	**18.94**
Other Lands	**65.82**	**104**	**85.77**	**63.27**	**39.63**	**65**	**27.36**	**21.03**
Islands not in GIS database[c]	**0.63**	**1**	**0.23**	**0.17**	**3.05**	**5**	**31.64**	**24.32**
State Total	**100.0**	**158**	**100.0**	**73.76**	**100.0**	**164**	**100.0**	**76.86**

[a] – Defined by state regulations as a 0.25 mi. buffer around nest sites.
[b] – Excludes Houlton Band of Maliseets and Aroostook Band of Micmacs who own little forestland.
[c] – Some islands were not present in the Conservation and Public Lands Database (i.e., too small to be mapped at the scale of 1:100,000).

White-tailed Deer: This important game species is near the northern edge of its distribution in northern Maine and southern Canada. To survive deep snow and prolonged periods of cold weather, deer concentrate in traditionally used habitats during the winter months termed deer wintering areas (DWAs). In Maine, DWAs are generally closed-canopy forests, although in the central, coastal, and southern parts of the state south facing slopes with a variety of overhead cover are used. The common features of DWAs are they provide both thermal advantages (i.e., lessen snow accumulation and increase mobility or facilitate heat gain during daylight hours) and food (i.e., litter fall in old forests and close proximity to woody browse).

In the state' s organized towns (i.e., towns with local governments) moderate and high value DWAs are protected under the Maine Natural Resources Protection Act, although the MDIFW has not formally designated any DWAs to date. In contrast, land use in the unorganized towns, those townships without local governments, come under the jurisdiction of the Land Use Regulations Commission (LURC), MDOC. LURC has zoned many DWAs in eastern, western, and northern Maine. Forestry operations, although allowed in zoned DWAs, are closely coordinated with the MDIFW.

Deer in Maine are managed geographically by Wildlife Management Districts (WMDs) (see *http://janus.state.me.us/ifw/wmd/wmd.htm*). To assess the statewide distribution of DWAs, we plotted, by WMDs, those DWAs that have been mapped to date by the MDIFW (Figure 17). Note that the density of mapped DWAs is highest in central and southern Maine, especially in WMDs 22, 23, and 25 where 10.8 %, 14.2 %, and 9.5 %, respectively, of the non-Open Water area of the districts are in DWAs. The high density of DWAs in central and southern Maine could be real or an artifact caused by geographic differences in mapping. All known DWAs are plotted for central and southern Maine (mostly organized towns) whereas only the LURC-regulated DWAs are plotted for the rest of the state (mostly unorganized townships). To determine how much of the difference in densities of DWAs was real versus the mapping of only regulated ones in the unorganized portions of Maine, we used the DWA and ME-GAP habitat data to estimate the percent of (1) WMDs in DWAs (Figure 18a), and (2) WMDs in potential winter cover (Figure 18b). Potential winter cover was defined as Conifer Forests and Conifer Forested Wetlands combined. Even though this measure of potential winter cover under-estimates winter cover in organized towns (because a wider variety of habitats are used as DWAs in organized versus unorganized towns), it' s clear from Figure 18 that the most northerly part of the state, the region most in need of DWAs due to a harsh winter climate (Boone 1997), currently has a low potential for deer in terms of winter cover. Although northern Maine is unlikely to ever support deer densities as high as southcentral Maine, this analysis and the higher densities of deer in northern Maine during historic times, suggests that current low populations are caused, at least in part, by a lack of adequate winter cover.

Other types of questions that could be addressed with ME-GAP data related to DWAs include: (1) What is the relationship between the locations of DWAs and other regulated habitats, specifically wetlands and shorelands?; (2) In those townships with the most severe winters (i.e., western and northern Maine), are deer harvests inversely related to the amount of mature conifer cover, and inversely related to the amount of clearcuts and regenerating habitats?; and (3) If deer were managed by goals related to population levels versus relative carrying capacity, how much winter habitat would it take, and where, to obtain these populations?

Figure 17. Locations of Deer Wintering Areas mapped by the Maine Department of Inland Fisheries and Wildlife in relation to the Wildlife Management Districts (numbered).

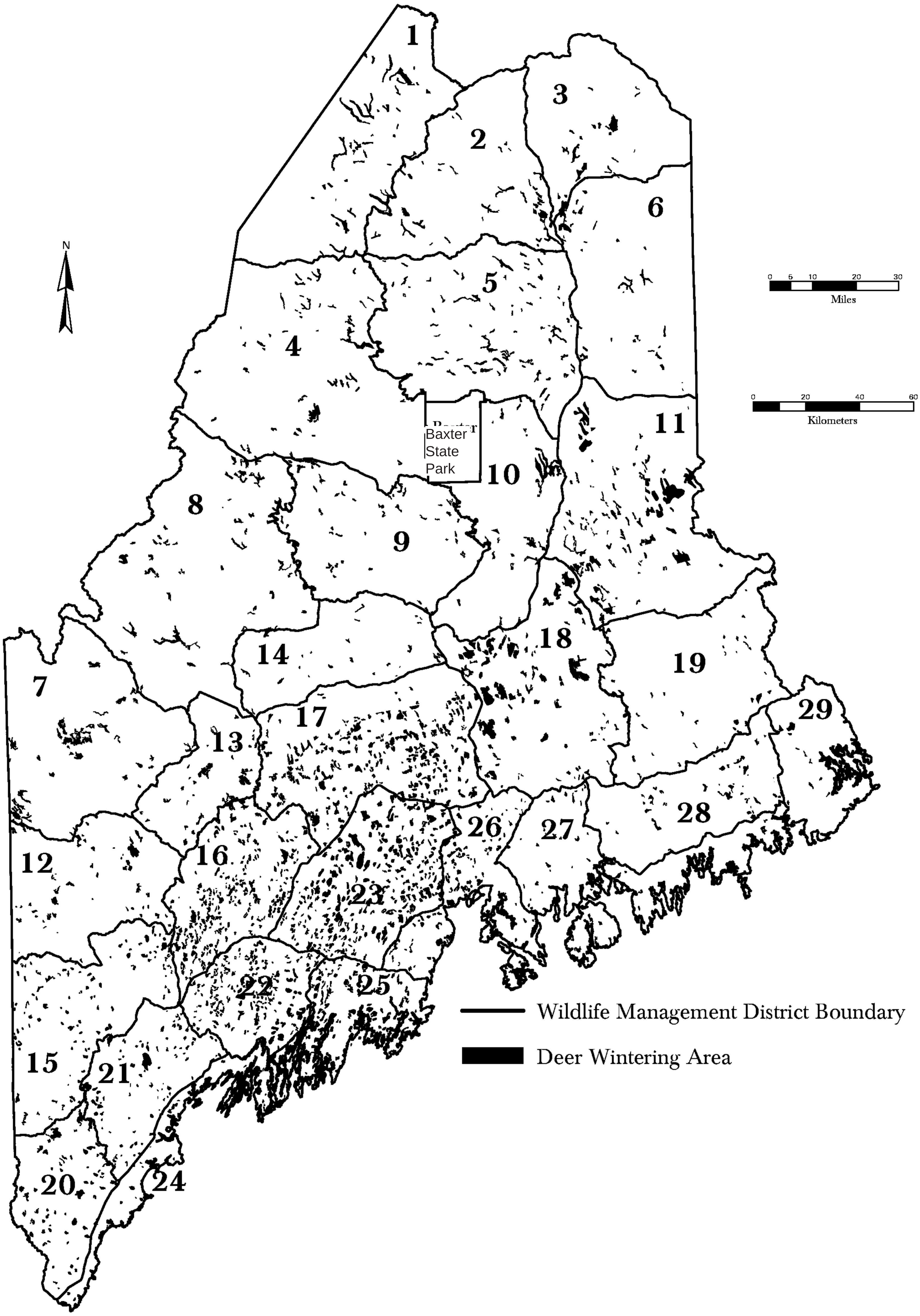
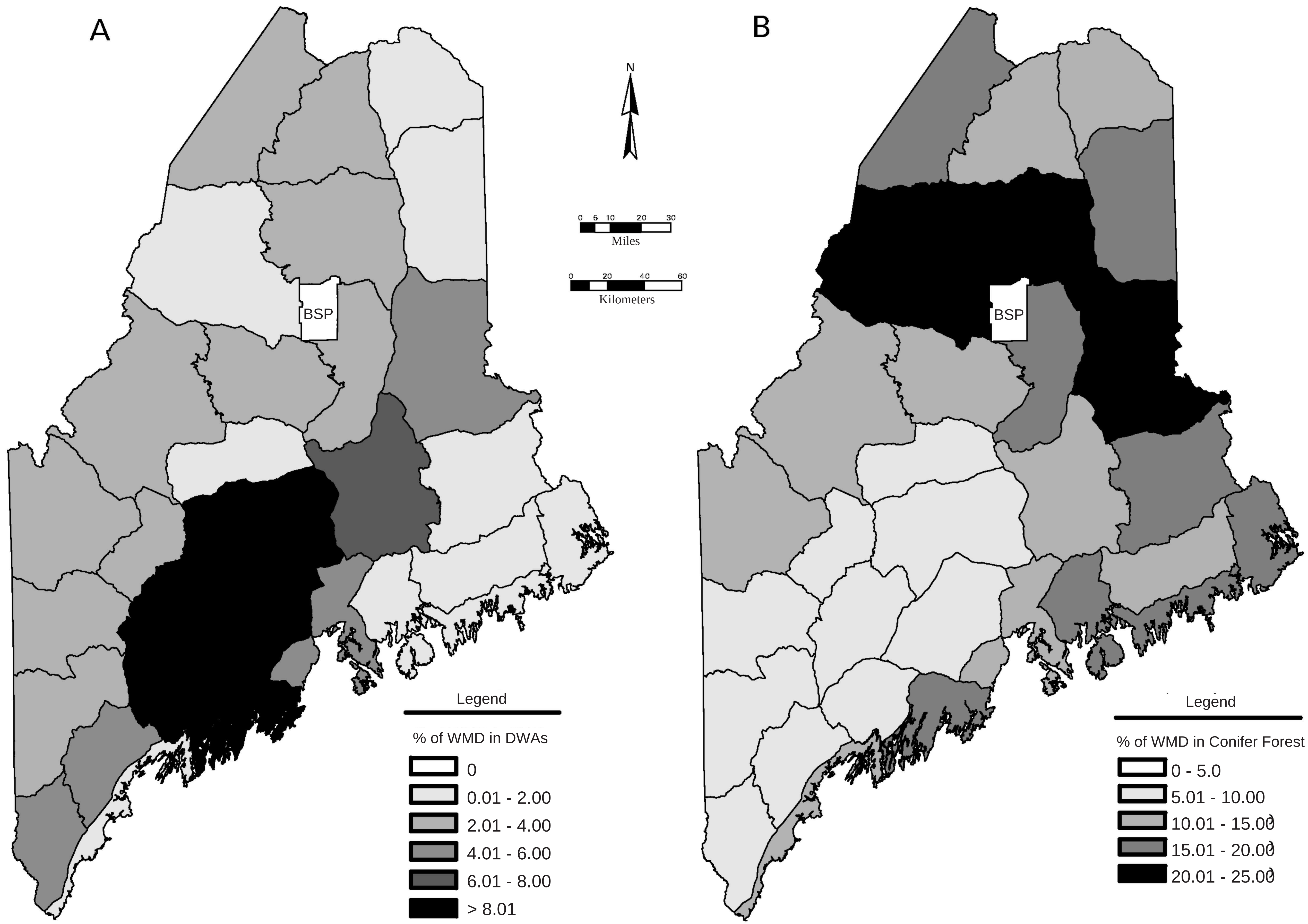


Figure 18. Percent (%) of Wildlife Management Districts (WMDs) in mapped Deer Wintering Areas (DWAs) (A), and the percent of WMDs in conifer forest as mapped by ME-GAP, 1993 (B). BSP = Baxter State Park; DWAs not inventoried.



Representational Analysis

Key questions in land conservation planning are: (1) Has a given set of conservation lands captured a representative sample of a landscape' s biodiversity and natural variability? If not, how much more of what has to be conserved before representation is reached? Gap databases, supplemented with data on climate and other abiotic factors in GIS format, are well suited for representational analyses. For example, consider the simple question: Has a representative sample of the elevations in Maine been captured in all land management Categories across the state? Table 32, below, has the data needed to answer that question.

Table 32. An example representational analysis based on statewide data from ME-GAP. Shown are the percent (%) and area (km^2) of five elevational ranges (m) by land management Categories.

Elevation (m)	Categories 1 & 2		Categories 3a & 3b		Category 4		Open Water[a]		Total	
	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2
1-200	39.4	947	30.3	13,527	81.1	27,333	59.6	2,277	52.1	44,084
201-500	41.8	1,005	58.5	26,090	18.2	6,131	39.5	1,508	41.1	34,734
501-700	9.7	232	8.7	3,886	0.7	222	0.9	33	5.2	4,373
701-1,000	7.1	171	2.5	1,111	0	13	0.1	3	1.5	1,298
> 1,000	2	49	0	0	0	0	0	0	0.1	49
Total	**100**	**2,404**	**100**	**44,614**	**100**	**33,699**	**100**	**3,821**	**100**	**84,538**

[a] – Defined as lakes, ponds, and rivers in USGS Digital Line Graph data at 1:100,000 scale.

Of the five elevation classes in this table, note that most of Maine (52.1 %) is between 1 and 200 m above sea level. In comparison, only 39.4 % of the Category 1 and 2 lands are at the lowest elevations, meaning that elevations above 201 m are over-represented on Maine' s most conservatively managed conservation lands. Also note that most (58.5 %) Category 3 (i.e., multiple-use forests) lands are in the 201-500 m elevation class whereas most (81.1 %) Category 4 (i.e., private lands) are in the lowest elevation class (1-200 m) (81.2%) (Table 32). We are currently conducting a representational analysis of Maine' s conservation lands stratified by the biophysical regions (i.e., Figure 2) based on essentially the variables used to delineate the regions shown in Figure 2.

Limitations and Discussion

When applying the results of our analyses, it is critical that the following limitations are considered: 1) the limitations described for each of the component parts (i.e., land cover mapping, stewardship [i.e., ownership and land management] mapping, and predicted vertebrate distributions) of the analyses, 2) the spatial and thematic map accuracy of the components, and 3) the suitability of the results for the intended application (see last Chapter and Appendix 12).

In addition, and perhaps most importantly, the analyses shown here are more for illustrative purposes than for off-the-shelf use. Conservation rankings of species by federal and state management authorities change frequently and thus the kinds of results shown in Appendix 8 (upon which Table 24 is based) are quickly out of date. Areas defined by the MDIFW as Essential Habitats are reviewed and updated yearly and also become quickly dated. While we tried to be realistic with the analyses shown in this chapter, readers should view this chapter primarily as examples, or potential applications of ME-GAP. Limitations not withstanding, the databases built for ME-GAP are potentially applicable to a wide range of research and management issues (Appendix 12). However, applications of the data created by ME-GAP should be attempted only after consultation with the appropriate management authorities and careful consideration of the limitations documented in this report in relation to the study objectives at hand.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

Nature, the earth herself, is the only panacea.

Thoreau - Journal, 1859

Introduction

Thoreau's *The Maine Woods*, published in 1862, contains an appendix that lists 23 species of trees, 38 species of small trees and shrubs, 145 small shrubs and herbaceous plants, nine "lower order" plants, 37 bird species, and seven species of "quadrupeds." While far from a complete inventory of the region's biodiversity [see Gawler *et al.* (1996) for a more comprehensive assessment], Thoreau's book has been widely read and studied for over 130 years, giving insights and inspirations to generations as to the value of wilderness in general, and the beauty of the Maine's forestlands in particular. Recently, interest in the natural diversity and resources of the forestlands of northern, western, and eastern Maine, collectively known as The North Maine Woods, has intensified.

Conservation and Management

Controversy regarding the conservation and management of Maine's forestlands is more intense today than at any time in the state's history. Clear-cutting is an issue that has received the most attention (e.g., Lansky 1992), going to public votes as to whether or not this forest management practice should be banned (the banned failed but discontent with the practice continues). Because Maine has the largest blocks of undeveloped forestlands in the eastern USA, these lands are increasingly of interest to a variety of groups and organizations. The Wilderness Society has outlined options for protecting Maine's northern wildlands (Kellett 1989), RESTORE has proposed a National Park and preserve for the North Maine Woods (RESTORE 1994), Maine Aubudon Society (MAS) issued a set of maps outlining important areas for conservation (MAS 1996), and, most recently, the Greater Laurentian Wildlands Project (GLWP) made a draft proposal for wildland reserves in Maine (GLWP 1998). Government has also been active in holding meetings and preparing reports. A partial sample includes the Maine Legislation, in 1985, establishing a Forests For The Future Program (FFTFP 1988), a joint federal-state regional effort to look at conserving the northern forests (Northern Forest Lands Council 1994), and conferences held by the University of Maine to have forestland owners and users explore conservation and management issues (e.g., Field 1994). From 1994 to present, a collaborative effort, known as the Maine Forest Biodiversity Project (MFBP), involving landowners, environmentalists, federal and state natural resources agencies, scientists, and other stakeholders have periodically meet to discuss biodiversity issues (Vickery 1997). While it is premature to assess the accomplishments of these efforts, it's obvious that the conservation agenda in Maine, both historically and currently, has focused on the North Maine Woods. But the question arises - should the North Maine Woods be the sole focus of conservation efforts in Maine?

A preliminary assessment of Maine's terrestrial biodiversity, based on range-level distributions of vertebrate species, concluded that coastal and southern Maine also deserve conservation attention (Krohn and Boone 1997). We reiterate that conclusion here. First, if one considers the change of natural habitats to human dominated land uses as the main long-term threat to biodiversity, then note that not only is the density of humans greatest in coastal and southern Maine, but it is in these regions where people are currently moving out of cities and towns and into the less developed countryside (Figure 1). Furthermore, southern and coastal Maine support the highest richness of terrestrial vertebrates (Figure 6), Threatened and Endangered vertebrates (Figure 16), and woody plants (Boone 1996), although having only small and scattered Category 2 and 3 conservation lands (Map 6). However, we also note that northwestern Maine, because it supports a number of species at the southern edge of their ranges (e.g., American Marten, Lynx, Fox Sparrow), and because the region has so few public conservation lands, also deserves special consideration in conservation land planning.

A major conservation need in Maine is a system of ecological reserves where natural communities, including old-growth forests (Davis 1996), can serve as benchmarks for assessing the affects of management (Gawler *et al.* 1996; McMahon 1993, 1998). The need for ecological reserves, as well as the need for additional conservation lands in southern Maine, has recently been recognized by the State of Maine (Land Acquisition Priorities Advisory Committee [LAPAC] 1997). However, the size and distribution of ecological reserves being discussed are designed for plant versus animal communities (McMahon 1998). Thus, for Maine to continue to support viable populations of terrestrial vertebrates, conservation lands should become, on average, larger (Figure 13) and more numerous (Map 5) across Maine. However, in a state with such a low percentage of its lands in public ownership, it' s unrealistic to argue public ownership as the only solution to vertebrate conservation, although consideration is being given to at least a modest increase in Maine' s public lands (LAPAC 1997). In addition to increasing Maine' s public lands, serious consideration must be given to (1) linking existing and future conservation lands, and (2) managing the working forests that form the habitat matrix between the conservation lands with biodiversity friendly methods. The preceding suggestions are not either or choices and which suggestions to follow (if any), and to what degree, depends upon public will.

Increasing travel corridors such as the Appalachian Trail Corridor would have major conservation benefits, particularly those that link coastal and interior conservation lands. The density of people in Maine is greatest along rivers (Figure 1), and because human alteration of natural habitats is presumably the single largest long-term threat to biodiversity, conserving riverine habitats would provide critical local habitats as well providing corridors between coastal and inland conservation lands. In terms of better management of the forest matrix, these lands are largely in private ownership (Map 5). Thus, the key on these lands will be implementation of land management practices that will not result in extinctions of native flora or fauna. Private land in Maine can be viewed as two types: large blocks of forestlands owned by 15 or so commercial forestry companies, almost all of which is located in unorganized townships (i.e., no town governments); and (2) smaller woodlots in the organized towns (i.e., towns with local governments) (Map 6). Development and implementation of biodiversity friendly management practices will thus require at least two different approaches. Landowners with larger forested parcels generally have foresters and other resource specialists on staff, detailed forest-type maps, and access to GIS technology. Thus, these landowners can design and implement detailed forest management plans that incorporate biodiversity concerns. Owners of smaller parcels, in contrast, rely more on technical assistance from private and government natural resource specialists, and thus are more dependent on information developed by others. Some guidance on integrating wildlife conservation into forest management in Maine is already available (e.g., Elliott 1988, Venno 1991). In addition, the Maine Forest Biodiversity Project (MFBP) plans to publish a handbook describing forest management practices that address many biodiversity conservation concerns.

Clearly, biodiversity conservation will be successful, regardless of the size of the land holding, only with public support and implementation of practices that prevent species extinction as well as providing economic returns to landowners. Given the growing public awareness of the importance of biodiversity, and that commercial forestland owners are hiring resource specialists knowledgeable in habitat conservation, Maine' s forestlands can continue to provide a wide variety of ecological and economic benefits. However, as Maine' s forests continue to change from the days of Thoreau, new knowledge must continuously be discovered and applied to ensure that the joint goals of ecological sustainability and economic viability are obtained.

Given that most of the state' s human population is in central and southern Maine, especially along the coast, and that these regions correspond with the locations of the state' s major rivers (Figure 1), it' s appears that the most extensive habitat loss has probably occurred along these rivers. Although not well documented, we suspect, based on patterns of human settlement and current population densities, that bottomland forests and wetlands have been lost and existing examples of these habitats are at risk, thus deserving more conservation attention, especially in the lower reaches of the state' s largest rivers. Conservation planning along large rivers needs to pay special attention to the issues of floodplain and wetland conservation, and there are many opportunities along Maine' s larger rivers for such integration. For example, the Penobscot River Valley in central Maine is an expansive lowland with numerous wetlands (Map 1). If one looks at the east side of this valley from the town of Enfield south to Brewer, a series of wetlands occur from north to south as follows: the lower portion of the Passadumkeag River, along the middle part of Olamon Stream, Sunkhaze Meadows, and the Chemo Bog/ Blackman Stream area. Of these wetlands, only Sunkhaze Meadows is mostly in conservation ownership (i.e., a National Wildlife Refuge) and the Maine Chapter of The Nature Conservancy owns some of the Passadumkeag wetlands (Map 5), specifically along Ayers Brook. Clearly, the opportunities for more integrated sets of conservation lands in Maine are numerous (Maps 5 and 6).

Because of the high number of vertebrate (and probably also plants and invertebrates, although we have no direct measures) in wetland habitats, the importance of wetland and shoreland regulations to conservation in Maine can not be overstated. Riparian (i.e., streamside) and wetlands habitats form an inter-connected, fine-scale skeleton on the landscape in which coarser-scale patches of upland habitats are embedded. Thus, riparian and wetland habitats have multiple ecological function as well as a number of hydrologic functions. Public benefits such as habitat and flood control provided by these habitats makes evaluation of existing regulations protecting these habitats paramount. Clearly, state policy and regulations recognize the values of these habitats, but how well, or poorly, are current regulations working? More specifically, to what degree are existing federal, state, and local regulations known, understood, and observed? If not being widely observed, of what ecological significance are these non-compliances? Clearly, better knowledge on the condition of Maine' s riparian and wetland habitats is needed, especially in the more developed portions of the state.

In terms of importance of specific wetland types, special consideration must be given to emergent wetlands and floodplain wetlands, especially along the state' s major rivers where human populations are highest and threats to floodplain habitats the greatest. Emergent wetlands occur in Maine where lands have been flooded. Dams, such as those on State Wildlife Management Areas, have created some of Maine' s largest and most important emergent wetlands. However, natural factors, specifically beaver impoundments and periodic flooding of lowlands from runoff, also create emergent wetlands. Beaver ponds are especially dynamic and although we don' t have any direct measure of how much beaver habitat we have in the state, we believe that the higher amount of water measured by the satellite data versus USGS digital data was, at least in part, due to the TM data being sensitive to identifying water, including beaver ponds. Beaver are a major ecological force in the Maine landscape, directly altering habitats and the occurrences of many species. Thus, refining the management system for this species, especially in terms of periodic and statewide habitat inventories, should be given consideration by the Maine Department of Inland Fisheries and Wildlife.

With < 6 % of the state' s area in conservation lands, the current network of conservation lands is clearly inadequate in both area and distribution to provide a stand-alone conservation capability (i.e., all of the state' s plants and animals able to exist solely on these lands, independent of the surrounding landscape). The State of Maine recognizes the needs for more public lands, but the goal of these lands relative to biodiversity conservation objectives (e.g., provide adequate habitat for X % of Maine' s flora and fauna) have not been defined (LAPAC, 1997).

A study by the Maine Forest Service, based on USDA Forest Service 1995 forest inventory of Maine and using a set of computer models to simulate forest growth and harvest under various forestry practices, examined the 50-year balance between statewide growth and harvest. The study concluded that between 1995 and 2045, current forest management will support only 86% of the current level of harvest (Gadzik *et al.* 1998). Assuming that technology in the next 50 years will improve and that mill capacity and efficiency will increase for Maine, due to the need to stay competitive in a worldwide market, the pressure for harvest beyond current levels will be high. The need for intensive, high-yield forestry such as stand conversion and plantations will also increase, not only from demand factors but also from a declining supply of spruce and fir (see citations in Gadzik *et al.* 1998). Regardless of a lack of widespread negative affects on terrestrial vertebrates (i.e., no evidence or expectations of increased rates of extinction) from intensive forestry, concern about high yield practices is driven by philosophical concerns that may well increase as fast, or faster, that application of the practices themsleves. Thus, beyond the realm of terrestrial vertebrate biodiversity, public interest and concern about the North Maine Woods can be expected to remain high, and from a forest yield perspective, for good reason.

Research

Our finding that richness of terrestrial vertebrates is higher in southern versus northern Maine is consistent with the general pattern that species richness increases from the poles towards the equator (Brown and Lomolino 1998). Because coastal and southern Maine have the warmest climate and longest growing season in the state (Boone 1997), and richness is often correlated with productivity, it is not surprising that these two regions of Maine support the highest number of woody plant species (Boone 1996) as well as terrestrial vertebrates (Figure 6). While the coarse-scale patterns of species richness are fairly well documented, the reasons explaining these patterns are not (Brown and Lomolino 1998), and deserve more attention as research topics (for more details on possible explanations of the richness patterns of terrestrial vertebrates in Maine, see Boone [1996]). Such research would increase our understanding of species-habitat relations, knowledge that is fundamental to predicting and understanding the affects of forest management and other habitat changes on wildlife species and communities (Krohn and Salwasser 1982, Krohn 1996). Only with a better understanding of the habitat relations of species (plants as well as animals) can we develop biodiversity friendly management practices that have a reasonable chance of succeeding (i.e., avoiding extinctions).

Biodiversity conservation is not only concerned with patterns of species richness, but even more so with identifying and understanding patterns of rarity as a basis for preventing extinctions. In terms of concentrations of rare plants and animals in Maine, both southern Maine and Mount Katahdin are critcial (Figure 16). From a biophysical perspective, Mount Katahdin, although inhabited by relatively few terrestrial vertebrates (Map 4), is unique in that the variety of rare habitats here support a number of plant and animal species of high conservation priority. In terms of conserving complementary sets of species (see page 3), we suspect that this goal would be best served with a set of large conservation lands established in eastern, southern, and northern Maine.

If marine vertebrates such as seabirds, seals, and whales had been included in ME-GAP, richness levels along the coast would have been even higher than the numbers reported here. In addition to excluding marine vertebrates (and all invertebrates, clearly the largest source of species richness on the earth), ME-GAP did not include fishes. Maine, like the northeast in general, has a low diversity of freshwater fishes (although having an abundant and diverse array of freshwater habitats) (Hocutt and Wiley 1986). While the last glaciers that covered eastern North American left Maine with an abundance and diversity of aquatic habitats (brooks, streams, rivers, ponds, lakes, marshes, peatlands, etc.), the aquatic fauna associated with such habitats apparently have not had sufficient time to diversify. Thus, the inclusion of freshwater fishes would have little effect on overall richness patterns reported here, although some aquatic-specific patterns would undoubtedly emerge. However, even with a low diversity of inland fishes, Maine' s contribution to the region' s fish biodiversity could be significant. In a study of the distribution of minnows in the northeastern USA, only in northern Maine did lakes apparently still support intact assemblages of native minnows (Whittier *et al.* 1997). Clearly, there is much yet to learned about Maine' s biodiversity, especially in aquatic environments (coastal as well as inland) and with invertebrates across all environments (also see Gawler *et al.* 1996). New methods should be researched and developed to encompass additional environments and species beyond the terrestrial and wetland ecosystems dealt with here.

Because Maine is so dependent on commercial forests to provide habitat, a better understanding of the working landscape is clearly needed. On-going efforts along this line are too numerous to mention without omitting some projects, but suffice it to say that partnerships to cooperatively study and understand forestry/habitat relations are, and will continue to be, a vital component of more biodiversity friendly forest management. Landowners, both small and large, should be assisted in the identification of important animal and plant habitats, and incentives put in place to ensure the conservation of these habitats. In terms of identification of wildlife habitats, a joint publication by the Maine Chapter of The Wildlife Society and University of Maine Cooperative Extension Service (Elliott 1988) is a good starting point. Also, a manual developed by the MFBP on biodiversity friendly management in the working forest is available (Elliott 1999). As to incentives, both industry's Sustainable Forestry Initiative (American Forest & Paper Association 1995), and the more market orientated green certification (Society of American Foresters 1995), are providing internal, nonregulatory incentives for proactive biodiversity management. The success of these voluntary approaches will depend, in part, on public confidence and confidence in these programs, in term, will depend on information, independent of commercial interests, about the health and status of the forests. Broad-scale habitat maps, such as the one developed for ME-GAP, if done periodically, could provide the public with an overview of certain aspects of the condition of Maine' s forestlands (e.g., the percentage of forestlands in regenerating versus mature trees). Such information would, hopefully, add a more factual dimension to the public debate on conservation and management of Maine' s forests.

By merging climatic, geomorphic, and land survey records in a GIS, a pre-settlement map of Maine' s forest could be created. Similar maps have been produced in the Great Lakes Region (see *http://www.nbs.gov/luhna/cole/index.html*), and like there, this historic information is needed as a baseline with which changes through time in forests, and forestlands, can be evaluated.

Closing Remarks

In closing, we reiterate that ME-GAP is a statewide assessment of selected elements of biodiversity and as such had limitations (e.g., inadequate detail to assess plant communities). Obviously, because major elements of biodiversity, such as invertebrates, were not included, there is little we can say regarding the conservation of these critically important organisms. We also acknowledge that there are site-specific issues deserving study that go beyond what the data presented here can address. We also recognize that there are aesthetic and conservation concerns that go beyond biodiversity assessments, regardless of taxa covered or data resolution. For example, scenic value, old-growth forests, recreational uses, remoteness, and wilderness are all valid conservation issues that were beyond the scope of ME-GAP. Nevertheless, even with these limitations in mind, we offer this report, and the data contained herein, to the on-going debate on conservation and land management in Maine. To the extent that these data help to move the debate forward along factual and logical lines, we will consider our efforts in producing ME-GAP a success.

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 home page (URL below). While a CD-ROM of the data will be the most convenient way to obtain the data, it may also be downloaded via the Internet from the national GAP home page at:

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

The home page will also provide, over the long term, the status of state's project, future updates, data availability, and contacts. Within a few months of this project's completion, CD-ROMs of the final report and data should be available at a nominal cost; the above home page will provide ordering information. To find information on this state GAP project status and data, follow the links or the above home page to the particular state of interest.

With the completion of ME-GAP, the long-term maintenance, revision, and application of the GIS databases is a concern. In addition to these data becoming part of the National Biological Information Infrastructure of the USGS Biological Resources Division, these databases will be housed and used by various state agencies. The Maine Department of Inland Fisheries and Wildlife will continue to use the vertebrate data (i.e., range limits and habitat associations) and vegetation and land cover map; the Maine Image Analysis Laboratory, University of Maine, will store and use the TM and aerial videography data; and the Maine Office of GIS will maintain and distribute the conservation and public lands database created by SPO and ME-GAP. In the end, the relative success of this project should be judged on how long these databases are revised and reused in the decision-making processes affecting Maine's biological resources.

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 (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 animals 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.

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, shown below, 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. Metadata Data Element Categories are as follows:

I Identification Information: What the data set 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 on GAP and metadata via Internet, see the following:

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

waisqvarsa.er.usgs.gov (anonymous ftp, cd to wais/docs, get FGDCmeta6894.ps)

http://geochange.er.usgs.gov/pub/tools/metadata/standard/metadata.html

Appropriate and Inappropriate Uses

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 (see A Handbook for Gap Analysis, Scott *et al.* 1993) to meet program objectives. 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 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 tool to answer that question.

Scale: First we must address the issue of appropriate scale to which these data may be applied. The data were produced with an intended application at the ecoregion level, that is, geographic areas from several hundred thousand to millions of hectares in size. The data provide a coarse-filter approach to analysis, meaning that not every occurrence of every plant community or animal species habitat is mapped, only larger, more generalized distributions. The data are also based on the USGS 1:100,000 scale of mapping in both detail and precision. When determining whether to apply GAP data to a particular use, there are two primary questions: do you want to use the data as a map for the particular geographic area, or do you wish to use the data to provide context for a particular area? The distinction can be made with the following example: You could use GAP land cover to determine the approximate amount of hardwood forests occurring in a county, or you could map shade tolerant and intolerant hardwoods with aerial photography to determine the exact amounts of these more specific types. You then could use GAP data to determine the approximate percentage of all harwood forests in the region or state that occurs in the county, and thus gain a sense of how important the county’ s distribution is to maintaining this forest type.

Appropriate Uses: The above example illustrates two appropriate uses of the data; as a coarse map for a large area such as a county, and to provide context for finer-level maps. Specific case-study examples are provided in Appendix 12, 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 nonoccurrence 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: Images of the land surface taken with videography cameras from an airplane. A Global Position System (GPS), through a time code on each frame of video, allows the position of videography on the ground (and TM data) to be precisely determined.

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

anthropogenic: Caused by humans.

AML (Arc Macro Language): ARC/INFO[b]' s scripting language, where a series of commands and branching decisions may be included in a program, and submitted to ARC for processing. Programs may be simple or complex, producing predicted distributions, managing data, or making maps, for example.

association: The classification level of vegetation synonymous with community type used by GAP. Plants in the subdominant canopy shrub layers contribute to the definition of the vegetation type (e.g., Engelmann spruce-subalpine fir/grouse whortleberry).

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

biodiversity: A shortened form of biological diversity, referring to the variety and variability of living organisms and the ecological complexes in which they occur. This definition encompasses diversity at all levels of biological organization (e.g., ecosystems, species, and genes). As there is no single measure of biodiversity, a variety of indicators have been suggested as surrogates for biodiversity (e.g., species richness).

biodiversity hotspots: Areas with a high number of species (i.e., high species richness).

biophysical region: See ecoregion.

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).**

coarse filter strategy: An approach to conserving biodiversity focusing on large ecological units, usually but not exclusively focusing on spatial rather than organismal concepts that make up the higher levels in the biodiversity hierarchy (e.g., landscapes, ecosystems, communities).

coarse scale: A relative scale of spatial analysis indicating the use of mapping units that cover a large area with lesser detail. The ratio of map length to true length is small (e.g., 1:5,000,000 as opposed to 1:5,000). The opposite of fine scale and similar to large scale.

commercial forestlands: Maine forestlands owned and managed in large blocks (i.e., often townships or larger), generally by corporations, for commercial forestry purposes (e.g., to produce fiber and timber). Numerous other private forestry lands in Maine are excluded from this definition because these lands are generally in small blocks (< 200 ha [554 ac]) and assumed to be more susceptible to changes in land use than the larger ownerships.

commission error: The error of incorrectly predicting the occurrence of a species or community in an area when it does not occur. This type of error results from overestimation and is commonly called "user's error" by specialists in remote sensing.

community: An assemblage of populations of plants, animals, bacteria, and/or fungi that occur in an environment, forming a distinctive living system with its own composition, structure, environmental relations, development and function. GAP usually refers to vegetation communities, excluding the animal component. It is defined as an assemblage of plant species that interact at the same time and place, of defined species composition and physiognomy.

cover type: A floristic and structural description of vegetation cover often used to operationally define habitats (or habitat types). Note that wildlife habitats, the areas where organisms live, are made up of abiotic factors in addition to vegetative cover and other biotic factors (e.g., prey species for predators).

cross-walking: The process of matching equivalent land cover categories between two or more classification systems.

digitization: Entering spatial data digitally into a Geographic Information System (i.e., putting map data into a form computers use).

distribution maps: Maps that depict the discontinuous, more specific distribution of a species within its overall range (Krohn 1996).

ecology: The study of the relationships between organisms and their environment.

ecoregion: In general terms, a large area of regional extent with similar biota, climate, and physical environment. Climate and vegetation are used as key indicators to delineate each unit, which can be thought of as ecosystems at a regional level (same as biophysical region).

ecosystem: In general terms, all of the organisms in a given place in interaction with their abiotic environment. More specifically, an assemblage of species and their environment combined to form a distinct unit; a functional system which includes complementary relationships, as well as the transfer and circulation of energy and matter. Ecosystems can occur at many different scales.

edge-matching: A method for adjusting the locations of connecting areas (often polygons) to produce a common, smooth interface.

EMAP: Environmental Monitoring and Assessment Program (EMAP) under the United States (US) Environmental Protection Agency (EPA). A national monitoring and research program designed to monitor and detect changes in ecological conditions in the USA.

EMAP hexagons: A grid network designed by the US EPA EMAP (see EMAP). The grid is made up of hexagons; those being used by Gap Analysis are approximately 635 km^2 each.

endemic species: A species which is restricted to or peculiar to a locality or region.

fine filter strategy: An approach to conserving biodiversity focusing on small ecological units, usually but not exclusively focusing on organismal rather than spatial concepts that make up the lower levels in the biodiversity hierarchy (e.g., single species, genes).

fine scale: A relative scale of spatial analysis indicating the use of mapping units that cover a small area with greater detail. The ratio of map length to true length is large (e.g., 1:5,000 as opposed to 1:5,000,000). The opposite of coarse scale and similar to large scale.

gap: A species or community under-represented in the existing natural area network. A missing component in a strategy to conserve biodiversity.

gap analysis: The generalized technique of creating GIS data sets of various biological factors, and using them to identify critical components and important areas they represented in the current network of special management areas. This process may also include socioeconomic factors.

GAP (Gap Analysis Program): The multi-state project administered by the Biological Resources Division of the US Geological Service (USGS). GAP is responsible for conducting, on a state-by-state basis, gap analyses throughout the United States.

gap location: A defined area (such as a specific polygon) identified through gap analysis that contains elements of biodiversity that are important to biodiversity conservation.

GIS (Geographic Information System): A system of geographically referenced, spatially explicit data. The system is designed for collecting, storing, retrieving, and analyzing spatial data in a digital (i.e., computer) format.

GPS (global positioning system): A system of satellites orbiting above the earth, that when used with an instrument designed to receive electronic signals from these satellites, allows a user to determine locations on and near the earth's surface.

ground-truth: Actual observations collected at specific locations to verify model predictions or to confirm information derived from remotely-sensed data sources.

habitat: The area used by an organism, defined by the species-specific associations of the animal and its physical environment. The locality, site, and type of local environment are often characterized by a dominant plant form or physical characteristic (i.e., cover type), even though habitats consist of abiotic (i.e., climate) as well as biotic factors.

hierarchy: In general terms, a sequence of sets composed of smaller, more detailed or more specific subsets. In biological systems, the ordering has followed a pattern from large to small (e.g., species, populations, individuals, genes). However, each level has not necessarily been completely contained in the next level (ecoregions, landscapes, ecosystems, communities, species). GAP focuses on the landscape level, but may include components from other levels (e.g., species, communities).

Landsat: The United States' civilian earth-observing satellite system. Landsat satellites orbit the earth in regular paths. Their sensors collect information in several spectral wavelengths. Data is currently received only from Landsat 5. However, the images received from Landsat 1 through 5 collectively provide a 20 year archive of observations of the earth.

landscape: In general terms, it is a heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. Landscapes vary in size, from several hundred km down to a few km in diameter. Davis and Stoms [in Scott et al. (1996)] propose landscape as a level in GAP's spatial analytical hierarchy used to compile data on biodiversity landscape features, with an approximate size of 1-100 km^2, making it the second smallest level in their four-level hierarchy.

land trusts: Conservation organizations that are nonprofit and own land, or limited interests in land (i.e., conservation easements), to protect long-term ecologic, recreation, scenic, historic, education, or production values of the land (MCHT and MLTN, 1998).

large scale map: A relative description of map scale, referring to the "large" value of the representative ratio that describes the ratio between distance on the map and corresponding distance on the ground that it represents (e.g., 1:5,000 as opposed to 1:5,000,000). Large scale maps cover a small area with considerable detail. It is similar to fine scale and the opposite of small scale.

LOOR (Likelihood of Occurrence Rank): A species-specific rank, essentially based on incidence of occurrence over extensive survey areas, representing the relative difficulty in observing a species in field surveys conducted within the species' range. The validity of this concept has been confirmed for birds in Maine (Boone and Krohn1999).

map scale: The proportion (ratio) that represents the spatial relationship between a map's dimensions and those of reality. Map scale is frequently expressed in terms of a representative ratio (e.g., 1:24,000-scale where 1 unit on the map represents 24,000 units on the ground).

meso-scale: A relative description of map scale, referring to an intermediate or middle value between small and large scales. It is the representative value that describes the ratio between distance on the map and corresponding distance on the ground that it represents (e.g., 1:100,000 as opposed to small scale [1:5,000,000] or large scale [1:5,000]). GAP maps are most frequently produced at this scale.

metadata: The source, lineage, content, structure and availability of data (i.e., data about data).

native species: A species known to occur naturally in an area, rather than one introduced at any time in the recent or historic past by humans.

omission error: The error of not predicting the occurrence of a species or community in an area when it does occur there. This type of error results from overestimation and is commonly called "producer's error" by specialists in remote sensing.

pixel: The smallest unit, or picture element, whose characteristics may be uniquely determined in a digital image. Images have a raster data structure composed of pixels.

planning unit: The spatial unit used to analyze patterns of specific elements of biodiversity in order to identify priority areas. It covers areas of approximately 10-10,000 km^2, and is the second largest component of the Davis and Stoms (1996) spatial analytical hierarchy.

polygon: An areal feature with an undefined number of sides identified on a map that defines a thematically homogeneous area differing from adjacent polygons. This multi-sided feature is most often defined in GIS by a series of arcs comprising its boundary, but it can also be derived from grids by aggregating cells. In vector systems they also have attributes.

population: A group of potentially inter-breeding individuals of the same species located in a particular place and time.

predicted distribution maps: Maps depicting expected locations of species based on associations with land cover types and species specific habitat attributes.

producer accuracy: Diagonal elements in an error matrix divided by the column total, where rows represent the reference data and columns represent the map classes. Off-diagonal elements are omission errors (map class underestimate reference class).

range maps: Maps that depict the continuous geographic distribution of a species (Krohn 1996).

raster: A data structure used for digital images and in GIS. Refers to a matrix structure of regularly shaped (square) pixels or map cells. The position in the matrix or grid provides a reference to ground coordinates. Each grid contains the value or attribute for the cell.

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.

small scale map: A relative description of map scale, referring to the small value of the representative fraction that describes the ratio between distance on the map and corresponding distance on the ground that it represents (e.g., 1:5,000,000 as opposed to 1:5,000). Small scale maps cover a large area with relatively little detail. It is similar to coarse scale and the opposite of large scale.

special management areas: Areas that are managed primarily for natural values, including the long-term maintenance of populations of native species and functional natural ecosystems.

species: In general terms, it refers to all organisms of the same kind. The biological species concept used by GAP refers to a group of actually or potentially interbreeding natural populations that are reproductively isolated from all other organisms.
species composition: The specific species present in a particular area (e.g., a list of the species in a particular community).

species/habitat model: An explicit statement of the relations linking the occurrence of a species within its range to mapped habitat information.

species richness: The total number of species in a given area, sometimes restricted to a given taxonomic group (e.g., reptile richness).

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

supervised clustering algorithm: A method of grouping remotely-sensed satellite data into similar units ("clusters") that is based on known statistical properties of specific land cover images, and therefore allows substantial intervention ("supervision") by the analyst.

terrestrial vertebrate: For ME-GAP this means those native species of amphibians, reptiles, birds, and mammals (i.e., excludes fishes and marine species) that regularly breed (i.e., approximately 5 out of 10 years, 1984-1993) in Maine.

Thematic Mapper (TM): A sensor carried on-board the Landsat 4 and 5 satellites. TM records information in seven spectral bands: three visible wavelengths, one near-infrared, two mid-infrared, and one thermal infrared. Information is provided in pixels with a nominal ground measurement of 28.5-m on a side. TM scenes for GAP are processed by the USGS EROS Data Center into 30-m, UTM projection pixels in six wavelengths (excluding the thermal band).

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

unsupervised clustering algorithm: A method of grouping remotely-sensed satellite data into similar units ("clusters") that requires little intervention ("supervision") by the analyst, with decisions based primarily on statistical criteria. The analyst must then assign the clusters to information classes using ancillary data or expert knowledge.

user accuracy: Diagonal elements in an error matrix divided by the row total, where rows represent the reference data and columns represent the map classes. Off-diagonal elements are commission errors (map class overestimate reference class).

vector: A data structure used in GIS. Information is stored as a series of ordered x, y geographic coordinates. Geographic features are represented by points, lines, and polygons; each can have attributes. Lines and polygons are delineated by arcs connecting geographic coordinates.

GLOSSARY OF ACRONYMS

ANP	Acadia National Park (part of NPS, USDI)
BCD	Biological Conservation Database (managed by TNC)
BRD	Biological Resources Division (USGS) (formerly NBS)
BSP	Baxter State Park
DEM	Digital Elevation Model (created by USGS)
DLG	Digital line graph (created by USGS)
EMAP	Environmental Monitoring and Assessment Program (managed by EPA)
EPA	US Environmental Protection Agency
FGDC	Federal Geographic Data Committee
GAP	Gap Analysis Program
GIS	Geographic Information System
GPS	Global Positioning System
MBPL	Maine Bureau of Parks and Lands (part of MDOC)
MDOC	Maine Department of Conservation
MDIFW	Maine Department of Inland Fisheries and Wildlife (manages WMAs)
ME-GAP	Maine Gap Analysis Program
MMU	Minimum mapping unit
NBII	National Biological Information Infrastructure (program with BRD)
NBS	National Biological Service (now BRD in USGS)
NPS	National Park Service
NRCS	Natural Resources Conservation Service (formerly SCS; part of USDA)
NWI	National Wetlands Inventory (administered by USFWS)
NWR	National Wildlife Refuge (managed by USFWS)
OGIS	Maine Office of GIS
PIN	Penobscot Indian Nation
PIT	Passamaquoddy Indian
SCS	Soil Conservation Service (now NRCS)
SPO	Maine State Planning Office
TM	Thematic Mapper
TNC	The Nature Conservancy
URL	Universal Resource Locator (used to locate home pages on WWW)
USDA	US Department of Agriculture
USDC	US Department of Commerce
USDI	US Department of the Interior
USFS	US Forest Service (part of USDA)
USGS	US Geological Survey (part of USDI)
USFWS	US Fish and Wildlife Service (part of USDI; manages NWRs)
UTM	Universal Transverse Mercator
WMA	Wildlife Management Area (managed by MIDFW)
WWW	World Wide Web

APPENDICES

Appendix 1. Descriptions of vegetation and land cover classes used in ME-GAP.

Appendix 2. Computer program used to convert the physiographic classification of the USFWS National Wetlands Inventory to the structural habitats for ME-GAP.

Appendix 3. Distribution of vegetation and land cover classes (km^2) by biophysical regions of Maine, 1993.

Appendix 4. Experts who provided information regarding species distributions and habitat relationships.

Appendix 5. Example computer program used to create a prediction distribution map for a species (i.e., Common Snapping Turtle).

Appendix 6. Results of comparisons between predicted occurrences and known occurrences of vertebrates.

Appendix 7. Results of ME-GAP vertebrate accuracy assessment reported by Likelihood of Occurrence Ranks.

Appendix 8. Federal, Heritage, and State rankings of terrestrial vertebrate species, with areas (km^2) in land management Categories 1 and 2.

Appendix 9. Major land ownerships by biophysical regions of Maine, 1995.

Appendix 10. The quantity of vegetation and land cover types (km^2) in Maine stratified by major land ownerships and land management Categories.

Appendix 11. The quantity of habitat (km^2) predicted to be available to each vertebrate species (n = 270) in ME-GAP, stratified by major ownerships and land management Categories.

Appendix 12. List of example GAP applications (Maine examples under Statewide planning).

Appendix 1. Descriptions of vegetation and land cover classes used in ME-GAP.

AGRICULTURAL LANDS

Agricultural lands are those land cover types where human intervention maintains an open landscape dominated by grasses, row crops, blueberry (*Vaccinium* spp.) bushes.

Abandoned Field: This type includes abandoned agriculture reverting to forestland through old field succession, characterized by grasses, shrubs and trees invading along the field-forest ecotone. Spectral signatures contain a mixture of grassland and shrub/tree signatures. This class includes the *Dactylis glomerata-Rumex acetosella* herbaceous alliance (Sneddon and Anderson, 1994).

Blueberry Field: This type is composed of agricultural fields dominated by the production of low-bush blueberries . Multiple structural forms include: burned field, pruned field, early season with leaves, and late season with leaves and fruit set (Yardborough, 1996). This type is most common in eastern Maine and occurs primarily on acidic gravel soils.

Grasslands: This type is composed of vegetation dominated by perennial graminoid plants (grasses and grass-like plants, including sedges (*Carex* spp.) and rushes (*Juncus* spp.). This class includes hayfields, pastures, lawns, and golf courses. Sparse residential lands will be included in this category if the coverage of buildings is lower than the coverage of lawns/fields. This class includes: *Dactylis glomerata-Rumex acetosella* herbaceous alliance; *Myrica pensylvanica-Shizachyrium scoparium* sparse shrubland alliance; *Chamaedaphne calyculata* and *Hudsonia (tomentosa, ericoides)* dwarf shrub alliances along the Maine coast and islands, as well as *Andropogon geradii-Sorgastrum nutans* and *Calamagrostis canadensis-Phalaris arundinacea* herbaceous alliances (Sneddon and Anderson, 1994).

Crops/Ground: This class includes areas dominated by vegetation planted by humans for food production including plowed or bare ground. Potatoes (*Solanum tuberosum*) and other cool crops are commonly grown in northeastern Maine.

DEVELOPED LANDS

Developed lands are those lands where human use is intensive and structures (roads, buildings, etc.) dominate the landscape. The dominance of human structures varies from low (**Sparse Residential**, **Highways/Runways**) to high (**Urban/Industrial**).

Sparse Residential: This type is dominated by single family homes where building and road coverage is greater than lawn or tree coverage. Areas with scattered houses in a field matrix will be in the **Grasslands** class and scattered houses within a forested matrix will be in one of the **Forestlands** classes.

Dense Residential: This type includes areas where building and road cover is greater than 75%. Areas included are towns, villages, and strip developments along roads.
Urban/Industrial: This type is defined by areas where building and road coverage is greater than 95%. This class includes industrial developments, mills, large towns and cities, and transportation, power, and communications facilities.

Highways/Runways: This type includes some of Maine's major highways and most airports with paved runways.

FORESTLANDS

Forestlands are those lands dominated by forests with tree crown closure of 10% or more and capable of producing trees suitable for harvesting (Anderson *et al.* 1976). This superclass includes areas that have been recently harvested (clearcut, light partial, or heavy partial), are in various stages of regeneration (early or late), as well as mature forests.

Clearcut: This type includes areas harvested after 1991 from forest with greater than 90% canopy cover removal and expected to regenerate into forest. This class is structurally similar to **Crops/Ground** with minimal biomass present, but the time series of satellite imagery indicated that the areas were in forest in 1991 but not in 1993.

Early Regeneration: Areas harvested before 1991 that have begun to regenerate to forest are included in this type. Seedling to sapling sized trees are expected, possibly with some residual trees present. Species present will vary based on the original site composition, harvesting techniques and site disturbance, and the presence of advance regeneration at the time of harvesting. These sites will return to mature forests.

Late Regeneration: This type includes areas harvested before 1991 that have greater than 50% crown closure. Sapling to poletimber sized trees expected with a species composition that will vary based on the same variables for **Early Regeneration** as well as any subsequent site treatments. These sites will return to mature forests.

Light Partial Cut: This type is composed of forestland where less than 50% of the overstory canopy has been removed through harvesting. Harvesting may have occurred before 1991. May include improvement thinning, light shelterwood and light selection harvests.

Heavy Partial Cut: This type includes forestland where greater than 50% of the overstory canopy has been removed through harvesting. Harvesting may have occurred before 1991. May include heavy shelterwood and heavy selection harvests.

Deciduous Forest: This type is composed of associations in which deciduous trees (trees that shed foliage simultaneously in response to an unfavorable season) generally contribute greater than 75% to the total dominant tree species. This class includes paper birch (*Betula papyrifera*), aspen (*Populus tremuloides*), sugar maple (*Acer saccharum)*-beech (*Fagus grandifolia*)-yellow birch (*Betula alleghaniensis*) forest cover types. Canopy closure is greater than 75%. This class includes all forest alliances dominated by deciduous tree species: *Acer saccharum-Betula allegheniensis-Fagus grandifolia* (northern hardwoods, often associated with spruce-fir forests), *Acer saccharum-Fraxinus americana-Tilia americana* (rich northern hardwoods, often on well-drained, high fertility soils)*; Carya-Fraxinus americana-Quercus* (dry, upper slope and ridgetop communities)*; Quercus* (Northeastern upland oak-dominated forests on acidic, nutrient poor soils); *Populus tremuloides* (short-lived, post-disturbance forests on acidic, well-drained soils)*; Prunus pensylvanica* (short-lived, post-disturbance forest community, occurring in association with boreal conifers and northern hardwoods)*;* and *Quercus rubra woodlands* (at higher elevations on rocky and talus slopes) (Sneddon and Anderson, 1994).

Deciduous/coniferous Forest: Forests in this type are composed of mixed deciduous and coniferous trees with deciduous trees the majority. Canopy closure is greater than 75%. This class potentially contains the following forest alliances: *Tsuga canadensis-Acer saccharum-Betula alleghaniensis* (hemlock-northern hardwoods, in cool, moist sites)*; Pinus rigida/Quercus ilicifolia* woodlands (pine barrens, occurring in southern Maine)*; Pinus strobus-Quercus (rubra, velutina)* (oaks and white pine codominant) (Sneddon and Anderson, 1994), in addition to those alliances listed under **Deciduous Forest** when conifer species contribute more than 25% of the canopy coverage.

Coniferous/Deciduous Forest: Forests of this type are composed of mixed coniferous and deciduous trees with coniferous trees the majority. Canopy closure is greater than 75%. This class includes all alliances listed under **Deciduous/coniferous Forest** as well as *Myrica pensulvanica-Prunus maritima* shrubland occurring along the Maine coast (Sneddon and Anderson, 1994).

Coniferous Forest: This type is composed of associations in which coniferous trees (trees that are never without green foliage) generally contribute greater than 75% to the total dominant tree species. Includes red spruce (*Picea rubens*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), northern white cedar (*Thuja occidentalis)*, white pine (*Pinus strobus*), and red pine (*Pinus resinosa*). Canopy closure is greater than 75%. This class includes all forest alliances dominated by conifers including: *Picea rubens-Abies* (*balsamea, fraseri*) ("spruce-fir" forests); *Pinus strobus-Pinus resinosa* (on acidic, well-drained sandy soils)*; Picea mariana* (upland closed-canopy black spruce); *Tsuga canadensis-Pinus strobus* on well-drained, acidic soils; *Pinus (banksiana, resinosa, rigida)* woodland (pine-dominated woodlands on acidic rock outcrops); *Picea rubens* woodland on talus or rock outcrops at higher elevations; *Thuja occidentalis* woodland on calcareous bedrock outcrops; and *Myrica pensulvanica-Prunus maritima* shrubland on the coast and coastal islands (Sneddon and Anderson, 1994, Davis 1966).

WETLANDS

Wetlands are those transitional land cover types occurring on the landscape between open water and uplands. The US Fish and Wildlife Service (USFWS) defines wetlands in terms of a landscape unit that must have at least one of the three following characteristics: (1) supports predominantly hydrophytes; (2) substrate is predominantly undrained hydric soils; or (3) if the substrate is nonsoil, the substrate is saturated or covered with water during at least part of the growing season (Cowardin *et al.*, 1979). USFWS National Wetlands Inventory (NWI) maps, in digital form, were used in this study to map wetlands. For an excellent overview of wetlands in one region of Maine (i.e., Acadia National Park and vicinity) based on the NWI, including descriptions of NWI types based on field reconnaissance, see Calhoun *et al.* (undated).

Deciduous Forested: Wetlands where broad-leaved, deciduous trees are the predominant life form are common throughout Maine and the northeast. On river floodplains, dominant vegetation includes silver maple (*Acer saccharinum*), red maple (*Acer rubrum)*, ashes (*Fraxinus* spp.), elms (*Ulmus* spp.). In isolated depressions in the uplands, along stream and lakes, and in other non-floodplain setting that are wet, red maple is dominant. Red maple swamps, the major type of plant community in this type, become increasingly more common from northern to southern Maine (and from north to south throughout the northeast; see Golet *et al.* 1993). In contrast, **Peatlands** increase in abundance on the landscape from southern to northern Maine.

Coniferous Forested: This type tends to occur on low gradient landscapes with the dominant trees in relatively pure stands. Northern white cedar swamps, stands of black spruce, larch (*Larix laricina*) stands, and mixtures of black spruce and larch are common in Maine. Generally, black spruce and larch stands are adjacent to **Peatlands**, whereas cedar swamps generally grade into stands of spruce and balsam fir, an upland type included in **Coniferous Forest** above).

Dead-forest: This is a relatively short-lived type dominated by dead, standing trees [i.e., woody vegetation greater than 6 m (20 ft) in height] resulting from a rise in water levels. High water levels could be the result of human activity (i.e., damming), but currently in Maine the more common cause is damming by beavers (*Castor canadensis*). Within less than a decade, assuming water levels stay high, the dead woody material falls into the water and the area will becomes a different type of wetland (e.g., **Deciduous Scrub-Shrub** or **Fresh Emergent**).

Deciduous Scrub-Shrub: This type is dominated by such shrubs as Labrador tea (*Ledum groenlandicum*), leatherleaf (*Chamaephne calyculata*), rhodora (*Rhododendron canadense*), sweetgale (*Myrica gale*), blueberry (*Vaccinium* spp.), willow (*Salix* spp.), and alder (*Alnus* spp.). Commonly occurs along low gradient streams and rivers, lake inlets and outlets, and usually associated with other wetlands (e.g., **Peatlands, Wet Meadows**).

Coniferous Scrub-Shrub: As the above type, this type is dominated by woody vegetation less than 6 m (20 ft) in height, including true shrubs and trees stunted by extreme environmental conditions, and is generally associated with riparian areas and other types of wetlands. The predominant vegetation is generally stunted spruce and larch.

Dead Scrub-Shrub: Similar to **Dead-forest Wetland** above, but in this type, the dominant life-form is shrubs, such as flooded alders or willows. Generally this type is created by beavers occupying a **Scrub-Shrub Wetland** and killing the woody vegetation via flooding.

Fresh Aquatic Bed: This type, sometimes known as "flowering lakes," include tidal and non-tidal freshwaters that are shallow and slow to non-running. These watered basins are dominated during the growing season by a variety of floating and submergent (under water) aquatic plants, although emergent (above water) plants do occur. Pondweeds (*Potomageton* spp.), water lilies (*Nuphar* spp.), bladderworts (*Utricularis* spp.) and duckweeds (*Lemna* spp.) are common species that form aquatic beds in Maine.

Fresh Emergent: This type of shallow water wetland, which can occur in tidal and non-tidal situations, is dominated by emergent aquatics. Common species include arrowheads (*Sagittaria* spp.), bulrushes (*Scripus* spp.), burreeds (*Spagonium* spp.), cattails (*Typha* spp.), and pickerelweed (*Poutedaria cordata*). Generally, this type of wetland is slightly less deep than **Fresh Aquatic Beds,** although **Fresh Emergent** marshes regularly have patches of mostly floating and submergent aquatic plants.

Peatland: This type is really a complex of vegetation types (e.g., Stockwell 1994), dominated by mosses (*Sphagnum* spp.), ericaceous shrubs, and sedges (Cyperaceae). Conifers, especially black spruce and larch are generally scattered across the peatland, and often grade into pure stands at the edges (defined as **Coniferous Forested Wetland)**. Small ponds regularly occur on peatlands, and **Water** and **Scrub Shrub** types are common along peatland borders. Compared to the continental USA, Maine has an unusually high variety of peatland types. For more information see Davis and Anderson (1991) and Damman and French (1987).

Meadow Wet: This type is often linear in shape, occurring adjacent to slow moving waters between the water and **Scrub-Shrub** wetlands or uplands. Grasses such as bluejoint (*Calamagrotis canadensis*) and cottongrass (*Eriophorous* spp.) are common, as are many kinds of sedges (*Carex* spp.). Scattered shrubs and stunted tress are often present, especially toward the upland edges.

Salt Aquatic Bed: This type occurs in marine and estuarine environments, over a wide range of substrates. Common plant communities in this type, ranging from high to low salinity environments, include kelps (*Laminaria* spp.), rockweeds (*Ascophyllum* spp.), eelgrass (*Zostera marina*), and widgeon grass (*Ruppia maritima*).

Salt Emergent: This type occurs on flats that are flooded by tides. Regularly flooded areas are dominated by saltmarsh cordgrass (*Spartine alterniflora*) whereas the less frequently flooded sites are dominated by saltmarsh hay (*S. patens*). Teal (1986) synthesized studies on salt marsh ecology in New England, focusing on the southern part of the region, whereas the works of Jacobson and Jacobson (1989), Jacobson *et al.* (1989), and Kelley *et al.* (1988) are specific to Maine.

Mudflat: Some of the highest tides in the world occur along the Maine coast. For this and other reasons (glacial history, winter icing, etc.), intertidal mudflats are common features of estuarine environments in Maine. Although appearing unvegetated, these areas of silt and clay deposits support a rich community of microalgae and many types of invertebrates. To the sides and upper edges of this type, **Sand** or **Gravel Shore** occur regularly, whereas on the deeper edges **Salt Aquatic Beds,** such as eelgrass, commonly occur**.**

Sand Shore: Areas immediately adjacent to fresh, brackish, and salt watercourses and waterbodies where sand-sized particles and small stones predominate. Areas along the coast, but above the intertidal zone, are included. This type tends to be linear in shape.

Gravel Shore: Similar to **Sand Shore** above, but here unconsolidated cobbled, gravel, or stones predominate.
Rock Shore: Similar to **Sand Shore** above, but in this type rock, including boulders and bedrock, cover 75 % or more of the area. In coastal areas, rockweeds, a group of brown algae, are commonly found in this type.

Shallow Water: Watered areas where the bottom could be seen in aerial photographs; generally less than 2 m (6.6 ft) in depth.

Open Water: Watered (fresh and brackish only; marine excluded) areas that are unvegetated (i.e., none of the above wetland types). Operationally, **Open Water** was mapped by combining data from the NWI and satellite imagery. Because these data sources miss watercourses and waterbodies concealed by dense tree canopies, **Shallow** and **Open Water** were combined with a GIS databases on hydrology when predicting the distribution of vertebrates occurring in, or adjacent to, water.

OTHER

Alpine Tundra: This type includes the zone just below the treeline (alpine) and just above the treeline and below permanent snow (tundra), includes krummholz (a growth form assumed by trees species close to the upper treeline or within the alpine zone). This class includes the following alliances: *Picea mariana/Kalmia-Ledum* sparse woodland (apline and boreal woodlands, with stunted, open canopy black spruce); *Picea mariana-Abies balsamea* shrubland (krummholz); *Carex bigelowii-Juncus trifidus* (alpine meadows above treeline) (Sneddon and Anderson, 1994).

Exposed Rock/Talus: This type includes exposed bedrock, talus, and bare mountain tops. Also included in this class are gravel pits.

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Appendix 2. Computer program used to convert the physiographic classification of the USFWS National Wetlands Inventory (NWI) types from Cowardin *et al.* (1979) to the structural habitats used in ME-GAP (see Appendix 1). The program, called *reseler.aml*, is in ARC/INFO format, which uses >reselect= and >aselect= to build sets of database records to be labeled using >move=. Entering an >aselect= by itself clears the selected set of records. Groups of attributes from the NWI coding system were identified using a wildcard (e.g., PFO3*, where * is a wildcard, and may represent any characters).

```
/* **** Coniferous Forested Wetland ****
aselect
reselect attribute lk 'PFO3*' or attribute lk 'PFO4*' or attribute lk 'PFO7*'
aselect attribute lk 'E2FO3*' or attribute lk 'E2FO4*' or attribute lk 'E2FO7*'
/* Add Tamarack as an conifer during the breeding season ...
aselect attribute lk 'PFO2*'
/* A few polygons are only identified as forested wetland ... placed here.
aselect attribute lk 'PFO/*' or attribute = 'PFOW'
/* ****
move 'SFW' to gap_code
aselect
/* ******************************

/* **** Deciduous Forested Wetland ****
reselect attribute lk 'PFO1*' or attribute lk 'PFO6*'
aselect attribute lk 'E2FO1*' or attribute lk 'E2FO2*' or attribute lk 'E2FO6*'
/* ****
move 'HFW' to gap_code
aselect
/* ******************************

/* **** Dead Forested Wetland ****
reselect attribute lk 'PFO5*' or attribute lk 'E2FO5*'
/* ****
move 'DFW' to gap_code
aselect
/* ******************************

/* **** Coniferous Scrub-shrub Wetland ****
reselect attribute lk 'PSS3*' or attribute lk 'PSS4*' or attribute lk 'PSS7*'
aselect attribute lk 'E2SS3*' or attribute lk 'E2SS4*' or attribute lk 'E2SS7*'
/*  A few polygons were only identified to shrub-wetlands.  Placed here.
aselect attribute lk 'PSS/*'
```

```
/* ****
move 'SSW' to gap_code
/* ******************************

/* **** Peatlands (with coniferous dominant) ****
/*         Note the reselect from the selected set
reselect attribute lk '*a*'
/* ****
move 'PW' to gap_code
aselect
/*
/*  Select just the wet meadow polygons from the scrub-shrub polygons
reselect attribute lk 'PSS3*' or attribute lk 'PSS4*' or attribute lk 'PSS7*'
aselect attribute lk 'E2SS3*' or attribute lk 'E2SS4*' or attribute lk 'E2SS7*'
aselect attribute lk 'PSS/*'
/*  Now select the Semipermenantly flooded group
reselect attribute lk '*F' or attribute lk '*F/*' or attribute lk '*Fb' or ~
attribute lk '*Fb/*' or attribute lk '*Fh' or attribute lk '*Fh/*'
move 'MW' to gap_code
/*  Peatlands still take precidence over wet meadows
reselect attribute lk '*a*'
move 'PW' to gap_code
aselect
/* ******************************

/* **** Deciduous Scrub-shrub Wetland ****
reselect attribute lk 'PSS1*' or attribute lk 'PSS2*' or attribute lk 'PSS6*'
aselect attribute lk 'E2SS1*' or attribute lk 'E2SS2*' or attribute lk 'E2SS6*'
/* ****
move 'HSW' to gap_code
/* ******************************

/* **** Peatlands (with deciduous dominant) ****
/*         Note the reselect from the selected set
reselect attribute lk '*a*'
/* ****
move 'PW' to gap_code
aselect
/* ********
/*
/*  Select just the wet meadow polygons from the scrub-shrub polygons
reselect attribute lk 'PSS1*' or attribute lk 'PSS2*' or attribute lk 'PSS6*'
```

```
aselect attribute lk 'E2SS1*' or attribute lk 'E2SS2*' or attribute lk 'E2SS6*'
/*  Now select the Semipermenantly flooded group
reselect attribute lk '*F' or attribute lk '*F/*' or attribute lk '*Fb' or ~
attribute lk '*Fb/*' or attribute lk '*Fh' or attribute lk '*Fh/*'
move 'MW' to gap_code
/*  Peatlands still take precidence over wet meadows
reselect attribute lk '*a*'
move 'PW' to gap_code
aselect
/* ********************************

/* **** Dead Scrub-shrub Wetland ****
reselect attribute lk 'PSS5*' or attribute lk 'E2SS5*'
/* ****
move 'DSW' to gap_code
/* ***
/*
/*  Select just the wet meadow polygons from the scrub-shrub polygons
reselect attribute lk 'PSS5*' or attribute lk 'E2SS5*'
/*  Now select the Semipermenantly flooded group
reselect attribute lk '*F' or attribute lk '*F/*' or attribute lk '*Fb' or ~
attribute lk '*Fb/*' or attribute lk '*Fh' or attribute lk '*Fh/*'
move 'MW' to gap_code
/*  Peatlands still take precidence over wet meadows
reselect attribute lk '*a*'
move 'PW' to gap_code
aselect
/* ********************************

/* **** Peatlands (moss and lichen dominant) ****
reselect attribute lk 'PML1*' or attribute lk 'PML2*'
/* ****
move 'PW' to gap_code
aselect
/* ********************************

/* **** Fresh Emergent Marsh ****
reselect attribute lk 'PEM*' or attribute lk 'L2EM*' or attribute lk 'R2EM*'
aselect attribute lk 'R3EM*' or attribute lk 'R5EM*' or attribute lk 'R1EM*'
move 'FEW' to gap_code
aselect
```

```
/* ****
reselect attribute lk 'PEM1*'
reselect attribute lk '*F' or attribute lk '*F/*' or attribute lk '*Fb' or ~
attribute lk '*Fb/*' or attribute lk '*Fh' or attribute lk '*Fh/*'
move 'MW' to gap_code
aselect
/* ******************************

/* **** Salt Emergent Marsh ****
reselect attribute lk 'E2EM*'
/* ****
move 'SEW' to gap_code
aselect
/* ******************************

/* **** Fresh Aquatic Bed ****
reselect attribute lk 'PAB*' or attribute lk 'L2AB*' or attribute lk 'RAB*'
aselect attribute lk 'RAB*'
aselect attribute lk 'R1AB*'
/* ****
move 'FAB' to gap_code
aselect
/* ******************************

/* **** Salt Aquatic Bed ****
reselect attribute lk 'M2AB*' or attribute lk 'E2AB*'
aselect attribute lk 'M1AB*' or attribute lk 'E1AB*'
/* ****
move 'SAB' to gap_code
aselect
/* ******************************

/* **** Shallow Water ****
reselect attribute lk 'PRB*' or attribute lk 'PUB*' or attribute lk 'POW*'
aselect attribute lk 'L2RB*' or attribute lk 'L2UB*'

/* ****
move 'SW' to gap_code
aselect
/* ******************************
```

```
/* **** Open Water ****
reselect attribute lk 'R1OW*' or attribute lk 'R2OW*' or attribute lk 'R3OW*'
aselect attribute lk 'R5OW*' or attribute lk 'L1*' or attribute lk 'M1RB*'
aselect attribute lk 'M1US*' or attribute lk 'M1RF*' or attribute lk 'M1OW*'
aselect attribute lk 'L2OW*' or attribute lk 'L2RB*' or attribute lk 'L2UB*'
aselect attribute lk 'R4SB*' or attribute lk 'R1RB*' or attribute lk 'R2RB*'
aselect attribute lk 'R3RB*' or attribute lk 'R5RB*' or attribute lk 'R1UB*'
aselect attribute lk 'R2UB*' or attribute lk 'R3UB*' or attribute lk 'R5UB*'
aselect attribute lk 'E1UB*' or attribute lk 'M1UB*'
/* ****
move 'OW' to gap_code
aselect
/* *******************************

/* **** Mud Shores ****
reselect attribute lk 'L2US3*' or attribute lk 'PUS3*' or attribute lk 'E2US3*'
aselect attribute lk 'E2SB3*' or attribute lk 'M2US3*' or attribute lk 'R1US3*'
aselect attribute lk 'R2US3*' or attribute lk 'R3US3*' or attribute lk 'R5US4*'
aselect attribute lk 'R5US3*' or attribute lk 'L2US4*' or attribute lk 'PUS4*'
aselect attribute lk 'E2US4*' or attribute lk 'E2SB4*' or attribute lk 'M2US4*'
aselect attribute lk 'R1US4*' or attribute lk 'R2US4*' or attribute lk 'R3US4*'
/* ****
move 'MS' to gap_code
aselect
/* *******************************

/* **** Rocky shore ****
reselect attribute lk 'L2RS*' or attribute lk 'M2RS*' or attribute lk 'E2RS*'
aselect attribute lk 'R1RS*' or attribute lk 'R2RS*' or attribute lk 'R3RS*'
aselect attribute lk 'R5RS*' or attribute lk 'M1RS*'
/* Marine classification incomplete ... rock bottom and unconsolidated bottom exists
aselect attribute lk 'M2RB1N' or attribute lk 'M2UB2N'
/*
/* Two reef polygons placed in rocky shore
aselect attribute lk 'M2RF2*' or attribute lk 'E2RF2N'
/* ****
move 'RS' to gap_code
aselect
/* *******************************

/* **** Gravel Shore ****
```

```
reselect attribute lk 'L2US1*' or attribute lk 'PUS1*' or attribute lk 'E2US1*'
aselect attribute lk 'M2US1*' or attribute lk 'R1US1*' or attribute lk 'R2US1*'
aselect attribute lk 'R3US1*' or attribute lk 'R5US1*'
/* Miscellaneous unidentified shorelines placed in cobble shore
aselect attribute lk 'E2USK*' or attribute lk 'E2USN'  or attribute lk 'L2USA'
aselect attribute lk 'M2USKh' or attribute lk 'PUSAh'
aselect attribute lk 'R2USA*' or attribute lk 'R2USB*' or attribute lk 'R2USC*'
aselect attribute lk 'R3USA*' or attribute lk 'R3USB*' or attribute lk 'R3USC*'
aselect attribute lk 'L2USA*' or attribute lk 'L2USB*' or attribute lk 'L2USC*'
aselect attribute lk 'L2USD*' or attribute lk 'L2USE*' or attribute lk 'L2USG*'
/* More miscellaneous unidentified shorelines
aselect attribute lk 'PUSC*' or attribute lk 'R1US*' or attribute lk 'PUS/*'
aselect attribute = 'PUSW' or attribute = 'RSUSW' or attribute = 'PUSA' or attribute = 'L2USF'
aselect attribute = 'R5USC'
aselect attribute lk 'L2USF*' or attribute lk 'R3USE' or attribute lk 'R2USE'
/* ****
move 'GS' to gap_code
aselect
/* ********************************

/* **** Sandy Shore ****
reselect attribute lk 'L2US2*' or attribute lk 'PUS2*' or attribute lk 'E2US2*'
aselect attribute lk 'M2US2*' or attribute lk 'R1US2*' or attribute lk 'R2US2*'
aselect attribute lk 'R3US2*' or attribute lk 'R5US2*'
/* ****
move 'SS' to gap_code
aselect
/* ********************************

/* **** Vegetated Shore ****
/* Vegetated Shore was included for completeness only.  It is a code used in NWI, but did not
/* occur in Maine.   RBB June 9, 1998
reselect attribute lk 'L2US5*' or attribute lk 'PUS5*' or attribute lk 'R5US5*'
aselect attribute lk 'R1US5*' or attribute lk 'R2US5*' or attribute lk 'R3US5*'
/* ****
move 'VS' to gap_code
aselect
/* ********************************

/* **** Upland ****
reselect attribute lk 'U*'
```

```
aselect attribute lk ''
/* ****
move 'U' to gap_code
aselect
/* ********************************

/* **** Out ****
/* Out was confirmed to be portions of Canada that fell within the
/*     1:24,000 quads mapped, RBB June 9, 1998
reselect attribute lk 'OUT'
aselect attribute lk 'NP'
/* ****
move 'OUT' to gap_code
aselect
/* ********************************
/* End of program
```

Appendix 3. Distribution of vegetation and land cover classes (km^2) by biophysical regions in Maine, 1993. (See Figure 2 for locations of regions).

Vegetation and Land Cover Types	St. John Uplands		St John Valley Interior Foothills		Western and Interior Mountains		Eastern Lowlands and Foothills		Coastal Plains and Foothills	
	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2
Agricultural Lands	**0.8**	**96.5**	**8.2**	**1,632.1**	**2.3**	**446.4**	**4.9**	**683.7**	**17.3**	**3,310.0**
Abandoned Field	0.0	1.0	0.1	16.6	0.1	14.3	0.8	108.8	0.3	60.5
Blueberry Field	0.0	0.0	0.0	0.0	0.0	0.0	0.9	124.6	0.0	9.0
Grasslands	0.3	36.0	5.0	993.0	2.1	408.4	2.6	361.1	15.3	2,920.8
Crops/Ground	0.5	59.5	3.1	622.5	0.1	23.7	0.6	89.3	1.7	319.7
Forestlands	**89.7**	**11,243.8**	**72.8**	**14,503.7**	**85.6**	**16,306.2**	**71.8**	**10,072.7**	**64.7**	**12,356.5**
Clearcut	1.9	242.0	1.2	240.8	1.6	300.6	1.9	260.3	1.2	228.6
Early Regeneration	14.0	1,760.3	6.9	1,369.3	6.7	1,278.0	5.0	695.0	1.4	267.1
Late Regeneration	5.0	628.5	2.6	517.4	3.6	683.7	4.4	610.5	2.5	485.5
Light Partial Cut	1.7	215.3	0.9	184.5	1.6	307.1	1.3	186.1	1.3	244.5
Heavy Partial Cut	2.7	332.4	1.2	244.1	3.0	566.2	1.2	169.0	1.2	224.3
Deciduous	17.9	2,246.0	12.0	2,388.1	25.9	4,932.8	6.3	877.9	12.4	2,373.8
Decid./conif. Forest	20.0	2,508.0	14.5	2,891.4	18.4	3,510.6	9.7	1,361.1	16.8	3,215.2
Conif./decid. Forest	16.9	2,116.4	22.4	4,469.8	16.6	3,171.2	30.6	4,285.7	20.8	3,977.3
Coniferous	9.5	1,194.9	11.0	2,198.5	8.2	1,556.1	11.6	1,627.1	7.0	1,340.1
Wetlands (Preliminary)	**9.4**	**1,182.5**	**18.1**	**3,602.3**	**11.5**	**2,199.0**	**21.5**	**3,011.9**	**14.9**	**2,854.3**
Deciduous Forested	0.2	21.4	0.7	135.4	0.5	104.0	0.7	101.0	2.0	374.4
Coniferous Forested	4.5	562.7	7.7	1,529.3	2.5	476.5	5.5	775.4	2.9	547.3
Dead-forest	0.0	2.4	0.0	6.2	0.0	3.6	0.1	7.8	0.0	8.0
Deciduous Scrub-shrub	1.1	134.5	2.0	402.2	1.2	223.5	2.2	312.0	1.6	311.8
Coniferous Scrub-shrub	0.1	11.5	0.2	48.9	0.1	28.1	0.2	32.0	0.2	35.8
Dead Scrub-shrub	0.0	0.0	0.0	0.2	0.0	0.7	0.0	0.0	0.0	0.3
Fresh Aquatic Bed	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.6	0.0	0.5
Fresh Emergent	0.7	81.7	0.8	162.0	0.6	116.6	1.3	180.5	0.9	178.0
Peatland	0.3	43.1	0.7	137.1	0.2	34.8	1.2	173.8	0.4	84.0
Wet Meadow	0.1	9.5	0.2	36.3	0.1	25.7	0.4	56.5	0.2	42.0
Salt Aquatic Bed	0.0	0.0	0.0	0.0	0.0	0.0	1.0	136.4	0.3	60.5
Salt Emergent	0.0	0.0	0.0	0.0	0.0	0.0	0.1	20.3	0.3	59.9
Mudflat	0.0	0.0	0.0	0.0	0.0	1.8	0.9	130.1	0.5	104.2
Sand Shore	0.0	0.0	0.0	0.0	0.0	0.0	0.1	16.4	0.1	15.1
Gravel Shore	0.1	13.0	0.1	11.9	0.0	6.9	0.0	4.1	0.0	1.4
Rock Shore	0.0	0.8	0.1	27.0	0.0	5.1	0.2	22.5	0.0	8.0
Shallow Water	0.1	17.6	0.2	33.4	0.2	37.8	0.2	28.9	0.2	29.1
Open Water	2.3	284.2	5.4	1,072.2	6.0	1,133.8	7.2	1,013.7	5.2	994.1
Developed Lands	**0.1**	**12.2**	**0.9**	**179.1**	**0.3**	**57.5**	**1.7**	**237.8**	**3.0**	**579.3**
Sparse Residential	0.1	8.8	0.7	145.8	0.2	36.8	1.5	213.3	1.5	285.8
Dense Residential	0.0	3.4	0.2	32.8	0.1	20.3	0.2	23.1	1.4	272.7
Urban/Industrial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	14.9
Highways/Runways	0.0	0.0	0.0	0.5	0.0	0.3	0.0	1.5	0.0	6.0
Other	**0.0**	**0.6**	**0.0**	**0.1**	**0.2**	**41.6**	**0.1**	**13.4**	**0.1**	**9.8**
Alpine Tundra	0.0	0.0	0.0	0.0	0.1	20.6	0.0	0.0	0.0	0.0
Exposed Rock/Talus	0.0	0.6	0.0	0.1	0.1	20.9	0.1	13.4	0.1	9.8
Totals	100.0	**12,535.7**	100.0	**19,917.2**	100.0	**19,050.7**	100.0	**14,019.5**	100.0	**19,109.9**

Appendix 4. Experts who provided information regarding species distributions and habitat relationships.

Name	Affiliation	Taxonomic group(s)
John Albright	Atlantic Salmon Federation	amphibians, reptiles, mammals
Linda Alverson	Seven Islands Corporation	birds
Dave Capen	University of Vermont	birds
Jim Connolly	MDIFW[a]	mammals
Patrick Corr	MDIFW[a]	birds
Phillip deMaynadier	University of Maine	amphibians, reptiles
Richard DeGraaf	USDA Forest Service	amphibians, reptiles, birds, mammals
Norm Famous	Private consultant	birds
Lyman Feero	Bowater Corporation	birds
Curt Griffin	University of Massachusetts	amphibians, reptiles, birds, mammals
John Hagan	Manomet Center for Conservation Sciences	birds
Dan Harrison	University of Maine	mammals
Thomas Hodgman	MDIFW	birds
Malcolm Hunter	University of Maine	amphibians, reptiles, mammals
Allen Hutchinson	Forest Society of Maine	amphibians, reptiles, mammals, birds
Thomas Kunz	Boston University	mammals
John Litvaitis	University of New Hampshire	mammals
Judy Markowski	Maine Audubon Society	amphibians, birds
Mark McCollough	MDIFW	amphibians, reptiles, mammals, birds
Craig McLaughlin	MDIFW	mammals
Kim Morris	MDIFW	mammals
Anders Rhodin	Chelonian Research Foundation	reptiles
Beth Schwartz	MDIFW	amphibians, reptiles,

		mammals, birds
Mike Sullivan	New Brunswick Fish and Wildlife Branch	amphibians, reptiles, mammals, birds
Peter Vickery	Massachusetts Audubon Society	birds
Ken Williams	USGS Biological Resources Division	amphibians, reptiles, mammals, birds
Mariko Yamasaki	USDA Forest Service	amphibians, reptiles, mammals, birds

[a] - Maine Department of Inland Fisheries and Wildlife.

Appendix 5. Example computer program used to create a prediction distribution map for a species (i.e., Common Snapping Turtle). This AML uses algebraic raster modeling techniques to merge several data layers to generate the predicted distribution for the Common Snapping Turtle. The distribution that is generated from the following model is not generalized along range boundaries, and so is not equal to the final predicted distributions of ME-GAP, but a precursor. Ancillary programs called by the primary program are also shown. Finally, the AML that creates an initial habitat value grid is shown (i.e., RECLSER.AML).

CHSEMOD.AML

```
&sv spp = CHSE
&sv name = 'Snapping turtle'
&sv name = [unquote %name%]

/* CHSE    Snapping turtle   Chelydra serpentina
/*
/* This file models the habitat relations of the species in the state,
/* marking habitats that are within the species' range as occupied (with
/* a score from 1 to 4) or unoccupied (0).  Habitat patches that include
/* only some portion of the species' range, and are within the same
/* hydrologic unit, are also shown occupied.  Habitat patches outside
/* the species' range are not scored.
/*
/* This model assumes as inputs:
/*
/* Arguments (now set, rather than passed):
/*   spp (Four letter species code)
/*   name (full species common name, for reporting progress)
/*
/* Files:
/*   r%spp%  -  r%spp% (e.g., rstoc) is a grid, at 30 m resolution
/*              which includes the range of the species, WITH the
/*              edge of the range inluding zones that overlap the
/*              boundary.  STATEWIDE species will not have or need
/*              the r%spp% grid.  The r%spp% grid is generated by
/*              the RANGER.AML, stored within the /unit4/gap/rngs
/*              workspace.
/*
/*   %spp%bnd - From /unit4/gap/rngs/bnd, these files CONTAIN TICS
/*              ONLY, and were generated from the r%spp% files.
/*              They will be used to restrict analyses to windows
/*              for non-statewide species, with the windows
/*              ensured to be wider than the range of the species,
/*              with its feathered edges.
/*
/*   g%spp%  -  FROM /unit2/spp/me.  These long-standing grids
```

```
/*              (from 1996 and modified through time) depict
/*              species ranges at 200 m resolution.  A grid will
/*              exist for each species, and the grids must be kept
/*              up-to-date (the sm%spp% [smooth line] coverages from
/*              /unit2/spp/me and the g%spp% grids should always
/*              agree).
/*
/*   habmap  -  FROM /unit4/gap/hab.  A habitat map with habitats numbered
/*              from 1 to n.  Here, the habitat map is 30 m resolution, and n
/*              is 37.
/*
/*   %spp%gap.lut  -  FROM /unit4/gap/tabs.  Here "tabs" is tables.  In tabs are
/*              all the look-up files for each species ("*gap.lut").  These are
/*              ASCII reclassification files appropriate for GRID.  The files
/*              list each habitat type in the habitat map (sorted), and a
/*              corresponding habitat quality from the matrices.
/*              The lookup tables use a coding system to include breeding, feeding
/*              and breed-feed (maximum) habitat scores.  The breed-feed score
/*              is multiplied by 100, breed by 10, and feed by 1, then  summed.
/*              From this, for example, a value of 434 means breed-feed of 4
/*              breed of 3, and feed of 4.
/*
/*   %spp%.mat - FROM /unit4/gap/tabs.  These tables are in INFO format, and
/*              contain the full 51 class matrices developed, with breeding,
/*              feeding, and breed-feed habitat preferences.  These tables will
/*              not often be used in modeling, but I set-up a cursor for each
/*              species for simplicity.
/*
/*   strmdis -  Distance from streams and single-line rivers, in meters.  This
/*              grid has been reclassed into distance classes.  Look at the
/*              vat to view the classes.  From /unit4/gap/hab.
/*
/*   streamsg - A grid of the streams and single-line rivers.
/*              From /unit4/gap/hab
/*
/*   waterdis - Distance from waterbodies and dual-line rivers, in meters. This
/*              grid has been reclassed into distance classes.  Look at the
/*              vat to view the classes.  From /unit4/gap/hab.
/*
/*   wateralloc - Allocation table for water distance above ... that is, the
/*              type of water closest to each cell.
/*
/*   wetlanddis - As above for waterdis - Distance to wetlands.
/*   wetlandalloc - As above for wateralloc - Allocation of wetlands.
/*   durbandis - As above for waterdis - Distance to high density residential and
/*              urban areas
/*   durbanalloc - As above for wateralloc - Allocation of urban areas.
/*
/*   Other ancillary inputs will be documented as they are used.
```

```
/*
/* Run module from ARC
/*
/* Programmer:  Randall B. Boone
/* Creation date:  November 4, 1997
/*
/* Last modified:  March 24, 1998, RBB
/* Modified by a program, April 21 1998, to include preprocessed habitat data.
/*

/*  Determine if the species is statewide
/*     The range grids have '5' within the species' range, '3' outside but in Maine
/*     There is always a 0 class, so a statewide species will have only two types.
&describe /unit2/spp/me/g%spp%
&if %grd$nclass% = 2 &then
  &sv Statewide = Yes
&else
  &sv Statewide = No

/*  Crosswalk the habitats to the selection matrix of the animal
grid
display 0
&if [exists habrec -grid] &then
  kill habrec all
&if [exists habrec90 -grid] &then
  kill habrec90 all
&if [exists habmod -grid] &then
  kill habmod all
&if [exists habmod90 -grid] &then
  kill habmod90 all
&if [exists /wild1/gap/spp/gap%spp% -grid] &then
   kill /wild1/gap/spp/gap%spp% all

/* If a statewide species, then set a large window, otherwise a small one
&if %Statewide% = Yes &then
  setwindow /unit1/me/meok
&else
  setwindow ../rngs/bnd/%spp%bnd

/*   &type Reclassifying habitats for %name%
/* ***  The following was modified to allow processing on another machine.
/*   habrec = reclass(../hab/habmap, ../tabs/%spp%gap.lut)
&run gethabitats %spp%  [quote %name%]
/*

/*   &type Aggregating the habitat to 90 meters.
/* Aggregate to 90 meters, based upon the majority habitat.
/*   habrec90 = blockmajority(habrec, rectangle, 3, 3, data)
setcell 90

/* Set-up a cursor (HAB) to access specific entries in the species' full-size habitat matrix.
```

```
cursor hab declare ../tabs/%spp%.mat ro
cursor hab open

/* ***********************************************************************************************

/*  WATERBODIES AND WETLANDS (USING MATRIX HABITAT VALUES).  DEEP AREAS OF LAKES NOT HIGHLIGHTED.
/*    WET_CODE  EST=2, LAC=4, OUT=7, PAL=5, RIV=3, SEA=1, U=6
/*  Southern New England cites a study reporting a 16 km round trip to breeding sites!  Many studies
/*  report long distances ... too long to include nesting habitat in this model and not over
/*  estimate species occurrence.  Nesting habitat is assumed to be available.
/*  500 m from shore is excluded as deep water unlikely to be occupied by snappers ... they must breath.

  &sv habget = 'SRW'
  &call gethab
  &sv running = %:hab.habscore%
  &sv habget = 'SSW'
  &call gethab
  &sv standing = %:hab.habscore%
  &sv habget = 'DSW'
  &call gethab
  &sv deep = %:hab.habscore%

  if (../hab/streamsg == 1) habmod90 = %running%
  else if (../hab/strmdis <= 75) habmod90 = habrec90
  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/waterdis <= 75) and (../hab/waterdis > 0)) habmod90 = habrec90
  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/wetlanddis <= 75)) habmod90 = habrec90
  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/watershore <= 250) and (../hab/watershore > 0)) habmod90 = %standing%
  else if ((../hab/allnwig.wet_int in {3,4,5,6}) and (../hab/watershore <= 500) and (../hab/watershore > 250)) habmod90 = %deep%
  endif


/* ***********************************************************************************************
/* Write the results to their final location

/* If a statewide species, then there is no need to consider range
&if %Statewide% = Yes &then
  /wild1/gap/spp/gap%spp% = habmod90
&else
  if (../rngs/r%spp% == 5) /wild1/gap/spp/gap%spp% = habmod90

/* End the modeling procedure

quit

/*  Now compressing the images on the fly
&run crusher %spp%  [quote %name%]
```

```
&return

/* ********************************************************************************************

&routine gethab
  cursor hab first
  /* Loop assumes that the habitat requested is really there.
  &do &until %:hab.code% = %habget%
     cursor hab next
  &end
/* Return to the body of the AML
&return
```

GETHABITATS.AML, called by CHSEMOD.AML

```
  &args spp name

/* Gethabitats uncompresses and moves about habitat scores for the
/*  species being processed. This module was added after using
/*  another machine to pre-process the habitat map for each species.
/*  In another AML (reclser), habitats were reclassified to scores
/*  according to the matrices created, then generalized to 90 m cells,
/*  coverted to imagine format, and compressed.

  /* I don't want to remove the original file and uncompress it, so ...
  &sv spp = [locase %spp%]

  &sys cp /unit3/gap/spp/scores/%spp%hab.img.Z .
  &sys cp /unit3/gap/spp/scores/%spp%hab.igw .

  &type Uncompressing the habitat for %name%
  &sys uncompress %spp%hab.img

  &type Converting the image to a grid
  &sys arc imagegrid %spp%hab.img habrec90

  &type Removing the image file for %name%
  &sys rm -f %spp%hab.img
  &sys rm -f %spp%hab.igw
```

CRUSHER.AML, called by CHSEMOD.AML

```
&args spp  name

/*  Crusher compresses habitat maps

&sv spp = [locase %spp%]

&type Converting the grid to an image

gridimage /wild1/gap/spp/gap%spp% none /wild1/gap/spp/gap%spp%.img imagine

compress /wild1/gap/spp/gap%spp%.img
kill /wild1/gap/spp/gap%spp% all

&type Done with compressing %name%
```

RECLSER.AML, which is run prior to CHSEMOD.AML, to prepare a habitat quality map for the species

```
&args spp  name

/*  RECLSER reclasses habitats according to a LOOK-UP-TABLE that
/*   stores habitat values.  The program then generalizes the results
/*   to 90 meters, exports an image file, and crushes it for storage.
/*
/*  Randy Boone       April 16, 1998 (!)

&sv spp = [unquote %spp%]
&sv spp = [locase %spp%]

&if [exists habrec -grid] &then
  kill habrec all
&if [exists habrec90 -grid] &then
  kill habrec90 all
&if [exists habsamp90 -grid] &then
  kill habsamp90 all

rm -f %spp%hab.img.Z
rm -f %spp%hab.igw

grid
display 0
setcell 30
```

```
&type

&type Reclassifying habitats for %name%
habrec = reclass(./hab/habmap, ./tabs/%spp%gap.lut)

&type Aggregating the habitat to 90 meters for %name%.
/* Aggregate to 90 meters, based upon the majority habitat.
habrec90 = blockmajority(habrec, rectangle, 3, 3, data)
setcell 90

&type Resampling grid to 90 meters for %name%.
habsamp90 = resample(habrec90, 90)

quit

&type Exporting habitat grid for %name%.
gridimage habsamp90 none %spp%hab.img imagine

&type Compressing habitat grid for %name%.
compress %spp%hab.img

mv %spp%hab.img.Z ./scores/.
mv %spp%hab.igw ./scores/.

&type Done with %name%
```

Appendix 6. Results of comparisons between predicted occurrences of individual species and known occurrences based on checklist and research projects. Under each comparison location the results are listed as "M" for match, "C" for commission error, and "O" for omission error. Comparisons were not made if the species was not predicted to occur and it does not occur, dashed lines indicate that data were not available for the site. Range information has also been incorporated (0 = test site outside range, 1 = within range). LOORs is Likelihood of Occurrence Ranks. (see Glossary of Terms for definition).

CHECKLIST SITES

Amphibians

			MDI, Acadia NP		Moosehorn NWR		Sunkhaze Meadows NWR		Petit Manan NWR		Rachel Carson NWR	
Element Code	**Common name**	**LOORs**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**
AAAAA01060	Blue-spot. Salamander	4	M	1	--	--	--	--	--	--	M	1
AAAAA01090	Spotted Salamander	11	M	1	--	--	--	--	--	--	M	1
AAAAD03040	Dusky Salamander	2	M	1	--	--	--	--	--	--	M	1
AAAAD05010	N. Two-lin. Salamander	10	M	1	--	--	--	--	--	--	M	1
AAAAD06020	Spring Salamander	3		0	--	--	--	--	--	--	M	1
AAAAD08010	Four-toed Salamander	1	M	1	--	--	--	--	--	--	M	1
AAAAD12020	N. Redback Salamander	8	M	1	--	--	--	--	--	--	M	1
AAAAF01030	Eastern Newt	7	M	1	--	--	--	--	--	--	M	1
AAABB01020	American Toad	14	M	1	--	--	--	--	--	--	M	1
AAABC02130	Gray Treefrog	13	M	1	--	--	--	--	--	--	M	1
AAABC05090	Spring Peeper	16	M	1	--	--	--	--	--	--	M	1
AAABH01070	Bullfrog	12	M	1	--	--	--	--	--	--	M	1
AAABH01090	Green Frog	15	M	1	--	--	--	--	--	--	M	1
AAABH01160	Pickerel Frog	9	M	1	--	--	--	--	--	--	M	1
AAABH01170	Northern Leopard Frog	5	M	1	--	--	--	--	--	--	M	1
AAABH01190	Mink Frog	6		0	--	--	--	--	--	--		0
AAABH01200	Wood Frog	17	M	1	--	--	--	--	--	--	M	1

Reptiles

Element Code	Common name	LOORs	MDI, Acadia NP Results	MDI, Acadia NP Range	Moosehorn NWR Results	Moosehorn NWR Range	Sunkhaze Meadows NWR Results	Sunkhaze Meadows NWR Range	Petit Manan NWR Results	Petit Manan NWR Range	Rachel Carson NWR Results	Rachel Carson NWR Range
ARAAD01010	Painted Turtle	13	M	1	--	--	--	--	--	--	M	1
ARAAB01010	Snapping Turtle	11	M	1	--	--	--	--	--	--	M	1
ARAAD02010	Spotted Turtle	15		0	--	--	--	--	--	--	M	1
ARAAD02020	Wood Turtle	5	M	1	--	--	--	--	--	--	M	1
ARAAD04010	Blanding's Turtle	16	O	0	--	--	--	--	--	--	M	1
ARAAD08010	Eastern Box Turtle	10		0	--	--	--	--	--	--	M	1
ARAAE02040	Common Musk Turtle	3	O	0	--	--	--	--	--	--	M	1
ARADB07010	Racer	14		0	--	--	--	--	--	--	M	1
ARADB10010	Ringneck Snake	1	M	1	--	--	--	--	--	--	M	1
ARADB19050	Milk Snake	8	M	1	--	--	--	--	--	--	M	1
ARADB22060	Northern Water Snake	7	C	1	--	--	--	--	--	--	M	1
ARADB34010	Brown Snake	9		0	--	--	--	--	--	--	M	1
ARADB34030	Redbelly Snake	4	M	1	--	--	--	--	--	--	M	1
ARADB36120	Eastern Ribbon Snake	2		0	--	--	--	--	--	--	M	1
ARADB36130	Common Garter Snake	12	M	1	--	--	--	--	--	--	M	1
ARADB47010	Smooth Green Snake	6	M	1	--	--	--	--	--	--	M	1

Mammals

Element Code	Common name	LOORs	MDI, Acadia NP Results	MDI, Acadia NP Range	Moosehorn NWR Results	Moosehorn NWR Range	Sunkhaze Meadows NWR Results	Sunkhaze Meadows NWR Range	Petit Manan NWR Results	Petit Manan NWR Range	Rachel Carson NWR Results	Rachel Carson NWR Range
AMAAA01010	Virginia Opossum	22		0		1	--	--	--	--	O	0
AMABA01010	Masked Shrew	51	M	1	M	1	--	--	--	--	M	1
AMABA01150	Water Shrew	17	M	1	C	1	--	--	--	--	M	1
AMABA01180	Smoky Shrew	18	M	1	C	1	--	--	--	--	M	1
AMABA01210	Long-tailed Shrew	4		0		1	--	--	--	--	M	1
AMABA01250	Pygmy Shrew	15	C	1	C	1	--	--	--	--	M	1
AMABA03010	N. Short-tailed Shrew	52	M	1	M	0	--	--	--	--	M	1
AMABB03010	Hairy-tailed Mole	23	M	1	M	1	--	--	--	--	M	1
AMABB05010	Star-nosed Mole	24	M	1	M	1	--	--	--	--	M	1
AMACC01010	Little Brown Myotis	21	M	1	M	0	--	--	--	--		0
AMACC01130	E. Small-footed Myotis	8		0		1	--	--	--	--	O	0
AMACC01150	Northern Myotis	7	M	1	C	1	--	--	--	--	M	1
AMACC02010	Silver-haired Bat	3	C	1	C	1	--	--	--	--	C	1
AMACC03020	Eastern Pipistrelle	10	C	1	C	1	--	--	--	--	M	1
AMACC04010	Big Brown Bat	20	M	1	C	1	--	--	--	--	M	1
AMACC05010	Eastern Red Bat	9	C	1	C	1	--	--	--	--	M	1
AMACC05030	Hoary Bat	11	C	1	C	1	--	--	--	--	M	1
AMAEB01050	New England Cottontail	6		0		1	--	--	--	--	M	1
AMAEB03010	Snowshoe Hare	46	M	1	M	0	--	--	--	--		0
AMAFB02230	Eastern Chipmunk	40	M	1	M	1	--	--	--	--	M	1
AMAFB03010	Woodchuck	45	M	1	M	1	--	--	--	--	M	1
AMAFB07010	Eastern Gray Squirrel	49	M	1	M	1	--	--	--	--	M	1
AMAFB08010	Red Squirrel	50	M	1	M	0	--	--	--	--		0
AMAFB09010	S. Flying Squirrel	13	M	1	C	1	--	--	--	--	M	1
AMAFB09020	N. Flying Squirrel	33	M	1	M	0	--	--	--	--	M	1
AMAFE01010	American Beaver	44	M	1	M	1	--	--	--	--	M	1
AMAFF03040	Deer Mouse	56	M	1	M	1	--	--	--	--	M	1
AMAFF03070	White-footed Mouse	55	M	1	O	1	--	--	--	--	M	1

Mammals cont.

Element Code	Common name	LOORs	MDI, Acadia NP Results	MDI, Acadia NP Range	Moosehorn NWR Results	Moosehorn NWR Range	Sunkhaze Meadows NWR Results	Sunkhaze Meadows NWR Range	Petit Manan NWR Results	Petit Manan NWR Range	Rachel Carson NWR Results	Rachel Carson NWR Range
AMAFF09020	S. Red-backed Vole	53	M	1	M	1	--	--	--	--	M	1
AMAFF11010	Meadow Vole	54	M	1	M	0	--	--	--	--	O	0
AMAFF11090	Rock Vole	5		0		1	--	--	--	--	M	1
AMAFF11150	Woodland Vole	12		0		1	--	--	--	--	C	1
AMAFF15010	Muskrat	36	M	1	M	1	--	--	--	--	M	1
AMAFF17010	Southern Bog Lemming	16	C	1	C	1	--	--	--	--	M	1
AMAFF17020	Northern Bog Lemming	1		0		1	--	--	--	--	M	1
AMAFH01010	Meadow Jump. Mouse	29	M	1	M	0	--	--	--	--	M	1
AMAFH02010	Woodland Jump. Mouse	26	M	1	M	1	--	--	--	--	O	0
AMAFJ01010	Common Porcupine	39	M	1	M	1	--	--	--	--	M	1
AMAJA01010	Coyote	30	M	1	M	1	--	--	--	--	M	1
AMAJA03010	Red Fox	37	M	1	M	1	--	--	--	--	M	1
AMAJA04010	Common Gray Fox	14		0		1	--	--	--	--	M	1
AMAJB01010	Black Bear	31	M	1	M	0	--	--	--	--		0
AMAJE02010	Common Raccoon	47	M	1	M	1	--	--	--	--	M	1
AMAJF01010	American Marten	27		0	C	1	--	--	--	--	C	1
AMAJF01020	Fisher	28	C	1	M	1	--	--	--	--	C	1
AMAJF02010	Ermine	35	M	1	M	0	--	--	--	--		0
AMAJF02030	Long-tailed Weasel	19	M	1	M	1	--	--	--	--	C	1
AMAJF02050	Mink	38	M	1	M	0	--	--	--	--	M	1
AMAJF06010	Striped Skunk	48	M	1	M	1	--	--	--	--	M	1
AMAJF08010	Northern River Otter	34	M	1	M	1	--	--	--	--	M	1
AMAJH03010	Lynx	2		0		1	--	--	--	--	O	0
AMAJH03020	Bobcat	25	O	0	M	0	--	--	--	--	M	1
AMALC02020	White-tailed Deer	43	M	1	M	1	--	--	--	--	M	1
AMALC03010	Moose	42	O	0	M	1	--	--	--	--	M	1

Birds

Element Code	Common name	LOORs	MDI, Acadia NP Results	MDI, Acadia NP Range	Moosehorn NWR Results	Moosehorn NWR Range	Sunkhaze Meadows NWR Results	Sunkhaze Meadows NWR Range	Petit Manan NWR Results	Petit Manan NWR Range	Rachel Carson NWR Results	Rachel Carson NWR Range
ABNBA01030	Common Loon	66	M	1	M	1	C	1	C	1	M	1
ABNCA02010	Pied-billed Grebe	20	M	1	M	1	M	1	M	1	C	1
ABNGA01020	American Bittern	33	M	1	M	1	M	1	M	1	M	1
ABNGA02010	Least Bittern	3	M	1	C	1	C	1	M	1	M	1
ABNGA04010	Great Blue Heron	40	M	1	C	1	M	1	C	1	C	1
ABNGA06030	Snowy Egret	80		0		1	M	1	M	1	M	1
ABNGA06040	Little Blue Heron	0		0		1	M	1	M	1	C	1
ABNGA07010	Cattle Egret	0		0		1	O	0		0	M	1
ABNGA08010	Green Heron	42	M	1	M	1		0		0	C	1
ABNGA11010	Bl.- C. Night-Heron	53	C	1	C	1		0		0		0
ABNGE02010	Glossy Ibis	0		0		1	M	1	M	1	M	1
ABNJB05030	Canada Goose	11	M	1	M	0	M	1	M	1	M	1
ABNJB09010	Wood Duck	56	M	1	M	1	M	1	M	1	M	1
ABNJB10010	Green-winged Teal	8	M	1	M	1	M	1	M	1	M	1
ABNJB10040	American Black Duck	89	M	1	M	1		0		0		0
ABNJB10060	Mallard	29	M	1	M	1		0		0		0
ABNJB10130	Blue-winged Teal	47	M	1	M	1	M	1	M	1	C	1
ABNJB10180	American Wigeon	0		0		1	C	1	M	1	C	1
ABNJB11040	Ring-necked Duck	95	M	1	M	1		0		0	C	1
ABNJB18010	Common Goldeneye	54	C	1	M	0	C	1	C	1		0
ABNJB20010	Hooded Merganser	60	M	1	M	1	C	1	C	1	C	1
ABNJB21010	Common Merganser	73	M	1	M	1	M	1	C	1	C	1
ABNJB21020	Red-breasted Merganser	55	M	1	C	1	C	1	C	1	C	1
ABNKA02010	Turkey Vulture	17	C	1		1	M	1	M	1	M	1
ABNKC01010	Osprey	19	M	1	M	0	M	1	M	1	C	1
ABNKC10010	Bald Eagle	12	M	1	M	1	M	1	M	1	M	1
ABNKC11010	Northern Harrier	49	M	1	M	1	C	1	C	1	M	1

Birds cont.

			MDI, Acadia NP		Moosehorn NWR		Sunkhaze Meadows NWR		Petit Manan NWR		Rachel Carson NWR	
Element Code	**Common name**	**LOORs**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**
ABNKC12020	Sharp-shinned Hawk	31	M	1	M	0	C	1	C	1	C	1
ABNKC12040	Cooper's Hawk	9	C	1	M	1	C	1	C	1	C	1
ABNKC12060	Northern Goshawk	28	M	1	M	1	M	1	C	1	C	1
ABNKC19030	Red-shouldered Hawk	43	C	1	M	1	M	1	M	1	C	1
ABNKC19050	Broad-winged Hawk	104	M	1	M	1	M	1	C	1	M	1
ABNKC19110	Red-tailed Hawk	94	M	1	C	1	M	1	M	1	M	1
ABNKC22010	Golden Eagle	0		0		1	C	1	C	1	C	1
ABNKD06020	American Kestrel	123	M	1	M	1	O	0	C	1	M	1
ABNKD06030	Merlin	0	C	1	C	1	M	1	C	1	M	1
ABNKD06070	Peregrine Falcon	0	M	1		1	M	1	M	1	C	1
ABNLC09010	Spruce Grouse	59	M	1	M	1		0		1		0
ABNLC11010	Ruffed Grouse	99	M	1	M	1	M	1	M	1	C	1
ABNLC14010	Wild Turkey	32		0		0	M	1	M	1	M	1
ABNME01010	Yellow Rail	0	C	1	C	1	M	1	M	1	M	1
ABNME05030	Virginia Rail	15	M	1	M	1	M	1	M	1	C	1
ABNME08020	Sora	7	M	1	M	1	C	1	M	1	M	1
ABNME13010	Common Moorhen	22		0		1	M	1	M	1	C	1
ABNME14020	American Coot	0		0	O	0	M	1	M	1	M	1
ABNNB03090	Killdeer	116	M	1	M	0	M	1	C	1	C	1
ABNNF04020	Spotted Sandpiper	108	M	1	M	1		0		0		0
ABNNF06010	Upland Sandpiper	86	C	1	C	1	C	1	C	1	C	1
ABNNF18010	Common Snipe	71	C	1	M	1	M	1	M	1	M	1
ABNNF19020	American Woodcock	88	M	1	M	1	M	1	M	1	C	1
ABNNM03120	Herring Gull	51	M	1	C	1	M	1	C	1	C	1
ABNNM03210	Great Black-back. Gull	74	C	1	C	1	C	1	C	1		1

Birds cont.

Element Code	Common name	LOORs	MDI, Acadia NP Results	Range	Moosehorn NWR Results	Range	Sunkhaze Meadows NWR Results	Range	Petit Manan NWR Results	Range	Rachel Carson NWR Results	Range
ABNNM08070	Common Tern	39	M	1	C	1	C	1	C	1	C	1
ABNNM10020	Black Tern	117		0	C	1	M	1	M	1	M	1
ABNPB04040	Mourning Dove	157	M	1	M	1	M	1	C	1	C	1
ABNRB02010	Black-billed Cuckoo	36	M	1	M	1	M	1	M	1	M	1
ABNRB02020	Yellow-billed Cuckoo	37	C	1	M	1	M	1	M	1	C	1
ABNSB05010	Great Horned Owl	10	M	1	M	1	M	1	M	1	C	1
ABNSB12020	Barred Owl	25	C	1	M	1	C	1	C	1	C	1
ABNSB13010	Long-eared Owl	6	M	1	C	1	C	1	C	1	C	1
ABNSB13040	Short-eared Owl	0	C	1	C	1	M	1	M	1	M	1
ABNSB15020	Northern Saw-w. Owl	38	M	1	M	1	M	1	M	1	M	1
ABNTA02020	Common Nighthawk	52	M	1	M	1	M	1	C	1	C	1
ABNTA07070	Whip-poor-will	72	M	1	M	1	M	1	M	1		0
ABNUA03010	Chimney Swift	129	M	1	M	1	M	1	M	1	M	1
ABNUC45010	Ruby-thr. Hummingbird	76	M	1	M	1	M	1	C	1		0
ABNXD01020	Belted Kingfisher	103	M	1	M	1		0		0	C	1
ABNYF05010	Yellow-bell. Sapsucker	136	M	1	M	1	M	1	M	1	C	1
ABNYF07030	Downy Woodpecker	115	M	1	M	1	M	1	M	1	M	1
ABNYF07040	Hairy Woodpecker	113	M	1	M	1	M	1	M	1		0
ABNYF07080	Three-toed Woodpecker	16		0	C	1	M	1	M	1	M	1
ABNYF07090	Black-backed W.	63	M	1	M	1	M	1	C	1	M	1
ABNYF10020	Northern Flicker	139	M	1	M	1	M	1	M	1	M	1
ABNYF12020	Pileated Woodpecker	64	M	1	M	1	O	0	C	1		0
ABPAE32010	Olive-sided Flycatcher	65	M	1	M	1	M	1	C	1		0
ABPAE32060	Eastern Wood-pewee	146	M	1	M	0	M	1	M	1	M	1
ABPAE33010	Yellow-bell. Flycatcher	77	M	1	M	1	M	1	M	1	C	1
ABPAE33030	Alder Flycatcher	132	M	1	M	1	M	1	C	1	C	1
ABPAE33040	Willow Flycatcher	18	C	1	C	1	M	1	M	1	M	1
ABPAE33070	Least Flycatcher	148	M	1	M	0		0		0	C	1

Birds cont.

Element Code	Common name	LOORs	MDI, Acadia NP Results	MDI, Acadia NP Range	Moosehorn NWR Results	Moosehorn NWR Range	Sunkhaze Meadows NWR Results	Sunkhaze Meadows NWR Range	Petit Manan NWR Results	Petit Manan NWR Range	Rachel Carson NWR Results	Rachel Carson NWR Range
ABPAE35020	Eastern Phoebe	159	M	1	M	0	M	1	M	1	C	1
ABPAE43070	Great Crest. Flycatcher	133	M	1	M	1	M	1	M	1		0
ABPAE52060	Eastern Kingbird	131	M	1	M	1	M	1	M	1	C	1
ABPAT02010	Horned Lark	35	C	1	C	1	M	0	C	1	M	1
ABPAU01010	Purple Martin	67	C	1	M	1	C	1	C	1	M	1
ABPAU03010	Tree Swallow	168	M	1	M	0		0		0		0
ABPAU07010	N. Rough-winged S.	70	C	1	C	1		0	C	1	C	1
ABPAU08010	Bank Swallow	119	M	1	M	1		0		0		0
ABPAU09010	Cliff Swallow	87	M	1	M	1	C	1	C	1	C	1
ABPAU09030	Barn Swallow	141	M	1	M	1		0		0	C	1
ABPAV01010	Gray Jay	58	M	1	M	1		0		0	C	1
ABPAV02020	Blue Jay	151	M	1	M	1	M	1	C	1	C	1
ABPAV10010	American Crow	142	M	1	M	1	C	1	C	1	C	1
ABPAV10110	Common Raven	84	M	1	C	1	M	1	M	1	M	1
ABPAW01010	Black-cap. Chickadee	164	M	1	M	1		1	M	1		1
ABPAW01060	Boreal Chickadee	69	M	1	M	1	C	1	M	1	M	1
ABPAW01110	Tufted Titmouse	68	C	1		0	C	1	M	1	M	1
ABPAZ01010	Red-breasted Nuthatch	120	M	1	M	1		0		0	C	1
ABPAZ01020	White-breast. Nuthatch	109	M	1	C	1	M	1	C	1	M	1
ABPBA01010	Brown Creeper	85	M	1	M	1	M	1	C	1	M	1
ABPBG06130	Carolina Wren	0		0		1	C	1	C	1	C	1
ABPBG09010	House Wren	92	M	1	M	1	M	1	M	1	C	1
ABPBG09050	Winter Wren	154	M	1	M	1	C	1	M	1	C	1
ABPBG10010	Sedge Wren	0	M	1	M	1		0	M	1	C	1
ABPBG10020	Marsh Wren	5	C	1	M	1	M	1	M	1	C	1
ABPBJ05010	Golden-crown. Kinglet	82	M	1	M	1	C	1	C	1	C	1
ABPBJ05020	Ruby-crowned Kinglet	101	M	1	M	1	C	1	C	1	C	1

Birds cont.

			MDI, Acadia NP		Moosehorn NWR		Sunkhaze Meadows NWR		Petit Manan NWR		Rachel Carson NWR	
Element Code	**Common name**	**LOORs**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**
ABPBJ08010	Blue-gray Gnatcatcher	26		0		1		0		0	C	1
ABPBJ15010	Eastern Bluebird	83	M	1	M	1	M	1	M	1	M	1
ABPBJ18080	Veery	160	M	1	M	1	M	1	M	1		0
ABPBJ18100	Swainson's Thrush	143	M	1	M	1	C	1	C	1		0
ABPBJ18110	Hermit Thrush	138	M	1	M	1	M	1	M	1	M	1
ABPBJ18120	Bicknell's Thrush	2		0		1		0	C	1		1
ABPBJ19010	Wood Thrush	140	M	1	M	1	M	1	M	1	M	1
ABPBJ20170	American Robin	171	M	1	M	0	M	1	M	1	M	1
ABPBK01010	Gray Catbird	152	M	1	M	1	M	1	M	1	M	1
ABPBK03010	Northern Mockingbird	98	C	1	C	1	M	1	M	1	M	1
ABPBK06010	Brown Thrasher	90	M	1	C	1		0	C	1	M	1
ABPBM02050	American Pipit	0		0		1	M	1	C	1		0
ABPBN01020	Cedar Waxwing	156	M	1	M	1	M	1	M	1	C	1
ABPBW01160	Blue-headed Vireo	124	M	1	M	1	M	1	M	1	M	1
ABPBW01170	Yellow-throated Vireo	46		0	O	0		0	C	1	M	1
ABPBW01210	Warbling Vireo	57	M	1	M	0	M	1	C	1	M	1
ABPBW01230	Philadelphia Vireo	27		0	M	0	M	1	M	1	C	1
ABPBW01240	Red-eyed Vireo	169	M	1	M	1	M	1	M	1		0
ABPBX01020	Blue-winged Warbler	0		0		1		0		0		0
ABPBX01040	Tennessee Warbler	125	M	1	M	1	C	1	M	1	M	1
ABPBX01060	Nashville Warbler	150	M	1	M	1	M	1	C	1		0
ABPBX02010	Northern Parula	137	M	1	M	1	M	1	C	1	M	1
ABPBX03010	Yellow Warbler	153	M	1	M	1	M	1	C	1		0

Birds cont.

Element Code	Common name	LOORs	MDI, Acadia NP Results	Range	Moosehorn NWR Results	Range	Sunkhaze Meadows NWR Results	Range	Petit Manan NWR Results	Range	Rachel Carson NWR Results	Range
ABPBX03020	Chestnut-sided Warbler	149	M	1	M	1		0		0		0
ABPBX03030	Magnolia Warbler	127	M	1	M	1	C	1	M	1	M	1
ABPBX03040	Cape May Warbler	93	M	1	M	1	M	1	C	1	M	1
ABPBX03050	Black-throated Blue W.	106	M	1	M	0	M	1	M	1	M	1
ABPBX03060	Yellow-rump. Warbler	134	M	1	M	1	C	1		0		0
ABPBX03100	Black-throat. Green W.	121	M	1	M	0	M	1	M	1	M	1
ABPBX03120	Blackburnian Warbler	114	M	1	M	1		0		0	C	1
ABPBX03170	Pine Warbler	50	C	1	M	1		0		0	C	1
ABPBX03190	Prairie Warbler	48		0		1	M	1	C	1	C	1
ABPBX03210	Palm Warbler	23	M	1	M	1	C	1	C	1	C	1
ABPBX03220	Bay-breasted Warbler	96	M	1	M	0	C	1	C	1	C	1
ABPBX03230	Blackpoll Warbler	81	M	1	M	1	C	1	C	1	M	1
ABPBX05010	Black-and-white W.	135	M	1	M	1	M	1	M	1	M	1
ABPBX06010	American Redstart	162	M	1	M	1	M	1	C	1	C	1
ABPBX10010	Ovenbird	165	M	1	M	1	M	1	M	1	C	1
ABPBX10020	Northern Waterthrush	111	M	1	M	1	M	1	M	1	C	1
ABPBX10030	Louisiana Waterthrush	14		0		1	C	1	M	1	C	1
ABPBX11030	Mourning Warbler	102	C	1	M	1	M	1	M	1	M	1
ABPBX12010	Common Yellowthroat	170	M	1	M	1	M	1	M	1	M	1
ABPBX16020	Wilson's Warbler	13	M	1	M	1	M	1	M	1	M	1
ABPBX16030	Canada Warbler	126	M	1	M	1		0		0	C	1
ABPBX60010	Northern Cardinal	24	M	1	C	1	M	1	M	1	M	1
ABPBX61030	Rose-breasted Grosbeak	130	M	1	M	1	M	1	M	1	M	1
ABPBX64030	Indigo Bunting	100	M	1	M	1	M	1	C	1	M	1
ABPBX74030	Eastern Towhee	128	M	1	C	0	M	1	C	1	M	1
ABPBX94020	Chipping Sparrow	163	M	1	M	1	C	1	M	1	M	1
ABPBX94050	Field Sparrow	61	M	1	M	0	C	1	C	1	M	1
ABPBX45040	Scarlet Tanager	110	M	1	M	0	M	1	C	1	C	1

Birds cont.

Element Code	Common name	LOORs	MDI, Acadia NP Results	MDI, Acadia NP Range	Moosehorn NWR Results	Moosehorn NWR Range	Sunkhaze Meadows NWR Results	Sunkhaze Meadows NWR Range	Petit Manan NWR Results	Petit Manan NWR Range	Rachel Carson NWR Results	Rachel Carson NWR Range
ABPBX95010	Vesper Sparrow	79	C	1	M	1	M	1	C	1	C	1
ABPBX99010	Savannah Sparrow	75	M	1	M	1	C	1	M	1	M	1
ABPBXA0020	Grasshopper Sparrow	1		0		1	C	1	C	1	M	1
ABPBXA0050	Saltmarsh Sharp-tail. S.	4	O	0	O	1	C	1	C	1	M	1
ABPBXA2010	Fox Sparrow	0		0		1	M	1	C	1	C	1
ABPBXA3010	Song Sparrow	167	M	1	M	1	M	1	M	1	M	1
ABPBXA3020	Lincoln's Sparrow	62	M	1	M	1		0		0	C	1
ABPBXA3030	Swamp Sparrow	97	M	1	M	1	M	1	M	1	C	1
ABPBXA4020	White-throated Sparrow	166	M	1	C	1	M	1	C	1	M	1
ABPBXA5020	Dark-eyed Junco	145	M	1	M	1	M	1	M	1	C	1
ABPBXA9010	Bobolink	107	M	1	M	1	M	1	M	1	M	1
ABPBXB0010	Red-winged Blackbird	147	M	1	M	1	M	1	M	1	M	1
ABPBXB2020	Eastern Meadowlark	44	M	1	M	1	M	1	M	1		0
ABPBXB5010	Rusty Blackbird	21		0	M	1		0		0	C	1
ABPBXB6070	Common Grackle	158	M	1	M	1	M	1	M	1	M	1
ABPBXB7030	Brown-headed Cowbird	155	M	1	M	0		0		0	C	1
ABPBXB9190	Baltimore Oriole	112	M	1	M	1	M	1	C	1	C	1
ABPBY03010	Pine Grosbeak	45		0	O	0	M	1	M	1	M	1
ABPBY04020	Purple Finch	118	M	1	M	1	C	1		0		0
ABPBY05010	Red Crossbill	34	M	1	M	1	M	1	M	1	M	1
ABPBY05020	White-winged Crossbill	30	M	1	M	1	M	1	M	1	M	1
ABPBY06030	Pine Siskin	41	M	1	M	1	M	1	M	1		0
ABPBY06110	American Goldfinch	144	M	1	M	1	M	1	M	1	M	1
ABPBY09020	Evening Grosbeak	91	M	1	M	1	M	1	M	1	M	1

RESEARCH SITES

Amphibians

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Result	N Maine Forest, area 2 Range
AAAAA01060	Blue-spotted Salamander	4	--	--	C	1	--	--	--	--	--	--
AAAAA01090	Spotted Salamander	11	--	--	M	1	--	--	--	--	--	--
AAAAD03040	Dusky Salamander	2	--	--	C	1	--	--	--	--	--	--
AAAAD05010	N. Two-lined Salamander	10	--	--	M	1	--	--	--	--	--	--
AAAAD06020	Spring Salamander	3	--	--		0	--	--	--	--	--	--
AAAAD08010	Four-toed Salamander	1	--	--	M	1	--	--	--	--	--	--
AAAAD12020	Redback Salamander	8	--	--	M	1	--	--	--	--	--	--
AAAAF01030	Eastern Newt	7	--	--	M	1	--	--	--	--	--	--
AAABB01020	American Toad	14	--	--	M	1	--	--	--	--	--	--
AAABC02130	Gray Treefrog	13	--	--	C	1	--	--	--	--	--	--
AAABC05090	Spring Peeper	16	--	--	M	1	--	--	--	--	--	--
AAABH01070	Bullfrog	12	--	--	M	1	--	--	--	--	--	--
AAABH01090	Green Frog	15	--	--	M	1	--	--	--	--	--	--
AAABH01160	Pickerel Frog	9	--	--	M	1	--	--	--	--	--	--
AAABH01170	Northern Leopard Frog	5	--	--	M	1	--	--	--	--	--	--
AAABH01190	Mink Frog	6	--	--		0	--	--	--	--	--	--
AAABH01200	Wood Frog	17	--	--	M	1	--	--	--	--	--	--

Reptiles

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Results	N Maine Forest, area 2 Range
ARAAD01010	Painted Turtle	13	--	--	C	1	--	--	--	--	--	--
ARAAB01010	Snapping Turtle	11	--	--	M	1	--	--	--	--	--	--
ARAAD02010	Spotted Turtle	15	--	--		1	--	--	--	--	--	--
ARAAD02020	Wood Turtle	5	--	--	C	1	--	--	--	--	--	--
ARAAD04010	Blanding's Turtle	16	--	--		0	--	--	--	--	--	--
ARAAD08010	Eastern Box Turtle	10	--	--		0	--	--	--	--	--	--
ARAAE02040	Common Musk Turtle	3	--	--		0	--	--	--	--	--	--
ARADB07010	Racer	14	--	--		0	--	--	--	--	--	--
ARADB10010	Ringneck Snake	1	--	--	M	1	--	--	--	--	--	--
ARADB19050	Milk Snake	8	--	--	M	1	--	--	--	--	--	--
ARADB22060	Northern Water Snake	7	--	--	C	1	--	--	--	--	--	--
ARADB34010	Brown Snake	9	--	--	M	1	--	--	--	--	--	--
ARADB34030	Redbelly Snake	4	--	--	M	1	--	--	--	--	--	--
ARADB36120	Eastern Ribbon Snake	2	--	--	C	1	--	--	--	--	--	--
ARADB36130	Common Garter Snake	12	--	--	M	1	--	--	--	--	--	--
ARADB47010	Smooth Green Snake	6	--	--	M	1	--	--	--	--	--	--

Mammals

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Results	N Maine Forest, area 2 Range
AMAAA01010	Virginia Opossum	22	--	--	O	0	--	--	--	--	--	--
AMABA01010	Masked Shrew	51	--	--	M	1	--	--	--	--	--	--
AMABA01150	Water Shrew	17	--	--	M	1	--	--	--	--	--	--
AMABA01180	Smoky Shrew	18	--	--	M	1	--	--	--	--	--	--
AMABA01210	Long-tailed Shrew	4	--	--	M	1	--	--	--	--	--	--
AMABA01250	Pygmy Shrew	15	--	--	M	1	--	--	--	--	--	--
AMABA03010	N. Short-tailed Shrew	52	--	--	C	1	--	--	--	--	--	--
AMABB03010	Hairy-tailed Mole	23	--	--	C	1	--	--	--	--	--	--
AMABB05010	Star-nosed Mole	24	--	--	M	1	--	--	--	--	--	--
AMACC01010	Little Brown Myotis	21	--	--		0	--	--	--	--	--	--
AMACC01130	E. Small-footed Myotis	8	--	--		0	--	--	--	--	--	--
AMACC01150	Northern Myotis	7	--	--	M	1	--	--	--	--	--	--
AMACC02010	Silver-haired Bat	3	--	--	M	1	--	--	--	--	--	--
AMACC03020	Eastern Pipistrelle	10	--	--	C	1	--	--	--	--	--	--
AMACC04010	Big Brown Bat	20	--	--	C	1	--	--	--	--	--	--
AMACC05010	Eastern Red Bat	9	--	--	C	1	--	--	--	--	--	--
AMACC05030	Hoary Bat	11	--	--	C	1	--	--	--	--	--	--
AMAEB01050	New England Cottontail	6	--	--	M	1	--	--	--	--	--	--
AMAEB03010	Snowshoe Hare	46	--	--		0	--	--	--	--	--	--
AMAFB02230	Eastern Chipmunk	40	--	--	M	1	--	--	--	--	--	--
AMAFB03010	Woodchuck	45	--	--	M	1	--	--	--	--	--	--
AMAFB07010	Eastern Gray Squirrel	49	--	--	M	1	--	--	--	--	--	--

Mammals cont.

Element Code	Common Name	LOORs	N Maine Forest, area 1		Holt Research Forest		Nesowadnehunk Field, Baxter SP		White Mnts NF		N Maine Forest, area 2	
			Results	Range	Results	Range	Results	Range	Results	Range	Results	Range
AMAFB08010	Red Squirrel	50	--	--		0	--	--	--	--	--	--
AMAFB09010	S. Flying Squirrel	13	--	--	M	1	--	--	--	--	--	--
AMAFB09020	N. Flying Squirrel	33	--	--		0	--	--	--	--	--	--
AMAFE01010	American Beaver	44	--	--	M	1	--	--	--	--	--	--
AMAFF03040	Deer Mouse	56	--	--	M	1	--	--	--	--	--	--
AMAFF03070	White-footed Mouse	55	--	--	M	1	--	--	--	--	--	--
AMAFF09020	S. Red-backed Vole	53	--	--	C	1	--	--	--	--	--	--
AMAFF11010	Meadow Vole	54	--	--		0	--	--	--	--	--	--
AMAFF11090	Rock Vole	5	--	--	C	1	--	--	--	--	--	--
AMAFF11150	Woodland Vole	12	--	--	M	1	--	--	--	--	--	--
AMAFF15010	Muskrat	36	--	--	M	1	--	--	--	--	--	--
AMAFF17010	Southern Bog Lemming	16	--	--	M	1	--	--	--	--	--	--
AMAFF17020	Northern Bog Lemming	1	--	--	M	1	--	--	--	--	--	--
AMAFH01010	Meadow Jump. Mouse	29	--	--	M	1	--	--	--	--	--	--
AMAFH02010	Woodland Jump. Mouse	26	--	--		0	--	--	--	--	--	--
AMAFJ01010	Common Porcupine	39	--	--	C	1	--	--	--	--	--	--
AMAJA01010	Coyote	30	--	--	M	1	--	--	--	--	--	--
AMAJA03010	Red Fox	37	--	--	M	1	--	--	--	--	--	--
AMAJA04010	Common Gray Fox	14	--	--	M	1	--	--	--	--	--	--
AMAJB01010	Black Bear	31	--	--		0	--	--	--	--	--	--
AMAJE02010	Common Raccoon	47	--	--	C	1	--	--	--	--	--	--

Mammals cont.

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Results	N Maine Forest, area 2 Range
AMAJF01010	American Marten	27	--	--	C	1	--	--	--	--	--	--
AMAJF01020	Fisher	28	--	--	C	1	--	--	--	--	--	--
AMAJF02010	Ermine	35	--	--		0	--	--	--	--	--	--
AMAJF02030	Long-tailed Weasel	19	--	--	C	1	--	--	--	--	--	--
AMAJF02050	Mink	38	--	--		0	--	--	--	--	--	--
AMAJF06010	Striped Skunk	48	--	--	M	1	--	--	--	--	--	--
AMAJF08010	Northern River Otter	34	--	--	M	1	--	--	--	--	--	--
AMAJH03010	Lynx	2	--	--		0	--	--	--	--	--	--
AMAJH03020	Bobcat	25	--	--	C	1	--	--	--	--	--	--
AMALC02020	White-tailed Deer	43	--	--	M	1	--	--	--	--	--	--
AMALC03010	Moose	42	--	--	C	1	--	--	--	--	--	--

Birds

Element Code	Common Name	LOORs	N Maine Forest, area 1		Holt Research Forest		Nesowadnehunk Field, Baxter SP		White Mnts NF		N Maine Forest, area 2	
			Results	Range	Results	Range	Results	Range	Results	Range	Results	Range
ABNBA01030	Common Loon	66	C	1	C	1	C	1	M	1	C	1
ABNCA02010	Pied-billed Grebe	20	C	1	C	1	C	1	C	1	C	1
ABNGA01020	American Bittern	33	C	1	C	1	C	1		1	C	1
ABNGA02010	Least Bittern	3	C	1	C	1	C	1	C	1	M	1
ABNGA04010	Great Blue Heron	40	C	1	C	1	C	1	C	1	C	1
ABNGA06030	Snowy Egret	80	C	1	C	1	C	1	C	1	C	1
ABNGA06040	Little Blue Heron	0	C	1	C	1	C	1	C	1	C	1
ABNGA07010	Cattle Egret	0		0		0		0		0		0
ABNGA08010	Green Heron	42		0		1		0		0		0
ABNGA11010	Black-cr. Night-heron	53		0		0		0		0		0
ABNGE02010	Glossy Ibis	0	C	1	C	1	C	1	C	1	C	1
ABNJB05030	Canada Goose	11	C	1	C	1		0	C	1		0
ABNJB09010	Wood Duck	56	C	1	C	1	C	1	C	1	C	1
ABNJB10010	Green-winged Teal	8	C	1	C	1	C	1	C	1	C	1
ABNJB10040	American Black Duck	89		0		0		0		0		0
ABNJB10060	Mallard	29	C	1		0	C	1	C	1	C	0
ABNJB10130	Blue-winged Teal	47	M	1	M	1	C	1	M	1	M	1
ABNJB10180	American Wigeon	0	C	1	C	1	C	1	C	1	C	1
ABNJB11040	Ring-necked Duck	95		0		0		0		0		0
ABNJB18010	Common Goldeneye	54	C	1		0	C	1		0	C	1
ABNJB20010	Hooded Merganser	60	C	1	C	1	C	1	C	1	C	1
ABNJB21010	Common Merganser	73	C	1	C	1	C	1	C	1	C	1
ABNJB21020	Red-breasted Merganser	55		0	C	1		0		1		0
ABNKA02010	Turkey Vulture	17	M	1	M	1	M	1	M	1	M	1
ABNKC01010	Osprey	19	C	1	C	1	C	1		1	C	1
ABNKC10010	Bald Eagle	12	M	1	M	1	M	1	M	1	M	1
ABNKC11010	Northern Harrier	49	C	1	C	1	C	1	C	1	C	1
ABNKC12020	Sharp-shinned Hawk	31	C	1		1	M	1	C	1	C	1

Birds cont.

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Results	N Maine Forest, area 2 Range
ABNKC12040	Cooper's Hawk	9	C	1	C	1	C	1	M	1	C	1
ABNKC12060	Northern Goshawk	28	C	1	C	1	C	1	C	1	C	1
ABNKC19030	Red-shouldered Hawk	43	M	1	M	1	M	1	M	1	C	1
ABNKC19050	Broad-winged Hawk	104		0	C	1		0	C	1		0
ABNKC19110	Red-tailed Hawk	94	C	1	M	1	C	1	M	1	C	1
ABNKC22010	Golden Eagle	0		0	C	1		0		0		0
ABNKD06020	American Kestrel	123		0	C	1		0	C	1		0
ABNKD06030	Merlin	0	M	1	M	1	M	1	M	1	M	1
ABNKD06070	Peregrine Falcon	0	M	1	M	1	M	1	M	1	M	1
ABNLC09010	Spruce Grouse	59		0		0		1		1	C	1
ABNLC11010	Ruffed Grouse	99	M	1	M	1	M	1	M	1	M	1
ABNLC14010	Wild Turkey	32	M	1	M	1	M	1	M	1	M	1
ABNME05030	Virginia Rail	15	M	1	O	0	M	1	M	1	M	1
ABNME08020	Sora	7	C	1	C	1	C	1	C	1	C	1
ABNME01010	Yellow Rail	0	C	1	M	1	C	1	M	1	M	1
ABNME13010	Common Moorhen	22	C	1	C	1	M	1	M	1	C	1
ABNME14020	American Coot	0	M	1	M	1	M	1	M	1	M	1
ABNNB03090	Killdeer	116	C	1	C	1	C	1	C	1	C	1
ABNNF04020	Spotted Sandpiper	108		0		0		0		0		0
ABNNF06010	Upland Sandpiper	86	M	1	C	1	C	1	C	1	C	1
ABNNF18010	Common Snipe	71	C	1	C	1	C	1	C	1	C	1
ABNNF19020	American Woodcock	88	C	1	C	1	C	1	C	1	C	1
ABNNM03120	Herring Gull	51		0	C	1		0		0		0
ABNNM03210	Great Black-back. Gull	74		0		1		0		1		0
ABNNM08070	Common Tern	39		0	C	1		0	C	1		0
ABNNM10020	Black Tern	117	C	1	M	1	M	1	M	1	M	1

Birds cont.

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Results	N Maine Forest, area 2 Range
ABNPB04040	Mourning Dove	157	M	1	C	1	M	1	M	1	M	1
ABNRB02010	Black-billed Cuckoo	36	C	1	M	1	C	1	M	1	C	1
ABNRB02020	Yellow-billed Cuckoo	37	M	1	M	1	M	1	M	1	M	1
ABNSB05010	Great Horned Owl	10	C	1	C	1	C	1	C	1	M	1
ABNSB12020	Barred Owl	25	C	1		1		1		1	C	1
ABNSB13010	Long-eared Owl	6	M	1	M	1	M	1	M	1	M	1
ABNSB13040	Short-eared Owl	0	M	1	M	1	M	1	M	1	M	1
ABNSB15020	Northern Saw-whet Owl	38	M	1	M	1	M	1	M	1	M	1
ABNTA02020	Common Nighthawk	52	M	1	M	1	C	1	M	1	M	1
ABNTA07070	Whip-poor-will	72	C	1		0	C	1	C	1	M	1
ABNUA03010	Chimney Swift	129	M	1	M	1	M	1	M	1	M	1
ABNUC45010	Ruby-thr. Hummingbird	76	M	1	O	0	C	1	M	1	M	1
ABNXD01020	Belted Kingfisher	103		0	C	1		0		0		0
ABNYF05010	Yellow-bell. Sapsucker	136	M	1	M	1	M	1	M	1	M	1
ABNYF07030	Downy Woodpecker	115	M	1	M	1	M	1	M	1	M	1
ABNYF07040	Hairy Woodpecker	113	C	1		0	C	1		0	M	1
ABNYF07080	Three-toed Woodpecker	16	C	1	C	1	C	1	C	1	C	1
ABNYF07090	Black-backed W.	63		0	M	1		0	C	1	C	1
ABNYF10020	Northern Flicker	139	M	1	M	1	M	1	M	1	M	1
ABNYF12020	Pileated Woodpecker	64	M	1		0	C	1	M	1	M	1
ABPAE32010	Olive-sided Flycatcher	65	M	1		0	M	1		0	C	1
ABPAE32060	Eastern Wood-pewee	146	M	1	M	1	C	1	M	1	M	1
ABPAE33010	Yellow-bell. Flycatcher	77	C	1	C	1		1		1	C	1
ABPAE33030	Alder Flycatcher	132	M	1	M	1	M	1	M	1	M	1
ABPAE33040	Willow Flycatcher	18	C	1	M	1	C	1	M	1	M	1
ABPAE33070	Least Flycatcher	148		0	C	1		0		0		0
ABPAE35020	Eastern Phoebe	159	M	1	C	1	C	1	M	1	M	1

Birds cont.

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Results	N Maine Forest, area 2 Range
ABPAE43070	Great Crest. Flycatcher	133	M	1		0	M	1	M	1	M	1
ABPAE52060	Eastern Kingbird	131	M	1	M	1	M	1	M	1	M	1
ABPAT02010	Horned Lark	35		0	C	1		0	C	1		0
ABPAU01010	Purple Martin	67	C	1	C	1		1	C	1	C	1
ABPAU03010	Tree Swallow	168	C	1		0	C	1	C	1	C	1
ABPAU07010	N. Rough-winged S.	70	C	1		0	C	1		0	C	1
ABPAU08010	Bank Swallow	119		0	C	1	C	1	C	1	C	1
ABPAU09010	Cliff Swallow	87	C	1	C	1	C	1	C	1	C	1
ABPAU09030	Barn Swallow	141		0	C	1		0		0		0
ABPAV01010	Gray Jay	58		0	C	1		0		0		0
ABPAV02020	Blue Jay	151	C	1	C	1	C	1	C	1	C	1
ABPAV10010	American Crow	142	C	1	C	1		1		1	C	1
ABPAV10110	Common Raven	84	M	1	M	1	M	1	M	1	M	1
ABPAW01010	Black-cap. Chickadee	164	C	1		1		1		1	C	1
ABPAW01060	Boreal Chickadee	69	C	1	C	1	C	1		1	C	1
ABPAW01110	Tufted Titmouse	68	C	1	C	1	C	1	C	1	C	1
ABPAZ01010	Red-breasted Nuthatch	120		0		0		0		0		0
ABPAZ01020	White-breast. Nuthatch	109	M	1	C	1	M	1	M	1	M	1
ABPBA01010	Brown Creeper	85	C	1	C	1	C	1	M	1	C	1
ABPBG06130	Carolina Wren	0		0	C	1		0		0		0
ABPBG09010	House Wren	92	M	1	M	1	M	1	M	1	M	1
ABPBG09050	Winter Wren	154	C	1	C	1		1		1	C	1
ABPBG10010	Sedge Wren	0		0	C	1		0		0		0
ABPBG10020	Marsh Wren	5	C	1	C	1	C	1	C	1	C	1
ABPBJ05010	Golden-crowned K.	82	M	1	C	1	M	1	C	1	C	1
ABPBJ05020	Ruby-crowned Kinglet	101	C	1	C	1	C	1	C	1	C	1
ABPBJ08010	Blue-gray Gnatcatcher	26		0	C	1		0		0		0

Birds cont.

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	N Maine Forest, area 1 Range	Holt Research Forest Results	Holt Research Forest Range	Nesowadnehunk Field, Baxter SP Results	Nesowadnehunk Field, Baxter SP Range	White Mnts NF Results	White Mnts NF Range	N Maine Forest, area 2 Results	N Maine Forest, area 2 Range
ABPBJ15010	Eastern Bluebird	83	C	1	C	1	C	1		1	C	1
ABPBJ18080	Veery	160	M	1		0	C	1		0	M	1
ABPBJ18100	Swainson's Thrush	143	C	1		0	C	1	C	1	C	1
ABPBJ18110	Hermit Thrush	138	C	1	M	1	C	1	M	1	M	1
ABPBJ18120	Bicknell's Thrush	2	C	1		1		1		0	C	1
ABPBJ19010	Wood Thrush	140	C	1		1	C	1	C	1	C	1
ABPBJ20170	American Robin	171	M	1	M	1	M	1	M	1	M	1
ABPBK01010	Gray Catbird	152	C	1	M	1	C	1	M	1	C	1
ABPBK03010	Northern Mockingbird	98	C	1	M	1	C	1	M	1	M	1
ABPBK06010	Brown Thrasher	90		0	C	1		0		0		0
ABPBM02050	American Pipit	0	M	1		0	M	1	M	1	M	1
ABPBN01020	Cedar Waxwing	156	M	1	M	1	M	1	M	1	M	1
ABPBW01160	Blue-headed Vireo	124	M	1	M	1	C	1	M	1	M	1
ABPBW01170	Yellow-throated Vireo	46		0	C	1		0	C	1		0
ABPBW01210	Warbling Vireo	57		0	C	1		0	M	1	C	1
ABPBW01230	Philadelphia Vireo	27	C	1	C	1	C	1	C	1	C	1
ABPBW01240	Red-eyed Vireo	169	M	1		0	C	1		0	M	1
ABPBX01020	Blue-winged Warbler	0	C	1		0	C	1		0	C	1
ABPBX01040	Tennessee Warbler	125	C	1	C	1		1		1	C	1
ABPBX01060	Nashville Warbler	150	M	1		0	M	1	C	1	M	1
ABPBX02010	Northern Parula	137	M	1	M	1	M	1	M	1	M	1
ABPBX03010	Yellow Warbler	153	C	1		0	M	1	C	1	M	1
ABPBX03020	Chestnut-sided Warbler	149	C	1		0	C	1		0	C	1
ABPBX03030	Magnolia Warbler	127		0	M	1		0	C	1		0
ABPBX03040	Cape May Warbler	93	M	1	M	1	C	1	M	1	M	1
ABPBX03050	Black-throated Blue W.	106	M	1	M	1	M	1	M	1	M	1
ABPBX03060	Yellow-rumped Warbler	134	M	1		0	M	1	C	1	M	1
ABPBX03100	Black-throated Green W	121	M	1	M	1	C	1	M	1	M	1
ABPBX03120	Blackburnian Warbler	114		0		0		0		0		0

Birds cont.

			N Maine Forest, area 1		Holt Research Forest		Nesowadnehunk Field, Baxter SP		White Mnts NF		N Maine Forest, area 2	
Element Code	**Common Name**	**LOORs**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**	**Results**	**Range**
ABPBX03170	Pine Warbler	50		0	C	1		0	C	1		0
ABPBX03190	Prairie Warbler	48	C	1		1	C	1		1	C	1
ABPBX03210	Palm Warbler	23		0	C	1		0	C	1		0
ABPBX03220	Bay-breasted Warbler	96	C	1	C	1	C	1		1	C	1
ABPBX03230	Blackpoll Warbler	81		0	C	1		0		0		0
ABPBX05010	Black-and-white W.	135	C	1	M	1	M	1	M	1	M	1
ABPBX06010	American Redstart	162	C	1		1	C	1		1	C	1
ABPBX10010	Ovenbird	165	M	1	M	1	M	1	M	1	M	1
ABPBX10020	Northern Waterthrush	111	M	1	M	1	M	1	M	1	M	1
ABPBX10030	Louisiana Waterthrush	14	C	1	C	1	C	1	C	1	C	1
ABPBX11030	Mourning Warbler	102	C	1	M	1	C	1	M	1	C	1
ABPBX12010	Common Yellowthroat	170	C	1	C	1	C	1	C	1	C	1
ABPBX16020	Wilson's Warbler	13	M	1	M	1	M	1	M	1	M	1
ABPBX16030	Canada Warbler	126		0		1		0	C	1		0
ABPBX45040	Scarlet Tanager	110	M	1	C	1	M	1	M	1	M	1
ABPBX60010	Northern Cardinal	24	M	1	M	1	M	1	M	1	M	1
ABPBX61030	Rose-breasted Grosbeak	130	M	1	M	1	M	1	M	1	M	1
ABPBX64030	Indigo Bunting	100	M	1	M	1	C	1	M	1	M	1
ABPBX74030	Eastern Towhee	128	C	1	C	1	C	1	C	1	C	1
ABPBX94020	Chipping Sparrow	163	M	1	C	1	M	1	M	1	M	1
ABPBX94050	Field Sparrow	61		0	C	1		0	C	1		0
ABPBX95010	Vesper Sparrow	79	M	1	C	1	M	1	M	1	M	1
ABPBX99010	Savannah Sparrow	75	C	1	C	1		1		0	C	1
ABPBXA0020	Grasshopper Sparrow	1		1	C	1		0	C	1	C	1
ABPBXA0050	Saltmarsh Sharp-tail. S.	4		0	C	1		0	C	1	C	1
ABPBXA2010	Fox Sparrow	0	C	1	M	1	C	1	M	1	C	1
ABPBXA3010	Song Sparrow	167	C	1	C	1	M	1	M	1	M	1

Birds cont.

Element Code	Common Name	LOORs	N Maine Forest, area 1 Results	Range	Holt Research Forest Results	Range	Nesowadnehunk Field, Baxter SP Results	Range	White Mnts NF Results	Range	N Maine Forest, area 2 Results	Range
ABPBXA3020	Lincoln's Sparrow	62		0		0		0		0		0
ABPBXA3030	Swamp Sparrow	97		0		1		0	C	1	C	1
ABPBXA4020	White-throated Sparrow	166		0	C	1		0	C	1	C	1
ABPBXA5020	Dark-eyed Junco	145	M	1	M	1	M	1	M	1	M	1
ABPBXA9010	Bobolink	107	M	1	M	1	M	1	M	1	M	1
ABPBXB0010	Red-winged Blackbird	147	C	1	C	1	C	1	C	1	C	1
ABPBXB2020	Eastern Meadowlark	44	M	1	O	0	M	1	C	1	M	1
ABPBXB5010	Rusty Blackbird	21		0		0		0		0		0
ABPBXB6070	Common Grackle	158	M	1	M	1	M	1	M	1	M	1
ABPBXB7030	Brown-headed Cowbird	155		0	C	1		0	C	1		0
ABPBXB9190	Baltimore Oriole	112	M	1	C	1	C	1	C	1	C	1
ABPBY03010	Pine Grosbeak	45	M	1	M	1	M	1	M	1	M	1
ABPBY04020	Purple Finch	118	C	1		0	C	1	M	1	M	1
ABPBY05010	Red crossbill	34	M	1	M	1	M	1	M	1	M	1
ABPBY05020	White-winged Crossbill	30	M	1	M	1	M	1	M	1	M	1
ABPBY06030	Pine Siskin	41	C	1		0	C	1	M	1	M	1
ABPBY06110	American Goldfinch	144	C	1	M	1	C	1	M	1	C	1
ABPBY09020	Evening Grosbeak	91	M	1	M	1	M	1	M	1	M	1

Appendix 7. Results of ME-GAP accuracy assessment reported by Likelihood of Occurrence Ranks (LOORS) reported by test sites with checklists and research data for each taxonomic group. (see Glossary of Terms for definition).

Amphibians

Mount Desert Island and Acadia National Park	Low	Grouped LOORs[a]	High
	1	2	3
Predicted species not present (commission)	0	0	0
Present species not predicted (omission)	0	0	0
Predicted species present (correct)	5	5	5

Rachel Carson National Wildlife Refuge	Low	Grouped LOORs	High
	1	2	3
Predicted species not present (commission)	0	0	0
Present species not predicted (omission)	0	0	0
Predicted species present (correct)	5	6	5

Reptiles

Mount Desert Island and Acadia National Park	Low	Grouped LOORs	High
	1	2	3
Predicted species not present (commission)	0	0	1
Present species not predicted -- range (omission)	1	0	1
Present species not predicted (omission)	0	0	0
Predicted species present (correct)	3	5	2

Rachel Carson National Wildlife Refuge	Low	Grouped LOORs	High
	1	2	3
Predicted species not present (commission)	0	0	0
Present species not predicted -- range (omission)	0	0	0
Present species not predicted (omission)	0	0	0
Predicted species present (correct)	5	6	5

Mammals

Mount Desert Island and Acadia National Park	Low		Grouped LOORs		High
	1	2	3	4	5
Predicted species not present (commission)	6	0	1	0	0
Predicted species not present -- range (commission)	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	1	0	1
Present species not predicted (omission)	0	0	0	0	0
Predicted species present (correct)	2	8	8	9	8

Moosehorn National Wildlife Refuge

	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	8	3	0	0	0
Predicted species not present -- range (commission)	0	0	1	0	0
Present species not predicted -- range (omission)	0	0	0	0	1
Present species not predicted (omission)	0	0	0	0	0
Predicted species present (correct)	0	6	9	9	8

Rachel Carson National Wildlife Refuge

	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	1	3	1	0	0
Predicted species not present -- range (commission)	0	0	0	0	0
Present species not predicted -- range (omission)	1	0	2	0	2
Present species not predicted (omission)	0	0	0	0	0
Predicted species present (correct)	7	6	9	9	8

Birds

Mount Desert Island and Acadia National Park

	0	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	3	7	8	5	0	0
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted -- range (omission)	0	1	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	2	23	22	26	31	30

Moosehorn National Wildlife Refuge

	0	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	3	6	6	6	2	1
Predicted species not present -- range (commission)	0	0	0	0	1	0
Present species not predicted -- range (omission)	1	1	2	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	1	24	24	26	29	29

Sunkhaze Meadows National Wildlife Refuge

	0	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	3	14	11	5	5	1
Predicted species not present -- range (commission)	0	1	0	0	0	0
Present species not predicted -- range (omission)	0	2	0	1	0	0

Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	0	14	18	25	25	28

<u>Rachel Carson National Wldlife Refuge</u>		Low		Grouped LOORs		High
	0	1	2	3	4	5
Predicted species not present (commission)	8	19	18	16	9	4
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	0	10	11	13	20	25

<u>Petit Manan National Wildlife Refuge</u>		Low		Grouped LOORs		High
	0	1	2	3	4	5
Predicted species not present (commission)	4	17	20	13	9	1
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	0	13	10	18	22	2

SITES WITH RESEARCH DATA

Amphibians

<u>Holt Research Forest</u>	low	Grouped LOORs	high
	1	2	3
Predicted species not present (commission)	2	0	1
Present species not predicted (omission)	0	0	0
Predicted species present (correct)	3	5	4

Reptiles

<u>Holt Research Forest</u>	low	Grouped LOORs	high
	1	2	3
Predicted species not present (commission)	1	2	1
Present species not predicted -- range limit (omission)	0	0	0
Present species not predicted (omission)	0	0	0
Predicted species present (correct)	2	2	3

Mammals

Holt Research Forest	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	7	6	1	1	0
Predicted species not present -- range (commission)	0	0	0	0	0
Present species not predicted -- (omission)	0	0	0	0	1
Present species not predicted (omission)	0	0	0	0	0
Predicted species present (correct)	1	2	8	8	8

Birds

North Maine Forestlands (area 2), Moosehead Lake	0	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	0	22	18	16	8	5
Predicted species not present -- range (commission)	1	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	5	6	10	13	20	23

Holt Research Forest	0	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	2	25	24	17	9	4
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	1	1	1	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	0	2	3	11	18	23

Nesowadnehunk Field, Baxter State Park	0	Low 1	Grouped LOORs 2	3	4	High 5
Predicted species not present (commission)	5	22	16	15	10	8
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted b/c of range (omission)	0	0	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	0	3	9	11	15	17

White Mountains National Forest

	Low		Grouped LOORs		High	
	0	1	2	3	4	5
Predicted species not present (commission)	9	11	8	12	11	10
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	1	14	17	13	14	15

Rachel Carson National Wildlife Refuge

	Low		Grouped LOORs		High	
	0	1	2	3	4	5
Predicted species not present (commission)	8	19	18	16	9	4
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	0	10	11	13	20	25

North Maine Forestlands area 1, Northern Townships

	Low		Grouped LOORs		High	
	0	1	2	3	4	5
Predicted species not present (commission)	5	25	17	12	8	10
Predicted species not present -- range (commission)	0	0	0	0	0	0
Present species not predicted -- range (omission)	0	0	0	0	0	0
Present species not predicted (omission)	0	0	0	0	0	0
Predicted species present (correct)	0	2	10	15	19	17

Appendix 8. Federal, Heritage, and State rankings of terrestrial vertebrate species, with areas (km^2) in land management Categories 1 and 2. Species are sorted in ascending order by their percent of habitat in management Categories 1 and 2 lands.

		Rankings[a]			Habitat		
Common name	**% ME in range**	**NHP**	**FWS**	**IFW**	**Cat. 1& 2**	**Total**	**% in 1 & 2**
AMPHIBIANS							
Gray Treefrog	56	.	.	.	818	36,137	2.26
Northern Leopard Frog	100	S3	.	.	1,013	38,764	2.61
Spring Salamander	33	S3	.	.	67	2,324	2.86
Pickerel Frog	100	.	.	.	2,224	76,028	2.92
N. Redback Salamander	100	.	.	.	1,864	63,428	2.94
American Toad	100	.	.	.	2,174	72,303	3.01
Spring Peeper	100	.	.	.	2,121	70,572	3.01
Wood Frog	100	.	.	.	2,120	67,007	3.16
Spotted Salamander	100	.	.	.	2,069	64,179	3.22
Blue-spotted Salamander	100	.	.	.	2,020	61,273	3.30
Green Frog	100	.	.	.	2,053	61,516	3.34
Eastern Newt	100	.	.	.	885	25,334	3.49
Dusky Salamander	97	.	.	.	173	4,818	3.59
Mink Frog	72	.	.	.	277	7,585	3.65
N. Two-lined Salamander	100	.	.	.	870	23,682	3.67
Bullfrog	89	.	.	.	351	9,195	3.81
Four-toed Salamander	49	S3	.	.	279	5,855	4.77
REPTILES							
Common Musk Turtle	2	S3	.	.	3	334	0.87
Smooth Green Snake	56	.	.	.	366	18,553	1.97
Racer	6	S2	.	E	64	2,912	2.21
Brown Snake	6	S3	.	.	90	4,042	2.21
Milk Snake	30	.	.	.	410	16,642	2.46
Eastern Ribbon Snake	29	S3	.	.	80	3,138	2.54
Blanding's Turtle	3	S2	.	E	37	1,441	2.58
Eastern Box Turtle	1	S1	.	E	9	321	2.72

Common Garter Snake	100	.	.	.	2,225	77,909	2.86
Northern Water Snake	23	.	.	.	47	1,594	2.93
Spotted Turtle	3	S3	.	T	5	175	2.98
Snapping Turtle	66	.	.	.	286	9,114	3.13
Ringneck Snake	84	.	.	.	1,754	54,477	3.22
Redbelly Snake	86	.	.	.	2,031	62,687	3.24
Wood Turtle	100	.	.	.	1,316	39,652	3.32
Painted Turtle	70	.	.	.	326	9,575	3.41
BIRDS							
American Wigeon	1	S1S2B,S3N	.	.	< 1	181	0.22
Herring Gull	100	.	.	.	39	9,736 [c]	0.41
Grasshopper Sparrow	9	S1B	.	E	11	1,233	0.89
Great Black-backed Gull	15	.	.	.	70	6,858 [c]	1.02
Field Sparrow	49	S3S4B	.	.	73	6,547	1.11
Mourning Dove	100	.	.	.	219	18,319	1.19
Blue-winged Warbler	1	S1B	.	.	1	69	1.21
Purple Martin	54	S3B	.	.	127	9,376	1.36
Horned Lark	100	S3B,S3S4N	.	.	106	7,700	1.37
Brown Thrasher	74	.	.	.	169	12,360	1.37
Barn Swallow	100	.	.	.	208	14,635	1.42
Killdeer	100	S3,S5B	.	.	216	14,921	1.45
Vesper Sparrow	61	S3S4B	.	.	102	6,786	1.51
Eastern Meadowlark	78	S3S4B	.	.	122	7,653	1.59
Indigo Bunting	76	.	.	.	232	14,171	1.63
Northern Mockingbird	77	.	.	.	212	12,968	1.64
Savannah Sparrow	100	.	.	.	133	7,913	1.68
American Goldfinch	100	.	.	.	285	16,681	1.71
Brown-headed Cowbird	100	.	.	.	389	22,634	1.72
Carolina Wren	3	S1B?,S1N	.	.	13	749	1.73
Bobolink	100	.	.	.	127	6,915	1.83
House Wren	70	.	.	.	785	42,366	1.85
Wild Turkey	16	.	.	.	144	7,738	1.86
American Kestrel	100	S3N,S5B	.	.	314	16,631	1.89
Prairie Warbler	7	.	.	.	31	1,648	1.89

Black Tern	2	S2B	.	E	1	58	1.95
Eastern Towhee	48	.	.	.	473	24,073	1.97
Bank Swallow	100	.	.	.	290	14,457	2.01
N. Rough-winged Swallow	64	S3S4B	.	.	227	11,260 [b]	2.01
Eastern Bluebird	100	.	.	.	417	20,571	2.03
Common Nighthawk	100	.	.	.	442	21,595	2.05
Yellow Warbler	100	.	.	.	305	14,733	2.07
Yellow-billed Cuckoo	39	S3?B	.	.	244	11,698	2.09
Eastern Kingbird	100	.	.	.	545	25,928	2.10
American Woodcock	100	.	.	.	308	14,586	2.11
Lincoln's Sparrow	72	.	.	.	286	13,590	2.11
Mourning Warbler	92	.	.	.	362	16,750	2.16
Northern Harrier	100	.	.	.	238	10,902	2.18
Ruffed Grouse	100	.	.	.	999	44,570	2.24
Belted Kingfisher	100	S3N,S5B	.	.	346	15,372 [b]	2.25
Whip-poor-will	83	S3B	.	.	522	22,900	2.28
Chimney Swift	100	.	.	.	491	20,896	2.35
Wilson's Warbler	79	S3S4B	.	.	370	15,594	2.37
Chestnut-sided Warbler	100	.	.	.	677	28,013	2.42
Yellow-throated Vireo	16	S3B	.	.	145	5,948	2.44
Warbling Vireo	100	.	.	.	940	38,303	2.45
Least Flycatcher	100	.	.	.	910	36,934	2.46
Red-tailed Hawk	100	S3N,S5B	.	.	1,738	69,978	2.48
American Redstart	100	.	.	.	1,600	63,203	2.53
Cattle Egret	3	S1B	.	.	33	1,304	2.54
Willow Flycatcher	31	S3?B	.	.	284	11,148	2.54
Red-eyed Vireo	100	.	.	.	1,561	60,890	2.56
Wood Thrush	100	.	.	.	1,555	60,331	2.58
Cliff Swallow	100	.	.	.	327	12,548	2.60
Eastern Wood-pewee	100	.	.	.	1,653	63,077	2.62
Canada Goose	100	.	.	.	416	15,822	2.63
Mallard	100	.	.	.	515	19,388	2.66
Downy Woodpecker	100	.	.	.	1,513	56,315	2.69
Sharp-shinned Hawk	100	S2S3N,S3S4B	.	.	1,882	68,861	2.73
Dark-eyed Junco	100	.	.	.	2,080	75,351	2.76
Philadelphia Vireo	70	.	.	.	1,022	37,079	2.76

Gray Catbird	100	.	.	.	2,134	76,932	2.77
Black-and-white Warbler	100	.	.	.	1,355	48,761	2.78
American Robin	100	.	.	.	2,154	77,553	2.78
Spotted Sandpiper	100	.	.	.	239	8,532	2.80
Black-billed Cuckoo	100	.	.	.	1,952	69,661	2.80
American Crow	100	.	.	.	2,190	78,115	2.80
Baltimore Oriole	100	S2S3N,S5B	.	.	1,328	47,217	2.81
Nashville Warbler	100	.	.	.	2,132	75,924	2.81
Chipping Sparrow	100	S3NS5B	.	.	2,120	75,584	2.81
Veery	100	.	.	.	1,539	54,797	2.81
Cedar Waxwing	100	.	.	.	2,042	72,315	2.82
Black-throat. Blue Warbler	100	.	.	.	1,465	51,997	2.82
White-breasted Nuthatch	100	.	.	.	1,335	47,154	2.83
Song Sparrow	100	.	.	.	2,192	77,604	2.83
Common Yellowthroat	100	.	.	.	2,190	77,306	2.83
Hermit Thrush	100	.	.	.	1,720	60,498	2.84
Common Grackle	100	.	.	.	1,465	51,427	2.85
Blue-gray Gnatcatcher	9	S2S3	.	.	90	3,147	2.86
Common Raven	100	.	.	.	2,201	76,612	2.87
Eastern Phoebe	100	.	.	.	2,260	78,626	2.87
Tree Swallow	100	.	.	.	1,923	66,819	2.88
Common Loon	100	.	.	.	163	5,656	2.89
Tufted Titmouse	29	.	.	.	367	12,658	2.90
Blue-headed Vireo	100	.	.	.	1,937	66,605	2.91
Rose-breasted Grosbeak	100	.	.	.	2,063	70,901	2.91
Blue Jay	100	.	.	.	2,005	68,112	2.94
Northern Goshawk	100	S3?B,S3?N	.	.	1,728	58,656	2.95
Alder Flycatcher	100	.	.	.	399	13,546	2.95
White-throated Sparrow	100	.	.	.	2,105	71,378	2.95
Northern Flicker	100	.	.	.	2,036	68,945	2.95
Broad-winged Hawk	100	.	.	.	1,742	58,950	2.95
Great Horned Owl	100	.	.	.	2,060	69,330	2.97
Ruby-throat. Hummingbird	100	.	.	.	2,136	71,836	2.97
Black-capped Chickadee	100	.	.	.	2,040	68,755	2.97
Canada Warbler	100	.	.	.	2,089	70,272	2.97
Upland Sandpiper	49	S3B	.	T	123	4,127	2.97

Three-toed Woodpecker	73	S3	.	.	863	28,971	2.98
Yellow-bellied Sapsucker	98	.	.	.	2,054	68,510	3.00
Great Crested Flycatcher	99	.	.	.	1,491	49,707	3.00
Long-eared Owl	100	S1S3B,SZN	.	.	2,055	68,158	3.01
Barred Owl	100	.	.	.	2,034	67,386	3.02
Magnolia Warbler	100	.	.	.	1,673	55,308	3.02
Blue-winged Teal	61	.	.	.	246	8,148	3.02
Merlin	38	S3B,SZN	.	.	613	20,302	3.02
Red-winged Blackbird	100	.	.	.	327	10,824	3.03
Purple Finch	100	.	.	.	1,666	55,031	3.03
Winter Wren	100	.	.	.	1,725	56,841	3.03
Olive-sided Flycatcher	100	.	.	.	1,597	52,204	3.06
Green-winged Teal	100	.	.	.	422	13,749	3.07
Pine Warbler	66	.	.	.	531	17,323	3.07
Osprey	100	.	.	.	1,183	38,581 [b]	3.07
Turkey Vulture	26	.	.	.	435	13,969	3.12
Hairy Woodpecker	100	.	.	.	1,943	61,371	3.17
Spruce Grouse	85	.	.	.	1,110	35,030	3.17
Pileated Woodpecker	100	.	.	.	1,954	61,400	3.18
Tennessee Warbler	83	.	.	.	1,809	56,928	3.18
Northern Saw-whet Owl	100	.	.	.	2,005	62,916	3.19
Yellow-rumped Warbler	100	.	.	.	1,509	47,055	3.21
Cooper's Hawk	84	S3S4B,S3?N	.	.	1,729	53,852	3.21
Brown Creeper	100	.	.	.	1,951	60,651	3.22
Common Snipe	100	.	.	.	277	8,588	3.23
Blackburnian Warbler	100	.	.	.	1,815	56,236	3.23
Northern Cardinal	36	.	.	.	557	17,210	3.23
Scarlet Tanager	100	.	.	.	1,917	59,245	3.24
Black-throat. Green Warbler	100	.	.	.	1,899	58,541	3.24
Ovenbird	100	.	.	.	1,888	58,313	3.24
Common Tern	67	.	.	.	27	827 [b]	3.25
Pied-billed Grebe	98	.	.	.	176	5,318	3.32
Red-breasted Nuthatch	100	.	.	.	1,476	44,249	3.34
American Black Duck	100	.	.	.	459	13,568	3.38
Northern Parula	95	.	.	.	1,857	54,539	3.40
Red-breasted Merganser	44	S3B,S5N	.	.	134	3,930 [b]	3.41

Red-shouldered Hawk	83	S3N,S4B	.	.	1,821	53,291	3.42
Pine Siskin	100	.	.	.	1,572	45,907	3.42
Black-backed Woodpecker	73	.	.	.	1,304	37,937	3.44
Evening Grosbeak	96	.	.	.	1,413	41,100	3.44
Common Merganser	90	.	.	.	930	26,762	3.47
Pine Grosbeak	49	S3?B,S3S5N	.	.	665	19,134	3.48
Swainson's Thrush	81	.	.	.	1,474	42,398	3.48
Louisiana Waterthrush	11	S2B	.	.	50	1,419	3.49
Ruby-crowned Kinglet	91	.	.	.	1,349	38,144	3.54
Bay-breasted Warbler	86	.	.	.	1,373	38,346	3.58
Wood Duck	100	.	.	.	1,053	29,330	3.59
Red Crossbill	100	S3S4B,S3S4N	.	.	1,074	29,839	3.60
Northern Waterthrush	100	.	.	.	1,236	34,258	3.61
Green Heron	45	S3S4B	.	.	487	13,445	3.63
Palm Warbler	78	.	.	.	206	5,651	3.64
White-winged Crossbill	97	S3S4B,S3S4N	.	.	1,058	28,672	3.69
Short-eared Owl	65	S1B,S1N	.	.	191	5,145	3.72
Fox Sparrow	32	S2B,S2N?	.	.	748	19,988	3.74
Golden-crowned Kinglet	95	.	.	.	1,073	28,661	3.74
Hooded Merganser	100	.	.	.	804	21,284	3.78
Great Blue Heron	100	.	.	.	821	21,556	3.81
Ring-necked Duck	100	.	.	.	347	9,020	3.84
Cape May Warbler	76	.	.	.	938	24,376	3.85
Common Goldeneye	94	.	.	.	759	19,623	3.87
Yellow-bellied Flycatcher	90	.	.	.	1,162	29,398	3.95
Blackpoll Warbler	59	.	.	.	1,361	34,145	3.99
Boreal Chickadee	71	.	.	.	1,222	29,717	4.11
Gray Jay	67	.	.	.	866	20,978	4.13
Little Blue Heron	3	S1B	.	.	28	675	4.19
Rusty Blackbird	62	S3N,S3S4B	.	.	606	14,334	4.23
Common Moorhen	21	S2?B	.	.	20	443	4.49
Black-crowned Night-heron	20	S2B	.	.	253	5,189	4.88
Snowy Egret	4	S3B	.	.	46	936	4.90
American Bittern	100	.	.	.	187	3,693	5.06
Least Bittern	30	S2B	.	.	42	777	5.38
Swamp Sparrow	100	.	.	.	174	2,745	6.35

Sora	100	.	.	.	130	2,013	6.47
Virginia Rail	89	.	.	.	130	1,864	6.98
Golden Eagle	3	S1B,S1N	.	E	33	461	7.16
Yellow Rail	100	SPB	.	.	69	949	7.25
Sedge Wren	43	S1B	.	E	44	567	7.74
Bald Eagle	100	.	T	T	86	1,073 [b]	8.03
Marsh Wren	41	.	.	.	91	1,111	8.17
Glossy Ibis	2	S2B	.	.	17	163	10.35
American Coot	16	S2?B	.	.	22	159	13.51
Nel.=s Sharp-tailed Sparrow	8	S3S4B	.	.	12	86	13.80
Peregrine Falcon	4	S1S2N,S2B	E	E	703	2,404	29.25
Bicknell's Thrush	25	S3B	.	.	61	208	29.36
Salt. Sharp-tailed Sparrow	2	S3B	.	.	17	40	41.27
American Pipit	0	S1B,S3N	.	E	10	10	100.00

MAMMALS							
New England Cottontail	9	S2	.	.	20	1,723	1.16
Red Fox	100	.	.	.	579	32,972	1.76
Snowshoe Hare	100	.	.	.	461	22,624	2.04
Lynx	31	S2	.	.	340	16,598	2.05
Woodland Vole	4	S1	.	.	28	1,336	2.12
Virginia Opossum	6	.	.	.	60	2,606	2.31
Eastern Chipmunk	100	.	.	.	1,478	62,888	2.35
Woodchuck	100	.	.	.	858	35,194	2.44
Eastern Gray Squirrel	78	.	.	.	933	36,131	2.58
White-footed Mouse	18	.	.	.	268	10,249	2.61
Common Gray Fox	17	.	.	.	264	9,726	2.72
Hairy-tailed Mole	100	.	.	.	1,896	69,685	2.72
Southern Bog Lemming	100	.	.	.	1,549	56,718	2.73
Bobcat	93	.	.	.	1,832	65,724	2.79
White-tailed Deer	100	.	.	.	2,137	76,607	2.79
Eastern Red Bat	100	SU	.	.	2,269	81,044	2.80
Striped Skunk	100	.	.	.	2,210	78,809	2.80
Southern Red-backed Vole	100	.	.	.	2,128	75,753	2.81
Northern Myotis	100	.	.	.	2,334	82,645	2.82

Little Brown Myotis	100	.	.	.	2,350	83,472	2.82
Masked Shrew	100	.	.	.	2,216	78,692	2.82
Hoary Bat	100	SU	.	.	2,267	80,510	2.82
Meadow Vole	100	.	.	.	2,214	78,065	2.84
Moose	91	.	.	.	1,716	60,252	2.85
Long-tailed Weasel	100	.	.	.	2,194	76,933	2.85
N. Short-tailed Shrew	100	.	.	.	2,203	77,148	2.86
Meadow Jumping Mouse	100	.	.	.	2,218	77,573	2.86
Big Brown Bat	100	.	.	.	2,276	79,096	2.88
Common Raccoon	100	.	.	.	1,933	67,034	2.88
Pygmy Shrew	99	.	.	.	2,165	75,115	2.88
Ermine	100	.	.	.	2,198	75,825	2.90
E. Small-footed Myotis	14	S1S2	.	.	147	5,005	2.93
Coyote	100	.	.	.	2,217	74,411	2.98
Smoky Shrew	100	.	.	.	2,158	72,120	2.99
Black Bear	90	.	.	.	1,954	64,336	3.04
Common Porcupine	100	.	.	.	2,122	69,651	3.05
Deer Mouse	86	.	.	.	1,844	60,308	3.06
Star-nosed Mole	100	.	.	.	1,174	37,443	3.14
Fisher	99	.	.	.	1,953	61,687	3.17
American Beaver	100	.	.	.	1,025	31,929	3.21
Northern Flying Squirrel	100	.	.	.	1,807	56,104	3.22
Muskrat	100	.	.	.	399	12,280	3.25
Long-tailed Shrew	38	.	.	.	530	16,048	3.30
Red Squirrel	100	.	.	.	1,423	42,594	3.34
American Marten	68	.	.	.	1,297	38,841	3.34
Silver-haired Bat	100	SU	.	.	1,419	42,093	3.37
Woodland Jumping Mouse	98	.	.	.	725	21,407	3.38
Eastern Pipistrelle	24	SU	.	.	426	12,412	3.43
Southern Flying Squirrel	14	SU	.	.	158	4,348	3.63
Mink	100	.	.	.	1,061	28,939	3.67
Northern River Otter	100	.	.	.	1,046	28,132	3.72
Water Shrew	100	.	.	.	339	8,412	4.03
Rock Vole	28	S3	.	.	150	1,018	14.74
Northern Bog Lemming	1	S1	.	T	125	156	79.77

[a] C Rankings representing rarity:

NHP: Natural Heritage Program state element ranks (animal ranks assigned by IFW, plant ranks by MNHP, Doc.)
S1 = Critically imperiled in Maine, S2 = Imperiled in Maine, S3 = Rare in Maine, SU = Possibly in peril in Maine, but status uncertain, SZN = regularly passes through Maine, unable to map occurrences, S? = element is not yet ranked in the state. Qualifiers : B = breeding in Maine, N = nonbreeding, PB = potential breeder, ? = after a number or qualifier represents inexactness or unsureness. Other state element ranks representing secure species are not shown to highlight species of concern.

FWS: US Fish and Wildlife Service Endangered and Threatened species listing.
E = Endangered, T = Threatened

IFW: Maine Department of Inland Fisheries and Wildlife Endangered and Threatened species listing .
E = Endangered, T = Threatened

[b] C The quantity of available habitat includes open ocean, and so may sum to more than shown in tables summing only Maine=s landbase.

[c] C The quantity of available habitat includes open ocean, to the limit of our study area (i.e., a 4 km buffer along the Atlantic coast). Additional habitat is available in offshore waters.

Appendix 9. Major land ownerships by biophysical regions of Maine, 1995. See Figure 2 for locations of regions.

Land Ownerships	**St. John Uplands**		**St. John Valley Interior Foothills**		**Western and Interior Mountains**		**Eastern Lowlands and Foothills**		**Coastal Plain and Foothills**	
	Total (ha)	**%**	**Total (ha)**	**%**	**Total (ha)**	**%**	**Total (ha)**	**%**	**Total (ha)**	**%**
Federal	**0**	**0.00**	**4,195**	**0.05**	**38,270**	**0.45**	**29,747**	**0.35**	**8,012**	**0.10**
US Department of Agriculture Forest Service	0	0.00	0	0.00	19,813	0.24	0	0.00	1,508	0.02
US Department of the Interior	0	0.00	0	0.00	13,284	0.16	29,572	0.35	6,504	0.08
Fish and Wildlife Service	0	0.00	0	0.00	399	0.00	10,910	0.13	6,147	0.07
National Park Service	0	0.00	0	0.00	0	0.00	18,662	0.22	356	0.00
US Department of Defense	0	0.00	4,195	0.05	5,172	0.06	175	0.00	0	0.00
Air Force	0	0.00	4,195	0.05	0	0.00	175	0.00	0	0.00
Navy	0	0.00	0	0.00	5,172	0.06	0	0.00	0	0.00
State	**36,226**	**0.43**	**82,192**	**0.97**	**158,026**	**1.87**	**43,610**	**0.52**	**35,371**	**0.40**
Baxter State Park	0	0.00	22,376	0.27	61,000	0.72	0	0.00	83	0.00
Maine Department of Inland Fisheries and Wildlife	1,668	0.02	7,422	0.09	1,233	0.01	8,905	0.11	16,301	0.19
The University of Maine, Orono	0	0.00	132	0.00	47	0.00	0	0.00	4,348	0.05
Maine Department of Conservation	34,558	0.41	52,262	0.62	95,746	1.14	34,706	0.41	13,927	0.15
Bureau of Parks and Lands	34,558	0.41	52,262	0.62	95,746	1.14	34,706	0.41	13,699	0.15
Public Reserve Lands	30,792	.36	45,422	.54	91,750	1.09	33,124	.39	9,312	.10
Historic Sites, Parks	3,766	.05	6,840	.08	3,996	.05	1,582	.02	4,387	.05
Maine Forest Service	0	0	1	tr	8	tr	0	0	228	tr
Other	0	0.00	0	0.00	0	0.00	0	0.00	712	.01
Native American	**5,979**	**0.07**	**15,165**	**0.18**	**33,431**	**0.40**	**45,032**	**0.53**	**3,391**	**0.04**
Passamaquoddy Indian Tribe	5,979	0.07	644	0.01	13,454	0.16	27,922	0.33	0	0.00
Penobscot Indian Nation	0	0.00	14,295	0.17	19,977	0.24	17,110	0.20	3,391	0.04
Other	0	0.00	226	0.00	0	0.00	0	0.00	0	0.00
Municipal	**5,307**	**0.06**	**274**	**0.00**	**1,145**	**0.01**	**498**	**0.01**	**3,024**	**0.04**
Private	**2,063**	**0.02**	**2,285**	**0.03**	**3,659**	**0.04**	**3,526**	**0.04**	**6,509**	**0.08**
Forest Society of Maine	0	0.00	0	0.00	388	0.00	0	0.00	0	0.00
Maine Audubon Society	0	0.00	0	0.00	59	0.00	0	0.00	308	0.00
Maine Coast Heritage Trust	0	0.00	0	0.00	2,288	0.03	1,072	0.01	191	0.00
National Audubon Society	0	0.00	0	0.00	107	0.00	37	0.00	201	0.00
The Nature Conservancy Organization	2,063	0.02	2,285	0.03	74	0.00	2,269	0.03	3,599	0.04
Others	0	0.00	0	0.00	743	0.01	148	0.00	2,210	0.03
Subtotal	**49,576**	**0.59**	**104,111**	**1.24**	**234,531**	**2.79**	**122,413**	**1.46**	**56,307**	**0.65**
Commercial Forestland	1,115,700	13.3	1,218,820	14.5	1,138,250	13.5	656,722	7.8	99,310	1.2
Other	81,162	1.0	598,737	7.1	455,937	5.4	503,180	6.0	1,637,034	19.4

Open water	22,766	0.3	95,246	1.1	102,954	1.2	83,883	1.0	77,221	0.9

Appendix 10. The quantity of habitat and land cover (km^2) in Maine, stratified by major land ownerships and land management Categories. Total quantities of habitat by owner, management category, and overall are also shown. Combinations of landowner and management Category that do not occur in Maine are shown with a dash ("-"), and water is not given a management Category.

The habitats and land cover database was based on 1991 and 1993 Landsat Thematic Mapper satellite imagery interpreted using 1994 aerial videography (see Land Cover Classification and Mapping). Wetlands were from the US Fish and Wildlife Service National Wetlands Inventory. Conservation lands are described in detail in Land Stewardship. Note that a small number of lots ranked as non-conservation lands (e.g., buildings owned by the Maine Department of Inland Fisheries and Wildlife) were summed under "Other Private" holdings, regardless of owner.

Major land owners identified in the table are:

FWS C US Fish and Wildlife Service (e.g., Moosehorn National Wildlife Refuge)
NPS C US National Park Service (e.g., Acadia National Park)
Other Federal C Other Federal ownerships (e.g., US Department of Defense)
Native American C Native American lands (e.g., The Penobscot Indian Nation)
BSP C Baxter State Park Authority
IFW C Maine Department of Inland Fisheries and Wildlife (e.g., Wildlife Management Areas)
BPL C Maine Bureau of Parks and Lands (including parks and historic sites)
Other State C Other Maine State lands (e.g., University of Maine holdings)
Private Conserv. C Private Conservation groups (e.g., The Nature Conservancy)
Municipal C Municipal-owned lands (e.g., Portland area parks)
Comm. Forest C Commerical forestlands (e.g., Champion International Corporation lands)
Other Private C All other private holdings (e.g., Woodlots, private homes, private golf courses)
Water C Lakes, ponds, and ocean shores. For the habitat type AOpen Water,@ the total under water does not include open ocean, and is noted with a >*=.

ABANDONED FIELD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.5	0.1	0.0	-	0.0	0.1	0.0	0.0	0.1	0.0	-	-		0.8
2	2.8	1.1	-	0.1	0.0	0.8	0.4	0.0	0.0	0.0	-	-		5.3
3	-	-	0.0	0.2	0.0	0.0	2.1	0.1	0.0	0.1	36.1	0.1		38.7
4	-	-	-	-	-	-	0.1	-	-	0.0	-	156.0		156.1
Total (km^2)	3.3	1.2	0.0	0.3	0.0	1.0	2.6	0.1	0.2	0.1	36.1	156.1	0.1	201.1

BLUEBERRY FIELD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.6	0.0	0.0	-	0.0	0.1	0.0	0.0	1.1	0.0	-	-		1.9
2	1.7	0.1	-	0.0	0.0	1.2	0.2	0.0	0.0	0.0	-	-		3.1
3	-	-	0.0	0.6	0.0	0.0	2.8	0.0	0.0	0.0	46.8	0.0		50.2
4	-	-	-	-	-	-	0.5	-	-	0.0	-	77.9		78.4
Total (km^2)	2.3	0.1	0.0	0.6	0.0	1.3	3.5	0.0	1.1	0.0	46.8	77.9	0.1	133.6

GRASSLAND	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.3	3.0	0.5	-	3.8	0.8	0.2	0.5	3.8	0.0	-	-		13.0
2	3.2	1.6	-	0.0	0.1	11.0	5.0	0.3	1.0	1.2	-	-		23.4
3	-	-	6.6	5.9	0.0	0.1	4.4	1.6	0.3	1.6	246.0	0.1		266.6
4	-	-	-	-	-	-	0.1	-	-	0.0	-	4,411.0		4,411.0
Total (km^2)	3.5	4.6	7.1	6.0	3.9	11.9	9.7	2.4	5.1	3.1	246.0	4,411.0	5.0	4,718.9

CROPS/GROUND	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.2	0.9	0.0	-	1.1	0.0	0.0	0.8	0.5	0.0	-	-		3.5

2	0.5	0.7	-	0.0	0.0	2.4	0.8	0.1	0.3	0.3	-	-		5.1
3	-	-	4.6	4.1	0.0	0.0	2.1	0.3	0.0	0.4	70.6	0.0		82.3
4	-	-	-	-	-	-	0.1	-	-	0.0	-	1,017.8		1,017.9
Total (km²)	0.7	1.6	4.6	4.1	1.1	2.4	3.1	1.1	0.9	0.7	70.6	1,017.8	5.9	1,114.7

CLEARCUT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.1	0.2	0.1	-	6.0	0.1	0.0	0.2	1.1	0.0	-	-		7.7
2	1.8	1.3	-	0.1	0.4	2.0	2.1	0.0	1.3	0.2	-	-		9.2
3	-	-	0.7	11.1	0.0	0.0	8.9	0.7	0.0	0.7	869.0	0.0		891.1
4	-	-	-	-	-	-	0.1	-	-	0.0	-	361.5		361.6
Total (km²)	1.9	1.5	0.7	11.2	6.5	2.1	11.0	1.0	2.4	0.9	869.0	361.5	2.3	1,271.9

EARLY REGENERATION	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.7	0.2	0.1	-	28.9	0.3	0.7	0.2	3.2	0.0	-	-		34.3
2	4.0	2.1	-	0.2	2.6	5.1	9.3	0.0	0.4	0.2	-	-		24.0
3	-	-	2.2	66.7	0.0	0.0	46.3	0.9	0.0	2.8	4,296.6	0.6		4,416.1
4	-	-	-	-	-	-	0.2	-	-	0.0	-	890.3		890.5
Total (km²)	4.7	2.3	2.3	67.0	31.5	5.5	56.4	1.1	3.6	3.0	4,296.6	891.0	3.2	5,368.1

LATE REGENERATION	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.7	1.5	0.3	-	9.0	0.1	0.5	1.0	3.7	0.0	-	-		16.7
2	4.0	4.2	-	0.3	0.3	7.6	8.0	0.1	0.8	0.3	-	-		25.5
3	-	-	2.6	48.5	0.0	0.1	45.7	1.0	0.0	2.5	1,916.3	0.2		2,016.7
4	-	-	-	-	-	-	0.6	-	-	0.0	-	862.2		862.8
Total (km²)	4.7	5.7	2.8	48.7	9.2	7.7	54.8	2.0	4.5	2.8	1,916.3	862.4	3.1	2,924.9

LIGHT PARTIAL CUT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.8	1.1	0.2	-	9.6	0.0	0.2	0.2	0.9	0.0	-	-		13.1
2	2.1	3.3	-	0.6	0.5	8.0	4.4	0.0	0.3	0.3	-	-		19.5
3	-	-	2.7	10.6	0.0	0.0	27.2	0.8	0.0	1.0	678.7	0.2		721.0
4	-	-	-	-	-	-	0.1	-	-	0.0	-	381.8		381.9
Total (km^2)	2.9	4.4	2.9	11.2	10.2	8.0	32.0	1.1	1.2	1.3	678.7	382.0	1.0	1,140.1

HEAVY PARTIAL CUT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.4	0.1	0.2	-	2.0	0.1	0.0	0.5	2.4	0.0	-	-		5.6
2	1.4	2.0	-	0.2	0.1	3.4	3.2	0.0	0.2	0.2	-	-		10.9
3	-	-	2.5	20.2	0.0	0.0	25.6	0.3	0.0	2.0	989.8	0.1		1,040.4
4	-	-	-	-	-	-	0.4	-	-	0.0	-	477.4		477.8
Total (km^2)	1.8	2.1	2.7	20.4	2.1	3.5	29.2	0.7	2.5	2.2	989.8	477.5	0.9	1,535.5

DECIDUOUS FOREST	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	1.2	4.1	22.5	-	144.2	0.3	2.2	0.3	12.8	0.4	-	-		188.1
2	4.1	27.7	-	0.8	7.8	50.1	75.2	0.0	1.3	2.2	-	-		169.4
3	-	-	99.7	199.7	0.0	0.9	364.0	1.7	0.0	17.8	7,065.8	0.2		7,749.8
4	-	-	-	-	-	-	2.2	-	-	0.0	-	4,702.1		4,704.3
Total (km^2)	5.3	31.9	122.2	200.5	152.1	51.3	443.6	2.1	14.2	20.4	7,065.8	4,702.3	6.1	12,817.7

DECID./CONIFER. FOREST	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.3	23.0	7.3	-	140.0	2.6	5.3	0.4	20.7	0.2	-	-		199.8
2	5.0	22.9	-	5.7	15.3	43.4	68.9	0.0	2.2	2.9	-	-		166.3

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	53.9	127.5	0.3	0.9	370.7	5.1	0.2	17.1	6,844.5	0.4		7,420.7
4	-	-	-	-	-	-	3.0	-	-	0.0	-	5,683.6		5,686.6
Total (km^2)	5.3	46.0	61.2	133.2	155.6	47.0	447.9	5.5	23.1	20.2	6,844.5	5,684.0	11.5	13,484.9

CONIFER./DECID. FOREST	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	17.8	30.2	4.7	-	151.3	3.0	4.2	1.7	27.6	0.1	-	-		240.7
2	35.3	36.4	-	6.1	40.7	64.9	89.7	0.1	3.2	4.6	-	-		280.9
3	-	-	46.8	249.9	0.2	0.6	486.6	14.7	0.3	15.8	9,050.4	1.1		9,866.4
4	-	-	-	-	-	-	11.0	-	-	0.0	-	7,587.4		7,598.4
Total (km^2)	53.1	66.6	51.4	256.0	192.2	68.5	591.5	16.6	31.1	20.4	9,050.4	7,588.5	32.5	18,018.8

CONIFEROUS FOREST	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	9.9	47.3	6.9	-	131.9	0.5	2.6	0.4	35.1	0.0	-	-		234.6
2	15.4	60.7	-	0.6	38.5	27.5	80.7	0.0	4.9	2.8	-	-		231.1
3	-	-	17.5	118.4	0.1	0.3	233.7	4.9	0.1	8.1	4,626.2	0.3		5,011.3
4	-	-	-	-	-	-	5.1	-	-	0.0	-	2,412.0		2,417.1
Total (km^2)	25.3	108.1	24.4	119.0	170.5	28.2	322.0	5.4	40.0	10.9	4,626.2	2,412.3	23.3	7,915.7

DECID. FORESTED WETLAND	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.1	0.9	0.0	-	1.5	0.3	0.1	0.1	0.9	0.0	-	-		4.0
2	1.7	1.3	-	1.0	0.7	13.4	3.4	0.0	1.1	0.5	-	-		23.0
3	-	-	3.4	6.2	0.0	0.1	9.7	0.3	0.0	0.4	195.8	0.1		216.0
4	-	-	-	-	-	-	0.0	-	-	0.0	-	489.5		489.5
Total (km^2)	1.9	2.2	3.4	7.2	2.3	13.7	13.2	0.4	2.0	0.9	195.8	489.6	3.6	736.1

CONIF. FORESTED WETLAND	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	1.3	2.3	3.0	-	16.5	0.1	0.8	2.1	16.7	0.0	-	-		42.9
2	12.8	1.5	-	0.7	6.3	26.9	16.6	0.1	1.4	0.6	-	-		66.9
3	-	-	9.2	69.1	0.1	0.5	97.8	1.6	0.0	8.3	2,545.3	0.3		2,732.2
4	-	-	-	-	-	-	0.3	-	-	0.0	-	1,040.0		1,040.2
Total (km^2)	14.1	3.9	12.2	69.8	22.9	27.5	115.4	3.7	18.2	9.0	2,545.3	1,040.3	9.4	3,891.0

DEAD-FORESTED WETLAND	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.1	0.0	-	-		0.2
2	0.3	0.0	-	0.0	0.0	1.1	0.2	0.0	0.0	0.0	-	-		1.6
3	-	-	0.1	0.1	0.0	0.0	0.6	0.0	0.0	0.0	11.8	0.0		12.6
4	-	-	-	-	-	-	0.0	-	-	0.0	-	13.1		13.1
Total (km^2)	0.3	0.1	0.1	0.1	0.0	1.1	0.8	0.0	0.1	0.0	11.8	13.1	0.4	28.0

DECID. SHRUB-SCRUB WETLAND	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.9	1.7	0.0	-	10.6	0.1	0.1	0.5	4.8	0.0	-	-		18.7
2	10.8	2.2	-	0.2	2.4	22.5	14.5	0.1	1.1	0.2	-	-		54.0
3	-	-	2.9	23.6	0.0	0.1	26.8	1.0	0.0	1.7	708.7	0.2		765.0
4	-	-	-	-	-	-	0.4	-	-	0.0	-	515.9		516.3
Total (km^2)	11.7	4.0	2.9	23.8	13.0	22.7	41.8	1.6	5.9	1.9	708.7	516.1	30.9	1,384.9

CONIFER. SHRUB-SCRUB WETLAND	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.1	0.4	0.0	-	2.1	0.0	0.0	0.1	0.7	0.0	-	-		3.5
2	0.1	0.3	-	0.0	0.4	4.0	1.6	0.0	0.0	0.0	-	-		6.5
3	-	-	0.2	2.5	0.0	0.0	3.2	0.1	0.0	0.0	87.6	0.0		93.6

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	0.1	-	-	0.0	-	49.9		50.0
Total (km²)	0.3	0.7	0.2	2.5	2.5	4.0	4.8	0.1	0.7	0.0	87.6	49.9	3.4	156.9

DEAD SHRUB-SCRUB WETLAND	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
2	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0		0.6
4	-	-	-	-	-	-	0.0	-	-	0.0	-	0.6		0.6
Total (km²)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.6	0.0	1.2

FRESH AQUATIC BED	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.1	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.1
2	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
4	-	-	-	-	-	-	0.0	-	-	0.0	-	0.8		0.8
Total (km²)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.5	1.4

FRESH EMERGENT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.7	1.1	0.0	-	5.2	0.0	0.1	0.1	1.6	0.0	-	-		8.8
2	3.6	0.8	-	0.1	1.0	9.2	9.0	0.0	0.5	0.0	-	-		24.2
3	-	-	1.2	14.5	0.0	0.0	15.3	0.2	0.0	0.3	357.8	0.0		389.4
4	-	-	-	-	-	-	0.5	-	-	0.0	-	265.3		265.8
Total (km²)	4.3	1.9	1.2	14.6	6.2	9.2	24.9	0.3	2.0	0.3	357.8	265.3	30.5	718.8

			Other	**Native**				**Other**	**Private**	**Munic-**	**Comm.**	**Other**		

PEATLAND	FWS	NPS	Federal	American	BSP	IFW	BPL	State	Conserv.	ipal	Forest	Private	Water	Total
Category 1	0.3	0.7	0.0	-	1.8	0.0	0.2	0.8	6.5	0.0	-	-		10.3
2	6.1	0.5	-	0.0	0.9	4.2	11.1	0.0	1.9	0.0	-	-		24.7
3	-	-	0.5	8.1	0.0	0.0	10.1	0.2	0.0	0.3	290.5	0.0		309.8
4	-	-	-	-	-	-	0.2	-	-	0.0	-	122.3		122.5
Total (km^2)	6.4	1.1	0.5	8.1	2.7	4.2	21.7	1.0	8.4	0.3	290.5	122.3	6.3	473.5

WET MEADOW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.7	0.3	0.0	-	1.4	0.0	0.0	0.4	0.3	0.0	-	-		3.0
2	4.1	0.1	-	0.1	0.2	8.2	0.9	0.0	0.1	0.1	-	-		13.7
3	-	-	0.2	3.7	0.0	0.0	4.1	0.0	0.0	0.7	71.3	0.0		80.0
4	-	-	-	-	-	-	0.1	-	-	0.0	-	57.9		58.0
Total (km^2)	4.8	0.3	0.2	3.7	1.6	8.2	5.1	0.4	0.4	0.8	71.3	57.9	16.0	170.7

SALT AQUATIC BED	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.3	1.0	0.0	-	1.2	0.3	1.3	0.0	2.5	0.0	-	-		6.7
2	0.3	2.7	-	0.0	0.0	0.2	0.5	0.0	0.3	0.0	-	-		4.0
3	-	-	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	5.1	0.0		5.4
4	-	-	-	-	-	-	0.1	-	-	0.0	-	181.4		181.5
Total (km^2)	0.5	3.8	0.0	0.1	1.3	0.5	2.2	0.0	2.9	0.0	5.1	181.4	0.0	196.7

SALT EMERGENT WETLAND	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.3	0.0	-	0.0	0.1	0.0	0.0	1.7	0.0	-	-		2.2
2	8.3	0.3	-	0.0	0.0	8.5	1.4	0.0	0.0	0.2	-	-		18.7
3	-	-	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.1

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	0.0	-	-	0.0	-	58.0		58.0
Total (km²)	8.4	0.6	0.0	0.0	0.1	8.5	1.4	0.0	1.8	0.2	0.0	58.0	1.1	80.2

MUDFLAT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.1	0.2	0.0	0.4	0.0	-	-		0.7
2	1.0	0.0	-	0.0	0.0	1.0	0.2	0.0	0.0	0.0	-	-		2.3
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.2	0.0		1.3
4	-	-	-	-	-	-	0.0	-	-	0.0	-	228.6		228.6
Total (km²)	1.0	0.1	0.0	0.0	0.0	1.1	0.4	0.0	0.4	0.1	1.2	228.6	3.1	236.1

SAND SHORE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.1	0.0	-	0.0	0.0	0.0	0.0	0.1	0.0	-	-		0.2
2	0.0	0.3	-	0.0	0.0	0.0	0.3	0.0	0.0	0.0	-	-		0.6
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0		0.1
4	-	-	-	-	-	-	0.0	-	-	0.0	-	30.5		30.6
Total (km²)	0.1	0.3	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.1	30.5	0.0	31.5

GRAVEL SHORE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.1	0.0	0.0	0.0	0.0	0.0	-	-		0.1
2	0.0	0.0	-	0.0	0.0	0.1	6.0	0.0	0.0	0.0	-	-		6.2
3	-	-	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	5.4	0.0		5.5
4	-	-	-	-	-	-	0.0	-	-	0.0	-	10.0		10.0
Total (km²)	0.0	0.0	0.0	0.0	0.1	0.1	6.1	0.0	0.0	0.0	5.4	10.0	15.6	37.3

ROCK SHORE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	0.3	0.6	0.0	-	0.0	0.2	0.3	0.0	1.5	0.0	-	-		2.9
2	0.3	1.0	-	0.0	0.0	0.0	3.4	0.0	0.1	0.0	-	-		4.9
3	-	-	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	5.9	0.0		6.1
4	-	-	-	-	-	-	0.1	-	-	0.0	-	27.0		27.1
Total (km^2)	0.6	1.6	0.0	0.0	0.0	0.2	4.0	0.0	1.6	0.0	5.9	27.0	22.7	63.6

SHALLOW WATER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.1	0.2	0.0	-	1.5	0.0	0.0	0.0	0.3	0.0	-	-		2.2
2	0.8	0.3	-	0.1	0.1	0.7	0.8	0.0	0.1	0.0	-	-		2.9
3	-	-	0.3	1.7	0.0	0.0	3.0	0.0	0.0	0.1	57.5	0.0		62.5
4	-	-	-	-	-	-	0.2	-	-	0.0	-	37.0		37.1
Total (km^2)	0.9	0.5	0.3	1.7	1.6	0.7	3.9	0.0	0.5	0.1	57.5	37.0	41.6	146.3

OPEN WATER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.5	1.0	0.0	-	5.2	0.1	0.5	0.0	2.8	0.0	-	-		10.2
2	1.9	2.3	-	2.2	1.0	11.4	18.3	0.0	0.4	0.3	-	-		37.7
3	-	-	0.7	12.4	0.0	0.0	19.7	0.2	0.0	0.4	280.5	1.1		315.1
4	-	-	-	-	-	-	0.1	-	-	0.0	-	768.2		768.2
Total (km^2)	2.3	3.4	0.7	14.6	6.2	11.5	38.6	0.3	3.2	0.7	280.5	769.3	3,541.5*	4,672.8

SPARSE RESIDENTIAL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.3	2.8	0.1	-	0.0	0.0	0.1	0.1	0.6	0.0	-	-		3.9
2	1.5	0.9	-	0.0	0.0	1.0	0.8	0.0	0.1	0.1	-	-		4.5
3	-	-	0.2	3.3	0.0	0.0	1.8	0.5	0.0	0.2	119.5	0.1		125.6

4	-	-	-	-	-	-	0.0	-	-	0.0	-	555.6		555.7
Total (km²)	1.7	3.7	0.2	3.3	0.0	1.0	2.8	0.6	0.7	0.3	119.5	555.7	0.9	690.5

DENSE RESIDENTIAL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.2	0.0	-	-		0.2
2	0.0	0.1	-	0.1	0.0	0.2	0.1	0.0	0.0	0.4	-	-		0.9
3	-	-	4.3	0.1	0.0	0.0	0.2	0.1	0.0	1.2	9.9	0.0		15.8
4	-	-	-	-	-	-	0.0	-	-	0.0	-	335.0		335.0
Total (km²)	0.0	0.1	4.3	0.2	0.0	0.2	0.4	0.1	0.2	1.6	9.9	335.0	0.3	352.2

URBAN/ INDUSTRIAL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
2	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0		0.1
4	-	-	-	-	-	-	0.0	-	-	0.0	-	14.7		14.7
Total (km²)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	14.7	0.0	14.9

HIGHWAYS/ RUNWAYS	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
2	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0		0.5
4	-	-	-	-	-	-	0.0	-	-	0.0	-	7.7		7.7
Total (km²)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	7.7	0.0	8.2

ALPINE TUNDRA	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	0.0	0.0	0.0	-	18.4	0.0	0.0	0.0	0.0	0.0	-	-		18.4
2	0.0	0.8	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.8
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0		1.5
4	-	-	-	-	-	-	0.0	-	-	0.0	-	0.0		0.0
Total (km^2)	0.0	0.8	0.0	0.0	18.4	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	20.6

EXPOSED ROCK/TALUS	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	12.7	0.0	-	19.4	0.0	0.0	0.0	0.1	0.0	-	-		32.2
2	0.0	0.1	-	0.0	0.4	0.0	0.1	0.0	0.0	0.0	-	-		0.7
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0		1.1
4	-	-	-	-	-	-	0.0	-	-	0.0	-	10.8		10.8
Total (km^2)	0.1	12.8	0.0	0.0	19.8	0.1	0.1	0.0	0.1	0.1	1.0	10.8	0.0	44.8

Appendix 11. The quantity of habitat (km^2) predicted to be available to each species (n = 270) in ME-GAP, stratified by major ownerships and land management category. Total quantities of habitat available by owner, management category, and overall are also shown. Combinations of land owner and management category that do not occur in Maine are shown with a dash (‘ -’), and water is not given a management status.

Estimates of habitat quantities were calculated by using habitat relations and geographic ranges to predict where vertebrates were likely to occur. These estimates, created for cells 90 m by 90 m (1.12 million cells), were overlaid onto maps of major land ownership and management status, and tallies made. When inspecting these tables to identify deficiencies in Maine’ s conservation network, the reader should note that species that are not statewide may not occur in all conversation ownerships. For example, Eastern Box Turtles occur only in southern and south-central Maine, so the habitat estimates for the more northern Baxter State Park (BSP) are necessarily zero. Also note that a small number of lots ranked as non-conservation lands (e.g., buildings owned by the Maine Department of Inland Fisheries and Wildlife) were summed under “Other Private” holdings, regardless of owner.

Major land owners identified in the table are:

FWS	— US Fish and Wildlife Service (e.g., Moosehorn National Wildlife Refuge)
NPS	— US National Park Service (e.g., Acadia National Park)
Other Federal	— Other Federal ownerships (e.g., US Department of Defense)
Native American	— Native American lands (e.g., The Penobscot Indian Nation)
BSP	— Baxter State Park Authority
IFW	— Maine Department of Inland Fisheries and Wildlife (e.g., Wildlife Management Areas)
BPL	— Maine Bureau of Parks and Lands (including parks and historic sites)
Other State	— Other Maine State lands (e.g., University of Maine holdings)
Private Conserv.	— Private Conservation groups (e.g., The Nature Conservancy)
Municipal	— Municipal-owned lands (e.g., Portland area parks)
Comm. Forest	— Commerical forestlands (e.g., Champion International lands)
Other Private	— All other private holdings (e.g., Woodlots, private homes, private golf courses)
Water	— Lakes, ponds, and ocean. A ‘ *’ denotes the species has some portion of its habitat in open ocean, and ‘ **’ denotes the species may use ocean beyond the extent we had tallied.

BLUE-SPOTTED SALAMANDER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.5	114.0	44.7	-	613.9	6.7	15.4	7.2	125.2	0.6	-	-		962.0
2	104.3	157.9	-	14.0	114.3	278.0	358.2	0.3	17.2	13.8	-	-		1,058.1
3	-	-	236.9	828.5	0.6	3.4	1,639.4	30.5	0.5	71.8	32,370.7	3.1		35,185.3
4	-	-	-	-	-	-	23.3	-	-	0.0	-	23,648.1		23,671.4
Total (km^2)	138.8	271.9	281.6	842.5	728.8	288.1	2,036.3	37.9	142.9	86.2	32,370.7	23,651.2	396.3	61,273.2

SPOTTED SALAMANDER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.1	116.0	44.9	-	623.0	7.0	16.5	8.0	131.3	0.7	-	-		982.4
2	108.6	163.8	-	14.3	114.5	286.3	366.4	0.3	18.4	14.2	-	-		1,086.9
3	-	-	239.2	874.0	0.7	3.4	1,682.2	31.4	0.5	74.2	34,264.7	3.3		37,173.5
4	-	-	-	-	-	-	23.9	-	-	0.0	-	24,504.3		24,528.1
Total (km^2)	143.7	279.7	284.1	888.3	738.2	296.7	2,089.0	39.7	150.2	89.1	34,264.7	24,507.5	408.6	64,179.4

EASTERN NEWT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	14.1	38.9	12.0	-	214.6	3.1	3.0	7.1	59.7	0.1	-	-		352.6
2	70.5	38.0	-	10.5	47.1	174.4	175.6	0.3	9.6	5.9	-	-		531.9
3	-	-	68.7	384.7	0.0	2.1	588.6	14.0	0.1	30.1	13,418.6	2.7		14,509.4
4	-	-	-	-	-	-	5.5	-	-	0.0	-	9,469.1		9,474.6
Total (km^2)	84.6	76.9	80.7	395.3	261.7	179.6	772.6	21.4	69.3	36.1	13,418.6	9,471.8	465.3	25,333.9

DUSKY SALAMANDER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	1.4	8.8	1.2	-	54.2	1.0	1.1	1.1	15.3	0.0	-	-		84.1
2	16.2	5.2	-	0.8	5.3	40.6	18.7	0.0	1.5	0.5	-	-		88.8

3	-	-	13.4	59.5	0.0	0.1	91.9	2.4	0.0	8.3	2,512.3	0.3		2,688.3
4	-	-	-	-	-	-	2.0	-	-	0.0	-	1,912.3		1,914.3
Total (km^2)	17.5	14.0	14.6	60.3	59.5	41.6	113.6	3.6	16.8	8.8	2,512.3	1,912.6	42.3	4,817.7

N. TWO-LINED SALAMANDER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	13.7	38.5	11.9	-	211.6	3.1	2.9	6.0	58.4	0.1	-	-		346.1
2	70.3	37.2	-	9.9	47.8	171.9	171.6	0.3	8.9	5.5	-	-		523.4
3	-	-	67.7	363.9	0.0	2.1	566.3	13.3	0.1	28.4	12,547.6	2.4		13,591.8
4	-	-	-	-	-	-	5.2	-	-	0.0	-	8,886.0		8,891.3
Total (km^2)	84.0	75.7	79.6	373.7	259.4	177.1	746.1	19.6	67.4	34.0	12,547.6	8,888.4	329.0	23,681.6

SPRING SALAMANDER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	3.1	-	0.0	1.1	0.0	0.0	6.4	0.0	-	-		10.6
2	4.4	6.4	-	0.2	0.0	35.7	7.6	0.0	1.1	0.5	-	-		55.9
3	-	-	16.2	22.8	0.0	0.6	46.2	0.6	0.0	0.7	720.1	0.1		807.2
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,392.1		1,392.1
Total (km^2)	4.4	6.4	19.4	23.0	0.0	37.3	53.8	0.6	7.4	1.2	720.1	1,392.2	58.6	2,324.3

FOUR-TOED SALAMANDER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.2	25.6	0.0	-	65.5	2.1	0.6	5.9	23.7	0.0	-	-		123.7
2	34.0	15.9	-	4.4	16.0	58.1	19.3	0.2	5.5	2.0	-	-		155.4
3	-	-	9.5	51.2	0.4	0.9	78.5	8.0	0.2	6.1	1,674.4	0.9		1,830.0
4	-	-	-	-	-	-	1.1	-	-	0.0	-	3,700.5		3,701.6
Total (km^2)	34.2	41.5	9.6	55.6	81.8	61.1	99.6	14.1	29.4	8.0	1,674.4	3,701.3	44.3	5,855.0

REDBACK SALAMANDER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.1	108.1	42.2	-	613.8	6.6	15.4	5.4	108.6	0.6	-	-		932.8
2	80.1	159.5	-	12.6	106.6	209.7	334.0	0.2	14.7	13.4	-	-		930.8
3	-	-	225.8	835.1	0.5	2.8	1,584.4	28.9	0.5	66.9	35,351.4	3.0		38,099.4
4	-	-	-	-	-	-	22.7	-	-	0.0	-	23,135.9		23,158.7
Total (km^2)	112.2	267.5	268.1	847.6	720.9	219.1	1,956.6	34.6	123.7	80.9	35,351.4	23,139.0	306.5	63,428.1

AMERICAN TOAD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.5	120.9	45.4	-	651.2	8.1	16.7	9.7	139.4	0.7	-	-		1,028.5
2	116.3	169.8	-	14.8	114.5	306.2	386.0	0.8	20.3	16.2	-	-		1,144.9
3	-	-	254.4	908.0	0.7	3.6	1,719.8	33.3	0.9	78.3	35,759.5	3.5		38,762.0
4	-	-	-	-	-	-	25.0	-	-	0.0	-	30,848.0		30,873.0
Total (km^2)	152.8	290.6	299.8	922.8	766.4	318.0	2,147.5	43.8	160.5	95.3	35,759.5	30,851.5	494.5	72,303.1

GRAY TREEFROG	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.9	117.9	19.8	-	5.5	7.9	2.6	8.4	73.4	0.7	-	-		272.1
2	107.6	54.6	-	15.5	0.0	263.3	76.2	0.7	14.2	13.4	-	-		545.5
3	-	-	88.4	543.9	0.6	3.3	431.3	33.8	0.8	20.7	10,894.7	3.7		12,021.3
4	-	-	-	-	-	-	24.1	-	-	0.0	-	23,156.7		23,180.9
Total (km^2)	143.6	172.5	108.1	559.4	6.2	274.6	534.3	42.9	88.4	34.8	10,894.7	23,160.5	117.3	36,137.1

SPRING PEEPER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.5	115.0	45.0	-	639.3	7.4	17.1	8.4	136.3	0.7	-	-		1,004.8
2	112.3	165.9	-	14.9	115.9	288.7	383.8	0.3	19.2	15.2	-	-		1,116.3
3	-	-	245.3	945.2	0.7	3.4	1,729.9	32.1	0.5	78.4	39,003.4	3.9		42,042.8

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	23.8	-	-	0.0	-	25,895.8		25,919.7
Total (km²)	147.9	281.0	290.3	960.1	755.9	299.6	2,154.6	40.9	156.1	94.2	39,003.4	25,899.7	488.7	70,572.3

BULLFROG	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.3	9.8	2.7	-	53.3	0.6	0.2	3.8	34.0	0.0	-	-		108.8
2	43.0	10.4	-	4.8	11.6	98.9	65.5	0.2	6.2	1.2	-	-		241.7
3	-	-	11.6	134.7	0.1	0.6	147.2	3.4	0.0	3.0	3,731.0	1.4		4,033.1
4	-	-	-	-	-	-	1.8	-	-	0.0	-	2,841.5		2,843.3
Total (km²)	47.3	20.2	14.3	139.5	64.9	100.1	214.7	7.5	40.2	4.3	3,731.0	2,842.9	1,968.3	9,195.2

GREEN FROG	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	34.5	114.0	44.8	-	621.7	7.1	16.2	7.0	129.5	0.6	-	-		975.4
2	102.7	160.9	-	14.4	115.0	281.2	371.6	0.2	17.9	13.8	-	-		1,077.8
3	-	-	239.3	835.6	0.7	3.4	1,653.6	30.0	0.5	72.0	32,626.1	3.1		35,464.3
4	-	-	-	-	-	-	23.5	-	-	0.0	-	23,513.6		23,537.1
Total (km²)	137.2	274.9	284.1	850.0	737.4	291.8	2,064.9	37.2	147.8	86.4	32,626.1	23,516.7	461.5	61,516.1

PICKEREL FROG	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.7	121.8	45.6	-	660.6	8.6	18.1	8.8	143.6	0.7	-	-		1,044.5
2	127.3	170.9	-	14.9	117.5	315.0	395.9	0.7	20.7	16.3	-	-		1,179.2
3	-	-	250.3	957.2	0.8	3.7	1,745.0	34.0	0.9	79.7	39,291.2	4.1		42,367.0
4	-	-	-	-	-	-	24.3	-	-	0.0	-	30,902.7		30,927.0
Total (km²)	164.0	292.6	296.0	972.1	779.0	327.3	2,183.3	43.5	165.2	96.6	39,291.2	30,906.8	510.6	76,028.2

NORTHERN LEOPARD FROG	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	5.4	36.6	31.5	-	318.7	4.8	9.7	4.3	59.5	0.6	-	-		471.1
2	53.1	64.7	-	6.9	27.8	179.7	189.7	0.6	11.0	8.1	-	-		541.6
3	-	-	177.5	421.1	0.5	2.2	840.5	10.6	0.6	43.5	17,596.8	1.3		19,094.6
4	-	-	-	-	-	-	7.1	-	-	0.0	-	18,419.4		18,426.5
Total (km^2)	58.5	101.3	208.9	428.0	347.0	186.6	1,047.0	15.6	71.1	52.2	17,596.8	18,420.7	229.9	38,763.8

MINK FROG	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.7	0.0	0.5	-	57.5	0.1	1.4	0.0	27.3	0.0	-	-		91.5
2	20.1	6.7	-	2.7	12.8	57.9	81.6	0.0	3.2	0.8	-	-		185.7
3	-	-	11.9	130.9	0.0	0.0	175.6	0.0	0.0	9.8	4,358.6	1.3		4,688.3
4	-	-	-	-	-	-	1.4	-	-	0.0	-	1,136.9		1,138.3
Total (km^2)	24.8	6.7	12.4	133.7	70.2	58.0	260.0	0.0	30.6	10.5	4,358.6	1,138.3	1,481.6	7,585.4

WOOD FROG	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	35.6	117.6	45.0	-	631.6	7.2	16.6	8.0	133.3	0.7	-	-		995.6
2	111.3	166.0	-	16.9	115.5	295.9	385.3	0.3	19.0	14.3	-	-		1,124.6
3	-	-	241.8	887.9	0.6	3.5	1,706.6	31.7	0.5	74.8	34,575.1	4.1		37,526.6
4	-	-	-	-	-	-	24.0	-	-	0.0	-	25,118.3		25,142.3
Total (km^2)	146.8	283.6	286.8	904.7	747.8	306.6	2,132.5	40.1	152.8	89.8	34,575.1	25,122.4	2,217.8	67,006.9

SNAPPING TURTLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	5.3	14.2	1.4	-	15.4	1.1	0.6	4.8	32.7	0.0	-	-		75.4
2	45.4	9.9	-	6.5	0.1	106.0	35.8	0.4	3.9	1.9	-	-		210.2
3	-	-	7.9	118.2	0.1	0.8	94.8	4.6	0.1	3.3	2,650.1	1.8		2,881.7
4	-	-	-	-	-	-	2.1	-	-	0.0	-	4,060.4		4,062.5

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Total (km^2)	50.7	24.1	9.3	124.7	15.6	108.0	133.2	9.9	36.7	5.2	2,650.1	4,062.2	1,883.8	9,113.6

COMMON MUSK TURTLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.2	0.0	0.0	-	-		0.2
2	0.1	0.0	-	0.0	0.0	2.2	0.3	0.0	0.0	0.1	-	-		2.7
3	-	-	0.0	5.0	0.0	0.0	0.3	0.0	0.0	0.0	25.3	0.0		30.7
4	-	-	-	-	-	-	0.0	-	-	0.0	-	141.8		141.8
Total (km^2)	0.1	0.0	0.0	5.0	0.0	2.2	0.6	0.2	0.0	0.1	25.3	141.8	159.1	334.5

PAINTED TURTLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	5.4	13.1	0.0	-	49.7	1.1	0.5	4.8	34.1	0.0	-	-		108.7
2	46.1	11.1	-	6.6	7.9	97.2	42.4	0.4	3.9	1.9	-	-		217.6
3	-	-	9.7	121.1	0.1	0.6	116.3	4.3	0.1	3.5	3,001.0	1.8		3,258.5
4	-	-	-	-	-	-	2.4	-	-	0.0	-	3,937.3		3,939.7
Total (km^2)	51.5	24.2	9.7	127.7	57.7	98.9	161.6	9.5	38.1	5.5	3,001.0	3,939.1	2,050.9	9,575.4

SPOTTED TURTLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.3	0.0	0.0	0.2	0.0	-	-		0.6
2	3.8	0.0	-	0.0	0.0	0.4	0.1	0.0	0.1	0.1	-	-		4.6
3	-	-	0.5	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0		0.7
4	-	-	-	-	-	-	0.0	-	-	0.0	-	165.2		165.2
Total (km^2)	3.8	0.0	0.5	0.0	0.0	0.8	0.3	0.0	0.3	0.1	0.1	165.2	4.4	175.5

WOOD TURTLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	24.9	70.6	16.2	-	297.4	6.2	7.1	8.8	104.6	0.2	-	-		536.0

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
2	100.8	78.5	-	16.2	64.7	232.1	261.0	0.7	16.3	9.7	-	-		780.1
3	-	-	91.7	544.1	0.7	2.6	821.1	20.9	0.5	40.7	19,382.0	4.4		20,908.7
4	-	-	-	-	-	-	11.6	-	-	0.0	-	16,082.6		16,094.3
Total (km^2)	125.7	149.1	107.9	560.4	362.8	240.9	1,100.9	30.4	121.4	50.6	19,382.0	16,087.1	1,333.4	39,652.4

BLANDING'S TURTLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	3.9	0.0	0.0	9.0	0.0	-	-		12.9
2	11.8	0.0	-	0.0	0.0	7.8	1.7	0.0	1.1	1.9	-	-		24.3
3	-	-	13.2	0.0	0.0	0.0	1.8	0.0	0.0	0.0	11.8	0.1		26.9
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,371.2		1,371.2
Total (km^2)	11.8	0.0	13.2	0.0	0.0	11.7	3.5	0.0	10.1	1.9	11.8	1,371.4	6.1	1,441.4

EASTERN BOX TURTLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	2.2	-	0.0	0.0	0.0	0.0	0.4	0.0	-	-		2.6
2	0.2	0.0	-	0.0	0.0	4.4	1.1	0.0	0.0	0.4	-	-		6.1
3	-	-	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.1	8.6	0.0		21.5
4	-	-	-	-	-	-	0.0	-	-	0.0	-	289.7		289.7
Total (km^2)	0.2	0.0	15.0	0.0	0.0	4.4	1.1	0.0	0.4	0.5	8.6	289.7	1.2	321.1

RACER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	4.5	0.1	0.0	11.9	0.0	-	-		16.5
2	6.3	0.0	-	0.0	0.0	34.8	2.3	0.0	0.9	3.4	-	-		47.8
3	-	-	13.8	0.0	0.0	0.0	5.2	1.2	0.0	0.3	66.9	0.0		87.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	2,757.4		2,757.4
Total (km^2)	6.3	0.0	13.8	0.0	0.0	39.3	7.6	1.2	12.8	3.8	66.9	2,757.4	2.9	2,911.9

RINGNECK SNAKE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.4	113.0	42.6	-	608.6	7.8	2.7	5.5	95.2	0.7	-	-		908.5
2	81.3	162.4	-	13.9	81.6	211.6	266.8	0.6	14.3	12.6	-	-		845.1
3	-	-	210.2	853.8	0.7	3.1	1,188.1	32.0	0.8	27.9	24,189.9	3.2		26,509.8
4	-	-	-	-	-	-	22.9	-	-	0.0	-	26,085.0		26,107.9
Total (km^2)	113.7	275.4	252.8	867.7	690.9	222.6	1,480.6	38.0	110.3	41.2	24,189.9	26,088.2	105.3	54,476.5

MILK SNAKE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.7	117.6	0.8	-	0.0	5.6	0.9	1.3	41.6	0.7	-	-		169.1
2	11.2	35.8	-	0.3	0.0	128.9	45.8	0.4	9.9	8.2	-	-		240.5
3	-	-	24.6	0.0	0.6	2.7	55.4	10.9	0.8	12.1	648.2	0.3		755.7
4	-	-	-	-	-	-	5.5	-	-	0.0	-	15,435.8		15,441.4
Total (km^2)	11.9	153.3	25.3	0.3	0.6	137.2	107.7	12.6	52.3	21.0	648.2	15,436.1	35.3	16,641.9

NORTHERN WATER SNAKE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.5	0.5	0.0	-	0.0	0.5	0.1	0.0	4.8	0.0	-	-		6.4
2	6.7	0.2	-	0.0	0.0	27.8	3.2	0.0	1.6	0.7	-	-		40.3
3	-	-	2.8	0.0	0.0	0.1	5.2	0.5	0.0	0.7	27.4	0.1		36.8
4	-	-	-	-	-	-	0.3	-	-	0.0	-	1,058.3		1,058.6
Total (km^2)	7.2	0.7	2.8	0.0	0.0	28.4	8.9	0.5	6.4	1.4	27.4	1,058.4	451.5	1,593.7

SMOOTH GREEN SNAKE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.8	36.1	31.4	-	0.0	4.3	0.2	3.8	21.2	0.6	-	-		103.2
2	39.0	11.3	-	7.0	0.0	135.3	57.3	0.5	7.7	5.1	-	-		263.2
3	-	-	132.3	128.8	0.3	2.2	161.0	10.9	0.6	10.0	3,431.7	1.2		3,878.8

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	7.7	-	-	0.0	-	14,234.9		14,242.6
Total (km²)	44.8	47.3	163.6	135.8	0.3	141.9	226.0	15.2	29.4	15.7	3,431.7	14,236.1	65.3	18,553.1

BROWN SNAKE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.2	0.0	0.0	-	0.0	5.5	0.5	0.3	25.7	0.0	-	-		32.1
2	8.2	0.0	-	0.0	0.0	31.3	11.0	0.0	1.4	5.5	-	-		57.4
3	-	-	13.4	0.0	0.6	0.0	4.3	0.6	0.9	2.0	22.5	0.1		44.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	3,900.9		3,900.9
Total (km²)	8.4	0.0	13.4	0.0	0.6	36.8	15.8	0.9	27.9	7.5	22.5	3,901.0	7.7	4,042.5

REDBELLY SNAKE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.4	119.5	45.7	-	630.4	8.0	2.4	9.6	124.2	0.7	-	-		977.0
2	121.3	168.4	-	16.0	89.0	295.7	328.0	0.8	21.2	13.7	-	-		1,054.2
3	-	-	219.8	980.9	0.6	3.7	1,337.8	35.6	0.8	31.3	29,844.3	4.1		32,459.1
4	-	-	-	-	-	-	24.6	-	-	0.0	-	27,948.5		27,973.0
Total (km²)	157.7	287.9	265.5	996.9	720.1	307.5	1,692.9	46.0	146.3	45.7	29,844.3	27,952.6	224.2	62,687.4

EASTERN RIBBON SNAKE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.2	0.7	3.4	-	0.0	0.7	0.1	1.6	7.9	0.0	-	-		14.6
2	16.3	0.9	-	0.1	0.0	37.2	5.6	0.5	3.4	1.2	-	-		65.1
3	-	-	10.2	0.0	0.1	0.8	12.5	3.6	0.1	3.0	129.9	0.2		160.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	2,863.1		2,863.1
Total (km²)	16.4	1.5	13.6	0.2	0.1	38.6	18.2	5.7	11.4	4.2	129.9	2,863.3	35.2	3,138.5

COMMON GARTER SNAKE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	37.5	121.1	45.8	-	665.9	8.4	17.3	9.5	143.5	0.7	-	-		1,049.7
2	121.6	172.0	-	15.1	118.1	311.5	397.5	0.7	21.9	16.4	-	-		1,174.8
3	-	-	252.5	981.6	0.7	3.7	1,773.3	34.9	0.8	81.5	40,891.3	4.2		44,024.5
4	-	-	-	-	-	-	25.1	-	-	0.0	-	31,119.0		31,144.1
Total (km^2)	159.1	293.1	298.3	996.7	784.6	323.6	2,213.1	45.1	166.3	98.6	40,891.3	31,123.2	515.9	77,909.0

COMMON LOON	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.3	5.8	0.1	-	17.9	0.7	1.2	0.3	11.4	0.0	-	-		39.7
2	16.1	8.2	-	3.0	2.6	35.2	56.3	0.0	1.7	0.6	-	-		123.6
3	-	-	3.2	41.1	0.1	0.1	58.3	1.3	0.1	1.3	979.5	1.2		1,086.2
4	-	-	-	-	-	-	1.0	-	-	0.0	-	1,048.9		1,049.9
Total (km^2)	18.4	14.0	3.2	44.1	20.6	36.0	116.8	1.6	13.2	1.9	979.5	1,050.1	3,356.7	5,656.2

PIED-BILLED GREBE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.7	5.8	0.1	-	22.8	0.6	1.0	0.9	11.5	0.0	-	-		45.3
2	20.2	9.0	-	4.2	2.9	43.2	49.1	0.0	1.8	0.7	-	-		131.1
3	-	-	4.1	47.6	0.1	0.2	62.4	1.5	0.1	2.3	1,080.7	1.3		1,200.1
4	-	-	-	-	-	-	0.9	-	-	0.0	-	1,241.4		1,242.3
Total (km^2)	22.9	14.8	4.1	51.9	25.8	44.0	113.5	2.4	13.3	3.0	1,080.7	1,242.7	2,698.7	5,317.7

AMERICAN BITTERN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.8	6.8	0.3	-	30.9	0.7	1.2	0.9	11.2	0.0	-	-		54.7
2	20.5	9.2	-	3.9	3.7	43.8	48.6	0.1	1.7	0.7	-	-		132.2

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	6.2	51.5	0.1	0.2	73.0	1.8	0.1	3.1	1,439.2	1.1		1,576.3
4	-	-	-	-	-	-	1.3	-	-	0.0	-	1,470.5		1,471.8
Total (km^2)	23.2	16.1	6.5	55.4	34.7	44.6	124.1	2.7	13.0	3.8	1,439.2	1,471.7	458.0	3,693.0

LEAST BITTERN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.6	4.4	0.0	-	0.0	0.3	0.2	0.2	3.5	0.0	-	-		9.3
2	10.8	1.5	-	0.0	0.0	15.5	3.5	0.1	0.8	0.4	-	-		32.5
3	-	-	0.5	0.7	0.1	0.0	7.5	0.6	0.0	0.5	103.3	0.1		113.2
4	-	-	-	-	-	-	1.0	-	-	0.0	-	604.7		605.7
Total (km^2)	11.4	5.9	0.5	0.7	0.1	15.8	12.2	0.8	4.3	0.9	103.3	604.8	16.0	776.7

GREAT BLUE HERON	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	14.3	40.3	9.7	-	170.0	3.8	4.1	6.3	70.8	0.0	-	-		319.4
2	75.5	45.1	-	8.4	37.4	165.3	152.9	0.5	10.8	5.5	-	-		501.4
3	-	-	55.2	300.7	0.6	1.7	462.8	11.3	0.2	24.7	10,487.9	2.2		11,347.3
4	-	-	-	-	-	-	6.6	-	-	0.0	-	8,935.2		8,941.8
Total (km^2)	89.8	85.4	64.9	309.1	208.0	170.9	626.3	18.0	81.8	30.2	10,487.9	8,937.4	446.6	21,556.5

SNOWY EGRET	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.2	0.0	0.0	-	0.0	1.7	0.6	0.1	10.3	0.0	-	-		12.9
2	12.2	0.0	-	0.0	0.0	11.3	6.6	0.0	1.1	1.7	-	-		33.0
3	-	-	0.0	0.0	0.5	0.0	0.9	0.1	0.4	0.1	0.4	0.0		2.3
4	-	-	-	-	-	-	0.0	-	-	0.0	-	875.1		875.1
Total (km^2)	12.4	0.0	0.0	0.0	0.5	13.0	8.0	0.2	11.8	1.8	0.4	875.1	13.0	936.3

LITTLE BLUE HERON	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	2.5	0.0	0.0	1.5	0.0	-	-		4.0
2	13.6	0.0	-	0.0	0.0	7.7	1.2	0.0	0.8	1.2	-	-		24.3
3	-	-	6.5	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.8	0.0		8.1
4	-	-	-	-	-	-	0.0	-	-	0.0	-	629.2		629.2
Total (km^2)	13.6	0.0	6.5	0.0	0.0	10.2	2.0	0.0	2.2	1.2	0.8	629.3	9.3	675.0

CATTLE EGRET	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	3.9	0.0	0.0	3.5	0.0	-	-		7.4
2	13.5	0.0	-	0.0	0.0	7.5	1.7	0.0	1.0	2.0	-	-		25.7
3	-	-	8.7	0.0	0.0	0.0	1.8	0.0	0.0	0.0	7.7	0.0		18.2
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,237.0		1,237.0
Total (km^2)	13.5	0.0	8.7	0.0	0.0	11.4	3.5	0.0	4.5	2.0	7.7	1,237.1	15.6	1,304.0

GREEN HERON	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	26.3	72.0	15.7	-	0.0	6.0	2.5	1.8	52.5	0.1	-	-		176.9
2	73.9	33.6	-	1.1	0.0	131.5	58.4	0.2	6.7	5.2	-	-		310.5
3	-	-	61.3	164.9	0.8	1.8	194.8	11.5	0.5	8.0	3,348.1	1.8		3,793.4
4	-	-	-	-	-	-	11.2	-	-	0.0	-	9,062.3		9,073.5
Total (km^2)	100.2	105.6	77.0	166.0	0.8	139.2	266.9	13.6	59.6	13.3	3,348.1	9,064.1	90.6	13,445.0

BLACK-CROWNED NIGHT-HERON	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	7.3	90.5	0.0	-	0.0	4.7	1.8	0.2	37.6	0.0	-	-		142.1
2	21.5	36.7	-	0.0	0.0	24.2	21.5	0.0	4.6	2.7	-	-		111.1
3	-	-	30.5	0.0	0.6	0.0	77.3	0.1	0.2	1.6	640.6	0.2		751.1

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	6.5	-	-	0.0	-	4,155.1		4,161.7
Total (km²)	28.8	127.2	30.5	0.0	0.6	28.9	107.0	0.3	42.4	4.4	640.6	4,155.3	22.8	5,188.8

GLOSSY IBIS	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	0.5	0.0	0.0	0.3	0.0	-	-		0.8
2	10.0	0.0	-	0.0	0.0	4.9	0.4	0.0	0.3	0.5	-	-		16.1
3	-	-	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.8
4	-	-	-	-	-	-	0.0	-	-	0.0	-	140.3		140.3
Total (km²)	10.0	0.0	0.8	0.0	0.0	5.3	0.5	0.0	0.7	0.5	0.0	140.3	5.4	163.4

CANADA GOOSE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.5	15.2	3.3	-	47.2	1.8	2.3	5.1	41.4	0.0	-	-		121.7
2	56.7	14.2	-	2.5	11.4	115.1	83.0	0.6	7.8	3.3	-	-		294.7
3	-	-	28.3	145.3	0.3	0.8	188.7	5.9	0.4	14.1	4,714.5	1.6		5,099.8
4	-	-	-	-	-	-	2.1	-	-	0.0	-	8,645.6		8,647.7
Total (km²)	62.2	29.4	31.6	147.9	58.9	117.6	276.1	11.6	49.6	17.5	4,714.5	8,647.2	1,658.0	15,821.9

WOOD DUCK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	21.4	56.5	13.5	-	206.7	4.8	6.2	6.2	91.5	0.1	-	-		406.8
2	79.3	61.9	-	15.0	59.8	188.0	222.2	0.2	12.8	7.3	-	-		646.6
3	-	-	68.8	425.6	0.6	2.3	680.0	16.2	0.4	30.5	14,182.2	3.7		15,410.4
4	-	-	-	-	-	-	9.0	-	-	0.0	-	11,012.9		11,021.9
Total (km²)	100.7	118.4	82.3	440.6	267.2	195.1	917.5	22.6	104.7	37.9	14,182.2	11,016.6	1,844.6	29,330.3

GREEN-WINGED TEAL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total

Category 1	6.0	12.4	3.6	-	68.0	1.6	2.5	6.0	43.0	0.0	-	-		143.0
2	55.4	14.6	-	2.7	12.9	111.1	70.8	0.6	8.8	2.6	-	-		279.3
3	-	-	23.7	195.0	0.2	0.9	225.1	6.3	0.1	16.2	7,199.7	1.4		7,668.5
4	-	-	-	-	-	-	2.7	-	-	0.0	-	5,465.0		5,467.7
Total (km^2)	61.3	26.9	27.3	197.6	81.1	113.5	301.0	12.8	51.9	18.9	7,199.7	5,466.3	190.1	13,748.5

MALLARD	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	7.5	18.6	3.7	-	65.9	2.3	2.6	6.0	49.3	0.0	-	-		155.8
2	63.1	19.9	-	6.4	13.5	130.2	111.3	0.7	9.7	4.2	-	-		359.0
3	-	-	34.9	185.0	0.3	0.9	241.7	7.8	0.4	17.9	6,628.3	2.3		7,119.6
4	-	-	-	-	-	-	3.2	-	-	0.0	-	9,553.0		9,556.3
Total (km^2)	70.6	38.5	38.6	191.4	79.7	133.4	358.8	14.4	59.5	22.1	6,628.3	9,555.4	2,197.5	19,388.3

AMERICAN BLACK DUCK	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	6.6	13.0	3.2	-	63.4	1.5	2.3	4.7	44.5	0.0	-	-		139.3
2	57.9	16.8	-	6.2	13.4	118.8	95.9	0.3	8.3	2.4	-	-		319.9
3	-	-	22.2	171.9	0.2	0.8	233.5	5.6	0.1	14.7	6,189.9	2.1		6,641.1
4	-	-	-	-	-	-	3.0	-	-	0.0	-	4,331.8		4,334.8
Total (km^2)	64.5	29.8	25.4	178.1	77.1	121.1	334.8	10.5	52.9	17.2	6,189.9	4,333.9	2,133.1	13,568.3

BLUE-WINGED TEAL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	5.6	12.7	3.4	-	0.0	1.3	0.3	5.1	19.6	0.0	-	-		48.1
2	53.9	5.9	-	4.6	0.0	96.6	30.3	0.5	4.0	2.0	-	-		197.9
3	-	-	22.4	102.5	0.1	0.4	92.1	4.9	0.1	7.2	1,840.1	1.3		2,071.0
4	-	-	-	-	-	-	2.5	-	-	0.0	-	4,882.8		4,885.3
Total (km^2)	59.5	18.6	25.8	107.1	0.1	98.3	125.2	10.6	23.8	9.2	1,840.1	4,884.1	945.5	8,147.9

AMERICAN WIGEON	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.1	0.0	-	-		0.1
2	0.0	0.0	-	0.0	0.0	0.0	0.2	0.0	0.1	0.0	-	-		0.3
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0		0.6
4	-	-	-	-	-	-	0.0	-	-	0.0	-	157.0		157.0
Total (km^2)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.6	157.0	23.3	181.3

RING-NECKED DUCK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	4.1	8.1	2.5	-	39.2	0.6	1.4	3.8	34.1	0.0	-	-		93.8
2	38.4	8.4	-	5.4	10.2	94.5	88.6	0.1	6.0	1.3	-	-		252.9
3	-	-	16.4	128.9	0.1	0.5	174.0	3.5	0.0	11.1	4,069.9	1.9		4,406.3
4	-	-	-	-	-	-	1.5	-	-	0.0	-	2,643.0		2,644.5
Total (km^2)	42.5	16.6	18.8	134.2	49.6	95.6	265.5	7.5	40.1	12.4	4,069.9	2,644.9	1,622.1	9,019.5

COMMON GOLDENEYE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	13.1	39.8	9.7	-	173.8	0.7	3.6	5.2	56.8	0.0	-	-		302.8
2	57.3	44.0	-	12.2	38.8	122.3	169.4	0.3	9.2	2.7	-	-		456.2
3	-	-	45.0	314.6	0.0	1.8	481.4	10.1	0.0	22.8	10,643.4	2.9		11,521.8
4	-	-	-	-	-	-	6.4	-	-	0.0	-	6,289.4		6,295.7
Total (km^2)	70.4	83.9	54.7	326.8	212.6	124.8	660.7	15.6	66.1	25.5	10,643.4	6,292.3	1,046.2	19,622.8

HOODED MERGANSER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	13.5	36.7	8.5	-	142.2	3.5	4.5	5.7	73.8	0.0	-	-		288.5
2	69.8	44.5	-	12.6	37.3	163.1	172.5	0.2	10.9	5.0	-	-		515.9

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	47.2	304.8	0.5	1.8	456.3	10.5	0.2	21.6	10,033.8	3.2		10,880.1
4	-	-	-	-	-	-	5.4	-	-	0.0	-	7,738.7		7,744.1
Total (km^2)	83.3	81.2	55.6	317.4	180.0	168.4	638.6	16.5	84.9	26.7	10,033.8	7,742.0	1,855.3	21,283.8

COMMON MERGANSER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	21.7	14.2	14.7	-	242.4	1.3	5.3	6.0	61.7	0.0	-	-		367.3
2	74.1	47.0	-	15.0	61.9	144.1	209.1	0.1	7.5	3.6	-	-		562.3
3	-	-	64.6	446.6	0.0	1.8	702.6	13.1	0.0	29.2	14,720.4	3.4		15,981.6
4	-	-	-	-	-	-	8.3	-	-	0.0	-	6,705.9		6,714.2
Total (km^2)	95.8	61.2	79.3	461.5	304.4	147.2	925.3	19.3	69.2	32.7	14,720.4	6,709.3	3,136.4	26,761.8

RED-BREASTED MERGANSER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.9	12.0	0.0	-	1.1	1.1	3.5	0.0	13.7	0.0	-	-		36.3
2	14.1	11.6	-	0.0	2.3	11.8	55.0	0.0	2.6	0.3	-	-		97.7
3	-	-	1.8	28.4	0.0	0.0	87.0	0.0	0.0	8.9	1,622.1	0.6		1,748.8
4	-	-	-	-	-	-	1.4	-	-	0.0	-	861.8		862.2
Total (km^2)	19.0	23.7	1.8	28.4	3.4	12.8	146.9	0.0	16.4	9.2	1,622.1	862.4	1183.7*	3,929.8

TURKEY VULTURE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	1.4	128.0	0.1	-	0.0	5.6	2.1	0.7	48.3	0.6	-	-		186.9
2	23.3	43.5	-	0.5	0.0	124.3	40.5	0.4	8.3	7.8	-	-		248.6
3	-	-	15.0	0.0	0.7	0.9	77.8	12.0	0.9	9.5	788.4	0.7		906.0
4	-	-	-	-	-	-	14.0	-	-	0.0	-	12,582.2		12,596.3
Total (km^2)	24.7	171.5	15.1	0.5	0.7	130.9	134.4	13.1	57.5	18.0	788.4	12,582.9	31.3	13,969.1

OSPREY	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	26.1	70.7	15.4	-	217.3	6.5	9.2	6.2	102.4	0.1	-	-		453.7
2	94.5	72.3	-	16.5	70.0	217.4	236.3	0.2	13.0	8.9	-	-		729.2
3	-	-	75.2	482.8	0.7	2.8	789.2	18.7	0.5	34.5	16,082.4	4.1		17,491.0
4	-	-	-	-	-	-	10.1	-	-	0.0	-	13,477.8		13,487.9
Total (km^2)	120.6	143.0	90.5	499.3	288.1	226.7	1,044.8	25.1	115.9	43.5	16,082.4	13,477.8	6419.1*	38,580.8

BALD EAGLE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	8.9	1.7	0.0	-	2.2	0.7	1.1	0.0	11.9	0.0	-	-		26.6
2	8.7	6.5	-	3.3	0.0	22.0	18.7	0.0	0.3	0.0	-	-		59.5
3	-	-	0.0	16.8	0.3	0.2	19.2	0.0	0.0	0.0	177.1	0.8		214.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	400.6		400.6
Total (km^2)	17.7	8.2	0.0	20.2	2.5	22.9	39.0	0.0	12.2	0.0	177.1	401.4	362.0*	1,073.2

NORTHERN HARRIER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	4.3	7.6	0.5	-	28.0	1.2	0.5	3.5	21.3	0.0	-	-		66.9
2	34.3	9.1	-	0.7	4.9	62.5	51.0	0.6	5.8	2.4	-	-		171.2
3	-	-	17.4	82.1	0.1	0.2	89.1	4.2	0.4	7.0	3,304.9	0.6		3,505.9
4	-	-	-	-	-	-	2.3	-	-	0.0	-	7,001.5		7,003.9
Total (km^2)	38.5	16.7	18.0	82.7	33.0	64.0	142.9	8.2	27.4	9.4	3,304.9	7,002.1	154.5	10,902.3

SHARP-SHINNED HAWK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.8	109.0	42.0	-	618.5	7.4	15.2	6.3	105.8	0.6	-	-		937.4
2	81.1	160.0	-	12.9	105.8	224.8	328.8	0.6	15.6	15.0	-	-		944.7
3	-	-	235.1	840.3	0.5	2.9	1,579.2	30.6	0.8	69.4	35,851.2	3.1		38,613.1

4	-	-	-	-	-	-	22.9	-	-	0.0	-	27,991.3		28,014.2
Total (km²)	113.9	269.0	277.1	853.2	724.8	235.1	1,946.1	37.6	122.2	84.9	35,851.2	27,994.4	351.4	68,860.9

COOPER'S HAWK	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	33.1	108.9	41.9	-	595.9	7.4	2.1	6.3	93.8	0.6	-	-		890.2
2	81.3	158.5	-	13.7	79.1	205.5	272.4	0.6	15.1	12.7	-	-		838.9
3	-	-	206.3	840.9	0.5	2.9	1,184.2	31.7	0.8	28.0	24,673.5	3.2		26,972.1
4	-	-	-	-	-	-	23.3	-	-	0.0	-	25,013.2		25,036.5
Total (km²)	114.4	267.4	248.2	854.6	675.6	215.8	1,482.1	38.7	109.7	41.4	24,673.5	25,016.3	113.9	53,851.6

NORTHERN GOSHAWK	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	29.6	104.8	41.7	-	570.7	7.0	14.1	3.8	97.1	0.6	-	-		869.4
2	65.3	150.1	-	11.7	101.4	196.5	305.6	0.4	13.3	13.7	-	-		858.2
3	-	-	225.3	715.9	0.5	2.8	1,463.3	27.5	0.7	62.3	29,022.5	2.1		31,523.1
4	-	-	-	-	-	-	21.9	-	-	0.0	-	25,109.7		25,131.6
Total (km²)	95.0	254.9	267.0	727.7	672.7	206.3	1,804.9	31.8	111.2	76.7	29,022.5	25,111.8	273.7	58,656.0

RED-SHOULDERED HAWK	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	35.6	115.2	44.6	-	543.2	7.7	2.4	9.1	112.5	0.6	-	-		870.9
2	112.8	160.6	-	15.2	59.9	284.5	282.6	0.7	20.1	13.4	-	-		949.8
3	-	-	212.5	850.2	0.6	3.5	1,203.5	33.4	0.8	28.6	22,498.9	3.2		24,835.3
4	-	-	-	-	-	-	24.2	-	-	0.0	-	26,435.4		26,459.6
Total (km²)	148.5	275.7	257.1	865.4	603.8	295.7	1,512.7	43.2	133.4	42.6	22,498.9	26,438.6	175.3	53,290.9

BROAD-WINGED HAWK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	30.4	105.2	41.2	-	573.2	7.0	14.3	4.1	97.6	0.6	-	-		873.5
2	67.4	152.1	-	12.0	101.0	201.4	306.1	0.4	13.5	14.0	-	-		868.0
3	-	-	224.9	715.4	0.6	2.8	1,470.4	28.0	0.7	62.6	29,239.0	2.2		31,746.5
4	-	-	-	-	-	-	21.8	-	-	0.0	-	25,163.9		25,185.8
Total (km^2)	97.8	257.3	266.0	727.5	674.7	211.2	1,812.6	32.5	111.9	77.2	29,239.0	25,166.2	276.1	58,949.9

RED-TAILED HAWK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	26.9	70.2	38.9	-	531.1	7.8	14.3	9.5	107.2	0.7	-	-		806.6
2	104.4	107.4	-	14.5	78.9	284.4	310.7	0.8	16.6	14.2	-	-		931.8
3	-	-	239.6	863.3	0.6	3.4	1,543.7	29.8	0.8	73.3	36,153.7	3.8		38,911.9
4	-	-	-	-	-	-	19.8	-	-	0.0	-	28,933.4		28,953.2
Total (km^2)	131.3	177.6	278.5	877.9	610.6	295.6	1,888.5	40.1	124.5	88.1	36,153.7	28,937.2	375.0	69,978.4

GOLDEN EAGLE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.7	-	0.5	0.0	0.0	0.0	0.0	0.0	-	-		1.3
2	0.0	4.6	-	0.0	0.0	9.4	17.6	0.0	0.0	0.0	-	-		31.8
3	-	-	3.0	0.1	0.0	0.0	25.0	0.5	0.0	0.0	274.6	0.0		303.1
4	-	-	-	-	-	-	0.0	-	-	0.0	-	120.3		120.3
Total (km^2)	0.0	4.6	3.7	0.1	0.5	9.4	42.6	0.5	0.0	0.0	274.6	120.3	4.6	461.1

AMERICAN KESTREL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.0	10.6	0.7	-	72.7	1.6	1.6	3.8	26.1	0.0	-	-		122.1
2	39.0	14.1	-	0.8	7.1	68.3	52.3	0.6	6.8	2.7	-	-		191.8
3	-	-	19.1	146.9	0.1	0.3	130.5	5.6	0.4	9.8	7,565.0	1.3		7,878.9

4	-	-	-	-	-	-	2.5	-	-	0.0	-	8,295.6		8,298.1
Total (km^2)	44.0	24.7	19.7	147.7	79.9	70.2	187.0	10.0	33.3	12.5	7,565.0	8,296.9	140.4	16,631.3

MERLIN	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	14.6	93.9	0.0	-	127.0	2.5	16.1	0.0	46.7	0.0	-	-		300.8
2	17.8	42.9	-	0.0	66.7	33.4	145.3	0.0	3.6	2.6	-	-		312.4
3	-	-	36.2	19.9	0.0	0.0	606.9	0.0	0.0	49.9	14,541.2	0.2		15,254.4
4	-	-	-	-	-	-	11.0	-	-	0.0	-	4,381.5		4,392.4
Total (km^2)	32.4	136.8	36.2	19.9	193.7	36.0	779.4	0.0	50.3	52.4	14,541.2	4,381.7	41.8	20,301.8

PEREGRINE FALCON	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	85.7	22.6	-	504.0	0.0	0.6	0.0	6.9	0.0	-	-		619.8
2	0.1	16.3	-	0.0	15.8	6.2	44.7	0.0	0.1	0.0	-	-		83.3
3	-	-	60.7	27.6	0.0	0.0	104.9	0.5	0.0	0.0	588.7	0.0		782.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	820.1		820.1
Total (km^2)	0.1	102.0	83.3	27.6	519.8	6.2	150.3	0.5	7.0	0.0	588.7	820.1	98.2	2,403.8

SPRUCE GROUSE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	32.5	27.7	9.5	-	354.9	1.8	8.0	6.8	67.9	0.0	-	-		509.3
2	87.2	83.3	-	8.4	91.7	111.5	207.1	0.2	7.2	4.3	-	-		600.9
3	-	-	61.6	598.7	0.0	0.5	947.6	22.3	0.0	36.3	24,249.5	2.9		25,919.4
4	-	-	-	-	-	-	18.4	-	-	0.0	-	7,891.9		7,910.4
Total (km^2)	119.8	111.1	71.2	607.1	446.7	113.8	1,181.0	29.3	75.1	40.6	24,249.5	7,894.9	89.8	35,029.8

RUFFED GROUSE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	6.0	35.8	31.9	-	349.8	4.3	9.0	3.9	52.1	0.6	-	-		493.3
2	42.1	66.8	-	6.9	27.9	161.2	183.2	0.6	8.6	8.1	-	-		505.4
3	-	-	173.2	504.4	0.3	2.2	907.6	12.4	0.5	48.0	23,332.4	2.0		24,982.9
4	-	-	-	-	-	-	7.1	-	-	0.0	-	18,404.4		18,411.5
Total (km^2)	48.1	102.5	205.0	511.3	378.1	167.6	1,107.0	16.8	61.2	56.7	23,332.4	18,406.4	177.0	44,570.2

WILD TURKEY	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.2	0.0	0.0	-	0.0	5.1	0.5	0.3	28.7	0.6	-	-		35.3
2	6.2	0.2	-	0.0	0.0	76.4	17.2	0.0	3.1	5.7	-	-		108.9
3	-	-	11.1	0.0	0.5	0.3	26.0	2.5	0.8	4.8	154.2	0.1		200.3
4	-	-	-	-	-	-	0.0	-	-	0.0	-	7,382.0		7,382.0
Total (km^2)	6.4	0.2	11.1	0.0	0.5	81.8	43.7	2.7	32.6	11.1	154.2	7,382.1	11.9	7,738.3

VIRGINIA RAIL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	1.6	2.6	0.0	-	12.3	0.1	0.0	1.2	12.2	0.0	-	-		30.1
2	20.9	2.6	-	0.2	3.1	40.7	29.2	0.1	3.2	0.1	-	-		100.0
3	-	-	1.8	37.2	0.0	0.0	36.6	0.9	0.0	0.9	983.6	0.2		1,061.3
4	-	-	-	-	-	-	0.8	-	-	0.0	-	583.5		584.3
Total (km^2)	22.5	5.2	1.8	37.4	15.4	40.8	66.6	2.2	15.4	1.1	983.6	583.7	88.1	1,863.9

SORA	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	1.5	3.1	0.0	-	12.2	0.1	0.5	1.3	12.7	0.0	-	-		31.4
2	20.6	3.3	-	0.2	3.1	39.7	28.7	0.1	3.1	0.1	-	-		99.0
3	-	-	3.3	36.7	0.0	0.0	41.5	1.0	0.0	2.4	1,053.6	0.3		1,138.8
4	-	-	-	-	-	-	0.9	-	-	0.0	-	636.7		637.6
Total (km^2)	22.1	6.4	3.3	36.9	15.3	39.8	71.6	2.3	15.8	2.5	1,053.6	637.0	106.6	2,013.2

YELLOW RAIL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.8	1.7	0.0	-	4.3	0.0	0.5	1.0	8.1	0.0	-	-		16.4
2	11.5	1.7	-	0.1	1.5	17.6	17.8	0.0	2.1	0.1	-	-		52.3
3	-	-	1.1	18.1	0.0	0.0	20.5	0.2	0.0	1.0	499.5	0.1		540.5
4	-	-	-	-	-	-	0.5	-	-	0.0	-	285.3		285.7
Total (km^2)	12.3	3.3	1.1	18.2	5.8	17.6	39.3	1.2	10.2	1.1	499.5	285.3	53.5	948.5

COMMON MOORHEN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	0.1	0.1	1.0	2.4	0.0	-	-		3.7
2	7.7	0.0	-	0.1	0.0	5.6	1.6	0.0	0.8	0.3	-	-		16.2
3	-	-	0.0	7.6	0.1	0.0	1.3	0.1	0.0	0.3	85.0	0.0		94.5
4	-	-	-	-	-	-	0.0	-	-	0.0	-	318.4		318.4
Total (km^2)	7.7	0.0	0.0	7.7	0.1	5.8	3.0	1.1	3.3	0.6	85.0	318.4	10.2	442.9

AMERICAN COOT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	0.1	0.1	0.0	1.7	0.0	-	-		1.9
2	8.2	0.0	-	0.0	0.0	9.8	1.3	0.0	0.1	0.3	-	-		19.7
3	-	-	0.3	0.0	0.1	0.0	0.1	0.1	0.0	0.1	3.3	0.0		4.0
4	-	-	-	-	-	-	0.0	-	-	0.0	-	126.1		126.1
Total (km^2)	8.2	0.0	0.3	0.0	0.1	9.9	1.5	0.1	1.8	0.4	3.3	126.1	7.9	159.5

KILLDEER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	3.2	19.1	0.7	-	74.2	1.5	1.0	2.3	12.4	0.0	-	-		114.5
2	19.7	9.7	-	0.7	3.2	32.4	29.1	0.5	3.5	3.0	-	-		101.9

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	19.1	102.9	0.1	0.2	82.1	4.3	0.4	9.1	6,340.0	0.9		6,559.0
4	-	-	-	-	-	-	1.2	-	-	0.0	-	8,050.2		8,051.4
Total (km^2)	22.9	28.8	19.8	103.6	77.5	34.2	113.5	7.1	16.3	12.1	6,340.0	8,051.1	94.6	14,921.5

SPOTTED SANDPIPER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	3.9	8.8	0.6	-	36.7	0.9	0.6	2.8	18.9	0.0	-	-		73.3
2	33.0	9.2	-	0.4	5.5	61.6	49.2	0.5	4.2	1.8	-	-		165.4
3	-	-	15.2	67.9	0.1	0.3	81.3	3.4	0.3	5.6	2,212.7	0.5		2,387.3
4	-	-	-	-	-	-	2.1	-	-	0.0	-	5,769.0		5,771.1
Total (km^2)	36.9	18.0	15.8	68.4	42.3	62.8	133.1	6.7	23.5	7.4	2,212.7	5,769.5	135.3	8,532.3

UPLAND SANDPIPER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	3.4	6.1	0.0	-	0.0	0.8	0.1	2.2	11.2	0.0	-	-		23.9
2	29.4	3.3	-	0.3	0.0	44.2	18.2	0.4	1.8	1.2	-	-		98.7
3	-	-	1.0	37.5	0.0	0.0	27.5	2.6	0.3	2.0	693.6	0.3		764.8
4	-	-	-	-	-	-	1.8	-	-	0.0	-	3,207.2		3,209.1
Total (km^2)	32.8	9.4	1.0	37.7	0.0	45.0	47.6	5.2	13.3	3.2	693.6	3,207.6	30.5	4,127.0

COMMON SNIPE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	2.5	6.0	1.9	-	24.6	0.9	1.0	3.5	30.7	0.0	-	-		71.2
2	44.1	5.6	-	1.2	6.7	87.0	53.8	0.3	5.6	1.8	-	-		206.3
3	-	-	16.1	88.2	0.2	0.5	113.8	2.9	0.2	10.5	3,001.6	0.8		3,234.9
4	-	-	-	-	-	-	1.0	-	-	0.0	-	4,909.1		4,910.1
Total (km^2)	46.6	11.7	18.1	89.5	31.5	88.4	169.7	6.8	36.5	12.3	3,001.6	4,909.9	165.4	8,587.8

AMERICAN WOODCOCK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.0	8.4	0.6	-	62.4	1.1	1.6	3.5	24.5	0.0	-	-		107.1
2	39.7	15.8	-	2.1	7.3	75.3	51.7	0.3	6.9	2.2	-	-		201.1
3	-	-	14.4	176.5	0.1	0.2	179.4	5.4	0.0	11.0	9,380.5	1.5		9,769.1
4	-	-	-	-	-	-	2.3	-	-	0.0	-	4,399.9		4,402.1
Total (km^2)	44.8	24.2	15.0	178.6	69.7	76.5	235.0	9.2	31.4	13.2	9,380.5	4,401.4	106.3	14,585.7

HERRING GULL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.7	1.9	0.0	-	3.7	0.4	1.1	0.0	3.6	0.0	-	-		11.5
2	1.9	2.4	-	0.0	0.2	7.7	15.1	0.0	0.6	0.1	-	-		28.0
3	-	-	0.7	6.6	0.0	0.0	14.7	0.1	0.0	0.1	164.3	0.5		187.1
4	-	-	-	-	-	-	0.1	-	-	0.0	-	583.7		583.8
Total (km^2)	2.6	4.3	0.7	6.6	3.9	8.2	31.1	0.1	4.2	0.1	164.3	584.2	8,925.8*	9,736.2

GREATER BLACK-BACKED GULL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	1.8	17.9	0.0	-	0.0	1.1	2.7	0.0	8.5	0.0	-	-		32.1
2	11.9	5.6	-	0.0	0.0	14.9	4.1	0.0	0.9	0.3	-	-		37.7
3	-	-	0.1	0.2	0.1	0.0	4.4	0.0	0.0	0.2	33.6	0.2		38.9
4	-	-	-	-	-	-	0.8	-	-	0.0	-	855.8		856.6
Total (km^2)	13.7	23.5	0.1	0.2	0.1	16.0	11.9	0.1	9.4	0.5	33.6	856.0	5892.5**	6,857.8

COMMON TERN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.8	2.0	0.0	-	2.2	0.5	1.3	0.0	3.1	0.0	-	-		10.0
2	1.4	2.1	-	0.0	0.2	3.3	9.4	0.0	0.3	0.0	-	-		16.9
3	-	-	0.2	3.0	0.0	0.0	4.4	0.0	0.0	0.1	72.0	0.3		80.2

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	0.1	-	-	0.0	-	220.7		220.8
Total (km²)	2.2	4.1	0.2	3.1	2.5	3.8	15.3	0.0	3.5	0.1	72.0	221.0	499.3*	827.2

BLACK TERN	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
2	0.6	0.0	-	0.0	0.0	0.6	0.0	0.0	0.0	0.0	-	-		1.1
3	-	-	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0		11.0
4	-	-	-	-	-	-	0.0	-	-	0.0	-	20.6		20.6
Total (km²)	0.6	0.0	0.0	4.2	0.0	0.6	0.0	0.0	0.0	0.0	6.8	20.6	25.2	57.9

MOURNING DOVE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.1	8.2	1.0	-	53.3	1.5	1.4	3.4	15.9	0.0	-	-		88.8
2	25.1	14.3	-	1.1	3.4	46.2	31.0	0.6	4.4	3.6	-	-		129.8
3	-	-	23.2	152.0	0.1	0.2	140.5	5.6	0.4	12.2	8,612.5	1.2		8,947.9
4	-	-	-	-	-	-	1.8	-	-	0.0	-	9,077.0		9,078.7
Total (km²)	29.2	22.5	24.2	153.1	56.8	47.9	174.7	9.6	20.7	15.8	8,612.5	9,078.2	74.2	18,319.5

BLACK-BILLED CUCKOO	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	33.6	110.0	42.6	-	633.1	7.5	15.3	5.8	111.7	0.6	-	-		960.2
2	88.8	162.6	-	12.8	109.2	243.1	343.3	0.6	16.1	14.9	-	-		991.4
3	-	-	235.4	864.9	0.5	3.0	1,615.3	31.5	0.8	70.4	36,746.9	3.4		39,572.1
4	-	-	-	-	-	-	23.6	-	-	0.0	-	27,760.1		27,783.7
Total (km²)	122.4	272.6	278.0	877.7	742.8	253.6	1,997.5	37.9	128.5	85.9	36,746.9	27,763.4	353.2	69,660.6

YELLOW-BILLED CUCKOO	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	5.7	35.0	22.1	-	0.0	4.3	0.3	0.3	19.8	0.6	-	-		88.1
2	28.4	7.3	-	0.6	0.0	80.2	33.0	0.3	2.8	3.5	-	-		156.1
3	-	-	94.8	57.2	0.3	0.6	98.6	5.6	0.5	6.1	2,042.8	1.3		2,307.9
4	-	-	-	-	-	-	7.3	-	-	0.0	-	9,115.4		9,122.8
Total (km^2)	34.0	42.3	116.9	57.8	0.3	85.1	139.3	6.2	23.2	10.2	2,042.8	9,116.8	22.7	11,697.5

GREAT HORNED OWL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	35.1	117.1	45.4	-	621.9	8.0	15.8	8.0	128.1	0.7	-	-		980.0
2	104.5	163.3	-	14.5	113.6	288.2	361.3	0.7	18.0	16.0	-	-		1,080.3
3	-	-	250.9	849.3	0.7	3.5	1,662.8	32.9	0.8	75.7	33,965.5	3.3		36,845.5
4	-	-	-	-	-	-	23.6	-	-	0.0	-	29,970.0		29,993.6
Total (km^2)	139.6	280.4	296.3	863.9	736.3	299.8	2,063.5	41.6	146.9	92.3	33,965.5	29,973.3	430.9	69,330.2

BARRED OWL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	33.3	113.2	45.1	-	618.0	7.8	15.7	7.5	130.3	0.7	-	-		971.6
2	102.1	160.8	-	14.4	113.4	278.7	358.3	0.6	18.9	15.5	-	-		1,062.8
3	-	-	246.2	841.3	0.7	3.5	1,651.9	31.8	0.7	74.4	33,752.9	3.1		36,606.5
4	-	-	-	-	-	-	23.0	-	-	0.0	-	28,354.4		28,377.4
Total (km^2)	135.5	274.0	291.3	855.6	732.1	290.0	2,048.9	39.8	150.0	90.5	33,752.9	28,357.5	367.8	67,386.2

LONG-EARED OWL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	34.8	113.9	45.2	-	620.0	7.6	15.5	8.6	131.1	0.6	-	-		977.3
2	106.2	161.1	-	14.2	113.8	286.9	359.7	0.7	19.2	15.7	-	-		1,077.6
3	-	-	249.4	846.7	0.7	3.5	1,658.4	32.2	0.8	75.2	33,855.9	3.2		36,726.0
4	-	-	-	-	-	-	23.7	-	-	0.0	-	28,963.4		28,987.1

Total (km²)	141.0	275.0	294.6	861.0	734.4	298.0	2,057.3	41.5	151.1	91.5	33,855.9	28,966.6	390.3	68,158.3

SHORT-EARED OWL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	3.1	6.9	0.0	-	44.4	0.5	0.4	3.1	12.7	0.0	-	-		70.9
2	26.9	6.2	-	0.5	4.8	35.4	44.1	0.5	1.3	0.6	-	-		120.2
3	-	-	11.2	50.4	0.0	0.0	46.7	2.4	0.0	3.4	1,967.9	0.3		2,082.2
4	-	-	-	-	-	-	1.5	-	-	0.0	-	2,776.9		2,778.4
Total (km²)	30.0	13.1	11.2	50.9	49.2	35.9	92.6	5.9	13.9	3.9	1,967.9	2,777.2	93.5	5,145.3

NORTHERN SAW-WHET OWL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	33.4	113.1	44.8	-	615.0	7.0	15.5	7.1	127.1	0.6	-	-		963.6
2	99.4	160.1	-	14.3	113.9	266.9	354.3	0.3	18.1	14.2	-	-		1,041.4
3	-	-	239.4	834.9	0.7	3.3	1,650.5	31.3	0.5	72.6	33,568.7	3.1		36,404.9
4	-	-	-	-	-	-	23.0	-	-	0.0	-	24,120.8		24,143.8
Total (km²)	132.8	273.1	284.2	849.2	729.5	277.2	2,043.2	38.8	145.7	87.4	33,568.7	24,123.9	362.6	62,916.2

COMMON NIGHTHAWK	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	6.2	25.8	0.7	-	102.0	2.0	2.1	3.9	31.9	0.0	-	-		174.7
2	42.0	18.5	-	5.1	9.0	83.7	97.7	0.6	7.6	3.5	-	-		267.7
3	-	-	24.8	171.8	0.1	0.4	169.0	6.9	0.5	11.9	8,114.2	2.4		8,501.9
4	-	-	-	-	-	-	2.8	-	-	0.0	-	9,331.9		9,334.7
Total (km²)	48.2	44.3	25.5	176.9	111.1	86.0	271.7	11.4	40.0	15.5	8,114.2	9,334.3	3,316.0	21,595.1

WHIP-POOR-WILL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	8.0	15.4	3.7	-	89.1	2.3	1.3	7.0	51.8	0.1	-	-		178.7

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
2	58.8	22.6	-	6.7	15.1	126.6	98.2	0.7	10.8	3.9	-	-		343.4
3	-	-	16.9	282.4	0.2	0.9	258.0	8.6	0.5	8.7	9,238.9	2.8		9,817.8
4	-	-	-	-	-	-	3.5	-	-	0.0	-	9,420.8		9,424.2
Total (km^2)	66.8	38.0	20.5	289.1	104.3	129.9	361.0	16.3	63.0	12.7	9,238.9	9,423.6	3,135.7	22,899.8

CHIMNEY SWIFT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	7.1	16.3	3.4	-	73.6	2.0	2.3	5.9	47.2	0.0	-	-		158.0
2	53.1	19.1	-	6.4	12.5	119.5	107.8	0.6	9.6	4.3	-	-		333.0
3	-	-	35.3	180.0	0.2	0.8	232.0	7.7	0.5	17.5	6,562.5	2.3		7,038.8
4	-	-	-	-	-	-	2.9	-	-	0.0	-	10,033.4		10,036.4
Total (km^2)	60.2	35.5	38.7	186.4	86.2	122.4	345.1	14.3	57.3	21.8	6,562.5	10,035.7	3,329.5	20,895.6

RUBY-THROATED HUMMINGBIRD	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	35.6	115.3	45.1	-	653.9	7.2	16.3	8.8	134.2	0.6	-	-		1,016.9
2	114.5	165.3	-	14.6	117.2	294.3	377.7	0.4	19.8	15.3	-	-		1,119.1
3	-	-	247.2	959.1	0.6	3.5	1,743.1	33.1	0.5	79.8	40,000.4	4.0		43,071.3
4	-	-	-	-	-	-	24.1	-	-	0.0	-	26,180.4		26,204.6
Total (km^2)	150.0	280.6	292.3	973.7	771.7	304.9	2,161.2	42.3	154.6	95.8	40,000.4	26,184.4	424.3	71,836.1

BELTED KINGFISHER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.6	13.3	3.1	-	48.4	1.7	4.0	2.6	34.2	0.0	-	-		112.0
2	34.5	15.4	-	5.8	9.8	82.1	79.5	0.1	4.7	1.9	-	-		233.8
3	-	-	17.9	123.4	0.3	0.8	176.1	4.2	0.1	10.8	4,101.8	1.8		4,437.2
4	-	-	-	-	-	-	1.7	-	-	0.0	-	4,089.2		4,090.9
Total (km^2)	39.1	28.7	21.0	129.3	58.4	84.6	261.3	6.9	39.1	12.7	4,101.8	4,091.0	6,498.3*	15,372.3

YELLOW-BELLIED SAPSUCKER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.4	114.6	45.1	-	650.1	2.3	16.0	8.3	123.1	0.7	-	-		994.4
2	100.5	165.1	-	15.4	116.4	253.8	377.2	0.5	18.6	12.2	-	-		1,059.6
3	-	-	228.1	952.3	0.4	3.5	1,734.8	32.8	0.3	77.4	39,723.3	3.9		42,756.7
4	-	-	-	-	-	-	23.5	-	-	0.0	-	23,525.9		23,549.4
Total (km^2)	134.9	279.7	273.1	967.7	766.9	259.5	2,151.5	41.5	142.0	90.2	39,723.3	23,529.8	149.4	68,509.5

DOWNY WOODPECKER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	23.4	65.2	37.1	-	475.1	6.5	13.1	6.8	88.9	0.6	-	-		716.7
2	81.6	98.6	-	13.8	71.7	239.7	265.9	0.3	12.4	12.4	-	-		796.4
3	-	-	223.3	738.9	0.5	3.0	1,418.5	26.8	0.4	66.8	29,864.7	2.9		32,345.8
4	-	-	-	-	-	-	17.9	-	-	0.0	-	22,167.4		22,185.3
Total (km^2)	104.9	163.9	260.5	752.7	547.3	249.2	1,715.4	33.9	101.7	79.8	29,864.7	22,170.3	270.9	56,315.1

HAIRY WOODPECKER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	33.0	111.1	44.1	-	604.7	6.7	15.0	6.3	118.9	0.6	-	-		940.5
2	92.6	157.3	-	13.9	111.7	259.0	337.9	0.3	16.3	13.9	-	-		1,003.0
3	-	-	235.0	816.6	0.6	3.2	1,616.6	30.7	0.5	71.5	32,835.9	3.0		35,613.7
4	-	-	-	-	-	-	22.7	-	-	0.0	-	23,450.5		23,473.2
Total (km^2)	125.6	268.5	279.1	830.5	717.1	269.0	1,992.2	37.3	135.6	86.0	32,835.9	23,453.5	340.3	61,370.7

THREE-TOED WOODPECKER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	13.6	0.0	2.3	-	352.7	0.3	6.2	1.7	42.4	0.0	-	-		419.2
2	37.9	72.5	-	5.0	90.8	64.1	166.3	0.0	3.4	3.6	-	-		443.5

3	-	-	49.2	557.3	0.0	0.0	787.1	4.2	0.0	29.9	21,827.4	1.6		23,256.7
4	-	-	-	-	-	-	0.0	-	-	0.0	-	4,798.4		4,798.4
Total (km^2)	51.4	72.5	51.5	562.2	443.5	64.4	959.6	5.9	45.8	33.5	21,827.4	4,800.0	53.7	28,971.5

BLACK-BACKED WOODPECKER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	31.6	102.5	4.1	-	489.5	1.8	13.1	0.0	77.4	0.0	-	-		720.0
2	65.9	96.4	-	5.1	104.5	86.2	216.6	0.0	4.2	4.9	-	-		583.8
3	-	-	62.2	644.0	0.0	0.0	1,180.6	7.2	0.0	40.7	28,318.8	2.7		30,256.2
4	-	-	-	-	-	-	20.4	-	-	0.0	-	6,300.3		6,320.8
Total (km^2)	97.5	198.8	66.3	649.1	594.0	88.1	1,430.7	7.3	81.6	45.6	28,318.8	6,303.0	55.8	37,936.5

NORTHERN FLICKER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	34.9	116.0	45.4	-	619.7	7.8	15.4	8.0	126.0	0.6	-	-		973.9
2	102.1	161.6	-	14.5	113.6	284.4	350.7	0.7	17.8	16.3	-	-		1,061.7
3	-	-	254.4	844.5	0.7	3.5	1,658.4	33.0	0.8	76.6	33,830.2	3.2		36,705.3
4	-	-	-	-	-	-	23.6	-	-	0.0	-	29,788.5		29,812.1
Total (km^2)	137.0	277.7	299.8	859.0	734.0	295.7	2,048.0	41.8	144.7	93.5	33,830.2	29,791.7	392.4	68,945.4

PILEATED WOODPECKER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	32.5	110.0	44.3	-	610.1	6.8	15.4	6.5	118.8	0.6	-	-		945.2
2	91.6	157.8	-	14.2	111.8	261.9	341.4	0.3	15.5	13.8	-	-		1,008.4
3	-	-	237.0	834.0	0.6	3.3	1,635.5	29.9	0.4	72.0	33,025.2	3.0		35,840.8
4	-	-	-	-	-	-	22.7	-	-	0.0	-	23,245.7		23,268.4
Total (km^2)	124.2	267.8	281.3	848.1	722.5	272.0	2,015.0	36.8	134.8	86.4	33,025.2	23,248.7	337.0	61,399.8

OLIVE-SIDED FLYCATCHER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	31.5	103.8	20.9	-	483.6	6.5	13.6	6.4	111.0	0.3	-	-		777.6
2	82.8	128.3	-	12.6	105.3	184.5	279.7	0.2	15.2	11.4	-	-		819.9
3	-	-	129.8	663.3	0.6	2.3	1,277.8	28.5	0.4	54.4	29,707.8	3.0		31,867.9
4	-	-	-	-	-	-	20.4	-	-	0.0	-	18,394.2		18,414.7
Total (km^2)	114.3	232.1	150.8	675.9	589.4	193.3	1,591.5	35.2	126.6	66.1	29,707.8	18,397.3	324.3	52,204.4

EASTERN WOOD-PEWEE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	25.2	67.5	38.0	-	513.5	6.9	14.1	8.1	100.2	0.6	-	-		774.1
2	95.8	103.4	-	14.3	76.0	260.2	301.1	0.4	15.1	12.5	-	-		878.7
3	-	-	224.8	827.9	0.6	3.2	1,499.2	27.9	0.4	70.2	35,072.0	3.6		37,729.7
4	-	-	-	-	-	-	18.5	-	-	0.0	-	23,310.2		23,328.6
Total (km^2)	120.9	170.9	262.8	842.1	590.1	270.2	1,832.8	36.3	115.7	83.3	35,072.0	23,313.8	365.7	63,076.8

YELLOW-BELLIED FLYCATCHER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	31.2	83.6	8.7	-	324.6	1.5	7.3	5.6	73.1	0.0	-	-		535.6
2	81.5	103.5	-	8.5	91.2	122.2	203.6	0.3	10.8	5.2	-	-		626.8
3	-	-	59.2	483.2	0.0	1.1	873.9	22.5	0.0	32.7	17,704.9	2.3		19,179.7
4	-	-	-	-	-	-	17.3	-	-	0.0	-	8,913.0		8,930.3
Total (km^2)	112.6	187.1	67.9	491.7	415.8	124.8	1,102.1	28.4	83.9	37.9	17,704.9	8,915.2	125.5	29,397.8

ALDER FLYCATCHER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.7	13.4	3.5	-	55.6	1.8	2.1	5.0	41.1	0.0	-	-		128.3
2	50.8	15.3	-	2.2	12.6	105.0	73.1	0.5	8.7	2.8	-	-		271.1

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	26.5	154.0	0.2	0.8	198.9	5.7	0.2	15.4	5,821.3	1.1		6,224.1
4	-	-	-	-	-	-	2.5	-	-	0.0	-	6,719.7		6,722.2
Total (km^2)	56.6	28.7	30.1	156.2	68.3	107.6	276.5	11.3	50.1	18.3	5,821.3	6,720.9	200.3	13,546.0

WILLOW FLYCATCHER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	5.5	41.5	14.1	-	0.0	4.6	0.5	0.1	25.8	0.6	-	-		92.9
2	24.0	9.5	-	0.0	0.0	105.4	44.4	0.2	3.7	3.7	-	-		190.9
3	-	-	65.1	8.4	0.4	0.7	84.1	3.9	0.5	5.0	1,198.4	0.7		1,367.1
4	-	-	-	-	-	-	8.0	-	-	0.0	-	9,437.2		9,445.3
Total (km^2)	29.5	51.0	79.2	8.4	0.4	110.7	137.0	4.2	30.1	9.4	1,198.4	9,437.9	51.9	11,148.0

LEAST FLYCATCHER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.4	35.5	30.5	-	301.1	4.2	8.2	3.8	52.1	0.6	-	-		440.3
2	37.1	58.7	-	6.7	25.3	151.3	172.6	0.6	9.7	7.7	-	-		469.7
3	-	-	172.1	391.2	0.3	2.0	797.7	10.7	0.5	41.5	16,736.4	1.3		18,153.7
4	-	-	-	-	-	-	6.6	-	-	0.0	-	17,705.6		17,712.2
Total (km^2)	41.5	94.2	202.6	397.9	326.7	157.5	985.2	15.0	62.3	49.7	16,736.4	17,706.8	157.7	36,933.6

EASTERN PHOEBE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	37.3	133.4	45.7	-	685.0	8.4	17.3	9.9	143.6	0.7	-	-		1,081.2
2	123.2	171.8	-	15.1	118.4	314.0	396.9	0.8	21.9	17.0	-	-		1,179.2
3	-	-	260.4	978.4	0.7	3.7	1,769.0	35.2	0.9	82.5	40,717.3	4.1		43,852.2
4	-	-	-	-	-	-	25.1	-	-	0.0	-	31,975.1		32,000.2
Total (km^2)	160.5	305.2	306.1	993.6	804.1	326.1	2,208.3	45.9	166.4	100.1	40,717.3	31,979.3	513.5	78,626.3

GREAT CRESTED FLYCATCHER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	23.6	65.9	34.5	-	470.1	6.5	4.1	4.7	78.4	0.6	-	-		688.4
2	81.5	96.4	-	14.0	69.5	234.0	284.3	0.3	11.6	11.3	-	-		802.8
3	-	-	216.7	656.3	0.5	2.7	1,323.2	25.4	0.4	57.2	24,709.1	2.5		26,994.1
4	-	-	-	-	-	-	18.1	-	-	0.0	-	20,966.1		20,984.2
Total (km^2)	105.1	162.2	251.2	670.3	540.0	243.2	1,629.7	30.3	90.5	69.2	24,709.1	20,968.6	237.3	49,706.7

EASTERN KINGBIRD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	8.1	18.5	4.1	-	104.7	2.2	3.1	7.1	50.3	0.1	-	-		198.1
2	63.1	25.4	-	3.0	15.2	129.6	95.1	0.7	10.6	4.5	-	-		347.1
3	-	-	38.0	284.9	0.2	0.9	318.8	9.1	0.4	22.4	13,218.7	2.2		13,895.7
4	-	-	-	-	-	-	3.7	-	-	0.0	-	11,247.4		11,251.1
Total (km^2)	71.2	43.9	42.1	287.9	120.1	132.7	420.7	16.9	61.3	26.9	13,218.7	11,249.6	235.5	25,927.6

HORNED LARK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.1	5.8	0.5	-	24.6	0.9	0.3	1.9	7.8	0.0	-	-		44.0
2	10.6	5.4	-	0.3	0.3	23.5	17.7	0.4	1.6	2.0	-	-		61.8
3	-	-	12.7	31.0	0.1	0.1	32.2	2.4	0.3	4.4	1,286.5	0.2		1,370.0
4	-	-	-	-	-	-	1.0	-	-	0.0	-	6,148.7		6,149.7
Total (km^2)	12.7	11.2	13.2	31.3	25.1	24.5	51.2	4.7	9.7	6.4	1,286.5	6,148.9	74.6	7,700.1

PURPLE MARTIN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	4.5	12.7	0.0	-	0.0	1.4	0.8	2.2	11.1	0.0	-	-		32.7
2	21.5	5.3	-	5.5	0.0	45.8	9.7	0.4	3.4	2.9	-	-		94.5
3	-	-	3.0	52.3	0.0	0.2	38.0	4.7	0.5	4.2	1,285.0	1.2		1,389.1

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	2.4	-	-	0.0	-	6,785.1		6,787.5
Total (km²)	26.0	18.0	3.1	57.9	0.0	47.4	50.8	7.3	14.9	7.1	1,285.0	6,786.3	1,072.5	9,376.3

TREE SWALLOW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	33.7	114.7	42.8	-	602.1	7.9	15.8	5.3	113.8	0.6	-	-		936.8
2	81.1	162.1	-	16.7	107.0	231.9	356.3	0.6	15.8	15.0	-	-		986.6
3	-	-	237.9	787.2	0.7	3.2	1,568.8	31.3	0.9	66.0	31,267.7	3.8		33,967.4
4	-	-	-	-	-	-	23.6	-	-	0.0	-	28,752.1		28,775.7
Total (km²)	114.8	276.9	280.7	803.9	709.8	242.9	1,964.5	37.3	130.6	81.6	31,267.7	28,755.9	2,152.1	66,818.6

N. ROUGH-WING. SWALLOW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.1	26.9	0.8	-	0.0	1.5	0.6	3.5	19.7	0.0	-	-		58.1
2	46.8	13.6	-	3.4	0.0	64.7	29.3	0.6	7.2	2.9	-	-		168.5
3	-	-	8.0	67.1	0.1	0.4	84.6	5.2	0.4	5.4	1,716.4	1.0		1,888.7
4	-	-	-	-	-	-	2.6	-	-	0.0	-	7,033.6		7,035.6
Total (km²)	51.9	40.5	8.7	70.6	0.1	66.6	117.2	9.2	27.3	8.4	1,716.4	7,034.6	2,109.5*	11,260.5

BANK SWALLOW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	4.9	25.8	0.9	-	65.7	1.9	1.6	2.2	20.5	0.0	-	-		123.6
2	21.4	17.5	-	5.0	5.8	49.4	59.8	0.5	4.6	2.9	-	-		166.8
3	-	-	20.1	88.5	0.1	0.4	115.0	5.3	0.5	7.1	3,516.5	1.9		3,755.4
4	-	-	-	-	-	-	2.5	-	-	0.0	-	8,346.0		8,348.5
Total (km²)	26.3	43.3	21.0	93.5	71.7	51.6	178.9	8.0	25.6	10.0	3,516.5	8,348.0	2,062.8	14,457.1

CLIFF SWALLOW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.4	13.1	0.5	-	36.7	1.7	1.7	3.4	27.6	0.0	-	-		90.2
2	38.6	14.3	-	4.4	6.3	76.8	85.5	0.6	7.1	2.6	-	-		236.3
3	-	-	17.8	91.4	0.1	0.3	108.7	5.6	0.5	6.8	3,059.2	1.7		3,292.1
4	-	-	-	-	-	-	2.4	-	-	0.0	-	8,083.6		8,086.0
Total (km^2)	44.0	27.5	18.3	95.8	43.1	78.8	198.2	9.6	35.2	9.5	3,059.2	8,085.3	843.5	12,548.1

BARN SWALLOW	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.2	10.7	0.6	-	28.4	1.7	1.5	2.0	18.2	0.0	-	-		67.3
2	17.5	14.0	-	5.0	3.8	39.7	53.6	0.5	4.1	3.1	-	-		141.1
3	-	-	20.1	71.3	0.1	0.3	89.2	4.6	0.5	6.7	2,808.1	1.9		3,002.7
4	-	-	-	-	-	-	1.9	-	-	0.0	-	8,017.5		8,019.4
Total (km^2)	21.6	24.7	20.7	76.3	32.3	41.7	146.2	7.1	22.7	9.8	2,808.1	8,019.4	3,404.2	14,634.7

GRAY JAY	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	29.5	75.0	0.8	-	283.6	1.6	6.9	0.0	60.7	0.0	-	-		458.1
2	48.9	50.4	-	0.2	86.8	68.2	146.3	0.0	4.0	3.2	-	-		408.1
3	-	-	38.0	374.9	0.0	0.0	677.8	3.7	0.0	22.8	14,831.0	1.6		15,949.9
4	-	-	-	-	-	-	16.9	-	-	0.0	-	4,102.7		4,119.5
Total (km^2)	78.4	125.4	38.8	375.1	370.4	69.8	847.9	3.8	64.7	26.0	14,831.0	4,104.2	42.5	20,978.1

BLUE JAY	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	33.7	111.7	44.2	-	629.2	7.0	15.9	7.2	123.7	0.6	-	-		973.1
2	97.7	160.0	-	14.2	112.4	268.1	348.7	0.3	16.1	14.8	-	-		1,032.3
3	-	-	241.4	910.0	0.6	3.3	1,677.6	31.5	0.4	76.9	37,908.2	3.7		40,853.6
4	-	-	-	-	-	-	23.0	-	-	0.0	-	24,878.7		24,901.7
Total (km^2)	131.4	271.7	285.5	924.2	742.2	278.3	2,065.1	39.0	140.2	92.3	37,908.2	24,882.4	351.2	68,111.8

AMERICAN CROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.6	119.1	45.7	-	661.4	8.1	16.4	10.0	139.3	0.7	-	-		1,037.2
2	119.1	167.9	-	15.0	117.7	309.2	385.5	0.8	21.1	16.9	-	-		1,153.2
3	-	-	259.9	974.7	0.7	3.7	1,761.8	35.1	0.9	82.2	40,519.9	4.1		43,642.7
4	-	-	-	-	-	-	24.8	-	-	0.0	-	31,801.8		31,826.6
Total (km^2)	155.7	287.0	305.6	989.6	779.7	321.0	2,188.5	45.8	161.3	99.8	40,519.9	31,805.9	455.4	78,115.2

COMMON RAVEN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.2	130.8	44.8	-	671.2	7.9	16.4	9.9	137.6	0.6	-	-		1,055.5
2	117.5	166.5	-	14.5	116.8	303.5	388.5	0.8	21.1	16.4	-	-		1,145.6
3	-	-	252.1	958.8	0.7	3.5	1,730.6	34.5	0.8	80.0	39,888.3	4.1		42,953.3
4	-	-	-	-	-	-	24.2	-	-	0.0	-	30,955.0		30,979.2
Total (km^2)	153.7	297.3	296.9	973.2	788.7	315.0	2,159.7	45.2	159.5	97.1	39,888.3	30,959.0	478.0	76,611.6

BLACK-CAPPED CHICKADEE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	33.9	112.3	44.2	-	631.4	7.0	16.1	8.0	129.6	0.6	-	-		983.1
2	103.3	160.6	-	14.2	113.5	272.0	360.1	0.4	17.8	14.8	-	-		1,056.6
3	-	-	241.9	922.3	0.6	3.3	1,691.2	31.9	0.4	77.3	38,371.5	3.8		41,344.2
4	-	-	-	-	-	-	23.2	-	-	0.0	-	24,988.0		25,011.2
Total (km^2)	137.2	272.9	286.2	936.5	745.5	282.3	2,090.6	40.3	147.9	92.7	38,371.5	24,991.8	359.5	68,754.6

BOREAL CHICKADEE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	31.4	100.4	0.0	-	459.0	1.5	12.5	0.0	76.1	0.0	-	-		681.0
2	55.1	81.5	-	2.0	104.7	96.3	192.0	0.0	5.0	4.7	-	-		541.2

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	52.3	527.8	0.0	0.0	1,069.5	3.1	0.0	36.9	21,227.5	2.0		22,919.1
4	-	-	-	-	-	-	20.1	-	-	0.0	-	5,471.6		5,491.8
Total (km^2)	86.5	181.9	52.3	529.8	563.6	97.9	1,294.1	3.1	81.1	41.6	21,227.5	5,473.7	83.5	29,716.5

TUFTED TITMOUSE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.5	101.6	6.4	-	0.0	5.0	1.0	0.5	40.8	0.6	-	-		156.4
2	9.0	35.4	-	0.0	0.0	115.0	35.7	0.1	8.9	6.7	-	-		210.9
3	-	-	37.1	0.0	0.6	2.3	46.0	6.9	0.4	10.2	507.2	0.1		610.9
4	-	-	-	-	-	-	3.3	-	-	0.0	-	11,637.1		11,640.4
Total (km^2)	9.4	137.0	43.5	0.0	0.6	122.4	85.9	7.5	50.2	17.6	507.2	11,637.2	39.6	12,658.1

RED-BREASTED NUTHATCH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	30.7	104.9	20.6	-	445.8	6.1	12.6	4.9	98.5	0.3	-	-		724.5
2	74.2	123.8	-	12.0	101.4	171.7	246.3	0.1	11.7	10.8	-	-		751.9
3	-	-	124.4	561.6	0.6	2.2	1,194.0	26.9	0.4	49.4	23,302.1	2.3		25,263.9
4	-	-	-	-	-	-	19.9	-	-	0.0	-	17,225.0		17,245.0
Total (km^2)	104.9	228.6	145.1	573.6	547.8	180.0	1,472.8	32.0	110.6	60.4	23,302.1	17,227.4	264.2	44,249.4

WHITE-BREASTED NUTHATCH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	21.3	61.4	33.8	-	444.0	6.2	12.1	3.3	65.0	0.6	-	-		647.7
2	62.8	91.1	-	12.8	64.9	198.1	238.1	0.2	8.8	10.6	-	-		687.3
3	-	-	205.8	604.5	0.5	2.5	1,256.8	23.5	0.4	53.5	24,007.4	2.3		26,157.2
4	-	-	-	-	-	-	16.8	-	-	0.0	-	19,416.0		19,432.8
Total (km^2)	84.1	152.5	239.6	617.3	509.4	206.8	1,523.7	26.9	74.2	64.7	24,007.4	19,418.2	229.2	47,154.2

BROWN CREEPER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.5	112.5	44.9	-	610.7	6.8	15.2	5.9	118.3	0.6	-	-		947.4
2	88.8	156.5	-	14.2	113.1	260.7	341.0	0.3	15.1	13.7	-	-		1,003.5
3	-	-	238.0	814.0	0.6	3.5	1,625.7	30.2	0.5	70.9	32,049.7	3.0		34,836.1
4	-	-	-	-	-	-	22.5	-	-	0.0	-	23,493.4		23,515.9
Total (km^2)	121.3	268.9	282.9	828.2	724.5	270.9	2,004.4	36.4	133.9	85.3	32,049.7	23,496.4	348.5	60,651.5

HOUSE WREN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	24.0	67.0	36.0	-	15.2	7.5	0.6	5.5	59.0	0.7	-	-		215.4
2	78.7	98.5	-	14.8	0.1	192.9	161.7	0.6	12.6	10.1	-	-		569.9
3	-	-	199.7	692.2	0.5	2.9	869.1	29.4	0.8	27.3	15,848.0	3.2		17,673.1
4	-	-	-	-	-	-	18.7	-	-	0.0	-	23,798.5		23,817.3
Total (km^2)	102.7	165.5	235.7	707.0	15.8	203.3	1,050.1	35.6	72.3	38.1	15,848.0	23,801.7	90.1	42,365.8

WINTER WREN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	33.7	107.4	21.1	-	503.8	6.7	13.8	8.0	119.7	0.3	-	-		814.5
2	104.2	134.7	-	13.1	108.2	222.0	298.0	0.4	17.4	11.9	-	-		910.0
3	-	-	135.7	741.8	0.6	2.4	1,354.9	30.7	0.5	58.8	32,443.5	3.5		34,772.3
4	-	-	-	-	-	-	21.9	-	-	0.0	-	19,955.4		19,977.3
Total (km^2)	137.9	242.1	156.9	754.9	612.6	231.1	1,688.7	39.1	137.6	71.1	32,443.5	19,958.8	367.3	56,841.5

MARSH WREN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	1.6	3.7	0.0	-	0.0	0.2	0.0	1.6	7.2	0.0	-	-		14.3
2	28.5	2.3	-	0.2	0.0	27.1	16.7	0.1	1.1	0.4	-	-		76.4
3	-	-	0.7	11.2	0.0	0.1	19.0	1.2	0.0	1.1	333.9	0.2		367.3

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	1.1	-	-	0.0	-	620.7		621.9
Total (km^2)	30.1	6.0	0.7	11.4	0.0	27.4	36.8	2.9	8.3	1.4	333.9	621.0	31.1	1,111.1

SEDGE WREN	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	1.5	1.8	0.0	-	0.0	0.0	0.0	0.7	1.6	0.0	-	-		5.7
2	11.9	0.7	-	0.0	0.0	13.6	11.8	0.0	0.3	0.1	-	-		38.2
3	-	-	0.5	12.2	0.0	0.0	12.7	0.3	0.0	0.8	204.6	0.1		231.2
4	-	-	-	-	-	-	0.8	-	-	0.0	-	274.5		275.3
Total (km^2)	13.3	2.4	0.5	12.2	0.0	13.6	25.2	1.0	1.9	0.9	204.6	274.6	16.6	566.9

CAROLINA WREN	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	4.7	0.0	0.0	0.6	0.0	-	-		5.2
2	3.9	0.0	-	0.0	0.0	1.4	0.9	0.0	0.6	0.9	-	-		7.7
3	-	-	5.4	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.5	0.0		6.8
4	-	-	-	-	-	-	0.0	-	-	0.0	-	728.8		728.8
Total (km^2)	3.9	0.0	5.4	0.0	0.0	6.1	1.8	0.0	1.2	0.9	0.5	728.8	1.0	749.5

GOLD.-CROWNED KINGLET	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	29.7	80.7	11.9	-	310.2	1.7	7.0	4.4	68.7	0.0	-	-		514.4
2	63.1	100.0	-	7.3	87.5	103.3	182.6	0.2	8.2	6.3	-	-		558.4
3	-	-	60.5	445.9	0.1	1.3	834.3	21.3	0.1	31.7	16,595.0	1.9		17,992.1
4	-	-	-	-	-	-	16.6	-	-	0.0	-	9,514.4		9,531.1
Total (km^2)	92.8	180.7	72.4	453.2	397.9	106.3	1,040.5	26.0	77.0	38.0	16,595.0	9,516.4	64.6	28,660.5

RUBY-CROWNED KINGLET	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	29.9	102.9	5.5	-	447.9	1.6	12.3	4.6	77.6	0.0	-	-		682.3
2	65.7	121.1	-	12.8	101.6	120.9	228.6	0.2	8.6	6.8	-	-		666.3
3	-	-	74.0	564.7	0.0	1.7	1,189.4	25.7	0.0	46.7	23,015.3	2.3		24,919.8
4	-	-	-	-	-	-	19.5	-	-	0.0	-	11,784.9		11,804.4
Total (km^2)	95.6	224.0	79.5	577.5	549.5	124.2	1,449.9	30.5	86.2	53.5	23,015.3	11,787.2	71.1	38,143.9

BLUE-GRAY GNATCATCHER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	10.5	-	0.0	4.4	0.0	0.0	12.4	0.0	-	-		27.4
2	4.8	0.0	-	0.0	0.0	48.0	6.2	0.0	1.3	2.3	-	-		62.6
3	-	-	50.1	0.0	0.1	0.0	9.8	1.2	0.1	0.7	137.5	0.1		199.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	2,851.0		2,851.0
Total (km^2)	4.8	0.0	60.6	0.0	0.1	52.4	16.0	1.2	13.9	2.9	137.5	2,851.1	6.5	3,147.0

EASTERN BLUEBIRD	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	6.1	12.3	3.5	-	70.8	1.8	1.8	5.3	41.5	0.0	-	-		143.1
2	53.0	12.9	-	2.4	13.6	107.6	70.9	0.5	8.6	3.9	-	-		273.4
3	-	-	31.2	218.8	0.2	0.8	235.4	7.4	0.3	19.0	10,318.1	1.8		10,833.0
4	-	-	-	-	-	-	2.6	-	-	0.0	-	9,157.6		9,160.2
Total (km^2)	59.1	25.2	34.7	221.3	84.7	110.2	310.6	13.2	50.4	23.0	10,318.1	9,159.4	161.2	20,570.9

VEERY	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	23.7	66.1	37.9	-	478.0	6.3	13.3	7.0	93.3	0.6	-	-		726.2
2	85.4	98.2	-	13.7	73.0	241.8	276.5	0.3	12.7	11.6	-	-		813.3
3	-	-	219.9	731.2	0.5	3.1	1,422.8	26.2	0.4	64.6	28,889.2	2.8		31,360.8
4	-	-	-	-	-	-	17.8	-	-	0.0	-	21,603.3		21,621.0
Total (km^2)	109.1	164.2	257.8	744.9	551.5	251.3	1,730.4	33.5	106.4	76.9	28,889.2	21,606.0	276.1	54,797.3

BICKNELL'S THRUSH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	27.4	0.0	0.0	0.0	0.0	0.0	-	-		27.4
2	0.0	15.3	-	0.0	0.1	0.0	18.3	0.0	0.0	0.0	-	-		33.7
3	-	-	2.5	1.8	0.0	0.0	6.2	0.0	0.0	0.0	135.9	0.0		146.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	0.5		0.5
Total (km^2)	0.0	15.3	2.5	1.8	27.5	0.0	24.5	0.0	0.0	0.0	135.9	0.5	0.0	208.0

SWAINSON'S THRUSH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.2	109.2	8.1	-	494.5	1.7	13.7	4.8	87.7	0.0	-	-		751.9
2	85.9	121.7	-	12.5	106.9	122.0	258.5	0.2	8.8	5.9	-	-		722.3
3	-	-	81.2	706.2	0.0	0.0	1,285.6	24.0	0.0	47.0	29,887.2	3.5		32,034.7
4	-	-	-	-	-	-	20.6	-	-	0.0	-	8,777.1		8,797.6
Total (km^2)	118.1	230.9	89.3	718.6	601.4	123.7	1,578.4	28.9	96.5	52.9	29,887.2	8,780.5	91.1	42,397.7

HERMIT THRUSH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.9	110.8	21.1	-	493.3	7.4	13.9	8.2	120.2	0.3	-	-		808.2
2	101.3	134.1	-	13.8	105.9	233.4	292.1	0.6	17.5	13.5	-	-		912.3
3	-	-	143.5	728.3	0.6	2.6	1,337.0	31.6	0.7	59.8	31,584.1	3.6		33,891.9
4	-	-	-	-	-	-	21.2	-	-	0.0	-	24,521.4		24,542.6
Total (km^2)	134.3	244.9	164.6	742.1	599.8	243.4	1,664.3	40.4	138.5	73.7	31,584.1	24,525.0	343.2	60,498.1

WOOD THRUSH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	23.9	65.0	37.4	-	499.3	6.5	13.7	6.9	91.4	0.6	-	-		744.7
2	81.3	98.9	-	13.9	74.4	243.2	274.5	0.3	11.6	12.0	-	-		810.1

3	-	-	221.4	800.9	0.5	3.1	1,463.9	27.0	0.4	68.2	33,589.0	3.5		36,177.8
4	-	-	-	-	-	-	17.9	-	-	0.0	-	22,301.3		22,319.3
Total (km²)	105.2	163.8	258.8	814.7	574.2	252.8	1,770.0	34.2	103.4	80.8	33,589.0	22,304.8	279.1	60,330.9

AMERICAN ROBIN	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	35.7	117.7	45.5	-	654.4	8.1	16.5	9.9	137.7	0.7	-	-		1,026.1
2	114.8	166.9	-	15.0	115.9	300.9	376.3	0.8	20.7	16.9	-	-		1,128.4
3	-	-	258.9	962.2	0.7	3.6	1,745.4	34.7	0.8	82.1	40,264.9	4.0		43,357.4
4	-	-	-	-	-	-	24.3	-	-	0.0	-	31,598.9		31,623.2
Total (km²)	150.5	284.6	304.4	977.2	770.9	312.6	2,162.5	45.4	159.3	99.8	40,264.9	31,602.9	417.7	77,552.7

GRAY CATBIRD	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	35.3	117.2	45.7	-	652.7	7.8	16.3	9.5	136.9	0.7	-	-		1,022.0
2	110.4	166.4	-	14.6	116.1	291.3	374.6	0.8	20.5	16.8	-	-		1,111.5
3	-	-	257.7	953.0	0.6	3.6	1,736.9	34.7	0.8	80.9	40,002.3	3.9		43,074.4
4	-	-	-	-	-	-	24.1	-	-	0.0	-	31,300.9		31,325.0
Total (km²)	145.7	283.6	303.3	967.7	769.4	302.7	2,151.9	45.0	158.2	98.4	40,002.3	31,304.8	398.8	76,931.7

NORTHERN MOCKINGBIRD	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.9	9.4	1.0	-	25.6	1.2	0.2	3.9	18.6	0.0	-	-		64.9
2	33.8	15.8	-	1.4	0.3	66.5	21.3	0.6	4.5	2.9	-	-		147.2
3	-	-	10.2	130.5	0.0	0.2	109.9	6.2	0.4	7.1	4,500.1	1.5		4,766.1
4	-	-	-	-	-	-	2.2	-	-	0.0	-	7,938.6		7,940.8
Total (km²)	38.7	25.2	11.1	131.9	25.9	68.0	133.7	10.7	23.5	10.1	4,500.1	7,940.1	48.8	12,967.9

BROWN THRASHER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	4.3	8.5	0.9	-	2.7	1.2	0.2	3.6	17.2	0.0	-	-		38.7
2	31.8	12.6	-	1.1	0.0	58.9	18.2	0.6	4.8	2.7	-	-		130.7
3	-	-	8.4	159.8	0.0	0.2	103.6	5.7	0.4	7.6	4,569.1	1.3		4,856.1
4	-	-	-	-	-	-	2.1	-	-	0.0	-	7,284.0		7,286.2
Total (km^2)	36.1	21.1	9.2	160.9	2.7	60.4	124.1	9.9	22.4	10.4	4,569.1	7,285.3	48.1	12,359.8

AMERICAN PIPIT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	9.8	0.0	0.0	0.0	0.0	0.0	-	-		9.8
2	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-		0.0
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
4	-	-	-	-	-	-	0.0	-	-	0.0	-	0.0		0.0
Total (km^2)	0.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8

CEDAR WAXWING	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.9	114.2	42.6	-	641.4	7.6	15.6	7.2	120.5	0.6	-	-		984.7
2	104.1	164.6	-	13.3	110.8	265.6	364.3	0.7	18.4	15.5	-	-		1,057.3
3	-	-	242.0	897.6	0.6	3.1	1,650.2	32.8	0.8	73.5	37,764.2	3.5		40,668.3
4	-	-	-	-	-	-	24.5	-	-	0.0	-	29,169.5		29,194.1
Total (km^2)	139.0	278.8	284.6	910.9	752.8	276.3	2,054.6	40.6	139.7	89.7	37,764.2	29,173.1	410.9	72,315.3

BLUE-HEADED VIREO	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.8	109.8	44.2	-	619.6	6.9	15.8	6.7	118.7	0.6	-	-		955.2
2	86.5	158.1	-	14.1	110.3	246.6	336.7	0.2	15.0	14.1	-	-		981.7
3	-	-	234.8	890.4	0.6	3.3	1,656.1	30.3	0.4	74.1	37,388.5	3.5		40,281.9

4	-	-	-	-	-	-	22.6	-	-	0.0	-	24,051.9		24,074.5
Total (km²)	119.3	267.9	279.0	904.4	730.5	256.7	2,031.2	37.2	134.2	88.9	37,388.5	24,055.3	312.0	66,605.4

YELLOW-THROAT. VIREO	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	32.6	-	0.0	4.6	0.1	0.1	15.8	0.6	-	-		53.8
2	4.7	0.0	-	0.0	0.0	53.3	27.1	0.0	2.6	3.4	-	-		91.1
3	-	-	132.9	0.0	0.4	0.3	24.2	1.3	0.4	3.0	338.1	0.1		500.7
4	-	-	-	-	-	-	0.0	-	-	0.0	-	5,287.8		5,287.8
Total (km²)	4.7	0.0	165.5	0.0	0.4	58.2	51.4	1.5	18.8	7.0	338.1	5,287.8	14.8	5,948.1

WARBLING VIREO	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.3	33.6	31.3	-	339.3	3.7	9.1	2.5	45.4	0.6	-	-		469.6
2	33.5	63.4	-	7.4	27.5	148.7	175.3	0.2	7.1	7.2	-	-		470.2
3	-	-	171.2	474.7	0.3	2.1	876.5	10.6	0.1	45.1	21,549.6	2.0		23,132.2
4	-	-	-	-	-	-	6.1	-	-	0.0	-	14,080.9		14,087.0
Total (km²)	37.8	97.0	202.5	482.1	367.0	154.4	1,066.9	13.3	52.6	52.9	21,549.6	14,082.9	143.8	38,302.8

PHILADELPHIA VIREO	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	2.2	0.0	12.6	-	487.4	0.0	12.2	0.5	42.0	0.0	-	-		556.9
2	9.4	84.9	-	6.4	68.4	75.3	213.4	0.0	2.0	5.0	-	-		464.8
3	-	-	109.1	655.2	0.0	0.0	1,169.7	1.7	0.0	46.5	27,666.8	1.3		29,650.3
4	-	-	-	-	-	-	0.0	-	-	0.0	-	6,345.4		6,345.4
Total (km²)	11.6	84.9	121.7	661.6	555.8	75.3	1,395.3	2.2	44.1	51.5	27,666.8	6,346.7	61.3	37,078.7

RED-EYED VIREO	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	24.3	65.2	37.5	-	499.2	6.6	13.7	6.9	91.5	0.6	-	-		745.5
2	83.8	99.8	-	14.0	74.3	244.2	274.8	0.3	11.6	12.5	-	-		815.4
3	-	-	225.4	801.1	0.5	3.1	1,465.2	27.2	0.4	69.6	33,645.0	3.5		36,240.9
4	-	-	-	-	-	-	18.0	-	-	0.0	-	22,790.0		22,808.0
Total (km^2)	108.1	165.0	262.8	815.1	574.1	253.8	1,771.6	34.4	103.5	82.7	33,645.0	22,793.5	279.9	60,889.6

BLUE-WINGED WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	0.3	0.0	0.0	0.0	0.0	-	-		0.4
2	0.3	0.0	-	0.0	0.0	0.0	0.1	0.0	0.1	0.1	-	-		0.5
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
4	-	-	-	-	-	-	0.0	-	-	0.0	-	68.5		68.5
Total (km^2)	0.3	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.1	0.1	0.0	68.5	0.1	69.5

TENNESSEE WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.3	87.3	27.4	-	655.3	2.4	15.7	4.3	98.4	0.0	-	-		926.1
2	92.6	150.6	-	12.6	116.8	155.2	340.5	0.1	7.3	7.1	-	-		882.8
3	-	-	172.8	955.6	0.0	0.3	1,683.6	14.6	0.0	64.2	39,082.3	3.6		41,977.1
4	-	-	-	-	-	-	24.0	-	-	0.0	-	13,004.9		13,028.9
Total (km^2)	127.9	238.0	200.2	968.2	772.1	158.0	2,063.8	18.9	105.7	71.4	39,082.3	13,008.5	113.0	56,927.9

NASHVILLE WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.7	117.2	45.7	-	655.2	7.9	16.3	8.7	136.0	0.7	-	-		1,022.4
2	109.0	166.8	-	14.8	116.5	289.8	375.9	0.7	20.3	16.1	-	-		1,110.0
3	-	-	250.4	955.1	0.6	3.6	1,742.2	34.4	0.8	79.8	40,126.9	3.9		43,197.6

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	23.6	-	-	0.0	-	30,170.6		30,194.1
Total (km²)	143.7	284.0	296.0	969.9	772.4	301.3	2,157.9	43.8	157.1	96.6	40,126.9	30,174.5	400.4	75,924.5

NORTHERN PARULA	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	32.6	112.5	24.8	-	610.0	4.0	14.8	6.5	108.9	0.4	-	-		914.7
2	90.5	155.2	-	14.7	113.4	201.4	341.5	0.3	14.2	11.2	-	-		942.3
3	-	-	151.6	818.9	0.4	3.1	1,615.1	29.1	0.1	68.0	31,748.7	2.9		34,437.9
4	-	-	-	-	-	-	22.6	-	-	0.0	-	18,099.0		18,121.6
Total (km²)	123.1	267.8	176.4	833.6	723.8	208.4	1,994.0	35.9	123.2	79.7	31,748.7	18,101.9	123.0	54,539.5

YELLOW WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.7	8.3	0.5	-	65.7	0.7	1.3	3.7	23.1	0.0	-	-		108.0
2	39.8	14.9	-	1.3	7.6	68.6	56.2	0.3	6.3	2.1	-	-		197.0
3	-	-	16.0	187.5	0.0	0.2	179.4	5.4	0.1	12.2	9,616.4	1.4		10,018.5
4	-	-	-	-	-	-	2.2	-	-	0.0	-	4,275.1		4,277.4
Total (km²)	44.5	23.2	16.6	188.8	73.3	69.4	239.0	9.3	29.4	14.3	9,616.4	4,276.5	131.8	14,732.6

CHESTNUT-SIDED WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	6.0	13.0	23.6	-	207.0	1.1	3.6	4.1	36.2	0.3	-	-		295.0
2	45.2	43.8	-	2.8	15.1	130.8	130.6	0.3	8.4	4.7	-	-		381.6
3	-	-	120.6	391.7	0.1	1.1	546.5	7.1	0.1	30.6	16,723.5	1.8		17,823.2
4	-	-	-	-	-	-	4.2	-	-	0.0	-	9,342.7		9,346.9
Total (km²)	51.2	56.8	144.3	394.5	222.2	133.0	684.9	11.5	44.7	35.6	16,723.5	9,344.4	166.2	28,012.9

MAGNOLIA WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	33.0	108.0	20.9	-	491.1	6.5	13.8	7.7	117.0	0.3	-	-		798.2
2	99.1	131.9	-	12.7	106.2	210.7	286.1	0.3	15.6	11.8	-	-		874.5
3	-	-	132.9	719.5	0.6	2.4	1,326.9	30.1	0.4	58.0	31,292.2	3.4		33,566.3
4	-	-	-	-	-	-	21.3	-	-	0.0	-	19,718.1		19,739.4
Total (km²)	132.1	239.9	153.8	732.2	597.9	219.6	1,648.0	38.2	133.0	70.1	31,292.2	19,721.5	329.3	55,307.6

CAPE MAY WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	30.5	71.1	0.0	-	312.8	1.6	7.1	0.4	56.1	0.0	-	-		479.5
2	58.1	85.7	-	3.8	86.2	73.6	144.5	0.0	3.0	3.5	-	-		458.5
3	-	-	37.2	473.3	0.0	0.0	799.6	5.9	0.0	24.0	17,253.0	1.7		18,594.7
4	-	-	-	-	-	-	16.1	-	-	0.0	-	4,783.2		4,799.3
Total (km²)	88.6	156.8	37.2	477.1	399.0	75.2	967.3	6.2	59.1	27.5	17,253.0	4,784.9	44.4	24,376.4

BLACK-THROAT. BLUE WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	22.8	64.1	37.7	-	467.4	6.2	12.8	5.4	83.3	0.6	-	-		700.4
2	75.9	93.8	-	13.2	72.1	229.1	258.7	0.2	10.3	11.3	-	-		764.6
3	-	-	217.9	686.2	0.5	3.1	1,377.1	25.1	0.4	62.5	27,048.2	2.7		29,423.8
4	-	-	-	-	-	-	17.2	-	-	0.0	-	20,836.1		20,853.3
Total (km²)	98.7	158.0	255.7	699.4	540.0	238.4	1,665.7	30.7	94.0	74.4	27,048.2	20,838.8	254.7	51,996.7

YELLOW-RUMPED WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	30.2	105.7	20.4	-	448.2	6.4	13.0	5.8	100.9	0.3	-	-		730.9
2	75.1	125.2	-	13.2	100.1	188.6	251.1	0.2	13.2	11.9	-	-		778.6
3	-	-	132.9	600.0	0.6	2.3	1,222.2	27.7	0.4	52.5	24,860.3	2.5		26,901.4
4	-	-	-	-	-	-	20.1	-	-	0.0	-	18,355.2		18,375.3
Total (km²)	105.3	230.9	153.3	613.3	548.9	197.3	1,506.4	33.7	114.6	64.6	24,860.3	18,357.7	268.9	47,055.1

BLACK-THROAT. GREEN WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.3	110.0	43.6	-	593.2	6.7	14.9	5.8	114.8	0.6	-	-		921.9
2	88.9	152.5	-	13.6	109.9	253.6	330.2	0.2	14.6	13.5	-	-		977.1
3	-	-	231.8	786.3	0.6	3.3	1,577.1	29.4	0.4	69.2	30,989.9	2.9		33,690.9
4	-	-	-	-	-	-	22.2	-	-	0.0	-	22,605.0		22,627.3
Total (km^2)	121.3	262.5	275.5	799.9	703.7	263.5	1,944.4	35.4	129.9	83.3	30,989.9	22,608.0	324.2	58,541.3

BLACKBURNIAN WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	30.7	106.0	43.5	-	582.2	6.4	14.8	5.2	109.5	0.6	-	-		898.9
2	73.8	149.1	-	13.4	107.2	229.8	316.5	0.1	13.4	13.1	-	-		916.4
3	-	-	228.5	757.9	0.6	3.2	1,545.4	27.5	0.4	66.9	30,111.5	2.6		32,744.4
4	-	-	-	-	-	-	21.7	-	-	0.0	-	21,373.6		21,395.3
Total (km^2)	104.5	255.1	272.0	771.3	690.0	239.4	1,898.4	32.8	123.3	80.6	30,111.5	21,376.2	280.6	56,235.6

PINE WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	28.9	80.9	13.4	-	0.0	3.4	2.0	4.3	54.5	0.1	-	-		187.4
2	64.7	85.2	-	6.6	0.0	89.4	82.7	0.2	8.1	6.7	-	-		343.6
3	-	-	52.3	372.6	0.3	1.4	403.5	21.7	0.3	10.8	6,295.6	1.7		7,160.2
4	-	-	-	-	-	-	16.3	-	-	0.0	-	9,577.1		9,593.4
Total (km^2)	93.6	166.1	65.7	379.3	0.3	94.2	504.6	26.2	62.8	17.6	6,295.6	9,578.7	38.8	17,323.3

PRAIRIE WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	2.9	0.0	0.0	6.3	0.0	-	-		9.3

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
2	3.9	0.0	-	0.0	0.0	12.3	3.1	0.0	0.7	1.9	-	-		21.9
3	-	-	5.7	0.0	0.1	0.0	1.0	0.4	0.2	0.2	14.6	0.0		22.3
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,592.9		1,592.9
Total (km^2)	3.9	0.0	5.7	0.0	0.1	15.2	4.2	0.4	7.2	2.1	14.6	1,592.9	1.5	1,647.8

PALM WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	3.0	3.8	0.0	-	33.3	0.1	0.0	3.5	23.7	0.0	-	-		67.5
2	28.9	4.2	-	0.9	9.7	50.2	39.0	0.2	4.9	0.2	-	-		138.3
3	-	-	4.2	109.1	0.0	0.0	116.7	3.0	0.0	3.5	3,917.0	0.5		4,154.0
4	-	-	-	-	-	-	1.3	-	-	0.0	-	1,249.3		1,250.6
Total (km^2)	32.0	8.1	4.2	110.1	42.9	50.4	157.0	6.7	28.6	3.7	3,917.0	1,249.8	40.3	5,650.7

BAY-BREASTED WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	30.9	103.4	19.9	-	451.1	1.7	12.8	5.3	77.3	0.0	-	-		702.4
2	69.8	126.1	-	12.9	100.3	111.8	236.2	0.2	7.3	6.0	-	-		670.4
3	-	-	111.6	618.9	0.0	0.1	1,224.0	25.6	0.0	46.7	25,330.5	2.5		27,359.9
4	-	-	-	-	-	-	20.2	-	-	0.0	-	9,524.3		9,544.5
Total (km^2)	100.6	229.5	131.6	631.8	551.5	113.6	1,493.1	31.0	84.6	52.7	25,330.5	9,526.7	68.3	38,345.5

BLACKPOLL WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	11.6	100.1	0.2	-	617.7	1.4	15.0	0.0	83.8	0.0	-	-		829.8
2	16.9	109.2	-	0.0	114.6	34.6	246.0	0.0	7.9	2.5	-	-		531.7
3	-	-	72.3	376.0	0.0	0.0	1,207.5	0.1	0.0	57.3	26,042.5	0.3		27,756.1
4	-	-	-	-	-	-	8.4	-	-	0.0	-	4,949.2		4,957.6
Total (km^2)	28.5	209.3	72.5	376.0	732.3	36.0	1,476.9	0.1	91.8	59.9	26,042.5	4,949.5	69.5	34,144.7

BLACK-&-WHITE WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	21.3	60.9	34.6	-	449.5	6.1	12.0	3.6	67.5	0.6	-	-		656.1
2	62.7	93.5	-	12.7	65.1	202.4	242.4	0.2	8.9	10.8	-	-		698.7
3	-	-	209.7	625.2	0.5	2.6	1,286.3	23.4	0.4	55.2	25,003.7	2.3		27,209.3
4	-	-	-	-	-	-	17.1	-	-	0.0	-	19,947.9		19,965.0
Total (km^2)	84.0	154.4	244.3	637.9	515.0	211.1	1,557.9	27.2	76.8	66.6	25,003.7	19,950.2	231.4	48,760.5

AMERICAN REDSTART	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	24.4	66.2	38.3	-	511.4	6.8	13.8	7.1	93.7	0.7	-	-		762.5
2	86.0	102.9	-	14.4	75.7	250.4	281.7	0.4	13.2	12.8	-	-		837.4
3	-	-	229.4	824.9	0.5	3.2	1,497.8	28.3	0.4	71.2	34,976.0	3.5		37,635.4
4	-	-	-	-	-	-	18.2	-	-	0.0	-	23,659.1		23,677.3
Total (km^2)	110.4	169.1	267.7	839.3	587.6	260.4	1,811.4	35.9	107.3	84.7	34,976.0	23,662.6	290.3	63,202.8

OVENBIRD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	31.9	110.0	43.7	-	591.9	6.5	15.0	5.7	114.2	0.6	-	-		919.4
2	86.6	151.7	-	13.7	109.9	248.9	329.2	0.2	14.7	13.4	-	-		968.2
3	-	-	231.2	785.4	0.6	3.2	1,574.5	29.3	0.4	69.2	30,966.3	2.9		33,663.1
4	-	-	-	-	-	-	22.1	-	-	0.0	-	22,418.4		22,440.5
Total (km^2)	118.5	261.6	274.9	799.1	702.4	258.6	1,940.8	35.3	129.3	83.1	30,966.3	22,421.4	321.4	58,312.6

NORTHERN WATERTHRUSH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	24.5	76.3	18.2	-	311.2	5.6	6.6	6.2	97.3	0.2	-	-		546.1
2	81.1	80.6	-	11.9	71.8	197.4	224.9	0.3	12.8	9.0	-	-		689.8
3	-	-	99.7	491.7	0.6	2.7	837.6	19.4	0.4	39.3	17,363.8	2.7		18,857.9

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	11.9	-	-	0.0	-	13,844.9		13,856.8
Total (km²)	105.6	156.9	117.9	503.5	383.6	205.8	1,081.1	25.9	110.4	48.5	17,363.8	13,847.6	307.1	34,257.6

LOUISIANA WATERTHRUSH	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	6.6	-	0.0	1.7	0.0	0.0	5.0	0.0	-	-		13.3
2	4.2	0.0	-	0.0	0.0	26.9	3.8	0.0	0.6	0.7	-	-		36.3
3	-	-	33.5	0.0	0.1	0.0	3.8	0.5	0.1	0.3	67.9	0.1		106.2
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,250.9		1,250.9
Total (km²)	4.2	0.0	40.0	0.0	0.1	28.7	7.7	0.5	5.7	1.0	67.9	1,250.9	11.9	1,418.6

MOURNING WARBLER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.9	9.9	3.5	-	77.6	0.3	2.2	5.3	36.4	0.0	-	-		140.0
2	44.3	17.1	-	2.9	12.8	71.0	64.8	0.3	7.4	1.4	-	-		221.9
3	-	-	18.5	245.0	0.0	0.6	266.6	5.6	0.0	17.8	11,856.4	1.9		12,412.4
4	-	-	-	-	-	-	1.8	-	-	0.0	-	3,917.0		3,918.9
Total (km²)	49.2	26.9	22.0	247.9	90.4	71.9	335.4	11.2	43.8	19.2	11,856.4	3,918.9	56.7	16,749.8

COMMON YELLOWTHROAT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.2	119.2	45.7	-	662.5	8.1	16.6	9.3	139.1	0.7	-	-		1,037.3
2	118.7	168.4	-	15.0	117.8	307.9	386.5	0.7	21.1	16.4	-	-		1,152.5
3	-	-	252.0	978.3	0.7	3.7	1,766.0	34.8	0.8	81.3	40,761.0	4.1		43,882.7
4	-	-	-	-	-	-	24.3	-	-	0.0	-	30,754.9		30,779.3
Total (km²)	154.9	287.6	297.7	993.3	781.0	319.7	2,193.4	44.8	160.9	98.3	40,761.0	30,759.1	454.0	77,305.7

WILSON'S WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	6.1	8.6	0.7	-	84.4	0.4	2.3	5.8	34.8	0.0	-	-		143.0
2	48.5	15.1	-	2.9	14.0	69.0	71.4	0.3	4.8	1.0	-	-		226.8
3	-	-	13.6	252.3	0.0	0.0	277.1	5.1	0.0	17.3	11,957.2	1.8		12,524.4
4	-	-	-	-	-	-	2.4	-	-	0.0	-	2,613.4		2,615.8
Total (km^2)	54.5	23.6	14.3	255.2	98.4	69.4	353.2	11.2	39.6	18.3	11,957.2	2,615.2	84.2	15,594.2

CANADA WARBLER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.4	114.4	45.2	-	647.3	7.2	16.4	8.1	132.7	0.7	-	-		1,006.5
2	105.3	164.8	-	14.7	116.1	278.6	369.8	0.4	18.2	14.7	-	-		1,082.6
3	-	-	243.4	940.4	0.7	3.5	1,730.1	32.3	0.5	77.5	39,100.0	3.8		42,132.1
4	-	-	-	-	-	-	23.5	-	-	0.0	-	25,643.9		25,667.4
Total (km^2)	139.7	279.3	288.6	955.0	764.1	289.3	2,139.7	40.8	151.4	92.9	39,100.0	25,647.8	383.3	70,271.9

SCARLET TANAGER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.4	111.1	44.0	-	599.6	6.5	15.0	5.8	116.1	0.6	-	-		931.1
2	87.8	154.2	-	13.8	111.7	254.4	334.7	0.3	14.8	13.9	-	-		985.5
3	-	-	236.7	792.6	0.6	3.3	1,592.1	29.9	0.5	70.7	31,273.5	3.0		34,002.8
4	-	-	-	-	-	-	22.3	-	-	0.0	-	22,968.2		22,990.6
Total (km^2)	120.2	265.2	280.8	806.4	711.9	264.2	1,964.2	35.9	131.4	85.2	31,273.5	22,971.2	334.7	59,244.7

NORTHERN CARDINAL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	13.4	113.3	44.8	-	0.0	6.5	1.9	0.3	56.2	0.7	-	-		237.1
2	24.3	44.6	-	0.0	0.0	140.9	94.4	0.1	8.5	6.7	-	-		319.5
3	-	-	162.0	5.4	0.6	3.1	156.9	3.5	0.5	9.4	1,719.1	0.8		2,061.3

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	18.2	-	-	0.0	-	14,533.4		14,551.6
Total (km²)	37.7	157.9	206.9	5.4	0.6	150.4	271.3	3.9	65.3	16.8	1,719.1	14,534.2	40.2	17,209.8

ROSE-BREASTED GROSBEAK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.1	113.4	45.2	-	649.5	7.2	16.0	7.5	126.2	0.6	-	-		999.8
2	100.6	164.1	-	14.8	115.6	276.0	359.0	0.4	17.8	14.7	-	-		1,063.0
3	-	-	243.5	942.6	0.6	3.5	1,725.6	32.9	0.5	77.9	39,653.6	3.9		42,684.4
4	-	-	-	-	-	-	23.3	-	-	0.0	-	25,761.2		25,784.5
Total (km²)	134.7	277.5	288.7	957.4	765.7	286.7	2,123.9	40.7	144.5	93.3	39,653.6	25,765.1	369.2	70,900.9

INDIGO BUNTING	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.8	11.3	1.0	-	0.0	1.3	0.3	4.9	22.8	0.0	-	-		47.4
2	43.6	16.7	-	1.5	0.0	80.2	31.4	0.6	7.5	2.6	-	-		184.2
3	-	-	12.1	183.7	0.0	0.3	141.1	6.6	0.4	7.5	5,192.5	1.6		5,545.7
4	-	-	-	-	-	-	2.9	-	-	0.0	-	8,322.3		8,325.2
Total (km²)	49.5	28.0	13.1	185.3	0.0	81.8	175.7	12.1	30.7	10.1	5,192.5	8,323.9	68.3	14,170.9

EASTERN TOWHEE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	8.6	62.6	34.6	-	0.0	6.0	0.6	2.9	43.3	0.7	-	-		159.1
2	23.1	37.4	-	4.7	0.0	126.9	105.9	0.5	8.3	7.1	-	-		313.9
3	-	-	172.4	51.5	0.4	2.6	279.3	20.3	0.7	15.2	4,501.8	0.9		5,045.1
4	-	-	-	-	-	-	16.3	-	-	0.0	-	18,499.0		18,515.3
Total (km²)	31.6	100.0	207.0	56.2	0.4	135.4	402.1	23.7	52.2	22.9	4,501.8	18,499.9	39.6	24,073.0

CHIPPING SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.5	115.6	45.5	-	653.4	7.7	16.4	9.0	136.3	0.7	-	-		1,020.0
2	112.3	165.5	-	13.9	115.7	283.8	372.8	0.7	19.5	16.2	-	-		1,100.5
3	-	-	250.0	953.1	0.7	3.5	1,732.7	33.9	0.8	81.2	39,999.3	3.8		43,059.0
4	-	-	-	-	-	-	24.1	-	-	0.0	-	29,978.1		30,002.2
Total (km^2)	147.8	281.1	295.5	966.9	769.7	295.1	2,146.0	43.7	156.6	98.1	39,999.3	29,981.9	402.1	75,583.7

FIELD SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.0	6.0	0.9	-	0.0	1.0	0.2	1.5	6.4	0.0	-	-		18.1
2	15.4	4.4	-	0.4	0.0	19.1	10.0	0.4	3.2	1.8	-	-		54.7
3	-	-	4.4	48.0	0.0	0.2	25.8	4.1	0.3	2.7	1,219.1	0.9		1,305.4
4	-	-	-	-	-	-	1.0	-	-	0.0	-	5,158.4		5,159.4
Total (km^2)	17.5	10.4	5.2	48.5	0.0	20.3	37.0	6.0	9.9	4.6	1,219.1	5,159.3	9.8	6,547.5

VESPER SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.5	6.1	3.3	-	0.0	1.1	0.1	1.1	10.5	0.0	-	-		24.6
2	18.1	3.4	-	0.3	0.0	39.5	12.4	0.3	1.9	1.7	-	-		77.6
3	-	-	21.8	60.3	0.1	0.3	48.9	2.3	0.4	1.4	1,207.4	0.3		1,343.1
4	-	-	-	-	-	-	0.9	-	-	0.0	-	5,325.9		5,326.8
Total (km^2)	20.6	9.5	25.1	60.6	0.1	40.9	62.4	3.7	12.7	3.1	1,207.4	5,326.2	14.0	6,786.1

SAVANNAH SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.2	5.2	0.4	-	15.1	0.9	0.3	2.5	12.2	0.0	-	-		38.9
2	20.7	4.7	-	0.3	2.4	33.1	26.3	0.5	4.5	1.9	-	-		94.2
3	-	-	12.5	40.4	0.0	0.2	40.3	2.8	0.4	3.9	1,670.6	0.2		1,771.3

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	1.1	-	-	0.0	-	5,931.4		5,932.5
Total (km²)	22.9	9.9	12.9	40.7	17.5	34.1	68.0	5.7	17.1	5.8	1,670.6	5,931.7	76.2	7,913.1

GRASSHOPPER SPARROW	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.1	0.0	0.0	-	0.0	0.2	0.0	0.0	2.5	0.0	-	-		2.9
2	1.1	0.0	-	0.0	0.0	3.6	2.3	0.0	0.4	0.8	-	-		8.1
3	-	-	0.2	0.0	0.0	0.0	0.2	0.5	0.3	0.2	3.3	0.0		4.9
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,215.2		1,215.2
Total (km²)	1.2	0.0	0.2	0.0	0.0	3.8	2.6	0.5	3.2	1.0	3.3	1,215.2	1.7	1,232.7

SALT. SHARP-TAIL. SPARROW	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.2	0.0	-	-		0.2
2	8.1	0.0	-	0.0	0.0	8.0	0.1	0.0	0.0	0.2	-	-		16.4
3	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.1
4	-	-	-	-	-	-	0.0	-	-	0.0	-	22.7		22.7
Total (km²)	8.1	0.0	0.0	0.0	0.0	8.0	0.2	0.0	0.2	0.2	0.0	22.7	0.9	40.3

NELSON'S SHARP-TAIL. SPARROW	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.1	1.4	0.0	-	0.0	0.1	0.0	0.0	1.7	0.0	-	-		3.4
2	0.8	0.4	-	0.0	0.0	5.8	1.5	0.0	0.0	0.0	-	-		8.5
3	-	-	0.0	0.0	0.1	0.0	2.8	0.0	0.0	0.0	2.6	0.0		5.4
4	-	-	-	-	-	-	0.5	-	-	0.0	-	65.5		65.9
Total (km²)	0.9	1.8	0.0	0.0	0.1	5.9	4.7	0.0	1.7	0.0	2.6	65.5	2.7	85.9

FOX SPARROW	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	438.3	0.0	13.9	0.0	23.6	0.0	-	-		475.7
2	0.0	1.9	-	0.0	109.4	17.8	140.4	0.0	0.0	2.5	-	-		272.0
3	-	-	25.0	78.9	0.0	0.0	582.3	0.0	0.0	51.4	16,675.8	0.1		17,413.5
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,791.7		1,791.7
Total (km^2)	0.0	1.9	25.0	78.9	547.7	17.8	736.5	0.0	23.6	53.9	16,675.8	1,791.8	35.3	19,988.2

SONG SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.8	119.0	45.7	-	662.0	8.1	16.4	9.3	139.5	0.7	-	-		1,037.6
2	119.7	168.2	-	15.1	117.9	309.1	386.2	0.7	21.1	16.8	-	-		1,154.7
3	-	-	256.8	974.3	0.7	3.7	1,764.6	34.9	0.8	82.3	40,623.4	4.1		43,745.5
4	-	-	-	-	-	-	24.8	-	-	0.0	-	31,188.1		31,212.9
Total (km^2)	156.5	287.1	302.5	989.3	780.6	321.0	2,192.0	44.9	161.5	99.8	40,623.4	31,192.2	453.7	77,604.4

LINCOLN'S SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.1	2.3	0.0	-	70.5	0.4	2.1	0.4	32.9	0.0	-	-		113.6
2	36.3	6.8	-	1.5	12.7	54.2	57.3	0.0	3.2	0.8	-	-		172.9
3	-	-	10.3	231.2	0.0	0.0	227.5	1.1	0.0	14.2	10,829.3	1.3		11,314.8
4	-	-	-	-	-	-	1.8	-	-	0.0	-	1,933.3		1,935.1
Total (km^2)	41.4	9.1	10.3	232.7	83.2	54.6	288.7	1.5	36.1	15.0	10,829.3	1,934.6	54.0	13,590.5

SWAMP SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.2	4.5	0.0	-	16.2	0.5	1.1	1.7	16.9	0.0	-	-		43.1
2	32.2	5.1	-	0.2	4.0	52.3	33.5	0.1	3.4	0.5	-	-		131.3
3	-	-	4.0	45.0	0.1	0.1	49.7	1.3	0.1	2.9	1,288.5	0.3		1,392.1
4	-	-	-	-	-	-	1.2	-	-	0.0	-	1,087.5		1,088.6
Total (km^2)	34.4	9.6	4.0	45.3	20.3	52.9	85.4	3.2	20.3	3.3	1,288.5	1,087.8	89.6	2,744.6

WHITE-THROATED SPARROW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.8	114.6	45.3	-	650.6	7.3	16.4	8.5	133.7	0.7	-	-		1,011.8
2	107.8	165.7	-	14.7	116.6	281.2	372.1	0.4	19.6	14.8	-	-		1,093.0
3	-	-	243.3	950.2	0.7	3.5	1,738.8	33.2	0.5	78.2	39,904.7	3.9		42,957.0
4	-	-	-	-	-	-	23.7	-	-	0.0	-	25,904.7		25,928.4
Total (km^2)	142.6	280.4	288.7	964.9	767.9	291.9	2,151.0	42.2	153.7	93.8	39,904.7	25,908.6	387.5	71,377.7

DARK-EYED JUNCO	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.2	115.1	45.7	-	651.0	7.7	16.2	8.0	130.2	0.7	-	-		1,009.7
2	104.0	165.8	-	13.9	115.0	274.1	362.3	0.7	17.8	16.2	-	-		1,069.8
3	-	-	249.9	944.0	0.7	3.5	1,725.7	34.0	0.8	80.7	39,774.4	3.9		42,817.4
4	-	-	-	-	-	-	24.0	-	-	0.0	-	30,047.4		30,071.4
Total (km^2)	139.2	280.9	295.5	957.9	766.6	285.4	2,128.3	42.7	148.8	97.5	39,774.4	30,051.3	382.3	75,350.6

BOBOLINK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	2.1	4.5	0.4	-	14.4	0.9	0.3	1.9	11.8	0.0	-	-		36.3
2	20.3	4.3	-	0.3	2.4	31.3	25.7	0.3	4.3	1.6	-	-		90.5
3	-	-	8.3	37.2	0.0	0.2	38.8	2.5	0.3	3.6	1,620.2	0.2		1,711.3
4	-	-	-	-	-	-	0.9	-	-	0.0	-	5,006.3		5,007.2
Total (km^2)	22.4	8.8	8.7	37.5	16.8	32.4	65.7	4.7	16.5	5.2	1,620.2	5,006.5	69.9	6,915.2

RED-WINGED BLACKBIRD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	3.9	9.0	2.8	-	33.8	1.3	1.9	4.8	36.7	0.0	-	-		94.1

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
2	49.6	9.2	-	1.7	9.4	98.9	55.2	0.5	6.4	2.5	-	-		233.4
3	-	-	22.4	116.2	0.2	0.6	148.7	3.9	0.3	12.0	3,882.8	0.9		4,188.0
4	-	-	-	-	-	-	1.5	-	-	0.0	-	6,185.6		6,187.1
Total (km^2)	53.5	18.3	25.2	117.8	43.5	100.9	207.2	9.1	43.4	14.5	3,882.8	6,186.5	121.1	10,823.7

EASTERN MEADOWLARK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	3.1	7.0	0.4	-	1.5	0.9	0.2	2.6	13.3	0.0	-	-		29.0
2	24.7	5.1	-	0.3	0.0	36.6	18.7	0.4	5.0	1.7	-	-		92.6
3	-	-	8.3	40.6	0.0	0.1	35.4	3.1	0.4	2.9	1,243.6	0.3		1,334.6
4	-	-	-	-	-	-	1.5	-	-	0.0	-	6,152.7		6,154.2
Total (km^2)	27.8	12.1	8.7	40.9	1.5	37.6	55.8	6.1	18.6	4.7	1,243.6	6,153.0	42.4	7,652.8

RUSTY BLACKBIRD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	16.4	0.0	0.0	-	236.0	1.0	4.4	0.0	41.8	0.0	-	-		299.7
2	29.2	10.6	-	0.7	66.3	64.5	128.4	0.0	4.0	2.9	-	-		306.6
3	-	-	29.0	291.1	0.0	0.0	477.2	0.0	0.0	22.3	10,676.4	0.8		11,496.7
4	-	-	-	-	-	-	3.5	-	-	0.0	-	2,132.6		2,136.2
Total (km^2)	45.6	10.6	29.0	291.8	302.3	65.5	613.5	0.0	45.8	25.2	10,676.4	2,133.4	94.6	14,333.7

COMMON GRACKLE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.4	92.2	14.7	-	373.0	5.1	8.6	9.2	106.4	0.1	-	-		644.8
2	110.7	116.8	-	9.4	95.1	214.3	243.9	0.8	17.6	11.9	-	-		820.5
3	-	-	103.0	641.5	0.4	1.7	1,016.2	29.0	0.7	46.3	26,419.9	3.5		28,262.3
4	-	-	-	-	-	-	19.8	-	-	0.0	-	21,303.9		21,323.7
Total (km^2)	146.1	209.0	117.7	650.9	468.5	221.1	1,288.5	39.0	124.8	58.3	26,419.9	21,307.4	375.3	51,426.6

BROWN-HEADED COWBIRD	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.5	12.2	3.7	-	72.4	1.8	2.0	5.8	36.8	0.1	-	-		140.3
2	46.6	15.1	-	2.5	11.8	102.3	58.6	0.7	7.5	4.0	-	-		249.0
3	-	-	31.5	241.8	0.2	0.8	249.3	7.8	0.4	19.8	11,492.5	1.9		12,046.0
4	-	-	-	-	-	-	2.3	-	-	0.0	-	10,061.2		10,063.6
Total (km^2)	52.1	27.2	35.3	244.3	84.3	104.9	312.2	14.3	44.7	23.9	11,492.5	10,063.1	135.5	22,634.3

BALTIMORE ORIOLE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	20.6	60.6	34.4	-	442.7	6.2	11.9	3.1	65.9	0.6	-	-		645.9
2	59.8	89.5	-	12.3	65.4	196.6	238.7	0.2	8.5	10.8	-	-		681.8
3	-	-	210.6	604.8	0.5	2.6	1,249.3	23.0	0.4	54.2	23,764.5	2.1		25,911.9
4	-	-	-	-	-	-	16.8	-	-	0.0	-	19,730.2		19,747.1
Total (km^2)	80.4	150.1	245.0	617.1	508.5	205.4	1,516.7	26.3	74.8	65.6	23,764.5	19,732.3	230.8	47,217.5

PINE GROSBEAK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	373.0	0.0	6.5	0.0	28.6	0.0	-	-		408.1
2	0.0	15.0	-	0.0	92.2	28.3	117.8	0.0	3.3	0.5	-	-		257.0
3	-	-	18.6	125.2	0.0	0.0	513.1	0.0	0.0	26.9	15,778.5	0.2		16,462.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,967.9		1,967.9
Total (km^2)	0.0	15.0	18.6	125.2	465.1	28.3	637.3	0.0	31.9	27.4	15,778.5	1,968.0	38.7	19,134.0

PURPLE FINCH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	32.8	107.8	20.8	-	488.8	6.5	13.7	7.6	116.6	0.3	-	-		794.8
2	98.3	131.8	-	12.7	105.6	210.3	285.1	0.3	15.5	11.8	-	-		871.4
3	-	-	133.1	714.5	0.6	2.4	1,323.1	30.1	0.4	57.9	31,091.3	3.4		33,356.6

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	21.2	-	-	0.0	-	19,661.5		19,682.8
Total (km^2)	131.1	239.5	153.9	727.1	594.9	219.3	1,643.1	38.0	132.5	69.9	31,091.3	19,664.9	325.8	55,031.5

RED CROSSBILL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	29.0	80.4	13.4	-	294.9	3.3	6.8	4.4	76.4	0.1	-	-		508.8
2	64.0	96.2	-	6.7	85.5	121.1	175.0	0.1	8.9	7.5	-	-		565.0
3	-	-	71.0	430.7	0.3	1.3	798.3	21.4	0.3	31.1	15,978.2	1.8		17,334.5
4	-	-	-	-	-	-	16.7	-	-	0.0	-	11,205.2		11,221.8
Total (km^2)	93.1	176.6	84.4	437.4	380.7	125.7	996.9	25.8	85.7	38.7	15,978.2	11,206.9	208.9	29,839.0

WHITE-WINGED CROSSBILL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	29.1	81.2	13.6	-	296.7	1.7	7.0	4.3	70.1	0.1	-	-		503.7
2	61.6	96.4	-	6.9	85.7	109.1	179.3	0.2	8.4	6.5	-	-		554.0
3	-	-	63.2	437.0	0.2	1.4	806.3	21.1	0.1	31.3	16,036.9	1.8		17,399.4
4	-	-	-	-	-	-	16.5	-	-	0.0	-	10,132.6		10,149.1
Total (km^2)	90.7	177.6	76.8	443.9	382.6	112.2	1,009.0	25.6	78.6	37.8	16,036.9	10,134.4	65.8	28,671.9

PINE SISKIN	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	30.9	107.0	20.2	-	452.1	6.3	12.8	6.1	108.4	0.3	-	-		743.9
2	87.9	123.8	-	12.9	103.0	206.7	267.1	0.2	15.0	11.2	-	-		827.9
3	-	-	129.7	590.0	0.6	2.3	1,217.4	28.0	0.4	51.0	24,084.8	2.7		26,106.8
4	-	-	-	-	-	-	20.3	-	-	0.0	-	17,905.0		17,925.3
Total (km^2)	118.7	230.8	149.9	602.9	555.7	215.3	1,517.5	34.3	123.8	62.5	24,084.8	17,907.7	303.4	45,907.3

AMERICAN GOLDFINCH	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total

Category 1	4.7	9.6	0.7	-	54.1	1.3	0.9	3.8	23.7	0.0	-	-		98.7
2	38.6	10.9	-	0.8	7.1	67.7	51.8	0.6	6.3	2.6	-	-		186.5
3	-	-	19.2	149.5	0.1	0.3	131.6	5.8	0.4	10.0	7,704.3	1.3		8,022.3
4	-	-	-	-	-	-	2.4	-	-	0.0	-	8,232.1		8,234.5
Total (km^2)	43.3	20.4	19.9	150.3	61.3	69.3	186.7	10.1	30.3	12.7	7,704.3	8,233.4	138.6	16,680.6

EVENING GROSBEAK	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	30.4	105.2	21.2	-	448.5	1.7	12.5	4.9	82.2	0.1	-	-		706.7
2	67.4	122.4	-	12.9	102.0	136.6	247.1	0.2	10.0	7.6	-	-		706.2
3	-	-	113.8	570.1	0.1	2.2	1,203.6	26.6	0.0	48.0	23,406.3	2.4		25,373.3
4	-	-	-	-	-	-	19.6	-	-	0.0	-	14,213.0		14,232.6
Total (km^2)	97.8	227.6	135.1	582.9	550.6	140.5	1,482.9	31.8	92.2	55.8	23,406.3	14,215.4	81.4	41,100.3

VIRGINIA OPOSSUM	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	4.9	0.2	0.0	11.7	0.0	-	-		16.8
2	8.1	0.0	-	0.0	0.0	25.7	4.7	0.0	1.2	3.5	-	-		43.3
3	-	-	13.9	0.0	0.2	0.0	2.0	0.5	0.2	0.8	37.0	0.1		54.8
4	-	-	-	-	-	-	0.0	-	-	0.0	-	2,485.0		2,485.0
Total (km^2)	8.1	0.0	13.9	0.0	0.2	30.7	6.9	0.5	13.1	4.3	37.0	2,485.1	6.0	2,605.9

MASKED SHREW	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	37.2	120.1	45.8	-	663.9	8.3	16.6	10.1	141.2	0.7	-	-		1,044.0
2	121.0	169.5	-	15.2	118.2	312.3	396.6	0.8	21.5	16.6	-	-		1,171.8
3	-	-	256.6	983.7	0.7	3.7	1,773.3	35.2	0.9	81.8	40,928.2	4.2		44,068.2
4	-	-	-	-	-	-	25.0	-	-	0.0	-	31,882.7		31,907.7
Total (km^2)	158.2	289.6	302.4	999.0	782.8	324.3	2,211.6	46.2	163.6	99.1	40,928.2	31,886.9	499.7	78,691.5

WATER SHREW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	4.5	9.9	3.0	-	53.0	0.6	1.3	4.1	33.6	0.0	-	-		110.0
2	44.5	9.2	-	1.9	12.1	95.2	58.1	0.2	5.9	1.5	-	-		228.6
3	-	-	20.0	134.7	0.1	0.7	180.2	3.9	0.0	12.4	4,623.4	0.9		4,976.2
4	-	-	-	-	-	-	2.1	-	-	0.0	-	2,948.1		2,950.1
Total (km²)	49.0	19.0	23.0	136.6	65.3	96.5	241.6	8.2	39.5	13.9	4,623.4	2,949.0	147.0	8,411.9

SMOKY SHREW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.0	113.7	45.3	-	661.1	7.3	16.3	9.0	135.9	0.7	-	-		1,025.3
2	116.5	166.4	-	14.8	118.0	298.9	382.2	0.4	20.3	14.8	-	-		1,132.4
3	-	-	245.2	972.4	0.6	3.5	1,763.5	33.0	0.5	79.4	40,506.8	4.0		43,609.0
4	-	-	-	-	-	-	24.5	-	-	0.0	-	25,880.3		25,904.8
Total (km²)	152.5	280.1	290.5	987.2	779.6	309.7	2,186.6	42.5	156.7	94.9	40,506.8	25,884.2	448.3	72,119.7

LONG-TAILED SHREW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	42.7	-	149.6	0.0	0.0	0.1	10.2	0.0	-	-		202.7
2	3.4	111.0	-	1.8	1.1	37.2	168.5	0.0	3.9	0.1	-	-		326.9
3	-	-	170.4	240.8	0.0	1.4	620.2	2.1	0.0	8.1	8,926.3	0.1		9,969.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	5,515.1		5,515.1
Total (km²)	3.4	111.0	213.2	242.5	150.7	38.6	788.7	2.2	14.1	8.3	8,926.3	5,515.1	33.5	16,047.6

PYGMY SHREW	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.1	117.2	45.7	-	666.3	3.2	16.3	9.5	131.4	0.7	-	-		1,026.4
2	111.7	167.2	-	16.1	118.4	293.3	397.9	0.8	20.1	13.5	-	-		1,138.9

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	241.5	988.9	0.7	3.7	1,778.7	34.9	0.8	81.4	40,868.8	4.2		44,003.6
4	-	-	-	-	-	-	24.4	-	-	0.0	-	28,700.1		28,724.4
Total (km²)	147.9	284.4	287.2	1,005.0	785.4	300.2	2,217.3	45.2	152.3	95.7	40,868.8	28,704.2	222.1	75,115.5

N. SHORT-TAILED SHREW	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.2	118.4	45.7	-	679.3	7.9	16.6	9.4	138.5	0.7	-	-		1,052.9
2	117.8	168.5	-	14.8	117.8	307.3	385.6	0.7	21.0	16.3	-	-		1,149.8
3	-	-	251.2	975.5	0.7	3.7	1,761.8	34.8	0.8	81.1	40,630.3	4.1		43,744.0
4	-	-	-	-	-	-	24.4	-	-	0.0	-	30,728.2		30,752.6
Total (km²)	154.0	287.0	296.9	990.3	797.8	318.9	2,188.4	44.9	160.3	98.1	40,630.3	30,732.3	449.0	77,148.4

STAR-NOSED MOLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	25.5	65.2	16.0	-	227.8	6.1	7.3	8.3	104.1	0.2	-	-		460.6
2	97.3	68.0	-	12.6	70.9	214.5	224.6	0.6	15.2	9.7	-	-		713.3
3	-	-	79.9	541.3	0.7	2.9	810.3	20.1	0.6	37.6	18,957.9	3.6		20,455.0
4	-	-	-	-	-	-	10.7	-	-	0.0	-	15,351.8		15,362.5
Total (km²)	122.8	133.2	96.0	553.9	299.4	223.6	1,052.8	29.0	119.9	47.5	18,957.9	15,355.4	451.7	37,443.1

HAIRY-TAILED MOLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	32.4	109.8	42.9	-	627.0	7.6	15.4	5.5	107.3	0.7	-	-		948.4
2	78.3	162.3	-	13.2	107.0	222.2	333.6	0.6	15.4	15.0	-	-		947.4
3	-	-	235.5	855.1	0.5	3.1	1,606.3	31.0	0.8	69.9	36,596.6	3.2		39,401.8
4	-	-	-	-	-	-	22.8	-	-	0.0	-	28,037.8		28,060.5
Total (km²)	110.6	272.1	278.4	868.3	734.6	232.9	1,978.0	37.0	123.5	85.5	36,596.6	28,040.9	326.3	69,684.6

LITTLE BROWN MYOTIS	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	38.0	135.5	45.7	-	689.3	8.9	17.9	10.1	150.2	0.7	-	-		1,096.3
2	132.3	174.9	-	19.3	119.2	336.2	431.4	0.8	22.5	17.6	-	-		1,254.1
3	-	-	261.7	996.4	0.8	3.8	1,796.2	36.0	0.9	83.3	40,989.1	5.2		44,173.4
4	-	-	-	-	-	-	25.2	-	-	0.0	-	33,122.2		33,147.4
Total (km^2)	170.3	310.4	307.4	1,015.7	809.3	348.8	2,270.7	46.9	173.7	101.6	40,989.1	33,127.4	3,801.2	83,472.4

NORTHERN MYOTIS	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	37.3	134.5	45.6	-	688.4	8.6	17.3	10.1	146.8	0.7	-	-		1,089.3
2	130.3	172.9	-	19.0	119.2	332.1	430.8	0.8	22.1	17.0	-	-		1,244.3
3	-	-	256.9	992.5	0.8	3.7	1,791.5	35.8	0.9	81.7	40,862.5	5.2		44,031.5
4	-	-	-	-	-	-	24.6	-	-	0.0	-	32,454.3		32,478.9
Total (km^2)	167.6	307.4	302.5	1,011.5	808.4	344.4	2,264.2	46.7	169.9	99.4	40,862.5	32,459.5	3,801.4	82,645.3

E. SMALL-FOOTED MYOTIS	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	45.4	-	0.0	0.0	0.1	0.0	3.0	0.1	-	-		48.5
2	0.6	1.9	-	0.0	0.0	36.5	56.2	0.0	1.7	1.2	-	-		98.0
3	-	-	150.4	0.0	0.0	1.1	41.5	1.3	0.0	1.9	538.2	0.0		734.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	3,888.9		3,888.9
Total (km^2)	0.6	1.9	195.8	0.0	0.0	37.6	97.8	1.3	4.6	3.2	538.2	3,888.9	235.3	5,005.1

SILVER-HAIRED BAT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	27.6	88.4	18.6	-	330.4	6.8	7.6	7.8	109.5	0.2	-	-		596.9
2	103.0	89.2	-	16.4	74.1	238.3	273.9	0.6	16.4	10.6	-	-		822.6

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
3	-	-	106.0	543.4	0.7	2.7	900.1	22.5	0.6	43.3	18,976.0	4.1		20,599.4
4	-	-	-	-	-	-	13.1	-	-	0.0	-	17,809.8		17,822.9
Total (km²)	130.6	177.6	124.7	559.7	405.2	247.8	1,194.8	30.9	126.6	54.1	18,976.0	17,813.9	2,251.2	42,093.0

EASTERN PIPISTRELLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	9.3	112.5	9.0	-	0.0	6.9	2.2	0.4	56.0	0.6	-	-		196.9
2	25.6	33.9	-	0.0	0.0	115.8	40.0	0.0	7.1	6.7	-	-		229.1
3	-	-	43.8	1.3	0.8	0.5	84.0	3.3	0.9	6.9	446.4	0.4		588.3
4	-	-	-	-	-	-	10.2	-	-	0.0	-	10,850.4		10,860.6
Total (km²)	34.9	146.4	52.9	1.3	0.8	123.2	136.4	3.7	64.0	14.2	446.4	10,850.8	537.3	12,412.2

BIG BROWN BAT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.3	133.2	45.5	-	675.6	8.7	17.4	8.5	145.0	0.7	-	-		1,070.9
2	125.6	168.2	-	18.8	119.4	320.5	414.2	0.6	21.3	16.7	-	-		1,205.4
3	-	-	253.9	949.5	0.8	3.8	1,742.3	34.6	0.9	79.9	38,792.3	4.9		41,862.9
4	-	-	-	-	-	-	24.1	-	-	0.0	-	31,177.3		31,201.4
Total (km²)	162.0	301.4	299.4	968.2	795.8	332.9	2,198.0	43.8	167.2	97.4	38,792.3	31,182.2	3,755.6	79,096.2

EASTERN RED BAT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.8	121.0	45.2	-	661.4	8.6	17.7	9.4	146.8	0.7	-	-		1,047.5
2	129.0	171.3	-	18.6	117.2	328.6	416.8	0.7	21.9	17.1	-	-		1,221.2
3	-	-	253.9	979.8	0.8	3.7	1,767.9	35.2	0.9	81.9	40,325.4	5.1		43,454.5
4	-	-	-	-	-	-	24.4	-	-	0.0	-	31,548.0		31,572.4
Total (km²)	165.9	292.3	299.1	998.3	779.3	340.8	2,226.8	45.3	169.6	99.7	40,325.4	31,553.1	3,748.3	81,043.9

HOARY BAT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	37.1	121.2	44.9	-	661.8	8.4	17.4	9.5	146.0	0.6	-	-		1,046.9
2	129.0	171.9	-	18.6	117.6	326.5	417.1	0.7	22.0	16.6	-	-		1,220.0
3	-	-	248.7	979.3	0.7	3.6	1,766.8	35.2	0.9	80.5	40,325.6	5.1		43,446.5
4	-	-	-	-	-	-	24.4	-	-	0.0	-	31,017.0		31,041.4
Total (km^2)	166.0	293.1	293.6	997.9	780.1	338.5	2,225.7	45.3	169.0	97.7	40,325.6	31,022.1	3,754.8	80,509.5

NEW ENGLAND COTTONTAIL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	0.0	0.6	0.0	0.0	1.8	0.0	-	-		2.4
2	2.6	0.0	-	0.0	0.0	11.5	2.0	0.0	0.5	1.0	-	-		17.5
3	-	-	4.5	0.0	0.0	0.0	1.7	0.9	0.0	0.7	23.6	0.1		31.5
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,665.7		1,665.7
Total (km^2)	2.6	0.0	4.5	0.0	0.0	12.0	3.7	0.9	2.3	1.7	23.6	1,665.8	5.6	1,722.7

SNOWSHOE HARE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	5.9	13.4	3.7	-	77.8	1.7	2.1	6.1	44.4	0.1	-	-		155.1
2	62.9	16.0	-	2.4	13.7	119.1	77.6	0.6	9.3	3.9	-	-		305.5
3	-	-	28.7	256.9	0.2	0.8	266.6	7.8	0.4	20.1	11,929.9	1.9		12,513.3
4	-	-	-	-	-	-	2.5	-	-	0.0	-	9,479.2		9,481.7
Total (km^2)	68.8	29.4	32.3	259.4	91.7	121.7	348.7	14.5	54.1	24.0	11,929.9	9,481.1	168.2	22,623.8

EASTERN CHIPMUNK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	22.8	64.4	35.6	-	494.0	7.0	13.0	5.4	77.0	0.6	-	-		719.9
2	73.4	101.1	-	12.5	67.9	214.2	264.0	0.6	11.6	13.1	-	-		758.3
3	-	-	222.9	747.4	0.5	2.8	1,379.6	27.4	0.7	64.1	32,228.2	3.1		34,676.7

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	17.9	-	-	0.0	-	26,446.0		26,463.9
Total (km²)	96.2	165.5	258.5	759.9	562.3	224.0	1,674.5	33.4	89.3	77.8	32,228.2	26,449.1	268.9	62,887.6

WOODCHUCK	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	4.5	31.5	30.6	-	298.0	4.0	7.9	3.2	44.7	0.6	-	-		425.0
2	32.6	56.9	-	5.8	24.0	140.2	159.1	0.6	7.0	7.2	-	-		433.5
3	-	-	168.1	377.9	0.3	2.0	779.7	9.4	0.5	41.4	16,163.4	1.1		17,543.8
4	-	-	-	-	-	-	6.5	-	-	0.0	-	16,633.0		16,639.5
Total (km²)	37.1	88.4	198.7	383.8	322.3	146.2	953.2	13.3	52.2	49.1	16,163.4	16,634.1	152.0	35,193.7

EASTERN GRAY SQUIRREL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	22.0	61.7	34.6	-	196.4	6.4	0.5	3.7	50.9	0.6	-	-		376.7
2	64.1	92.3	-	13.8	4.9	195.8	167.7	0.2	8.6	8.7	-	-		556.2
3	-	-	191.4	549.3	0.4	2.6	835.2	24.9	0.4	20.0	14,754.7	2.2		16,381.2
4	-	-	-	-	-	-	17.5	-	-	0.0	-	18,715.4		18,732.9
Total (km²)	86.0	154.0	226.0	563.1	201.8	204.8	1,020.8	28.7	59.9	29.3	14,754.7	18,717.6	84.3	36,131.3

RED SQUIRREL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	29.4	103.0	20.1	-	429.8	6.1	12.4	4.6	96.2	0.3	-	-		701.9
2	70.5	118.5	-	11.5	99.1	162.0	237.8	0.1	11.2	10.5	-	-		721.1
3	-	-	121.2	543.7	0.6	2.2	1,151.5	25.9	0.4	47.8	22,359.1	2.1		24,254.5
4	-	-	-	-	-	-	19.7	-	-	0.0	-	16,645.2		16,664.8
Total (km²)	99.9	221.5	141.2	555.2	529.5	170.3	1,421.3	30.6	107.8	58.6	22,359.1	16,647.3	251.7	42,594.0

S. FLYING SQUIRREL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	7.1	60.5	0.0	-	0.0	5.1	0.4	0.2	20.9	0.3	-	-		94.6
2	10.4	11.1	-	0.0	0.0	24.8	12.4	0.0	1.5	3.0	-	-		63.3
3	-	-	10.5	0.1	0.4	0.0	59.9	0.2	0.3	2.6	140.5	0.3		214.8
4	-	-	-	-	-	-	11.1	-	-	0.0	-	3,958.6		3,969.7
Total (km^2)	17.6	71.7	10.5	0.1	0.4	29.9	83.9	0.4	22.7	5.8	140.5	3,958.9	5.2	4,347.6

N. FLYING SQUIRREL	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	30.6	105.5	43.5	-	580.5	6.4	14.8	5.1	108.7	0.6	-	-		895.8
2	73.9	149.0	-	13.2	106.9	226.1	315.3	0.1	13.5	13.1	-	-		911.0
3	-	-	228.0	756.0	0.6	3.2	1,541.8	27.5	0.4	66.9	30,023.7	2.6		32,650.7
4	-	-	-	-	-	-	21.6	-	-	0.0	-	21,346.6		21,368.2
Total (km^2)	104.5	254.4	271.6	769.2	688.0	235.6	1,893.5	32.7	122.6	80.7	30,023.7	21,349.2	277.9	56,103.5

AMERICAN BEAVER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	18.5	44.4	11.8	-	230.3	5.2	5.1	7.6	76.8	0.1	-	-		399.9
2	86.1	51.0	-	15.7	40.9	206.6	205.7	0.3	11.2	7.3	-	-		624.8
3	-	-	82.2	454.6	0.6	2.3	683.4	16.2	0.3	34.0	16,005.9	4.1		17,283.6
4	-	-	-	-	-	-	9.3	-	-	0.0	-	12,348.5		12,357.8
Total (km^2)	104.6	95.4	94.0	470.3	271.7	214.1	903.5	24.2	88.4	41.4	16,005.9	12,352.6	1,263.0	31,929.1

DEER MOUSE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	34.2	113.4	38.6	-	655.8	2.3	15.5	8.3	97.9	0.0	-	-		965.9
2	93.0	160.2	-	14.3	112.9	145.2	331.8	0.5	11.5	8.6	-	-		878.1
3	-	-	206.7	925.8	0.0	1.6	1,653.8	29.9	0.0	70.1	38,625.4	3.6		41,516.9
4	-	-	-	-	-	-	23.2	-	-	0.0	-	16,816.7		16,839.9
Total (km^2)	127.2	273.6	245.3	940.1	768.7	149.1	2,024.3	38.7	109.4	78.8	38,625.4	16,820.3	107.3	60,308.1

WHITE-FOOTED MOUSE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.2	48.2	27.7	-	0.0	5.3	0.6	0.3	35.5	0.7	-	-		118.3
2	6.4	15.4	-	0.0	0.0	85.8	29.4	0.0	6.2	6.0	-	-		149.2
3	-	-	108.6	0.0	0.6	0.3	38.1	3.4	0.9	6.2	287.9	0.1		446.0
4	-	-	-	-	-	-	0.0	-	-	0.0	-	9,512.2		9,512.2
Total (km^2)	6.6	63.5	136.3	0.0	0.6	91.3	68.1	3.7	42.5	12.8	287.9	9,512.3	23.8	10,249.4

S. RED-BACKED VOLE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	35.0	115.8	45.3	-	650.6	7.8	16.3	9.1	135.0	0.7	-	-		1,015.6
2	112.0	164.9	-	14.6	115.1	295.8	372.6	0.7	20.4	16.1	-	-		1,112.3
3	-	-	249.0	957.3	0.6	3.6	1,734.3	34.1	0.8	80.4	40,111.3	4.0		43,175.4
4	-	-	-	-	-	-	23.5	-	-	0.0	-	30,027.3		30,050.8
Total (km^2)	147.0	280.7	294.3	971.9	766.4	307.2	2,146.8	43.9	156.2	97.2	40,111.3	30,031.2	399.2	75,753.3

MEADOW VOLE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.8	119.3	45.7	-	680.3	8.1	16.4	10.1	139.8	0.7	-	-		1,057.3
2	119.6	169.0	-	15.1	118.0	310.0	386.1	0.8	21.2	16.5	-	-		1,156.4
3	-	-	256.2	977.2	0.7	3.7	1,767.1	35.0	0.9	81.4	40,661.1	4.1		43,787.3
4	-	-	-	-	-	-	24.9	-	-	0.0	-	31,581.1		31,606.0
Total (km^2)	156.5	288.3	302.0	992.3	799.0	321.9	2,194.5	45.9	161.8	98.6	40,661.1	31,585.2	457.6	78,064.6

ROCK VOLE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	8.8	-	95.8	0.0	0.0	0.0	7.6	0.0	-	-		112.2
2	0.1	14.7	-	0.0	0.6	0.0	22.2	0.0	0.3	0.0	-	-		37.9
3	-	-	10.7	46.4	0.0	0.0	42.6	0.0	0.0	1.1	717.4	0.0		818.2

	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
4	-	-	-	-	-	-	0.0	-	-	0.0	-	38.4		38.4
Total (km²)	0.1	14.7	19.5	46.4	96.4	0.0	64.9	0.0	7.9	1.1	717.4	38.4	11.6	1,018.2

WOODLAND VOLE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	0.0	3.1	0.0	0.0	4.8	0.0	-	-		7.9
2	2.9	0.0	-	0.0	0.0	14.9	0.9	0.0	0.3	1.5	-	-		20.4
3	-	-	5.6	0.0	0.0	0.0	1.1	0.1	0.0	0.0	16.5	0.1		23.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1,283.8		1,283.8
Total (km²)	2.9	0.0	5.6	0.0	0.0	18.0	1.9	0.1	5.1	1.5	16.5	1,283.9	1.0	1,336.5

MUSKRAT	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	5.7	13.3	3.4	-	54.7	1.6	2.0	5.0	40.1	0.0	-	-		126.0
2	52.5	14.6	-	2.6	12.2	106.2	74.9	0.6	7.3	2.6	-	-		273.4
3	-	-	25.5	142.2	0.2	0.8	192.8	5.1	0.2	13.8	4,839.0	1.5		5,221.1
4	-	-	-	-	-	-	2.6	-	-	0.0	-	6,043.3		6,045.9
Total (km²)	58.2	27.9	28.9	144.8	67.1	108.6	272.3	10.7	47.7	16.4	4,839.0	6,044.8	613.5	12,279.9

SOUTHERN BOG LEMMING	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	24.3	65.2	37.1	-	469.3	7.2	13.0	7.0	95.2	0.6	-	-		719.0
2	91.6	92.3	-	13.0	73.2	254.3	278.0	0.6	14.2	12.5	-	-		829.6
3	-	-	221.7	702.2	0.6	3.2	1,372.1	26.0	0.7	63.9	27,628.3	2.7		30,021.3
4	-	-	-	-	-	-	18.4	-	-	0.0	-	24,807.9		24,826.3
Total (km²)	115.9	157.5	258.9	715.2	543.2	264.7	1,681.5	33.6	110.1	77.0	27,628.3	24,810.6	321.4	56,717.7

NORTHERN BOG LEMMING	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**

Category 1	0.0	0.0	0.0	-	123.6	0.0	0.0	0.0	0.0	0.0	-	-		123.6
2	0.0	0.0	-	0.0	0.8	0.0	0.1	0.0	0.0	0.0	-	-		0.9
3	-	-	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	29.7	0.0		29.9
4	-	-	-	-	-	-	0.0	-	-	0.0	-	1.2		1.2
Total (km^2)	0.0	0.0	0.0	0.0	124.4	0.0	0.3	0.0	0.0	0.0	29.7	1.2	0.5	156.1

MEADOW JUMPING MOUSE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.9	117.4	45.7	-	680.1	8.2	16.6	10.0	140.2	0.7	-	-		1,055.7
2	118.6	169.1	-	15.1	117.8	309.4	394.3	0.8	21.2	16.5	-	-		1,162.6
3	-	-	256.0	975.5	0.7	3.6	1,765.1	34.5	0.8	81.0	40,572.8	4.1		43,694.1
4	-	-	-	-	-	-	24.8	-	-	0.0	-	31,148.2		31,173.0
Total (km^2)	155.5	286.4	301.6	990.6	798.5	321.3	2,200.8	45.2	162.3	98.2	40,572.8	31,152.3	487.7	77,573.2

WOODLAND JUMPING MOUSE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	13.6	36.8	9.9	-	163.8	1.3	3.7	7.4	56.8	0.0	-	-		293.4
2	55.7	40.1	-	10.2	36.6	131.2	143.8	0.6	8.9	4.0	-	-		431.2
3	-	-	44.1	328.8	0.4	1.7	473.1	11.7	0.2	24.8	11,459.9	2.3		12,347.0
4	-	-	-	-	-	-	6.6	-	-	0.0	-	8,115.3		8,121.8
Total (km^2)	69.3	77.0	54.0	339.0	200.9	134.3	627.1	19.7	66.0	28.8	11,459.9	8,117.5	213.2	21,406.7

COMMON PORCUPINE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	35.7	113.3	45.0	-	649.3	7.3	16.8	8.6	135.3	0.6	-	-		1,012.0
2	112.1	166.0	-	14.4	116.7	291.3	375.7	0.4	18.9	14.5	-	-		1,109.9
3	-	-	242.1	947.9	0.6	3.4	1,733.4	31.6	0.5	77.7	39,091.5	3.8		42,132.5
4	-	-	-	-	-	-	24.1	-	-	0.0	-	24,955.4		24,979.5
Total (km^2)	147.8	279.3	287.2	962.3	766.6	302.0	2,150.0	40.5	154.7	92.9	39,091.5	24,959.2	417.4	69,651.3

COYOTE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.9	126.0	44.2	-	697.8	8.2	16.6	8.9	138.5	0.7	-	-		1,077.7
2	115.0	168.4	-	14.2	118.1	298.3	390.2	0.4	19.7	14.9	-	-		1,139.1
3	-	-	234.2	967.0	0.7	3.6	1,756.1	31.2	0.8	78.4	40,398.8	4.1		43,474.9
4	-	-	-	-	-	-	24.8	-	-	0.0	-	28,222.0		28,246.7
Total (km^2)	151.9	294.4	278.4	981.2	816.6	310.0	2,187.7	40.5	159.0	94.0	40,398.8	28,226.1	472.1	74,410.6

RED FOX	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	17.1	120.2	10.0	-	0.0	1.7	5.2	6.6	48.1	0.7	-	-		209.8
2	88.5	40.3	-	16.0	0.0	147.3	58.4	0.4	11.3	7.3	-	-		369.5
3	-	-	48.6	284.8	0.8	0.7	234.2	23.6	0.6	25.2	8,373.0	2.2		8,993.6
4	-	-	-	-	-	-	7.5	-	-	0.0	-	22,415.2		22,422.7
Total (km^2)	105.6	160.6	58.6	300.8	0.8	149.7	305.4	30.6	60.1	33.1	8,373.0	22,417.3	976.5	32,972.1

COMMON GRAY FOX	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.1	0.0	45.0	-	0.0	5.2	0.3	0.2	24.2	0.7	-	-		75.7
2	9.5	5.1	-	0.0	0.0	85.3	79.6	0.0	3.6	5.5	-	-		188.7
3	-	-	164.3	0.0	0.6	0.1	65.7	3.2	0.8	3.8	808.3	0.1		1,046.9
4	-	-	-	-	-	-	0.0	-	-	0.0	-	8,387.1		8,387.1
Total (km^2)	9.7	5.1	209.3	0.0	0.6	90.6	145.6	3.4	28.6	10.0	808.3	8,387.2	27.5	9,725.8

BLACK BEAR	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.4	96.8	45.0	-	658.9	2.4	15.6	8.6	103.9	0.0	-	-		967.7
2	106.9	154.0	-	14.6	116.1	210.6	363.3	0.4	12.0	8.3	-	-		986.2

3	-	-	238.4	975.3	0.0	2.1	1,718.9	30.7	0.0	70.8	40,099.6	3.9		43,139.7
4	-	-	-	-	-	-	24.9	-	-	0.0	-	19,028.2		19,053.1
Total (km²)	143.3	250.7	283.4	989.9	775.0	215.2	2,122.7	39.7	115.9	79.1	40,099.6	19,032.1	189.3	64,335.9

COMMON RACCOON	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	36.6	114.0	28.9	-	513.6	8.2	11.7	10.1	136.4	0.7	-	-		860.3
2	129.3	124.6	-	18.2	105.7	303.7	354.2	0.8	20.6	15.8	-	-		1,072.9
3	-	-	177.2	843.7	0.7	3.3	1,416.6	32.6	0.8	68.2	32,663.5	5.1		35,211.8
4	-	-	-	-	-	-	20.2	-	-	0.0	-	27,796.6		27,816.7
Total (km²)	165.9	238.6	206.1	862.0	620.0	315.3	1,802.7	43.5	157.8	84.8	32,663.5	27,801.7	2,072.8	67,034.5

AMERICAN MARTEN	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	0.0	0.0	0.0	-	606.4	0.0	13.2	3.8	68.2	0.0	-	-		691.6
2	24.1	99.9	-	12.3	111.2	109.4	235.6	0.0	6.1	6.8	-	-		605.3
3	-	-	59.0	794.1	0.0	0.0	1,374.7	10.9	0.0	57.9	29,202.1	1.7		31,500.4
4	-	-	-	-	-	-	0.0	-	-	0.0	-	5,953.3		5,953.3
Total (km²)	24.1	99.9	59.0	806.4	717.6	109.4	1,623.5	14.7	74.3	64.7	29,202.1	5,955.0	90.7	38,841.3

FISHER	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	11.9	111.7	44.2	-	615.7	5.0	14.7	8.4	114.9	0.6	-	-		927.3
2	73.9	159.1	-	15.0	113.1	268.9	362.5	0.4	18.0	14.4	-	-		1,025.4
3	-	-	238.8	877.0	0.6	3.4	1,609.3	31.3	0.5	74.4	33,864.4	3.1		36,702.8
4	-	-	-	-	-	-	16.6	-	-	0.0	-	22,787.2		22,803.9
Total (km²)	85.8	270.9	283.1	892.0	729.5	277.3	2,003.1	40.0	133.4	89.5	33,864.4	22,790.3	227.5	61,686.9

ERMINE	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.1	116.2	45.6	-	676.5	8.1	16.5	9.3	138.0	0.7	-	-		1,047.0
2	116.2	167.9	-	14.9	117.5	304.8	392.0	0.7	20.9	16.1	-	-		1,151.1
3	-	-	250.7	962.0	0.7	3.6	1,750.2	34.0	0.8	80.4	40,130.2	4.0		43,216.6
4	-	-	-	-	-	-	24.1	-	-	0.0	-	29,912.2		29,936.3
Total (km^2)	152.3	284.1	296.3	976.9	794.7	316.4	2,182.9	44.0	159.7	97.1	40,130.2	29,916.2	474.4	75,825.4

LONG-TAILED WEASEL	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	36.5	118.8	45.7	-	659.8	8.1	16.5	9.5	139.0	0.7	-	-		1,034.5
2	118.6	168.1	-	14.7	117.8	307.2	394.6	0.7	21.2	16.3	-	-		1,159.4
3	-	-	251.0	970.0	0.7	3.7	1,754.9	34.7	0.8	80.9	40,421.7	4.1		43,522.4
4	-	-	-	-	-	-	24.3	-	-	0.0	-	30,707.0		30,731.3
Total (km^2)	155.0	287.0	296.6	984.7	778.3	319.0	2,190.4	44.8	161.0	97.9	40,421.7	30,711.1	485.4	76,933.0

MINK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	18.9	54.5	12.2	-	230.7	4.4	5.7	7.3	86.1	0.1	-	-		419.8
2	82.8	59.6	-	14.1	49.3	195.2	220.5	0.3	12.8	6.9	-	-		641.5
3	-	-	68.8	427.8	0.5	2.1	632.2	15.1	0.3	30.8	14,787.4	3.9		15,968.8
4	-	-	-	-	-	-	8.7	-	-	0.0	-	10,690.6		10,699.4
Total (km^2)	101.7	114.1	80.9	441.9	280.6	201.6	867.1	22.7	99.2	37.8	14,787.4	10,694.5	1,209.7	28,939.1

STRIPED SKUNK	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	37.1	119.6	45.7	-	663.6	8.2	16.6	10.0	140.7	0.7	-	-		1,042.2
2	119.5	169.3	-	15.1	117.8	310.7	395.9	0.8	21.4	17.1	-	-		1,167.6
3	-	-	260.4	982.4	0.7	3.7	1,770.8	35.3	0.8	82.7	40,873.4	4.2		44,014.4

4	-	-	-	-	-	-	24.9	-	-	0.0	-	32,062.0		32,087.0
Total (km²)	156.6	288.9	306.1	997.5	782.2	322.5	2,208.3	46.1	162.9	100.5	40,873.4	32,066.2	497.9	78,809.1

NORTHERN RIVER OTTER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	18.5	53.5	12.0	-	218.5	4.9	5.9	6.3	87.4	0.1	-	-		406.9
2	82.9	60.3	-	14.2	48.7	195.9	217.5	0.3	12.4	6.7	-	-		638.9
3	-	-	68.5	382.6	0.6	2.3	604.5	14.2	0.3	29.2	12,901.8	3.6		14,007.6
4	-	-	-	-	-	-	8.4	-	-	0.0	-	10,807.8		10,816.2
Total (km²)	101.3	113.8	80.4	396.8	267.9	203.1	836.3	20.7	100.1	36.0	12,901.8	10,811.4	2,262.5	28,132.2

LYNX	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	0.0	0.0	0.0	-	131.6	0.0	14.0	0.0	21.0	0.0	-	-		166.5
2	0.2	0.1	-	0.0	56.2	10.6	102.2	0.0	2.7	1.6	-	-		173.7
3	-	-	0.0	208.2	0.0	0.0	416.3	0.0	0.0	32.8	15,093.8	0.1		15,751.2
4	-	-	-	-	-	-	0.0	-	-	0.0	-	482.4		482.4
Total (km²)	0.2	0.1	0.0	208.2	187.8	10.6	532.5	0.0	23.7	34.4	15,093.8	482.5	24.0	16,597.8

BOBCAT	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total
Category 1	34.5	0.1	45.6	-	655.8	2.4	14.8	8.9	95.8	0.1	-	-		857.9
2	103.3	126.3	-	15.4	116.7	218.3	369.7	0.7	13.9	9.6	-	-		973.9
3	-	-	234.4	963.2	0.0	3.2	1,695.3	32.6	0.0	74.5	39,757.1	3.8		42,764.0
4	-	-	-	-	-	-	14.5	-	-	0.0	-	20,935.9		20,950.4
Total (km²)	137.8	126.4	279.9	978.7	772.5	223.8	2,094.3	42.1	109.6	84.3	39,757.1	20,939.7	178.1	65,724.4

WHITE-TAILED DEER	FWS	NPS	Other Federal	Native American	BSP	IFW	BPL	Other State	Private Conserv.	Munic-ipal	Comm. Forest	Other Private	Water	Total

Category 1	34.8	117.2	45.5	-	651.8	8.0	16.5	9.4	136.6	0.7	-	-		1,020.4
2	108.8	166.4	-	14.8	116.2	289.7	382.7	0.8	20.6	16.8	-	-		1,116.9
3	-	-	257.7	947.9	0.7	3.6	1,730.9	34.6	0.8	80.8	39,797.0	4.0		42,858.0
4	-	-	-	-	-	-	23.6	-	-	0.0	-	31,155.2		31,178.8
Total (km^2)	143.5	283.7	303.2	962.8	768.7	301.2	2,153.7	44.8	158.0	98.3	39,797.0	31,159.2	432.9	76,607.0

MOOSE	**FWS**	**NPS**	**Other Federal**	**Native American**	**BSP**	**IFW**	**BPL**	**Other State**	**Private Conserv.**	**Munic-ipal**	**Comm. Forest**	**Other Private**	**Water**	**Total**
Category 1	33.7	0.1	41.4	-	634.5	2.3	14.2	6.7	80.7	0.0	-	-		813.5
2	92.9	123.2	-	14.6	109.3	185.7	354.0	0.6	12.7	8.9	-	-		902.0
3	-	-	224.4	890.8	0.0	2.1	1,585.7	30.8	0.0	64.2	36,982.5	3.4		39,783.9
4	-	-	-	-	-	-	16.8	-	-	0.0	-	18,502.7		18,519.5
Total (km^2)	126.6	123.3	265.8	905.4	743.8	190.1	1,970.6	38.2	93.4	73.1	36,982.5	18,506.2	232.9	60,251.8

Appendix 12. List of Example GAP Applications (Maine examples under AStatewide Planning").

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 ASpecies 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. 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.

In Maine, data on vertebrate trends and status were used in a statewide assessment of biodiversity done as part of the Maine Forest Biodiversity Project (i.e., W. B. Krohn and R. B. Boone listed as Collaborators in Gawler et al. 1996). Maine GAP was acknowledged by the State Planning Office for providing data that greatly assisted the Governor=s Land Acquisition Priorities Advisory Committee (LAPAC). Four of the five areas recommended for acquisition focus by LAPAC were areas identified by Maine GAP. Cooperative work with the Maine Department of Inland Fisheries and Wildlife (MDIFW) will use gap habitat data, and selected species data collected by the state, to define and test habitat relationships models. These models will be applied to the statewide gap habitat database to assess conditions for selected upland and wetland species across the state. These habitat assessments, in turn, will become part of MDIFW planning done under the Federal Aide Program of the US Fish and Wildlife Service. An ongoing study, based on gap databases, will determine the degree to which private, state, and federal conservation lands have captured the state=s natural variability.

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 US 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 US Fish and Wildlife Service regularly uses the GAP data for Southern California for habitat evaluation and management.

$ The US 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 US 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 US 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 US 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 US 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 US Natural Resources Conservation Service (NRCS) in New Mexico is using a GAP clustered imagery as a base for their land cover mapping activities.

$ The DOD 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.
