The Hoosier-Shawnee Ecological Assessment: Objectives, Approach, and Major Findings

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The landscapes of southern Illinois and Indiana consist of a mix of private, State, and federally owned land used in a variety of ways. The area is comprised of nearly equal proportions of forest and open or agricultural lands. It includes species and communities that contribute significantly to global biodiversity and other communities that exist in small remnants of their former distribution or in a highly degraded state. Keystone species such as the American chestnut have disappeared, and now abundant species such as oaks may be threatened by exotic pest species and alteration of historic disturbance regimes. Nearby urban areas put large recreational demands on these landscapes. The way in which these lands are managed will affect the benefits people derive from them.

The USDA Forest Service initiated the Hoosier-Shawnee ecological assessment and collaborated with other agencies, universities, and individuals to review the information available on ecological conditions in the assessment area. The purpose of an assessment is to gain an understanding of current conditions and trends regarding the land, resources, and people and to place this within a relevant historical context. Assessments focus on measures of ecosystem integrity because ecosystems with high integrity maintain their characteristic species diversity and ecological processes, such as productivity, soil fertility, and rates of biogeochemical cycling (Committee of Scientists 1999). Regional assessments provide valuable information for land management planning and may discuss consequences of various management actions; however, they make no land management decisions or even recommendations.

OBJECTIVES

This report is a scientific assessment of the characteristic composition, structure, and processes of ecosystems in the southern one-third of Illinois and Indiana and a small part of western Kentucky. It describes the ecological integrity of the area under current policies and across ownerships but focuses on information most likely to be relevant to land management planning on the Hoosier and Shawnee National Forests, the area's two national forests (fig. 1). The assessment area is defined by 16 ecological subsections within the Ozark Highlands Section; the Upper Gulf Coastal Plain Section; the Interior Low Plateau, Shawnee Hills Section; and Interior Low Plateau, Highland Rim Section (fig. 2). This report should be of interest, however, to all landowners and citizens interested in land management and conservation in the assessment area.

Assessment authors reviewed and synthesized existing knowledge; there was neither funding nor time to discover new information or develop new knowledge. For the same reason the scope of this assessment is significantly narrower than either the Southern Appalachian Assessment or the Ozark-Ouachita Highlands Assessement (USDA Forest Service 1996, 1999). The assessment reports on current and historical ecological conditions, but does not address social and economic conditions. The assessment does not make management decisions or even management recommendations, nor does it provide any formal analyses of possible management actions. Some sections of the assessment do, however, discuss the consequences of various land management activities based on existing knowledge.

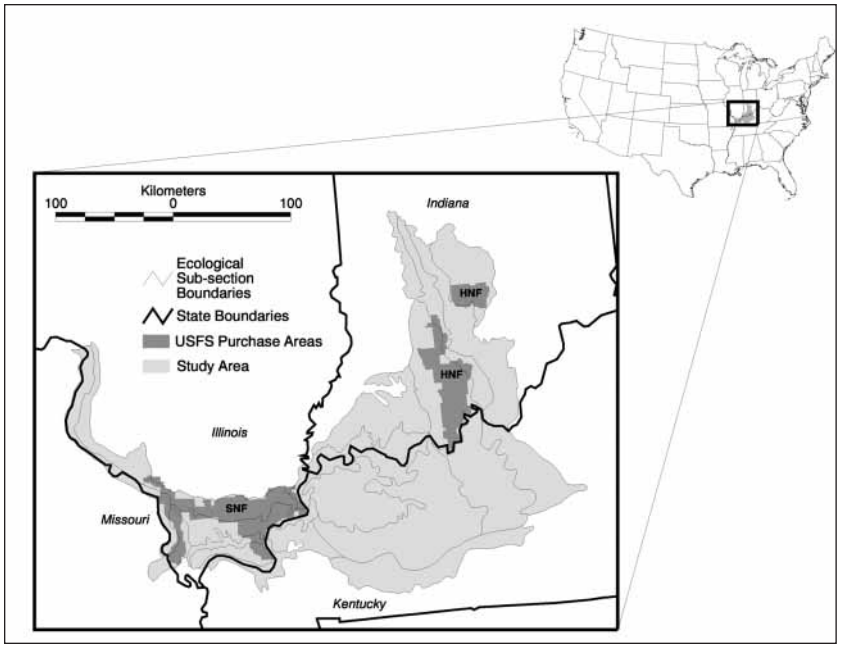

Figure 1. Location of the Hoosier and Shawnee National Forests within the ecological assessment area.

APPROACH

A charter for the Hoosier-Shawnee Ecological Assessment, established by the supervisors of the Hoosier and Shawnee National Forests, identified a team to conduct the assessment as well as tentative questions to answer. The team was composed of individuals from universities and Federal and State agencies with scientific expertise in subject areas to be addressed by the assessment. The team met to refine the scope and objectives of the assessment, and a subset of the team along with additional coauthors wrote the chapters in this report. Authors were selected based on their expertise and availability and represent university and Federal and State agency scientists and land managers. Drafts of each chapter were reviewed anonymously by experts not affiliated with the Hoosier or Shawnee, as well as by the appropriate resources staff from each national forest. The editor oversaw the review process and ensured that authors adequately addressed reviewer comments. Participants, including steering team members, authors, and reviewers, are listed on the acknowledgments

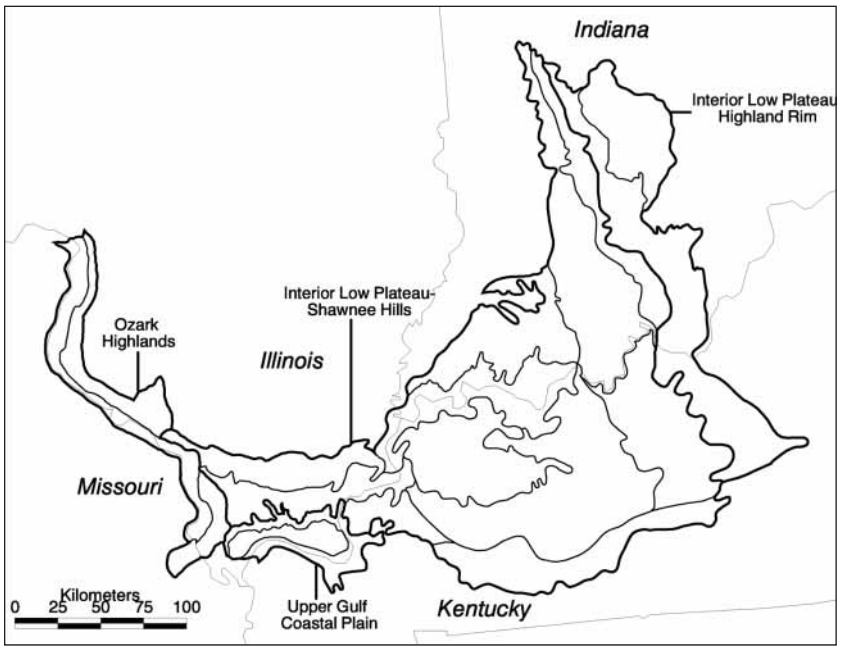

Figure 2. Ecological sections and subsection boundaries (Keys et al. 1995) within the Hoosier-Shawnee Ecological Assessment Area.

page of the assessment (Thompson 2004). I especially thank Kelle Reynolds (Hoosier National Forest), and Steve Widowski (Shawnee National Forest) for their key role as my primary liaison with the national forests and who acted in many ways as co-editors, and Lucy Burde (Technical Publications Editor, North Central Research Station) for her work in copy-editing the assessment.

SUMMARY OF MAJOR FINDINGS

The following sections summarize findings reviewed in the individual chapters or present findings particularly relevant to conservation issues. Each section references a chapter in the assessment; readers should see the chapters for original sources of the information reported.

Ecological Regions and Soils (Ponder 2004)

The assessment area is located in the unglaciated southern one-third of Illinois and Indiana and a small part of western Kentucky. The assessment area includes 16 subsections within the Ozark Highlands Section; the Upper Gulf Coastal Plain Section; the Interior Low Plateau, Shawnee Hills Section; and the Interior Low Plateau, Highland Rim Section.

Water in the assessment area drains to the Mississippi, Ohio, and Wabash Rivers. Among ecological sections, mean rainfall varies from 44 to 61 inches, mean temperature from 55 to 61ºF, and length of growing season from 180 to 200 days. Bedrock is typically limestone, shale, and sandstone. Some areas have soluble bedrock primarily composed of limestone that has resulted in karst landforms. Deep alluvial soils are present in floodplains of major rivers; otherwise, soils are generally well drained to moderately well drained and many have silt loam or loam textures. On steep slopes, soils are typically thin with gravelly or cherty textures. There are areas of thin, very droughty soils over bedrock that is often exposed in places, and these soils support barren or transitional vegetation.

Management practices such as logging, fire or its exclusion, water, human-made drainage, and conversion to agricultural uses have led to much change in soil productivity and forest cover type since presettlement times. Private agricultural lands purchased by the National Forest System in the 1930s through the 1950s were reforested; abandoned crop fields in the uplands were planted to non-native pine plantations while floodplain fields were primarily planted to tulip-poplar. These plantations helped control further erosion for watershed protection. Most of the once eroded forest soils planted to trees are in better condition now than they have been in decades, and many now support native tree species.

Current and Historical Forest Conditions (Parker and Ruffner 2004)

Forest covers 43 percent of the assessment area and agriculture occupies 48.9 percent. The remaining 8 percent is in urban (1.8%), wetlands (3.0%), water (2.5%), and barren or transitional land (0.6%).

The aerial extent of major forest types in assessment area is 37 percent oak/hickory, 16 percent beech/maple, 25 percent mixed upland hardwoods, 10 percent bottomland hardwoods, 4 percent pine/cedar, 4 percent pine/hardwoods, and 4 percent post oak/scrub oak.

Most of the timberland within the assessment area is less than 100 years old, reflecting the major logging that was done around the turn of the 19th/20th century. The acreage of forests in older age classes is expected to dramatically increase, and forests less than 10 years old are expected to decrease under current land use trends.

Fire was an important historical factor throughout the region. Fire return intervals in at least a portion of the area averaged 12 and 4 years during periods of Native American and European settlement, respectively.

By 1900 most forests had been cut and all had been subjected to fire and grazing by domestic livestock during 100 years of European occupation. Some of the cut-over forest land was allowed to regrow, but most was permanently cleared for row crop agriculture. Clearing steeply sloping lands led to severe erosion and eventual abandonment. Forest abuse began to decline in the 1930s as severely eroded lands were transferred from private to public ownership and better management practices were established.

The long history of disturbance by Native Americans and European settlers from the 1400s to the early 1900s followed by better management and greater protection of forests from the 1940s to the present has resulted in the forests we find today.

Native and Exotic Plants

(Olson et al. 2004)

Natural communities in the assessment area include forests, barrens, cliffs, wetlands, and streams. Based on global and state heritage ranks, 360 plant species are a conservation concern in at least one of the three States covered by the assessment.

Twenty invasive, exotic plants are described that potentially threaten native plants and ecosystems in the assessment area.

Aquatic Resources

(Whiles and Garvey 2004)

The Shawnee National Forest includes parts of six major drainages in Illinois: the Upper Mississippi-Cape Girardeau, Big Muddy, Cache, Saline, Lower Ohio, and Lower Ohio Bay. The Hoosier National Forest includes parts of the Lower Ohio-Little Pigeon, Blue Sinking, Patoka, and Lower East Fork White drainages. There are at least portions of 40 major watersheds in the assessment area.

Approximately 69,000 miles of streams flow through the assessment area, of which 60 percent are perennial and 14 percent are artificial or greatly altered (e.g., drainage ditches). Most stream riparian zones are either urban or agricultural; only 22 percent of watersheds in the assessment area contain streams with abundant forested riparian areas.

More than 8,000 reservoirs have been constructed in the region. These provide important water supplies, recreational opportunities, and economic benefits, but also potentially influence the ecological integrity of streams.

Wetland habitats are some of the most degraded and diminished freshwater resources in the region, with only 2.8 percent woody and 0.3 percent herbaceous wetland vegetation remaining in the assessment area.

Water quality varies greatly across the region, with elevated nutrients and contaminants (e.g., heavy metals and organic compounds) exceeding USEPA regional standards in many of the systems. Increased surface water and groundwater contamination and rising public and industrial demand may continue to compromise water quality and quantity within much of the assessment area.

Aquatic Animals

(Burr et al. 2004)

The assessment area includes 194 native fish species, 76 native mussel species, and 34 native crayfish species. Five of the subregions (e.g., Mississippi Embayment) that make up the assessment area were recently ranked as either globally or bioregionally outstanding aquatic resource areas.

At least 12 fish species are of conservation concern within the Shawnee and Hoosier National

Forest boundaries, and another 10 species are poorly known, need status surveys, or other forms of conservation evaluation. Nearly 30 mussel species and 10 crayfish species are of conservation concern in the area, but fewer than 10 of these actually occur within national forest boundaries or would be directly affected by national forest activities.

Commercial and recreational fisheries are popular in the region, and commercial exploitation of both mussels and crayfishes occurs in the assessment area.

The most valuable and unique aquatic habitats in the area include springs, spring runs, karst aquifers, wetlands, swamps, mainstem large rivers, and upland, gravel-bottomed streams in both the Shawnee and Hoosier National Forests.

Wildlife (McCreedy et al. 2004)

Five species are federally listed as threatened or endangered: the bald eagle (threatened), the interior least tern (endangered), the gray bat (endangered), the Indiana bat (endangered), and the American burying beetle (endangered).

There are 173 species of global viability concern; 14 are vertebrates, 159 are either terrestrial invertebrates or cave-associated aquatic invertebrates. These species are considered rare to critically imperiled throughout their global ranges. An additional 172 terrestrial species are of viability concern at the State level; 81 of these species are birds. These species are considered rare to critically imperiled within at least one of the States of the assessment area.

In the assessment area, 161 species of viability concern are cave or karst-associated species. Four cave and karst systems within the assessment area are globally significant from the standpoint of their obligate subterranean fauna.

In addition, 160 species of birds are a conservation concern. Data from the North American Breeding Bird Survey are adequate to evaluate trends from 1966 to 2000 for 40 species; 14 species increased in abundance and 27 species decreased in abundance.

Neotropical migrant birds make up approximately a third of the avian species of conservation concern in the assessment area. Sixteen species declined in numbers and five species increased in numbers from 1966 to 2000.

White-tailed deer and eastern wild turkey are common to abundant throughout the assessment area. Ruffed grouse and woodcock populations are locally restricted, and numbers of both species have declined substantially across the assessment area. Northern bobwhite quail populations vary from locally stable to declining across the assessment area; current populations are a third of those present in the early 1980s.

Native and Exotic Forest Insects and Diseases (Scarbrough and Juzwik 2004)

Defoliating insects have had the greatest effects in forests where oak species predominate. Increases in oak decline are expected with the imminent establishment of the European gypsy moth. Insects and diseases of the pine forests are artifacts of stand origin and age. Chestnut blight and Dutch elm disease have had the greatest broad-ranging and historical effects on the non-oak, broad-leaved forests.

Oak decline and mortality were associated with defoliation of looper complex outbreaks between 1978 and 1981 in the assessment area. In southern Indiana, mortality levels exceeded 10 percent in oak-hickory stands (P. Marshall, personal communication). Scattered oak decline and mortality also occurred following a severe drought in 1987-88.

Although oak wilt is a serious problem in the more northern areas of Indiana and Illinois, it is just a minor problem in the southern areas because infection centers usually do not become very large. Species in the assessment area are susceptible to Sudden Oak Death, a recently discovered and newly described fungal species found on the west coast of North America, but it has not been detected in the assessment area. Diseases of non-oak hardwoods include Dutch elm disease, butternut canker, ash yellows, dogwood anthracnose, and chestnut blight.

Potential insect pest problems in oak forests in the assessment area include the forest tent caterpillar, two-lined chestnut borer, red oak borer, jumping oak gall, looper complex, walkingstick, and Asiatic oak weevil. Insect pests of non-oak hardwoods include the emerald ash borer and Asian longhorned beetle.

European gypsy moth (*Lymantria dispar*) is a major defoliator of hardwood trees in both forest and urban landscapes and has caused much damage to forests in the Northeastern United States. It will likely have a major effect on the oak forests of the assessment area in the near future.

Exotic Aquatic and Terrestrial Animals (Burr et al. 2004)

The origin, status, trends, habitat associations, and distribution of 43 exotic fish or invertebrate species, 5 exotic hybrid fish species, and 9 exotic terrestrial vertebrates are reviewed. Nineteen exotic aquatic species originated from elsewhere in the Midwest through stocking programs, six came from Asia or Eurasia, five from the Gulf coast, three from the Atlantic coast, four from South America, two from the Pacific coast, and one from the Southeastern United States. The majority of exotic terrestrial vertebrates found within the assessment area originated in Europe, Asia, and Africa. Terrestrial exotics species are generally well adapted to human habitation.

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