

Ohio Gap Analysis Project

Compiled from Final Project Report

Introduction

The Ohio Gap Analysis Project (OH-GAP) is a regional assessment of the predicted distribution and current conservation status of native wildlife species and natural land cover types in the state. These coarse filter assessments facilitate conservation efforts by proactively identifying areas of potentially high biodiversity that occur outside protected area boundaries as “gaps” in the existing network of conservation lands. This is accomplished through the following five primary objectives, as suggested by the National Gap Analysis Program (GAP): (1) map and describe actual land cover; (2) map predicted terrestrial vertebrate species distributions based on species habitat affinities; (3) document species and land cover types represented in areas managed for the long-term maintenance of biodiversity; (4) provide the compiled information and analysis to the public and those entities charged with land use, research, policy, planning, and management; and (5) build institutional cooperation in the application of this information to state and regional management activities. GAP projects use a data driven approach applying GIS, remote sensing, and other advanced technologies to identify gaps in the representation of biological diversity in areas managed exclusively or primarily for the long-term maintenance of native species and natural ecosystems. OH-GAP was conducted for the entire state of Ohio, encompassing approximately 110,000 km² and portions of the Huron-Erie Lake Plain, Eastern Corn Belt Plain, Eastern Ontario Lake Plain, Interior Plateau, and Western Allegheny Plateau ecoregions.

GAP is conducted as state-level projects that are coordinated by the U.S Geological Survey. Cooperative efforts among regional, state, and federal agencies, as well as private groups are encouraged. OH-GAP was conducted in accordance with national GAP standards in cooperation with the U.S. Geological Survey Water and Biological Resources Divisions, The Ohio State University, and the Ohio Division of Wildlife, taking advantage of the expert knowledge and background of many individuals. The Ohio State University Center for Mapping (CFM) was responsible for the production of the land cover map. Animal modeling was conducted through the Department of Evolution, Ecology and Organismal Biology (EEOB) and the Ohio Ecological Services Field

Office of the U.S. Fish and Wildlife Service. Mapping of conservation land stewardship for the state was conducted by the U.S. Geological Survey Water Resource Division. Financial support was provided by Ohio Division of Wildlife.

A Biodiversity Overview of Ohio

Landscape patterns of biodiversity are the result of complex interactions, now and in the past, among the geology, climate, and human use of Ohio’s natural resources. Ohio’s border encompasses a wide variety of landscapes within two major landforms: the Central Lowlands and the Appalachian Plateau. Approximately two-thirds of the state’s 44,825 mi² of land area makes up the glaciated region, bearing the fingerprint of the last great Ice Age that ended approximately 10,000 years ago. This resulted in a relatively youthful plain with flat to rolling topography covered by glacial till. In contrast, the southeastern hill country remains a rugged, mature landscape dissected by river valleys. These are broken down into five distinct physiographic regions defined by soil type, vegetation, and topography: (1) Huron/Erie Lake Plains, (2) Eastern Corn Belt Plain, (3) Erie/Ontario Lake Plain, (4) Interior Plateau, and (5) Western Allegheny Plateau.

Lying in the humid continental zone, Ohio experiences a temperate climate with abundant and evenly distributed precipitation. Variations in temperature produce distinct seasonal differences. These variations are the result of topography and the influence of Lake Erie, which exerts a major influence on weather and climate conditions. In the winter, temperatures usually approach or slightly exceed 32°F, but periods of cold weather frequently occur, when temperatures can drop below zero. Summer temperatures normally reach their peak during July, with mean daily maximums ranging from 80–82°F in the northeastern counties to 88°F in southern Ohio.

Ohio receives a moderate amount of total precipitation annually, which varies from 29–33 inches in northwestern counties near Lake Erie to 39–45 inches in northeastern and southern Ohio. Snowfall ranges from more than 50 inches in the northeast to less than 20 inches in south-central Ohio along the Ohio River. The “lake-effect” contributes to large

accumulations of snow in the snowbelt, which is east of Cleveland, averaging in excess of 100 inches annually in Geauga County. The overall pattern of annual precipitation reveals that the southeastern Ohio receives more than the northwestern Ohio.

The earliest human inhabitants of what is now Ohio were Paleo-Indian peoples, who lived in the area as early as 13,000 B.C. Later, the Mound Builders, the Adena, and the Hopewell cultures, occupied Ohio from about 100 B.C. to A.D. 500. Ohio was populated by successive groups of Native Americans until European settlement. Population pressure from expanding European colonies on the Atlantic coast compelled several groups to relocate to the Ohio country by 1730. Ohio's chief tribes prior to European exploration were the Wyandot and Ottawa in the northwest, the Erie in the northeast; the Shawnee, ranging north across Ohio; the Miami in the southwest; and the Delaware in the southeast. When the first Europeans began to arrive to the Ohio Country, Native Americans participated in the fur trade.

In the early 1700s, Ohio's pristine environment was described as a predominantly forested landscape with scattered openings, numerous wetlands, and an abundance of wildlife. Ohio's rich natural history and resources drew settlers to the region and make the state economically productive today. However, human settlement has left its mark throughout the state by the clearing, draining, and reshaping of the land to provide for agricultural, industry, and housing. Historically, 95 percent of Ohio's landscape was covered by hardwood forests. The remainder of the state included 5 million acres of various wetland types (bogs, fens, and marshes). The Great Black Swamp in northwestern Ohio stretched 120 miles long and 30 to 40 miles wide. Until it was drained by the end of the 19th century, it was a barrier to early east-west travel and settlement. In addition, it is estimated that approximately 1,000 mi² of prairies occupied large forest openings, predominately in the western half of the state. Today, Ohio's landscape is a mosaic of agricultural, suburban and urban areas, and fragmented woodlands. Less than 10 percent of Ohio's original wetlands remain, and original prairie habitat has been lost as a functional ecosystem.

Ohio once was a land of vast mature hardwood forests and wetlands, and coastal beaches and cliff communities, interspersed with prairie and grasslands. Ohio's natural resources provided habitat for numerous species of fish and wildlife. These resources were the foundation for Ohio's current prosperity. The Ohio Gap Analysis project can assist in proactive efforts to protect biological diversity by identifying critical areas where habitat can be preserved or restored in order to ensure that these components remain a part of Ohio's precious natural heritage.

Land Cover Classification and Mapping

The OH-GAP land cover map contains 37 categories, consisting of natural land cover types and human features. Ohio's land cover was mapped to the ecological system (multiple Alliance) level. The alliance level represents vegetation based on species composition of the dominant vegetation type. This map was produced using Landsat Thematic Mapper (TM) satellite imagery at a 30 by 30 meter resolution acquired between 1999–2002. Nine scenes were required to cover the land area of Ohio. In addition, land cover classification efforts incorporated georeferenced digital color aerial photographs, vegetation field samples to validate and ground-truth the photointerpretation, and image processing techniques (supervised classification) to classify all satellite pixels covering the state.

Predicted Vertebrate Species Distributions

The OH-GAP vertebrate species modeling effort produced predicted range and predicted habitat maps for 38 amphibians, 42 reptiles, 176 birds, and 54 mammals that breed in the state. General range maps were produced using existing location data and published range maps. These draft range maps were reviewed by experts who had the opportunity to provide an update based on the most recent occurrence data and their expert knowledge. Predicted habitat maps were created using wildlife habitat relation models for each species. Each model relates the habitat associations of the species to GAP land cover classes and other ancillary datasets. The predicted habitat map for each species was clipped with the general range map, resulting in a spatially explicit map of predicted habitat for each species within its range.

Species richness measured by the number of species present varied geographically for each of the four major taxonomic groups. Amphibian species richness was highest in the central to south central part of the state. Reptile species richness was highest in the south central part of the state. Mammal species richness was highest in the north central part of the state. Bird species richness was highest in the southwest of the state.

Land Stewardship

The land stewardship layer represents the permanence and intent of the management based on information in management plans or agency mandates for specific land units. Status 1 and 2 represent permanently protected lands that are managed for biological diversity, with Status 1 representing the highest level of protection. Status 3 lands are those lands under a management plan that prevents conversion to non-natural cover types but allows either intensive local or extensive resource extraction. Status 4 lands are not managed for biodiversity or are not under a management plan.

The analysis of land stewardship showed that a small proportion of the State is under any sort of protection for biodiversity. In fact, 3.7 percent of the State was under management; and of that, 29.3 percent was federally managed and approximately 50 percent was managed by State agencies.

Lands with high protection for biodiversity (GAP Status 1 or 2) comprised only 0.7 percent of Ohio's land. State Management, primarily the Ohio Department of Natural Resources (ODNR) (43.4 percent) along with The Nature Conservancy (30.3 percent), accounted for the majority of the status 1 and 2 lands. Status 3 lands were managed primarily by ODNR (54.5 percent).

Gap Analysis—Land Cover

Six of the 59 natural cover types in the state have less than 1 percent of their distribution on Status 1 and 2 lands.

Status 1 lands in Ohio are mainly comprised of small parcels dispersed across the state. There is a concentration of Status 1 lands along the Lake Erie coast in Ottawa and Erie Counties, another in Fairfield and Hocking Counties, and a third in Adams and Scioto Counties. In Fairfield and Hocking Counties, Status 1 lands include Central Ohio Metro parks and State Nature Preserves. An example of these, the Clear Creek Valley, is one of the most pristine and secluded natural

areas in Central Ohio. Variations of land surfaces, soils and climates have produced habitats that hold more than 800 plant species and 150 species of birds, many of them rare. In Adams and Scioto Counties, Status 1 lands include The Nature Conservancy's "Edge of Appalachia," Shawnee State Forest. This area is one of the most biologically diverse collections of natural systems in the Midwestern United States.

Gap Analysis—Vertebrates

Information System (GIS) analysis of stewardship status for terrestrial vertebrates showed 44 of 177 (24.8 percent) birds, 19 of 54 (35.1 percent) mammals, 12 of 39 (30.7 percent) reptiles, and 3 of 37 (30.7 percent) amphibians have less than 1 percent of their predicted distribution ([Table 1](#)) in status 1 or 2 lands.

Only 3 of 177 (3.4 percent) birds, 0 mammals, 1 reptile (2.5 percent), and 0 amphibians have over 10 percent of their predicted distribution in status 1 or 2 lands.

Table 1. Summary of species at different thresholds of biodiversity management in Ohio.

[Biodiversity management is defined as the percent of predicted distribution on GAP Status 1 and 2 lands divided by the total predicted distribution. **Abbreviations:** <, less than; >, more than]

Taxa	Less than 1 percent	1-2 percent	2-5 percent	5-10 percent	Greater than 10 percent	Total number of species
Amphibians	3	19	12	3	0	37
Birds	44	78	46	6	3	177
Mammals	19	25	10	0	0	54
Reptiles	12	13	12	1	1	39
All Species	78	135	80	10	4	307