



United States  
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Forest Service

Eastern  
Region

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# Land and Resource Management Plan

## Hoosier National Forest

*Caring for the Land and Serving People*



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# **Land and Resource Management Plan**

## **Hoosier National Forest**

Brown, Crawford, Dubois, Jackson, Lawrence, Martin, Monroe, Orange,  
and Perry Counties, Indiana

USDA Forest Service

Eastern Region

Milwaukee, Wisconsin

2006

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## List of Administrative Corrections

CORRECTION	WHERE INSERTED OR PAGE REPLACED	TOPIC	APPROVAL DATE
1	Table of Contents	Tracking Corrections and Amendments	March 20, 2007; <i>replaced by #7, 9/14/2007</i>
2	Appendix J, Maps 1A, 1B, 1C, and 1D	Inclusion of acres	March 20, 2007; <i>replaced by #5, 9/11/2007</i>
3	Appendix B, page B-11	Vegetation Treatments	March 20, 2007
4	Appendix B, page B-18	Timber Stand Improvement Tables	March 20, 2007
5	Appendix J, Maps 1A, 1B, 1C, and 1D	Correction of Table	September 11, 2007
6	Forest Plan, Chapter 3, pages 3-2 through 3-13, and Appendix C pages C-1 through C-4	Delisting of Bald Eagle	September 14, 2007
7	Table of Contents	Tracking Corrections and Amendments	September 14, 2007; <i>replaced by #10, 4/9/2010</i>
8	Forest Plan pages 3-20, 3-20a, Clarification of Forest-wide Direction	Clarification of Forest- wide Direction	April 9, 2010
9	Forest Plan pages 3-39 – 3-42, Clarification of Management Area Direction,	Tracking Corrections and Amendments and Clarification of Management Area Direction	April 9, 2010
10	Table of Contents	Tracking Corrections and Amendments	April 9, 2010

Narrative for Administrative Corrections should be placed following this page in *Forest Plan*.

## List of Amendments

AMENDMENT	WHERE INSERTED OR PAGE REPLACED	TOPIC	APPROVAL DATE

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# Chapter 1

## FOREST PLAN INTRODUCTION

### Purpose of the Forest Plan

The Land and Resource Management Plan (Forest Plan) guides all natural resource management activities and establishes management guidance for the Hoosier National Forest. The Forest Plan describes resource management opportunities and the availability and suitability of lands for resource management.

The Forest Plan embodies the provisions of the National Forest Management Act (NFMA), the implementing regulations, and other guiding documents. Land use determinations, goals, and guidance constitute a statement of the management direction. The projected outputs, services, and rates of implementing these activities are dependent on the annual budgeting process, additional public involvement, and site-specific project environmental analyses.

The Plan will be revised in accordance with planning regulations or whenever conditions have changed significantly. Site-specific treatments and actions are not included in the Forest Plan. Site-specific analyses and decisions will be done at the project level. The contents of a forest plan include:

- Establishment of forest-wide, multiple-use goals and objectives [36 CFR 219.11(b)];
- Establishment of forest-wide management requirements (guidance or standards and guidelines) to fulfill requirements of NFMA applying to future activities (resource integration requirements of 36 CFR 219.13 to 219.26 and the requirements of 36 CFR 219.27);
- Establishment of management area direction applying to future management activities in that management area [36 CFR 219.11(c)];
- Establishment of allowable timber sale quantity and designation of suitable timber land [36 CFR 219.16 and 219.14];
- Monitoring and evaluation requirements [36 CFR 219.11(d)]; and
- Recommendations to Congress, if any, on designations of additional Wilderness or Wild, Scenic, and Recreational Rivers [36 CFR 219.17 and 219.18].



# Relationship of the Forest Plan to Other Documents

The Forest Plan sets the direction for managing the land and resources of the Hoosier National Forest. Once finalized, the Plan replaces the 1985 Forest Plan and subsequent amendments. The Plan results from extensive analyses and considerations addressed in the accompanying Final Environmental Impact Statement (FEIS).

The planning process and the analysis procedures used to develop the Forest Plan are described in the FEIS, Appendix B. The FEIS also describes the range of alternatives considered in Chapter 2 and discloses their significant environmental effects in Chapter 3.

Site-specific projects will be planned and implemented to carry out the direction in this Plan. Environmental analyses will be performed as needed. These subsequent environmental analyses use data and evaluations in the Forest Plan and FEIS as their basis. Environmental analyses of projects will be tiered to the FEIS accompanying the Forest Plan.

## Organization of the Forest Plan

The Forest Plan document consists of two parts, the Plan and the appendices. The Plan is organized into four chapters.

- Chapter 1 - Introduces the structure of the Forest Plan.
- Chapter 2 - Describes the role of the Hoosier National Forest, its goals and objectives.
- Chapter 3 - Establishes guidance for future management activities. By following this direction, the Forest hopes to achieve the desired conditions.
- Chapter 4 - Explains how management direction will be monitored, evaluated, and kept current in light of changing conditions and assumptions. This chapter also looks at research needs for the Hoosier.
- Appendices - Includes information such as a glossary, detailed summaries, and other required data on specific management practices or outputs.
- Maps, which show National Forest System (NFS) lands and management area boundaries, are included in Appendix J.

In this document the Hoosier National Forest may be referred to as either the "Hoosier" or the "Forest." Either term includes the NFS land base in Indiana, as well as the Forest Service administrative structure.

In this document, the term "Plan" or "Forest Plan" refers to this revised Forest Plan and not to the 1985 Hoosier Forest Plan or the 1991 Forest Plan Amendment, unless clearly referring to a previous forest plan.

## **Forest Location**

The Hoosier National Forest is located in nine counties in southern Indiana (Figure 1.1). Bounded by the Ohio River to the south, the Forest is within a two-hour drive of the metropolitan centers of Cincinnati, Evansville, Indianapolis, and Louisville. The Forest is located among timeless hills and sharp ridges, lakes and streams, diverse stands of hardwoods and pine, springs, caves, and sinkholes.

Principal access routes to the Hoosier are State Route 37 (in a north-south direction from Indianapolis), U.S. Highways 50 and 150, State Highway 64, 66, and 446, and Interstate 64 in an east-west direction.

## **Management Direction**

Management direction provides guidance for managing resources and multiple uses on NFS land. This direction has been developed for resources (for instance, wildlife and vegetation) on a Forest-wide basis and for management areas. Chapter 2 contains management direction that applies Forest-wide, and more specific direction for management areas.

Goals, desired conditions, and objectives always form the purpose and need for site-specific projects. Not every project will further every goal or objective.

## **Goals, Desired Conditions, and Objectives**

Goals and desired conditions are broad statements that describe the situation that the Forest Service will strive to achieve. They are generally timeless and not measurable. Goals and desired conditions describe the ends to be achieved, rather than the means of doing so. They are a narrative description of the state of the land and resources expected when objectives and their associated guidance are fully implemented.

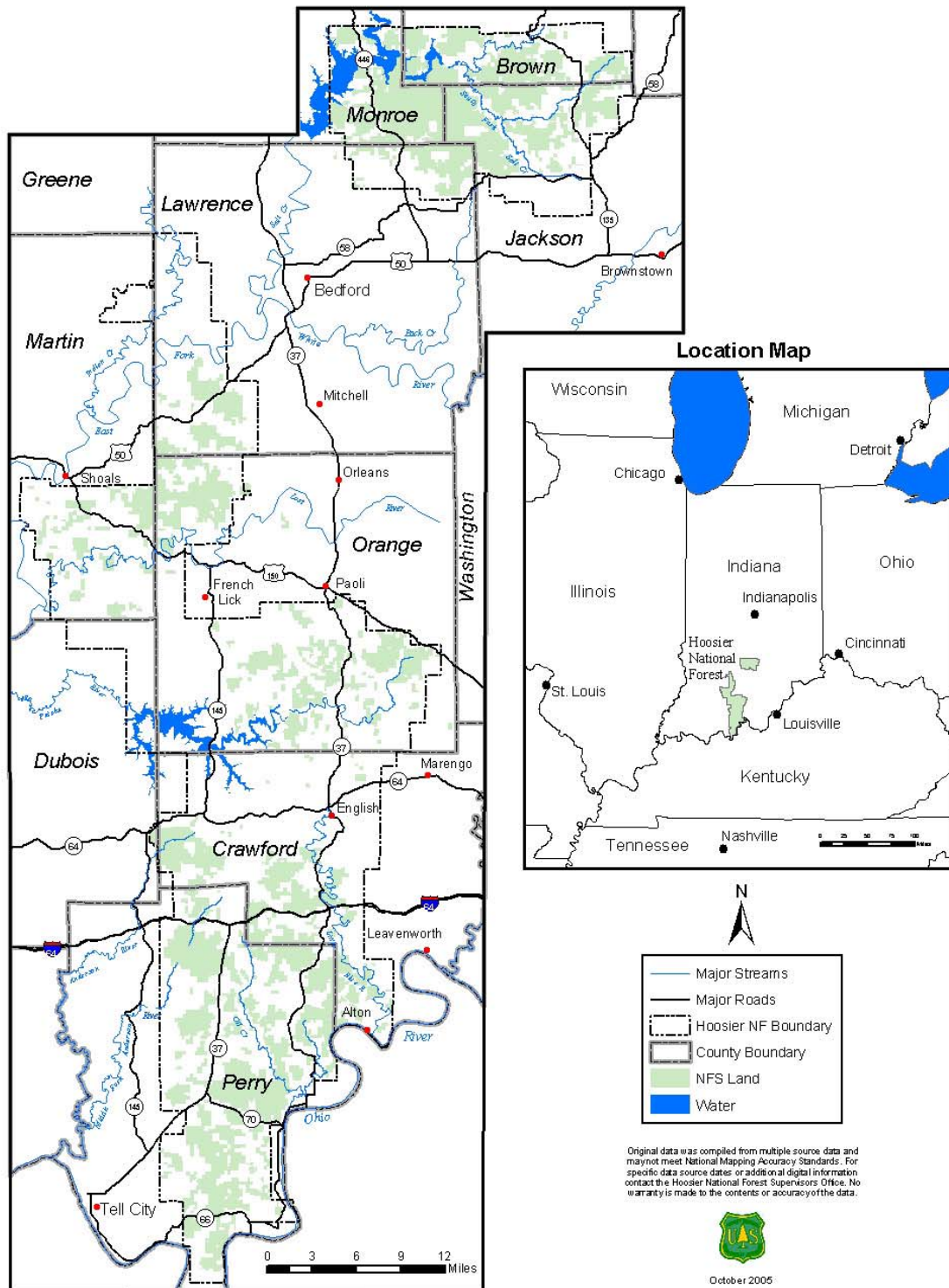
Goals and desired conditions are not absolutes. Their purpose is to ensure that they are considered when planning management activities and that efforts are made to move components toward desired conditions.

In many cases, there will be short-term impediments to reaching desired conditions, such as the current state of the resource, but the long-term aim would be to reach the desired conditions. Some areas on the landscape may be far from the desired condition, while other parts may already be in the desired condition or have a greater likelihood of reaching it soon.

The eight goals are broad statements of the Forest's overall purpose. Desired conditions are described by management areas and provide a vision of what the Forest should look like in the future.

Figure 1.1

## Hoosier National Forest Vicinity Map



Objectives are measurable steps taken within a specified timeframe to move toward a desired condition. Objectives are generally achieved by implementing site-specific projects or activities. However, objectives are not targets. Targets for outputs are dependent upon budgets and may or may not reflect Forest Plan emphasis areas.

Forest-wide objectives have been developed for some resources (see Chapter 2).

## **Guidance**

Guidance or standards and guidelines, found in Chapter 3, are the specific technical direction for managing resources. They provide guidance to implement projects that will move resources toward the desired conditions.

Guidance may apply Forest-wide to NFS land, or may apply specifically to different management areas.

Only measures that are specific to the Hoosier National Forest are included in the guidance. Laws, regulations, and policies that apply to the entire NFS are not reiterated in this guidance section.

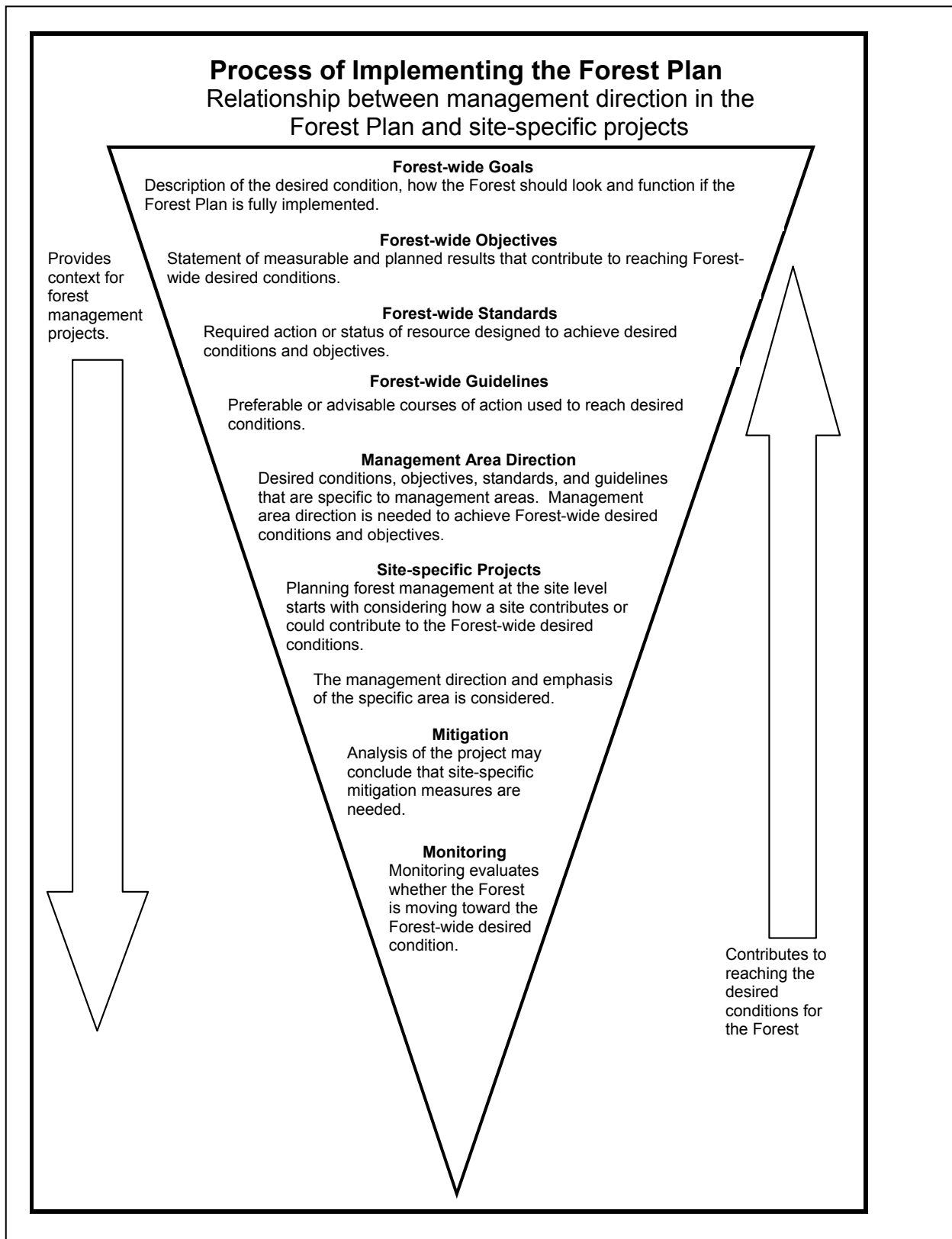
Standards are required limits to activities. These limitations help the Forest reach the desired conditions and objectives. Standards also ensure compliance with laws, regulations, executive orders, and policy direction. Deviations from standards must be analyzed and documented in Forest Plan amendments.

Guidelines are preferable limits or permissions for management actions that may be followed to achieve desired conditions. Guidelines are generally expected to be implemented. They help the Forest reach the desired conditions and objectives in a way that permits operational flexibility to respond to variations over time. Deviations from guidelines must be analyzed during project-level analysis and documented in a project decision, but these deviations do not require a Forest Plan amendment.

## **Implementing the Forest Plan**

The Forest Plan provides a framework to guide the Hoosier National Forest's day-to-day resource management operations (Figure 1.2). It is a strategic, programmatic document that does not make project-level decisions.

Figure 1.2



The National Forest Management Act requires that resource plans and permits, contracts, and other instruments issued for the use and occupancy of NFS land be consistent with the Forest Plan. All outstanding and future contracts, cooperative agreements, and other instruments for use and occupancy will be brought into compliance with the Forest Plan as soon as practical.

## **Principles of Management on the Hoosier National Forest**

Fundamental principles guide management on the Forest. Direction in the Forest Plan adds to and qualifies these principles.

### **Principle 1**

The Forest Service will follow laws and regulations as well as policies in Forest Service Manuals that relate to managing NFS land. The Plan is designed to supplement, not replace, direction from these sources.

### **Principle 2**

The Forest Service will coordinate management activities with the appropriate local, State, or Tribal governments, as well as other Federal agencies.

### **Principle 3**

The Forest Service will collaborate with interested organizations, groups, and individuals.

### **Principle 4**

The Forest Service will manage the Hoosier for multiple uses. The Hoosier is open for any legal public activity or management action, unless restricted by law, policy, or the Forest Plan. While allowed, such activities and actions may require administrative review and authorization before they are implemented.

## **Tools and Techniques**

The Forest will reach its desired vegetative conditions through natural ecological processes and by using a diverse range of management tools and techniques.

To the extent practical, timber management will be used to emulate naturally occurring disturbances (fire and windstorms for instance). These management practices will include both even-aged and uneven-aged techniques. The Forest will use group selection, individual tree selection, and other methods of harvesting to create or maintain uneven-aged stands. The Forest will use shelterwood and clearcutting to create even-aged stands. Clearcutting will only be used when it is the optimal method for resource objectives.

Prescribed fire will be used alone or with silvicultural treatments to mimic the effects of historic fire regimes. Controlled fire will help maintain, enhance, and restore natural ecological

processes. Minimum impact fire suppression tactics should be considered in wildland fire suppression and prescribed fire application to reduce adverse effects.

The Forest will promote re-growth of harvested or other disturbed forests with a variety of regeneration practices. This includes regenerating forests through natural regeneration, tree planting, and seeding. Areas will naturally change through forest succession.

The Forest will also reach desired conditions for human uses by using a diverse range of management tools and techniques. This will include providing recreational opportunities, special forest products, and commodity resources.

Ecological functions of watersheds and riparian areas will be enhanced or restored through techniques such as reconstructing or improving road and trail crossings, decommissioning unneeded roads, using silvicultural treatments or fire to enhance shade, recruiting coarse woody debris, or stabilizing banks in riparian areas.

The Forest may create new roads and trails for site-specific projects or to respond to increased demand. The majority of these roads will be temporary and will be decommissioned when no longer needed.

## **Site-Specific Projects**

Implementing the Forest Plan means developing and implementing site-specific projects to move toward the desired conditions established in the Forest Plan (Figure 1.2).

Project-level compliance with the National Forest Management Act is primarily concerned with consistency with the Plan and the Act's regulations.

Compliance with the National Environmental Policy Act (NEPA) involves the environmental analysis process for the specific proposal, proper documentation, and public disclosure of effects in an environmental assessment, environmental impact statement, or decision document. When necessary, the Forest will perform environmental analysis on site-specific projects and activities. When required, an analysis file or project file is available for public review, but it is not always necessary to document the analysis in the form of an environmental assessment or environmental impact statement.

Environmental analysis of site-specific projects will use as its basis the data and evaluations in the Forest Plan and the FEIS for the Forest Plan. Environmental analysis of site-specific projects will be tiered to the FEIS accompanying the Plan. By referencing discussions in the Plan and FEIS, subsequent documents will be able to concentrate on issues specific to the proposed action. Discussing environmental effects at the time the project is designed allows for better management decisions.

Thus, there are two levels of decision-making. The first is the development of the Forest Plan, which provides direction for all management programs, practices, uses, and future decisions. The second level is the analysis and implementation of projects. Each of these projects must consider the goals and objectives in this Plan. This process requires land managers to take an integrated look before they make their final project-level decisions.

Site-specific decisions are postponed to the project level, allowing for focused public involvement. By waiting until a project is proposed and then asking for public comments and

involvement, the Forest can ensure people are better informed of the specific activity and its effects, as well as alternative activities.

Project level decisions will be documented following NEPA guidelines.

## **Budgets**

Congress approves the Forest Service's budget on an annual basis. The National Forest System appropriation from Congress provides funds for stewardship and management of all 192 million acres of Federal land and the ecosystems on that land across the country. These appropriated funds are key for translating desired conditions and objectives to on-the-ground results.

This budget results in program development, annual work planning, and monitoring. These processes fund implementation of the Forest Plan and make annual adjustments and changes to reflect current priorities within the overall management direction contained in the Plan. Therefore, the funding distribution between program components and intensity or level of activities in those programs is a reflection of the Plan as well as the will of Congress. The final determining factor in carrying out the intent of the Forest Plan is the level of funding, which dictates the rate of implementation of the Plan.

## **Forest Plan Amendments and Revisions**

One of the important lessons learned during the years of developing and working with forest plans is the unpredictability of the future. Forest Plans must remain flexible even as they guide us toward the desired conditions.

A number of possibilities could prompt consideration of amending or revising the Forest Plan in the future. Every contingency cannot be considered, but the Plan establishes a basic framework for making sound management decisions.

Amendments to the Forest Plan may be recommended if the Forest finds that the prescribed activities are not resolving the issues, that new and more important challenges have been identified that should be addressed, that there are significant changes in demands, that some basic assumptions of the Plan are not valid, or that activities prescribed by the Plan are not achieving desired objectives.

The Forest Supervisor will determine whether an amendment to the Plan would be significant. Amendments will not be considered significant if they only adjust the implementation to reflect differences between proposed and appropriated funding, if they modify a prescription, or if they are minor changes when direction has been found to be unproductive, inefficient, unnecessary, or damaging. An amendment is only considered significant if the change affects the intent of the Plan. If the amendment is not significant, the Forest Supervisor may implement the change following public notification and completion of appropriate environmental analysis (Reference FSM 1922.51 and 1922.52).

If the proposed amendment is found to be significant, it could only be implemented by following the same procedure required for development and approval of this Forest Plan.



Forest Plan amendments, if any, will be incorporated into this Plan as an addition, and made available to the public. This ensures the Plan is kept current.

The Forest Plan will be revised pursuant to 36 CFR 219. It also may be revised when the Forest Supervisor determines that changes in conditions of the land, in public demands, or in Resources Planning Act policies, goals, or objectives would have a significant effect on the Forest program. Any revision would go through the same process required for development and approval of this Forest Plan.

# Chapter 2

## GOALS AND OBJECTIVES

### INTRODUCTION

This section defines the role of the Hoosier National Forest and outlines goals set for the Forest. The role identifies the Hoosier's niche as a national forest in south-central Indiana and how the Forest intends to care for the land while serving the people.

### ROLE OF THE FOREST

National forests have many inherent values that contribute to the quality of life of the American people. Air quality, cave systems, heritage resources, minerals, natural areas, recreation opportunities, scenery, soil, terrestrial and aquatic ecosystems, timber, water, and wilderness all contribute to the values that people expect to find on their national forests. The USDA Forest Service has the responsibility of managing the Hoosier to provide natural resources in a combination that best meets the needs of people now and in the future. The Hoosier provides leadership in natural resource management.

The Forest comprises much of the public forest land in Indiana. As a result, it continues to be at the forefront of forest management issues. As one of the largest public land holders in the State, the Hoosier plays a major role in providing forest ecosystems that enhance biological diversity on a regional scale and high quality recreation opportunities. Management for large, linked, natural-forest ecosystems and native plant and animal communities provides biological diversity, including genetic diversity and ecological processes, not found in other areas.

Part of the Forest Service's role is providing leadership in working with state agencies, other Federal agencies, and private landowners to link together forest ecosystems on a larger landscape level. No other area in Indiana, and few in the Midwest, offers such an opportunity to restore a portion of the forest ecosystems that were once extensive in this region.

The Forest is a precious asset to the public. Each decision the Forest makes with the public demonstrates our commitment to enhancing the character of southern Indiana and accepting our supporting role in local communities. The Hoosier has worked with the public to develop a shared vision of how the Forest should be managed and keeps them involved in deciding what path the national forest should take.

The Forest can provide natural resources, biological diversity, recreational opportunities, and other commodities society has come to expect from the Forest. The Forest's staff is committed to helping people understand why NFS lands are managed and making them partners in management decisions. Our mission is to continue to make it possible for people

to enjoy the values and benefits through responsible resource management tailored to meet public desires.

## **GOALS**

The following eight goals present broad statements of the overall purpose of the Forest.

### **Conservation of Threatened and Endangered Species Habitat**

The Hoosier will aid in delisting endangered and threatened species, maintain an array of habitats to meet the needs of a variety of species, and potentially prevent the need to list additional sensitive species. The Forest is committed to the conservation and recovery of threatened, endangered, and proposed species and their habitats. As a Forest, we consistently put a high value on the restoration and recovery of native plant and wildlife species and the protection and conservation of those species that most need help to ensure they continue to be a viable component of the Hoosier National Forest.

In cooperation with the USDI Fish and Wildlife Service and appropriate State agencies, the Forest has established management objectives, including mitigating measures, for conservation of these species. This Plan fulfills Endangered Species Act Section 7(a)(1) obligations for conservation of Federally listed threatened, endangered, and proposed species. The basic objective is to design projects in a manner that ensures management activities will not adversely affect habitat of threatened or endangered species.

#### **Objective**

- Maintain, protect, or improve the habitat for threatened and endangered species by working toward the goals and objectives of Federal recovery plans and management direction in the Forest Plan.

### **Maintain and Restore Sustainable Ecosystems**

The Forest recognizes the inherent value of evolving natural in the area it manages. Their variety adds value to our lives and reflects the power and permanence of our natural world. These ecosystems are a barometer of the quality of land management. Ecosystems, with their natural variety of species, genetic make-up, and ecological processes, are key to providing the diversity needed to be resilient in the face of environmental disturbances. To be sustainable, each ecosystem must include viable populations of its component species. The Forest intends to maintain and restore individual communities within the ecological capabilities of the landscape.

This goal includes restoration and maintenance of plant and wildlife species and their habitat components. All ecosystems will be recognized and enhanced, based on site capabilities. The capabilities of each site will be identified at a site-specific level and the basic integrity of air, soil, and water resources protected.

Some components of this goal are:

- Emphasize native plant and animal species and communities in management.
- Develop and maintain stands of the appropriate composition and structure to meet management goals; and when possible, provide for interconnecting corridors.
- Use vegetation management to perpetuate and enhance biological diversity. Intersperse vegetative types to provide viable habitat for native species.
- Protect cave resources from potential surface and subterranean impacts.
- Protect areas that have significant natural characteristics or represent relatively undisturbed examples of important forest ecosystems.
- Emphasize prevention and control in the integrated pest management program through appropriate means.
- Use prescribed fire to maintain fire-adapted ecosystems, to promote a more diverse community of plants and animals, and to manage accumulated fuels.
- Control and prevent the spread of nonnative invasive species.

### **Objectives**

- Provide the diversity of habitats needed for viable populations of all native and desired nonnative species.
- Use prescribed fire to restore ecological processes and provide habitat for RFSS and other wildlife and plant species. A minimum of five prescribed burns will occur in barrens communities (average of one site every other year).
- Benefit RFSS by improving hydrologic connectivity of aquatic ecosystems by improving stream crossing structures to assure passage of water, sediment, nutrients, wood, invertebrates, fish, and to facilitate freshwater mussel dispersal. Restore up to 10 (average of one site per year) stream crossings.
- Cooperate with adjacent landowners, towns, state agencies, and private organizations to prevent the spread and establishment of non-native invasive species that pose a risk to native ecosystems.
- Develop conservation assessments for sensitive species within five years of listing.

## **Maintain and Restore Watershed Health**

The goal of watershed health reaffirms the historic mission of the Hoosier for watershed protection and restoration. The driving force for establishing the Hoosier was to stabilize and restore eroding lands and protect watersheds from sediment. This goal emphasizes collaborative stewardship of watersheds and interrelated biological, economic, and social factors that affect these areas. The Forest will contribute to the restoration of water quality and soil productivity to improve the condition of those watersheds impacted by past land use practices.

## **Protect our Cultural Heritage**

The goal is to protect significant heritage resources, to share their values with the American people, and to contribute relevant information and perspectives to natural resource management.

Some components of this goal are:

- Stewardship emphasizes protection of heritage resources including identification, evaluation, preservation, scientific investigation, interpretation, and proactive law enforcement.
- Interprets a variety of sites for the public to bring the past alive and illustrate relevance to the issues and challenges of today and the future.
- Provide opportunities for recreation experiences, public education, development of a conservation ethic, and an appreciation of common links with the past.
- Integrate historical and cultural data at the landscape level to provide context for natural resource management.

## **Provide for Visually Pleasing Landscape**

Emphasize natural-appearing landscapes, with attention given to views from roads, trails, and high use areas. Visual quality will be considered in all management activities.

To the extent possible, Forest management activities, roads, and facilities are to blend with their settings. With design, timing, and care, minimal disturbance and disruption of the natural setting will occur. Long-term visual goals are not necessarily negated by short-term disruption of visual character.

## **Provide for Recreation Use in Harmony with Natural Communities**

The Forest provides an opportunity for outdoor recreational experiences consistent with protection of the Forest's natural resources.

The Forest fills a much-needed niche in Indiana by offering recreational experiences not readily available or otherwise in short supply such as long distance trails, wilderness, water-based, and dispersed.

The recreation program strives to provide a range of opportunities from wilderness to developed recreation areas.

Some components of this goal are:

- Provide a trail system for use by hikers, mountain bikers, and horse riders.
- Create and maintain a variety of dispersed and developed recreational opportunities.
- Protect and enhance wilderness values.

## **Provide a Useable Landbase**

The Forest strives to provide a landbase for biological diversity, recreational opportunities, and management efficiency. National Forest System land will be identifiable by the public.

The Forest will strive to provide public access. We are committed to an acquisition and exchange program to consolidate NFS lands, to resolve encroachments, and to protect significant cultural resources, areas of historical interest, and unusual habitats.

## **Provide for Human and Community Development**

The Forest meets certain individual, community, and national needs such as clean water, minerals, recreation, timber, and wilderness values. The knowledge that the forest is there and that natural wild places are preserved and available is important to many people, whether or not they ever visit the Hoosier.

The Forest contributes to local economies and provides commodities, products, and services to people and local communities.

Some components of this goal are:

- Reduce wildfire risk to communities, municipal water supplies, and at-risk Federal land.
- Provide interpretive services to enhance the visitor's experience, to assist with management issues, or to protect forest resources whenever possible.
- Provide for a balance of forest products within the capabilities of the ecosystems.
- Support regional tourism development.

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# Chapter 3

## MANAGEMENT DIRECTION

### INTRODUCTION

This is the heart of the Plan. This section contains guidance needed to help meet goals and objectives. The Forest has identified environmentally sound management practices to help achieve these goals and assured the needs of the public are met. Some guidance is applied Forest-wide, while other parts are specific to individual management areas. This guidance sets the framework for making future site-specific decisions at the project level. The management area maps in Appendix J show the location of different management areas.

### Guidance

The goals discussed in Chapter 2 necessitate different treatment in different areas of the Hoosier National Forest. Management direction provides guidance for managing resources and uses on NFS lands.

Guidance is the direction governing how and where management activities can take place. The guidance includes both standards and guidelines as prescribed by the implementing regulations for the National Forest Management Act (36 CFR 219.11[c]).

We present guidance in two sections. The first section is Forest-wide guidance, applicable to all but specifically noted exceptions. The second section presents guidance for specific management areas, but does not repeat Forest-wide guidance. It further refines Forest-wide guidance by providing additional considerations, restrictions, activities, and direction that are to be applied to meet the specific objectives of each management area. Consult both sections before determining which management activities are appropriate in a management area.

We incorporate by reference the direction and guidance from Forest Service manuals and handbooks. The plan is designed to supplement, not replace, direction from laws and regulations.

This document identifies management areas, outlines activities compatible in each one, and provides guidance toward designing projects. Final decisions, however, will be based on project implementation and additional site-specific analysis.

Standards and guidelines are the specific technical direction for managing resources on the ground. They provide another link in moving toward the desired condition.

Only measures that are specific to the Hoosier are included in the standards and guidelines. Laws, regulations, and policies that apply to the entire National Forest System are not reiterated



in the standards and guidelines. In addition, desired conditions and objectives that have a prescriptive component are not reiterated in the standards and guidelines.

Guidance includes standards and guidelines.

- \* **Standards** are shown with an asterisk. These must be implemented to achieve Forest goals and objectives. Deviation from a standard requires an amendment to the Forest Plan.

**Guidelines** (shown without an asterisk) should be implemented in most cases to achieve the goals and objectives. Deviation from a guideline does not require a Forest Plan amendment, but the rationale must be disclosed in the project decision documents. In some cases a guideline grants permission.

## Forest-wide Guidance

### Conservation of Threatened and Endangered Species Habitat

Refer to Appendix C for more information on threatened and endangered species on the Forest.

- \* Evaluate lands affected by Federal land adjustment activities and evaluate management activities to avoid or minimize effects on Federally designated threatened and endangered species habitat.
- \* Identify lands with known threatened or endangered species habitat as a top priority for acquisition.

Determine and implement management activities that will maintain and improve habitat features for threatened and endangered species.

Locate new activities away from areas that might negatively impact any threatened or endangered species.

### Bald Eagle

- \* Aerial flights associated with national forest projects will not be permitted within ¼ mile horizontal distance and 500 feet vertical distance of any known active nest.

When vegetation management is planned within one mile of a body of water greater than 40 acres, the USDI Fish and Wildlife Service will be consulted about protection of potential nesting, roosting, and feeding areas.

Human entry within ¼ mile horizontal distance of an active nest during bald eagle courtship, nest building, incubation, or brooding periods will be discouraged.

## Indiana Bat

### Management of Hibernacula

- \* Establish a zone with a one-quarter mile radius around each known hibernacula of Indiana bats on the Forest. This zone may be irregular in shape to take into account likely flight paths, foraging habitat, and areas where Indiana bats are likely to swarm. Prohibit new construction activities within this zone.
- \* Considering both public and private ownerships, maintain or promote at least 70 percent forest canopy cover within a one mile radius of known hibernacula of Indiana bats. Timber harvest should be conducted within this zone only during hibernation and is restricted to single-tree and group selection.
- \* Implement prescribed fire within a five mile zone around hibernacula only when bats are unlikely to be swarming or staging. Burns should be conducted under conditions that will reduce or eliminate smoke dispersing into hibernacula.
- \* Develop management goals and directives (conservation plan) for each known hibernaculum at micro-topographical level, taking into consideration current conditions and future restraints and/or challenges. A five mile radius should be included from the entrance of the known hibernacula.

### Management of Roosting Habitat

- \* Maintain a component of large, mature trees in harvest areas, retaining at least three live trees per acre greater than 20 inches diameter at breast height (DBH) of these preferred species (leave trees will be located along edges of the harvest area or in clumps to maximize their benefit to bats):
  - silver maple (*Acer saccharinum*)
  - bitternut hickory (*Carya cordiformis*)
  - shellbark hickory (*Carya laciniosa*)
  - shagbark hickory (*Carya ovata*)
  - white ash (*Fraxinus americana*)
  - green ash (*Fraxinus pennsylvanica*)
  - eastern cottonwood (*Populus deltoides*)
  - white oak (*Quercus alba*)
  - northern red oak (*Quercus rubra*)
  - post oak (*Quercus stellata*)
  - black locust (*Robinia pseudoacacia*)
  - American elm (*Ulmus americana*)
  - slippery elm (*Ulmus rubra*)
- \* If a stand possesses no trees greater than 20 inches DBH, leave 16 live trees per acre (leave trees will be located along edges of the harvest area or in clumps to maximize their benefit to bats) of these preferred species remaining in the stand.

- \* Shellbark hickory or shagbark hickory trees will not be harvested or killed for the purpose of timber stand improvement, unless the density of trees of these two species combined exceeds 16 trees per acre. If present, at least 16 live shagbark and shellbark hickory trees (combined) greater than 11 inches DBH must be maintained per acre.
- \* Firewood cutting permits must clearly state that standing dead trees may not be taken unless specific trees are identified in the permit by the Forest Service. When approved for removal, standing dead trees would be designated by Forest Service personnel and described in the firewood cutting permit.
- \* When demolition of abandoned buildings is considered, inspect buildings as necessary to confirm the presence or absence of maternal roosts prior to initiating operations. Delay operations until bats have departed buildings used as maternal roosts and provide suitable roost replacement.
- \* Any hazard tree that has characteristics of a potential maternal roost tree (splintered bole that provides crevices, evidence of decay so that either their bark is exfoliating, it possesses cavities, or dead portions of the tree have been used, excavated, or occupied by species such as woodpeckers or other cavity nesting birds and, most importantly, exposure of the roost to sunlight) will not be removed until consultation with a Forest Service biologist has been completed. An exception is, trees may be cut that are an immediate safety danger to an individual.
- \* Consultation will occur with the USFWS any time a hazard tree is identified as being used by bats.
- \* Develop management goals and directives (conservation plan) for each known maternity colony at micro-topographic level, taking into consideration current conditions and future restraints and/or challenges.
- \* Perform emergence counts on all trees targeted for removal during the bats' active period (April 15 – September 15) that exhibit maternity roost tree characteristics.
- \* Any dead bats located on the Forest, regardless of species, should be immediately reported to the Bloomington Field Office (BFO) [(812)334-4261], and subsequently transported to the BFO. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to the BFO.
- \* Conduct pre-harvest environmental meeting with contractors and their employees on-site before any activities associated with timber harvest and/or removal; emphasize strict adherence to Standards and Guidelines; discuss life history and habitat needs of Indiana bats; adequately describe roost tree characteristics and the critical role they play for bats, and the subsequent importance in avoiding these trees during harvest operations.

All personnel tasked with the removal of hazard trees will attend training with a biologist to learn how to identify potential maternal roost trees.

When even-aged management is conducted, leave trees will be left along the edges of clearcuts or in large clumps (1/10th acre) to maximize their benefit to bats.

Retain dead and dying trees that have characteristics for potential maternal roost trees (leave trees) unless they are safety hazards. Characteristics for leave trees include evidence of decay so that either their bark is exfoliating, they possess cavities, or dead portions of the tree have been used, excavated, or occupied by species such as woodpeckers or other cavity nesting birds and, most importantly, exposure of the roost to sunlight. In addition, retain any tree that has a splintered bole providing crevices that can be used as roosts by eastern forest bats.

When possible, delay removal of hazard trees until bats are likely to occupy hibernacula, between September 15 and April 15.

If potential primary roosts are located during single-tree and group selection harvest planning, design harvests to create gaps that border these trees so as to improve their suitability as roosts.

When there are not at least three standing dead trees greater than 11 inches DBH per acre during single-tree or group selection harvest, consider girdling live trees.

In the event that an occupied primary roost is located on NFS land, designate a zone extending in a radius of 300 feet from the roost. Prohibit land management activities within this zone during the breeding season (April 15 – September 15).

Restrict prescribed burning within a radius of one mile from occupied roosts during the breeding season.

#### Management of Foraging Habitat

- \* When conducting uneven-aged hardwood timber harvests or conducting hardwood timber stand improvements, maintain at least 60 percent canopy cover on a stand-by-stand basis. Design boundaries of timber harvest areas to be irregular in shape so as to enhance foraging by bats.

#### Management of Water Sources

When conditions allow and need is determined, create shallow water extensions of existing waterholes and ponds to enhance insect diversity and abundance for foraging bats.

### **Gray Bat**

- \* When caves are found to contain gray bats, coordinate with the USDI Fish and Wildlife Service and other appropriate groups or agencies to determine if access to caves needs to be restricted.
- \* Establish a zone with a one-quarter mile radius around each known hibernacula of gray bat on the Forest. This zone may be irregular in shape to take into account likely flight paths, foraging habitat, and areas where gray bats are likely to swarm. Prohibit new construction activities within this zone.

- \* Considering both public and private ownerships, maintain or promote at least 70 percent forest canopy cover within a one mile radius of known hibernacula of gray bats. Timber harvest should be restricted to single-tree and group selection within this zone. Implement vegetation management to maintain or improve bat habitat for staging, swarming, roosting, or foraging. Implement prescribed fire within this zone only when bats are unlikely to be swarming, hibernating, or staging.

## **Fanshell**

- \* Prohibit any activity that might negatively affect the known but limited population in the East Fork of the White River, or any population located in the future.
- \* Prohibit the application of pesticides within the riparian corridors of the sixth level watersheds of the East Fork White River where the species has known occurrences. Currently, known sites in sixth level watersheds that contain some parcels of NFS lands are the E. Fork White River – Henshaw Bend and the E. Fork White River – Poplar/Willow Creeks.

## **Rough Pigtoe**

- \* Prohibit any activity that might negatively affect recovery of the rough pigtoe in the East Fork of the White River or any population located in the future.
- \* Prohibit the application of pesticides within the riparian corridors of the sixth level watersheds of the East Fork White River where the species has known occurrences. Currently, known sites in sixth level watersheds that contain some parcels of NFS lands are the E. Fork White River – Henshaw Bend and the E. Fork White River – Poplar/Willow Creeks.

## Maintain and Restore Sustainable Ecosystems

### Manage Vegetation to Provide Diverse Ecosystems

- \* Prohibit adverse modifications to the landscape within 660 feet of known active osprey nests and heron rookeries. Seasonally restrict management activities within ¼ mile of known osprey nests and heron rookeries to avoid disturbance during nest building, egg laying, incubation, and fledgling stages.

Design projects in a manner that ensures management activities would not adversely affect habitat of sensitive species, unless there is a higher priority concern, such as habitat for threatened and endangered species.

Avoid planting, seeding, or introducing nonnative species.

Consider planting mixed species where suitable to reduce insect and disease damage, increase visual variety, and add habitat diversity.

Where possible, restore native ecosystems.

Retain where appropriate large diameter trees and mature or over-mature stands around ponds, lakes, wetlands, and stream shorelines.

Wherever appropriate, manage cliff faces, springs, caves, barrens, and glades as special habitats to protect or enhance physical, historical, and ecological characteristics.

Leave downed logs, limbs, and other scattered ground materials resulting from vegetative management or natural causes on the site where appropriate.

Use sanitation and salvage harvests to remove dead, dying, diseased, or potentially affected trees except in Management Areas 5.1 and 8.1.

Skid roads should be designated by Forest Service personnel and should not exceed a gradient of 35 percent.

Where applicable, clearcutting may only be used where it has been found to be the optimum method of regeneration to meet multiple-use objectives and is essential to meet forest plan objectives, involving one or more of the following circumstances:

- To establish, enhance, or maintain habitat for threatened, endangered, or sensitive species.
- To enhance wildlife habitat or water yield values or to provide for recreation, scenic vistas, utility lines, road corridors, facility sites, reservoirs, or similar development.
- To rehabilitate lands adversely impacted by events such as fire, windstorms, or insect or disease infestations.
- To preclude or minimize the occurrence of potentially adverse impacts or disease infestations, windthrow, or other factors affecting forest health.

- To provide for the establishment and growth of desired trees or other vegetative species that are shade intolerant.
- To rehabilitate poorly stocked stands due to past management practices or natural events.

Accomplish regeneration primarily through natural means. Planting or seeding may be used if adequate stocking, desired species composition, or acceptable genetic quality cannot otherwise be achieved. Refer to Appendix B for minimum stocking standards following timber harvest for even-aged management and uneven-aged management using group selection.

As needed, use salvage to reduce hazardous fuels from disturbances such as storm events, fires, and insect or disease infestations.

Consider the experience of trail users when conducting activities near and along trails.

## **Regional Forester Sensitive Species**

- \* Prohibit adverse modifications to the landscape within 660 feet of known nests of sensitive raptor species. Seasonally restrict management activities within ¼ mile of known sensitive raptor species nests to avoid disturbance during nest building, egg laying, incubation, and fledgling stages.
- \* Prohibit timber harvests within a distance of 100 feet from the top and base of large cliffs or overhangs (see Appendix A, Glossary) except for the salvage of dead and dying trees, or sanitation harvest. Trees harvested outside but near this zone would require directional felling away from the cliff area. These rock outcrop habitats are not limited to solid cliffs and may include discontinuous rock faces (i.e. fractured cliffs, discontinuous large blocks).
- \* Prohibit planting of exotic or nonnative invasive plants within or near barrens, glades, and other sensitive plant communities.

When evaluating the need for harvest within 50 feet of a perennial or intermittent stream, consider the presence of sensitive species and potential effects.

In areas potentially affected by land exchange, surface-disturbing activities or vegetation management, assess the need for and, as needed, conduct surveys or inventories for Regional Forester sensitive species.

Maintain or enhance barrens or glades habitat. Removal of woody vegetation by burning, cutting, or mowing may be desirable to maintain or enhance these areas.

Avoid soil-disturbing activities in barrens or glades unless required to meet management objectives (i.e. provide for management access, put in fire lines for prescribed burns, or remove tall fescue or other nonnative invasive plants).

Identify other areas that are not barrens or glades, that harbor botanical Regional Forester sensitive species requiring full sun.

## **Nest Boxes and Other Structures**

For conservation and educational purposes, supplement natural cavities with nest boxes for cavity-nesting mammals and birds. Use nesting platforms or other structures as appropriate.

## **Forest Openings**

Whenever possible, create and maintain larger openings or opening complexes to provide habitat for species that are area sensitive.

Generally manage forest openings to provide early successional habitat to benefit wildlife species, provide habitat for native plant communities, add visual variety, and provide for recreation opportunities. Manage the edges of most forest openings as shrubby edge or thickets. Develop and maintain other areas, or portions of shrubby areas, in native forbs and grasses.

Where possible, improve wildlife forage and native plant diversity on transmission lines and pipeline right-of-ways.

Where conditions allow, locate openings away from heavily traveled roadways.

Consider public access and recreation when establishing openings.

Mow openings from August to October when possible to minimize disturbance to nesting birds while maintaining some herbaceous food and cover over winter.

Restore native plant communities and replace exotic pasture grasses and other nonnative plants wherever possible.

Retain standing dead trees in created openings as needed, in conjunction with opening development and maintenance.

## **Caves and Other Karst Features**

- \* Prohibit timber harvesting and prescribed burning within 200 feet of cave entrances, direct drainage inputs, such as sinkholes and swallow holes, and any streams flowing into a known cave, except for research purposes.
- \* Do not discharge drilling muds into a karst hydrologic system.
- \* Do not conduct surface disturbing activities on any slopes steeper than 30 percent adjacent to cave entrances without use of mitigation measures.



- \* Do not promote caves as available for general public use unless the Forest develops adequate protection measures to control and manage this use and can clearly establish that no substantial risk, harm, or vandalism of the cave would occur.
- \* Do not conduct seismic surveys within 200 feet of known cave passages or conduits.
- \* Location of caves on NFS lands will not be disclosed.
- \* Cave management will be integrated into general land management practices to protect cave resources from subterranean and surface impacts.
- \* Inventory and evaluate caves in accordance with the Federal Cave Resources Protection Act, Forest Service Manual direction, and Memorandum of Understandings with other organizations.
- \* All caves and karst features shall be excluded from leasing and mineral activities and no drilling will occur within the boundaries of any cave. Boundaries are defined as the area within the known cave plus a buffer zone of 200 feet around the cave.

Cease drilling operations and notify the authorized officer when anyone encounters previously undiscovered voids (more than 12 inches) within 300 feet of the surface.

Do not allow sediment from access roads and other activities to wash into caves or karst features.

Examine and inventory to the extent possible each cave and karst feature. Prepare management prescriptions and plans describing considerations and criteria for protection of cave resources whenever feasible.

Where practical and beneficial, restore cave and karst hydrologic systems choked with debris from non-natural causes or sediment.

Take corrective action if damage to karst or other resources exists and is likely to continue.

Whenever possible, remove non natural debris from sinkholes to improve water quality entering directly into karst systems.

Gating of cave entrances will only be considered as a last resort on a case-by-case basis for safety, and after evidence demonstrates this to be the only option to protect cave species and other resources.

Under normal circumstances, do not place signs with cave names or other information that would reveal cave locations outside of caves. Small signs or registers inside caves (20 to 100 feet) that discuss cave conservation or safety are acceptable.

The Forest will be careful not to promote or dissuade the recreational use of caves; unless it becomes necessary to control access to protect cave resources.

Information on caving basics, ethics and safety, and locations of broad regions of karst topography may be provided. Information about a particular cave may be exchanged with individuals who demonstrate a pre-existing personal knowledge of a cave's location, extent, and layout.

## **Aquatic Habitat and Species Management**

Manage vegetation canopies in and along streams and other aquatic habitats to maintain appropriate water temperatures and chemistry for fish and other aquatic species.

Incorporate habitat needs of animal and plant communities associated with wetlands into wetland design (islands, peninsulas, and standing live and dead trees). Consider the habitat needs of waterfowl, aquatic flora and other wildlife.

As opportunities arise, restore or enhance fisheries habitat in lakes, ponds, and streams by introducing large woody debris and maintaining or improving streambank and shoreline stability. Trees should be removed from dams of maintained lakes and ponds.

Avoid blocking fish passage in streams.

Consider improvement and enhancement of aquatic habitats in all management activities associated with lakes. Incorporate consideration of habitat needs of animals attracted to lakes into lake design including islands, peninsulas, and standing live and dead trees. Determine the type of access and boat and motor restrictions on lakes on an individual basis.

Maintain or enhance the habitat quality of waterholes as necessary.

Where other objectives do not conflict, reduce aquatic vegetation to 20 to 30 percent coverage on lakes and ponds for the purpose of fisheries.

Maintain, enhance, or create ephemeral wetlands where feasible to provide breeding sites for reptiles and amphibians, as well as to provide drinking sites for bats.

## **Special Areas and Research Natural Areas**

Consider nominating newly acquired land as Special Areas if those areas have significant natural characteristics or represent relatively undisturbed examples of important forest ecosystems.

## **Pest and Nonnative Invasive Species Management**

- \* Evaluate pest and nonnative invasive species problems and use integrated pest management to control them, as needed. This includes manual, mechanical, chemical, and biological control methods.

- \* When applying pesticides, identify measures required to reduce off-site movement, drift potential, and adverse effects on threatened and endangered species and their habitat, sensitive species and their habitat, human and wildlife health, non-target vegetation, water quality, and any other relevant environmental elements.
- \* Pesticides will only be applied in accordance with State regulations.
- \* Include appropriate clauses for the prevention or treatment of nonnative invasive species in Forest contracts and permits.

For projects having moderate to high risk of introducing or spreading nonnative invasive plants, incorporate nonnative invasive species assessments in project planning and include nonnative invasive species prevention and treatment methods in project development, analysis, and implementation.

Generally prioritize nonnative invasive species management as follows:

1. Prevention of new infestations
2. Early detection and treatment of new infestations
3. Treatment of sites with the greatest potential for spreading such as trailheads, boat ramps, parking lots, recreation areas, and administrative sites
4. Protection of known endangered, threatened, and sensitive plant and animal sites susceptible to harm from invasive species
5. Protection of Forest special areas and Research Natural Area
6. Containment and control of established infestations

## **Fire and Fuels Management**

- \* Suppress all wildfires on NFS land.

Whenever possible maintain or restore ecosystems to a pre-fire suppression condition.

Consider prescribed fire, mechanical treatment, and isolation in addition to timber sales and other utilization options as tools for fuel treatment after natural disturbance events.

Use prescribed fire to accomplish silvicultural objectives such as oak regeneration.

Where possible, use natural or existing man made barriers for fire control and as boundaries on prescribed fire.

When using prescribed fire in riparian areas, use backing fires when possible and avoid lighting directly in the riparian area.

Avoid using tilled fire lines in riparian corridors.

## Maintain and Restore Watershed Health

### Soil and Water Conservation

- \* Stabilize areas disturbed by management activities as soon as practical, or at least within the same growing season.
- \* Improve or maintain water quality by designing and maintaining roads in accordance with Appendix G.
- \* Reduce compaction and rutting by prohibiting heavy equipment use when the soils are in a saturated condition, thereby reducing surface runoff, soil erosion, and loss of soil nutrients.

With exceptions such as emergency release of water, manage flows from dams and impoundments so that downstream aquatic habitats, reservoir habitats, and aquatic species are minimally impacted.

Permission to remove sand, gravel, or other materials from streams will be considered on a case-by-case basis, and may include, but is not limited to these activities:

- Excavation of deep holes in stream channels to improve fisheries or other wildlife habitat
- Incidental excavation operations for culverts, bridges, fords, dams, trails, or other new or existing facilities.
- Restoration to a more natural or stable stream channel that has been filled by sediment from other land-disturbing activities.
- Removal of materials from sediment basins that have been installed to trap sediment from some upstream activity.

Give priority to stabilizing areas discharging soil into watercourses, especially those that affect the watershed of municipal or recreational reservoirs.

Water bodies may be created if there are adequate watersheds and soil conditions are conducive to construction of water-holding structures.

Maintain functioning wetlands and streams, and restore or enhance wetlands and streams in areas with historical hydrology or appropriate soil characteristics (floodplain characteristics).

Guide soil protection and management for all activities according to site capabilities as identified by interpretation of soil and other ecological site factors.

Prohibit log skidding and heavy equipment within streambeds.

Construct and maintain waterbars on skid trails to slow surface runoff before it creates channels and gullies or moves excessive amounts of sediment into streams.

Soil disturbing operations that extend over a number of operating seasons may require mulching of exposed areas to reduce surface erosion.

Designate log landings on site by Forest Service personnel. Locate landings on upland, well-drained, nearly level sites to minimize surface runoff and soil erosion.

When operations are complete, prepare landings to provide favorable site conditions for seed germination. The landings should be seeded with approved Forest Service seed mixtures and mulched to prevent erosion until vegetation becomes reestablished on the site. These actions should be taken as soon as practical after disturbance.

Logging or site preparation equipment should avoid plastic soils (soils that can be molded or shaped like clay) when the water table is within 12 inches of the surface or when soil moisture exceeds the plastic limit. Soil moisture exceeds the plastic limit if the soil can be rolled to pencil size (approximately ¼ -inch diameter and 6 inches long) without breaking or crumbling.

Resource management activities that may affect soil or water quality must follow Logging and Forestry BMP's for Water Quality in Indiana (IDNR 1998), or most recent version, as a minimum to achieve soil and water quality objectives. When Forest Plan standards exceed Indiana BMPs or water quality standards, Forest Plan standards take precedence.

Where topsoil is less than one inch thick or where organic matter is less than 2 percent, retain logging slash in place (perform limbing at the stump).

Designate the location of roads, trails, main skid trails, and similar features that disturb soils. Stabilize disturbed sites during use and revegetate after use to control erosion.

Utilize the "Indiana Handbook for Erosion Control in Developing Areas" (IDNR 1992) as well as "Best Management Practices for Erosion and Sedimentation Control" (USDOT 1995) for guidance on limiting sedimentation.

In disturbed areas, generally stockpile topsoil and return it to the site.

Restoring natural wetlands will be the highest priority to maintain and restore watershed health.

## **Riparian Corridors**

This guidance is applicable to the entire riparian corridor, which includes the riparian area and a portion of the terrestrial ecosystem along a stream channel. Appendix I further describes the riparian corridor.

Riparian corridors are not excluded from management activities. These are zones where the application of mitigation measures and forethought must be applied to ensure water quality and riparian values are protected.

Protect, enhance, or restore natural water flows when feasible.

Riparian corridors will consist of the riparian area and the adjacent terrestrial ecosystem for a combined 25 to 100-foot corridor depending on the type of stream. Permanent water bodies and perennial streams will consist of a 100-foot riparian corridor. This can be adjusted based on site specific analysis.

Intermittent streams will have a minimum 50 foot corridor from each stream bank and ephemeral streams will have a 25 foot minimum riparian corridor.

Waterholes or small ponds up to 0.5 acre with adjacent slopes no more than 5 percent should have a 25 foot riparian corridor. If adjacent slopes are steeper, wider corridors may be needed.

In general, roads and trails will not be constructed in riparian corridors unless no practical alternatives exist. Road and trail approaches to streams will be located to minimize erosion and sediment introduction to the stream.

Roads and trails will generally cross channels at right angles. Channel crossings will be accomplished using bridges, culverts, fords, or other appropriate crossing structures according to site specific conditions. Remove unnecessary crossings when a road or trail is decommissioned.

Limit heavy equipment crossings in riparian corridors.

Minimize cuts and placement of fills while building new roads in wetlands and riparian corridors in accordance with safety and other engineering road design criteria. Provide sufficient drainage to ensure that the absorption capacity of the riparian corridor is not exceeded.

Reconstruction and stabilization of existing roads, trails, and other facilities within riparian corridors is permitted.

Design and maintain roads and trails in riparian corridors to sustain natural hydrologic patterns and allow for passage of aquatic species. Install appropriate drainage and crossing structures for all new roads and trails to prevent sedimentation.

Road and trail surfaces within riparian corridors should be stabilized with aggregate or other suitable material. Normally, the Hoosier will maintain four inches of gravel surfacing on roads in riparian corridors while they are open to vehicular traffic.

Management within riparian areas will include the maintenance of shade suitable for aquatic organisms over the stream corridor, minimize soil disturbance, and promote mesic native species along perennial, intermittent, and some ephemeral streams dependent on site-specific aquatic resources.

Keep slash out of water bodies, stream channels, floodplains, and areas where it may be swept into streams, rivers, and water bodies except to meet other habitat objectives.

Soil-disturbing activities of approved practices within designated riparian corridors will require effective erosion control. Implement, as needed, erosion control measures such as straw bales in ditch lines and small drainages, berms in road embankments during construction, diversion ditches, slash and unmerchantable logs across slopes and trails, check dams in ditch lines, sediment detention basins, and sediment fences.

Preserve the integrity of stream channels, maintain the beneficial values of floodplains and wetlands, and protect the interest of the public when structures and facilities are constructed or rehabilitated.

Forest openings may be developed and maintained within riparian corridors.

Permit emergency construction of fire lines or other earth disturbing measures within riparian corridors, but these disturbed areas will be stabilized as soon as possible.

## Protect Our Cultural Heritage

- \* Inventory affected lands prior to conducting ground-disturbing projects. This includes, but is not limited to, such activities as prescribed burns, vegetation management, and proposed land exchanges.
- \* If heritage resources are discovered during project implementation, cease all activity in the vicinity until an archaeologist has made an on-site assessment.
- \* Conduct inventories in non-project areas to locate and identify all significant heritage resources managed by the Forest.
- \* Complete all heritage resource investigations with archaeologists, archaeological technicians, or paraprofessional archaeological technicians. Volunteers may assist if under the supervision of an archaeologist.
- \* Evaluate sites for significance and potential listing to the National Register of Historic Places (NRHP). Nominate significant sites to the NRHP.
- \* Consider sites that have not been formally evaluated as potentially eligible to the NRHP and protect them. Sites not eligible to the NRHP do not require protection but may have interpretive potential. Protect all unevaluated, eligible, and listed sites from ground-disturbing activities. Implement protective measures, including avoidance buffers and site condition monitoring, as recommended during site-specific project development and analysis. If a project cannot be redesigned and would adversely affect a NRHP-eligible heritage resource, the heritage resource staff will develop and implement a mitigation plan to minimize the affects. Develop the plan in consultation with the State Historic Preservation Office (SHPO).
- \* Periodically assess the nature and degree of damage to heritage resources due to vandalism, visitor use, and natural deterioration. Identify and implement protective measures.
- \* Do not disclose heritage site locations without the approval of the Forest Supervisor.
- \* Appropriately curate heritage resource collections. All archaeological and historic materials recovered from NFS lands are the property of the Federal government.

Design activities to avoid damage to heritage resources.

Conduct stabilization, rehabilitation, and restoration activities when appropriate.

Use accurate and up-to-date site and survey information with a graphic and tabular data base to efficiently and effectively manage the resources.

To the extent possible, offer and maintain an array of heritage interpretive opportunities and experiences including on-site signs, trails, presentations, tours, exhibits, volunteer



projects, special events, heritage tourism, and internet web pages. The Forest may develop an interpretive plan to identify specific opportunities and coordinate a systematic approach.

Develop a strategy to systematically evaluate all sites on the Forest through use of thematic evaluations or other applicable models or strategies.

Prefer in-situ (in-place) management as the method for the preservation of human remains and associated grave goods, regardless of age or ethnicity. Treat human remains with dignity and respect.

## **Provide for a Visually Pleasing Landscape**

Meet the visual quality objectives (VQO) indicated on the VQO map in Appendix J where not overridden by management area guidance.

Consult Handbook Number 462, National Forest Landscape Management, Volume 2, Chapter 1 where not overridden by the VQO map in Appendix J.

Rehabilitate the visual aspects of most projects as soon as possible.

## **Provide for Recreation Use in Harmony with Natural Communities**

- \* Camping is permitted anywhere unless restricted by Forest Order or other regulation.
- \* Prohibit public off-highway vehicle use.

Prohibit paintball activity in Management Areas 5.1, 7.1, and 8.1 or where otherwise prohibited by regulation. Paintball guns are considered firearms and all applicable firearm regulations apply. Substances used in the paintballs and other devices must be water soluble and biodegradable.

Limit administrative use of off-highway vehicles to activities such as: trail or recreation site maintenance and construction, search and rescue, law enforcement, fire fighting, prescribed fire, permit administration, and maintenance of managed forest communities. Permit use of off-highway vehicles in activities such as contracts, volunteer and cooperative agreements, and special use permits only when specifically authorized by a line officer.

When possible, design roads, trails, and other facilities to enhance recreational experiences. Consider public health and safety, accessibility, and environmental quality as integral parts of recreation facility design and management.

Design or reconstruct roads open to the public to increase recreational opportunities by providing features such as parking, turnouts, overlooks, and points of interest.

## **Trails**

- \* Design trails to meet the standard of the highest impact user.
- \* Allow foot travel on any trail as well as off trails, unless otherwise prohibited.
- \* Allow horses, and other pack stock, on trails designated as open to horse use and on roads open to public vehicle travel, unless prohibited.
- \* Allow mountain bicycles on trails designated as open to mountain bicycle use, and on roads open to public vehicle travel, unless prohibited.
- \* Camping is not permitted at or within 300 feet of a designated trailhead, unless located in a campground or otherwise permitted.

Provide single and multiple-use trails.

Harden trails with appropriate material if conditions dictate. Motorized earth moving equipment may be used for trail maintenance.

Designate trails as system trails or special use permit trails.

Maintain a Forest-wide trail plan.

## **Provide a Useable Landbase**

### **Land Ownership and Adjustment**

Give high priority to land adjustments through purchase or exchange, that consolidate forest ownership, provide access to existing NFS land and water, and protect or enhance threatened and endangered species habitat or other special areas.

Give high priority to obtaining lands to protect significant cultural sites; acquire or retain areas with caves or outstanding examples of karst features; permit protection, development, and management of wetlands, lakes, and ponds or recreation facilities; and protect water quality (See Appendix E).

Satisfy one or more of the following purposes when implementing land adjustments:

- Accomplish objectives of Federal law or regulation
- Meet demand for national forest resources, including recognized special areas
- Result in more efficient land ownership patterns
- Result in lower resource management costs

Land adjustments, such as purchases, exchanges, or donations, should assume the land allocation of the surrounding area, unless circumstances warrant placement into Management Area 9.2 for study as a special area or nomination of a research natural area.

Avoid encumbering land available for exchange with land uses that compromise land exchange opportunities.

Do not acquire land by condemnation except in extreme cases to acquire right-of-ways or clear title, if all other reasonable efforts fail. Land acquisition program deals with willing sellers and exchange proponents.

Consider acquiring subsurface rights under NFS land when the rights and funding are available.

Whenever possible, landlines will be located and marked to standard.

### **Transportation System**

Maintain effective closures (to public motorized vehicles) on Maintenance Level 1 (See Appendix A, Glossary) roads. Closure devices should be visually compatible with the surrounding area.

Decommission unneeded roads when possible.

Follow guidelines in Appendix G for Hoosier National Forest road design.

## **Access Rights**

Consider on an individual basis requests for easements or special-use permits for new or improved road access across NFS land by State or local units of government, private landowners, or other interests.

Consider requests for access to other ownerships across NFS land when no other reasonable access exists. Consider alternative access, management area objectives, and public input when evaluating access requests.

## **Public Parking**

Parking lots may be provided.

Avoid locating new parking sites and access points within sight distance of springs, seeps, and mineral licks to minimize disruptions to wildlife.

## **Provide for Human and Community Development**

### **Special Uses and Utility Corridors**

- \* Do not allow sanitary landfills on or beneath NFS lands.

Wherever possible, combine utility right-of-ways across NFS land into shared right-of-ways or corridors to reduce total forest impacts.

Consider visual qualities in the design of permitted activities and, where feasible, bury all new utility lines.

Approval of applications for distribution systems crossing NFS lands (such as utility right-of-ways serving individual residences) will be determined on a case-by-case basis.

Evaluate applications on an individual basis for other special uses involving NFS lands, including but not limited to wind, solar, and hydro power generation sites and communication towers.

Where possible, manage lands under special-use permits for overall plant and animal diversity and enhancement of native communities.

Base qualification for a special use permit trail on a case-by-case evaluation of ability to meet Forest Service criteria established in the Trail Plan.

### **Minerals and Geology**

- \* Allow for the exploration and development of gypsum in Martin and Orange counties.
- \* Prohibit surface disturbing mineral development (including oil and gas) when the Federal government owns the subsurface rights.
- \* When the minerals are owned by other parties, require reclamation plans for all proposed surface-disturbing activities on Federal lands. The affected lands must be reclaimed to their natural state using the best scientific knowledge and principles available.

Any proposal to lease minerals from the Federal government, with no surface occupancy, would require consultation with USDI Fish and Wildlife Service during environmental analysis or prior to leasing. Such consultation will occur on a project by project basis.

Allow for mineral exploration that does not disturb the land surface.

Do not preclude the ability of private mineral owners to exercise their outstanding or reserved mineral rights as defined by deed and public law.

Recreational gold panning may be allowed except in the Charles C. Deam Wilderness or within 200 feet of caves. Gold panning is restricted to active stream beds or unvegetated gravel bars. Digging in stream banks is not allowed and no more than two cubic yards of material may be moved within the site. Commercial ventures are not allowed and tools are limited to hand tools such as a shovel and a gold pan.

Recreational mineral collection may be allowed except in the Charles C. Deam Wilderness or caves. Only negligible surface disturbance is allowed for recreational mineral collection. Tools are limited to rock hammers, garden trowels, or shovels.

## **Buildings and Structures**

Ensure that building design and appearance are compatible with the forest environment.

Provide communication sites to support resource management objectives. Some commercial use may be provided if space is available and the commercial use would not conflict with Forest equipment or frequencies.

Consider adaptive re-use of historic structures in lieu of constructing new ones.

## **Public Health**

Emphasize and promote “pack-it-in, pack-it-out” methods of disposal and the Leave No Trace ethic.

Provide educational materials at offices and trailheads to aid the public in awareness and avoidance techniques for health risks such as tick borne diseases and poison ivy.

# Management Area Guidance

Management area maps in Appendix J show the locations of each of the ten management areas. Also included in Appendix J are maps of visual quality objectives and recreation opportunity spectrum classifications for each area of the Forest.

## Management Area 2.4

### Desired Condition of Management Area

This management area protects and enhances water-based recreation opportunities, visual quality, and riparian values. This management area is associated with canoeable and fishable streams, rivers, lakes, and reservoirs. Maintain riparian corridors to protect, enhance, or restore channel stability, water flow, and habitat quality. The desired condition includes forested shorelines or corridors up to 1 mile or more in width, with an unbroken canopy in large-diameter trees of a variety of species. Human activities are evident but do not dominate the landscape. There is frequent interaction among visitors.

This management area generally features natural succession. Habitat is best suited to plants and animals of closed-canopied, hardwood forests with large trees, including bottomland species. A variety of tree species are present, including mixed bottomland hardwoods along rivers, streams, and lakes. Limited vegetation management is appropriate to create and improve habitat for wildlife and plant species within riparian corridors. Limited vegetation management includes maintenance of forest openings, wildlife habitat improvement for riparian dependent species, prescribed fire, or salvage and sanitation harvest when it is compatible with overall objectives.

Emphasize water based recreation opportunities such as canoeing, boating, fishing, waterfowl hunting, trapping, and nature watching. Viewing scenery, hunting, trapping, fishing, canoeing, boating, and trail use are key recreation activities. The Forest is generally accessible by canoe (on canoeable streams or lakes), foot travel, and vehicles on State and county roads.

The visual character of these areas emphasizes long corridors of big trees along rivers. In backwater areas of lakes and rivers, the areas have a big-tree character of bottomland hardwoods and riparian vegetation.

The Forest has portions of two U.S. Army Corps of Engineers reservoir shorelines included in the boundaries of this management area -- Monroe and Patoka.

Private lands in Management Area 2.4 are a high priority for acquisition on a "willing seller" basis as funds are available, or through the land exchange program.

### Desired Condition for Eligible Wild and Scenic River Areas:

The Lost River and Little Blue River have been determined eligible for Wild and Scenic Rivers. This description applies to Federal lands within each river's corridor, and is designed to protect the potential classification and outstanding values of each river during this planning period.



The Lost River and Little Blue River will be protected from activities that could diminish or change the free-flowing character, water quality and recreational, scenic, heritage, wildlife, and other values.

## Guidance

### *Maintain and Restore Sustainable Ecosystems*

Allow limited management of vegetative communities to maintain suitable early successional habitat for wildlife.

Maintain some existing forest openings that have value for wildlife, vegetation, or recreation and are adjacent to roads or have administrative access.

As needed, conduct activities to reduce the spread and potential of insect and disease infestations.

### *Maintain and Restore Watershed Health*

Avoid vegetation management or removal of trees on banks or in associated riparian areas except as necessary to manage threatened, endangered, sensitive, and management indicator species, restore natural wetlands, stabilize banks, develop and maintain access sites for recreation, or restore natural riparian vegetation, which provides shade or nutrients for aquatic communities.

When constructing aquatic habitat structures, allow for safe passage of canoes.

Limit new structures or roads, and avoid management activities on NFS lands within a river's corridor that might degrade rivers.

### *Provide for Recreation Use in Harmony with Natural Communities*

- \* Limit average cumulative trail density to 2.0 miles per square mile or less. The density limit is a cumulative figure for the total Forest acreage for this management area. The density may be exceeded on any given piece of ground as long as it is not exceeded for that management area overall. These density limits are not intended to be a target for miles of a trail in a management area.

Construction of river or lake access points with parking, toilet facilities, garbage pickup, camping, and information boards and other amenities is permitted. Design access points to provide vehicle parking, protect the bank, screen vehicles from the view of river travelers, and facilitate authorized uses.

When possible, locate sanitary facilities outside of riparian corridors and provide drainage from parking lots away from the watercourse.

Dispersed or developed trailheads for mountain bicycle, hiking, and canoe access are permitted.

Trails for horses may pass through this management area but no trailhead specifically designed for horse use will be provided.

### Eligible Wild, Scenic, and Recreational River Guidance

These additional Standards and Guidelines provide further protection to the eligible corridors.

- \* Water supply dams and diversions are prohibited. Water quality is to be protected at its current level, or improved where possible.
- \* Issuance of licenses or exploratory permits for hydroelectric power development will be opposed until a wild and scenic river suitability study is completed.
- \* Development of any activity that would diminish the free-flowing character, including but not limited to flood control dams, levees, or channelization, is prohibited within the river's corridors.
- \* Recreation developments within the scenic and recreational corridors will not be easily viewed from the river.
- \* New recreation facilities that maintain or enhance river values (such as primitive campsites) are permitted within the scenic and recreational segments.

New transmission lines, gas lines, and water lines are discouraged. Where no reasonable alternative exists, additional or new facilities shall be restricted to existing rights-of-way.

## MANAGEMENT AREA 2.8

### Desired Condition of Management Area

The area is general forest with large areas of old forests and scattered openings associated with a variety of forest plant communities. A variety of tree species is present, but shade-tolerant species may dominate some forest communities over time. A natural variety of other tree species intermediate in shade tolerance is perpetuated, and in other forest communities they may dominate. This area provides a variety of forest types, reflecting different ecological sites and management activities. Openings in the canopy result in different canopy levels and animal communities associated with vertically diverse, shade-tolerant vegetation, as well as different successional stages of vegetation. There is a higher percentage of edge habitat in this management area than in most of the forest. Site-specific decisions result in many variations within this management area.

These areas include scattered blocks of NFS land. There is ample evidence of human activities, most of which blends well with the natural environment. Visual quality and recreation opportunities are protected and enhanced. Interaction among visitors is frequent.

Habitat in these areas is best suited to wildlife that uses large hardwood trees and a mosaic of different-aged hardwood forests. The desired condition of this area is to maintain 4 to 12 percent of the area in young forest habitat and up to an additional 3 percent as openings. The Forest manages the area primarily for plant and animal habitat diversity and timber harvest is an appropriate tool for use in this area.

Viewing scenery, hunting, fishing, dispersed camping, gathering forest products, horseback and mountain bike riding, and hiking are key recreation activities. Due to the diversity provided by the area, bird watching, berry picking, and mushroom gathering and other forest products are also common uses of this management area. Some of the areas are surrounded by private lands, but most are generally accessible by foot travel and State and county roads.

Large trees with a continuous canopy characterize much of this area. This area allows a wide variety of management techniques, each resulting in a slightly different visual character.

In areas of fragmented ownership, the visual character is that of islands of large diameter trees. There is often a visual distinction between private and NFS lands.

### Guidance

#### *Maintain and Restore Sustainable Ecosystems*

- \* Limit temporary opening size in a group selection harvest to no larger than 3 acres.
- \* Limit temporary openings created by clearcut and shelterwood harvests to 10 acres.

A timber harvest can occur when the adjacent certified re-established stand has reached a height that is greater than 20 percent of the height of the surrounding vegetation.

Provide a variety of opening sizes in character with the landscape.

Blend openings created by harvest with the surrounding area. Distribute openings across the landscape to provide for biological diversity as well as visual and site considerations.

As needed, treat stand understories prior to harvest to promote advanced regeneration of desired plant species.

Consider crop tree release in young hardwood stands to promote oak survival, earlier mast production, forage production, and additional growth on desirable species.

Control grape, ivy, and other vines as necessary to ensure satisfactory regeneration and growth of the desired species. Perpetuate some vines to meet wildlife needs.

Retain a variety of hardwood species in timber stand improvement and thinning operations.

Conduct thinning, improvement cuts, and timber stand improvements.

Establish forest openings on newly acquired land as necessary to meet management area objectives.

### *Maintain and Restore Watershed Health*

Restoring natural wetlands will be the highest priority to maintain and restore watershed health.

### *Provide for a Visually Pleasing Landscape*

Woody debris resulting from vegetative management and prescribed burning should receive special treatment along the visual foreground of frequently traveled roads, trails, and streams to meet the visual quality objective.

### *Provide for Recreation Use in Harmony with Natural Communities*

- \* Limit the average cumulative trail density to 2.5 miles per square mile or less. See the definition of cumulative trail density in Glossary (Appendix A).

Trails and trailheads for horses, mountain bicycles, and hiking are permitted.

### *Provide for Human and Community Development*

Provide fuelwood to the public to better use wood left on the site after project implementation.

Allow for mineral development with no surface occupancy or disturbance in the Crawford Upland and Brown County Hills Ecological subsections.

## MANAGEMENT AREA 3.3

### Desired Condition of Management Area

This management area emphasizes diversity for wildlife species requiring a mix of early and late successional vegetative types and age classes. It is associated with a mosaic of forest conditions dominated by hardwood trees and their associated understory habitat. Horizontal and vertical diversity are present in the forest. Generally early and late successional stands are found in close proximity to each other to provide for those non-migratory species that require a mix of both of these habitats. Management is more intensive than in other management areas, but blends with the natural environment. There is a higher percentage of edge habitat created in this management area compared to other areas on the Forest. Site-specific decisions result in many variations within this management area.

This area will provide habitat for previously declining populations of wildlife, particularly Neotropical migrants, dependent on or associated with these habitat types. This management area will have the most concentrated areas of vegetative management activities, providing optimum habitat for many species.

Hardwood management is by even-aged methods, emphasizing a diversity of species such as ash, cherry, hickory, oak, yellow-poplar, and walnut to provide valuable habitat for wildlife and plant species. Vegetation management is more intense in this area than elsewhere in the Forest with as much as 16 percent of the forest in the 0-9 age class. Pine will also be harvested and the sites converted to native hardwoods.

To better provide specific requirements for a suite of wildlife species represented by species such as the ruffed grouse, yellow-breasted chat and American woodcock, even-aged harvest areas will not exceed 40 acres in size. The Forest manages the area primarily for plant and animal habitat diversity and timber harvest is an appropriate tool.

Maintained openings for wildlife are of a variety of sizes, well dispersed, and in character with the landscape. This management area also allows for maintaining and providing fishing lakes, marshes, ponds, and waterholes.

These areas include scattered blocks of NFS land. There is ample evidence of human activities, most of which blends well with the natural environment. Visual quality and recreation opportunities are protected and enhanced. Interaction among visitors is frequent.

Viewing scenery, bird-watching, hunting, and trail use are key recreation activities. The Forest is generally accessible by trails and a network of roads.

## Guidance

### *Maintain and Restore Sustainable Ecosystems*

- \* Limit temporary opening size in harvest areas to 40 acres or less.

A timber harvest can occur when the adjacent certified re-established stand has reached a height that is greater than 20 percent of the height of the surrounding vegetation.

Provide a variety of opening sizes in character with the landscape.

Blend openings created by harvest with the surrounding area. Distribute openings across the landscape to provide for biological diversity as well as visual and site considerations.

As needed, treat stand understories prior to harvest to promote advanced regeneration of desired plant species.

Consider crop tree release for young hardwood stands to promote oak survival, earlier mast production, forage production, and additional growth on desirable species.

Control grape, ivy, and other vines as necessary to ensure satisfactory regeneration and growth of the desired species. Perpetuate some vines to meet wildlife needs.

Retain a variety of hardwood species in timber stand improvement and thinning operations.

Conduct thinning, improvement cuts, and timber stand improvements.

Establish forest openings on newly acquired land as necessary to meet management area objectives.

### *Provide for a Visually Pleasing Landscape*

Woody debris resulting from vegetative management and prescribed burning should receive special treatment along the visual foreground of frequently traveled roads, trails, and streams to meet the visual quality objective.

### *Provide for Recreation Use in Harmony with Natural Communities*

- \* Limit the average cumulative trail density to 2.5 miles per square mile or less. See the definition of cumulative trail density in Glossary (Appendix A).

Trails and trailheads for horses, mountain bicycles, and hiking are permitted.

### *Provide for Human and Community Development*

Provide fuelwood to the public to better use wood left on the site after project implementation.

Allow for mineral development with no surface occupancy or disturbance in the Crawford Upland Ecological subsections.



## MANAGEMENT AREA 5.1

### Desired Condition of Management Area

This is the Congressionally designated Charles C. Deam Wilderness.

The area provides a recreation experience offering a degree of solitude, physical and mental challenge and risk, inspiration, and primitive recreation. Opportunities exist for non-mechanized recreational activities such as hiking, backpacking, camping, horseback riding, scientific study, hunting, fishing, and nature study.

There is little evidence of human development except remnants of past human occupation such as old roads, ponds, orchard trees and domestic vegetation, stone foundations, and cellar holes that have been overgrown and dilapidated by natural forces. Other than trails, designated campsites, user created campsites, and existing cemeteries and the roads to them, there is little evidence of past human activities, and these remnants will soon deteriorate and become overgrown by natural forces.

Natural succession is the dominant process within the Charles C. Deam Wilderness. In the future there will be extensive areas of old-growth vegetation. Some younger trees and openings occur as a result of natural processes. Timber harvesting is not appropriate in this area.

Interaction with other users is low.

The area primarily along the Tower Ridge Road and State Road 446 is not part of the Congressionally designated wilderness and will be managed under other management area guidance. These areas are:

- Manage the Blackwell Horsecamp and Pond under Management Area 7.1 guidance.
- Manage the 200-foot set-back east of State Road 446, the 100-foot set-back on either side of Tower Ridge Road, the 100-foot set-back along Hunter Creek Road, and other set-backs as identified in the legal description for the Charles C. Deam Wilderness under Management Area 6.2 guidance.

### Guidance

#### *Conservation of Endangered and Threatened Species Habitat*

Manage habitat when consistent with wilderness management objectives and necessary to meet the needs of Federal endangered and threatened species.

#### *Maintain and Restore Sustainable Ecosystems*

- \* Suppress wildfires using non-motorized equipment. The Forest Supervisor may allow the use of motorized equipment.

Emphasize minimum impact fire suppression tactics to minimize short-term and long-term impacts on resources.

Use pesticides as necessary to prevent the loss of significant aspects of the wilderness, or to prevent significant losses to resource values on private or public lands bordering the wilderness. Pesticide use must be approved by the Regional Forester prior to application.

Emphasize the removal of nonnative invasive plant species, except those associated with heritage resources.

### *Protect Our Cultural Heritage*

- \* On-site cultural resource interpretation will not occur.

Off-site cultural resource interpretation of the Charles C. Deam Wilderness area sites may occur.

Consider heritage resources an integral part of the wilderness and inventory, evaluate, retain, and preserve them whenever possible. These resources are available for scientific study, provided the manner of study is consistent with the concept of wilderness.

### *Provide for Recreation Use in Harmony with Natural Communities*

- \* Motorized use or mechanized transport is prohibited except for emergencies approved by the Forest Supervisor and cemetery maintenance and access. Non-motorized wheelchairs used by persons with disabilities are permitted.
- \* Restrict horses and pack stock to those portions of the trail system specifically designated for their use. Prohibit off trail riding.
- \* Limit the trail system to 40 miles with no connectors to trails outside of the wilderness..
- \* Limit group size to no more than 10 people.
- \* There will only be five trailheads.
- \* Prohibit the use or possession of spray paint, and any paintball activity.
- \* Prohibit the discharge of firearms for target shooting or reasons other than hunting.
- \* Prohibit camping within 100 feet of ponds, lakes, trails, or streams except at designated sites. Camping throughout the rest of the wilderness is not restricted. Additional designated camping sites may be provided throughout the wilderness.

- \* Prohibit roadside parking and camping along Tower Ridge Road except at designated locations. Provide parking and signs at trailheads as needed.

Emphasize refuse disposal through a pack-it-in and pack-it-out program.

Maintain trails to a standard as low as possible while still protecting the resources and providing for visitor safety.

Use native materials in trail construction to the extent possible. Generally utilize native and local materials in completing trail construction and reconstruction. Use nonnative materials if it is determined they are necessary to protect resources. Trail work includes but is not limited to: tread maintenance, diversion ditches, side-sloping and waterbars to divert water from trails and maintain adequate trail drainage, brushing and removing trees that fall across the trails, and removing and scattering vegetation from the tread area to make the materials unobtrusive. Make drainage structures look as natural as possible.

Only minimal facilities are provided to prevent site deterioration and protect users from safety hazards.

Design structures such as gates and signs on the periphery of the area according to wilderness policy so that they blend with the wilderness characteristics of the area.

Designated sites may be provided with a wilderness style fire grate and wilderness privy.

Use signs to close trails, protect the environment, and provide direction to help correct environmental damage when needed.

Gathering of fruits, nuts, and mushrooms for private use may occur.

Emphasize educational programs to help potential wilderness visitors understand wilderness philosophy and management and problem behaviors that affect the wilderness resource.

### *Provide a Useable Landbase*

- \* Provide public access to cemeteries as stated in the act establishing the wilderness. Maintain access routes as necessary to prevent damage to adjacent lands and resources.
- \* Keep Tower Ridge Road and Hunter Creek Road open.

### *Provide for Human and Community Development*

- \* Prohibit corridors for power projects, transmission lines, and other facilities, except as authorized by the act establishing the wilderness.
- \* Do not permit commercial grazing. Consider other special uses on an individual basis. Do not issue outfitter guide permits.
- \* Do not allow special use permit trails originating from adjacent private lands. To accommodate adjacent landowners, two of the five allowable trailheads are located for their convenience.
- \* Prohibit military maneuvers.
- \* The Charles C. Deam Wilderness has been formally withdrawn from mineral leasing. Mineral extraction is prohibited.

Coordinate with the military to restrict flights below 2,000 feet.

Vegetation manipulation occurs in conjunction with trail maintenance, cemetery maintenance, and maintenance of the roads leading to the cemeteries (including Terrill Ridge Road).

Determine appropriate search and rescue methods for each individual search and rescue, considering primitive means first. The USDA Forest Service will take the lead in protecting wilderness values.

Allow research activities that comply with and promote wilderness values.

Research projects that would yield the same results inside or outside the wilderness should be conducted outside of the wilderness.

Limit interviews and research contact with visitors unless there is a benefit to the wilderness resource.

## MANAGEMENT AREA 6.2

### Desired Condition of Management Area

This management area creates a physical setting that provides an opportunity for solitude and a feeling of closeness to nature. The area is general forest land with the appearance of extensive stands of forest dominating the landscape.

Over time, extensive stands of natural-appearing forests of shade-tolerant species will characterize the area. Stands will be dominated by large mature trees and will provide habitat for late-successional species. Some younger trees and openings will result from natural causes. Removal of commercial vegetation is not appropriate, other than salvage or sanitation harvest when it is compatible with overall objectives.

Key recreation activities include nature watching, hunting, trail use, and backpacking. The forest is generally accessible by foot travel, and from county or state roads around the perimeter of these areas.

Roads in the interior of these areas are closed to public motorized vehicles.

Interaction between users is low, and there is only subtle evidence of other users. Tranquility and solitude are probable experiences.

Though Management Areas 6.2 and 6.4 are very similar, there are some differences between the two. These differences are:

- In Management Area 6.2 no forest openings, waterholes, or ponds will be created and these existing features will not be maintained and will revert naturally.
- Visual quality objectives are more restrictive in Management Area 6.2 since some vegetative management is allowed in Management Area 6.4.
- Some management of pine is allowed in Management Area 6.4.

### Guidance

#### *Maintain and Restore Sustainable Ecosystems*

Allow identified research plots to remain active until the research study is complete, but only limited vegetation management could occur.

### *Provide for Recreation Use in Harmony with Natural Communities*

- \* Limit average cumulative trail density to 2.0 miles per square mile or less. See glossary (Appendix A) for definition of cumulative trail density.

Limit public motorized access to those roads on the periphery of the area, roads accessing active cemeteries, and roads under other jurisdictions. Use of other Forest roads is limited to resource management, administrative use, and foot travel.

Trails and trailheads for horses, mountain bikes, and hikers are permitted.

Minimize other recreation developments, and provide only those that prevent site deterioration or protect the user from health hazards.

### *Provide a Useable Landbase*

- \* Limit construction of additional roads except for roads associated with development of trailheads, parking lots, and other recreation facilities around the perimeter of these areas.

## MANAGEMENT AREA 6.4

### Desired Condition of Management Area

This management area creates a physical setting that provides an opportunity for solitude and a feeling of closeness to nature. The area is general forest land with the appearance of extensive stands of forest dominating the landscape with some openings.

Over time, extensive stands of natural-appearing forests will characterize the area. Stands will be dominated by large mature and over-mature trees and will provide habitat for late-successional species.

Natural barrens, glades, wetlands, and dry forest may be restored and perpetuated. Some existing forest openings, ponds, and lakes may be retained. Old roads will grow in and blend with the natural setting. Commercial removal of vegetation is not appropriate, other than salvage or sanitation harvest when it is compatible with overall objectives.

Key recreation activities include nature watching, hunting, trail use, and backpacking. The forest is generally accessible by foot travel, and from county or state roads around the perimeter of these areas.

Roads in the interior of these areas are closed to public motorized vehicles, except seasonal use in Mogan Ridge.

Interaction between users is low, and there is only subtle evidence of other users. Tranquility and solitude are probable experiences.

Though Management Areas 6.2 and 6.4 are very similar there are some significant differences between the two. These differences are:

- In Management Area 6.2 no forest openings, waterholes, or ponds will be created and existing features will not be maintained and will revert naturally.
- Visual quality objectives are more restrictive in Management Area 6.2 since some vegetative management is allowed in Management Area 6.4.
- Some management of pine is allowed in Management Area 6.4.

### Guidance

#### *Maintain and Restore Sustainable Ecosystems*

Retain the currently maintained openings at Mogan Ridge, Lukes Knob, and Felknor Hollow.

Natural barrens, glades, wetlands, and dry forest that contain sensitive plant communities may be restored and perpetuated.

Allow timber stand improvement to hasten the conversion of pine stands to hardwood stands.

### *Maintain and Restore Watershed Health*

Maintain existing ponds, lakes, and wetlands.

### *Provide for a Visually Pleasing Landscape*

To the extent feasible, maintain visual quality objectives along most streams, trails or roads at a minimum of retention.

### *Provide For Recreation Use in Harmony with Natural Communities*

- \* Limit average cumulative trail density to 2.0 miles per square mile or less. See glossary (Appendix A) for definition of cumulative trail density.

Limit public motorized access to those roads on the periphery of the area, roads accessing active cemeteries, and roads under other jurisdictions. Use of other Forest roads is limited to resource management, administrative use, and foot travel.

Trails and trailheads for horses, mountain bikes, and hikers are permitted.

Minimize other recreation developments, and provide only those that prevent site deterioration or protect the user from health hazards.

### *Provide a Useable Landbase*

- \* Construct no new roads unless they would be associated with the development of recreational facilities such as, but not limited to, trailheads, parking lots, or other developments.
- \* Retain administrative access to existing forest openings at Lukes Knob and Felknor Hollow. Continue to keep these roads closed to public access.

Open the main east-west gravel road through Mogan Ridge that begins at Old State Route 37 to public access during fall deer hunting seasons between the approximate dates of October 1 to January 1 for purposes of managing deer populations.



## MANAGEMENT AREA 7.1

### Desired Condition of the Management Area

These areas provide for recreational facilities and developed sites. They include campgrounds, picnic areas, boat ramps, swimming beaches, and other areas intended to serve large numbers of people.

These areas vary in size, and the Forest collects user fees at most of them. Use in these areas is high-density, destination-type use.

The area contains a variety of forest types, ages, and size of timber stands. The emphasis is on maintaining large-diameter trees where possible. These areas provide a small number of shrub and herbaceous openings. Vegetative management maintains or enhances existing recreation, road and utility corridors, wildlife habitat, education, watershed values, and visitor safety.

Favor treatment of vegetation on transmission line right-of-ways to improve wildlife habitat and perpetuate a variety of native plant species and communities. Manage plant and animal habitats, including habitat improvements, to enhance visitor enjoyment and maximize sightings while protecting the habitats and populations.

Manage vegetation to ensure the long-term viability, safety, and attractiveness of the area. In these areas, focus vegetative management on hazard tree removal; control of nonnative invasive species; flower, nut, or berry production; scenic enhancement; and specific area objectives. Mowing is common in high-use areas.

Developments are evident and may dominate the landscape. Design, building materials, and placement of facilities and structures are such that they are in harmony with the environment. Accessible facilities are provided.

Management Area 7.1 recreation areas include: Blackwell Horse Camp, Blackwell Pond (Brooks Cabin), Buzzard Roost, Celina Lake, German Ridge, Hardin Ridge, Hickory Ridge Fire Tower, Hickory Ridge Horse Camp, Indian Lake, Mano Point, Saddle Lake, Shirley Creek Horse Camp, Springs Valley, Tipsaw Lake, and Youngs Creek Horse Camp.

The transportation system is designed and constructed to safely and comfortably accommodate both specialized recreation vehicles and associated service vehicles.

The visual character of these areas reflects a higher percentage of open land than is generally found in the Forest, intermingled with trees, trails, roads, powerlines, buildings, and parking lots. The sights and sounds of humans are acceptable here, and a high degree of interaction between users is expected.

## Guidance

### *Maintain and Restore Sustainable Ecosystems*

- \* Rehabilitate sites and regulate use, to provide erosion control and minimize soil compaction.

Apply pesticides to control undesirable terrestrial and aquatic vegetation such as but not limited to woody vegetation on dams, poison ivy, Asian milfoil and stinging nettles and to control stinging insects, ticks, or chiggers when needed.

Maintain vegetation diversity and increase diversity using prescribed fire techniques.

Permit tree removal when appropriate, for purposes such as safety, facility expansion, vista maintenance, and site maintenance.

Trees may be cut to promote growth and vigor and to prevent insect and disease infestation.

### *Protect Our Cultural Heritage*

Encourage on-site interpretation of heritage resources.

### *Provide for a Visually Pleasing Landscape*

- \* Visual quality objectives shall meet modification standards or better, within recreation area boundaries.
- \* Manage visual quality objectives for forested areas adjacent to entrance roads and trails, and around associated lakes as far as the foreground limit as partial retention or better.

Provide and maintain scenic vistas where appropriate.

In developed recreation areas, there may be evidence of routine maintenance, such as mowing grass, pruning brush and trees, maintaining scenic vistas, or removing hazard trees.

### *Provide For Recreation Use in Harmony with Natural Communities*

Provide trailheads where feasible.

Prohibit paintball activity.

Design new recreational developments to minimize health and safety problems, protect the environment, complement recreational opportunities, and provide access.

As needed and feasible, include facilities such as beaches, boat ramps, cabins, electricity, fish cleaning stations, flush toilets, hardened campsites, hot showers, parking lots, roads, picnic shelters, sewer or dump stations, water, and user conveniences at developed sites.

Design developments oriented to pedestrians. Design trail access to encourage walking between sites.

Design roads and trails to accommodate the high-density recreation use and related activities associated with the area.

Provide and maintain hiking, horse, mountain bicycle, interpretive trails, and service trails where applicable.

Permit hunting except within the marked recreation area boundaries. Hunting may be permitted within the boundaries if conditions warrant and line officer approves.

Fees may be charged.

### *Provide a Useable Landbase*

Roads in certain areas of developed sites may be closed to allow for recreation site rehabilitation or to concentrate use during off-season to provide services more efficiently.

### *Provide for Human and Community Development*

- \* Provide and maintain buildings and structures for recreation opportunities. Emphasize visually appealing facilities and safety.
- \* Dispose of solid waste generated from developed sites at approved sanitary landfills.

Recycling may be provided.

Clearly mark developed recreation area boundaries.

Make dead and down wood available for firewood whenever feasible.

Bury utility lines and pipelines when possible.

## MANAGEMENT AREA 8.1

### Desired Condition of Management Area

These are the Research Natural Areas (RNAs). This designation allows unique ecosystems to follow natural processes for scientific purposes. Research may be conducted in these areas to improve understanding of natural processes and to increase the benefits from our forests.

The Hoosier has one Research Natural Area, the Pioneer Mothers Memorial Forest, an 88-acre old growth hardwood forest.

The RNA program is a cooperative partnership with Forest Service Research. RNA's require preparation of an Establishment Record, approved by the Forest Supervisor and the Research Station Director. The Chief of the Forest Service has approval authority to designate these areas. No RNA's are proposed at this time. The Forest Supervisor and Station Director have responsibility for record keeping, recommending, reviewing, and approving research and management activities in RNA's.

These nationally significant areas must meet one or more of the following criteria:

- Contributes to the diversity of plant communities and wildlife habitat.
- Typifies important forest, shrubland, grassland, alpine, aquatic or geologic types.
- Represents special or unique characteristics of scientific interest and importance.
- Helps carry out provisions of laws, such as providing habitat for endangered species.
- Protects or maintains special aquatic, geologic, or heritage resources or potential natural communities.

The rare or outstanding values of the areas are the primary consideration. Other resource values and uses are secondary to the protection of the area's special values for public education and enjoyment.

Each research natural area has a specific management plan developed for management of the area. Vegetation management occurs if it is compatible with the purpose of the designation and is addressed in the management plan for the specific area. Commercial timber harvest is not an appropriate tool.

Recreation uses are subject to the regulations that designated the specific areas. Determine access, road construction, reconstruction or closure needs during specific research natural area management plans.

## Guidance

### *Maintain and Restore Sustainable Ecosystems*

- \* Use pesticides if they are compatible with the management plan for the area.

Protect and preserve to the extent possible the natural condition of the forest or other qualities identified as the reason for its designation, while conducting research within the direction of the management plan written for the area.

### *Provide for Recreation Use in Harmony with Natural Communities*

- \* Prohibit mountain bike and horse use.
- \* Prohibit hunting and trapping.
- \* Prohibit camping.
- \* Prohibit paintball activity.

Limit developments to prevent site deterioration or protect the user from health hazards. Developments are subject to the regulations designating the area.

Permit hiking trails if they are consistent with guidelines established in the RNA management plan.

### *Provide a Useable Landbase*

Limit public motorized access to those roads on the periphery of the area.

### *Provide for Human and Community Development*

- \* Permit only those special uses and utility corridors that meet the intent of the management plan for the area.

## MANAGEMENT AREA 8.2

### Desired Condition of Management Area

These are designated special areas, which include unique or unusual botanical, ecological, geological, scenic, historic, prehistoric, or zoological values and other areas which merit special recognition and management. Management of these areas will emphasize the protection, perpetuation, or restoration of their special features and values. Management of these areas will emphasize management for Federally listed threatened, endangered, and proposed species, as well as Regional Forester sensitive species and State listed species if the species or habitat is present or has the potential to exist in the specific area.

The special areas included in Management Area 8.2 guidance as of 2006 are:

Beaver Creek	Horse Mill Branch
Browning Hill	Huron Woods
Boone Creek	Luke Knob
Buzzard Roost	Oil Creek
Carnes Mill	Pioneer Mother Memorial Forest*
Clover Lick	Plaster Creek
Deer Creek	Potts Creek
Faucett Chapel	Rockhouse Hollow
Grease Gravy	Stinking Fork Creek
Gypsy Bill Allen	Tar Springs
Harding Flats	Tincher
Hemlock Cliffs	Wesley Chapel

\*Not to be confused with the 88-acre RNA (Management Area 8.1) of the same name.

These regionally or locally significant areas must meet one or both of the following criteria:

- Be representative of unique or unusual geological, ecological, cultural, or other scientific values; or
- Have the potential to be a regional or national landmark based on natural or cultural values.

Special areas occur throughout the forest where there are special characteristics. They include cultural, historic, scientific, and scenic values as well as a variety of ecosystems and forest conditions. Plant and animal species and communities vary depending upon the characteristics of each area.

The rare or outstanding values of the areas are the primary consideration. Other resource values and uses are secondary to the protection, maintenance, and restoration of an area's special values for public education, enjoyment, and study.

Each special area has an establishment record (Appendix H).

A management plan will be prepared for each special area. Management plans identify special features of each area, area boundaries, desired conditions of the area, and specific management direction to achieve desired conditions. A special area may be designated an 8.2 Management Area before a management plan is finalized for it. With appropriate analysis

and public involvement, management activities essential for perpetuation of special features, such as unique ecosystems, may take place before final development of an area management plan.

## Guidance

### *Maintain and Restore Sustainable Ecosystems*

Inventory and evaluate biological diversity of special areas and adjoining ecosystems to the extent practical. Apply information from the inventory and evaluation to refine area management needs and plans.

Restore disturbed sites to native plant communities typical of the area. Tools applicable in these areas include, but are not limited to, burning, harvesting, seeding, and planting.

Permit research in special areas. Harvest of trees associated with research plots is acceptable.

Control or eliminate, as practical, invasive species of plants with emphasis on nonnative species. This includes native species that are degrading the area (for example, Eastern redcedar in barrens communities). Vegetation control methods include prescribed burning, girdling, cutting, herbicide use, and hand pulling.

### *Provide for Recreation Use in Harmony with Natural Communities*

Provide recreational use that is consistent with protecting the area's unique values. Determine appropriate uses in the management plan for each area based on individual site characteristics and public interest.

Where signs and other developments are used, design and construct them to limit the impacts on significant site features. Determine the compatibility of trails for hiking, mountain bike, and horse use in the special area management plan. Allow the continued use of pre-existing designated trails unless monitoring determines unacceptable resource damage is occurring from such use.

### *Provide a Useable Landbase*

Limit public motorized access to those roads on the periphery of the area. Limit Forest Service road use to administrative use and foot travel.

May provide parking for access on the periphery of each area. Keep developments to a minimum.

### *Provide For Human and Community Development*

Prohibit vegetation management unless necessary to maintain the vegetative character or ecosystem for which the area was established.

Permit pre-existing special uses and utility corridors. Permit new construction of utility corridors and special uses within existing roads and right-of-ways. Prohibit new development outside of the existing utility or road corridors.



## MANAGEMENT AREA 8.3

### Desired Condition of Management Area

This management area provides for research and scientific study of forest ecosystems. The only experimental forest on the Forest is the Paoli Experimental Forest, a 632-acre area located southwest of Paoli on the Tell City Ranger District.

The Forest Supervisor, Research Station Director, and Regional Forester may cooperatively establish further areas for research. The Forest is not considering any additional experimental forests at this time.

Research at the Paoli Experimental Forest takes an integrated, multidisciplinary approach to research problems in the Central Hardwood Forest from the landscape level to individual stand management.

### Guidance

#### *Maintain and Restore Sustainable Ecosystems*

Manage the area as needed to complete the assigned research.

Provide and maintain wildlife habitat developments.

#### *Provide for Recreation Use in Harmony with Natural Communities*

Do not encourage recreational uses, and provide no developments or facilities for recreation use. Allow foot travel.

#### *Provide a Useable Landbase*

Generally, keep this area closed to motorized public vehicles.

#### *Provide for Human and Community Development*

Vegetation management will be used to meet research objectives.

## **MANAGEMENT AREA 9.2**

### **Desired Condition of Management Area**

This management area emphasizes the protection and maintenance of environmental values. This designation serves as a holding category until further study and recommendations on specific designation can be made. There are currently no Management Area 9.2 areas on the Forest.

Forest-wide guidance will be followed and individual guidance will be developed as needed.



# Chapter 4

## MONITORING, EVALUATION, AND RESEARCH

This chapter describes how monitoring and evaluation requirements will be met. Monitoring and evaluation ensure that Forest Plan direction is being carried out and assess the quality of Forest Plan implementation (Table 4.1). In the process of evaluating the Plan, we also become aware of some modifications and changes needed. Monitoring results may be the catalyst for plan revisions or amendments.

The chapter also briefly discusses future research needs on the Forest.

### Monitoring

Monitoring is carried out to observe or record the results of management actions. This consists of collecting information from selected sources, usually on a sample basis. There are three levels of monitoring:

- **Monitoring Implementation - Was it done right?**  
This determines if prescriptions, projects, and activities are implemented as designed and in compliance with Forest Plan goals and guidance.
- **Monitoring Effectiveness - Did it work?**  
This determines if prescriptions, projects, and activities are effective in meeting management goals and direction.
- **Validation Monitoring - Is the guidance appropriate?**  
This determines if the initial data and assumptions used in developing the Plan were correct or if there is a better way to meet forest planning regulations, policies, and goals.

A monitoring and evaluation matrix (Table 4.2) contains the items to monitor and evaluate as the Forest Plan is implemented.

The monitoring requirements are designed to meet the legal requirements in 36 CFR 219 (1982). As the Forest Plan is implemented, more specific monitoring direction will be included in the program of work and project plans. This program will be responsive, dynamic, and updated as projects are proposed and added to the program of work for a particular fiscal year.

The monitoring program will be conducted to include a consideration of the effects of national forest management on land, resources, and communities adjacent to or near the Forest, and the effect upon national forest management from activities on nearby lands managed by other government agencies or under the jurisdiction of local governments. The program will be re-evaluated at least every five years (36 CFR 219.7 (f)). Monitoring and evaluation requirements will provide a basis for a periodic determination of the effects of management practices (36 CFR 219.11 (d)).

# Evaluation

An evaluation and summary of monitoring results will be written and published in an evaluation report. The report includes:

- A concise display of the results of monitoring and a statement of recommended actions, including changes in management direction, revisions, or amendments to the Forest Plan.
- A summary of available information on management indicator species (MIS) or comparable species.
- A summary of other agency monitoring activities which have a bearing on Forest management.
- A summary of accomplishments and expectations for future activities.
- An update of research needs and accomplishments.
- A summary of large scale or significant projects or programs such as storm recovery.

The report will be made available to the public. Public participation is encouraged in monitoring programs, including involvement of volunteers and partners in the actual monitoring procedures.

Five years after the Forest Plan is approved, the Forest Supervisor will review the land conditions to determine whether conditions or demands of the public have changed significantly (36 CFR 219.10 (g)). Significant changes may trigger a plan amendment or revision.

In 10-15 years, during the revision of the Forest Plan, an overall review of the annual evaluation reports will be used as one measure to analyze the management situation and identify possible needs for change in management direction. This analysis will be submitted to the Regional Forester for review prior to Plan revision.

Management reviews are also an important part of the monitoring and evaluation process. Interdisciplinary teams as well as the Forest Supervisor and Regional Forester perform management reviews periodically. These reviews may focus on information which surfaces through the monitoring and evaluation process.

Table 4.1

## MONITORING FRAMEWORK

<b>Forest Plan Monitoring (Chapter 4)</b>	<b>Monitoring and Evaluation Program (2-3 Year Schedule)</b>	<b>Monitoring and Evaluation Report</b>
Broad and Strategic. Provides the monitoring requirements and focuses on what is needed to monitor the Forest Plan. It provides the overall monitoring strategy including specific questions that need to be answered, what will be monitored, timetables for reporting, and other information.	Focused and Technical. Describes how, where, and when to accomplish the monitoring prescribed in the Forest Plan. It provides the specific methods, protocols, and analytical procedures. This program is flexible and is modified by the Forest leadership team in response to new information, emerging issues, species concerns, and budgetary considerations. Identifies precisely what will be monitored and by whom for the upcoming 2-3 years.	Specific, Technical, and Prescriptive. The Forest interdisciplinary team reviews the current year's projects and collects and documents the monitoring and evaluation results. These findings are documented in a report along with recommended changes to project design or implementation, the Monitoring and Evaluation Program, the Forest Plan, or Forest Service Manual or Handbook.

## Monitoring and Evaluation Program

Specific monitoring items, measuring frequencies, methodologies, precision, and reliability are identified in the annual Monitoring and Evaluation Plan.

Table 4.2

### MONITORING AND EVALUATION MATRIX

Monitoring Requirement or Question	Method	Resource to be Measured	Frequency	Reliability
PROGRAM ACCOMPLISHMENTS				
Have objectives been met by a quantitative comparison of outputs and services with those projected by the <i>Forest Plan</i> ?	Review annual accomplishment report	Various	Annual	High
Determine research opportunities, identify State and Private Forestry (S&PF) support and coordinate needs.	Various	Various	Annual	Good
CONSERVATION OF THREATENED AND ENDANGERED SPECIES HABITAT				
Monitor effects of management on critical habitat for threatened and endangered species and ensure compliance with recovery plan objectives.	Various	T&E Species	As determined by recovery plans	High
Monitor the extent Forest management is contributing to the conservation of threatened and endangered species and moving toward short term (10-20 years) and long term (100 years) objectives for their habitat conditions and population trends.	Various	T&E Species	As determined by recovery plans	High
In cooperation with the USDI Fish and Wildlife Service, track the status of Indiana bats on the Forest by monitoring: • Occupied hibernacula to assess changes in population numbers, changes in microclimate, and the effectiveness of protective	Various	Indiana bat populations and habitat	Annual	Moderate

Monitoring Requirement or Question	Method	Resource to be Measured	Frequency	Reliability
structures currently in place <ul style="list-style-type: none"> <li>Habitat use at all sites where Indiana bats are documented on the Forest will be quantified at both the local and landscape level using GIS or comparative software.</li> <li>Annual incidental take</li> </ul>	Various	Indiana bat populations and habitat	Annual	Moderate
Determine the number of suitable roost trees available on the Forest.	Forest Inventory Assessment data	Roost trees	1-5 years	Low
MAINTAIN AND RESTORE SUSTAINABLE ECOSYSTEMS				
Is this Forest complying with guidance outlined in <i>Forest Plan</i> ?	On the ground review	Soil and water resources, and regeneration areas	Annual	High
Has the land suitability classification changed since identified in the <i>Forest Plan</i> ?	Review acres identified as suitable	Suitable and unsuitable acres	Every 10 years	Moderate
Are insect and disease population levels compatible with objectives for restoring or maintaining healthy forest conditions?	Survey for insects and disease damage	Affected trees	Ongoing with USDA-FS S&PF and Indiana Department of Natural Resources (IDNR)	High
To what extent is Forest management controlling undesirable occurrences of fire, insect, and disease outbreaks?	See above, plus monitor fire reports	Occurrences	Annual	High
What level of prescribed fire should be used to maintain desired fuel levels or mimic natural processes, maintain and improve vegetative conditions, or restore natural processes and functions to ecosystems?	Monitor areas prescribed burned and areas where a fire regime is thought to be appropriate	Affected acres	1-5 years	Moderate



<b>Monitoring Requirement or Question</b>	<b>Method</b>	<b>Resource to be Measured</b>	<b>Frequency</b>	<b>Reliability</b>
To what extent is Forest management contributing or responding to air quality effects on ecosystems, human health, or human enjoyment?	As identified in regulations	Air in vicinity of prescribed burns	Annual *	Moderate
Are harvested lands adequately restocked within 5 years?	Stocking surveys on regenerated acres	Reforested acres	3 <sup>rd</sup> year after activity	High
Are the effects of Forest management resulting in significant changes to productivity of the land?	Varied	Acres affected by management	Annual	Moderate
Have there been changes in cave environments?	Various	Caves	Various *	Moderate
Is the right mix of even-aged and uneven-aged management being used and in the correct forest types to meet objectives?	Monitor size limits of harvest areas	Timber sales	Annual and compare to restocking surveys	Monitor
Does location and shape of even-aged harvests blend with the natural terrain?	Use ELTP boundaries for layout	Regenerated areas	Annual *	High
To what extent are management, natural disturbances, and subsequent recovery processes changing the vegetation composition, special patterns, and structure? Are conditions moving toward short-term and long-term objectives?	Vegetative inventory	Various	Every 5 years	Moderate
Are appropriate harvest methods, management intensity, and utilization standards being used?	On harvest areas, sale administrators will monitor utilization. Stocking surveys will determine if harvest methods was successful.		As EA's and Activity Reviews are done *	High
What are the population trends of management indicator species?	Done in cooperation with IDNR	MIS populations by their relationship to habitat changes	5 years	Moderate

<b>Monitoring Requirement or Question</b>	<b>Method</b>	<b>Resource to be Measured</b>	<b>Frequency</b>	<b>Reliability</b>
Are even-aged management practices benefiting wildlife species?	Done in cooperation with IDNR	Ruffed grouse populations by their relationship to habitat changes	5 years	High
What is the status of oak and hickory on established regeneration plots dating to 1985 Purdue study?	Monitor species data	Plot data on tree species from 1980's clearcuts	Every 15 years	High
To what extent is Forest management contributing or responding to populations of terrestrial or aquatic non-native invasive species that threaten native ecosystems?	Monitor trends in known populations of invasive species	Invasive populations	Monitor some populations	Moderate
How will diversity be affected by various mixes of resource outputs and uses? Ensure that the diversity of plant and animal communities is at least as great as that which would be expected in a natural forest and that reductions in diversity are prescribed only where needed to meet overall multiple use objectives.	Inventory population data on plant and animal communities on established plots or transects	Species observed	5 years	Moderate
<b>MAINTAIN AND RESTORE WATERSHED HEALTH</b>				
To what extent is Forest management affecting water quality, quantity, flow timing, and the physical features of aquatic, riparian, or wetland ecosystems?	Sampling of water features on Forest	Streams, riparian and wetland areas	Various *	Moderate
Have the soil and water mitigation and protection measures been effective as applied to all management activities?	Measure soil compaction and movement	Soil and water mitigation and protection measures	Various Activities Annual *	Moderate

<b>Monitoring Requirement or Question</b>	<b>Method</b>	<b>Resource to be Measured</b>	<b>Frequency</b>	<b>Reliability</b>
<b>PROTECT OUR HERITAGE RESOURCES</b>				
Are mitigation and protection measures correctly applied for ground disturbing activities?	Monitor project design and visual inspection of project areas	Number of heritage sites or projects	Annual	High
Are heritage resources being damaged by vandalism?	Visual inspection of site area	Number of heritage sites	Annual	High
<b>PROVIDE FOR A VISUALLY PLEASING LANDSCAPE</b>				
Is the Forest evaluating the visual resource?	Monitor project design and implementation	Forest-wide landscapes	Annual *	High
<b>PROVIDE FOR RECREATION IN HARMONY WITH NATURAL COMMUNITIES</b>				
Are we limiting and distributing visitor use in wilderness in accord with periodic estimates of the maximum levels of use that allow natural processes to operate freely and so as not to impair the values?	Monitor wilderness resources according to Wilderness Implementation Schedule	Entire wilderness	5 years	High
Consideration of establishment of physical facilities, use regulations, and recreation opportunities responsive to current and anticipated user demands.	Monitor public feedback to trailhead, campground, sign, and restroom designs and functions, including accessibility.	Forest-wide	Annual	High
Is trail use planned and implemented to protect land and other resources, promote public safety, and minimize conflicts, with other users of the NFS lands?	Monitor selected trails. Evaluate the type and amount of use.	Forest-wide	Annual	High

Monitoring Requirement or Question	Method	Resource to be Measured	Frequency	Reliability
PROVIDE A USEABLE LANDBASE				
Does the Forest's land adjustment program support and enhance the Plan's desired conditions and goals and contribute to efficient and effective stewardship?	Monitor public feedback on land adjustment activities	Comments and issues identified	Ongoing	Moderate
Are temporary roads closed and revegetated within 10 years of contract or permit termination?	Inspect temporary roads after closure or permit termination	Miles of temporary road	5 years	High
To what extent is the Forest, in coordination with other public agencies, providing safe, cost effective, minimum necessary road systems for administrative and public use?	Meetings with public agencies and following FSH and FSM guidelines	Miles and standards of roads	*	High
PROVIDE FOR HUMAN AND COMMUNITY DEVELOPMENT				
Are there emerging issues, concerns, and opportunities?	Monitor public comments and contacts in community	--	Ongoing	Moderate
Have output levels and mixes of goods and services demanded by society changed significantly when compared with those levels projected by the Forest Plan?	Demand analysis	Various resources	5 years	Moderate
How do actual costs of carrying out planned management compare to cost estimates?	Budget analysis	Unit costs	Annual	High
Are timber sales meeting Forest Plan ASQ?	Annual sale report	Ccf sold	Annual	High

\* As determined by Environmental Assessments, Activity Reviews, or Program Reviews.

# Steps in monitoring and evaluation and procedures to update the Forest Plan

## ***Monitoring***

- Forest staff assistance trips
- Management reviews
- Routine observations
- Site-specific observations by specialists
- Accomplishment reports
- Discussion with other agencies and public users

## ***Evaluation***

- Annual evaluation of monitoring results by interdisciplinary team and Forest staff
- Forest staff review evaluation on an annual basis
- General management review based on identified problems, generally on a 5-year basis
- Regional management reviews as needed
- Overall evaluation of annual reports by Forest Supervisor

## ***Recommendations***

- Monitoring and Evaluation Team conducts annual review and evaluation with recommendation to Forest Supervisor
- Regional management reviews recommendation to Regional Forester
- Forest Supervisor makes recommendation for Plan revision or as needed for a significant amendment

## ***Decision***

- Forest Supervisor's decision on nonsignificant amendments to Plan, documented in evaluation report
- Forest Supervisor's decisions on a need to recommend significant amendment or revision
- Regional Forester's decision on the need for significant amendment or revision

## **Research Needs**

Research and monitoring are related activities that allow for adaptive management of national forests. Research activities include planning, design, quality control, and peer review of studies, and relatively rigid publication standards. Monitoring, in contrast with research, is generally conducted under less controlled conditions and results are often more general. Research needs for management of the National Forests are identified during the planning process and reviewed periodically during monitoring and evaluation of the implemented Forest Plan.

Research is often done on an ad hoc basis as opportunities arise with other agencies or universities. Some needs, included here, have been identified during forest planning; other needs which surface as a result of monitoring will be reported in the annual Monitoring and Evaluation Reports.

## **Conservation Of Threatened And Endangered Species Habitat**

Research is needed to determine the distribution, abundance, genetics, ecology, and needs of endangered and threatened species.

## **Maintain And Restore Sustainable Ecosystems**

Native plant communities need to be better defined in terms of floral composition, distribution, genetics, abundance, site relationships (soil, slope, and aspect), indicator plants, and ecological requirements. The ecological classification system needs further development and analysis to increase understanding of natural communities, particularly site relationships affecting population distribution and abundance.

Research is needed to determine the current and historic distribution and relative abundance of animal species and communities and their ecological relationships with plant communities.

Research is needed to determine the effects of management for early successional forest habitat on biological diversity. Better understanding of the needs of young forest plant and animal species and communities, including Neotropical migrant birds, is a specific research need.

Effects need to be determined on biological diversity of management for extensive, closed-canopied forest; of forested corridors which link forest areas across the landscape; of old growth forests; and of restoration of natural plant communities. Better understanding of the needs of forest interior plant and animal species and communities, including Neotropical migrant birds, is a specific research need.

Research could focus on defining conditions that cause oak to regenerate well within those ecosystems (ECS units) where oak is a natural member of that plant community or successional or seral stage. Research needs to identify methods to ensure desired amounts of oak regeneration and the role of natural species selection in determining the final stand composition.

Better information needs to be developed on what plant species can coexist in a stable community and what appropriate control objectives and activities should be undertaken when these communities become out of balance or are invaded by exotic species. Research is needed to determine what native plants are best suited to what activities and how they can best be established.

More information on vegetation response to prescribed fire is needed to help managers make better decisions for timing and uses of prescribed fire in central hardwoods management. Determine the effects of prescribed fire and various silvicultural treatments on animal and plant species in the area, including beneficial effects to native plants and potential adverse effects to nonnative plants, animals, and karst systems.

## **Maintain And Restore Watershed Health**

Research is needed on the effect of different types of stream crossing structures on aquatic species and stream channel hydrology.

Research is needed on presettlement stream geomorphology and hydrological function.

## **Protect Our Heritage Resources**

Conduct non-project driven surveys to locate heritage resources on the Forest. Work toward completing surveys for all NFS lands.

Continue research of rock shelters including those at the end of their developmental cycle, i.e. those that are collapsed or have completely filled in. Because these may contain the oldest deposits, research will contribute to our understanding of the earliest humans.

Develop heritage contexts as an aid in evaluating the significance of heritage resources. Focus research on each context and identify prominent examples for intensive excavation. Interpret a range of these sites.

Emphasize oral history interviews of local elderly people to record unwritten history.

Research and compile a Forest history to document our contribution to the region and celebrate our organizational past.

## **Provide For A Visually Pleasing Landscape**

Research is needed on the role of the visual management system and its effectiveness in national forest management.

## **Provide For Recreation In Harmony With Natural Communities**

The Forest, working in partnership with interested groups, has the opportunity to develop many options for recreational users. More specific information is needed on current use and demand for recreation facilities now present on the Forest, along with an analysis of developing trends, and emphasis on areas needing future development.

The Forest also needs information on how to best market or de-market recreational opportunities available on the Forest to provide services to a higher percentage of the public.

## **Provide A Useable Landbase**

No research needs identified at this time.

## **Provide For Human And Community Development**

Effects of predicted long-term climate change on biological diversity in the Forest need to be monitored.

Management techniques need to be refined for acceptable hardwood regeneration, harvest schedules, and yield predictions for both even- and uneven-aged management.



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# Appendix A

## GLOSSARY

**Acid Rain** – The deposition of a variety of acidic pollutants in either wet (rain, snow, or fog) or dry forms (gas or dust particles).

**Acid-Seep Spring** – Springs or seeps form at the base of a slope where groundwater intersects with the land. Acid results from the soil type characteristics or from acid mine drainage.

**Acid Soil** - A soil with a pH value less than 7.0.

**Alliance** – A level of the National Vegetation Classification of existing vegetation. An alliance is a terrestrial plant community that is distinguished from other alliances by dominant or diagnostic species found in the canopy layer. The concept of an alliance is similar to a “cover type.” A cover type includes one or more alliances when the dominant species are widespread over varied environmental conditions.

**Allowable Sale Quantity (ASQ)** - The quantity of timber that may be sold from the area of (ASQ) suitable land covered by the forest plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the “average annual allowable sale quantity.”

### ***All-Weather Road versus Dry-Weather Road***

***All-Weather Road*** - A road capable of being used by two-wheel drive sedans or similar vehicles during all weather conditions, with only minor or short-term restrictions, such as following heavy snows. On the Hoosier, all-weather roads would normally be either aggregate surfaced or paved.

***Dry-Weather Road*** - A road that normally can be used by two- and four-wheel drive trucks and logging equipment without causing environmental damage only during dry weather or during the drier seasons of the year. On the Hoosier, dry-weather roads would normally be unsurfaced dirt roads or roads surfaced with native materials only.

**Alternate Roost** – While primary roosts typically house substantial aggregations of female bats and their young, smaller numbers of these bats may use alternate trees as roosts depending on weather and ambient temperature. In general, while primary roosts are typically exposed to solar radiation, alternate roosts may be located beneath the forest canopy. Alternate roosts may be widely distributed across the landscape in relation to a maternal colony’s primary roost or roosts; presumably this allows a maternal colony to select the most suitable microclimates or foraging area. Alternate roosts tend to be more variable in size than are primary roosts, a maternal colony may use as many as 33 alternate roosts in addition to a primary roost or roosts.

**Aquatic Ecosystems** - Stream channels, lakes, estuary beds; water; biotic communities; and the habitat features that occur therein.

**Arthropod** – Any member of a large group of invertebrate animals with jointed legs and a

segmented body: the arthropods include crustaceans, arachnids, insects, and myriapods.

**Aquatic passage** – The ability for aquatic organisms to pass through a stream crossing structure.

**Archaeological resource** - Any material remains of prehistoric or historic human life or activities which are of archaeological interest and are at least 50 years of age, and the physical site, location, or context in which they are found.

**ASQ** - See Allowable Sale Quantity.

**Barrens** – Characterized by species of canopy trees tolerant of xeric conditions, which have a stunted, open-grown appearance, also characterized by the dominance of native warm-season grasses and prairie forbs, and, in glades, significant exposures of bedrock.

**Basal Area** – The cross sectional area of all stems of a species or all stems in a stand measured at breast height and expressed per unit of land area.

**Benchmark** - {A part of the analysis} to define the range within which alternatives can be constructed.

**Benthic** – Pertains to the plant and animal life whose habitat is the bottom of a sea, lake or river.

**Best Management Practices (BMPs)** – a practice or usually a combination of practices that are determined by a state or a designated planning agency to be the most effective and practicable means (including technological, economic, and institutional considerations) of controlling point and nonpoint source pollutants at levels compatible with environmental quality goals.

**BF** - See Board Foot.

**Biological Diversity** – The variety and abundance of life forms, processes, functions, and structures of plants, animals, and other living organisms, including the relative complexity of species, communities, gene pools, and ecosystems at spatial scales that range from local through regional to global.

**Blind Valley** - A valley that ends suddenly at a point where its stream disappears underground; some blind valleys have no present day streams.

**BMPs** – See Best Management Practices

**Board Foot (BF)** – The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide. MBF - One thousand board feet. MMBF - One million board feet.

**Bottomland** – Lowlands along streams and rivers, usually on alluvial flood plains that are periodically flooded. These are usually forested and are sometimes called bottomland hardwood forests.

**Canopy** – 1. The foliar cover in a forest stand consisting of one or several layers. 2. The overhead branches and leaves of streamside vegetation.

**Carrying Capacity –**

**Ecological:** The maximum number or biomass of organisms of a given species that can be sustained or survive on a long-term basis within an ecosystem.

**Recreational:** The number of recreation users an area can accommodate during a given period of time and still provide protection of the resources and satisfaction of the users.

**Cave** – Any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge and which is large enough to permit a person to enter, whether the entrance is excavated or naturally formed. Such term shall include any natural pit, sinkhole, or other opening which is an extensive of a cave entrance or which is an integral part of the cave. A significant cave is one which has been designated in accordance with 36 CFR 290.

**Caver** - One who explores caves as a sport.

**Cleaning or Weeding** – A release treatment made in an age class not past the sapling stage to free the favored trees from less desirable individuals of the same age class that overtop them or are likely to do so.

**Clearcutting** – 1. A stand in which essentially all trees have been removed in one operation – note depending on management objectives, a clearcut may or may not have reserved trees left to attain goals other than regeneration 2. A regeneration or harvest method that removes essentially all trees in a stand.

**Cliffs or Overhangs** – For the purposes of the Hoosier, these terms are defined as rock outcrop areas 15 feet or more in height and 100 feet or more in length.

**Colluvial Soils** – Mixed deposits of soil material and rock fragments accumulated near the base of steep slopes through soil creep, landslides, and local surface run off.

**Commercial Thinning** – Any type of thinning producing merchantable material at least equal to the value of the direct costs of harvesting.

**Community** – An assemblage of plants and animals living together and occupying a given area.

**Cord** - A stack of fuelwood, pulpwood, or other material that measures 4 x 4 x 8 feet or 128 cubic feet, including wood, bark, and empty space within the stack.

**Corridor** – 1. A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries. 2. (Wildlife Corridors) The joining of fragmented habitats which helps to increase the gene flows between the individual habitats improving the fitness of species. Wildlife corridors are created as a means of conservation or general improvement of the environment.

**Critical Habitat** – 1. The specific areas within the geographic area occupied by a federally listed species on which physical and biological features are found that are essential to the conservation of the species and that may require special management or protection. 2. Specific areas outside the geographical area occupied by the species at the time it is listed in

accordance with the provisions of Section 4 of ESA, upon a determination by the Secretary that such areas are essential for the conservation of the species.

**Crop Tree Release** - A treatment designed to free young trees from undesirable, usually overtopping, competing vegetation.

**Cumulative Effects** – The combined effects resulting from sequential actions on a given area, note significant cumulative effects can result from individually minor but collectively important actions taking place over a period of time because of their being interconnected or synergistic.

**Developed Recreation** - Activities associated with man-made structures and facilities that result in concentrated use of an area. Examples are campgrounds and picnic areas.

**Diameter at Breast Height (DBH, dbh)** – The diameter of the stem of a tree measured at breast height (4.5 feet) from the ground.

**Disk** – A plow drawn by a tractor or skidder having one or more heavy, round, concave, sharpened, freely rotating steel disks angled to cut and turn a furrow, note a disk is used in site preparation or in the construction of firelines.

**Dispersed Recreation** - In contrast to developed recreation, these activities are associated with low-density use distributed over large expanses of land or water. When provided, facilities are more for protection of the environment than for comfort or convenience of the visitor.

**Diversity** - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

**Duff** - The partially decomposed organic material on the forest floor beneath the litter of freshly fallen twigs, needles, and leaves.

**Dry-Weather Road** - See All-Weather Road.

**Ecological Landtype (ELT)** - An integrated mapping unit designed at a specific hierarchical level in the ECS. Typical size generally ranges from tens to hundreds of acres.

**Ecoregion** - A continuous geographic area having a relatively uniform macroclimate, possibly with several vegetation types, used as an ecological basis for management or planning.

**Ecosystem** – A spatially explicit, relatively homogeneous unit of the earth that includes all interacting organisms and components of the abiotic environment within its boundaries.

**Edge** – The more or less well-defined boundary between two or more elements of the environment, e.g., a field adjacent to a woodland or the boundary of different silvicultural treatments.

**Edge Effect** – The modified environmental conditions or habitat along the margins (edges) of forest stands or patches.

**Effects** – Include: (a) Direct effects, which are caused by the action and occur at the same time and place; (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth

inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

**Endangered Species** – Any species which is in danger of extinction throughout all or a significant portion of its range.

**Ephemeral Stream** - A stream or portion of a stream that flows only in direct response to precipitation, receiving little or no water from springs and no long continued supply from snow or other sources, and whose channel is at all times above the water table.

**Erosion** - The wearing away of the land's surface by running water, wind, ice, gravity, or other natural or anthropogenic agents, including such processes as gravitational creep and tillage; kinds of erosion include the following:

**Geological** - The normal or natural erosion caused by geological processes acting over long geologic periods and resulting in the wearing away of mountains, the building up of floodplains, coastal plains, etc. Also called natural erosion.

**Erosion and sedimentation** - Refer to two phases in the process of detaching material in one place, transporting and depositing in another. *Erosion* refers to the detachment and transport of material and *sedimentation* to its deposition. Particulate material is called *sediment* once transport has begun.

**Even-aged Management** - The application of a combination of actions that results in the creation of a stand in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes throughout the forest area). The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

**Exotic** – A plant or species introduced from another country or geographic region outside its natural range.

**Fauna** – The animals of a specified region.

**Fertility (Soil)** – The quality of a soil that enables it to provide nutrients in adequate amounts and in proper balance for the growth of specified plants when other growth factors, such as light, moisture, temperature, and the physical condition of the soil, are favorable.

**Fire Intolerant Species** - A species with morphological characteristics that give it a higher probability of being injured or killed by fire than a fire-tolerant species, which has a “relatively low” probability of being injured or killed by fire.

**Fire Management** - All activities required for the protection of burnable wildland values from fire and the use of fire to meet land management goals and objectives.

**Fire Tolerant Species** - A plant species with morphological characteristics that give it a lower probability of being injured or killed by fire than a fire-intolerant species, which has a relatively high probability of being injured or killed by fire.

**Floodplain** – 1. A nearly level area situated on either side of a channel which is subject to overflow flooding. 2. As defined by Executive Order 11988, as amended, lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent (100 year recurrence) or greater chance of flooding in any given year.

**Forage** – Browse and herbage that is available either naturally or produced seasonally or annually on a given area that can provide food for grazing animals.

**Foreground (Visual Distance Zone)** - That part of a scene, landscape, etc., which is nearest to the viewer, and in which detail is evident, usually within 1/4 to 1/2 mile from the viewer.

**Forest** - When used with a capital F, this term refers to the Hoosier National Forest, including the landbase and administrative staff.

**Forest Land** - Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for nonforest use. Land developed for nonforest use includes areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and powerline clearing of any width.

**(Forest Land) Not Appropriate** - Lands not selected for timber production in the Forest plan alternative due to; (1) the multiple-use objectives for the alternative preclude timber production; (2) other management objectives for the alternative limit timber production activities to the point where management requirements set forth in 36 CFR 219.27 cannot be met; and (3) the lands are not cost-efficient, over the planning horizon, in meeting forest objectives that include timber production. Lands not appropriate for timber production shall be designated as unsuitable in the selected alternative and Forest plan.

**(Forest Land) Suitable** - Lands where timber production is an objective.

**(Forest Land) Unsuitable** - Forest land that is not managed for timber production because (1) the land has been withdrawn by Congress, the Secretary, or the Chief; (2) the land is not producing or capable of producing crops of industrial wood; (3) technology is not available to prevent irreversible damage to soils, productivity, or watershed conditions; (4) there is no reasonable assurance that lands can be adequately restocked within 5 years after final harvest, based on experience; (5) there is, at present, a lack of adequate information to respond to timber management activities; or (6) timber management is inconsistent with or not cost-efficient in meeting the management requirements and multiple-use objectives specified in the Forest Plan.

**Forest Openings** - Openings maintained on the Hoosier to provide habitat or habitat components for plants and animals which require or are benefited by early successional stages of vegetation. May include natural openings (barrens) and other openings with native or non-native vegetation. These openings are maintained by periodic treatments, such as mowing, cutting, or prescribed burning. These included openings previously identified as "wildlife openings."

**Forest Plan** – A document that guides all natural resource management and establishes management standards and guidelines for a national forest, and that embodies the provisions of the National Forest Management Act of 1976.

**Forest Road** - A road wholly or partly within, or adjacent to, and serving NFS land that is necessary for the protection, administration, and use of NFS land and the use and development of its resources; any road, regardless of jurisdiction (county or Forest Service), class (Arterial, Collector, Local), or standard (Traffic Service Level) that is considered to be on the Forest Road network.

**Forest Road System** - The inventory or network of roads, under all jurisdictions, that are needed for transporting forest products, accommodating planned motorized access for recreation purposes, and protecting and managing the Hoosier National Forest now and in the future.

**Forest Type** – A category of forest usually defined by its vegetation, particularly its dominant vegetation as based on percentage cover of trees, e.g., oak-hickory.

**Forestry** - The profession embracing the science, art, and practice of creating, managing, using, and conserving forests and associated resources for human benefit and in a sustainable manner to meet desired goals, needs, and values.

**Fragmentation** – The process by which a landscape is broken into small islands of forest within a mosaic of other forms of land use or ownership, note fragmentation is a concern because of the effect of noncontiguous forest cover on connectivity and the movement and dispersal of animals in the landscape.

**Fuels** - Combustible material. Includes vegetation such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire.

**Goal** - A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed.

**Grapevine Control** - Grapevine control is the practice on the Hoosier of reducing grapevines in a young forested stand. The number of vines is reduced by cutting. Sprouting is minimized by shading from the residual stand. Additional control may be accomplished with herbicides applied directly to the cut surface of grapevines. Small patches of vines may be left intentionally to provide wildlife food and cover.

**Groundwater** – Water within the earth that supplies wells and springs. Specifically, water in the zone of saturation where all openings in soils and rocks are filled- the upper surface of which forms the water table.

**Water Table** - The upper surface of the ground water, below which the soil is saturated with water.

**Group Selection Cutting** – Trees are removed and new age classes are established in small groups.

**Guidance** - A term which includes both standards and guidelines permitted or limitations set on all lands on the Hoosier unless exceptions are stated.

**Guidelines** – Permissions or limitations that should be implemented in most cases to achieve the goals and objectives. Deviation from a guideline does not require a forest plan amendment, but the rationale must be disclosed in the project decision documents.



**Habitat** – 1. A unit of the environment. 2. The place, natural or otherwise, (including climate, food, cover, and water) where an animal, plant, or population naturally or normally lives and develops.

**Hardwood** – Usually broad-leaved and deciduous.

**Herbicide** - A pesticide used for killing or controlling the growth of plants.

**Heritage Resource** - Heritage resources are the physical remains of districts, sites, structures, networks, or objects used by humans in the past. They may be historic or prehistoric, archaeological or architectural in nature. Heritage resources on the Hoosier include hunting, quarrying, plant gathering, and living areas from the prehistoric period. Historic period sites (at least 50 years of age) are associated with farming, logging, and a variety of industrial pursuits. Heritage resources are land based and are non-renewable.

**Hibernacula** – The winter den of a hibernating animal (plural: hibernaculum).

**Hoosier** - When used in this document, this term refers to NFS lands of the Hoosier National Forest or the Forest Service employees who manage the Forest.

**Hydrology** – The science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

**Impoundment** – A dam or body of water upstream of a dam or weir.

**Infiltration** - The downward entry of water into the soil to the groundwater system.

**Insecticide** – A pesticide employed against insects.

**Integrated Pest Management (IPM)** - A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resource values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable.

**Intermediate treatment** – Any treatment or tending designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest.

**Intermittent Stream** – A stream, or portion of a stream, that does not flow year-round but only when it (a) receives base flow solely during wet periods, or (b) receives groundwater discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources.

**Invasive species** – An alien (nonnative) species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

**IPM** – See Integrated Pest Management.

**K-V Funds** - In 1930, Congress passed the Knutson-Vanderberg Act (K-V Act) to authorize collection of funds (K-V Funds) for reforestation and timber stand improvement work, wildlife habitat work, and other resource improvements on areas cut over by timber sales.

**Karst Topography** - The word karst is taken from an area in Yugoslavia, where karst features were first documented. Karst is a terrain, underlain by limestone, in which the topography is chiefly formed by the dissolving of rock, and which is commonly characterized by closed depressions, subterranean drainage, and caves. Features found in karst terrain include rises, swallowholes, sinking streams, blind valleys, karst valleys, gulfs, cave springs, and other karst features.

**Landbase** - A specific area of the earth's surface and all its attributes including water bodies, from which goods, services, and uses can be supplied.

**Land Easement** - An interest in land restricting the manner in which an owner may develop or use his property, or allowing the holder of the easement to use the property in some specified way.

**Landform** – Term used to describe the many types of land surfaces which exist as a result of geological activity, such as a plateau, plain, basin, mountain, etc.

**Landline** - Property boundaries located between the NFS lands and other lands.

**Land management planning** – A formal process of management planning involving four iterative steps: monitoring, assessment, decision-making, and implementation.

**Log Landing** – A cleared area in the forest to which logs are yarded or skidded for loading onto trucks for transport.

**Long Range Planning** – (U.S. Forest Service usage) Planning for the period covered by basic resource management plans, usually 10 or more years.

**Long-Term Sustained-Yield Timber Capacity (LTSY)** - The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives.

**LTSY** – See Long-Term Sustained-Yield Timber Capacity above.

**MA** – See Management Area.

**Maintenance Level** - A formally established set of objectives which describe the conditions necessary to achieve the planned operation of a road.

**Maintenance Level 1** - This level is assigned to intermittent service roads during the time management direction requires that the road be closed or otherwise blocked to traffic. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

**Maintenance Level 2** - This level is assigned where management direction requires that

the road be open for limited passage of traffic. Roads in this maintenance level are intended for use by high clearance vehicles. Passenger car traffic is not a consideration. Administrative, permitted, other specialized use, or log haul may occur at this level.

**Maintenance Level 3** - This level is assigned where management direction requires the road to be open and maintained for safe travel by a prudent driver in a passenger car. Traffic volumes are minor to moderate. Use, comfort, and convenience are not considered a priority.

**Maintenance Level 4** - This level is assigned where management direction requires the road to provide a moderate degree of user comfort and convenience at moderate travel speeds.

**Maintenance Level 5** - This level is assigned where management direction requires the road to provide a high degree of user comfort and convenience.

**Management Area (MA)** - An area with similar management objectives and a common management prescription.

**Management Direction** - A statement of multiple use and other goals and guidance for attaining them.

**Management Indicator Species (MIS)** - 1. A species whose condition can be used to assess the impacts of management actions on a particular area. 2. A species whose population changes are believed to indicate the effects of management activities, and is monitored to track population numbers and habitat conditions, as a way of monitoring biodiversity.

**Management Practice** - A specific activity, measure, course of action, or treatment.

**Management Prescription** - Management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives.

**Mast** - 1. Nuts, acorns, and similar products of hardwood species, which are consumed by animals. 2. The fruit of trees and shrubs.

**Maternity Roosts** – With respect to the Indiana bat (*Myotis sodalis*), a maternity roost is a site used by a colony of pregnant or nursing female bats and their pups as a resting location within the foraging area of the colony. Indiana bats generally have at least one primary roost which is most frequently used throughout the summer, and a number of alternate roosts which may house a portion of the colony throughout the summer, or may be used as conditions within the primary roost vary. The primary roost is typically located in an area fully exposed to the sun. Indiana bats use maternal roosts in order to provide thermal conditions that favor the development of their young.

**MBF** - One thousand board feet of timber.

**MIS** – See Management Indicator Species.

**MMBF** - One million board feet of timber.

**Modification** - A visual quality objective in which management activities may dominate the

characteristic landscape but at the same time must borrow from naturally established form, line, color, or texture.

**Mulch** - Leaves, straw, or other loose material spread on the ground around plants to prevent evapotranspiration of water from soil, freezing of roots, etc.

**Multiple-Use** - The management of all the various renewable resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people. The most judicious use will be made of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions. Some lands will be used for less than all of the resources and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources. This is not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

**National Forest System (NFS)** - All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means; the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.

**National Register of Historic Places** - A listing (maintained by the National Park Service) of areas which have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the nation as a whole.

**Native Species** – Animals or plants which originated in the area in which they are found—i.e., were not introduced and naturally occur in that area.

**Neotropical Migrant** – A songbird that overwinters in Central or South America and breeds in North America.

**NEPA** - National Environmental Policy Act.

**NFS** – National Forest System.

**NFMA** - National Forest Management Act.

**NNIS** – Nonnative Invasive Species.

**Nonforest Land** - Lands never having or incapable of having 10 percent or more of the area occupied by forest trees, or lands previously having such cover and currently developed for nonforest use.

**Nonnative invasive species (NNIS)** – A plant or animal, including its seeds, eggs, spores, or other biological material that is nonnative to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm.

**Objective** - A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise

steps to be taken and the resources to be used in achieving identified goals.

**Off-highway vehicle (OHV)** - Generally accepted broad term for planning applications when referring to the major types of vehicles used for off-highway motorized recreation.

**OHV** - See Off-highway Vehicle.

**Old-Growth Forest** - The (usually) late successional stage of forest development; old growth forests are defined in many ways.

**Overstory** - That portion of the trees in a forest, with more than one roughly horizontal layer of foliage, which forms the upper or uppermost layer.

**Paintball** – 1. A game in which players on one team seek to eliminate those on an opposing team by marking them with a water-soluble dye shot in capsules from air guns. 2. The dye-filled gelatinous capsule shot from guns in this game.

**Partial Retention** – A visual quality objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.

**Perennial Stream** - Streams that flow throughout the year and from source to mouth.

**Pest** – 1. An organism that is undesirable or detrimental to the interest of humans. 2. An organism or environmental stress which the land manager determines to be detrimental to achieving resource management objectives.

**Pesticide** - A general term applied to a variety of chemical pest control measures, including insecticides for insects, herbicides for plants, fungicides for fungi, and rodenticides for rodents.

**Planning Area** - The area of the National Forest System covered by a regional guide or forest plan.

**Policy** - A definite course or method of action selected by a governmental agency, institution, group, or individual from among alternatives and, in the light of given conditions, to guide and usually determine present and future decisions.

**Precommercial Thinning** – The removal of trees not for immediate financial return but to reduce stocking to concentrate growth on the more desirable trees.

**Prescribed Burn** – To deliberately burn wildland fuels in either their natural or their modified state and under specified environmental conditions, which allows the fire to be confined to a predetermined area and produces the fireline intensity and rate of spread required to attain planned resource management objectives.

**Preservation** - A visual quality objective that allows for ecological change only.

**Primitive** – 1. The term "primitive" is often used synonymously with dispersed or undeveloped recreation or camping use. Running water, toilets, showers, and other developed facilities are available at only a limited number of areas on the Hoosier National Forest. Most of the forest can, therefore, provide "primitive" recreation and camping opportunities. 2. A classification in the recreation opportunity spectrum. No areas on the Hoosier can provide Primitive ROS

recreation opportunities at present.

**Project** - A site-specific resources management activity or combination of activities designed to accomplish a distinct on-the-ground purpose or result.

**Pruning** – The removal, close to the branch collar or flush with the stem, of side branches (live or dead) and multiple leaders from a standing tree.

**Public Issue** - A subject or question of widespread public interest relating to management of the National Forest System.

**Public Road** - Any road under the jurisdiction of and maintained by a public road authority that is open to public travel. In the context of this definition, the Forest Service is not a public authority.

**Record of Decision** – A document signed by a Responsible Official recording a decision that was preceded by preparation of an environmental impact statement.

**Recreation Area** - A relatively small, distinctly defined portion of a national forest where concentrated public use for the more traditional recreation purposes predominates, e.g., campgrounds, picnic areas, swimming areas, etc.

**Recreation Opportunity Spectrum (ROS)** - A system of classifying the range of recreational experiences, opportunities, and settings available on a given area of land. Classifications include:

- Primitive (P)
- Semi-primitive, Motorized (SPM)
- Semi-primitive, Nonmotorized (SPNM)
- Roaded Natural (RN)
- Rural (R)
- Urban (U)

**Recreational River (Wild and Scenic Rivers Act Usage)** - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

**Reforestation** – The establishment of forest cover either naturally (by natural seeding, coppice, or root suckers) or artificially (by direct seeding or planting).

**Regeneration** – The act of renewing tree cover by establishing young trees naturally or artificially.

**Removal Cut** – In the shelterwood method of stand regeneration, a removal cut releases established regeneration from competition with the overwood. (See also "Shelterwood Cut.")

**Research Natural Areas** – A designation (by the Chief of the U.S. Forest Service) that allows unique ecosystems to follow natural processes for scientific purposes.

**Retention** - A visual quality objective in which management activities are not evident to the casual forest visitor.

**Riparian** – Related to, living in, or located in conjunction with a wetland, on the bank of a river or stream but also at the edge of a lake or tidewater.

**Riparian Areas** - Geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.

**Riparian Ecosystems** - A transition area between the aquatic ecosystem and the adjacent terrestrial ecosystems identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

**RNA** - See Research Natural Area.

**RNA-equivalent** – An area other than an RNA that can serve as a control or reference area for one or more community types in an ecological unit. To qualify, an area must be...maintained in its natural state with active management which allows for mimicking of natural processes or allows natural disturbance events to proceed without interference.

**Road** - A general term denoting a way for purposes of travel by vehicles (either motorized or nonmotorized) greater than 40 inches in width.

**Local Road** - These connect terminal facilities, such as log landings and recreation sites, with forest collector or arterial roads. They are often less than 1.5 miles long and serve a single resource. The vast majority of county and Forest Service roads on the Hoosier National Forest would be classified as local roads, but few would serve just one resource.

**Rotation** – In even-aged management, the period between regeneration establishment and final cutting.

**ROD** - Record of Decision.

**ROS** – Recreation Opportunity Spectrum.

**RPA** - Forest and Rangeland Renewable Resources Planning Act of 1974.

**Runoff** – Rain falling on an irregular surface; the amount of runoff corresponds to the amount of rainfall minus the amount of water entering the ground through infiltration.

**Sale Schedule** - The quantity of timber planned for sale by time period, from the area of suitable land covered by a forest plan. The first period, usually a decade, of the selected sale schedule provides the allowable sale quantity. Future periods are shown to establish that long-term sustained yield will be achieved and maintained.

**Salvage Cutting** – A timber sale for which an important reason for entry includes the removal of disease- or insect-infested trees, dead, damaged, or down trees, or trees affected by fire or imminently susceptible to fire or insect attack. Such term also includes the removal of associated trees or trees lacking the characteristics of a healthy and viable ecosystem for the purpose of ecosystem improvement or rehabilitation, except that any such sale must include an identifiable salvage component of trees described in the first sentence.

**Sanitation Cutting** – The removal of trees to improve stand health by stopping or reducing the actual or anticipated spread of insects and disease.

**Sapling** - A usually young tree larger than a seedling but smaller than a pole.

**Sawtimber** - Trees or logs cut from trees with minimum diameter and length and with stem quality suitable for conversion to lumber.

**Scenic River (Wild and Scenic Rivers Act Usage)** – Those rivers or sections of rivers that are free of impoundments with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

**Sediment** - Solid material, both mineral and organic, that is in suspension and being transported from its site of origin by the forces of air, water, gravity, or ice.

**Sediment basin** – A basin designed to collect sediment particles that settle out from stream flow or runoff.

**Seedbed** - In natural regeneration, the soil or forest floor in which seed falls.

**Seedling** – A tree smaller than a sapling; as typically used in forest surveys, a size class definition meaning trees less than 1 inch at dbh.

**Sense of Place** – 1. Those things that add up to a feeling that a community is a special place, distinct from anywhere else. 2. A sense of place results gradually and unconsciously from inhabiting a landscape over time, becoming familiar with its physical properties, accruing history within its confines.

**Sensitive Species** – Plant and animal species designated in the forest plan by the Regional Forester which require special consideration to assure viable populations.

**Shade Intolerant** – Having the capacity to compete for survival under direct sunlight conditions.

**Shade-tolerant** – Having the capacity to compete for survival under shaded conditions.

**Shelterwood Cutting** – The cutting of most trees, leaving those needed to produce sufficient shade to produce a new age class in a moderated environment.

**Silvicultural System** - A planned series of treatments for tending, harvesting, and re-establishing a stand; the system name is based on the number of age classes.

**Sink, Sinkhole** – A depression or hole in a low-lying, poorly drained area formed by the dissolution of underlying rock, where waters collect or disappear before sinking down into the ground or by evaporation.

**Skid Road/Trail** – An access cut through the woods for skidding.

**Slash** – The residue, e.g., treetops and branches, left on the ground after logging or accumulating as a result of storm, fire, girdling, or delimbing.



**Snag** – 1. A standing, generally unmerchantable dead tree from which the leaves and most of the branches have fallen. 2. A standing section of the stem of a tree, broken off usually below the crown.

**Special Area** – Designated areas which include unique or unusual ecological, botanical, zoological, geological, scenic, historic, prehistoric, and other areas which merit special recognition and management.

**Special Use Permits** - An authorization which provides permission, without conveying an interest in land, to occupy and use National Forest System land or facilities for specified purpose, and which is revocable, terminable and non-compensable.

**Standards and Guidelines** – Requirements which preclude or impose limitations on resource management activities, generally for the purposes of environmental protection or public safety.

**Stand (Stand of Trees)** – A contiguous group of trees sufficiently uniform in age-class classification, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

**Stand Structure** – The horizontal and vertical distribution of components of a forest stand including the height, diameter, crown layers and stems of trees, shrubs, herbaceous understory, snags, and down woody debris.

**Streambed** – Refers to the bottom of the stream channel.

**Subsurface Rights (Mineral Rights)** - Ownership rights in a parcel of real estate to the water, minerals, gas, oil, and so forth that lie beneath the surface of the property.

**Succession** - The gradual replacement of one community of plants by another; the sequence of communities is called a seral stage.

**Suitability** - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone.

**Suitable Timber Lands** – See Suitability.

**Sustained Yield (or Production)** – The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resource without impairment of the productivity of the land.

**Thinning** – A cultural treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or recover potential mortality.

**Threatened Species** - A plant or animal species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**Timber Production** - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood.

**Timber Stand Improvement (TSI)** – An intermediate treatment made to improve the composition, structure, condition, health, and growth of even-aged or uneven-aged stands.

**Tolerance** – See shade tolerant.

**Traffic Service Level** - The measure of the standard of a road or the level of service provided to the user of the road. Detailed description of the four traffic service levels can be found in Forest Service Handbook 7709.56.

**Trail** - A trail primarily on NFS land that is designated and maintained by the Forest Service as an official trail.

**Single Use Trail:** A trail that is designated for use by one user group, generally hikers.

**Multiple Use Trail:** A trail that is designated for use by two or more user groups. On the Hoosier National Forest this is limited to horse riders, mountain bikers, and hikers.

**Special Use Permit Trail:** A trail primarily on NFS land that is designated and maintained under a special use permit. The purpose of a special use permit trail is to provide a legal means for adjacent landowners to access Hoosier National Forest system trails.

**Trail Density and Cumulative Trail Density** - Trail density represents the miles of trail contained in a square mile of land. The cumulative trail density represents a cumulative figure for the total Forest acreage for that management area. The density may be exceeded on any given piece of ground as long as it is not exceeded for that management area overall. These density limits are not intended to be a target for miles of a trail in a management area.

**Trail Plan** - A strategic forest-wide trail plan that identifies existing and proposed trails, special use trail criteria, supplemental trail standards, and scheduling of proposed projects.

**TSI** – See Timber Stand Improvement.

**Understory** - The plants of a forest undergrowth; broadly, an underlying layer of low vegetation; all forest vegetation growing under an overstory.

**Uneven-aged Management** - The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

**Utility Corridor** – See Corridor.

**Vegetative Management** – The forced change of one vegetative condition to another. It can be done with hand tools, mechanical equipment, chemicals, or fire. Usually this is done to improve habitat for plant and animal species, improve forest stand quality, or provide timber products.

**Vegetative Manipulation** – Similar to vegetation management although in the context of this plan, the term is used for maintenance activities such as hand pulling of exotics, mowing, limited bushhogging, or trail maintenance activities.

**Viable Population** - A population of plants or animals whose estimated number and distribution of reproductive individuals provides a high likelihood of continued existence, generally throughout its current range.

**Visual Quality Objective (VQO)** - A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape.

**Visual Resource Management** - The art and science of planning and administering the use of forest lands in such ways that the visual effects maintain or upgrade man's psychological welfare. It is the planning and design of the visual aspects of the multiple-use land management.

**Watershed** – 1. A land area that has all the surface drainage within its boundary converging at a single point. 2. Subdivisions within a subbasin. The 5<sup>th</sup> level (10-digit) in the HU hierarchy.

**Water Table** - The upper limit of the portion of the ground wholly saturated with water.

**Wetland** - As defined by Executive Order (E.O.) 11990, those areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do support, an abundance of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions (hydric soils) for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds. Wetlands generally are encompassed by the riparian ecosystem.

**Wheelchair** - A device designed solely for use by a person with mobility impairment for locomotion, that is suitable for use in an indoor pedestrian area.

**Wilderness** - The National Wilderness Preservation Act of 1964 defines a wilderness as an area of undeveloped, Federally owned land designated by Congress that has the following characteristics: (1) It is affected primarily by the forces of nature, where man is a visitor who does not remain. It may contain ecological, geological, or other features of scientific, education, scenic, or historical value. (2) It possesses outstanding opportunities for solitude or a primitive and unconfined type of recreation. (3) It is an area large enough so that continued use will not change its unspoiled natural condition.

**Wildlife Habitat** – The place where an animal or plant naturally or normally lives and develops.

**Wild River – (Wild and Scenic Rivers Act usage)** Those rivers or section of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and water unpolluted.

# **Appendix B**

## **VEGETATIVE MANAGEMENT PRACTICES - RATIONALE FOR CHOICE**

### **INTRODUCTION**

The National Forest Management Act of 1976 (Section 6(g)(3), (E)(iv) and (F)(i)), the resulting Secretary's Regulations (36 CFR 219.15), and good management require that vegetation management practices be chosen which are appropriate to meet the objectives and requirements of the Land and Resource Management Plan.

The National Forest Management Act also states that clearcutting may be used only if it is the optimum harvest method. This appendix explains when clearcutting is the optimum harvest method. It also explains the other vegetative management practices, and the conditions for which each practice would be appropriate.

The Eastern Region recognizes 59 different forest types (FSH 2409.21d-R9, Amendment 20 June 1984). Of these, the Hoosier National Forest has 34 types, (FSH R9-Hoosier 2409.21d-200 December 12, 2001).

### **SILVICULTURAL SYSTEMS AND REGENERATION HARVEST METHODS**

Timber harvests are designed to achieve a number of resource management objectives. These include objectives for insect and disease management, species composition, timber quality, visual management, and wildlife habitat. Harvest methods are selected to achieve the management objective. There are two silvicultural systems available-- uneven-aged and even-aged.

The uneven-aged category consists of a selection method, which may be single-tree or group selection harvests. Within the even-aged category, there are three silvicultural harvest methods recognized by the Society of American Foresters (Helms 1998): clearcutting, shelterwood, and seed tree.

#### **Uneven-aged Systems**

Uneven-aged management is manipulation of a stand for continuous high-forest cover, recurring regeneration of species favored by partial shade, and the orderly growth and development of trees through a range of diameters and age classes. Selection involves the removal of both immature and mature trees, either in groups or individually, to obtain or maintain uneven-aged stand structure.

A stand is considered uneven-aged if three or more 20-year age classes are represented within the stand (Roach 1974). Harvests are conducted at 10 to 30-year intervals to obtain or maintain an uneven-aged character. Assuming trees will be cut when they reach 150 years in age, a system with a 20-year cutting cycle would have harvesting activity on approximately 13 percent of the forestland each year.

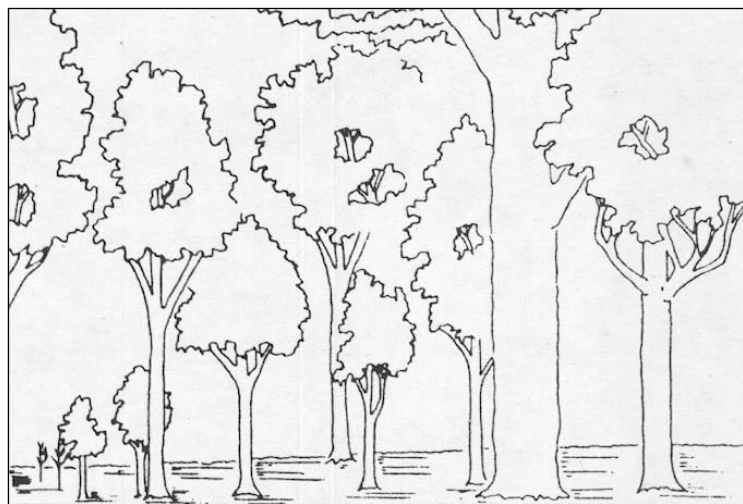
The uneven-aged system generally results in less volume growth than that of the even-aged system (Smith and DeBald 1978). This is due primarily to the high proportion of slower growing species and increased competition.

## Single-Tree Selection Method

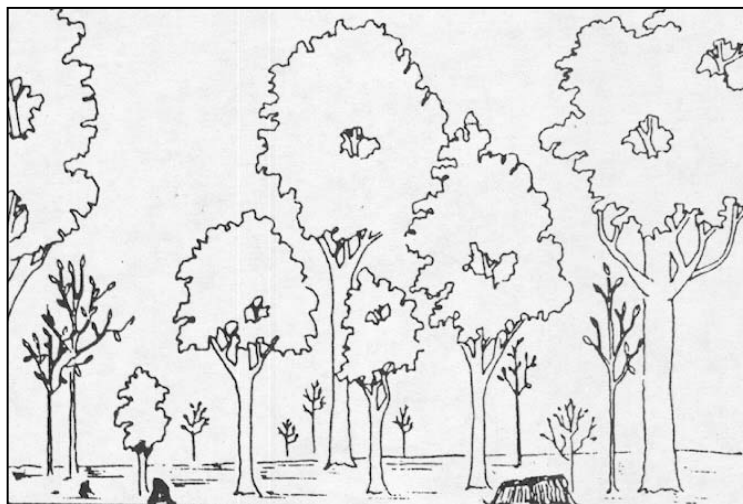
Single-tree selection is the periodic removal of individual trees. The goal is to maintain a given number of trees per acre in each diameter class. This practice should not be confused with "high grading" where only large trees are cut. For the practice to work, some trees must be cut or killed within most or all diameter classes.

Harvesting, with repeated entries, is an ongoing process in single-tree selection. Because this method allows only limited light to reach the forest floor, less shade-tolerant species are unlikely to regenerate. As those species, such as oaks and yellow-poplar, drop out of the stand, they are replaced by shade-tolerant species. These species, while less valuable than the oaks for wildlife, do have other benefits such as mast production.

Shade tolerance is a term which refers to the ability of a tree to survive and grow in shaded conditions. The primary shade-tolerant species are beech and maple. Species that are typically more intolerant of shade, include oak, cherry, and black walnut.



Stand before harvest



Stand after harvest

The single-tree selection method meets the needs of most high-forest, cavity dwelling, or closed or layered-canopy wildlife species.

This method is least beneficial for wildlife species which use openings, edges, and low browse.

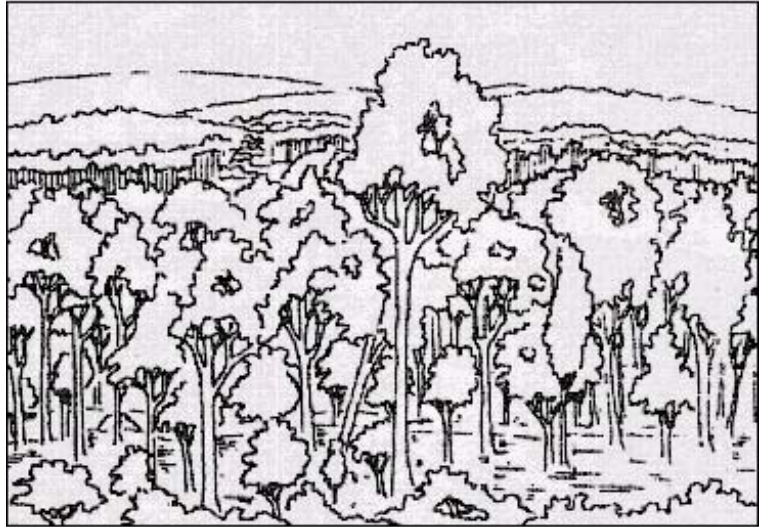
The visual resource is not greatly affected by single tree harvesting. This method provides for retaining a large-tree character in the landscape. Repeated harvest operations on a 10-30 year cycle are necessary to use this method.

## Group Selection Method

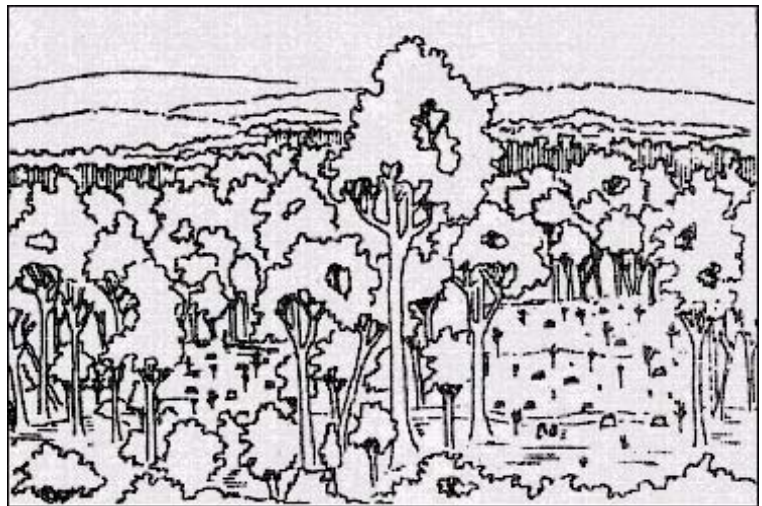
This cutting method removes trees periodically in small groups. This results in openings that do not exceed 3 acres in size. This leads to an uneven-aged stand because of differing age class groups within the stand.

In the group selection method, the management area is treated as a single stand, and the portion of the stand to be harvested each cutting cycle determines the number of openings to establish. For example, a 40-acre stand on a 30-year cutting cycle and a 150-year rotation would have 8 acres cut each entry ( $150/30=5$ ;  $40/5=8$ ). This could be 8 one-acre openings, 32 one-quarter acre openings, or some combination in between. Single tree selection may also occur between the group selection openings.

The objective of this method is to establish the desired regeneration with each harvest, thereby producing an uneven-aged stand. Because the removal of groups permits more light to reach the forest floor than does single-tree selection, group selection encourages a higher proportion of shade intolerant species such as oaks, cherry, and yellow-poplar (Minckler 1972). Openings of differing sizes and slope position will result in differences in species response (Fisher 1981). Larger openings allow a greater amount of sunlight on the forest floor resulting in more shade intolerant species (Minckler 1989). Table B.5 shows the shade tolerance of selected species occurring in the central hardwood region (Mills *et al* 1987). The aesthetic and wildlife benefits of group selection harvest depend largely upon group size, spacing, and frequency.



Stand before harvest



Stand after group selection cut

In a study of small groups with no pre- or post-harvest treatment, the majority of the groups regenerated to a mixture of sugar maple, yellow poplar, and dogwood (Weigel and Parker 1997).

This system develops a vegetative condition with an interconnected canopy and many small openings (1/10 acre to 3 acres in size) simulating a checkerboard pattern within a forested environment. Wildlife that favor areas of group selection harvests prefer mature forests, forest edges, and small patches of young forest. Small openings and seedling-sapling sized groups are perpetuated throughout the forest, providing the earlier stages of plant succession required by some wildlife. The mosaic of seral stages resulting from several entries of group selection includes interconnected groups of larger trees of different canopy heights, providing habitat for species adapted to a mature forest.

## **Even-Aged Systems**

Even-aged harvest methods create stands in which trees of essentially the same age grow together. A stand is considered even-aged if the difference in age between the oldest and youngest trees of the managed stand does not exceed 20 percent of the length of rotation. This is 24 years for a 120-year rotation. With any of these systems, the size, shape, and dispersion of harvest units are configured to achieve multiple-use management objectives of the area.

The rotation age under an even-aged management system is the number of years between establishment of a stand of timber and when it is considered ready for harvesting and regeneration. If a forested area is being managed on a 100-year rotation, about 10 percent of the area would be regenerated each decade, or 1 percent per year. During a rotation, there may be one or two thinnings before the next regeneration harvest. Individual stands managed under an even-aged system are entered for some type of cutting about one-half as often as stands managed under uneven-aged systems.

Habitats perpetuated through even-aged management activities most closely resemble today's forest of a mixed, predominantly single-aged stand. Oak and hickory species were dominant on the Brown County Hills and Crawford Uplands. American beech, sugar maple, oaks, and hickories were dominant on the limestone soils of the Mitchell Karst Plain and Crawford Escarpment. (Thompson 2004). Many of these old forests had several oak species in their overstories due to the disturbance regimes of the Native American and European settlement periods (DenUyl 1954).

Even-aged management has the potential to provide early successional stages in patch sizes large enough to satisfy life requirements of most species of wildlife that require early successional habitats and still provide large interconnected stands of larger trees.

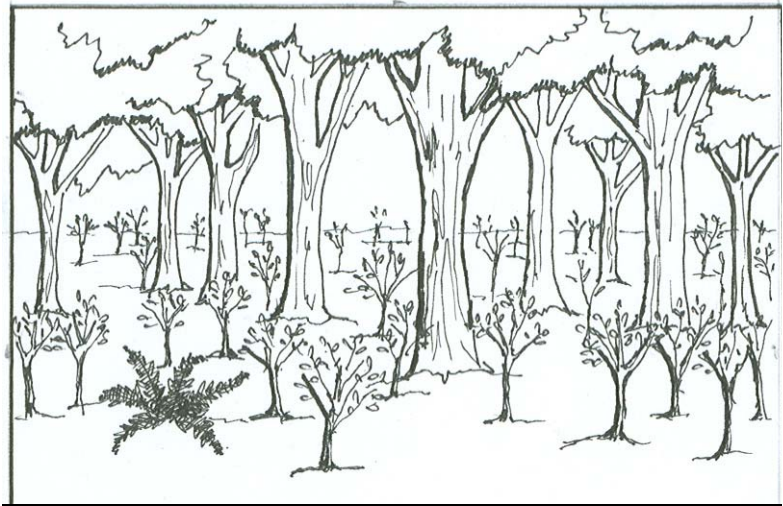


## Shelterwood Harvest Method

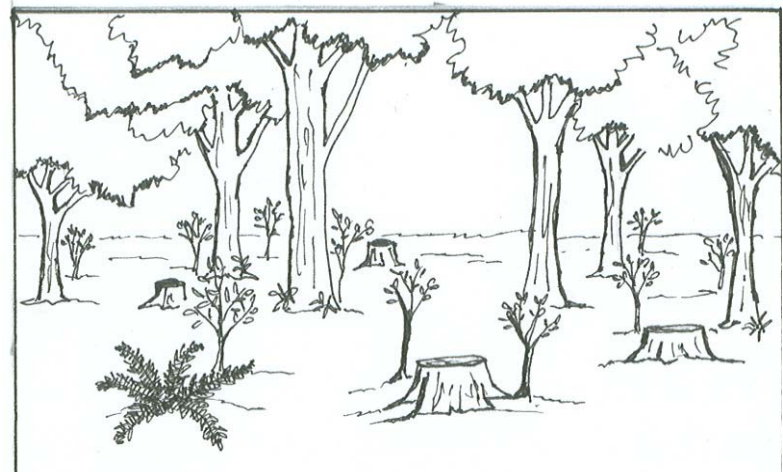
In the shelterwood method the mature stand is removed in a series of two or three cuts. The early cuts are designed to improve vigor and seed production of the remaining trees while preparing the site for new seedlings. The final harvest is made when a sufficient amount of desirable reproduction has become established and before the regeneration has reached 20 percent of its rotation age. This method provides a partial cover of trees which shelters the new seedlings. When the shelter becomes a hindrance to the growth of the seedlings, rather than a benefit, it is necessary to remove the remainder of the mature stand (Smith *et al* 1997). In central hardwoods, research has found that this will occur within 10 years (Sander and Clark 1971). Some large trees could be left for wildlife and visual purposes.

The shelterwood method is most appropriate for tree species or sites where the shelter of a partial overstory is needed for reproduction or where visual concerns warrant.

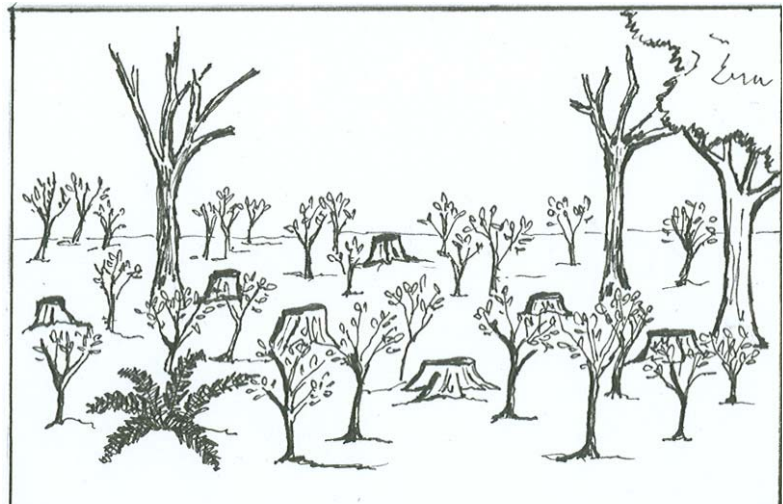
The method provides conditions favorable to regeneration of a wide variety of hardwood species and has frequently been advocated for oaks (Johnson 1992, Johnson *et al* 2002, Siefert *et al* 2004). The individual species favored depends on several physical and biological factors such as seed source, soil conditions, seedbed conditions, amount of shade, and forest floor microclimatic conditions.



Before harvest



After shelterwood seed tree cut



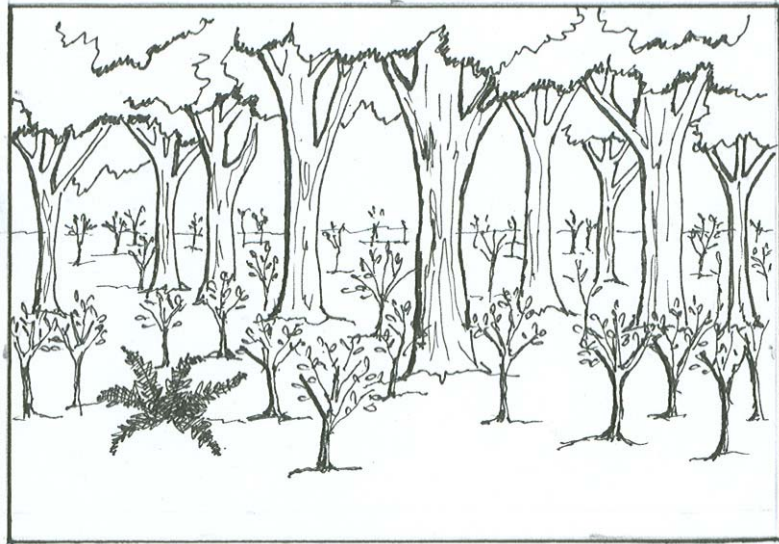
After removal of shelterwood



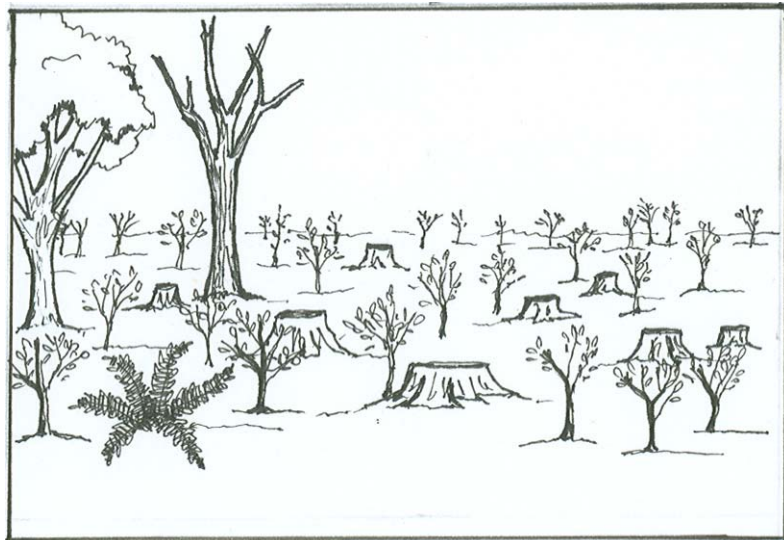
By regulating the density of trees held between the early cuts and the removal cut, the species composition of the new stand can be regulated. Leaving a denser stocking after the early cuts will tend to regenerate more shade-tolerant species, leaving a lighter stocking provides for more shade-intolerant species.

## Clearcut Method

In clearcutting, with the exception of trees that may be left for wildlife or visual purposes, all merchantable trees on an area are harvested at one time. Small unmerchantable trees are also felled to eliminate competition with the regeneration. Regeneration develops from natural seeding before or after harvests, advanced regeneration, and the sprouting from cut tree stumps. This regeneration method favors establishment and development of species more intolerant of shade. Clearcutting can slow the change from oak-hickory to the more mesic mixed hardwoods that is presently occurring on the Forest because of the absence of disturbance. Clearcutting provides vegetation in an early successional stage. In an unmanaged situation this successional stage could be caused by wildfire, insects, diseases, or windthrow. Without manmade or natural disturbances, the forest tends to move toward a condition dominated by shade-tolerant, late successional vegetation such as sugar maple and beech.



Even-aged stand before harvest



After harvest by clearcutting

Clearcutting is an effective method used to obtain desirable natural regeneration in central hardwood stands, although the regeneration of the oaks is still a problem (Mills *et al* 1987). Early results from an ongoing study conducted on the Hoosier show natural oak regeneration after clearcutting can result, over time, in a stand with an oak component. In approximately 70 percent of the sampled stands, oak composition has reached pre-harvest levels (Seifert *et al* 2005). Clearcutting normally results in more seedlings and new

sprouts than any other harvest method. Where regeneration of oak and hickory is of primary importance, advanced reproduction of these species is essential prior to harvesting the overstory (Sander and Clark 1971). Experience has also shown that other factors, such as site quality, aspect, and slope position affect the composition of natural regeneration. The oaks and hickories compete better on poor, dry sites with south and west exposure. The amount of oak regeneration and ability to occupy the stand can be enhanced through the use of prescribed burning. Burning helps to shift the regeneration from sugar maple, beech and yellow poplar to more oak (Van Lear 2000, Brose *et al* 1999).

Clearcutting is especially appropriate for stands where high grading has been used in the past, or in areas which have insufficient trees to adequately use growing space.

## Choice of Harvest Method

Uneven-aged management may be selected and applied to accomplish one or more of the following objectives.

- Provide continuous forest cover
- Meet wildlife habitat composition objectives
- Provide vertical diversity within a stand
- Provide a variety of age and type classes within stands
- Manage certain stands that are visually sensitive
- Protect sensitive riparian areas
- Meet visual quality objectives
- Regenerate shade-intolerant species, such as sugar maple and beech

Even-aged management may be selected and applied to accomplish one or more of the following:

- Meet wildlife habitat composition objectives
- Provide a variety of age and type classes among stands
- Regenerate less shade-tolerant species such as oak and yellow-poplar
- Meet visual quality objectives
- Accomplish conversions from pine to native hardwood species
- Regenerate high-risk and sparse stands
- Prevent the spread of insect and disease damage or related salvage losses

Even-aged management may also be used to harvest stands that are economically marginal. This may be caused by a number of factors including poor quality timber or access problems.

Some forest types can be regenerated successfully by a particular silvicultural system or harvest method, but other types may not. Since a management area typically contains several forest types and diversity is desirable within a management area, more than one harvest method may be used in a management area. Differing systems need to be applied depending on needs and site specific conditions (Minckler 1978).

When conditions warrant, shelterwood cuts will be used to regenerate hardwoods, especially where oak is the desired species. The density of residual stocking will be determined by species composition objectives (tolerant vs. intolerant), visual quality objectives, and the conditions of the stand before cutting.

Clearcuts will be used when they are the optimum harvest method to achieve our stated management objectives such as conversion of pine to hardwood or meet wildlife habitat composition objectives.

Clearcuts will be used to provide habitat for early successional species. This type of habitat is important to many species of wildlife. Oak, yellow-poplar, and cherry are the primary species that are intolerant to intermediate in tolerance to shade and will benefit most from this harvest technique. Where oak is a desired species in the future stand, at least 150 stems per acre of advanced oak-hickory regeneration should be present prior to overstory removal (Brose *et al* 1999). Fire may be used to enhance or sustain oak regeneration in various ecological conditions (Van Lear 2000).

Clearcuts will be used to create openings and vistas where the potential for such areas exists and the vegetative composition and visual quality objectives can be met by such management.

Clearcuts will be used to remove high-risk and sparse stands and create vigorous, healthy young stands that will enhance overall age-class diversity. These stands can usually not be regenerated by any other means because they lack sufficient numbers of acceptable trees. Many of these stands are on good sites and are in their current condition due to past cutting practices. Once regenerated, they will provide improved wildlife habitat, scenic beauty, and high-quality timber.

Clearcutting will also be used in areas so degraded by insects, disease, or weather-related damage that retaining any residual portion of the stand would be futile. Clearcutting will be used to reduce the spread of insect or disease outbreaks.

Single tree selection will be used where shade-tolerant species, vertical diversity, or continuous forest cover are desired.

Group selection will be used when continuous forest cover, vertical diversity, or the regeneration of species intolerant to intermediate in shade tolerance is desired.

Without ecological restoration in the form of silvicultural treatments, oak systems will continue to decline (in terms of species richness and ecological function), converting from oak to mesophytic forests within a generation. Native wildlife species dependent on trees producing large-seeded acorns and nuts may be imperiled (Nowacki and Carr in press). To maintain the oak component, silvicultural systems need to be matched to the site characteristics combining harvest systems with regeneration treatments such as prescribed burning.

## Utilization Standards

Utilization standards for commercial timber harvest are shown below in Table B.1; details are available in the Timber Sale Administration Handbook (FSH 2409.15).

Table B.1

### UTILIZATION STANDARDS (36 CFR 219.9)

	Minimum Tree <sup>1</sup> Specifications		Minimum Piece Specifications	
Type Product	Diameter inches at breast height	Length <sup>2</sup> (feet)	Diameter Small end/inside Bark (inches)	Percent Sound (without defect)
Hardwood Sawlogs	11.0	8	9.6	40
Softwood Sawlogs	9.0	8	7.6	40
Hardwood Pulpwood Softwood Pulpwood	7.0 5.0	8 8	5.0 4.0	70 % sound <sup>3</sup> and reasonably straight <sup>4</sup>

<sup>1</sup> A minimum tree must include at least one piece that meets minimum specs.

<sup>2</sup> Plus trim allowance.

<sup>3</sup> 70 percent applies to rot, voids, and char. Mechanical defects shall not be considered.

<sup>4</sup> Reasonably straight: When the true center line of a minimum length piece does not deviate more than one-half the inside diameter of the small end, plus 1 inch from a straight line drawn between the centers of the ends of the piece.

The Forest Supervisor may set more stringent utilization standards if local conditions and markets permit; more liberal standards would require Regional Forester approval.

Because of species variety, products sold, and variation in local requirements, the Forest Supervisor may establish local standards for special products with the approval of the Regional Forester.

Contractual requirements to remove hardwood pulpwood may be met by felling the pulpwood trees.

The schedules shown in Tables B.2 and B.3 meet all the requirements specified in 36 CFR 219.16. This vegetative treatment schedule is based on current conditions and available information at the time the Forest Plan is being revised. If conditions change or new information becomes available, the program may be modified during the implementation of the Plan. The degree of modification will determine whether or not the Plan will need to be amended.

Table B.2

**FIRST DECADE VEGETATIVE TREATMENT PROGRAM**  
**Acres by Treatment Type Accomplished by Timber Sales**

Clearcut	Shelterwood	Single Tree	Group Selection
2,020	840	1,110	2,850

Table B.3

**ESTIMATED DECADE ONE VOLUME - MILLION BOARD FEET**

Sawtimber Volume		Pulpwood Volume	
Hardwood	Pine	Hardwood	Pine
28.6	7.6	13.7	7.8

The acreage by treatment type and volumes are estimates only. The actual acreage treated and the volume of timber offered will be determined through site-specific planning at the project level and budget realities. Acres treated and volumes offered will be consistent with the objectives established in this Forest Plan.

There are several possible vegetation management treatments that could occur. Definitions of each of these practices are found in the glossary (Appendix A).

Timber stand improvement practices include: pruning, crop tree release, grapevine control, precommercial and commercial thinning, understory treatments, salvage, sanitation, and prescribed fire. Regeneration practices include planting and site preparation for natural regeneration.

## **Stocking Levels To Meet Regeneration Objectives**

Minimum Hoosier National Forest stocking standards five years after timber harvest for even-aged hardwood management and uneven-aged hardwood management using group selection are:

Unless a stand specific prescription calls for less, at least 150 potential crop trees per acre are needed to maintain the oak-hickory forest type. Potential crop trees must be generally recognized as having commercial value and be of good form and vigor. The average diameter of potential crop trees must be 0.5 inches dbh or larger. Potential crop trees must be well distributed over the regeneration area.

This stocking level was developed to determine the likelihood of regenerating a fully stocked oak-hickory stand. In many cases, stand prescriptions may call for less oak and hickory due to the many factors that inhibit regeneration of the oak-hickory forest type. In these areas species other than oak and hickory such as yellow-poplar will make up part of the 150 potential crop trees.

## **Planting For Reforestation**

Some planting may be required to protect a site or to increase species diversity. Only native vegetation will be planted. Newly acquired parcels may be planted to reforest open areas.

See Table B.4 on species selection when planting is the option selected and Table B.5 on the shade tolerance of selected species.

Table B.4

## SPECIES SELECTION GUIDE FOR REFORESTATION

Common Name	Scientific Name	Site	Shade Tolerance	Notes
shellbark hickory	<i>Carya laciniosa</i>	strictly a bottomland species	shade tolerant	grows on sites too wet for shagbark hickory
shagbark hickory	<i>Carya ovata</i>	rich alluvial soils along streams	shade tolerant	tolerant of drought
redbud	<i>Cercis canadensis</i>	moist, well-drained sites	shade tolerant	will not tolerate wet soil
flowering dogwood	<i>Cornus florida</i>	rich well drained soils	somewhat shade tolerant	sensitive to drought
hazelnut	<i>Corylus americana</i>	rich moist soil	intermediate	full sun will increase nut production
persimmon	<i>Diospyros virginiana</i>	wide range, best on alluvial sites	shade tolerant	drought tolerant
white ash	<i>Fraxinus americana</i>	moderately well drained	tolerant as seedling, but becomes intermediate to intolerant as it ages	grows most commonly on fertile soils with a high nitrogen content and a moderate to high calcium content
green ash	<i>Fraxinus pennsylvanica</i>	prefers wet sites	intermediate	
Kentucky coffee tree	<i>Gymnocladus dioica</i>	rich alluvial soils along streams and in wooded openings	shade tolerant	prolific root sprouter
butternut	<i>Juglans cineria</i>	prefers deep, rich moist soils	intolerant	now a rare tree due to butternut canker
black walnut	<i>Juglans nigra</i>	prefers deep, rich moist soils	intolerant	
sweetgum	<i>Liquidambar styraciflua</i>	wet, moist alluvial soils	intolerant	few diseases are associated with sweetgum
yellow-poplar	<i>Liriodendron tulipifera</i>	deep, rich, well-drained soils	intolerant	seeds must overwinter under natural conditions to overcome dormancy
flowering crab apple	<i>Malus coronaria</i>	grows on a wide variety of sites	intolerant	prolific root sprouter
blackgum	<i>Nyssa sylvatica</i>	moist alluvial, slightly acidic soils	shade tolerant	
ninebark	<i>Physocarpus opulifolius</i>	grows on a wide variety of sites	intermediate	best growth on moist sites



Common Name	Scientific Name	Site	Shade Tolerance	Notes
American sycamore	<i>Platanus occidentalis</i>	grows on a wide variety of sites	intolerant	does well on moist bottomlands
bigtooth aspen	<i>Populus grandidentata</i>	prefers dry sites	intolerant	can be planted on wet sites
black cherry	<i>Prunus serotina</i>	rich moist mesic sites	intolerant	
white oak	<i>Quercus alba</i>	well adapted to most soils, but prefers deep moist soils	intermediate, but less tolerant with age	
bur oak	<i>Quercus macrocarpa</i>	upland, wet depressional sites	intermediate	often dominates severe sites with thin soils
chinkapin oak	<i>Quercus muehlenbergii</i>	dry sites	shade tolerant	is common on southern aspects
pin oak	<i>Quercus palustris</i>	grows on poorly drained wet sites	intolerant	can be inundated in water for weeks and survive
chestnut oak	<i>Quercus prinus</i>	poor sites, dry rocky uplands	intermediate	usually found in pure stands
northern red oak	<i>Quercus rubra</i>	mesic sites	intermediate	
Shumard oak	<i>Quercus shumardii</i>	well drained bottomlands	intolerant	
post oak	<i>Quercus stellata</i>	dry shallow nutrient poor soils	intolerant	slow growing, usually associated with blackjack oak
black oak	<i>Quercus velutina</i>	moist, well drained soils	intermediate	
black locust	<i>Robinia pseudoacacia</i>	grows on a wide variety of sites	intolerant	good on poor sites

Note: Native species not listed in this table may be planted on appropriate sites.

Table B.5

SHADE TOLERANCE OF SELECTED SPECIES<sup>1</sup>

Very tolerant	Tolerant	Intermediate	Intolerant	Very Intolerant
		White oak	Black walnut	
Beech	Red maple	Red oak	Butternut	Quaking aspen
Sugar maple	Silver maple	Black oak	Hickories	Bigtooth aspen
	Basswood	American elm	Paper birch	Cottonwood
	Buckeye	Rock elm	Yellow-poplar	Black locust
	Boxelder	White ash	Sassafras	Willows
		Green ash	Sweetgum	
		Black ash	Sycamore	
		Hackberry	Black cherry	

<sup>1</sup> (Mills *et al* 1987)

## Timber Resource Summaries

### Land Suitability

Table B.6 identifies the lands suitable and unsuitable for timber production according to the National Forest Management Act and the implementing regulations. Unsuitable lands for timber production by management area are shown in the footnotes.

Table B.6

LAND SUITABILITY SUMMARY

LAND CLASSIFICATION	Acres
Total National Forest System Land	199,150
Nonforest Land <sup>1</sup>	(11,962)
Forest Land Withdrawn from Timber Production <sup>2</sup>	(13,673)
Forest Land Not Producing Crops of Wood	0
Forest Land Physically Not Suited:	
Irreversible Damage Likely to Occur	0
Not Restockable within five years	0
Forest Land with inadequate information	0
Forest Land, Tentatively Suitable	173,515
Forest Land not Appropriate for Timber Production <sup>3</sup>	(92,972)
Total Suitable Forest Land	80,543

<sup>1</sup> Includes all lakes, ponds, waterholes, wetlands, rivers, permanent forest openings, barrens, redcedar glades, roads, rock outcrops, and marginal timberland.

<sup>2</sup> Lands withdrawn from timber production designated by Congress, the Secretary of Agriculture, or the Chief of the Forest Service including the 12,953 acre Charles C. Deam Wilderness, 632 acre Paoli Experimental Forest, and 88 acre Pioneer Mothers Research Natural Area.

<sup>3</sup> Lands identified as not appropriate for timber production for the following reasons: assigned to other resource uses to meet Forest Plan objectives including all existing developed recreation sites; visually sensitive areas; and Management Areas 2.4, 6.2, 6.4, and 8.2; and bottomland areas of Management Area 2.8.

## Allowable Sale Quantity and Long-Term Sustained Yield

Figure B.1 displays the relationship between the planned timber sale levels over the planning horizon and the long-term sustained yield of the Forest. Long-term sustained yield is 15.1 million cubic feet/decade (90.6 million board feet/decade) and is not reached in the first 15 decades.

**Base Sale Schedule.** A base sale schedule is a timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale harvest for the preceding decade. This planned sale and harvest is not greater than the long-term sustained yield capacity of 15.1 million cubic feet per decade.

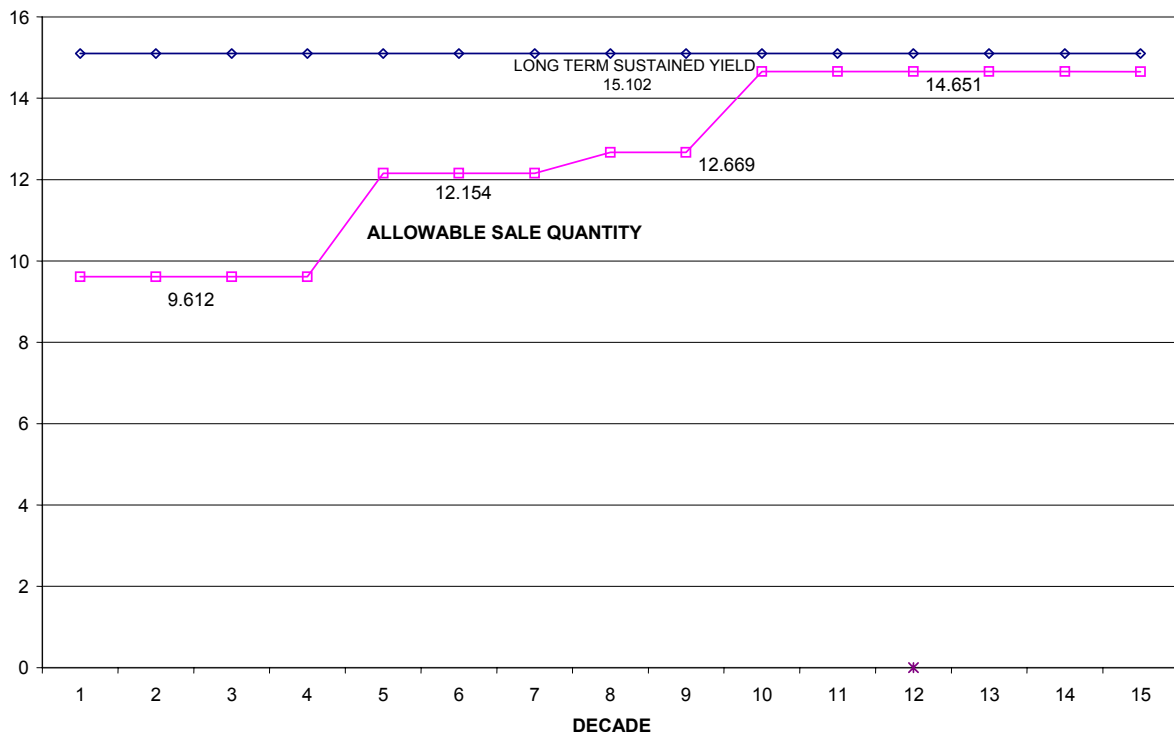
### Culmination of Mean Annual Increment (CMAI)

The CMAI ranges between 50-60 years for hardwoods and 20-25 years for pine in Indiana.

Figure B.1

### PROJECTED ALLOWABLE SALE QUANTITY AND BASE SALE SCHEDULE <sup>1</sup>

Units are MMCF/Decade



<sup>1</sup> To calculate the approximate volume in million board feet, multiply the million cubic feet volumes by the factor of 6.

## Allowable Sale Quantity (ASQ) and Vegetation Management Practices

Table B.7 shows the allowable sale quantity in the first decade of the Plan by harvest method. It also shows projections of other intermediate and reforestation activities and the acres by activity.

Table B.7

### ALLOWABLE SALE QUANTITY AND VEGETATION MANAGEMENT PRACTICES (Average Annual - First Decade)

		<b>Allowable Sale Quantity</b> Million Board Feet		
<b>Harvest Method</b>	<b>Acres</b>	<b>Sawtimber</b> (All Treatments)	<b>Other Products</b> (All Treatments)	<b>Total Products</b>
REGENERATION HARVEST				
Even-aged Management				
Clearcut	202			
Shelterwood	84	3.62	2.15	5.77
Uneven-aged Management				
Group Selection	285			
Single Tree Selection	111			
Timber Stand Improvement	571	0	0	0
REFORESTATION 1/	571	0	0	0

1/ Includes natural and artificial. Site preparation and timber stand improvement are estimated on the actual cut acres of the: clearcut, shelterwood, and group selection harvest methods.

Note: These are projections used in planning. The actual amount of vegetative management practices conducted will be determined at the project level and based on budget realities. Also, year-to-year mixes of activities and volumes are expected to vary, but the allowable sale quantity of 57.7 million board feet for decade one will not be exceeded. It should be noted that this ASQ is higher than the past plan's 44.0 million board feet for decade one. This is due to the growth that has occurred since that planning period. While the ASQ is higher the acres treated remains the same.

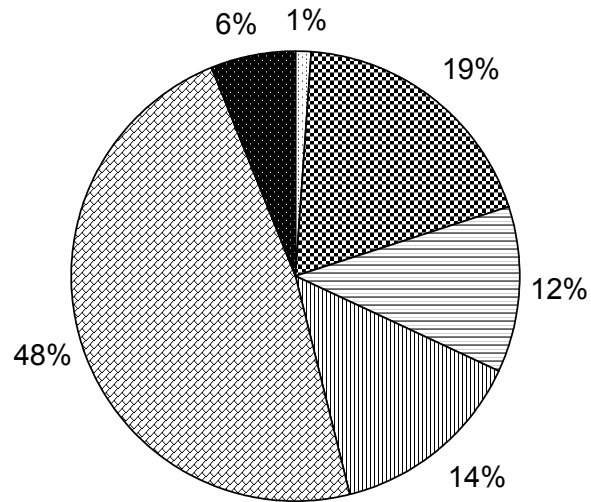
## Other Timber Information

Figure B.2 displays the age class distribution of the forested stands today and a projection of 150 years from today. It includes non-forested areas which are forest openings, lakes, ponds, streams, and power line rights of way. The projection shows that mature hardwood will increase under the Forest Plan's management from the existing 48 percent to an eventual 81 percent mature hardwood in 150 years.

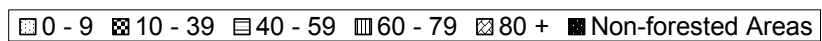
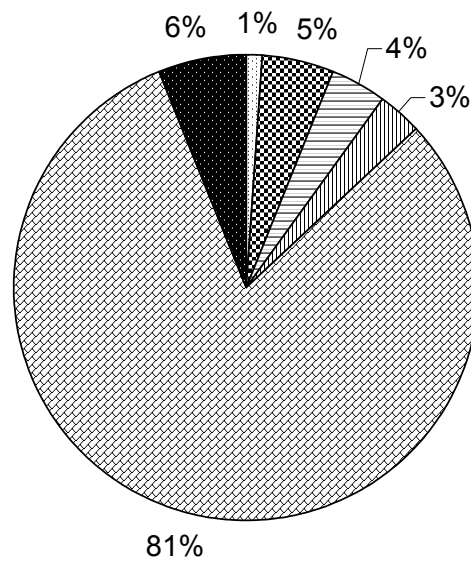
Figure B.2

## EXISTING AND DECADE 15 AGE CLASS PROJECTIONS

### Age Class - Existing Condition



### Age Class - Decade 15



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# Appendix C

## FEDERALLY ENDANGERED AND THREATENED; SENSITIVE SPECIES; MANAGEMENT INDICATOR SPECIES

### Federally Endangered, Threatened, and Proposed Species

As a Federal agency, the USDA Forest Service has defined responsibilities in supporting recovery objectives for Federally listed endangered, threatened, and proposed species. Populations of these species will receive individualized attention. Management activities that may affect Federally listed species occur in consultation with the USDI Fish and Wildlife Service. If additional species that occur on the Hoosier become listed as endangered or threatened, the Hoosier will consult with USDI Fish and Wildlife Service as appropriate (50 CFR 402.16).

The USDI Fish and Wildlife Service have identified five Federally listed species as having part of their range on the Hoosier National Forest. Indiana bat (*Myotis sodalis*), gray bat (*Myotis grisescens*), rough pigtoe mussel (*Pleurobema plenum*), and eastern fanshell mussel (*Cyprogenia stegaria*) are listed as endangered. The USDI Fish and Wildlife Service list the bald eagle (*Haliaeetus leucocephalus*) as threatened.

Indiana bat is widespread in Indiana and occupies much of the eastern half of the United States, from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida. Although there are a limited number of occurrence records for this species on the Hoosier National Forest, its habitat occurs throughout the Forest. Gray bat and eastern fanshell are of limited distribution in Indiana. There are only three known records of gray bat and one of the eastern fanshell on or near the Hoosier National Forest. There is evidence that the rough pigtoe mussel occurs or occurred in the Wabash and East Fork White Rivers in Indiana.

Eagles have repeatedly nested on National Forest System lands adjoining Patoka Lake (Castrale and Ferchak 2001), and within the Crooked Creek watershed adjoining Lake Monroe. No less than nine nest attempts were made by bald eagles within the boundary of the Forest in 2004. Two successful nest attempts occurred on NFS lands during the 2004 breeding season, one near Axsom Branch on Lake Monroe (near Crooked Creek ) and one other nest on the Lost River near the Narrows Marsh in Martin County.

### MANAGEMENT DIRECTION

#### Conservation Plan for Federally Threatened, Endangered, and Proposed Species

This Plan fulfills Endangered Species Act Section 7(a)(1) obligations for conservation of threatened, endangered, and proposed species. The Hoosier National Forest is committed to conserving, protecting, and maintaining habitat for Federally listed species. The Conservation



Plan of the Hoosier National Forest is, first of all, this Land and Resource Management Plan. The foundation of the Hoosier National Forest's Conservation Plan is the allocation of land into management areas that have the ecological conditions needed by particular species. A primary purpose of management area allocations is protection of biological diversity, including the conservation of threatened and endangered species. Management area desired conditions and guidance aid in conserving threatened and endangered species by providing a variety of ecological conditions.

Management Area (MA) 2.4 protects the shorelines of lakes, a primary nesting habitat for bald eagle. MA 2.8 and 3.3 provide benefits for a variety of users and resources. These management areas allow for vegetation management, which serves a variety of wildlife purposes, including the maintenance or enhancement of roosting habitat for the Indiana bat. MA 5.1 and MA 6.2 provide isolation, opportunity for natural succession, and areas with limited modification. Areas with such characteristics provide important habitat for wildlife, including threatened and endangered species. MA 6.4 primarily provides for natural succession to an old growth (climax) condition and limited modification. The direction for MA 8.1 (Research Natural Areas) includes "providing habitat for endangered species." MA 8.2 areas are Special Areas, and their management emphasizes the protection, perpetuation, or restoration of their special features and values. Special features include barrens, caves, and rock outcrops. The 632-acre Paoli Experimental Forest, which provides opportunities for studying the effects of specific management actions, is presently the only area designated 8.3. Taken together and with other Forest Plan guidance, the management areas provide a variety of habitats for various wildlife and plant species, with emphasis on threatened and endangered species. Approximately 60 percent of the Forest is in areas not appropriate for timber harvesting.

Recovery plans have been prepared for bald eagle, eastern fanshell mussel, gray bat, Indiana bat, and rough pigtoe mussel. The USDA Forest Service will work with the USDI Fish and Wildlife Service to identify and meet recovery objectives for the species on the Forest.

The purpose and goal of any conservation plan is recovery of each species such that there is no longer a need to list it as endangered or threatened under criteria found in Section 4(a)(1) of the Endangered Species Act, as amended. Actions of the Hoosier National Forest are directed toward conservation of listed species and, whenever possible, contributing toward recovery objectives outlined in approved recovery plans.

## **Relationship to Other Documents**

To meet the consultation requirements under Section 7(a)(2), the Hoosier National Forest completed the Programmatic Biological Assessment for Land and Resource Management Plan Hoosier National Forest (Biological Assessment) in April 2000. The Fish and Wildlife Service responded with their Biological Opinion on the Land and Resource Management Plan Hoosier National Forest, Indiana on July 31, 2001. This Biological Opinion provided terms and conditions to ensure that actions carried out under the direction of the Forest Plan would minimize the potential for incidental take. The Biological Assessment included a list of management activities with amounts (acreages, miles, etc.) estimated to occur in the next five years.

Species-specific recovery plans provide additional guidance for conserving and recovering each endangered or threatened species throughout its range. Each recovery plan has been developed by a team of scientists who are experts on the species being addressed. The Hoosier National Forest encompasses only a small part of the range of each of the four

endangered or threatened species, so all recovery objectives may not be applicable to the Forest.

## **Direction**

The Endangered Species Act provides authority for the Hoosier National Forest to be involved in and further the protection and recovery of threatened and endangered species. Section 7(a)(1) states, "All other Federal agencies shall, in accordance with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to Section 4 of this Act."

Section 2(b) of the Endangered Species Act states, "The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for conservation of such endangered species and threatened species..."

The policy of Congress, according to Section 2(c)(1), is "that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of this Act."

Biological evaluations or assessments will be conducted as part of site-specific analyses for known populations of Federally listed endangered, threatened, and proposed species (FSM 2672.4). Guidelines and mitigating measures are implemented if a determination is made through a biological evaluation or assessment that a species may be affected.

If it is determined that an endangered, threatened, or proposed species may be affected by a management decision, evaluation criteria will be established in consultation with the USDI Fish and Wildlife Service as early in the process as possible. These criteria will identify: (1) what (if any) additional information is needed and (2) what mitigation measures or course of action is most appropriate for conservation of the species involved. The Forest Service is responsible for collecting additional information if needed.

Current management direction for the Hoosier is not likely to adversely affect gray bat, eastern fanshell or rough pigtoe mussel, or bald eagle, as determined by the July 31, 2001 biological opinion from the USDI Fish and Wildlife Service - Bloomington Field Office. That Biological Opinion also concluded that continued implementation of the Forest Plan was "not likely to result in jeopardy" to the Indiana bat.

Some conservation actions may change if a species recovers and is delisted. The Conservation Plan will evolve as the Forest learns more about individual species, their limiting factors and habitat requirements, and the effects of various activities on these species. The following paragraphs provide direction in various aspects of the management of the Hoosier National Forest with regard to threatened and endangered species.

- Consult with USDI Fish and Wildlife Service to ensure that activities planned and implemented on the Hoosier National Forest meet both the letter and intent of the Endangered Species Act, as amended.
- Cooperate with experts in other agencies, universities, organizations, and Forest Service

research to identify objectives and projects that will conserve, protect, and recover populations and habitats of threatened and endangered species.

- Provide training and continuing education to Hoosier National Forest employees to ensure our workforce has the best scientific information available upon which to base decisions concerning threatened and endangered species on the Forest.
- Provide accurate and current information about the threatened and endangered species' life history requirements, habitat needs, threats to survival, and population and habitat status on the Hoosier National Forest, in Indiana, and across the species' ranges to ensure a sound basis for decision-making.
- Provide the public opportunities to learn about and appreciate threatened and endangered species so they will understand the importance of activities designed to maintain, protect, and recover these species and their habitats.
- Devise and implement a plan to guide the silvicultural management of the Forest that is based on sound principles of ecosystem management and works within the capabilities of the land to sustain natural resources, provide biodiversity, including habitat for, and populations of, threatened and endangered species.
- Acquire lands that provide habitat for threatened and endangered species through exchange with, or purchase or donation from, willing landowners.
- Ensure compliance with all laws, regulations, and policies pertaining to endangered and threatened species on the Hoosier National Forest.
- Cooperate with the USDI Fish and Wildlife Service law enforcement and other law enforcement agencies in enforcing laws and regulations pertaining to endangered and threatened species.

The Hoosier will report accomplishments that aid in the conservation of threatened and endangered species in the annual Monitoring and Evaluation Report.

## **Regional Forester Sensitive Species**

As of October 20, 2003, the Regional Forester has designated 741 species as sensitive in the Eastern Region. This list updated the February 29, 2000 Regional Forester sensitive species lists for both animals and plants. These are plant and animal species for which population viability is recognized as a concern, as evidenced by a downward trend in population or habitat capability.

Regional Office staff maintain the Regional Forester sensitive species list, which is located on the internet site at: [http://www.fs.fed.us/r9/wildlife/tes/tes\\_lists.htm](http://www.fs.fed.us/r9/wildlife/tes/tes_lists.htm). The current list for the Hoosier National Forest and any future updates are posted there.

Based on the October 2003 list, the Hoosier has 119 species as Regional Forester sensitive species. Of these species, 89 are animals and 30 are plants.

Another 8 animals and 40 plants that are sensitive species within the Eastern Region occur on the Forest. Risk evaluations for those species determined that they were not at risk or there is no concern about their continued viability on the Forest, and therefore, these 48 species are not designated as sensitive for the Hoosier.

Regional Forester sensitive species are designated and considered to be at risk, if they:

- Are candidates for listing under the Endangered Species Act;
- Have been delisted under the Endangered Species Act within the last five years;
- Have The Nature Conservancy species status ranks of G1-G3, T1-T3, N1-N3;
- Or are considered to be at risk based upon their state status ranks (S1-S3) and their respective forest risk evaluation.

Species listed as Regional Forester sensitive species must have at least one documented occurrence within the proclamation boundary of an Eastern Region national forest or grassland and be recognized as a valid species by taxonomic experts. The Regional Forester sensitive species list has been routinely and periodically maintained through a species risk evaluation process.

Direction and methods for maintaining and updating the Regional Forester sensitive species list is contained in a Region 9 supplement to the Forest Service Manual (FSM) 2670. The Forest Service Manual 2670 provides direction for sensitive species protection and management. The primary purpose of this direction is to be proactive and prevent each species from any loss of viability and ensure that any actions are not likely to cause a trend towards that species being listed as Federally endangered or threatened. In addition, it provides a basis for establishing sound management priorities for all Forest wildlife and plants.

As part of site-specific analyses, biologists will conduct biological evaluations to review and evaluate possible effects on sensitive species (FSM 2672.4). Project level analyses would identify and provide other necessary guidelines and mitigating measures not previously mentioned under Forest-wide guidance or management area guidance.

## **Management Indicator Species**

### **Management Indicator Species Selection Process**

The National Forest Management Act directs the Forest Service to select and track species that are of special interest or indicative of management trends. These species are called management indicator species (MIS). These MIS are selected on the basis of being likely candidates to provide information on the effects of management activities. Forest biologists reviewed 31 species identified as MIS in the 1991 Forest Plan Amendment along with the list of proposed MIS species developed in 1994 with the following criteria in mind:

- The diversity of habitats found on the Hoosier,
- Current forest issues,
- Feasibility and cost associated with monitoring populations across the forest,
- Ability to assess the effects of management activities listed in the alternatives on the selected species as well as the effects of additional species that utilize similar habitats, and
- Recommendations of the species viability evaluation panels.

The lack of creel surveys on the forest limited the selection of fish species, and the lack of surveys covering the three terrestrial species limited their selection. Because breeding bird survey routes have already been established on the Forest and breeding bird data has been consistently collected over the last ten years, bird species were chosen as MIS. After this selection, another criterion that was reviewed was whether a bird species was included in Cornell Lab of Ornithology's "Birds in Forested Landscapes Program." Data could be collected for this program with little additional cost, and could provide data regarding the specific habitat requirements of high-priority forest birds across the landscape.

### **Management Indicator Species Selected**

The following five species were selected as MIS to cover a range of habitats, as well as a range of response to the issues presented in the Forest Plan: yellow-breasted chat (*Icteria virens*), American woodcock (*Scolopax minor*), Louisiana waterthrush (*Seiurus motacilla*), wood thrush (*Hylocichla mustelina*), and Acadian flycatcher (*Empidonax virens*).

Yellow-breasted chat and American woodcock are MIS of early successional hardwood habitats. The effects of forest activities on these species indicate the effects on wildlife associated with early successional upland hardwood forest, open lands including old fields, and herbaceous open lands. The remaining species are associated with mature forests of varying tract sizes ranging from wood thrush on small tracts, to Louisiana waterthrush, to Acadian flycatchers which require much larger tracts of forest interior habitat. These species represent the effects on forest interior and forest fragmentation. Response to fire would vary among the species.

Table C.1 shows the management indicator species selected and the associated habitat conditions or life history traits for each.

Table C.1

## MANAGEMENT INDICATOR SPECIES AND ASSOCIATED HABITAT CONDITIONS

<b>Management Indicator Species</b>	<b>Habitat Conditions Associated with Species</b>
yellow-breasted chat	<ul style="list-style-type: none"> <li>• Early successional habitat; requires moderate to dense understory</li> <li>• Nests are located on lower limbs of trees or shrubs, hidden among leaves in a shady area</li> </ul>
American woodcock	<ul style="list-style-type: none"> <li>• Habitat requirements of woodcock vary with activity, time of day, and season. The birds prefer early successional habitats created by periodic disturbance of the forest. Therefore, young forests and abandoned farmland mixed with forested land are ideal woodcock habitat.</li> <li>• Woodcock use forest openings, clearcuts, fields, roads, pastures, and abandoned farmland as display areas for courtship.</li> <li>• Nests and broods are found in young to mixed-age forests, but young, open, second-growth stands are preferred. Nests are located on the ground.</li> <li>• During summer, young hardwoods and mixed woods with shrubs provide daytime cover for feeding.</li> </ul>
Louisiana waterthrush	<ul style="list-style-type: none"> <li>• Mature deciduous or mixed forests with moderate to sparse undergrowth, near rapid flowing streams.</li> <li>• Nests are located on the ground along stream banks, hidden in the underbrush, or among the roots of fallen trees.</li> </ul>
wood thrush	<ul style="list-style-type: none"> <li>• Inhabits the interior and edges of deciduous and mixed forests, generally in cool, moist sites.</li> <li>• Requires moderate to dense understory and shrub density with a lot of shade.</li> <li>• Nests are located on the lower limbs of a tree or shrub, usually 10 - 13 feet above ground, hidden among leaves in a shady area.</li> </ul>
Acadian flycatcher	<ul style="list-style-type: none"> <li>• Inhabits large tracts of mature, mesic, forests with shrubby understory.</li> <li>• Nests are usually placed on a fork of a horizontal branch well away from the main trunk. Height ranges from 6 – 30 feet.</li> </ul>

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## Appendix D

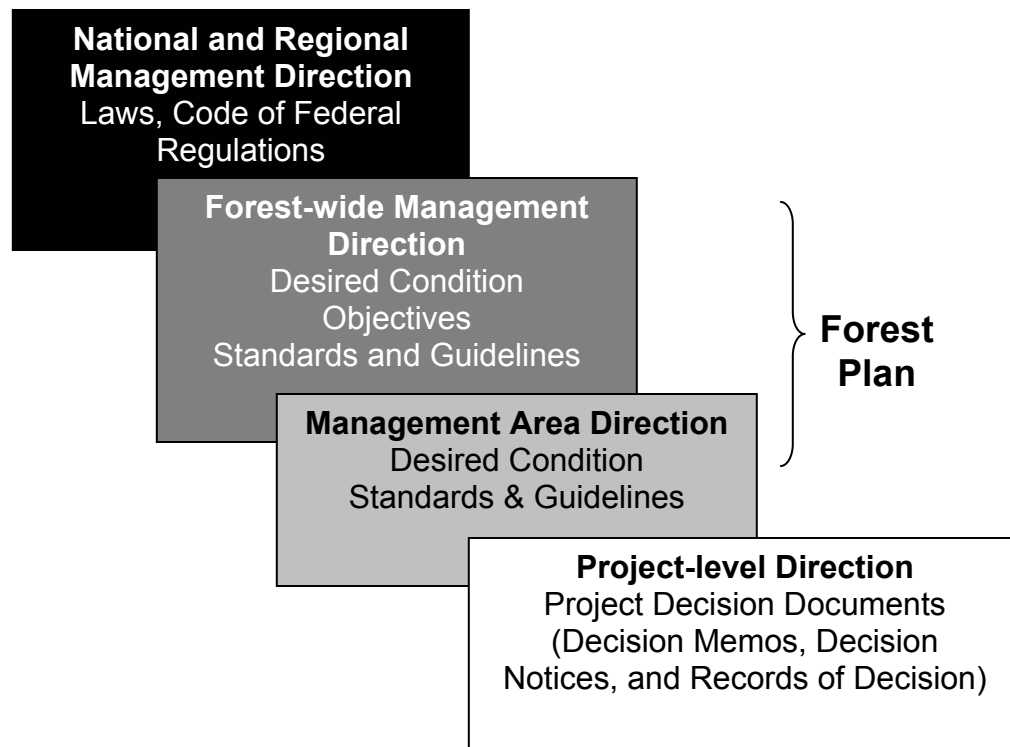
### RELEVANT FEDERAL STATUTES, REGULATIONS, POLICY, AND AGREEMENTS

Management direction in the Forest Service Directive System, including the Forest Service Manual (FSM) and the Forest Service Handbook (FSH), is part of the forest plan management direction and is not repeated in the Forest Plan. Management direction also includes applicable laws, regulations, and policies, although they may not be restated in this Forest Plan.

Direction for managing NFS land comes from a variety of levels. National and regional direction includes laws, executive orders, regulations, and Forest Service policy. Figure D-1 illustrates this hierarchy of management direction beginning with national and regional direction at the highest level and ending with site-specific, project-level direction when the Forest Plan is implemented.

Figure D.1

#### HIERARCHY OF MANAGEMENT DIRECTION FOR NATIONAL FORESTS





# FEDERAL STATUTES

The Hoosier National Forest will follow all of the laws listed below to the extent that they pertain to the USDA Forest Service.

Alaska National Interest Lands Conservation Act of December 2, 1980  
American Indian Religious Freedom Act of August 11, 1978  
American with Disabilities of 1990  
Anderson-Mansfield Reforestation and Revegetation Act of October 11, 1949  
Antiquities Act of June 8, 1906  
Archaeological Resources Protection Act of October 31, 1979, as amended 1988  
Architectural Barriers Act of 1968

Bankhead-Jones Farm Tenant Act of July 22, 1937

Clarke McNary Act of June 7 1924  
Clean Air Act of July 14, 1955  
Clean Air Act of August 7, 1977; Amendments of 1977 and 1990  
Clean Water Acts (1948-87)  
Clean Water Amendments (to "Federal Water Pollution Control Act Amendments of 1972")  
Color of Title Act of December 22, 1928  
Common Varieties of Mineral Materials Act of July 31, 1947  
Cooperative Forestry Assistance Act of July 1, 1978

Department of Agriculture Organic Act of August 3, 1956  
Disaster Relief Act of May 22, 1974

Eastern Wilderness Act of January 3, 1975  
Economy of June 30, 1932  
Emergency Flood Prevention (Agricultural Credit Act) Act of August 4, 1978  
Endangered Species Act of December 28, 1973  
Energy Policy Act of August 8, 2005  
Energy Security Act of June 30, 1980

Federal Advisory Committee Act of October 6, 1972  
Federal Cave Resources Protection Act of November 18, 1988  
Federal Insecticide, Rodenticide, and Fungicide Act of October 21, 1972  
Federal Land Exchange Facilitation Act of August 20, 1988  
Federal Land Policy and Management Act of October 21, 1976  
Federal Noxious Weed Act of January 3, 1975  
Federal Power Act of June 10, 1920  
Federal Records Act of September 5, 1950  
Federal-State Cooperation for Soil Conservation Act of December 22, 1944  
Federal Water Pollution Control Act of July 9, 1956, as amended (Water Quality Act of 1965, Clean Water Restoration Act of 1966)  
Federal Water Project Recreation Act of July 9, 1965  
Fish and Wildlife Conservation Act of September 15, 1960  
Fish and Wildlife Coordination Act of March 10, 1934  
Forest Highways Act of August 27, 1958

Forest and Rangeland Renewable Resources Planning Act of August 17, 1974  
Freedom of Information Act of November 21, 1974

Granger-Thye Act of April 24, 1950

Historic and Archaeological Data Preservation Act of May 24, 1974  
Historic Sites Act of August 21, 1935

Knutson-Vandenberg Act of June 9, 1930

Land Acquisition Act of March 3, 1925  
Land Acquisition-Declaration of Taking Act of February 26, 1931  
Land Acquisition-Title Adjustment Act of July 8, 1943  
Land and Water Conservation Fund Act of September 3, 1964  
Law Enforcement Authority Act of March 3, 1905

Mineral Leasing Act of February 25, 1920, as amended  
Mineral Leasing Act for Acquired Lands Act of August 11, 1955  
Mineral Resources on Weeks Law Lands Act of March 4, 1917  
Multiple-Use Sustained-Yield Act of June 12, 1960

National Environmental Policy Act of January 1, 1970  
National Forest Management Act of October 22, 1976  
National Forest Roads and Trails Act of October 13, 1964  
National Historic Preservation Act of October 15, 1966, as amended  
National Trails System Act of October 2, 1968  
Native American Graves Protection and Repatriation Act of January 23, 1990

Occupancy Permits Act of March 4, 1915  
Organic Administration Act of June 4, 1897

Pipelines Act of February 25, 1920  
Public Land Surveys Act of March 3, 1899

Real Property Quiet Title Actions Act of October 25, 1992  
Rehabilitation Act of 1973, as amended  
Renewable Resources Improvement Act of June 30, 1978  
Research Grants Act of September 6, 1958  
Right of Eminent Domain Act of August 1, 1888  
Rural Development Act of August 30, 1972

Safe Drinking Water Act of November 16, 1977 and Amendments  
Secure Rural Schools and Community Self-Development Act of 2000  
Sikes Act of October 18, 1974  
Sisk Act of December 4, 1967  
Small Tracts Act of January 22, 1983  
Soil and Water Resources Conservation Act of November 18, 1977  
Solid Waste Disposal (Resource Conservation & Recovery Act) Act of October 21, 1976  
Supplemental National Forest Reforestation Fund Act of September 18, 1972  
Surface Mining Control and Reclamation Act of August 3, 1977

Timber Export Act of March 4, 1917  
Timber Exportation Act of April 12, 1926  
Title Adjustment Act of April 28, 1930  
Toxic Substances Control Act of October 11, 1976  
Transfer Act of February 1, 1905

Uniform Federal Accessibility Standards  
Uniform Relocation Assistance and Land Acquisition Policies Act of January 2, 1971  
U.S. Criminal Code (Title 18 USC Chapter 91- Public Lands) Act of June 25, 1948

Volunteers in the National Forests Act of May 18, 1972

Water Quality Improvement Act of April 3, 1965  
Water Resources Planning Act of July 22, 1965  
Watershed Protection and Flood Prevention Act of August 4, 1954  
Weeks Act Status for Certain Lands Act of September 2, 1958  
Weeks Act of March 1, 1911  
Wild and Scenic Rivers Act of October 2, 1968  
Wilderness Act of September 3, 1964  
Wood Residue Utilization Act of December 19, 1980

Youth Conservation Corps Act of August 13, 1970

## **Regulations**

The Hoosier National Forest will also abide by the regulations listed below as they pertain to the U.S. Forest Service.

36 CFR 60 National Register of Historic Places  
36 CFR 63 Determinations of Eligibility for Inclusion in the National Register of Historic Places  
36 CFR 68 Secretary of the Interior's Standards for the Treatment of Historic Properties  
36 CFR 79 Curation of Federally-Owned and Administered Archeological Collections  
36 CFR 212 Forest Development Transportation System

36 CFR 213 Administration Under Bank-Jones Act  
36 CFR 219 Planning  
36 CFR 221 Timber Management Planning  
36 CFR 223 Sale and Disposal of NFS Timber  
36 CFR 228 Minerals

36 CFR 241 Fish and Wildlife  
36 CFR 251 Land Uses  
36 CFR 254 Landownership Adjustments  
36 CFR 261 Protection of Archaeological Resources  
36 CFR 290 Caves as referenced in Appendix A

36 CFR 291 Occupancy and Use of Developed Sites and Area of Concentrated Public Use  
36 CFR 293 Wilderness Primitive Areas  
36 CFR 294 Special Areas

36 CFR 295 Use of Motor Vehicles off Forest Development Roads  
36 CFR 296 Archaeological Resources Protection Act Uniform Regulations  
36 CFR 297 Wild and Scenic Rivers  
36 CFR 800 Advisory Council on Historic Preservation  
36 CFR 1222-1238 Federal Records Act Uniform Regulations  
40 CFR 121-135 Watershed Programs  
  
40 CFR 1500-1508 Council on Environmental Quality  
43 CFR Part 10 Native American Graves Protection and Repatriation Act Uniform Regulations  
American Association of State Highway and Transportation Guidelines for Geometric Design  
of Very Low-Volume Local Roads, 2001  
National Ambient Air Quality Standards  
National Electrical Code  
  
National Fire Code  
Uniform Building Code  
Uniform Mechanical Code  
Uniform Plumbing Code

## **Executive Orders**

EO 11593 Protection and Enhancement of the Cultural Environment  
EO 11990 Protection of Wetlands  
EO 11644/11989 Use of Off-Road Vehicles  
EO 11988 Floodplain Management  
  
EO 12088 Federal Compliance with Pollution Control Standards  
EO 12898 Environmental Justice  
  
EO 13007 Indian Sacred Sites  
EO 13112 Invasive Species  
EO 13287 Preserve America

## **Policy and Guidelines**

Forest Service Heritage Strategy  
Forest Service Manuals (all)  
Forest Service Handbooks (all)  
R8/R9 Policy on the Treatment of Human Remains  
Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation  
Forest Service Heritage Meaningful Measures

## **State and Local**

Indiana State Law IC-14-21 Historic Preservation and Archaeology

Indiana State Law IC-22-1 Human Remains, Burial Objects, and Artifacts

326 Indiana Administrative Code Article 4 4-1-3 Exemptions

Logging and Forestry Best Management Practices for Water Quality in Indiana, 1998

Gray Bat Recovery Plan, U.S. Fish and Wildlife Service, 1982

Fanshell Recovery Plan, U.S. Fish and Wildlife Service, 1991

Indiana Bat Recovery Plan, U.S. Fish and Wildlife Service, 1983

Northern States Bald Eagle Recovery Plan, Northern States Bald Eagle Recovery Team, 1983

Rough Pigtoe Mussel Recovery Plan U.S. Fish and Wildlife Service, 1984

# **Appendix E**

## **LAND ADJUSTMENT STRATEGY**

The intent of this section is to prioritize purchase and exchange activities by management areas. All land acquisition is based on availability and a willing seller. Condemnation will not be used on the Hoosier National Forest except in extreme cases to acquire rights-of-way or to clear title after all other efforts have failed. Following is a list of characteristics of land considered high priority for acquisition by either purchase or exchange.

### **High Priority Acquisitions**

#### **Management Area 2.4**

Acquire lands along major fishing and canoeing streams or adjacent to lakes to increase water-based recreation opportunities and to protect and develop wetland and bottomland hardwood resources. Lands that provide consolidation or protect closed-canopy forest along streams are a high priority. Acquiring these lands will protect the aquatic environment and provide consolidated ownership along water or riparian corridors.

#### **Management Area 2.8**

Acquire lands surrounded by or adjacent to existing NFS lands to consolidate ownership, increase remote recreation opportunities, or reduce resource management costs.

#### **Management Area 3.3**

Acquire lands surrounded by or adjacent to existing NFS lands to consolidate ownership, increase habitat management opportunities, add to biodiversity, or reduce resource management costs.

#### **Management Area 5.1**

Acquire lands in or adjacent to this management area to protect the wilderness character of the area.

#### **Management Areas 6.2 and 6.4**

Acquire lands, especially those surrounded or adjacent to existing NFS lands, to increase remote recreation opportunities in a natural forest environment, to provide extensive closed-canopied forest areas, or to provide travel corridors between areas. Although designed primarily to enhance biological diversity, these travel corridors provide unique opportunities for trails.

#### **Management Area 7.1**

Acquire lands identified as key properties in or adjacent to existing or potential recreation developments to improve dispersed and developed recreation opportunities around developed campgrounds.

#### Management Areas 8.1, 8.2, and 8.3

Acquire lands identified as key properties in or adjacent to Research Natural Area, Special Areas, or Paoli Experimental Forest. Lands that consolidate ownership or reduce resource management costs are also high priority for acquisition.

#### Management Area 9.2

Acquire lands identified as potential Research Natural Areas or potential Special Areas to protect the unique resources of those identified areas.

#### Other Areas

Acquire lands to protect or enhance threatened and endangered species habitat (see Appendix C), significant cultural resources, areas of historical interest, and special or unusual habitats or features such as springs, caves, geologic formation, and wetlands, regardless of management area.

## Criteria for Land Exchanges

Land exchanges will be analyzed on a case-by-case basis. Some factors to be analyzed include:

- Accomplishes objectives of Federal law or regulation.
- Meets demand for national forest resources, including Special Areas.
- Results in more efficient land ownership patterns.
- Results in lower resource management costs.
- Needs a minimum of investment for management of tract—for example, extensive reclamation is not needed.
- Provides an opportunity to solve a problem, for example trespasses.
- Offers land that is best suited to other than NFS use.
- Improves or does not reduce access to NFS land.
- Results in more efficient property boundary management.
- Little likelihood of acquiring adjacent land.
- Isolated NFS tracts of 160 acres or less will normally be exchanged in their entirety.
- Lands are not needed for economic development.

# Appendix F

## PEST AND NONNATIVE INVASIVE SPECIES MANAGEMENT

The Hoosier will evaluate each pest control problem on the Forest using an Integrated Pest Management (IPM) approach before proposing any pest control activity. IPM is a process that attempts to regulate forest pests to achieve resource management objectives. It is the planned and systematic use of detection, evaluation, and monitoring techniques and all appropriate silvicultural, biological, chemical, genetic, and mechanical methods to prevent or reduce adverse effects of pest-caused damages. It is a six-step analysis procedure as follows:

1. Pest identification.
2. Population monitoring - pest biology, natural enemies, population dynamics, etc.
3. Determination of injury level - How much injury or impact must occur before action is taken?
4. Selection of most appropriate control method or methods: biological, chemical, mechanical, genetic, manual, or silvicultural.
5. Determine most effective timing of control application.
6. Monitor and evaluate effectiveness of control project (several years may be needed).

Prevention will be the emphasis of management related to all pest and nonnative invasive species problems. The Forest would also emphasize early detection and treatment of new infestations.

The Forest may use chemicals to control undesirable pests if non-chemical methods are ineffective. In every case, the Forest would carefully consider the effectiveness, specificity, environmental, and economic effects of individual applications. The Hoosier would also involve affected and interested individuals and organizations in our decision.

The Forest would use only Environmental Protection Agency (EPA) registered pesticides. In every case, we would choose the least persistent pesticides to achieve objectives. Application of pesticides would occur in ways that minimize the dose rate, vapor loss, and drift with the lowest toxicity necessary. Pesticides must be used in accordance with State laws.

Prioritization for pest and nonnative invasive species management would follow:

1. Prevention of new infestations
2. Early detection and treatment of new infestations
3. Treatment of sites with the greatest potential for spreading such as trailheads, parking lots, recreation areas, and administrative sites
4. Protection of known endangered, threatened, and sensitive plant and animal sites susceptible to harm from invasive species
5. Protection of Forest special areas and research natural areas
6. Containment and control of established infestations



The most common applications and anticipated needs of pest management include:

#### Pest and Undesirable Vegetation Control

- In recreation areas: (1) to control poison ivy, (2) to reduce the operational expense of trimming around trees and parking barriers and to maintain grassy and herbaceous vegetation along roadsides when mowing is not feasible, (3) to selectively remove vegetation from ponds and lakes to improve fish habitat, improve the area for people fishing, maintain vegetation-free swimming areas, and (4) dam or dike maintenance.
- Control ticks or chiggers in campgrounds, near trails, and in other places where people congregate: Ticks are becoming an increasingly serious problem in many areas due not only to growing populations, but also because of the diseases they carry.
- Wasps and bees may also be sprayed in areas where people congregate to protect visitors.

#### Aquatic Invasive Plant Control

- Aquatic weed control keeps boat ramps and beaches from being overrun with submerged or floating aquatic weeds. No equipment has been developed for mechanical control on small-scale applications such as exist on the Forest. Herbicides available for use have been selected for environmental safety; will not harm fish, people, or other aquatic organisms; and do not require closure of the lakes to swimming or fishing.
- In Forest ponds and lakes, fish populations occasionally become unbalanced. Surveys are periodically done in cooperation with IDNR. If a problem is identified, rotenone may be prescribed to kill the existing fish populations. The pond is then restocked with desirable fish species.

#### Timber Stand Improvement

- Plantation establishment is nearly impossible without control of competing vegetation. Mechanical methods or herbicide use are the preferred treatment methods. It is occasionally necessary to retreat an area after three years to release the seedlings from competing vegetation. The necessity for this type of work is directly related to the acquisition of old open fields.
- Herbicides can be used in improving species composition in young, naturally regenerated hardwood stands. This generally involves control of grapevines but also can include thinning trees to concentrate growth on the higher quality trees in the stand. Herbicides are applied directly to the cut stump of the vine or tree or into a cut "girdle" around the tree to kill it and prevent resprouting.

#### Forest Openings

- Forest opening and natural plant community maintenance is accomplished by bushhogging, mechanical brush removal, burning, herbicide use, or a combination of these methods. Herbicides can control the reestablishment of undesirable plant

species, reducing costs, and increasing the length of time before re-treatment is necessary.

#### Public Utility Right-Of-Way Management

- Public utility rights-of-way and easements may pose vegetation management problems on the Forest. These treatments are implemented by utility companies with permission by the landowners involved, including the Forest Service. Maintenance work is done to ensure the lines are kept clear for uninterrupted public service. Utility corridors are normally treated selectively on the Forest, with both mowing and selective woody vegetation removal by basal spray application of herbicides. Some broadcast spraying is also permitted. The method of maintenance selected is based on existing vegetative conditions, aesthetics, economics, and proximity to streams, ponds, lakes, homes, gardens, and agricultural crops.

#### Insect and Disease Management

- Silvicultural changes can be the single most important action used to mitigate impacts of forest pests on the condition of the forest. Healthy well-managed forest vegetation would result in high levels of productivity. Genetically improved seedlings provide an opportunity to grow forests that are more resistant to insects and diseases. With the proper mix of silvicultural treatments, there is little opportunity for pest populations to reach unacceptable limits.
- Using the principles of IPM to control epidemic insect and disease outbreaks helps protect the Forest and surrounding private woodlands. When outbreaks do occur, natural variations in tree species and stand ages or condition of the immediate area may contain them. When these natural barriers are insufficient, the use of pesticides may be required to protect timber and other resources.
- If an outbreak does occur, the Forest could consider the use of biological and chemical pesticides to prevent an epidemic or reduce adverse effects of pests.
- The Hoosier would apply pesticides using the most economical methods that are specific in reaching their target. Pesticides can be indirectly applied by spraying from the air or ground nearby and by directly brushing or injecting undesirable vegetation. The efficiency of treating the pest and the chance of environmental damage would be taken into account when determining the application method.

#### Nonnative Invasive Plant Control

- Nonnative invasive plants occur across the Forest in scattered locations. Effective control measures are possible for smaller infestations using hand-pulling, mechanical methods, or prescribed burning. However, some invasive plant populations have reached the extent where applying pesticides is the only method feasible to remove or control these infestations. For these larger infestations, the cost of manual or mechanical methods may be prohibitive and could result in excessive soil disturbance or other resource damage. In some instances, the release of biological control insects can be effective in controlling invasive plants.

- Application of selective herbicides can kill target invasive plants while minimizing the effects to desirable vegetation and animal species. In most cases, herbicides would be applied by spot treatment directly to nonnative invasive plant species. This technique minimizes herbicide drift to avoid adverse effects to desirable vegetation and other organisms, including humans.
- An important last step in nonnative invasive plant management is rehabilitation and restoration activities. These actions aid in reestablishing native vegetation and help minimize or reverse the effects from invasive plants. In 1994, the Forest developed a native seed nursery for native plant propagation. Seeds produced from the nursery or collected native seed from forest openings has been used to re-vegetate disturbed areas across the Forest. The Forest would continue using local native seed sources and under normal circumstances, would avoid planting or seeding with nonnative species. When native seed is unavailable or not feasible, the Hoosier would use nonnative annuals or non-persistent perennial species.

# Appendix G

## HOOSIER NATIONAL FOREST ROAD DESIGN GUIDELINES

### DESIGN GUIDANCE

The following guidelines should be used, when appropriate, when setting design standards in road contracts or road special use permits on NFS lands in Indiana. The guidelines (Table G.1) are in compliance with Forest Service manuals and handbooks, recommended guidance from Hoosier staff, and the Indiana field guide for best management practices (IDNR 1998).

Table G.1

HOOSIER NATIONAL FOREST ROAD GUIDELINES

Type Of Use	Road Width (Feet)	Clearing Widths (Minimum Feet)	Driving Surface	Road Grades (Maximum Percent)	Traffic Svc Level	Maintenance Level	Cut Slope Ratios	Fill Slope Ratios
FS Access Roads non-gated, long term)	12	22	Aggregate	8	B	3-4	1:1-2:1	1½:1
FS Access Roads (gated, long term)	12	22	Native or Aggregate	12	D	1-3	1:1-2:1	1½:1
Driveways:								
1-5 Homes	12	22	Aggregate	8	B	3-4	1:1-2:1	1½:1
>5 Homes	14	24	Aggregate	8	B	3-4	1:1-2:1	1½:1
Recreation Roads:								
Access road (2 lane)	20	30	Asphalt or	8	A	4-5	1:1-2:1	1½:1
Campground loop	12	22	Aggregate	4	B	4-5	1:1-2:1	1½:1
Temporary Roads	10	10	Native or Aggregate	12	D	Obliterate after use	Verticle-2:1	1½:1

Note: All roads above are single lane except the 2-lane Recreation Access road.

## ROAD WIDTH

The widths shown above are the recommended road widths; the actual width should be based on the design vehicle for that particular road.

On single lane roads, turnouts should be constructed for safety purposes. The location of turnouts should reflect the proper blend of road user, safety, visuals, and economics. Normally, turnouts should be located on the outside of cuts; outside of curves; low side of fills or at the run out point between through cuts and fills. Turnout widths should be a minimum of 10 feet wide and 50 feet long with 25-foot tapers. Turnout spacing is showing in Table G.2 below (USDA 1994a).

## TURNOUT SPACING

Table G.2  
TURNOUT SPACING AND OPERATIONAL CONSTRAINTS BY TRAFFIC SERVICE LEVEL

Traffic Service Level	Turnout Spacing	Operational Constraints
A	Make turnouts intervisible unless excessive costs or environmental constraints preclude construction. Closer spacing may contribute to efficiency and convenience. Maximum spacing is 1,000 feet.	Traffic: mixed Capacity: up to 25 vehicles per hour Design Speed: up to 40 mph Delays: 20 seconds/mile or less
B	Intervisible turnouts are highly desirable but may be precluded by excessive costs or environmental constraints. Maximum spacing is 1,000 feet.	Traffic: mixed Capacity: up to 25 vehicles per hour Design Speed: up to 25 mph Delays: should be 30 seconds/mile or less Use signs to warn non-commercial users of the traffic to be expected. Road segments without intervisible turnouts should be signed.
C	Maximum spacing is 1,000 feet. When the environmental impact is low and the investment is economically justifiable, additional turnouts may be constructed.	Traffic: small amount of mixed Capacity: up to 20 vehicles per hour Design Speed: up to 20 mph Delays: up to 60 seconds/mile Road should be managed to minimize conflicts between commercial and noncommercial users.
D	Generally, only naturally occurring turnouts, such as additional widths on ridges or other available areas on flat terrain are used.	Traffic: not intended for mixed Capacity: generally 10 vehicles/hour or less Design Speed: 15 mph or less Delays: up to 60 seconds/mile expected Road should be managed to restrict concurrent use by commercial and noncommercial users.

Note: On roads identified as being subject to the Highway Safety Act, intervisible turnouts or appropriate signing should be provided.

## CLEARING WIDTHS

Clearing limits shall be kept to a minimum on all roads. The minimum clearing limits on all roads, not to be obliterated, are 5 feet from the shoulders of the road. On driveways and non-gated roads clearing limits shall be no greater than 5 feet beyond the top of cut and to the toe of fill. On gated access roads, the clearing shall be to the top of cut and toe of fill. On temporary roads clearing shall be enough to allow equipment to use the road without damage to the vehicle.

## SLASH DISPOSAL

To meet the visual quality objectives of the *Forest Plan*, slash generated from construction activities should be disposed of in such a manner that large concentrations are not showing. However, not all of the slash needs to be removed from a site in order to meet the ecosystem objectives of the *Forest Plan*. There several ways to handle slash, but recommendations will be based on site-specific analysis. Slash is the tops, limbs, and unmerchantable logs generated by building a road. Possible slash handling recommendations are:

- Lop and scatter:
  - Scatter the slash so that it is generally between 2 feet and 3 feet high. The lowest heights would be recommended on Traffic Service Levels A and B roads, with taller heights allowed on Traffic Service Levels C and D roads.
  - A variation of lop and scatter is to place some of the slash in such a way as to trap sediment and mitigate effects on soil and water, if needed.
- Chip: The slash could be chipped. The chips could be scattered on the site or could be partially scattered and partially removed.
- Burn: If the volume of slash is heavy, some of it could be burned to reduce the fuel loading.
- Bury: Some of the slash and stumps could be buried in the disturbed area.
- Remove: Tree stumps could be removed from the site. Other slash could be partially removed, as listed above.

## SURFACING

A minimum of 4 inches of aggregate should be placed on roads to be used year round. This will allow for adequate maintenance of the road surface. On gated roads, native surfacing is acceptable if the road is not to be used during wet times of the year. On temporary roads that are to be used during dry seasons, native surfacing is acceptable. If the road is to be used during wet seasons, the road shall be rocked to accommodate the design vehicle. Temporary roads shall be obliterated after use is terminated.

## ROAD GRADES

The desired grade on roads is 8 percent or less. Safety, State laws, and economic and environmental constraints and concerns govern the selection of the maximum grade, or at least require mitigating measures to lessen the impacts of steep grades. The maximum grade varies with the ability of each material type to resist erosion. Steeper grades normally require additional costs for drainage, surface stabilization, maintenance, and use.

## ROADWAY CRITERIA

The following recommendations should also be used as guidelines on new road construction.

### Type

The travel way should be constructed to the following type for the grades given:

0-2 percent	Crowned
2-4 percent	Insloped or outsloped
4-8 percent	Insloped or outsloped with drain dips
>8 percent	Insloped with ditch

Insloped, outsloped, and crowned travel ways shall have a three percent cross slope (Garland 1983). Shoulders are usually not needed. On side slopes greater than 35 percent, full bench excavation for the roadway shall be used. Slopes less than 35 percent cut and fill excavation for the roadway can be used.

### Sight distance

Roads should be evaluated for adequate sight distance on vertical and horizontal curves, intersections, and in passing areas. The ability to see ahead is important in the safe and efficient operation of a vehicle on a road.

Sight distance is the length of roadway ahead visible to the driver. The minimum sight distance available on a roadway should be sufficiently long to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. At road intersections, this is of great importance to allow vehicles time to see and react to a vehicle turning into the path of another vehicle or slowing to make a turn.

Stopping sight distance should be calculated to arrive at a minimum sight distance needed for a vehicle to see an obstruction and slow enough to avoid a collision. To arrive at the minimum required sight distance refer to one of the following: FSH 7709.56 Road Preconstruction Handbook (USDA 1994a); A Policy on Geometric Design of Highways and Streets (American Association of State Highway and Transportation Officials 1994); or the Indiana Department of Transportation Design Manual, Part V, Volume I, Road Design (INDOT 1994).

## Drainage structures

Use drain dips on road grades four to eight percent. Use culverts on grades of eight percent and greater. Install water bars on temporary roads when not in use (Barnickol 1988, IDNR 1998, USDA 1991, and West Virginia Department of Natural Resources Division of Forestry et al. 1980).

Culverts and drain dips should be skewed 30 degrees for ditch relief. Culverts shall consist of corrugated aluminum, galvanized or aluminized steel, or polypropylene. For culverts to be self-cleaning they should have a grade two percent greater than the ditch grade, minimum grade should be three percent (Beschta 1984b). If culverts are used on temporary roads, they shall be removed immediately upon termination of use on the road.

The Forest compared several sources for spacing formulas (Beschta 1984b, Fisher and Taber 1975, Kochenderfer 1970, Pence unknown, Trimble and Sartz 1957, Haussman and Pruett 1973, and USDA Forest Service Manuals and Handbooks). Spacing recommendations for culverts and drain dips are usually based on the Kochenderfer formula in the Eastern U.S. It is the formula that results in the spacing table on page 11 of the Indiana BMP field guide (IDNR 1998). The Kochenderfer formula is: spacing in feet =  $(400/\text{slope percent}) + 100$  (Kochenderfer 1970). The formula results in the following spacing for culverts and drain dips by road grade.

Table G.3

### RECOMMENDED MAXIMUM SPACING FOR CULVERTS AND DRAIN DIPS

Road Grade (Percent)	Spacing (feet)
1	500
2	300
3	233
4	200
5	180
6	167
7	157
8	150
9	144
10	140
11	136
12	133
13	131
14	129
15	127

Drainage structures should be properly sized. The structure size is dependant on local conditions, but an acceptable starting point is to have the area of the culvert-opening equal the area of the drainage channel at the high-water level. Although a minimum size of 12 inches diameter is recommended in many sources, the Hoosier NF recommends that the minimum culvert diameter be 18 inches due to the leaf litter in southern Indiana (Beschta 1984a, Douglass 1974, Fisher and Taber 1975, and Kochenderfer 1970). Smaller diameter pipes have a greater tendency to become plugged with leaves in the fall and winter. Additional information



about installing culverts is found on pages 27 and 28 of the Indiana BMP field guide (IDNR 1998).

There are several methods commonly used to determine the runoff and size for the proper drainage structure. The selection of the method depends on the conditions, availability of reliable information, and judgment of the designer. Several of the procedures and formulas that can be used are:

- Drainage end area calculations
- The Manning Formula \*
- The Talbot Formula\*
- McMath and Burkli-Ziegler Formulas\*
- The Rational Method\*
- Computer Programs

\*These formulas can be found in most drainage structure books such as the Handbook of Steel Drainage and Highway Construction Products (American Iron and Steel Institute 1971), FSH 7709.56 Drainage Structures Handbook (USDA 1994a and 1994b), and Flood Frequencies and Bridge and Culvert Sizes for Forested Mountains of North Carolina (Douglass 1974), as well as hydraulic manuals.

# Appendix H

## SPECIAL AREAS

### Special Area Establishment

Currently, there are 24 special areas designated on the Hoosier National Forest. These special areas occur throughout the Hoosier National Forest on about 17,500 acres of NFS land. The following section provides a brief description and some of the more important recommended management needs for each special area.

Each special area should have a tailored management plan written, regularly reviewed, and updated. The Forest has completed management plans for some, but not all, special areas. Updates to these plans would occur when necessary and appropriate as new information becomes available.

For those areas that do not have management plans completed, the District Ranger will appoint an interdisciplinary team that will conduct an evaluation and write the management plan. The team will conduct inventories based on issues and resource concerns and develop a prescription framework for specific management of the special area.

The report should include any special or unique features and their locations, past research, interested or affected parties, issues and concerns, past and present uses/ecological conditions, general management needs and desired condition, and the team's recommendations. The plan will include specifics on ecological and use potential for the area, as well as specific management needed to achieve the desired condition. The plan will outline periodical and sequential treatments. A key part of each plan will be the monitoring steps established to evaluate management of the area. The interdisciplinary team then presents the management plan to the District Ranger for approval. Special area management plans must be compatible with *Forest Plan* direction.

### Research Natural Area (RNA) Equivalent Designation

As part of a FY 2000 assessment of RNA representation for the Eastern Region some of the Hoosier special areas were noted as being RNA equivalents. For portions of special areas to qualify as RNA equivalents, they must have protection at least equal to that of a RNA. The process involves the identification of natural communities by community pattern and distribution. Each community receives vegetation quality and viability rankings on a scale from probably not viable to excellent quality, according to the best available data for the community. Every community receives three sub-ranks for size, condition, and landscape. To meet the requirement of a RNA equivalent, the area must have an overall ranking better than low quality.

The Forest has designated or incorporated all of the approximately 2,267 acres identified as RNA equivalents in 12 different special areas. The designated special areas provide similar

protection for the areas. Each area containing an RNA equivalent is noted as such in the following text.

## **Special Area Descriptions**

### **Beaver Creek**

*Location:* Beaver Creek is located in Sections 10, 11, 14 and 15 of T3N, R2W, Lawrence County, Brownstown Ranger District.

*Area:* Approximately 186 acres

*Type:* Karst geology

*General Description:* Beaver Creek is an example of a Crawford upland karst valley. Moorestown Rise variously pumps water out of a subterranean conduit in its rise mode, or swallows water when Beaver Creek is in flood.

*Management Needs:* Recommended studies include dye tracing, water quality testing, and specific conductivity analysis. The gated county road that bisects the area from north to south needs to have erosion control measures installed to reduce sediment entering into the creek.

### **Browning Hill**

*Location:* Browning Hill is located in Sections 1, 2, 3, 10, 11 and 12 T7N, R2E, and Sections 6 and 7 T7N, R3E, Brown County, Brownstown Ranger District.

*Area:* Approximately 1,190 acres

*Type:* Oak-hickory woods on ridge tops, mesophytic woods on a northeast facing slope

*General Description:* Relatively undisturbed and contains old growth woods containing trees of a noteworthy size for this area of the state.

*Management Needs:* Use prescribed fire to maintain chestnut oak community on the ridge tops. Illegal horse and bike use is occurring in the area. Management plan needs to address problem and propose potential solutions to curtail this activity.

### **Boone Creek**

*Location:* Boone Creek is located in Sections 25, 26, 35, and 36 T4S R1W and Sections 30 and 31 T4S R1E, Crawford and Perry Counties, Tell City Ranger District.

*Area:* Approximately 700 acres

*Type:* Dry forest and barrens communities. Contains RNA equivalent acres in the little

bluestem-sideoats grama, evergreen, or mixed wooded, herbaceous alliance communities.

*General Description:* The noteworthy features of the site are the barrens community.

*Management Needs:* Use repeated prescribed fire to restore and maintain the barrens and dry forest communities. Future management proposals are necessary for dealing with nonnative invasive plants.

## **Buzzard Roost**

*Location:* Buzzard Roost is located in Sections 31, and 32 T4S R1E, Section 36 T4S R1W, and Section 1 T5S R1E, Perry County, Tell City Ranger District.

*Area:* Approximately 454 acres

*Type:* River bluffs communities

*General Description:* The noteworthy features of the site are the bluffs and the associated species.

*Management Needs:* The Forest needs to make proposals for dealing with nonnative invasive plants, incorporating management of the Buzzard Roost Recreation area, trails, and vistas without degradation to the special features of the area.

## **Carnes Mill**

*Location:* Carnes Mill is located in Sections 11, 12, 13, and 14 T3S, R1W, and Section 18 T3S R1E, Crawford County, Tell City Ranger District.

*Area:* Approximately 280 acres

*Type:* The site is an historic mill site. It is a geologic site with subterranean cutoff forming a cave between the upper and lower curve in the river. The area consists of a dry upland forest community and sandstone cliffs. Contains RNA equivalent acres in the American beech, sugar maple, yellow poplar forest alliance and open bluff/cliff sparse vegetation communities.

*General Description:* The site is a bluff on the Little Blue River and includes an area across State Road 37 that has sandstone cliff communities. An historic mill took advantage of the subterranean cutoff in its operations. The area has special plant communities.

*Management Needs:* The Forest needs to develop proposals to deal with nonnative invasive plants.

## **Clover Lick**

*Location:* Clover Lick is located in Sections 20, 21, 28, 29, 30 and 32, T5S, R1W, Perry County, Tell City Ranger District.

*Area:* Approximately 1,658 acres

*Type:* Dry forest and barrens communities. Contains RNA equivalent acres in the little bluestem-sideoats grama, evergreen, or mixed wooded, herbaceous alliance and the black oak – white oak forest alliance communities.

*General Description:* The noteworthy features of the site are the barrens and associated plant communities.

*Management Needs:* Removal of planted nonnative pines and encroaching brush would help to restore the barrens to its former size. Conducting periodic prescribed burns will continue the restoration of the barrens and the dry forest community. Several nonnative invasive plants are encroaching upon the barrens and control measures are needed. Removal of woody encroachment within the maintained openings allows for collection of Indian grass seed for future restoration projects both within the special area and in other areas on the forest.

## **Deer Creek**

*Location:* The Deer Creek site is located in Sections 16, 20, and 21, T6S, R2W, Perry County, Tell City Ranger District.

*Area:* Approximately 135 acres

*Type:* Dry forest and sandstone cliff communities. Contains RNA equivalent acres in the American beech, sugar maple, yellow poplar forest alliance and open bluff/cliff sparse vegetation communities.

*General Description:* The noteworthy feature of this area is the sandstone cliff community and the presence of associated plant communities. Large sandstone boulders in the creek add to the scenic qualities.

*Management Needs:* Japanese honeysuckle is a nonnative invasive in the area and needs to be controlled.

## **Faucett Chapel**

*Location:* The Faucett Chapel site is located in portions of Sections 3, 4, 9 and 10 of T2N, R2W, Orange County, Brownstown Ranger District.

*Area:* Approximately 89 acres

*Type:* Chinquapin Oak/Twinleaf plant community. Contains RNA equivalent acres in the

chinquapin oak forest alliance community.

*General Description:* The plant community that exists on the site is one that might typically occur on soils derived from limestone. Chinquapin oak and twinleaf are obvious indicators of the site conditions. Removal of some over-story trees in the past had a beneficial effect on this area. Sugar maple in the understory is beginning to limit sunlight reaching the forest floor.

*Management Needs:* The Forest needs to control sugar maple to restore vigor to the understory plants. Several species of nonnative invasive plants occur within the area, but a recent study considered them as medium to low priority for invasive control.

## **Grease Gravy**

*Location:* Grease Gravy is located in Sections 28, 29, and 33 T1N, and R1E, Orange County, Tell City Ranger District.

*Area:* Approximately 254 acres

*Type:* Karst geology and prehistoric animal features

*General Description:* Noteworthy karst community with prehistoric animal features found within the karst features.

*Management Needs:* Monitoring of the karst features should occur to assess public use and determine if it is damaging the special features.

## **Gypsy Bill Allen**

*Location:* Gypsy Bill Allen is located in Section 31 T3N R2W, Section 36 T3N R3W, and Section 1 T2N R3W, Martin and Orange County, Brownstown Ranger District.

*Area:* Approximately 85 acres

*Type:* Karst geology

*General Description:* Karst features including species dependent upon these features, a spring, and exposed rock cliffs, shelters, and joints in a unique geomorphic weathering feature contained in Pennsylvanian age Mansfield sandstone.

*Management Needs:* Ensure the recharge area of the karst features does not add more than background levels of sediment to the system.

## **Harding Flats**

*Location:* Harding Flats is located in Sections 11, 12, 13, 14, 23 T6S, and R2W in Perry County, Tell City Ranger District.

*Area:* Approximately 782 acres

*Type:* Dry upland forest community with barrens. Contains RNA equivalent acres in the little bluestem-sideoats grama, evergreen, or mixed wooded, herbaceous alliance and the black oak – white oak alliance communities.

*General Description:* The area is a dry upland forest with barrens. Eastern redcedar is invading the openings that contain some rare plant species.

*Management Needs:* The management plan for the area recommends removal of invading redcedars by cutting or burning. The continued use of fire is necessary to restore the barrens community. Removal of the nonnative pines in the northern portion of the area would contribute to restoring the barrens. Japanese honeysuckle is degrading the community and project proposals need to include controlling this nonnative invasive species.

## **Hemlock Cliffs**

*Location:* Hemlock Cliffs is located in Sections 3, 4, 5, 8, and 9 T3S R1W in Crawford County, Tell City Ranger District.

*Area:* Approximately 1,860 acres

*Type:* Dry to mesic upland forest and sandstone cliff communities. Contains RNA equivalent acres in the chinquapin oak woodland alliance community.

*General Description:* The site contains Eastern hemlock remnants with cliff communities and associated plants.

*Management Needs:* Maintaining one 26-acre opening by using prescribed fire and mowing will continue. Rock climbing and rappelling have damaged some cliff communities. A forest closure order of the most sensitive part of the cliff has halted the continuation of much of the damage. Trails made by hikers, horse riders, and off-road vehicle users have damaged some areas. Attempts to close the worst of these user made trails has resulted in mixed results. These attempts should continue. The Forest has installed steps on the designated hiking trail to combat erosion on steep portions of the trail, re-routed portions of the trail to higher locations above the drainage, and construction of bridges to reduce impacts. Attempts to vacate old county roads have met with limited success. Before using prescribed fire, the Forest would examine the appropriateness of fire's application as a restoration tool in the upland communities. Several species of nonnative invasive plants have known occurrences within the area. Future control efforts will focus on those invasive species identified as having the greatest threats to the area.

## **Horse Mill Branch**

*Location:* Horse Mill Branch is located in Section 1, T6S, and R1W, Perry County, Tell City Ranger District.

*Area:* Approximately 7 acres

*Type:* Plant community

*General Description:* The area contains an unusual plant community.

*Management Needs:* Continue to monitor the plant community and conduct research to determine what management will best encourage the continuation of the plant community. Other needs include careful treatment to control Japanese honeysuckle without damaging the rare plant located within the special area.

## **Huron Woods**

*Location:* Huron Woods is located in Sections 7 and 18, T3N, R2W, Lawrence County, Brownstown Ranger District.

*Area:* Approximately 132 acres

*Type:* Shawnee Hills upland forest community

*General Description:* One of the least disturbed mesic upland forest communities in the Shawnee Hills Natural Region of Indiana.

*Management Needs:* Garlic mustard, a nonnative invasive plant occurs in the area and needs to be controlled.

## **Luke Knob**

*Location:* Luke Knob is located in Sections 26, 27, 34, and 35, T3N, and R2W, Orange County, Brownstown Ranger District.

*Area:* Approximately 59 acres

*Type:* Dry mesic upland forest

*General Description:* One of the least disturbed dry mesic and mesic upland forests occurring in the Shawnee Hills Natural Region of Indiana.

*Management Needs:* Nonnative invasive inventories identified Bush honeysuckle as a potential problem and it is important to manage for its control.

## **Oil Creek**

*Location:* Oil Creek is located in Sections 31 and 32, T3S, R1W; Sections 5, 6, 7, 8, and 18 T4S, R1W; and Sections 1, 2, 11, 12, 13 14, 23, 24, 25, and 26 T4S, R2W, Crawford and Perry Counties, Tell City Ranger District.



*Area:* Approximately 2,037 acres

*Type:* Cliff communities and associated plants. Contains RNA equivalent acres in the chinquapin oak woodland alliance community.

*General Description:* Contains Abbots Hollow, Jubin Creek, Bear Hollow, Oil Creek Cliffs, and Smith Hollow. These areas are disjunct sandstone cliff communities that have associated plants.

*Management Needs:* Monitor for nonnative invasive plants and treat if necessary.

## **Pioneer Mother's Memorial Forest**

*Location:* The Indiana Pioneer Mother's Memorial Forest is located south of Paoli east of State Highway 37 in Sections 1, 6, 7, 12 T1N, R1W in Orange County, Tell City Ranger District.

*Area:* Approximately 170 acres.

*Type:* The major items of interest in the Pioneer Mothers' Memorial Forest are the trees in the 88-acre, old-growth timber area, a prehistoric Native American village site, and the memorial development. Contains RNA equivalent acres in the white oak forest alliance community.

*General Description:* Pioneer Mothers' Memorial Forest is a 258-acre tract; 88 acres were designated a Research Natural Area by Lyle F. Watts, Chief of the Forest Service, in January 1944. An additional 170 acres provides a protection area around the RNA and is designated the Special Area. The Pioneer Mothers' memorial is located on the trail entering the forest from Forest Road 1022 on the northeast.

*Management Needs:* Monitor visitor use and manage for scenic qualities. Control and manage the nonnative invasive plant populations that are within the area.

## **Plaster Creek**

*Location:* The Plaster Creek site is located in portions of Sections 7, 10, 11 12, 14 and 23 of T2N, R4W, Martin County, Brownstown Ranger District.

*Area:* Approximately 568 acres

*Type:* The site consists of dry upland forest of chestnut oak/blueberry, sandstone cliff community, acid-seep spring community, bottomland hardwood forest of swamp white oak, sweetgum, and red maple. Contains RNA equivalent acres in the rock chestnut oak forest alliance; the American beech, sugar maple, yellow poplar forest alliance; the little bluestem-sideoats grama, evergreen, or mixed wooded, herbaceous alliance; the fringed sedge – royal fern/sphagnum spp. Saturated herbaceous alliance; the open bluff/cliff sparse vegetation; and the pin oak seasonally flooded forest alliance communities.

*General Description:* Area occurs adjacent to a series of sandstone bluffs paralleling Plaster Creek. A dry forest of chestnut oak, blackjack oak, and blueberry occur on the uplands. The few-flowered nut rush occurs here. This is the northernmost occurrence of blackjack oak on the Forest. The sandstone cliffs support hay-scented fern and cliff club moss. At Plaster Creek acid-seep, springs occur along the base of the cliffs. Cinnamon fern, royal fern, sphagnum moss, and green wood orchid occur there. The bottomland forest contains swamp white oak, swamp cottonwood, red maple, sweetgum, and yellow poplar with an understory of spicebush and winterberry.

*Management Needs:* Nonnative shortleaf pine seedlings occur in the dry forest above the seeps. The management plan for the area recommends their removal or killing them before they begin to replace the native plants. Reed canary grass, a nonnative invasive plant, threatens the noteworthy plant communities. Management proposals need to control and manage this species.

Visitors to the site have dislodged some plants from the cliffs, and trampling has occurred in the seep areas. Close monitoring of use should continue and if damage reaches unacceptable levels, the Forest would take appropriate mitigation measures or issue a local closure order.

## **Potts Creek**

*Location:* Potts Creek is located in Sections 8, 16, 17, 19, 20, 21, 30, 31, and 32 of T3S R1W, Crawford County, Tell City Ranger District.

*Area:* Approximately 1,722 acres

*Type:* Plant communities. Contains RNA equivalent acres in the chinquapin oak woodland alliance community.

*General Description:* The area contains unusual plant association communities, including plants at the edge of their range.

*Management Needs:* Reducing competition would lead to increased vigor and reproduction of umbrella magnolia.

## **Rockhouse Hollow**

*Location:* Rockhouse Hollow is located in Sections 24 and 25, T5S, R2W; and Sections 19 and 30, T5S, R1W; Perry County, Tell City Ranger District.

*Area:* Approximately 201 acres

*Type:* Dry upland forest community with barrens and sandstone cliffs. Contains RNA equivalent acres in the little bluestem-sideoats grama, evergreen, or mixed wooded, herbaceous alliance and the white oak forest alliance communities.

*General Description:* The site is an upland forest community ranging from dry to mesic. Sandstone cliffs are also present.

*Management Needs:* The management plan for the area recommends cutting or burning woody plants that are encroaching upon the barrens. Continuation of burning would also be helpful in restoration of the barrens community.

## **Stinking Fork Creek**

*Location:* Stinking Fork Creek is located in Sections 28, 33, 34, and 35 T3S, R1W, Sections 2 and 3, T4S, R1W, Crawford and Perry Counties, Tell City Ranger District.

*Area:* Approximately 579 acres

*Type:* Perennial stream

*General Description:* The site is a high quality example of a medium gradient, perennial stream within the Shawnee Hills Natural Region. Included in the boundary are other special features including cliff communities and their associated plants.

*Management Needs:* Monitor and maintain current health of the stream. Work with Crawford and Perry counties to design in-stream structures for erosion control. Monitor the designated trail (Oriole East) on the south-central boundary of the trail for unacceptable levels of erosion into the creek. If occurring, implement mitigation measures to control this excess erosion.

## **Tar Springs**

*Location:* Tar Springs is located in Section 15, T3S, and R1W, Crawford County, Tell City Ranger District.

*Area:* Approximately 20 acres

*Type:* Petroleum spring

*General Description:* A spring exists at the site from which flows a mixture of water and petroleum in the form of oil and tar.

*Management Needs:* Maintain protection around spring where it surfaces above ground.

## **Tincher**

*Location:* Section 6 T3N, R1W; Sections 1, 2, 3, 4, 5, and 6, T3N, R2W; Sections 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, and 36, T4N, R2W, Lawrence County, Brownstown Ranger District.

*Area:* Approximately 4,180 acres

*Type:* Karst geology

*General Description:* The main features of this area are its karst formations. There are many sinkholes, swallow holes, and caves. A fault in the Tinchier Pond area exposes a rock conglomerate not commonly seen exposed on the Forest. Preliminary fieldwork on an ecological classification system has identified some soils/geology differences that are likely to lead to the identification of plant communities not found elsewhere on the Forest.

*Management Needs:* The management plan for the area includes recommendations to inventory karst features and rare plant communities. The Forest needs to work with Lawrence County to identify county and non-county roads and eliminate unneeded roads not under county jurisdiction, and stabilize those that are to remain open. Clean up illegal trash dumping on NFS property.

## **Wesley Chapel**

*Location:* Wesley Chapel is located in Section 9, T2N, R1W, Orange County, Brownstown Ranger District.

*Area:* Approximately 188 acres

*Type:* Karst geology

*General Description:* Karst features include caves; sinkholes, and a gulf with a rise recognized as a National Natural Landmark by the USDI National Park Service.

*Management Need:* A 103-acre opening on the southern half of the special area will be maintained to encourage Henslow's sparrows (*Ammodramus henslowii*).

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# Appendix I

## DELINEATION OF RIPARIAN AREAS, RIPARIAN CORRIDORS, AND STREAM TYPES

### Riparian Area Definition and Delineation

The Forest Service Manual provides for the identification and delineation of riparian areas based on soil characteristics, hydrology, landform, and vegetation (FSM 2526.05). The following definitions apply:

**Riparian Areas** - Geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.

**Aquatic Ecosystems** - Stream channels, lakes, estuary beds; water; biotic communities; and the habitat features that occur therein.

**Riparian Ecosystems** - A transition area between the aquatic ecosystem and the adjacent terrestrial ecosystems identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

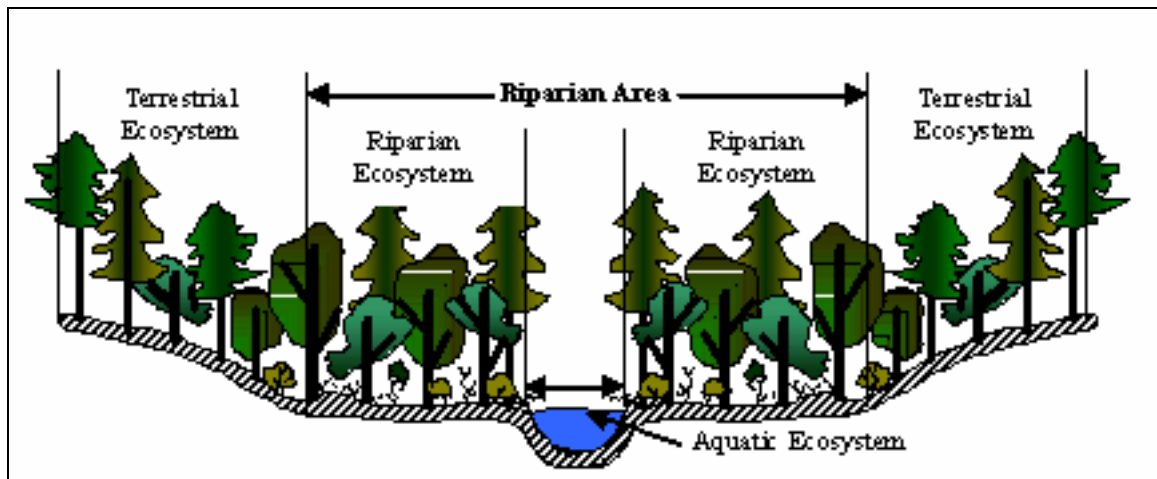
The riparian area definition includes the aquatic ecosystem and that portion of the terrestrial ecosystem substantially affected by the presence of surface and groundwater. Riparian areas consist of perennial and intermittent streams, ponds, lakes (reservoirs), waterholes, wetlands, and adjacent lands with soils, vegetation, and landform indicative of high soil moisture or frequent flooding. They have variable widths that are determined by ecologically significant boundaries rather than arbitrary distances. No single feature is used to delineate these ecosystems. In general, some characteristics common to riparian areas on the Hoosier National Forest include:

- Soils – soils formed in alluvial material, stratified sand, silt, and clay (often with thick, dark surfaces) some underlain with gravel or coarse fragments of sandstone.
- Landforms – alluvial valleys, their floodplains and terraces. Lakes and ponds with their associated beaches, shorelines, marshes, and swamps.
- Vegetation – Typical Hoosier National Forest riparian area species include sycamore, green ash, American elm, red elm, hackberry, box elder, silver maple, black walnut, river birch, and a variety of sedges, grasses and willows.

Figure I.1 shows a simplified schematic of the riparian area on the Hoosier National Forest.

Figure I.1

## SIMPLIFIED SCHEMATIC OF A RIPARIAN AREA AS DEFINED BY FSM 2526.02



Riparian areas often need to be managed in a broader, ecological context. Lands that are not technically part of the riparian area often influence these areas. For example, soil erosion from a steep slope adjacent to a stream could adversely affect the riparian area, even though much of the slope is technically outside of the riparian ecosystem defined by soils, hydrology, and vegetation.

The goal in delineating these corridors is to maintain a stable forest floor to filter sediment and other pollutants before runoff enters the stream, and to protect riparian habitat and species. Riparian corridors are not excluded from management activities, but rather zones where the application of mitigation measures and forethought must be applied to ensure water quality and riparian values are protected.

### The Riparian Corridor

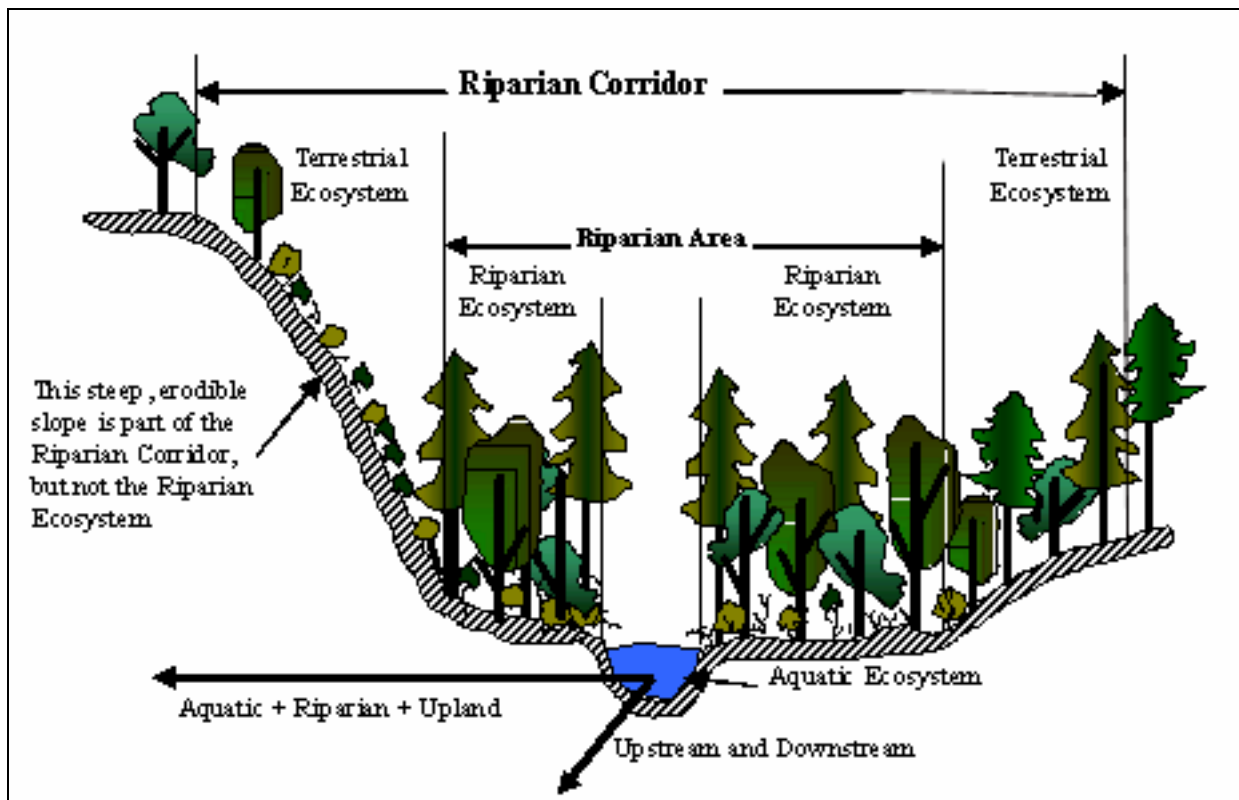
The Forest Service Region 9 terminology for the “adjacent terrestrial area” is riparian corridor.

The riparian corridor encompasses riparian areas, as well as adjacent associated upland components. A riparian area is functionally defined as a three-dimensional ecotone of interaction that includes both terrestrial and aquatic ecosystems. It is identified on the ground as one of the following: a perennial stream or other perennial water body or intermittent stream, as well as the associated soils, vegetation, and hydrology. It extends down into the ground water, up above the canopy, outward across the flood plain, up the near-slopes that drain into the water, laterally into the terrestrial ecosystem, and along the watercourse at a variable width (Ilhardt *et al.* 2000).

The Hoosier National Forest designates a “riparian corridor” as shown in Figure I.2 below.

Figure I.2

# SIMPLIFIED SCHEMATIC OF THE RIPARIAN CORRIDOR AS RECOMMENDED BY REGION 9



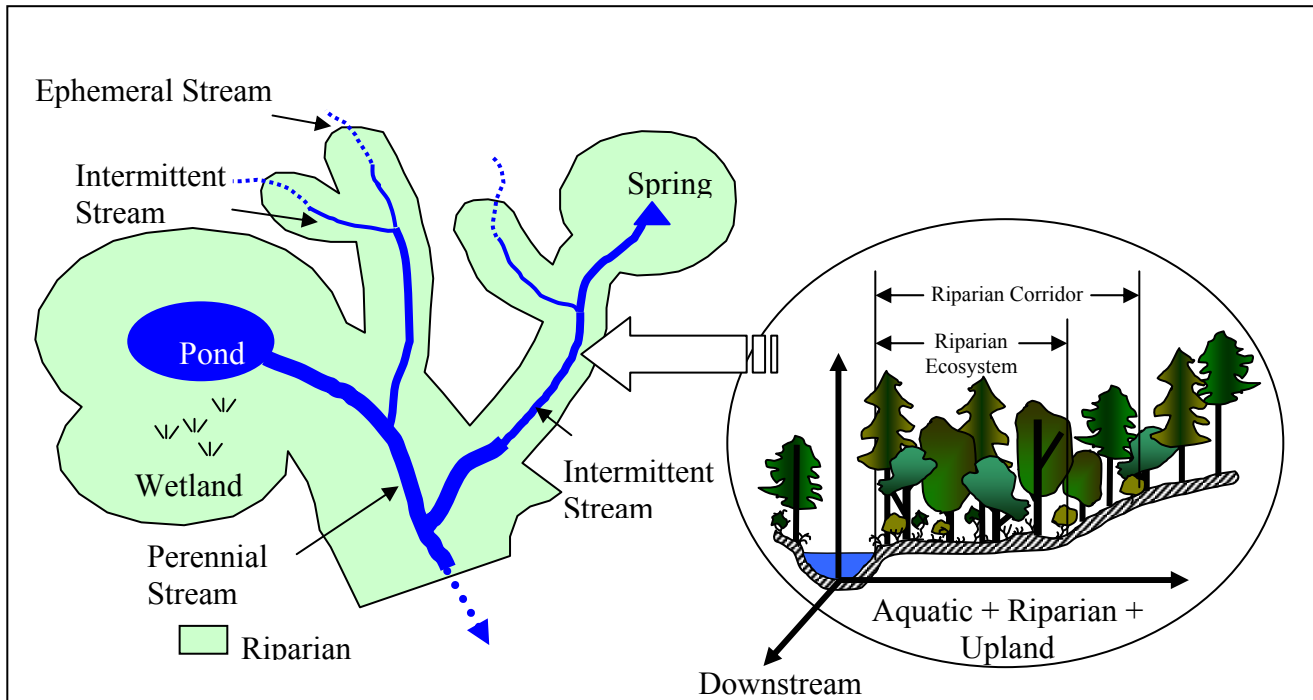
The riparian corridor includes the riparian area along all perennial and intermittent streams with defined, recognizable channels. Where necessary, the riparian corridor also includes any adjacent terrestrial areas needed to protect or restore riparian function. The example in Figure I.2 illustrates how a steep, erodible slope that could adversely affect the riparian area or the stream is included in the riparian corridor, even though it is not technically part of the riparian area.

Riparian corridors also include areas around ponds, lakeshores, wetlands, waterholes, springs, and seeps. Figure I.3 illustrates how the riparian corridor includes wetlands, waterholes, springs, seeps, perennial streams, and those portions of intermittent streams that have a defined, recognizable channel.



Figure I.3

# REPRESENTATION OF A RIPARIAN CORRIDOR



**Ephemeral streams** with recognizable channels will have a 25 foot minimum riparian corridor as measured from each channel or bank.

An **interrupted stream** (a watercourse that goes underground and then reappears) will be measured as if the stream were above ground.

For **braided streams**, the outermost braid will be used as the water's edge.

For **ponds, small lakes, waterholes, wetlands** (including associated seeps or springs), and other water bodies, the measurement begins at the ordinary high water mark.

# Appendix J

## MAPS

There are three types of maps in this appendix.

Map 1A – 1D - These maps show the management areas delineated for each part of the Forest. The management areas correspond to the guidance described in Chapter 3. Due to the size of the Forest, and in order to show a reasonable level of detail, we've displayed the Forest on four separate map sheets. The Forest is divided up by the most northern block, the block near Shoals, IN, the block near Patoka Lake, and the largest southern block. National Forest System ownership is shown in shaded gray on each map.

Map 2A, 2B - The Visual Quality Objective (VQO) Map shows the visual quality objectives identified for each portion of the Forest. This map is broken into the north and south sections of the Forest.

Map 3 - The Recreation Opportunity Spectrum (ROS) Map shows the recreation opportunity classifications for various portions of the Forest.

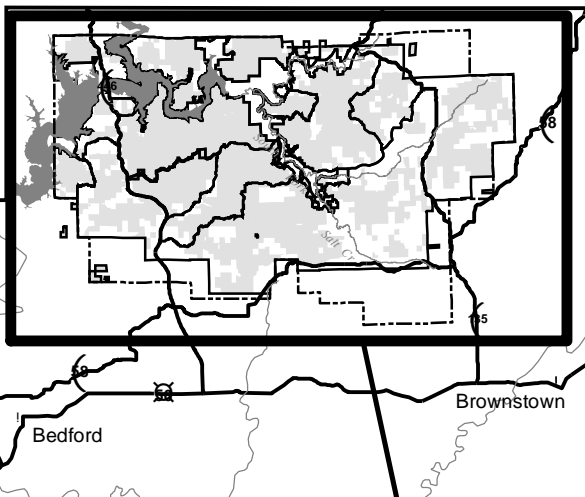
## Management Area (MA) Maps

<u>MA Number</u>	<u>Description of Area</u>
2.4	NFS land along streams, some maintenance and restoration of ecosystems
2.8	General Forest, provides young forest, mostly by uneven-aged methods, forest openings, timber products, and some minerals
3.3	General Forest, provides young forest, a mix of even-aged and uneven-aged methods, forest openings, and timber products.
5.1	Congressionally designated Charles C. Deam Wilderness
6.2	General Forest, preservation, limited access, solitude featured in recreation experience
6.4	General Forest, preservation, limited access, minimum management, allows restoration and maintenance of plant communities.
7.1	Developed recreation areas
8.1	Research Natural Areas
8.2	Special Areas
8.3	Experimental Forests
9.2	Candidate Special Areas and Research Natural Areas (none identified at this time)

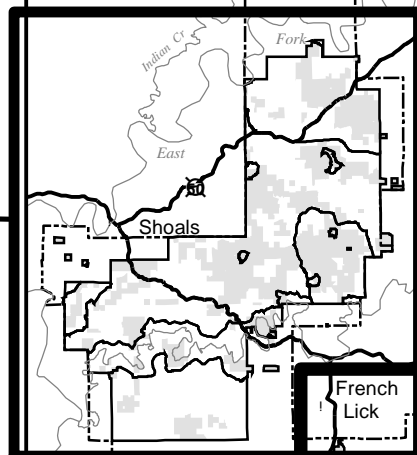
Management Area map numbers correspond to the condition of the land as described in the Guidance section of Chapter 3.

The management areas identified on these maps and the management direction defined in the Forest Plan apply to NFS lands only. They do not apply to any lands in State, county, private, or other ownership.

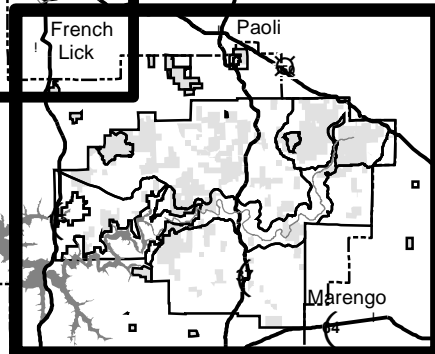
# Hoosier National Forest Vicinity Map and Management Areas Map Key



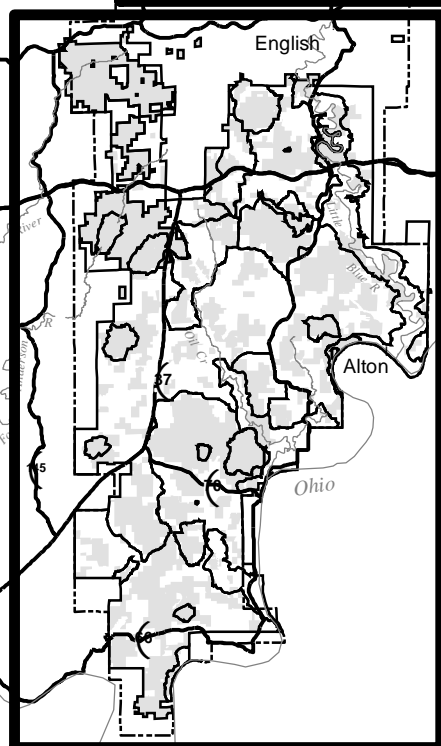
**Map 1A**



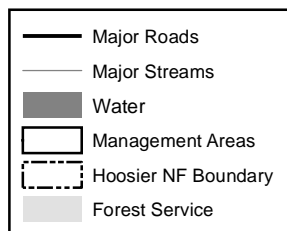
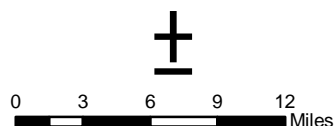
**Map 1B**



**Map 1C**



**Map 1D**

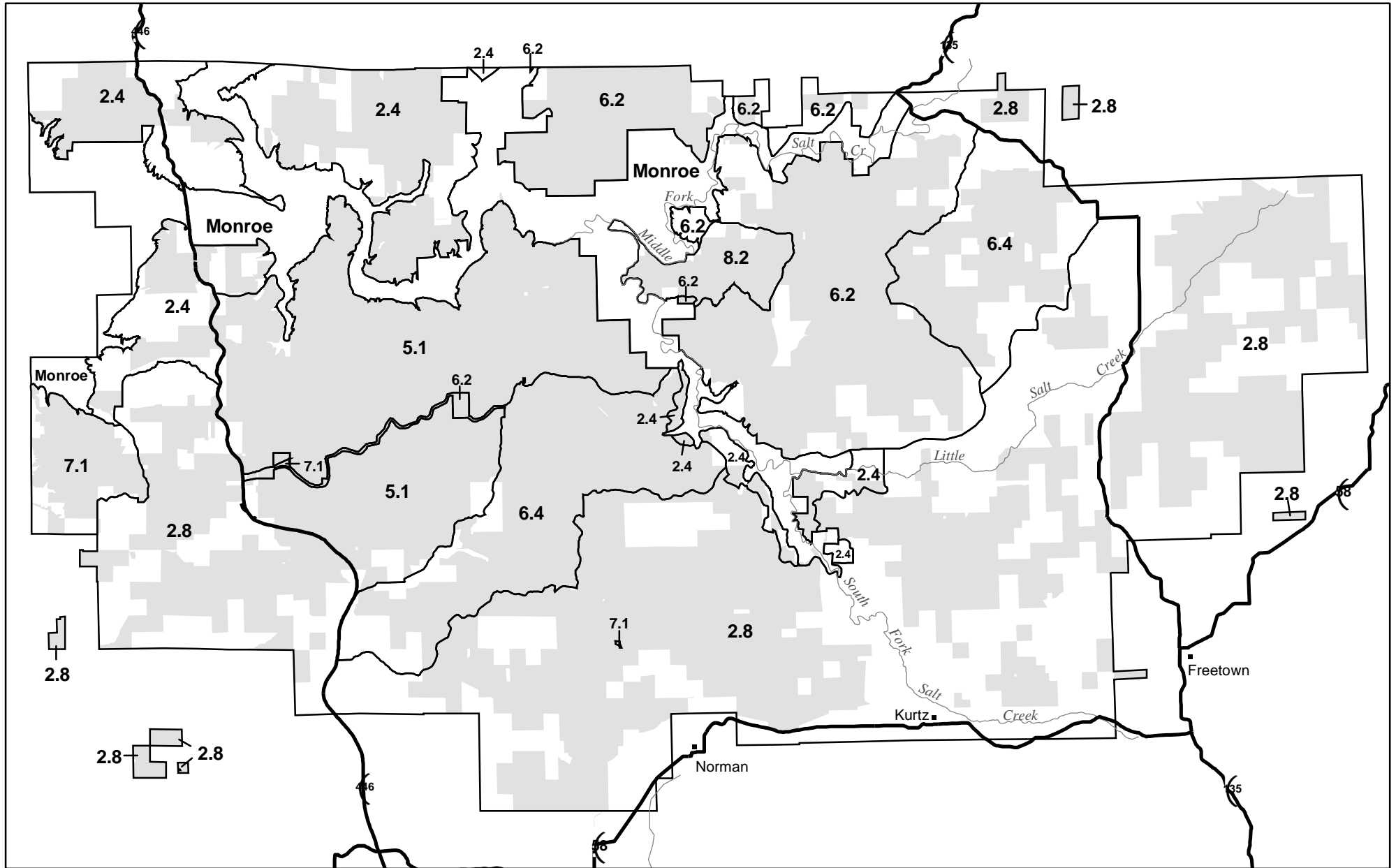


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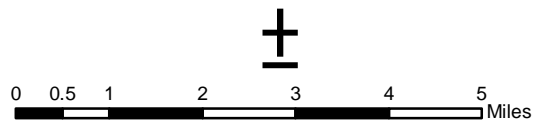


# Management Areas

Map 1A



- Management Areas
- Forest Service
- Highways
- Major Streams



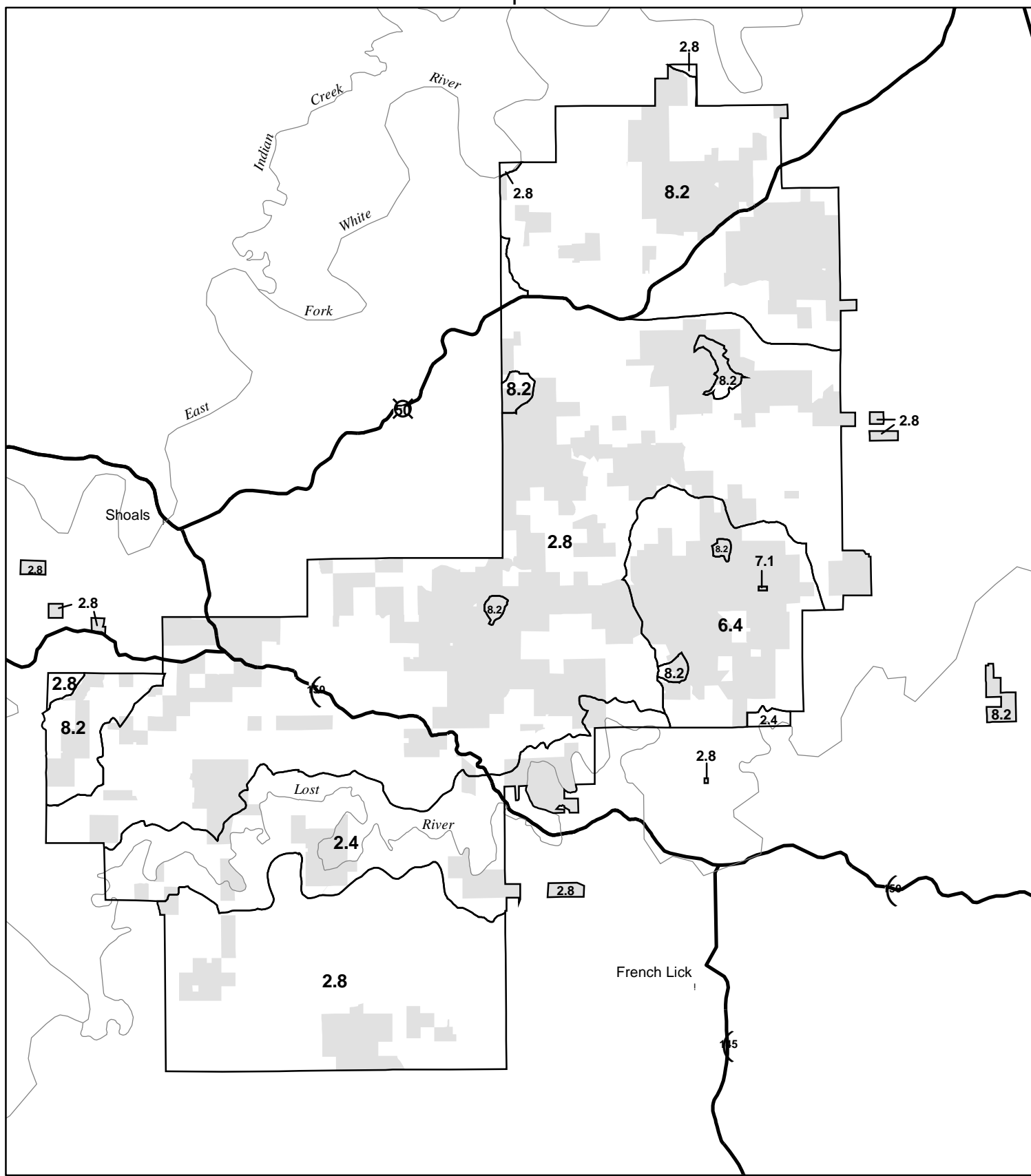
October 2005

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# Management Areas

Map 1B

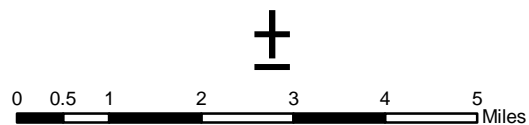
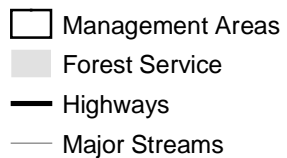


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## Map 1C

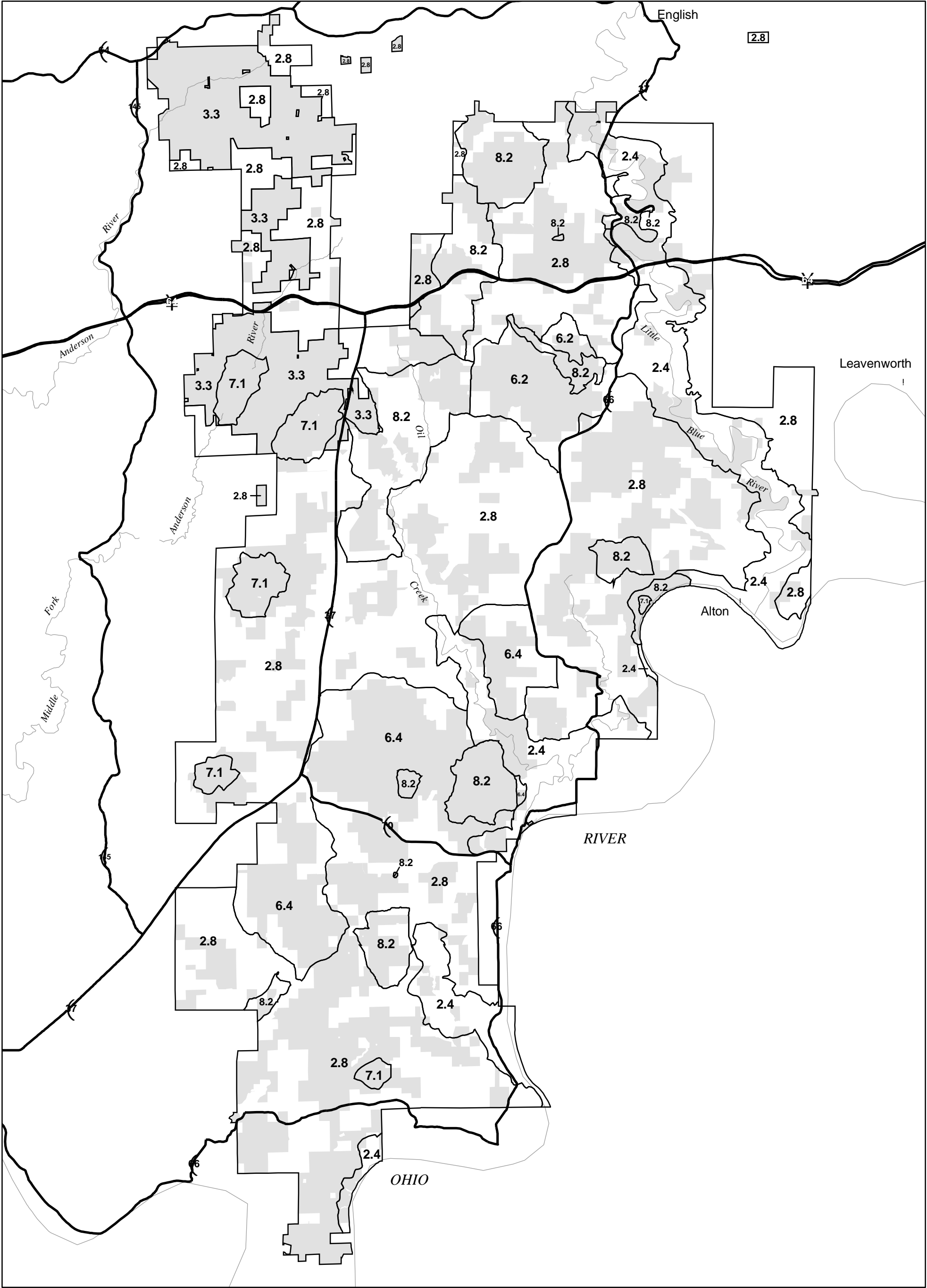


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# Management Areas

Map 1D



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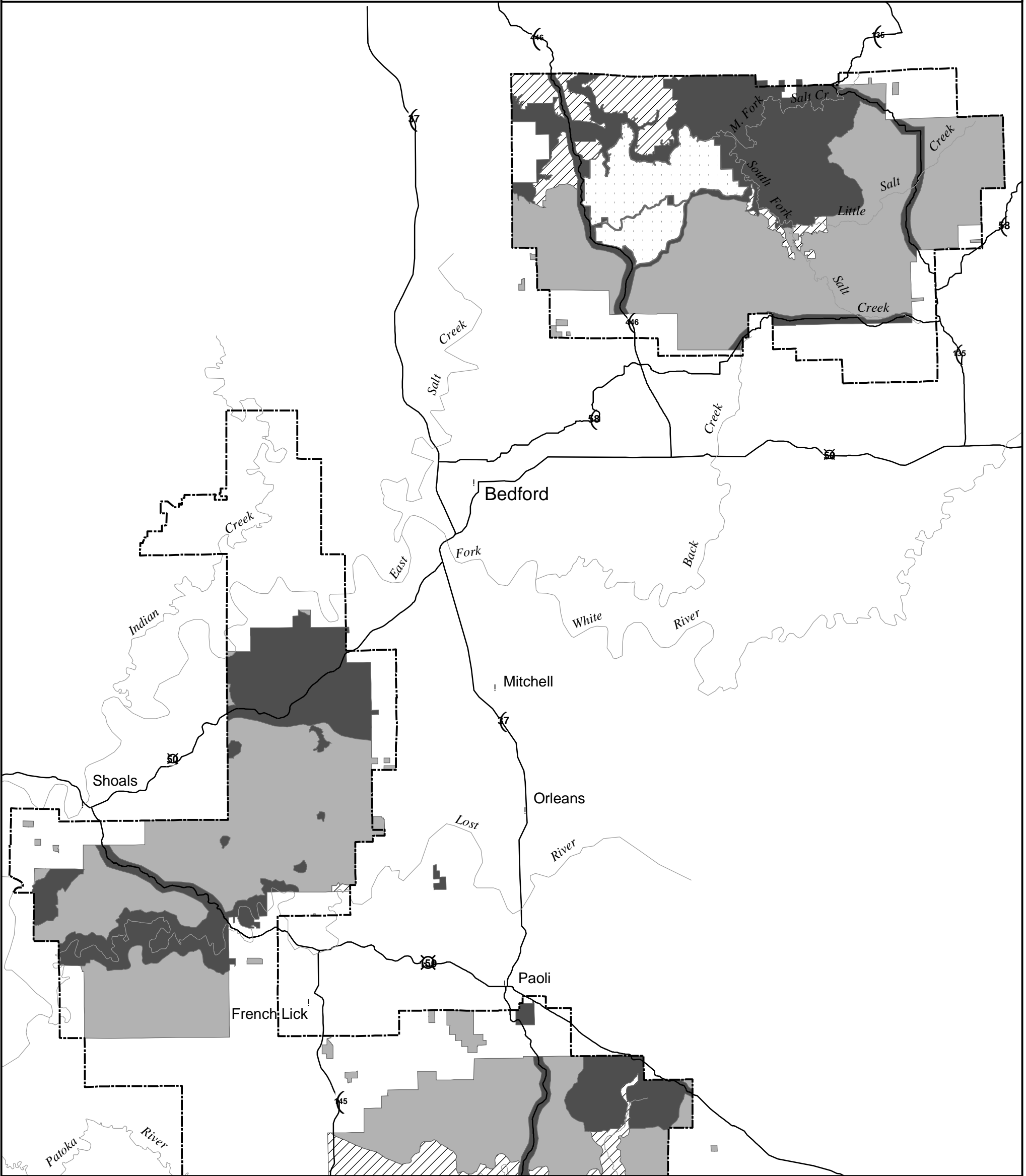




# HOOSIER NATIONAL FOREST

## Visual Quality Objectives

### Map 2A



Major Streams

Major Roads

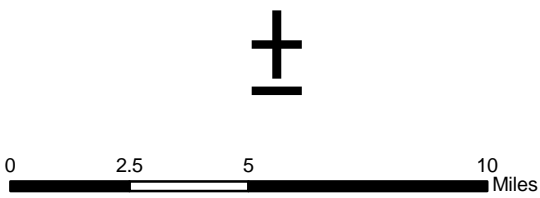
Purchase Unit Boundary

Retention

Partial Retention

Modification

Preservation



November 2005

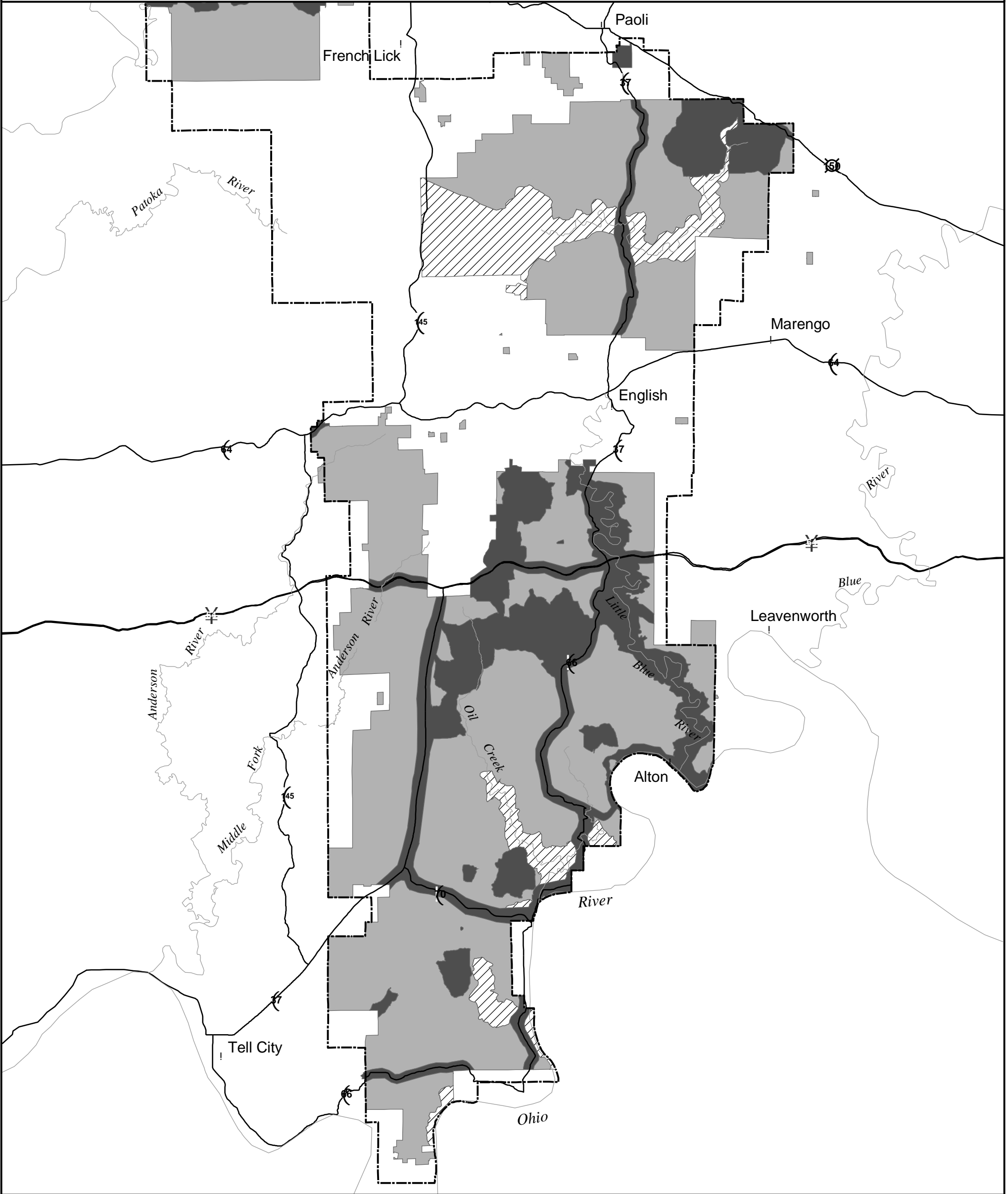
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# HOOSIER NATIONAL FOREST

## Visual Quality Objectives

### Map 2B



— Major Streams

— Major Roads

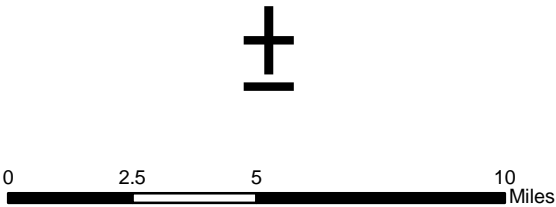
- - - Purchase Unit Boundary

**Visual Quality Objectives**

Retention

Partial Retention

Modification



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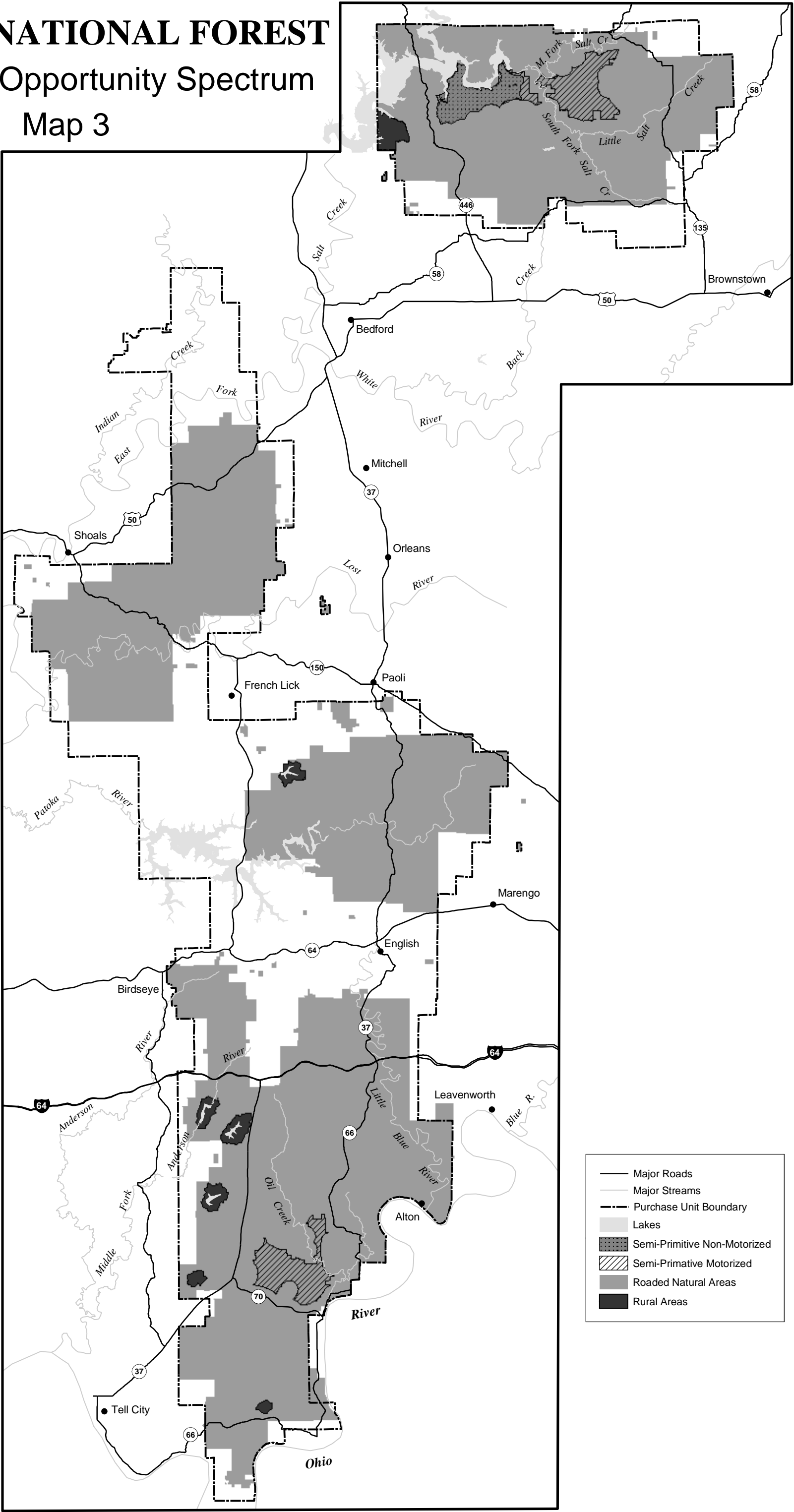


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# HOOSIER NATIONAL FOREST

## Recreation Opportunity Spectrum

### Map 3



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July 2004

