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Nebraska Gap Analysis Project

G.M. Henebry¹, M.R. Vaitkus¹, and J.W. Merchant¹

Introduction

The Nebraska Gap Analysis Project (NE-GAP) began in 1996 to assess the distribution and conservation status of biodiversity in the State under existing land ownership and management regimes. Our objectives were to (1) map land cover linked to dominant vegetation types; (2) map predicted distribution of terrestrial vertebrates; (3) document the representation of natural vegetation communities and animal species in areas managed for the long-term maintenance of biodiversity; and (4) make all information available to resource managers and land stewards in a readily accessible format.

Land Cover

A map of the land cover of Nebraska circa 1992 was prepared from Landsat Thematic Mapper (TM) imagery from 1991–93. The spatial resolution of the land cover map is 30 by 30 meters.

The legend for the land cover map is shown in [Table 1](#).

Accuracy Assessment

The overall accuracy was 29 percent, with a significant Kappa value of 0.201. Although the classification was far from random (Khat z-score=12.74), there was considerable confusion between land cover classes, especially among the grassland types. Aggregating the cover classes into five broader categories lead to a significant increase in overall accuracy (61 percent). These broader categories corresponded to the landscape matrix within which organisms need suitable habitat to persist: grasslands, woodlands, shrublands, wetlands, and anthropolands.

Although the aggregation of the land cover classes into the broader categories was mostly straightforward, one category “anthropolands” deserves some comment. Human influences on the landscape matrix and habitat availability can occur in many ways; however, the direct transformation of land to intensive human use is the most obvious.

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Table 1. Land cover legend for Nebraska.

Land cover value	Land cover name
1	Ponderosa pine forests and woodlands
2	Deciduous forest/woodland
3	Juniper woodland
4	Sandsage shrubland
5	Sandhills upland prairie
6	Lowland tallgrass prairie
7	Upland tallgrass prairie
8	Little bluestem-gamma mixedgrass prairie
9	Western wheatgrass mixedgrass prairie
10	Western shortgrass prairie
11	Barren/sand/outcrop
12	Agricultural fields
13	Open water
14	Fallow agricultural fields
15	Aquatic bed wetland
16	Emergent wetland
17	Riparian shrubland
18	Riparian woodland
19	Low intensity residential
20	Commercial/industrial/transportation

Anthropolands include the lands used for dense human settlement and commercial activity as well as active and fallow agricultural lands. Given the significant area covered by reservoirs, lakes, and farm ponds in Nebraska, it could be argued that class 13 “open water” should also be placed within the anthropolands category instead of the wetlands category. However, wildlife use of open water habitats is substantial and has more in common with wetlands than with lands intensively used by humans.

Challenging the aggregated classes with the best of our five collections of field data lead to an overall accuracy of 71 percent. A simple accuracy assessment treats each class as having equivalent importance. A more refined approach is to weight the columns of the confusion matrix by abundance or prevalence of the class. The aggregated categories have the following area extents: grasslands (53.9 percent), anthropolands (40.2 percent), woodlands (3.0 percent), wetlands (2.0 percent), and shrublands (0.9 percent). Applying this approach to the aggregated categories significantly increased the overall accuracy to 73 percent using all field data and to 79 percent using the best collection of field data alone.

Terrestrial Vertebrate Distributions

Potential distribution maps were developed for 332 terrestrial vertebrate species comprising 193 species of breeding birds, 78 species of mammals, 14 species of amphibians and 47 species of reptiles. Range limits of each species were delineated on a grid of 40 km² hexagons using a statistical modeling approach that combined locality records from museum voucher specimens and curated biological surveys with a suite of environmental variables. Alternatively, the models relied on cues in the literature coupled with the suite of environmental variables. The accuracy of the vertebrate potential distribution models was assessed using different locality records and, given the data availability and modeling approach, omission rates were selected as the focus for specific and taxon accuracy assessments. Excluded from the accuracy assessment were 65 species with state-wide distributions and 57 species with no independent observations. Omission rates were calculated differently across taxa, depending on the quality of the data available for accuracy assessment. For birds, data were available at two spatial resolutions: by county and by Breeding Bird Survey (BBS) route. Average and median omission rates for birds were, respectively, 7.2 and 0.0 percent at BBS level and 24.3 and 0.0 percent at the county level. For mammals, data were available at two levels: point locations for voucher specimens in the Nebraska State Museum and at the county level. Average and median omission rates for mammals were, respectively, 19.9 and 13.6 percent at point locations and 7.1 and 0.0 percent at the county level. For amphibians and reptiles, data were only available at the county level and the average and median omission rates were, respectively, 3.7 and 0.0 percent. The consistent pattern of the average omission rate being substantially larger than the median omission rate indicates that only a few species ranges are poorly modeled.

Land Stewardship

Approximately 1.79 percent of land in Nebraska is managed by public agencies with 1.15 percent under Federal management and 0.64 percent under State jurisdiction. About 0.79 percent of the land in Nebraska occurs within the boundaries of lands governed by five Native American tribal governments. Lands managed by non-profit conservation organizations account for 0.25 percent of the land in Nebraska. Private land owners are responsible for management of about 97.17 percent.

Status 1 and status 2 lands occupy 490.3 km² and 734.8 km², respectively, which combined is approximately 0.6 percent of the State and 30 percent of the area in public and private conservation lands. Federal stewards are responsible for 62 percent of status 1 and 2 lands. Sixty percent of Federal public lands were multiple-use and assigned a status of 3. Twelve percent of lands managed by State government stewards were assigned a status of 4, and the remaining 88 percent of state public lands was assigned a status of 3.

Gap Analysis

Approximately 97.4 percent of the prairie land cover category occurs on private lands; Federal agencies and State land departments manage 1.7 and 0.5 percent of prairie, respectively. Lands governed by the Native American Tribes account for 0.79 percent land cover category. Private land owners are responsible for stewardship of about 92.6 percent of the wetland land cover category. Federal agencies have responsibility for 4.1 percent of the wetland land cover category.