

Land and Resource Management Plan

Shawnee National Forest



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CHAPTER I. INTRODUCTION

I. THE FOREST PLAN

This document is the Shawnee National Forest Land and Resource Management Plan (Plan). It is a revision of the 1992 Forest Plan that was itself a significant amendment of the original 1986 Land and Resource Management Plan. The revision was undertaken in compliance with the law in order to review and improve the management of the Forest and to incorporate information that has been gained through monitoring and evaluation of the 1992 Plan.

The Plan focuses on the seven topics addressed in the notice of intent (to revise the Plan) published in the *Federal Register* on March 20, 2002:

1. Watershed Resources
2. Biological Diversity and Wildlife and Aquatic Habitat
3. Recreation Management
4. Forest Ecosystem Health and Sustainability
5. Mineral Resources
6. Wilderness, Roadless Areas, Wild and Scenic Rivers
7. Land-Ownership Adjustment

The Plan is based on Alternative 2 analyzed in the accompanying final environmental impact statement (FEIS) on the proposed revision of the land and resource management plan. Alternative 2 was selected because it addresses the issues raised by the public and identified during monitoring and evaluation, as well as during the Plan-revision analysis. The Plan sets management direction for the Forest that is sensitive to the environment and responsive to the people's needs.

A. PURPOSE OF THE PLAN

The Plan, together with applicable laws and regulations, guides all natural-resource management activities on the Shawnee National Forest (SNF or Forest). It describes and specifies resource-management practices, levels of resource production and management and the availability and suitability of lands for resource management.

The Plan complies with the National Forest Management Act (NFMA) and its implementing regulations, and other guiding documents. The land-use determinations, goals and guidance stated within constitute a statement of the management direction to be pursued by the Forest. Projected outputs, services and implementation rates are dependent on the annual budgeting process.

The Plan focuses on the decade 2005 through 2015. It may be amended as needed and should itself be revised within 10 to 15 years of the date it is adopted. It does not include

site-specific treatments and actions; these are considered at the project level. By regulation, it must include:

- Forest-wide multiple-use goals and objectives [36 CFR 219.11(b)];
- Forest-wide management requirements [36 CFR 219.13 to 219.27];
- Management-area direction [36 CFR 219.11];
- Identification of lands suited and not suited for resource use and production (e.g., timber production or motorized use) [36 CFR 219.14];
- Monitoring and evaluation requirements [36 CFR 219.11(d)] and
- Recommendations to congress, if any [36 CFR 219.17].

As soon as is practicable after approval of the Plan, the Forest Supervisor will ensure that all existing projects, outstanding and future permits, contracts, cooperative agreements and other instruments for occupancy and use of affected lands, subject to valid existing rights, are consistent with the Plan.

B. ORGANIZATION OF THE PLAN

The Plan is divided into five chapters and includes appendices and maps.

CHAPTER I explains the purpose and structure of the Plan and its relationship to other documents and includes a brief description of the Forest.

CHAPTER II examines some of the major outputs and benefits associated with management of the Forest under the Plan. It compares the potential supply of goods, services and uses to the anticipated demand.

CHAPTER III discusses how the Plan addresses and responds to the major issues, concerns and management opportunities identified during the planning process. It also provides a summary of research needs.

CHAPTER IV presents the integrated management direction for the Forest, describing overall goals and objectives. A listing of proposed and probable management practices for implementing the Plan is also provided.

CHAPTER V presents standards and guidelines applicable throughout the Forest as well as management prescriptions for specific management areas.

CHAPTER VI explains how the management direction will be implemented and how management activities will be monitored, evaluated and kept current in light of changing conditions and assumptions.

APPENDICES provide further information, such as a glossary and detailed data on several aspects of the Plan.

MAP displays the Forest and the location of each management area. (It is the map for Alternative 2 in the FEIS.)

II. THE FOREST

The Forest is located in the southern tip of Illinois. The region is bordered on the east and south by the Ohio River and on the west by the Mississippi River. The Forest is divided into two administrative units called ranger districts—Hidden Springs, on the east side of the Forest, and Mississippi Bluffs, on the west side—with offices at Jonesboro and Vienna. Overall Forest direction is provided through the Forest Supervisor's Office in Harrisburg.

A. UNIQUE FEATURES OF THE FOREST

The Forest is valued for its natural beauty and unique character. While most of the vast landscape to the north is gently rolling to level cropland, the Forest offers a setting of hills, rock formations and outstanding bluffs and streams, as well as a broad diversity of plants and animals. About 284,000 acres of national forest land lie within the Forest boundary, the largest, publicly owned forested area and only national forest in Illinois.

The Forest was created about 70 years ago when much of the area was exhausted, abandoned farmland, or forest that had been logged many times with no attempt at reforestation. In August, 1933 the National Forest Reservations Committee approved the establishment of two purchase units in southern Illinois. On September 6, 1939 President Franklin D. Roosevelt proclaimed these purchase units the Shawnee National Forest.

The Forest of today is a tribute to the early and visionary efforts of the citizens of Illinois who recognized the special values of this land, as well as the need to assure protection of its natural resources through wise conservation practices. Additional land was acquired; eroded fields and cutover areas were reforested; erosion was checked; the forest was protected from fire. The Forest has been managed for over 70 years under the multiple-use concept, which ensures the conservation and wise use of its many resources.

Over 5.6 million people live within 100 miles of the Forest (less than a two-hour drive). Nearly 71 million people (one-quarter of the national population) live within 400 miles (a day's drive). Major cities within a day's drive include Chicago, Indianapolis, Louisville, Nashville, Memphis, St. Louis and Kansas City.

The Forest is located at the edge of the glaciated area, at the integration-point of five regional ecotypes, resulting in a broad diversity of flora and fauna and unique geological features. The Forest provides diverse habitats for endangered, threatened and sensitive species, as well as for game and non-game species. The Oakwood Bottoms Greentree Reservoir and Mississippi River floodplains provide important wetland habitats for migrating waterfowl in the Mississippi flyway.

Wildlife abounds on the Forest, with about 500 vertebrate species represented: over 237 species of birds, 47 reptiles, 32 amphibians and 112 fish. These include common species such as whitetail deer, wild turkey, squirrel and northern bobwhite, as well as rare species found in few other places in Illinois. The variation in plant life on the Forest seems limitless and botanists have long recognized the Forest for its diversity of plant communities. The Forest protects remnants of 25 rare natural communities in 80 natural areas.

The SNF contains some of the largest and most diverse blocks of mature hardwood forest, forest-interior habitat, bottomland forest and openland habitats in Illinois. Most of the Forest is comprised of native oaks and hickories, providing excellent wildlife habitat. Non-native pines planted in the early years of the Forest to control erosion are now common, especially on the east side of the Forest. These habitats for both animals and plants depend on the protection offered by wise management of the Forest.

The Forest is characterized by an abundance of geologic features. The bluff regions of the Ohio and Mississippi Rivers have a broken topography dominated by high cliffs and floodplains. Other features are natural bridges and stone sculptures, such as those found at the Garden of the Gods. The Forest and the region provide a diversity of landscape not found elsewhere in Illinois. The geologic features of the area have long been recognized for their scenic beauty and are a highly valued natural resource. The geologic processes that formed the landscape have also created various mineral resources in the region, including fluorspar, coal, oil, Tripoli, refractory clay, sand, gravel and barite.

The highest quality, most scenic and most ecologically diverse streams in southern Illinois are in watersheds with a high percentage of national forest ownership. The Forest includes an abundance of wetlands, floodplains and riparian areas that enhance water quality. The Forest also contains many visually attractive hydrologic features like waterfalls, lakes, ponds and rocky streams.

The Forest has a rich cultural history. Native Americans used the area's resources for over 12,000 years. French and English explorers and settlers played an important role in the early European settlement of the area. Over 2,755 heritage-resource sites have been identified on the Forest. Inventory and protection of these sites is an important part of Forest management.

The Forest provides open space to public access and many recreational opportunities. It provides scenic landscapes, fresh air, natural beauty, quiet and peaceful settings, interesting historic sites, educational and research opportunities and many other attractions. Recreational opportunities are a major attraction for tourism and enhance the local economy. Visitor use includes fishing, hunting, camping, horseback-riding, hiking and sight-seeing. Unique opportunities offered on the Forest include big-game hunting, long-distance hiking and horseback-riding, orienteering, bird-watching, rock-climbing and rappelling, beach activities and motoring on two national scenic byways—the Ohio River and Great River Roads.

The Forest contains seven congressionally designated wildernesses and six candidate wild and scenic rivers for backcountry recreation, the largest amount of wilderness and roadless areas in Illinois. Recreational uses have become increasingly important as the surrounding urban population seeks renewal, relaxation and physical challenge in the outdoor environment. The diverse setting of forests, hills and streams attracts thousands of recreational users each year. The Forest provides and manages campgrounds, picnic areas, boat-launching sites and a trail system for the use and enjoyment of visitors.

The Forest offers valuable timber products to support the local and national economy. This involves the protection and utilization of the renewable timber resource to provide a sustained yield of wood for lumber and paper to meet the present and future needs of society. Timber harvesting is used to thin dense stands of trees, to create the environmental conditions necessary for the continued regeneration of oak and hickory forests and to provide essential habitat for wildlife. Reforestation is a continuing element of the management of the timber resource. The combination of all forest vegetation management practices ensures a future forest with a diversity of tree species from seedlings to large, old-growth trees, while maintaining recreational opportunities and the scenic qualities of the landscape.

B. A VISION OF THE FUTURE

The mission of the Forest Service is to sustain the health, diversity and productivity of the nation's forests and grasslands in order to meet the needs of present and future generations. This mission requires a balanced consideration of the use of all Forest resources. It requires the application of scientific knowledge, conservation leadership and prudent management in partnership with other government agencies and private organizations and individuals.

Through implementation of the Plan, the Forest will provide the public a variety of resource uses, recreational experiences, and services, while protecting physical and biological resources. The Forest will remain biologically diverse, serving as a touchstone for the large-scale ecosystem-conservation practices of an interconnected network of wildlands throughout the Midwest. It will offer a diversity of forest, openland and aquatic habitats that support sustainable populations of native plants and animals, particularly endangered, threatened and sensitive species.

The Forest will be a consolidation of large unfragmented blocks of healthy, native, hardwood-forest ecosystems presenting the visitor with a mosaic of hills and streams bordered by stands of hardwoods. Openlands will provide scenic vistas, wildlife habitat and recreational opportunities. The amount of hardwood forest will increase as existing pine stands are reforested to native hardwoods. The amount of the oak-hickory forest-type likely will decline due to the lack of disturbance on those parts of the Forest where vegetation is not actively managed. It will be replaced in these areas by the more shade-tolerant, maple-beech forest, especially on deeper soils and more productive sites.

The oak-hickory forest will be maintained in areas where there is active vegetation management to sustain it, and on the shallow soils and poorer sites. Vegetation-management activities, including landscape-scale prescribed burning and timber harvesting, will be supportive of wildlife habitats and recreation and scenery-management objectives. Much of the Forest will be managed to provide larger and older trees for wildlife habitat and visual quality.

Habitat for game and non-game, wildlife species will be maintained or enhanced, and wildlife populations will increase on the Forest. Special emphasis will continue on the management and protection of the many at-risk plants and animals on the Forest.

Cooperative efforts with other government agencies and private organizations in fisheries and wildlife management will continue.

A wide variety of recreational opportunities will be provided, ranging from highly developed recreational sites to semi-primitive, motorized and non-motorized areas that provide opportunities for a feeling of isolation from most of the sights and sounds of human activity. A roaded-natural recreational setting will be featured on most of the Forest to provide a mix of non-motorized and motorized recreational opportunities.

Opportunities for dispersed recreational uses will be emphasized. These include hunting, fishing, hiking, remote camping and the observation of natural features. A well-designed, maintained, marked and mapped trail system will be developed to enhance the recreational user's experience and to provide quality horseback-riding opportunities. Recreational operations and maintenance will provide for the protection of public health and safety and maintenance of investments.

Wilderness areas will be managed to provide backcountry recreational opportunities in a semi-primitive, non-motorized setting. These areas are places where ecological succession is allowed to proceed freely and which serve as ecological benchmarks for the rest of the Forest. Mature forests with shade-tolerant vegetation and wildlife predominate. Past human disturbances are becoming less evident. Trails and primitive facilities are provided as needed to enhance the wilderness experience or to protect the wilderness character.

Segments of six streams are candidates for further study for inclusion in the national wild and scenic rivers system. A variety of land conditions may be observed along these streams. The free-flowing condition, water quality and outstandingly remarkable values that qualified these stream-segments for further study are protected. Recreational settings and opportunities vary by stream, but are primarily roaded-natural with a mix of non-motorized and motorized uses.

Ninety areas on the Forest are managed to preserve and enhance their special features for future generations. These include 4 heritage-resource sites listed on the National Register of Historic Places, 4 research areas (such as the Kaskaskia Experimental Forest), 14 botanical areas, 58 ecological areas, 2 geological areas, 8 zoological areas and 10 research natural areas.

CHAPTER II. SUMMARY OF THE MANAGEMENT SITUATION

I. INTRODUCTION

The Plan provides for multiple use of the Forest as well as a sustained yield of goods and services from the Forest. Its objective is to maximize long-term, net, public benefits through environmentally sound management. Regulations implementing NFMA require an analysis of the management situation as part of the planning process. The purpose of the analysis is to identify need for change (if any) from the direction of the current Plan. The analysis also indicates the ability of the planning area to supply goods and services in response to society's demands.

The items identified as in need of change from current direction were discussed in the document, "Need for Change—Description of Proposal for Revising the Forest Plan of the Shawnee National Forest," that accompanied the *Federal Register* notice of intent to revise the Plan. The response of the Plan to need-for-change issues is addressed in Chapter III. FEIS Chapter 3 offers a detailed discussion of the current management situation and the affected environment. FEIS Appendix B discusses benchmarks and constraints on outputs.

As part of the planning process, the potential supply of, and demand for, certain forest products and services were assessed, given biological and legal constraints. Potential quantities were compared with quantities that could be produced under the management alternatives. Present demand was determined primarily by present use and surveys. Future demand, difficult to assess on a localized basis, was predicted mainly through consideration of national trends in the Resources Planning Act assessment. Planning team members, aware that the future cannot be predicted with surety, developed the estimates of demand by applying their collective, best professional judgment to the assessment of available information.

Supply-potential and demand were analyzed for recreation, timber, range, and energy and mineral resources. Table 2 displays the average annual amounts anticipated. The supply-potential is the highest output-level of goods or services over time, considering legislative and administrative requirements. Demand is the level of outputs, uses and services needed or expected to be desired by the public in the future.

II. RESOURCE SUPPLY AND DEMAND ANALYSIS

Table 2 compares the resource-production and -use levels that could be provided by the Forest under the current management direction (1992 Plan), maximum supply-potential, or revised Plan objectives (as described in Alternative 2 in the FEIS)

Table 2. Supply and demand (average annual amount for the decade 2004-2014).

Output/ Benefit	Unit of Measure	Projected Demand	Maximum Supply- Potential	Current Direction (1992 Plan)	Revised Plan (Alternative 2)
Recreation Visits	M Visits/Year ¹	618	745 (in 2050)	585 (current use)	618
Timber					
- Hardwood	MMBF/Year ²	7.7	7.6	3.4	1.1*
- Pine	MMBF/Year	4.1	3.3	0	3.6
- Total	MMBF/Year	11.8	10.9	3.4	4.7
Grazing	MAUM/Year ³	19	35	19	19

¹ M = Thousands

² MMBF = Millions of board feet

³ MAUM = Thousands of animal unit months

* There are potentially up to 0.8 MMBF of timber available each year on land unsuited for timber production as a by-product of wildlife-habitat improvement. This volume is not part of the regularly scheduled timber outputs.

A. RECREATION

The supply-potential of recreational opportunities on the Forest includes use at developed recreational sites, such as campgrounds, picnic areas, observation points, boat landings, swimming beaches and interpretive facilities; dispersed recreation, such as pleasure-driving, hiking, horseback-riding, nature study, forest-products collection, canoeing, fishing, hunting and wildlife-viewing; and wilderness recreation. The supply-potential for most types of recreation is not limited on the Forest; therefore, the supply-potential is estimated at the long-term demand in the year 2050. Demands for dispersed and developed recreation were based on reported use from the *National Visitor Use Monitoring Survey* in 2002. Demand trends were based on projected local populations and a one-percent increase per year for non-local recreational use.

B. TIMBER

The supply-potential of timber is the maximum amount that could be produced during the next ten years from lands that are classified as suitable for timber production, utilizing silvicultural treatments that would aid in sustaining the oak-hickory forest-type. Since very little timber has been sold on the Forest in the last ten years, the current demand for the timber resource is difficult to estimate. The present total demand is estimated based on mill capacities within reasonable distance of the Forest and the proportion of the Forest timberland in the market area. The proportion of demand for hardwoods and softwoods is also difficult to estimate since there have been so few sales on the Forest. The proportion of hardwood to softwood demand is based on regional averages. Future demands for timber from the Forest are expected to increase similar to the national trends.

C. RANGE

The supply-potential of range on the Forest is an estimate of the grazing capabilities of the Dixon Springs Agricultural Center and the acreage of large openlands acquired in the last 10 to 15 years. Current demand is assumed to be equal to current use, all of which occurs at the center. There are no areas elsewhere on the Forest suitable for range management and the Forest does not intend to meet any other demand for range. Future demand at Dixon Springs is expected to remain the same.

D. ENERGY AND MINERAL RESOURCES

The Forest does not supply these resources directly to the market, as it does timber. Rather, it supplies access for exploration and development of the energy and mineral resources. Excluding congressionally designated wilderness that has been withdrawn from mineral development, the Forest could supply over 197,000 acres of federally owned mineral estate to industry. There is no way to measure the level of demand for these resources; however, industry, through seismic permits and prospecting proposals, has indicated interest in continued access to the Forest for energy- and mineral-resource development.

CHAPTER III. RESPONSE OF PLAN TO THE NEED FOR CHANGE

I. INTRODUCTION

On March 20, 2002 the public was notified of the intent to revise the 1992 Forest Plan. This notice of intent was based on the need-for-change document that discussed the areas of the 1992 Plan requiring change, as identified in preliminary public and employee comments and through the findings of the monitoring and evaluation of Forest Plan implementation.

Many commented on the action proposed in the Notice of intent. The issues that were raised in these comments, together with those identified by the Forest Service, confirmed the need to revise the Forest Plan and helped in assessing the future management goals of the Forest. Together with the information gained at the public meetings on Plan alternatives, they helped guide the development of the proposed action and alternatives for analysis in the FEIS. For a detailed explanation of this process and a listing of each issue and concern, see Appendix A of the FEIS.

This chapter details the manner in which the Plan addresses the issues and concerns raised in the “Need for Change” and also identifies needed research.

A. NEED FOR CHANGE

The seven topics discussed in the need-for-change document are a consolidation of related public issues and management concerns. Each describes an important management consideration for Forest visitors of today and tomorrow. This Plan focuses on the elements requiring change in the 1992 Plan, changes based on consideration of new issues and information; the results of Forest Plan monitoring and evaluation; changes in law, regulations or policy; and the goals and objectives of the Forest Service national strategic plan. The seven topics are:

1. Watershed Resources
2. Biological Diversity and Wildlife and Aquatic Habitat
3. Recreation Management
4. Forest Ecosystem Health and Sustainability
5. Mineral Resources
6. Wilderness, Roadless Areas, Wild and Scenic Rivers
7. Land-Ownership Adjustment

1. WATERSHED RESOURCES

The protection and restoration of watershed health—ensuring continued supplies of clean water—is a priority for the Forest Service and the public. The lands adjacent to lakes and streams are rich in biological diversity and especially valued for wildlife habitat and recreational opportunities.

Most agree that riparian and streamside areas have special values and that water supply watersheds for local communities must protect water quality. However, there is disagreement about the size of filter strips necessary to protect water quality and the need to restrict various uses in riparian and watershed-protection areas. There is concern that restrictions within riparian areas, filter strips and water-supply watersheds could limit recreational opportunities.

Plan response to the need for change in watershed resources management:

The streams, riparian ecosystems and water-supply watersheds on the Forest will be protected. The Plan establishes new management prescriptions for water-supply watersheds and Forest land in the Mississippi and Ohio Rivers flood plains. Forest-wide standards and guidelines for the management of riparian ecosystems and streamside filter-strips have been revised to incorporate the state's best-management practices and new scientific information. Within these areas, timber harvest and road and trail construction—all of which could degrade water quality—are limited by bare-soil exposure limits. These limits apply to ground-disturbing activities within 100 to 300 feet of perennial streams, 50 to 150 feet of intermittent streams and 25 feet of ephemeral streams. Although designed to protect water quality, these restrictions should not interfere unduly with managed recreational use. Forest visitors can expect a natural setting within wetlands and floodplains and near perennial and intermittent streams.

2. BIOLOGICAL DIVERSITY, WILDLIFE AND AQUATIC HABITAT

Almost every aspect of Forest management has some effect on biological diversity and wildlife habitat. The plant and animal communities on the Forest are always changing; and, even if no actions were taken to care for or manage the Forest, the biological diversity and wildlife habitat would continue to change through natural processes. Through prudent management of the Forest's resources, we can influence the natural processes to ensure that a vigorous forest ecosystem with robust biological diversity will be here for our descendents.

Prudent management includes the use of fire, active manipulation of forest vegetation, conservation of natural areas, and maintenance of openlands for certain wildlife species. Lack of management could affect diversity and wildlife habitat by enabling natural processes to continue uninterrupted. For example, the failure to suppress invasive species—especially non-native species—could have significant effects on the biological diversity of native ecosystems when desirable native species are overwhelmed and crowded out.

There is disagreement regarding the level of management appropriate for the Forest. Some think there should be minimal or no active vegetation management, and that management activities will themselves decrease the overall biological diversity of the forest and its surrounding environment. These, for example, would limit the suppression of invasive species to biological, manual and mechanical methods.

Many are concerned about the steady conversion of the oak-hickory forest to the maple-beech type because of predictable, adverse effects on biodiversity. It is the opinion of the Forest Service, the Illinois Department of Natural Resources, the EPA and many others that the forest will be able to provide more benefits for users and enhance biological diversity if it is managed prudently, with the active vegetation manipulation needed for maintenance of the oak-hickory forest-type, the wildlife-habitat openlands, the unique biological features of natural areas and aggressive suppression of invasive species. There remain others who are not convinced that conversion to the maple-beech forest-type would have any adverse effects on biodiversity.

Plan response to the need for change in the management for biological diversity, wildlife and aquatic habitat:

The Forest Service is seeking on the SNF a balanced course guided by stewardship of the integrity of the forest ecosystem. The Forest is defined not only by its physical aspects—water, soil, rocks, plants and animals—but also by its non-physical aspects—recreational opportunities, wilderness experiences, heritage sites, remnant landscapes, geological formations, vistas, trails and roads and quality timber. The people of Illinois and the region have used the Forest for generations and will continue to do so. Management of the Forest will meet the needs of its visitors in a way that is socially responsive and sensitive to the environment.

The Forest will continue to be a composite of plant and wildlife communities, a diversity supported by the oak-hickory forest and large unfragmented blocks of hardwood forest. The oak and hickory provide the hard mast—acorns and nuts—that are critical food for many wildlife species; the large unfragmented blocks of hardwood provide essential habitat for many neo-tropical migrant birds and other forest-interior species.

In order to maintain what remains of the oak-hickory forest-type that dominated the regional landscape under the Native Americans, and that presently constitutes over two-thirds of the Forest, vegetation disturbance is required. Disturbance creates ecological conditions necessary to regenerate oaks and hickories and interrupts succession to the maple-beech forest-type. Large unfragmented blocks of hardwoods also will be maintained throughout the Forest.

Remnants of once-extensive hill prairies, glades and savannas will be restored. Natural areas will be managed to preserve the unique biological features for which they were established and to support the overall biological diversity of the Forest. Populations of species of concern—those federally-listed as endangered or threatened, listed as sensitive by the Regional Forester, or whose viability is under stress—will be maintained or improved through protection and management of their special habitat requirements.

In some parts of the Forest, large openlands, wildlife openings and oldfields will be maintained. These openings will support the diversity of plants and animals on the Forest, including game species such as deer, turkey and quail.

3. RECREATION MANAGEMENT

Few places in Illinois can equal the natural beauty of the Forest. While most of the state is gently rolling to level cropland, the Forest features hills, bluffs, rock formations and trees. This attracts thousands of people each year seeking many types of recreation. Some spend their entire visit at a campground. Some seek the solitude and challenge of wilderness. Others hike, hunt, fish, ride horses, or drive through the forest to view the scenery.

Many want the Forest to continue to be an attractive place to visit and to be available for as many types of recreational uses as possible. Most want well-maintained trails, roads, campgrounds and picnic areas. These facilities make a trip to the Forest more enjoyable. However, others want only undeveloped environments for their recreational pleasure. Many are concerned that activities such as timber harvest or oil and gas development would destroy the beauty of the Forest.

The primary reasons people visit the Forest are to view wildlife and natural features. The primary forms of access while on the Forest are hiking, horseback riding and/or bicycling. Horseback-riding on the Forest has increased notably during the last ten years, stimulating intense discussion over the extent of resource damage attributable to equestrian use and where, when and how equestrian use should be allowed. While all generally agree on the need for an adequate, well-marked, mapped and maintained trail system for the Forest, there is disagreement as to whether equestrian use should be restricted to system trails or continue to be allowed on 1992 Plan-era user-developed trails and cross-country.

There is also disagreement as to whether the use of ATV/OHMs should be allowed. Opinions range from allowing use virtually anywhere on the Forest to managing the use as an important recreational opportunity, to not allowing the use as incompatible with environmental protection and other recreational uses.

Plan response to the need for change in recreation management:

The Forest will be a place for everyone to enjoy. Some will use campgrounds and picnic areas offering camping, swimming and the enjoyment of the company of others. Others will seek to escape the commotion of urban areas and enjoy the natural environment. During this decade, one of the main emphases for recreation management will be the establishment of an adequate, well-marked, mapped and maintained trail system. A system of roads and trails will allow visitors to hike, ride horses or bicycles, and drive through many parts of the Forest.

Allowing ATV/OHM use would require a significant commitment of Forest resources to the planning and design, analysis, construction and management of an ATV/OHM trail system or recreational area. Because the Forest would be unable to make such a commitment during the 10-15-year planning period, ATV's and unlicensed OHM's will not be allowed except for administrative use, access by emergency vehicles, or use authorized by permit or contract.

Trails will be constructed and improved, with special emphasis on the River-to-River Trail and trails within wilderness. Some user-developed trails will be incorporated into the system while others will be obliterated. New recreational sites (campgrounds, picnic grounds, boat launches) could be considered, while others could be closed.

4. FOREST ECOSYSTEM HEALTH AND SUSTAINABILITY

The Forest is one of the only public land bodies in southern Illinois providing large, contiguous blocks of diverse forest, grasslands and shrubland that can be managed on a sustainable basis, providing native plant communities and habitat for native fish and wildlife. The Forest includes the largest blocks of oak-hickory forest in Illinois, although much is slowly converting to maple-beech forest mainly due to aggressive fire suppression for more than 50 years and reduced disturbance in the last 15 years.

There is disagreement about whether trees should be harvested from the Forest. Some believe that timber harvesting, in conjunction with prescribed burning and other vegetation management, can promote the conditions necessary for maintaining and regenerating the oak-hickory forest on a sustainable basis. Some promote the maintenance of a balanced age-class distribution with timber harvesting, while others believe forest composition and age-classes should be based on pre-settlement conditions and the natural range of variability. Those who believe that the Forest should be managed to maintain the oak-hickory forest-type differ on the manner of harvest. Some support uneven-aged management and group-selection harvesting, as prescribed in the 1992 Forest Plan. Others feel that a shelterwood harvest under the even-aged management system would be more effective in creating the conditions necessary for regenerating oaks and hickories to maintain the present forest-type.

Pine trees are not native to southern Illinois, except in a small area of the LaRue-Pine Hills Ecological Area. Most of the non-native pines on the Forest were planted in the 1930's and 1940's to control erosion on depleted farm fields. About 45,000 acres of the Forest is occupied by non-native pine plantations that are not part of the native hardwood forest ecosystem. Conversion of these plantations to native hardwoods could improve the diversity of the forest ecosystem. Some advocate the harvest of pines to accelerate conversion to native hardwoods while others believe the pine trees should be allowed to grow old and die, with no assurance of an eventual succession to hardwoods, even over a longer period of time.

Many want the Forest to cease harvesting timber and any associated road building. They feel that harvesting always harms the forest, and that natural processes, unaltered by humans, are always the best way to provide old-growth hardwood forests. They are concerned about below-cost timber sales and the effects of timber harvest on wildlife, water quality, visual quality and recreation. They do not approve of any commercial timber harvesting on National Forest System lands. They would prefer to see old-growth forest throughout the SNF, allowing natural succession to proceed unhindered and determine future forest composition.

Plan response to the need for change in the management for Forest ecosystem health and sustainability:

A combination of landscape-scale prescribed burns, shelterwood timber harvest and timber-stand improvement will be employed to interrupt succession to the maple-beech forest-type in those places where oaks and hickories have grown historically. Although timber production for the sole purpose of producing timber products is not a goal on the Forest, silvicultural treatments like timber harvesting can be useful in managing vegetation to maintain or improve wildlife habitat and a diverse forest ecosystem. This is particularly true of the oak-hickory forest-type, which requires disturbance to maintain its viability. The production of timber products is an added benefit of the Forest's vegetation management program, utilizing a portion of the renewable timber resource that is in demand for the manufacture of hundreds of products.

Shelterwood timber harvest, in compliance with Forest-wide and management-area standards and guidelines, will provide timber products and improve the health of the forest while maintaining ecological integrity, vegetative diversity, visual quality and recreational opportunities. With the careful design of openings created by timber harvesting and the use of prescribed fire, the Forest will contain more oak and hickory in the future than if no cutting and burning took place. Other harvest methods could be implemented to meet special management objectives. Clearcutting would not be done unless required for other than timber management. Prescribed burning will be carried out on about 8,000 acres per year to create conditions in the forest understory favorable to oak-hickory regeneration, and to help control competing vegetation.

About 60 percent of the Forest is classified as unsuitable for timber production, and most of the Forest will probably never be harvested. Timber-resource management can take place on about 40 percent of the Forest, with the remainder managed for other objectives. On average, less than one-half of one percent of the Forest—about 1,100 acres—could be entered for harvest activities annually during the next ten years.

During the first decade of the Plan, the scheduled hardwood timber harvest from the Forest would be about 1.0 MMBF per year, and pine-stand conversions to hardwoods could produce about 3.6 MMBF per year. Additional timber could be harvested from lands unsuitable for timber production when needed to achieve other resource-management objectives, about 0.9 MMBF per year for the next ten years.

It is possible that the timber-sale program on the Forest will result in below-cost timber sales, since lower-valued trees that are competing with oaks and hickories generally would be selected for harvest. Despite the cost of the investment, this type of treatment is needed for the maintenance and sustenance of the oak-hickory forest-type.

5. MINERALS MANAGEMENT

Most think of the Forest in terms of trees, wildlife and recreational opportunities; but, out of sight and underlying this, are minerals owned by the federal government, corporations and private citizens. These minerals are important resources for the nation's industry and economy, and a source of income for the federal and county governments. Mineral

production usually results in some change in the landscape of the Forest due to the installation of facilities required to develop the resource.

There is concern about the effects on the environment of oil and gas leasing on the Forest. Some feel that oil and gas development is appropriate on the Forest to any degree, while others urge special restrictions, especially within wilderness and natural areas and on developed recreational sites. Some are concerned that restrictions on availability could compromise the ability to discover and develop oil, gas or mineral resources.

Plan response to the need for change in minerals management:

Oil, gas and other minerals can be important to the public. Mineral resources will be managed to allow for the discovery and inventory of deposits, and will be developed in ways that do not degrade environmental quality. About ten percent of the federal mineral estate will be unavailable for oil and gas leasing; minerals underlying wilderness areas—about ten percent of the Forest—have been withdrawn by congress and will be unavailable.

About 55 percent of the federal mineral estate will be available for oil and gas exploration under standard lease terms; about 19 percent will require no surface-occupancy or no drilling within the area. The remaining 16 percent will be available for drilling, but specific conditions will apply, generally including a restriction on the season of operation. Appendix G contains details of oil and gas leasing stipulations within each management area.

6. WILDERNESS, ROADLESS AREAS, CANDIDATE WILD AND SCENIC RIVERS

The Illinois Wilderness Act of 1990 designated seven wilderness areas on the Forest: Bald Knob, Clear Springs, Panther Den, Burden Falls, Bay Creek, Lusk Creek and Garden of the Gods. These areas encompass about 28,100 acres, about ten percent of the Forest. The law excludes from these areas motorized use, timber harvest and development of the federal mineral estate. Private rights and private land within the areas are not affected. These wilderness areas provide excellent opportunities for hiking, hunting, trapping, fishing and horseback-riding.

Disagreement remains about the benefits of, and the need for, additional wilderness on the Forest. Many advocate the recommendation of the Ripple Hollow, Burke Branch and Camp Hutchins areas for wilderness study. The 1992 Forest Plan had recommended the Ripple Hollow area for wilderness study on the condition that conflicts with privately owned minerals be successfully resolved—a condition that was never met.

Segments of six streams on the Forest are candidates for inclusion in the national wild and scenic rivers system: Hutchins Creek, Big Creek, Big Grand Pierre Creek, Lusk Creek, Bay Creek and the Big Muddy River. A quarter-mile corridor along each is managed to retain the stream's eligibility for inclusion in the system. Some prefer that these corridors be abandoned, and others that the streams be included in the national system. These streams were managed under the 1992 Plan to maintain their eligibility for a Scenic classification because their potential classification had not been determined.

Plan response to the need for change in the management of wildernesses, roadless areas and candidate wild and scenic rivers:

As part of the analysis for the Plan revision, Ripple Hollow, Burke Branch, Camp Hutchins, and the remaining areas of the Forest were reviewed to determine their eligibility as roadless areas. It was determined that no areas on the Forest outside existing wildernesses meet the roadless criteria and, so, no areas were evaluated for wilderness potential. Accordingly, the Ripple Hollow area will be managed under a new non-motorized recreational area management prescription, as will Camp Hutchins. Non-motorized recreational opportunities will be emphasized in these areas and they will be considered unsuitable for timber production.

The Burke Branch area has a dense system of improved and unimproved roads that make it more suitable for motorized recreational use than as wilderness. Non-native pine plantations constitute over 18 percent of the area. The pine and the extensive road system are not consistent with roadless criteria. Accordingly, Burke Branch will be managed under the mature hardwood forest management prescription, with emphasis on wildlife habitat and recreation in a mature hardwood-forest setting. Timber harvest will not be scheduled within the Burke Branch area, but could be utilized as a tool for other management objectives.

Analysis of the six candidate wild and scenic rivers determined that the potential classification of all the streams is Recreational, except for the upper ten miles of Lusk Creek—north of the Eddyville Blacktop road—which has the potential for classification as Scenic. Compliance with management standards and guidelines will retain the classification-potential of each stream, as well as their eligibility for inclusion in the national wild and scenic rivers system.

7. LAND-OWNERSHIP ADJUSTMENT

The Forest is the largest tract of public land in Illinois and is regarded as an important resource by the people of Illinois and nearby states. These forested lands in the agricultural heartland of the nation contribute to biodiversity and the health of the ecosystem and provide important recreational opportunities. National forest land is highly fragmented within the Forest proclamation boundary. A consolidated land-base would provide for greater ease of public use and more efficient management. Current land-ownership and adjustment guidelines could inhibit the acquisition of desirable parcels.

Plan response to the need for change in land-ownership adjustment management:

Improvements to land-adjustment guidelines include: new direction revising surface-ownership prioritization and emphasizing the acquisition of all available property rights in each land-adjustment case, recommendations for statutory boundary adjustment and the elimination of the Forest Consolidation Map.

CHAPTER IV. FOREST MANAGEMENT DIRECTION

This section describes the long-term goals for management of the Forest. The principles that guide the actions the Forest Service will take are explained, along with the standards and guidelines. The desired future condition of the Forest's natural resources is described, as well as the estimated levels of goods and services that will be provided to meet public needs.

I. MANAGEMENT GOALS

Forest goals are established through the planning process. Public issues, management concerns and resource-use opportunities are evaluated in light of the Forest's natural-resource capabilities. From this evaluation, the role of the Forest emerges in terms of its capability to meet local, regional and national public desires and expectations. The goals are interrelated and provide a balance of resource protection and public uses.

A. MULTIPLE-USE MANAGEMENT

The Forest will be managed with environmentally sensitive, socially responsive and scientifically sound management practices that are, whenever possible, adapted from and supported by local research. Within its natural-resource capabilities and long-term sustainability, the Forest will provide a balance of multiple uses and public benefits. Public funds will be invested appropriately in the management of the Forest, in compliance with applicable laws and regulations. Multiple-use management practices and their standards will not be compromised to gain short-term monetary savings or to avoid a necessary investment in long-term public benefits.

B. ECOSYSTEM MANAGEMENT

Forest resources will be managed, not individually, but at an ecosystem and landscape level in a manner that addresses the complex issue of biological diversity. This includes:

- Management, maintenance and restoration of ecosystems and ecological processes emphasizing conservation of biological diversity;
- Protection of unique and special ecosystems;
- Resource management that is environmentally sensitive and in harmony with the capability and sustainability of ecosystems;
- Balancing the complex interrelationships of people and natural resources;
- Integration of the desired values and uses of the land and its resources into management and research activities; and
- Collaboration with scientists and educators to test new ideas and technologies.

C. PUBLIC RELATIONSHIPS

The Forest will continue to involve the participation of the public. The principles of the National Environmental Policy Act and other legislation will continue to guide the Forest Service in seeking the advice and counsel of all interested citizens. Management decisions and actions will consider the desires of the public, citizen groups, commercial interests and government authorities. A public relations program will continue in coordination with other public and private organizations to reduce conflicts and resource damage.

D. RECREATION MANAGEMENT

The Forest will continue to welcome all, providing a broad range of high-quality recreational opportunities and experiences. Use will be restricted only when it is essential to protect public health and safety and/or Forest resources and to provide the expected recreational experience.

The system trails on the Forest will be well-marked, mapped and maintained in order to provide for user safety and to protect natural resources. The Forest Service will continue to be a partner with others who provide recreational opportunities in southern Illinois. Trails and recreational facilities will be managed to complement opportunities available on nearby private and public land.

The Forest will provide opportunities for visitors to learn about their environment and heritage, natural resources management and the Forest. Interpretive and informational programs will offer the opportunity to discuss issues and to learn and share experiences.

E. VISUAL-RESOURCE MANAGEMENT

The effects of management practices and public use will often be observed in parts of the Forest. Roads and trails will be seen where they pass across hillsides or forest openings. Forest-openings for the benefit of wildlife or a campground will be seen occasionally, as well as some openings where trees have been removed and young trees are growing. However, even in those places where the results of human activity can be viewed, the Forest will work to blend the visual effects of the activity into the natural-appearing forest landscape.

F. HERITAGE RESOURCE MANAGEMENT

The Forest offers evidence of a rich cultural history that reflects our national heritage. Significant historical and archaeological sites enable all to better understand and appreciate our heritage. The Forest will continue to identify, evaluate and preserve these sites and, where appropriate, provide visitors access to them and interpretation. Other sites will require extensive protection and study.

G. SPECIAL-FEATURE MANAGEMENT

The Forest will preserve and maintain remnants of the rare plant communities that were present in the region before European settlement. Unique natural environments, such as national natural landmarks and other natural areas, will be managed to preserve and protect their special features. Savannas, barrens, prairies, glades and other natural plant communities will be restored and/or maintained through active management programs. These efforts will be undertaken with the cooperation and participation of other interested groups, such as the Illinois Department of Natural Resources, the Illinois Nature Preserves Commission, The Nature Conservancy, the Illinois Native Plant Society, and universities and colleges.

H. RESEARCH

The Forest will continue to play an active role in meeting research needs related to the ecosystems of the Forest, the interaction of people with their environment, and the long-term effects of management practices. The Forest will continue to facilitate and cooperate in research by universities and others and in the management of the Kaskaskia Experimental Forest and the Dixon Springs Agricultural Center.

I. CANDIDATE WILD AND SCENIC RIVER MANAGEMENT

Segments of six streams on the Forest are candidates for inclusion in the national system of wild and scenic rivers: Hutchins Creek, Big Creek, Big Grand Pierre Creek, Lusk Creek, Bay Creek and the Big Muddy River. A quarter-mile corridor along each will be managed to retain the stream's classification-potential and eligibility for inclusion in the system. Portions of any streams within wilderness will be managed according to wilderness standards and guidelines. Management restrictions will apply only to Forest lands; owners of private property on these streams will continue to enjoy every landowner right that they have.

J. WILDERNESS MANAGEMENT

There are seven wildernesses on the Forest: Bald Knob, Clear Springs, Panther Den, Burden Falls, Bay Creek, Lusk Creek and Garden of the Gods. The Forest will provide in each the opportunity for solitude, challenge and primitive recreation, as described in the Wilderness Act and the Illinois Wilderness Act of 1990. Wilderness management will employ approaches and tools that support and maintain wilderness values.

K. FOREST ECOSYSTEM HEALTH AND SUSTAINABILITY

As discussed in the FEIS, Chapter 3, section C, a healthy and sustainable forest ecosystem is essential for maintaining biological diversity on the Forest. Most of the hardwood forests on the SNF will be large and relatively aged, providing old-growth forest conditions on much of the Forest. Maintaining the oak-hickory forest type based on the historic range of variability is important for biological diversity and wildlife habitat. The Forest will utilize various vegetation-management activities, such as landscape-level prescribed burning, timber harvesting and timber-stand improvement to help create and/or maintain the

ecological conditions necessary to regenerate and maintain the oak-hickory forest-type. Forest-wide diversity of vegetation-types is ensured by application of the management prescriptions.

Where vegetation management is allowed, non-native pine plantations will be converted to native hardwoods, with priority given to plantations within or adjacent to natural areas. The restoration of native ecosystems will increase the biodiversity of the Forest and regional landscapes.

This goal emphasizes the maintenance of a healthy and sustainable hardwood-forest ecosystem that includes the production of some timber products as a by-product of vegetation-management activities. This would utilize a renewable forest resource and support the growing need for wood products in an environmentally sound manner that is compatible with other uses.

The Forest will continue to cooperate with state and private forestry programs, the Illinois Department of Natural Resources and university researchers to promote an integrated pest-management program for the prevention, suppression and eradication of insect and pathogenic infestations and non-native invasive species. A variety of integrated pest-management techniques will be used.

L. RANGE MANAGEMENT

The Forest will have no range program outside the Dixon Springs Agricultural Center. The Forest may use grazing to accomplish other goals, such as research on wildlife-habitat improvement. Mowing for hay could also be used to achieve desired vegetation and wildlife-habitat objectives.

M. WILDLIFE, FISH AND AT-RISK SPECIES MANAGEMENT

The Forest is home to hundreds of species of wildlife and fish. The Forest's wildlife and fisheries management program will maintain or enhance habitat for native species and ensure the diversity of natural communities throughout the forest environment.

Special attention will be given to the protection and management of critical riparian, forest-interior, oak-hickory forest, wetland and large-openland habitats. Some vegetation-management techniques that may be employed include prescribed burning, timber harvesting, timber-stand improvement, mowing, disking and seeding. Wetland management may include some structural engineering to restore and maintain important hydrological conditions.

The Forest will be managed to enhance opportunities for both consumptive and non-consumptive uses of wildlife and fish. In cooperation with many partners, the Forest will provide additional waterfowl and other migratory bird habitat along the Mississippi Flyway by expanding and renovating the Oakwood Bottoms Greentree Reservoir and restoring bottomland and riverine forests and wetlands in the Mississippi and Big Muddy Rivers floodplains.

Species that are endangered, threatened or sensitive, or whose viability is of special concern will be given necessary protection and special management to ensure their continued existence. This may include active vegetation and structural management to maintain or restore habitats, as well as the re-establishment of plants and animals on the Forest in cooperation with state and federal fish and wildlife management agencies.

N. TRANSPORTATION SYSTEM MANAGEMENT

The Forest will provide a system of roads and trails offering safe and efficient access for visitor use and enjoyment. In addition to enabling enjoyment of the Forest, the transportation system will support the safe and efficient administration of the Forest. Roads no longer required will be decommissioned or used as a part of the trail system. User-developed trails not designated into the Forest trail system will be rehabilitated.

O. SOIL, WATER, AIR MANAGEMENT

Soil, water and air resources are critical to the health and well-being of the Forest and natural environments of southern Illinois. Some of the most important areas on the Forest are the riparian zones of rivers, streams and lakes. These riparian ecosystems are characterized by abundant species-diversity, high densities of species and populations and ample productivity. Water quality is especially important in watersheds that supply municipal drinking water.

Soil productivity, water quality and the integrity of riparian ecosystems and water-supply watersheds will be maintained and/or enhanced through non-point water-pollution-control methods found in the best-management practices supported by state and federal agencies and coordinated with the US Environmental Protection Agency. These practices are incorporated into Forest-wide and specific management standards and guidelines, or incorporated by reference. Groundwater, lakes, rivers, streams, springs, wetlands and other bodies of water will be protected. Degraded aquatic and riparian ecosystems will be restored, as will the hydrologic condition of watersheds degraded by historic land uses.

Air quality will be maintained or improved through coordination with regulating agencies. Prescribed burning practices will ensure effective smoke management.

P. GEOLOGY AND MINERALS MANAGEMENT

The geologic features contributing to the Forest's diversity are recognized for their scenic beauty and contribution to unique habitats for flora and fauna, and prized as a rich natural resource. The Forest contains many rock formations, waterfalls, caves, groundwater resources, extensive fault systems, igneous rock dikes and other evidence of past geological processes. These same processes are also responsible for the existence of potentially useful mineral resources.

The Forest will protect and, in some instances, showcase unique geologic features to enhance public understanding, use and enjoyment. Mineral resource exploration, development and extraction will be considered and, if appropriate, approved. If approved, exploration, development and extraction activities will be conducted in an environmentally

sound manner that mitigates adverse effects on the forest ecosystem. Unique ecosystems will not be disturbed. Land that is disturbed will be quickly reclaimed and restored.

Q. LAND-OWNERSHIP ADJUSTMENT

The highest priorities of the Forest's land-ownership–adjustment program are providing for ecological restoration, protecting historic resources, reducing management costs and meeting the needs of the public. Acquisition of land that provides habitat for endangered, threatened or sensitive species will continue to be a prime consideration of land adjustment activities. Land consolidation will be sought in order to improve public benefits and reduce administrative costs and is especially important in congressionally-designated areas like wilderness.

Land-for-land exchanges will be considered when they meet the priorities for land ownership adjustment. Land exchanges involving isolated parcels of National Forest land will receive a higher consideration.

The resolution of encroachments, title claims and boundary disputes will be stressed. National Forest land will be managed with emphasis given to protecting the rights of intermingled or adjoining private land and mineral owners, in recognition of the mutual benefits derived from being a good neighbor. Special-use permits that encumber use of National Forest land will receive site-specific analysis, considering not only environmental effects, but also the need to encumber the land and the relative benefits of the encumbrance.

R. LAW ENFORCEMENT

The Forest will continue to inform the public regarding rules and regulations governing National Forest System lands. Forest Service law enforcement will continue to protect public safety and the resources of the Forest. Prevention of violations is the ultimate goal of law enforcement through proper engineering of facilities, public education and enforcement activities.

S. FIRE MANAGEMENT

The Forest will manage fire-suppression resources to provide a safe, efficient, cost-effective organization that can ensure public and firefighter safety, protect property and resource values and reduce the wildfire risk to rural communities. Interagency cooperation among local, state, federal and other agency partners will continue to be incorporated in all aspects of the fire-management program.

Fire use, the combination of prescribed and wildland fires, is applied on the landscape to restore and/or maintain desired vegetative communities, ecological processes and fire-adapted ecosystems; and fire regimes, condition classes and desired fuel-loadings. All appropriate methods to manage fuels, including prescribed fire and mechanical and manual methods, will be utilized in support of Revised Plan objectives.

T. HUMAN AND COMMUNITY DEVELOPMENT

The Forest will continue to be a partner in rural development. Forest Service management programs will provide products, opportunities and services that support economic growth and enhance the quality of rural life.

The Forest will provide human-resource programs that offer education, employment and resource experience opportunities. Opportunities will be made available for individuals and volunteer organizations to become partners in the management of the Forest through volunteer and challenge cost-share programs.

II. MANAGEMENT OBJECTIVES

Projected resource outputs and activities are presented in Table 4-1. These objectives reflect the management direction for the next 10 to 15 years and may change the next time the Plan is revised. The actual objectives of the vegetation management program on the Shawnee National Forest are the acres of forest treated to help maintain a healthy forest ecosystem, and not board feet of wood products. However, timber volumes are an annual output that can be expected as a result of Forest Plan implementation and vegetation management practices. The expected acres of vegetation treatments are presented in Table 4-2, Proposed and Probable Management Practices.

The annual budgets for the Shawnee National Forest are likely to vary and may not be sufficient to implement all aspects of the Plan. Short-range objectives must be flexible to accommodate variations in the annual budget. However, long-range objectives are intended to be met during several years of Forest Plan implementation. Objectives for the second decade onward are displayed to reflect conditions that would result if the Forest Plan were to continue to be implemented beyond its revision date.

Table 4-1. Average annual outputs.

Output	Unit of Measure	Planned, Decade 1	Projected, Decade 2
Recreation	M Visits ¹	618	650
Timber ²			
Hardwood	MMBF ³	1.1	4.5
Softwood	MMBF	3.6	5.2
Total	MMBF	4.7	9.7
Grazing	MAUM ⁴	19	19

¹ Thousands of recreation visits. The output shown is based on expected use. Actual use expected will be limited by actual demand.

² Additional timber volumes may be available as a by-product of vegetative treatments on lands that are classified as unsuited for timber management. These volumes are not scheduled and do not contribute to the long-term sustained yield or allowable sale quantity. Potentially, about 0.8 MMBF could be available each year of the first decade, and 2.2 MMBF per year in the second decade as a result of ecological restoration and wildlife management practices designed to help maintain the oak-hickory forest-type.

³ Millions of board feet

⁴ Thousands of animal unit months

III. PROPOSED AND PROBABLE MANAGEMENT PRACTICES

The following tables summarize the management practices proposed for the first decade of the Plan and the management practices probable during the second decade. Table 4-2 is a Forest-wide summary of practices in all management areas. Tables 4-3 through 4-17 summarize practices expected to occur within each management area.

Table 4-2. Scheduled management practices Forest-wide (in all management areas).

Management Practice/Activity	Unit of Measure	Amount Proposed, First Decade	Amount Probable, Second Decade
Timber Harvest			
- Hardwood shelterwood	Acre	3,197	6,175
- Hardwood shelterwood with reserves ¹	Acre	1,500	3,000
- Pine shelterwood with reserves	Acre	3,814	6,369
- Intermediate treatments ²	Acre	263	172
Reforestation			
- Site prep for natural regeneration	Acre	7,490	9,663
- Planting	Acre	6,166	7,186
Timber-Stand Improvement	Acre	5,362	12,656
Roads			
- Reconstruction	Mile	94	105
- Obliteration ³	Mile	20	20
Equestrian-Hiking Trail Construction ⁴	Mile	235	0
Wildlife Habitat Improvement			
- Wildlife opening maintenance	Acre	700	700
- Large openland maintenance	Acre	2,700	2,700
- Pine-stand restoration to hardwoods ⁵	Acre	586	1,431
- Shelterwood for oak management ⁶	Acre	659	1,330
- Shelterwood with reserves ⁷	Acre	400	800
- Intermediate treatments ²	Acre	95	45
Prescribed Burning			
- Site preparation/brush disposal ⁸	Acre	17,371	26,847
- Landscape-scale site prep for oak ⁹	Acre	66,218	66,218
- Ecological for barrens in NAs ¹⁰	Acre	30,000	30,000
- Large openland management ¹¹	Acre	10,800	10,800
Wetland Structures	Structure	10	10

1 Shelterwood with reserves primarily in forest-interior blocks.

2 Primarily in bottoms in forest-interior blocks.

3 Road obliteration may be performed as needed in any management area.

4 Trail allocations are estimates based on 1992 Plan and existing trail system.

5 On lands unsuited for timber management.

6 On lands unsuited for timber management.

7 In forest-interior blocks on lands unsuited for timber management.

8 At time of harvest.

9 Landscape-scale burning for oak management.

10 Three burns per decade on 10,000 acres.

11 Four burns per decade on 2,700 acres.

Table 4-3. CR management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed, First Decade	Amount Probable, Second Decade
Prescribed Burning			
- Landscape-scale site prep for oak	Acre	2,512	2,512
Equestrian-Hiking Trail Construction	Mile	12	0
No other practices scheduled. Specific additional practices required to maintain stream eligibility for wild and scenic rivers system may be determined during Plan implementation.			

Table 4-4. CV management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed, First Decade	Amount Probable, Second Decade
Equestrian-Hiking Trail Construction	Mile	4	0
No other practices scheduled. Specific additional practices required to maintain wildlife habitat may be determined during Plan implementation.			

Table 4-5. DR management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed, First Decade	Amount Probable, Second Decade
Prescribed Burning - Landscape-scale site prep for oak	Acre	81	81
Maintenance, rehabilitation, or reduction in services at developed recreation sites will be determined during Plan implementation.			

Table 4-6. EH management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed, First Decade	Amount Probable, Second Decade
Timber Harvest - Hardwood shelterwood - Hardwood shelterwood with reserves - Pine shelterwood with reserves - Intermediate treatments	Acre Acre Acre Acre	3,197 1,500 3,814 263	6,175 3,000 6,369 172
Reforestation - Site preparation for natural regeneration - Planting	Acre Acre	6,326 2,185	8,116 2,731
Timber-Stand Improvement	Acre	1,300	8,511
Roads - Reconstruction	Mile	77	85
Equestrian-Hiking Trail Construction	Mile	122	0
Wildlife Habitat Improvement - Wildlife opening maintenance	Acre	658	658
Prescribed Burning - Site prep/brush disposal - Landscape-scale site prep for oak	Acre Acre	11,970 43,228	19,776 43,228

Table 4-7. HR management area—scheduled management practices

Management Practice/Activity	Unit of Measure	Amount Proposed, First Decade	Amount Probable, Second Decade
Equestrian-Hiking Trail Construction	Mile	1	0
Prescribed Burning - Landscape-scale site prep for oak	Acre	420	420
Specific additional practices to protect, evaluate, or interpret significant heritage resource sites, or for wildlife habitat improvement, will be determined during Plan implementation.			

Table 4-8. LO management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Wildlife Habitat Improvement - Large openland maintenance	Acre	2,300	2,300
Prescribed Burning - Landscape-scale site prep for oak - Large openland management	Acre Acre	68 9,200	68 9,200

Table 4-9. MH management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Reforestation			
- Site prep for natural regeneration	Acre	1,164	1,547
- Planting	Acre	481	955
Timber-Stand Improvement	Acre	300	1,645
Roads			
- Reconstruction	Mile	17	20
Equestrian/Hiking Trail Construction	Mile	24	0
Wildlife Habitat Improvement			
- Wildlife opening maintenance	Acre	36	36
- Pine restoration to hardwoods	Acre	586	1,431
- Shelterwood for oak mgmt.	Acre	659	1,330
- Shelterwood with reserves	Acre	400	800
- Intermediate treatment	Acre	95	45
Prescribed Burning			
- Site prep/brush disposal	Acre	2,400	4,071
- Landscape-scale site prep for oak	Acre	11,431	11,431

Table 4-10. MM management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Prescribed Burning			
- Landscape-scale site prep for oak	Acre	440	440

Table 4-11. MO management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Reforestation			
- Planting	Acre	2,000	2,000
Timber-Stand Improvement	Acre	2,262	1,000
Prescribed Burning			
- Site preparation/brush disposal	Acre	1,500	1,500
- Landscape-scale site prep for oak	Acre	200	200
Wetland Structures	Structure	10	10
No other scheduled management practices. Specific practices required to manage for bottomland hardwoods and wetlands will be determined during Plan implementation.			

Table 4-12. NA management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Equestrian/Hiking Trail Construction	Mile	3	0
Prescribed Burning			
- Landscape-scale site prep for oak	Acre	611	611
- Ecological for barrens in NAs	Acre	30,000	30,000
No other scheduled management practices. Specific practices required to protect and maintain significant natural features will be determined during Plan implementation.			

Table 4-13. NM management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Equestrian-Hiking Trail Construction	Mile	2	0
Prescribed Burning			
- Landscape-scale site prep for oak	Acre	7,223	7,223

Table 4-14. OB management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Reforestation - Planting	Acre	1,500	1,500
Timber-Stand Improvement	Acre	1,500	1,500
Prescribed Burning - Site preparation/brush disposal	Acre	1,500	1,500

Table 4-15. RA management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Equestrian-Hiking Trail Construction	Mile	2	0
No other scheduled management practices. Specific practices involved with research will be determined during Plan implementation.			

Table 4-16. WD management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Equestrian-Hiking Trail Construction	Mile	60	0
No other scheduled management practices. Specific practices involved with wilderness management will be determined during Plan implementation.			

Table 4-17. WW management area—scheduled management practices.

Management Practice/Activity	Unit of Measure	Amount Proposed in First Decade	Amount Probable in Second Decade
Equestrian-Hiking Trail Construction	Mile	5	0
Wildlife Habitat Improvement - Large openlands maintenance	Acre	400	400
Prescribed Burning - Large openland management	Acre	1,600	1,600
No other scheduled management practices. Specific practices required for management of water-supply watersheds will be determined during Plan implementation.			

CHAPTER V. STANDARDS AND GUIDELINES

Standards and guidelines are rules and policies that guide Forest management. The standards and guidelines in this chapter are designed specifically for the SNF. They are permissions or limitations that apply to on-the-ground implementation of management practices and indicate what is required to establish and maintain desired land conditions.

The first section of this chapter presents standards and guidelines that apply Forest-wide. Where standards and guidelines apply only to certain places or situations, the exception is identified. The remaining fifteen sections present standards and guidelines that apply to specific management prescriptions. These standards and guidelines generally supplement or take precedence over the Forest-wide standards and guidelines, with the more stringent requirement prevailing.

A **standard** is a course of action that must be followed or level of attainment that must be reached, to achieve Forest goals. In general, standards limit project-related activities rather than compel or require them. Adherence to standards is mandatory. Deviations from standards require a Forest Plan amendment and must be analyzed and documented in an environmental analysis.

Standards are written in the imperative (“Manage the Forest transportation system for its intended use”) or use words that convey mandatory compliance, such as “shall,” “shall not,” “must,” “must not.” In the Forest Plan, standards are identified with an **(S)** indicator following their specific number.

A **guideline** is a course of action that should be followed in most circumstances, but which could require flexibility related to site-specific factors. Deviations from a guideline must be analyzed and documented in a project-level environmental analysis, but do not require a Plan amendment. Guidelines use words that convey discretion, such as “should,” “may,” “where possible.” Guidelines are identified with a **(G)** indicator following their specific number.

Laws, regulations and Forest Service directives generally are not repeated, although references to particular laws or directives may be included to emphasize the protection and management of a specific resource. Most standards and guidelines serve as mitigation measures to reduce or eliminate adverse effects. Singularly and collectively, they avoid, rectify, reduce or eliminate the potential, adverse environmental effects of management actions. Programmatic direction may be altered at the site-specific level to require additional environmental protection, as necessary.

Numbers following the resource titles, such as “(2300)” after “Recreation Management,” correspond to the chapter number and subject resource in the Forest Service Manual. In addition to Plan standards and guidelines, the Forest is required to follow all relevant laws, regulations and direction in the Forest Service manual and handbook.

FOREST-WIDE (FW)

FW19 LAND AND RESOURCE MANAGEMENT (1900)

FW19.2 (S) Seed Collection

Collection of plant seed for administrative or scientific use is allowed. Commercial collection is allowed by forest-product permit only.

FW19.3 (G) Natural Areas

Natural areas are managed under the natural area management prescription. See Appendix D for a description of each area. New natural areas may be designated.

FW19.3.1 (S) The boundaries of natural areas must encompass, at a minimum, the features and values requiring protection. Minor changes in size and boundary-location are allowed to include values requiring protection, or for administrative purposes.

FW19.3.2 (G) Natural area boundaries should be signed and marked.

FW21 ENVIRONMENTAL MANAGEMENT (2100)

FW21.1 (G) Pesticides and Biological Treatments

The use of pesticides and biological treatments to meet management objectives is allowed following appropriate environmental consideration.

FW21.2 (G) Household Pesticides

The use of household pesticides is allowed for the maintenance and protection of health and safety at buildings, recreational sites, administrative sites and other facilities.

FW21.3 (S) Pesticide Use

Pesticides must be applied in accordance with federal and state regulations. To protect human health and safety and the environment, product label directions and guidelines must be followed for pesticide mixing and application methods, rates and timing.

FW21.3.1 (S) Areas treated with pesticides shall be posted, as appropriate, to ensure users are informed of possible exposure. To minimize human exposure to pesticides, schedule treatment of high visitor use areas, such as developed recreational areas, during low use periods, or when the areas are temporarily closed and signed.

FW22 RANGE MANAGEMENT (2200)

(G) Grazing should be allowed for research purposes only, when compatible with the management prescription.

FW22.1 (S) Grazing in Filter Strips

Grazing is prohibited on range or pasture within filter strips, except as may be prescribed at the Dixon Springs Agricultural Center, managed under the Research Area management prescription.

FW22.2 (G) Mowing and Sale of Hay

The mowing and sale of hay is allowed as a vegetation- and/or wildlife-habitat-management tool. Mowing outside administrative areas and developed recreational sites is prohibited before August 1 in each year, except where included as part of disking or plowing activities in openings or openlands, or as part of fire-line preparation.

FW23 RECREATION MANAGEMENT (2300)

(G) An assortment of recreational opportunities, a variety of natural settings and different experience levels should be provided consistent with the Forest recreation niche.

FW23.1 (G) Recreational Facility Development

New construction or reconstruction of recreational facilities should be consistent with the recreation niche, the appropriate recreation opportunity spectrum class, and the “Built Environment Image Guide,” and should be accessible to people with disabilities to the extent feasible. (See glossary for definitions of recreation opportunity spectrum classes.)

FW23.2 (S) Recreational Facility Operation and Maintenance

Developed recreational sites that provide public service shall meet—at a minimum—the critical meaningful measures standards for health and cleanliness, resource setting, safety, security and responsiveness.

FW23.3 (G) System Trails

A Forest-wide system of non-motorized trails should be provided and maintained to enhance a variety of recreational opportunities, provide resource protection, protect public health and safety and minimize user-conflicts. System trails may be designated as hiking-only, hiking/equestrian-only, hiking/biking-only, hiking/biking/equestrian or non-motorized. Hiking is unrestricted.

FW23.3.1 (G) Construction and Maintenance

The development of a mapped, marked and maintained trail system is a priority. Construction and maintenance specifications should be guided by the Forest Service’s “National Trail Management Classes.”

FW23.3.2 (G) User Experience-Levels

User experience-levels should be consistent with management prescriptions and the recreation opportunity spectrum class objective, protect resources and provide for visitor safety.

FW23.3.3 (S) Trail-Signing

Signing and blazing shall be consistent with the recreation opportunity spectrum class objective, user-need and risk-reduction. Within wilderness, signing and blazing may differ. (See the wilderness management prescription for details.)

FW23.4 (S) Equestrian or Bicycle Use

Equestrian or bicycle use is allowed as designated only on system trails or in designated areas, and on roads open to public motorized use. (This standard is applicable only in those watersheds that have undergone environmental analysis as part of the Forest's trail-designation project.) Travel cross-country or on user-developed trails is prohibited except in an emergency that requires cross-country travel to protect public health or safety.

FW23.5 (G) Seasonal or Resource-Damage–Prevention Closures

System trails designated for equestrian- or bicycle-use, but not constructed for all-season standards, may be restricted as needed to prevent resource damage. Equestrian or bicycle use may be restricted from roads for safety reasons, to protect resources, or to meet specific management objectives.

FW23.6 (S) All-Terrain Vehicle (ATV)/Off-Highway Motorcycle (OHM) Use

ATV and unlicensed OHM use is prohibited forest-wide except for administrative use, access by emergency vehicles, or as authorized by permit or contract.

FW23.7 (S) Licensed Motorized Use

Except for administrative purposes, or where permitted, licensed motorized vehicles shall be allowed only on roads or in areas open to public motorized use.

FW23.8 (S) Administrative and Emergency Uses

In all management-prescription areas, motorized-, equestrian- or bicycle-use shall be allowed for administrative or emergency purposes, except where prohibited by law or regulation.

FW23.9 (S) Rock-Climbing and Rappelling

Technical rock-climbing and rappelling are permitted except within natural areas (listed in Appendix D) or where posted as closed. Placement of permanent fixtures used in climbing and rappelling requires prior approval by the Forest Supervisor.

FW23.10 (G) Interpretive Services

Informational and interpretive programs should be designed to enhance public understanding and enjoyment of Forest resources and to introduce the public to quality recreational opportunities. Information on rules, regulations and policies related to site-protection and public-use of areas should be incorporated. Discretion must be used in the distribution of data concerning sensitive-site locations. The design of interpretive structures should be consistent with the recreation opportunity spectrum class of the affected management-prescription area.

FW23.11 (S) Heritage Resource Management

The Forest must be managed in accordance with historic preservation legislation and executive orders. Prior to project implementation, decision documents shall confirm compliance with applicable laws and regulations, particularly regarding completion of heritage surveys, establishment of protective measures as necessary, and documentation of mitigation efforts, if required.

FW23.11.1 (S) Disclosure of Locations

Heritage resource locations are exempt from the provisions of the Freedom of Information Act and may not be disclosed without line-officer approval.

FW23.11.2 Evaluation

FW23.11.2.1 (S) Heritage resources potentially affected by Forest Service activities shall be evaluated for significance and potential listing on the National Register of Historic Places; however, in-place protection of inventoried heritage resources potentially eligible for the National Register is preferred over evaluation whenever practicable.

FW23.11.2.2 (S) Eligible properties shall be nominated to the National Register of Historic Places.

FW23.11.2.3 (S) Known archaeological sites potentially eligible for the National Register are to be included on the Forest's heritage resource priority list. These sites shall be managed under the Heritage Resource Significant Site management prescription upon notification by the Keeper of the National Register that they are eligible for listing. In the interim, use of the areas must be consistent with protection of their unique values.

FW23.11.3 (S) Protection

Heritage resources that have not been formally evaluated are considered potentially eligible for inclusion on the National Register and must be protected. Ineligible sites do not require protection; however, they may have interpretive potential. All unevaluated, eligible and listed sites shall be protected from ground-disturbing activities.

FW23.11.3.1 (S) Mitigation plans shall be developed in consultation with the State Historic Preservation Officer and the National Advisory Council on Historic Preservation for all listed, eligible and potentially eligible heritage resources potentially affected by management activities. Consulting parties may include tribal and local governments and other interested parties. Protective measures will be implemented as recommended. If a project cannot be redesigned and is expected to adversely affect a National Register-eligible heritage resource, a mitigation plan to minimize the effects will be developed and implemented in consultation with the State Historic Preservation Officer.

FW23.11.3.2 (S) When heritage resources are discovered during project implementation, all activities in the vicinity of the discovery must cease until a professional archaeologist has made an on-site assessment and consulted as necessary with the State Historic Preservation Officer.

FW23.11.4 (S) Restoration

Deterioration that affects the significant qualities of a heritage resource potentially eligible for the National Register shall be prevented or mitigated. Deteriorating

unevaluated properties should be given priority for evaluation. Portions of sites that have been disturbed should be restored to conditions that preserve the remaining unique values.

FW23.11.5 (G) Native American Human Remains

Native American human remains and associated funerary objects should be preserved in place.

FW23.11.6 (G) Fire Management

Mechanically constructed fire-lines generally are not compatible with the protection of archaeological sites listed, or eligible or potentially eligible for listing on the National Register. Compatible methods are foam, water, leaf blowing, raking to expose soil, lopping and scattering concentrated fuels, or sale of products. Fire-lines requiring earth-disturbance are not permitted on known heritage sites unless there is an emergency or high risk to health and safety.

FW23.11.7 (S) Vegetation Management

Earth-disturbing vegetation-management practices are prohibited on archaeological sites eligible or potentially eligible for the National Register. Plowing and disking are allowed on sites that have been plowed and disked in the past. Surface activities such as brushing and mowing are allowed unless they affect aboveground cultural features or the cultural landscape, or indirectly increase resource damage.

FW23.11.8 (S) Metal Detectors

The use of metal detectors by Forest visitors is restricted to developed recreational sites not associated with heritage resource sites.

FW23.12 (G) Visual-Resource Management

All management activities should meet the visual-quality objectives designated for each management-prescription area. The Forest landscape architect will retain a map of designated visual-quality objectives.

FW23.12.1 (G) Vistas

Vistas may be developed along roads or trails where consistent with management prescriptions, where topography is appropriate and where the recreational setting would be enhanced. The creation of vistas should be in conjunction with the accomplishment of other resource-management objectives requiring openings. Sizes of vistas may vary to accomplish the visual objective.

FW23.12.1.1 (G) Vista-openings should be maintained by mowing, burning, or cutting invading woody vegetation. Pull-off parking should be provided when the vista is adjacent to a road.

FW23.12.2 (G) Native Vegetation

Native species should be preferred in ornamental landscape plantings at developed sites and around Forest signs.

FW23.12.3 (G) Structural Color Selection

The use of naturally occurring colors should be favored in the choice of finishes for facilities, including buildings, gates and other recreational structures.

FW23.12.4 (G) Soil Color

Color-contrasts of exposed soil should be reduced within the time-limit specified by the appropriate visual-quality objective. Mulch, topsoil, seed and fertilizer may be used as appropriate.

FW23.12.5 (G) Timeframes for Meeting Visual-Quality Objectives

The visual-quality objective of retention should be met concurrently or immediately following the completion of activities; the objective of partial retention should be met within one year; and the objective of modification should be met within two years.

FW23.12.6 (G) Visual-Quality Guidelines for Practices and Activities

Appendix E contains recommended measures for meeting specified visual-quality objectives determined through site-specific analysis.

FW23.13 Cave Management

See Appendices D and H for management guidelines for caves and abandoned mines.

FW23.13.1 (G) All caves should be inventoried as to location, size, length and degree of user-difficulty during the life of the Plan. A strategy should be developed for the management of each cave, addressing maintenance, protection, evacuation and emergency procedures.

FW23.13.2 (S) The alteration or removal of speleological features such as stalactites, stalagmites, or “soda straws” is not allowed except under a scientific collector’s permit.

FW24 TIMBER MANAGEMENT (2400)

FW24.1 (G) Even-Aged Management

Even-aged management should be the predominant silvicultural system in areas where timber-management activities are scheduled and where it is determined to be the appropriate method. It is considered appropriate if any of the following is present:

- 1 Pine is the existing species.
- 2 The oak-hickory forest type is being regenerated.
- 3 Wildlife habitat is being created to meet species-objectives.
- 4 Even-aged stands are needed to provide habitat requirements for threatened, endangered or sensitive species.
- 5 Stands require salvage or sanitation cuts.

Based on the need to establish adequate oak advance regeneration, shelterwood and shelterwood with reserves will be the probable methods of harvest. Determination of the appropriateness of even-aged management will be decided on a project-specific basis.

FW24.1.1 (G) Clearcut Harvest Method

Only the shelterwood or seed-tree methods of even-aged management should be utilized, unless clearcutting is determined to be the optimum method as indicated by the presence of one or more of the following conditions and acceptable advanced regeneration is present, or is occurring through sprouting, seeding or planting:

- 1 Pine stands are to be converted to hardwood (where hardwood advanced regeneration is present);
- 2 Wildlife habitat is being created to meet species-objectives;
- 3 Clearcut stands are needed to provide habitat requirements for threatened, endangered or sensitive species;
- 4 Stands have been heavily high-graded and/or contain low-quality or high-risk timber;
- 5 Stands require salvage or sanitation cuts and there is not sufficient stocking to form the basis for a shelterwood or seed-tree harvest.

Determination of the optimality for clearcutting will be decided on a project-specific basis.

FW24.1.2 (S) Openings Created through Even-Aged Harvest

Temporary openings created through even-aged harvest methods will not exceed 40 acres, although larger openings may be used on an individual-sale basis after 60 days' public notice and review by the Regional Forester, or as a result of natural catastrophic conditions such as fire, insect and/or pathogen attack, or windstorm. A temporary opening occurs during overstory removal in a shelterwood, seed-tree, or clearcut harvest. Intermediate harvests are considered openings only if the basal area is reduced to 30 square feet per acre.

FW24.1.2.1 (S) Analysis of separations between openings created through even-aged harvest methods shall consider the visual quality and wildlife objectives for the area.

FW24.1.2.2 (S) An opening created through even-aged harvest methods shall no longer be considered an opening when the certified re-established timber stand has reached a height that is greater than twenty percent of the height of the surrounding trees.

FW24.1.2.3 (G) Openings created through even-aged harvest methods should be of irregular, natural-appearing shape and vary in size and shape to avoid uniformity of appearance and meet visual quality objectives.

FW24.2 (G) Regeneration

Timber harvest to regenerate even-aged timber stands in the hardwood forest-type should occur only after the stand-age generally has reached culmination of mean annual increment—the point at which the growth-rate begins to decrease. A dichotomous key in a Forest supplement to Chapter 2 of the “Silvicultural Practices Handbook” should be used to determine the management-type for regeneration of hardwoods in pine-stands.

FW24.2.1 Natural Regeneration

FW24.2.1.1 (S) Stocking surveys shall be made the first and third years after regeneration efforts. Minimum acceptable stocking in regenerated stands shall be identified in silvicultural prescriptions for individual stands.

FW24.2.1.2 (G) Natural hardwood-regeneration should be used when stump-sprouting and/or root-suckering, or when a regular seed-crop, good soil-moisture and trees of acceptable quality are present or anticipated.

FW24.2.1.3 (G) Grapevines should be controlled to reduce competition with hardwood regeneration when necessary to meet minimum acceptable stocking standards.

FW24.2.2 (G) Artificial Regeneration

Artificial regeneration should be used when the conditions necessary for natural regeneration are not present, or when it is needed to maintain or restore desired species-composition. This method is also appropriate for any species on newly-acquired land previously used for agricultural purposes and not classed as herbaceous openland.

FW24.2.2.1 (G) Site-preparation may be required prior to planting when competition-problems exist, such as when the predominant vegetation is a dense cover of briars, vines, scattered brush and small trees; or when heavy turf or dense weeds are present over more than 50 percent of the area. A guide for site preparation methods is provided in a Forest supplement to the "Silvicultural Practices Handbook."

FW24.3 (G) Uneven-Aged Management

Uneven-aged management may include single-tree or group-selection harvest methods.

FW24.3.1 (G) Single-Tree Selection

Single-tree selection typically should be used to manage shade-tolerant tree species such as beech and maple. Conditions other than desired stand-structure may override the selection of trees to be harvested. (One example is stands having a large number of high-risk trees.)

FW24.3.2 Group Selection

FW24.3.2.1 (G) Regulation of stand-structure is the same as single-tree selection with the exception that regeneration is achieved by harvesting groups of trees instead of cutting only one tree.

FW24.3.2.2 (G) Openings created through group-selection harvest may vary in size from .05 to 0.6 of an acre. Group openings may exceed 0.6 of an acre and may be as large as two acres when analysis shows a need that cannot be met with the normal maximum of 0.6 of an acre.

FW24.4 (G) Ecological Restoration of Pine Plantations to Hardwood

Shelterwood and shelterwood with reserves are the probable harvest methods for the ecological restoration of non-native pine plantations to hardwood forest. Restoration should be emphasized on plantations within and adjacent to natural areas.

FW24.5 (G) Intermediate Treatments

Intermediate treatments, such as commercial or non-commercial thinning and timber-stand improvement, may be used to enhance the health, vigor, composition, structure, growth and quality of the stand after establishment and prior to final harvest.

FW24.6 (S) Firewood

Gathering of downed material such as firewood may be allowed by permit only. To protect potential bat-roosting trees, the downing of standing dead trees for firewood is not allowed.

FW24.7 (S) Special Forest Products

The gathering of special forest products for personal use and/or commercial sale may be permitted throughout the Forest. The permit shall specify the species and quantities that may be gathered and what harvest/gathering locations are authorized. Not to be authorized are: 1) collection of any species federally or state-listed as threatened or endangered or on the list of Regional Forester sensitive species, 2) gathering of moss or lichens, or 3) gathering/harvesting within wetlands, developed recreational areas or administrative sites, or within 100 feet of perennial water-bodies. Collection of fruits, nuts, berries and fungi for personal use is not restricted where authorized.

FW25 WATER, SOIL, AIR MANAGEMENT (2500)

FW25.1 (G) Water Quality

Forest management activities will conserve soil and water resources and ensure the protection of streams, streambanks, lakes, wetlands and other bodies of water in accordance with applicable laws and regulations. Activities will be guided by the best-management practices defined by the Illinois Department of Natural Resources Division of Forest Resources and may include streambank restoration and/or stabilization and management of large, woody debris.

FW25.2 (S) Riparian Corridors (Filter Strips) and Riparian Areas

These Forest-wide standards and guidelines shall supersede other, less restrictive, management-prescription area standards and guidelines. Filter strips shall be established adjacent to lakes and wetlands and perennial, intermittent and ephemeral streams, except in the Oakwood Bottoms Greentree Reservoir and Mississippi and Ohio Rivers floodplains management areas. Table 5-2 describes the minimum widths of filter strips along perennial and intermittent streams and lakes. The minimum filter-strip width along the edge of wetlands is 100 feet and along ephemeral streams 25 feet. Riparian corridors along perennial and intermittent streams and lakes and wetlands are not part of the suitable timber base.

FW25.2.2 (G) Bare-Soil Exposure Limits

Bare-soil exposure limits are set to reduce the amount of soil-disturbance by limiting the exposure of bare soil to rainfall impact and overland flow. Bare soil is mineral

soil not covered by organic matter, such as leaf litter or plant material, or inorganic material such as gravel. The allowable bare-soil exposure limit is ten percent of each 150-foot linear segment of filter-strip width described in Table 5-2. Exposure limits shall be considered for all mechanical- or recreational-related disturbances, such as fire-lines, skid-trails, and roads and trails, with the exception of prescribed burning. Other exceptions to the exposure limits may be made by the Forest Supervisor if analysis of a proposed action indicates that the effects on soil and water would be less than if the limits were applied.

Table 5-2. Riparian corridor (filter-strip) guidelines

Adjacent land-slope	Perennial stream filter-strip width (feet)	Intermittent stream filter-strip width (feet)
<10 percent	100	50
20	130	65
30	170	85
40	200	100
50	250	125
60+	300	150

FW25.3 (S) Restoration

All disturbed areas that could cause significant impairment of the productivity of Forest land, downstream water resources, or aquatic and/or riparian habitat shall be promptly restored.

FW25.4 (G) Fertilizer-Use

Fertilizers may be used to meet management objectives.

FW25.5 (S) Equipment Limitations

Soil-type, land-slope and soil-moisture-content shall be considered in determining equipment-use restrictions.

FW25.6 (S) Disturbance Limitations

Activities shall be designed and located to limit the timing, degree and/or duration of soil disturbance to the inherent capability of the soils involved.

FW25.7 (G) Floodplains and Wetlands

Construction and rehabilitation of structures and facilities should preserve the beneficial values of floodplains and wetlands and protect public safety. The location of buildings and similar structures on floodplains or wetlands should be avoided to the extent possible.

FW25.8 (S) Air Quality

Emissions from Forest Service activities and related mitigation measures must comply with applicable state standards. Present and potential impairment of Forest resources attributable to air pollution are identified to the Forest Supervisor.

FW26 WILDLIFE HABITAT MANAGEMENT (2600)

FW26.1 (G) The Forest may cooperate with federal and State of Illinois fish and wildlife officials on reintroductions of native, federally and/or state-listed threatened and endangered species on national forest land in accordance with federal and/or state recovery plans and conservation strategies agreed upon by the Forest Service.

FW26.2 (S) Federally Listed Threatened and Endangered Species

Some species occurring on the Forest are federally listed as threatened or endangered and must be protected and/or managed in accordance with their recovery plans as issued by the US Fish and Wildlife Service. The list is included in the Plan by reference; and recovery-plan management strategies can be found in Appendix H. The list and management strategies and guidelines are subject to change by the US Fish and Wildlife Service over the life of the Plan. Any revision of the list that includes species or habitat occurring on the Forest, and/or any revision of the recovery plans' management guidelines shall be reflected in Appendix H and be included in the Plan by reference.

FW26.3 (G) Regional Forester Sensitive Species

Many species occurring on the Forest are listed as sensitive by the Regional Forester and sensitive-species habitat should be managed to ensure the continued existence of the species on the Forest. The current species list is included in the Plan by reference; and management strategies and guidelines can be found in Appendix H. The list and management strategies and guidelines are subject to change over the life of the Plan, and any revision of the list and/or the strategies and guidelines will be reflected in Appendix H and included in the Plan by reference.

FW26.3.1 (S) A biological evaluation of the effects on sensitive species that are expected to occur from a proposed project shall be done prior to the approval of that project.

FW26.3.2 (G) Known locations of sensitive species should be monitored periodically to identify disturbances and any necessary protective and/or management actions.

FW26.3.3 (S) The collection of a sensitive species for scientific purposes requires a permit from the Forest Service.

FW26.4 (S) Management-Indicator Species

Management-indicator species shall be used to monitor the effects of management practices on native and desired non-native vertebrate species. The species and their suitable habitats are:

- Northern bobwhite—representing species of grasslands, shrublands and edges: Wildlife and herbaceous openings, regeneration areas
- Yellow-breasted chat—representing species of shrublands: Herbaceous openings, and upland hardwood and pine to nine years old
- Worm-eating warbler—representing ground-nesting species: Upland hardwood more than 50 years old
- Scarlet tanager—representing canopy-nesting species: Upland and bottomland hardwood more than 50 years old
- Wood thrush—representing species that nest in shrubs and small trees: Bottomland hardwood more than 50 years old (riparian areas and filter strips, and wild and scenic river corridors) and upland hardwood more than 50 years old.

FW26.5 (G) State of Illinois-Listed Threatened and Endangered Species

Some species occurring on the Forest are listed by the state as threatened or endangered, but are not federally listed or included on the Regional Forester sensitive species list. These species may require special management to maintain their continued existence on the Forest and activities should not jeopardize their continued existence on the Forest.

FW26.5.1 (G) The effects of any proposed project on a state-listed species should be evaluated considering the project-specific conservation concerns of the Illinois Department of Natural Resources.

FW26.5.2 (G) Known locations of state-listed species should be monitored periodically to identify disturbances and any necessary protective actions.

FW26.5.3 (S) The collection of a state-listed animal species requires the approval of the Illinois Department of Natural Resources. The collection of state-listed animals in research natural areas requires an additional permit from the Forest Service.

FW26.6 (G) Viability-Evaluation Species

Viability-evaluation species are indicators of biodiversity whose viability has been determined to be under stress. They should be managed in accordance with the management guidelines in Appendix H to ensure their continued existence on the Forest.

FW26.7 (G) Forest-Interior Habitat

Managed forest-interior habitats that maintain oak-hickory forest as well as an abundance of forest-interior bird habitat should be provided in contiguous, forested areas greater than 500 acres to maintain habitat quality and quantity. Forest-interior habitat should be provided primarily in the CR, CV, EH, MH, NA, NM and WD management areas. However, only the EH and MH management areas will be actively managed for forest-interior habitat, utilizing vegetation-management practices such as prescribed burning, timber harvesting and timber-stand improvement. Prescribed burning may be utilized in forest-interior blocks in other management areas; otherwise, they will receive minimal vegetation management.

FW26.7.1 (G) All areas that are at least one mile in diameter and do not include power-lines, paved roads, levees and lakes should be considered for forest-interior management objectives. Within 400 meters (about 440 yards) from hard edge (paved or graveled roads, levees, major power-line corridors and large reservoirs or lakes) is considered buffer area in the one-mile-diameter area. Greater than 400 meters from hard edge is considered interior habitat. Interior habitats should be maintained along major streams or ravine bottoms where possible in each individual interior block.

FW26.7.2 (G) Forest-interior habitats should be managed for large blocks of oak-hickory forests, concentrating in historically oak areas. Multiple-species oak-hickory forests are featured on oak sites, with white, red and black oaks major components of the overstory. Hardwoods and pine may be included for management as interior habitat in these interior areas. Burning should be conducted frequently to promote oak-hickory regeneration and to control competition from shade-tolerant species.

FW26.7.3 (G) On ridge tops and upper slopes, use shelterwood with reserves to help create conditions favorable for the establishment of adequate oak regeneration and to maintain an open forest-canopy. Shelterwood with reserves may result in a two-aged stand. On lower slopes and in ravine bottoms, commercial or non-commercial thinning should be done when necessary. Natural regeneration should be supplemented with artificial regeneration where natural oak-hickory advance regeneration is not adequate.

FW26.7.4 (G) Wildlife openings should be eliminated from the interior-habitat areas within each one-mile- (or greater) -diameter area. Openings in buffer areas should be managed to reduce parasitism and predation effects on forest-interior birds. This includes fall disking or plowing and the planting of legumes and wheat cover-crops or native warm-season grasses or shrubs. All mowing should occur after August 1 in each year, except where included as part of disking or plowing activities, or as part of fire-line preparation.

FW26.7.5 (G) To protect forest-interior bird species, minerals exploration and development actions should be directed to the most fragmented portions of the area potentially affected.

FW26.8 (G) Wildlife Openings

No more than one percent of the Forest should be in managed wildlife openings. Where openings are created, they should be one-half to ten acres, with an average size of three acres in upland areas. They should be maintained in a legume, grass/forb, cereal, or warm-season grass-cover. Non-native invasive species will not be planted or seeded in wildlife openings. Existing openings (such as log-landings or openings created through timber harvest) may be utilized in opening-development.

FW26.8.1 (G) Wildlife Opening Maintenance

Permanent wildlife openings should be maintained by prescribed burning, seeding, disking, plowing, mowing, hydro-axing, bulldozing and the use of soil amendments and herbicides.

FW26.8.2 (G) Criteria for Establishing New Wildlife Openings

The following guidelines are used to determine the type and placement of new wildlife openings:

- New openings should not be established in wilderness, natural area and non-motorized recreation area management areas.
- No openings should be created on steep slopes or highly erodible soils where adverse water-quality impacts cannot be mitigated.
- New openings should not be placed where they could be bisected by permanently open roads.
- New openings in riparian areas should be located adjacent to uplands rather than in the interior of the riparian zone.
- When possible, utilize existing, oldfield-successional land rather than creating new openings.

FW26.8.3 (G) Criteria for Eliminating Wildlife Openings

Wildlife openings should be eliminated from filter strips and from within 500-acre-or-larger forest-interior habitat blocks that are further than one-quarter-mile from a perimeter in the even-aged hardwood forest and mature hardwood forest management-prescription areas.

FW26.9 (S) Wetland Habitat Management

Wetland habitats shall be protected and managed to meet the requirements of wetland-associated species.

FW26.10 (G) Ponds and Reservoirs

A desirable distribution of age- and size-classes of sport fish should be maintained to provide a quality fisheries resource to meet recreational demand. Existing ponds and reservoirs one-half-acre or larger should be managed for sport fisheries and surveyed at least once every five years. Some ponds less than one-half acre may be managed for amphibians.

FW26.10.1 (G) Pond Management

Excessive vegetation in lakes and ponds should be controlled when it impedes the use-objective for the water body. Control may be mechanical, biological or chemical, and management practices such as aquatic weed control, use of pesticides and annual drawdown are allowed. Shorelines should be mowed regularly to maintain dam stability and improve shoreline-fishing conditions. Construction of ponds will be based on site-availability and analysis of anticipated recreational demand.

FW27 SPECIAL-USE MANAGEMENT (2700)

(G) Applications for proposed uses of national forest lands should be evaluated considering the desired condition of the management-prescription area, applicable standards and guidelines, environmental factors and other uses of the affected lands. A share of the Forest's administrative cost should be recovered as allowed.

FW27.1 (G) Multiple-Facility Corridors

Use of existing utility or transportation corridors should be preferred when considering proposals for new linear land-use permits.

FW27.2 (G) Right-of-Way Maintenance

The use of cooperative agreements should be pursued with utility companies to maintain permit areas in a manner that will enhance wildlife habitat, control erosion, protect water quality and control noxious weeds/invasive species.

FW27.3 (G) Outfitter and Guide Permits

Outfitter and guide permits will be issued for a variety of commercial and recreational uses.

FW27.4 (S) Proponent-Prepared NEPA Documentation

NEPA documents prepared by proponents or their contractors must meet the same standard as similar documents prepared by the Forest Service.

FW28 MINERALS MANAGEMENT (2800)

FW28.1 (G) Exploration and Development

Exploration and development of federally owned, leasable minerals, gas, oil and mineral materials may be allowed where compatible with the management prescription. All land outside wilderness areas is available for non-surface-disturbing exploration. Surface-disturbing mineral activity, including core-drilling, may be allowed in most areas, especially where there is potential to discover minerals of compelling domestic significance, as identified by the Bureau of Land Management. Site-specific analysis under NEPA of lease proposals is required prior to any decision consenting to lease. Exploration and development should be directed to the most fragmented portions of the leased area to reduce effects on forest-interior birds.

FW28.1.1 (S) No seismic testing shall be conducted between November 15 and April 1 within 4 kilometers (~2.5 miles) of known Indiana bat or gray bat hibernacula.

FW28.2 (G) Rock, Gravel and Other Minerals

Mineral-materials removal is allowed for Forest maintenance or management needs. Removal for personal use may be authorized.

FW28.3 (S) Borrow Pits

Commercial borrow pits shall not be allowed.

FW28.4 (S) Recreational Rock-Collection

Non-ground-disturbing recreational collection of hand-size rocks and minerals is allowed except in natural areas and archeological areas and at developed recreational sites. Collection of rocks larger than hand-size is not allowed.

FW28.5 (S) Gold-Panning

Recreational gold-panning is allowed within streams on the Forest. Gold-panning may involve the pan only. Picks, shovels, or mechanical and motorized equipment are prohibited. Disturbance of streambanks during panning is prohibited.

FW28.6 (S) Non-federal Minerals

Use of the federal surface for mineral activities shall be governed by the legal instrument—deed or similar conveyance-document—that identifies the reserved and outstanding rights. Land-management decisions must not preclude the ability of private mineral-owners to make reasonable use of the surface as defined by deed and law.

FW34 PEST-MANAGEMENT (3400)

FW34.1 (S) Integrated Pest-management

Integrated pest-management methods shall be used to minimize or prevent the development of pest problems.

FW34.2 (S) Non-native Invasive Species

The introduction of non-native invasive species shall be prevented to the extent practicable.

FW34.2.1 (G) The risk of damage from existing non-native invasive species should be reduced through integrated pest-management. Invasion-prevention measures should be implemented to maintain native ecosystems. Existing populations of non-native invasive species should be eradicated, controlled and/or reduced. Effects of management activities on the invasion and spread of non-native invasive species should be considered and mitigated, if needed. Natural areas and lands adjacent to natural areas have the highest priority for the prevention and control of non-native invasive species.

FW51 FIRE MANAGEMENT (5100)

(S) Ensuring the safety of fire-management personnel and the public is the primary objective of all fire-management planning and operations. A fire-management plan shall be maintained that provides direction for wildfire prevention, detection and suppression, fire use, and hazardous fuels reduction. The plan shall be updated annually.

FW51.1 (G) Wildland Fire

Response to a wildland fire—any non-structure-related fire in the wildland—is based on the ecological, social and legal consequences of the fire. The appropriate response is dictated by the circumstances under which a fire occurs and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and any other values to be protected. Fire is an essential natural process that should be incorporated into all levels of planning and activities at the landscape scale and across national forest boundaries. As nearly as possible, wildland fire should be allowed to play its role in the creation and maintenance of disturbance-dependent ecosystems. Accordingly, fire should be used as a management tool, including planned ignitions and wildland-fire use.

FW51.1.1 (G) Wildfire

Wildfires—unwanted wildland fires—should be suppressed as necessary utilizing the full range of suppression strategies applicable and appropriate to the management area and the conditions in which the fire is burning, to protect lives and property, national forest lands and other ownerships.

FW51.1.2 (G) Fire Use (Prescribed Fire and Wildland Fire-Use Fire)

Prescribed fire and wildland-fire use may be employed to accomplish oak and other species regeneration, hazardous fuels reduction, wildlife habitat management, ecological restoration, maintenance of fire-dependent plant communities, timber-stand improvement and other management objectives. Preference should be given to landscape-scale burns. When possible, natural or existing features, such as streams, roads and trails, should be used as firebreaks.

FW51.1.2.1 (S) All management-ignited prescribed fires shall be carried out in accordance with the provisions of an approved burning plan. Smoke-management planning must be used to control the effects of smoke emissions and meet air-quality standards. During prescribed fires, consideration shall be given to smoke-sensitive areas downwind of the burn, including Indiana bat and gray bat hibernacula.

FW51.1.2.2 (S) All wildland fire use shall be managed in accordance with provisions of the wildland fire implementation plan. Smoke management will be incorporated into wildland fire implementation plans and wildland fire situation analyses in order to minimize adverse effects on smoke-sensitive downwind areas, including Indiana bat and gray bat hibernacula.

FW51.1.2.3 (S) Burns within 0.25 mile of any Indiana bat or gray bat hibernacula shall be conducted under conditions that reduce or eliminate the dispersal of smoke into the hibernacula.

FW51.1.2.4 (S) For the protection of Indiana bat or gray bat maternity roosts and foraging habitats, no prescribed burns shall be conducted in upland forests between May 1 and September 1 and in bottomland forests between April 1 and September 1. No burning shall be conducted in forested areas of Oakwood Bottoms between March 1 and April 1. No more than 30 percent of the Big Muddy River bottomlands east of the Big Muddy River levee shall be burned (blackened) in each year.

FW51.1.2.5 (S) For the protection of Indiana bat male roosting-habitat within 4 kilometers (~2.5 miles) around any known hibernacula, no more than 20 percent of the habitat in this zone shall be burned (blackened) in each year, and within 4-8 kilometers (~2.5 to 5 miles) around any known hibernacula, no more than 50 percent shall be burned (blackened) in each year.

FW51.1.2.6 (G) For the protection of the nests and nestlings of migratory birds, growing-season burns should be done as early or as late in the season as possible, preferably before April 15 and after August 1.

FW51.2 (G) Hazardous Fuels Management

Natural and activity fuels are managed for wildland-urban interface-community and resource protection, and other resource objectives. Agreements with cooperating agencies for fuels-management activities are encouraged. Fuels-management activities may include a range of available treatment methods, including prescribed burning, hand and mechanical treatments, and others in accordance with management prescriptions.

FW51.3 (S) Interagency Agreements

Agreements with cooperating fire-fighting agencies for fire-detection and suppression on national forest lands must define suppression action in accordance with established resource management objectives and fire plans. All contracts for work must contain clauses or direction that provide for adequate fire-prevention measures on or near the work site.

FW53 LAW ENFORCEMENT (5300)

(G) Law enforcement should be commensurate with the frequency, severity and types of violations committed. At all facilities, recommended security measures should be applied that are cost-efficient relative to the risk-value of potential loss. Rules and regulations governing National Forest System lands must be made available to users.

FW54 LAND OWNERSHIP (5400)

(G) The acquisition of land and interest in land should be on a willing seller-willing buyer basis. The encumbrance of land available for exchange with land-uses that compromise exchange opportunities should be avoided.

FW54.1 (G) Land Status

Perform a land-ownership review during the early stages of all projects, prior to management activities, to ensure protection of state, private and federal agency rights and interest.

FW54.2 (G) Surface Ownership

Land adjustments should be guided by the following priorities:

1. Land needed to carry out programs specified, prescribed, or endorsed by acts of congress or department policy (e.g., wilderness);
2. Tracts needed to block-in or consolidate existing national forest land that is valuable primarily for watershed-protection, access, special-feature or sensitive-species management, or recreation;
3. Other land parcels desirable and suitable for Forest purposes that would also enhance management efficiency.

FW73 BUILDINGS AND STRUCTURES (7300)

(G) Buildings and other structures should be provided and maintained to support resource-management objectives and provide for the health and safety of visitors. All new and renovated buildings and facilities should follow the guidelines and conventions of “The Built Environment Image Guide for the National Forest and Grasslands.” The three main tenets of the guide are:

1. Sustainability: Structures should give a sense of permanence while conserving resources and respecting natural systems;
2. Fitting the Landscape: Structures should complement the diversity of ecosystems and cultural influences on the Forest;
3. National Consistency: Structures should reinforce the Forest Service national image and identity (rustic, natural-appearing character).

FW74 PUBLIC HEALTH (7400)

FW74.1 (G) Water Supply

Drinking water may be provided.

FW74.2 (S) Solid Waste

Refuse generated by the Forest Service or collected from national forest lands shall be disposed of through community or area-wide systems operated in compliance with federal, state and local regulations. National forest lands shall not be made available for solid-waste disposal-sites.

FW75 WATER STORAGE AND DISTRIBUTION (7500)

FW75.1 (G) Water Storage

Water-storage and -distribution facilities should be safe and adequate for resource-management needs.

FW75.2 (G) Dam Administration

An appropriate level of inspection and maintenance should be provided to protect investments and ensure the safety of life and property downstream. Maintenance may involve periodic reduction in water-level, vegetation-manipulation, prescribed burning and/or the removal of trees and shrubs.

FW77 TRANSPORTATION SYSTEM (7700)

(G) Manage the Forest transportation system for its intended use, to support resource management and to protect the investment.

FW77.1 (S) Design and Construction

Temporary and permanent local roads may be provided as needed to meet management objectives. Forest roads and highways must be constructed to at least the minimum standards appropriate for their intended uses, considering safety, cost of transportation and effects on land and resources.

FW77.2 (G) Road Management

Forest system roads are managed as “open”—available for general motorized use year-round; “restricted”—available for general motorized use, but with some restriction on vehicle-type and/or season of use; or “closed”—not available for general motorized use, but possibly available for non-motorized use.

FW77.3 (S) Road Maintenance

Forest roads shall be maintained to serve their intended management purpose, provide for user safety and economy and protect the environment and adjacent resources. Forest roads are maintained to at least maintenance level 3 if passenger car travel is intended, maintenance level 2 if passage of vehicles is limited and maintenance level 1 if closed to public vehicular traffic.

FW77.4 (S) Road Closures

Orders must be issued for all restrictions and closures and posted prior to closure. Road-closure devices should be in accordance with the Manual of Uniform Traffic Control Devices.

FW77.5 (G) Road Decommissioning

Roads under Forest jurisdiction that are not required for administrative or public use should be decommissioned and may be revegetated.

MANAGEMENT AREA (MA) PRESCRIPTIONS

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CANDIDATE WILD AND SCENIC RIVER (CR) MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription protects and maintains land and resource conditions on about 14,600 acres along waterways recommended for study and possible inclusion in the national wild and scenic river system. Managed under this prescription are national forest lands that lie one-quarter mile on either side of Bay Creek, Big Creek, Big Grand Pierre Creek, Hutchins Creek, Lusk Creek and the Big Muddy River. Management activities that may be seen include prescribed burning, trails maintenance, recreational facility maintenance and non-native invasive species control.

Desired Future Condition of the Land: A variety of land conditions may be observed. The free-flowing condition, water quality and outstanding values that qualified these stream-segments as candidate wild and scenic rivers are protected. Recreational settings and opportunities vary by stream, but the corridors generally are managed for roaded-natural experiences, with a mix of non-motorized and motorized uses. Existing roads and trails provide access. Recreational facilities may be found that support the streams' qualities. Utility corridors and other special uses may be permitted that do not affect a stream's classification potential and eligibility for designation. There could be evidence of human activities, including trails maintenance, recreational use and wildlife habitat management.

Standards and Guidelines

CR19 LAND AND RESOURCE MANAGEMENT (1900)

(S) The outstanding remarkable values of these waterways must be maintained. Until a suitability study is carried out, these stream corridors must be managed consistent with the Recreational classification, or Scenic in the case of four miles of Lusk Creek (excluding wilderness) north of the Eddyville Blacktop road. The classifications are defined in the Departments of Interior and Agriculture interagency guidelines for wild and scenic rivers.

CR19.1 (S) Natural Areas

The stream-channels of Lusk Creek and Big Creek are natural areas, and other natural areas are located within the candidate wild and scenic river corridors. Management activities within the corridors must not compromise the values identified for each natural area.

CR23 RECREATION MANAGEMENT (2300)

(G) The recreational opportunities associated with these river corridors should be maintained and/or enhanced. Recreation should be consistent with management direction for the stream-classification of Recreational or Scenic and follow the recreation opportunity spectrum guide for river management. This includes a variety of non-motorized and motorized uses.

CR23.1 (S) Recreational Facility Development

New recreational facilities must be consistent with management-objectives for the potential classification and provide for visitor health and safety and resource protection.

CR23.2 (G) Visual-Resource Management

Management activities should meet the visual-quality objectives of retention for all sensitivity levels, distance zones and variety classes.

CR24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production, but removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as enhancing recreational qualities; management of endangered, threatened, or sensitive species; control of non-native invasive species; fuels management and prevention of significant resource loss.

CR25 WATER, SOIL and AIR MANAGEMENT (2500)

(S) Modifications that would adversely affect the free-flowing nature of a stream are prohibited. These include dam-construction and dredging.

CR26 WILDLIFE HABITAT MANAGEMENT (2600)

(G) Construction and maintenance of wildlife openings and water-developments are allowed. Where possible, maintain herbaceous openlands.

CR27 SPECIAL-USE MANAGEMENT (2700)

(G) New utility corridors may be allowed only when there is no acceptable and reasonable alternative.

CR28 MINERALS MANAGEMENT (2800)

(S) No-surface-occupancy stipulations apply. See Appendix G.

CR54 LAND OWNERSHIP (5400)

(G) The highest priorities for land-ownership adjustment are consolidation of ownership, control of access and protection of a stream's potential classification. Scenic, recreation and conservation easements are compatible and may be acquired consistent with the desired condition. These limited easements should be emphasized. Acquisition of the land surface separate from the mineral estate is acceptable.

CR73 BUILDINGS AND STRUCTURES (7300)

(S) New construction must be consistent with the classification potential of each stream.

CR77 TRANSPORTATION SYSTEM (7700)

(S) No new permanent roads may be constructed to or across the Scenic portions of Lusk Creek. Local roads may be provided to support management objectives, or to provide access to private lands. Bridges may be constructed or replaced consistent with the classification potential of the stream. Arterial and collector roads shall not be constructed within the stream corridor.

CAVE VALLEY BIRD AREA (CV)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for management of Swainson's and cerulean warblers and other non-game birds within the 2,000-acre Cave Valley-Cedar Creek area. The dense bottomland hardwood forest along Cedar and Cave Creeks and the pine and oak-hickory ridges contain one of the richest representations of breeding birds in southern Illinois. The area is the best cerulean warbler habitat on the Forest and perhaps in the Midwest. It has been identified by the Central Hardwoods Joint Venture as a wetland focus area in the Central Hardwoods Bird Conservation Region. The management emphasis is to enhance habitat for non-game bird species and provide non-motorized recreational opportunities in a roaded-natural setting. Timber harvest will be used to meet wildlife, recreation or visual-quality objectives. Mineral activity is generally compatible, but special stipulations apply. Management activities that may be seen include prescribed burning, trail construction and maintenance, non-native invasive species control and pond and waterhole maintenance.

Desired Future Condition of the Land: The floodplain forests are located along the creek-valley floors and support a canopy dominated by silver maple, box elder, sweet gum and green ash, with an understory limited to patches of spicebush and cane. This forest-type provides habitat for a diverse variety of forest-inhabiting songbirds, including Swainson's and cerulean warblers. The uplands are covered by a dry, oak forest dominated by white, black and post oak and mockernut hickory; and a mixed mesophytic forest dominated by sugar maple, beech and shagbark hickory, with a minor component of white and red oak and yellow poplar. Old-growth hardwood forest predominates, primarily with beech and maple, and snags and cavity trees are abundant.

Overall, the forest is a natural-appearing landscape with mature hardwood mixed with some pine and oldfield-successional land or other openings. Because some trees are up to 200 years in age, the area displays some old-growth characteristics, such as multi-layered canopy, large snags, cavities and large fallen logs. The land provides a variety of recreational opportunities, such as hunting, hiking, horseback riding and bird-watching. Some complementary recreational facilities are provided, such as equestrian and hiking trails. Existing roads provide access for recreational use and management of the Forest. Generally, new permanent roads are not constructed.

Standards and Guidelines

CV19 LAND AND RESOURCE MANAGEMENT (1900)

(G) Vegetation should be managed to protect threatened, endangered and sensitive species; to protect adjacent property from fire or pests; and to enhance habitat for non-game birds. Additionally, management should result in large tracts of large-diameter and/or old-growth deciduous hardwood trees.

CV23 RECREATION MANAGEMENT (2300)

(G) Roaded, natural recreational opportunities should be provided with emphasis on non-motorized uses. Management should be consistent with protection and/or enhancement of habitat for Swainson's warbler and other non-game birds.

CV23.1 (S) Recreational Facility Development

New developed recreational sites shall not be located within this management area. Recreation support-facilities such as parking areas and trailheads may be provided.

CV23.2 (G) Visual-Resource Management

Management activities should meet the visual-quality objective of retention for all sensitivity levels, distance zones and variety classes.

CV23.2.1 (G) Vistas

Maintenance or creation of vistas should be limited to the pruning or cutting of brush or trees that does not result in creating or expanding openings in the canopy.

CV24 TIMBER MANAGEMENT (2400)

(S) This area is classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as improving habitat for non-game birds, improving habitat for threatened, endangered and sensitive species, control of non-native invasive species, pest-management and prevention of significant resource loss and/or protecting existing investments or developments.

CV26 WILDLIFE HABITAT MANAGEMENT (2600)

(S) To reduce impacts on nesting birds, no surface-disturbing activities shall be allowed between April 1 and July 15. Management guidelines for Swainson's and cerulean warblers, Regional Forester sensitive species, are found in Appendix H.

CV26.1 (G) Wildlife Openings

Wildlife openings should not be established or maintained unless needed for non-game bird habitat.

CV26.2 (G) Waterholes

Waterholes may be maintained and/or created. Waterholes may range from .01- to .10-acre and should be located near permanent wildlife openings when possible.

CV26.3 (G) Ponds

Existing ponds may be maintained. New ponds should not be constructed.

CV27 SPECIAL-USE MANAGEMENT (2700)

(G) New utility corridors should not be permitted.

CV28 MINERALS MANAGEMENT (2800)

CV28.1 (S) Common-Variety Minerals

Removal of common-variety minerals is not permitted.

CV28.2 (G) Hardrock Mineral Exploration, Leasing and Development

Special stipulations regarding timing and location apply: no surface-disturbing activities are allowed between April 1 and July 15.

CV28.3 (S) Oil and Gas Leasing

No-surface–occupancy stipulations apply. See Appendix G.

CV51 FIRE MANAGEMENT (5100)

(S) Prescribed burning is prohibited between April 1 and July 15 to protect non-game, ground-nesting birds.

CV54 LAND OWNERSHIP (5400)

(G) The highest priorities for land-ownership adjustment should be consolidation in order to control access, improve management efficiency and enhance habitat for non-game species. Scenic, recreation and conservation easements are generally compatible and may be acquired. Acquisition of the land surface separate from the mineral estate is acceptable.

CV77 TRANSPORTATION SYSTEM (7700)

(S) New permanent roads shall not be constructed unless required for access to private land.

DEVELOPED RECREATIONAL AREA (DR)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for facilities, services and settings designed for human activities on about 1,600 acres. The facilities may include campgrounds, picnic areas, boat ramps, interpretive sites, overlooks, swimming areas and trailheads. Management emphasis is on services and facilities that best fill niches provided by the Forest. (Facilities that provide little public service for the operation and maintenance costs involved may be considered for closure, a change in operations, or redesigned for an alternate use.) Timber harvest may be used to meet recreational or visual objectives. Roads and utilities are provided to meet recreational needs. Mineral exploration and development may be allowed, with special stipulations. Management activities that may be seen include thinning and tree removal, lawn-mowing, trail and recreational facilities construction and maintenance, and non-native invasive species control.

Desired Future Condition of the Land: Vegetation is managed intensively with landscaping techniques to provide an attractive setting, maintaining the health of trees and shrubs and the shade and air-circulation necessary to enhance the recreational experience, and to ensure visitor safety. Facilities are generally shaded and screened by various trees and shrubs. The surrounding forested transition-area provides aesthetic values. Forest-interior habitats are common and a management emphasis. Within these surrounding areas a variety of wildlife and plants can be seen. Rare communities of plants or animals are not normally found in these areas, but are protected where they occur.

A substantially modified natural environment characterizes these areas. They are typically classified as roaded-natural or rural on the recreation opportunity spectrum. Resource modification and utilization will be conducted primarily to enhance specific recreational activities and to maintain vegetative and soil cover. Some recreation areas may have modifications to handle large numbers of people and provide desired amenities, but they retain a sense of the natural environment and aesthetically blend with their surroundings. Each site is designed and managed to support specific activities appropriate to the area and to encourage positive human interaction, as well as interaction between humans and the environment. Sites are available for use by visitors with disabilities based upon the characteristics of the land as well as intended uses.

Standards and Guidelines

DR19 LAND AND RESOURCE MANAGEMENT (1900)

(G) Vegetation should be managed as required to meet wildlife, recreation, fuels, safety and visual-quality objectives, generally during off-season or when facilities are closed to public use.

DR21 ENVIRONMENTAL MANAGEMENT (2100)

(G) Pesticide application should be limited to periods of low visitor-use when possible.

DR23 RECREATION MANAGEMENT (2300)

(G) Feature roaded-natural and rural recreational opportunities.

DR23.1 (G) Visual-Resource Management

Management activities should meet the visual-quality objective of retention for all sensitivity levels, distance zones and variety classes.

DR24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve management objectives, such as site-enhancement, visitor safety, pest-management, or the control of non-native invasive species.

DR28 MINERALS MANAGEMENT (2800)

(S) No-surface-occupancy stipulations apply to oil and gas leases. See Appendix G.

DR54 LAND OWNERSHIP (5400)

(G) The highest priority for land-ownership adjustment should be the acquisition of land required for developed recreation or for protection of a recreational opportunity from adverse development.

DR77 TRANSPORTATION SYSTEM (7700)

(S) Arterial and collector roads shall not be constructed.

EVEN-AGED HARDWOOD FOREST (EH) MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for the production of high-quality hardwoods on about 137,800 acres in a roaded-natural recreational setting. Wildlife habitat is associated with a mix of hardwoods, pine and openland. Management provides for maintenance of the oak-hickory forest-type and ecological restoration of areas that have been planted with non-native pine. Mineral activity is generally compatible, with standard stipulations. Management activities that may be seen include prescribed burning, timber harvest, temporary road construction and maintenance, trail and recreational area construction and maintenance, openings maintenance, pond maintenance and non-native invasive species control.

Desired Future Condition of the Land: Overall, the even-aged hardwood forest is a natural-appearing landscape with stands of hardwood trees in various age and size classes interspersed with both permanent and temporary openings. Stands range from seedlings to mature age and vary in size and shape. Oak and hickory and associated understories dominate. The land supports a variety of wildlife, ranging from species that utilize early-successional stages to those requiring mature-stand characteristics. Some areas are actively managed for forest-interior species. Generally there are huntable populations of game species and a broad diversity of non-game species. Because some trees may be up to 200 years old prior to harvest, the areas display some old-growth characteristics, such as multi-layered canopy, large snags, cavities and large fallen logs. A system of well-maintained roads and trails provides access for transporting forest products, general management activities and recreational use. Recreational facilities may provide interpretation and protect natural and heritage resources.

Standards and Guidelines

EH19 LAND AND RESOURCE MANAGEMENT (1900)

EH 19.1 (G) Vegetation Management

The following vegetation composition objectives apply:

Vegetation Condition		Management Area	
Permanent Wildlife Openings		1-4%	
Herbaceous Openland		1-2% ¹	
Mixed Pine/Hardwood Types		0-10%	
Hardwood Types		80-99% ²	
¹	All herbaceous openland may be managed to retain its natural open character. The composition objectives shown above are an estimate of the amount that actually can be attained.		
²	Oak-hickory composition objectives vary by ecological units as listed below: -- Illinois Ozarks - 60-75% in uplands and 25-50% on low slopes and alluvial plains; -- Greater and Lesser Shawnee Hills LTA's 1, 2, 4, 5, 7 -- 70-90% in uplands and 30-90% on low slopes and alluvial plains; -- Greater and Lesser Shawnee Hills LTA's 3 and 6 -- 85-100% on uplands and 30-85% on low slopes and alluvial plains.		

EH23 RECREATION MANAGEMENT (2300)

(G) A roaded-natural recreational setting—as described in the recreation opportunity spectrum—should be featured primarily, providing a mix of non-motorized and motorized recreation opportunities.

EH23.1 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and meet at least the following visual-quality objectives based on variety class, distance zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident. PR – Partial Retention – Activities are visually subordinate to the characteristic landscape. M – Modification – Activities are visually dominant but blend with natural characteristics.				

EH24 TIMBER MANAGEMENT (2400)

EH24.1 (G) Harvest Methods

Shelterwood and shelterwood with reserves are the preferred harvest methods; but seed-tree and clearcut may be used. Single-tree or group selection may be utilized under uneven-aged management.

EH24.2 (G) Harvest Age

The usual rotation age for hardwoods is 120 years; however, pine may be harvested at any age for the purpose of ecological restoration of native hardwoods.

EH24.3 (G) Thinning, Timber-Stand Improvement, Salvage and Sanitation Cuts

Thinning and/or timber-stand improvement may be used to improve stand composition, and salvage and sanitation cutting may be used to remove dead, dying, deteriorating or susceptible trees in order to promote forest vigor and to recover trees damaged by fire, wind, insects, pathogens or other injurious agents.

EH26 WILDLIFE HABITAT MANAGEMENT (2600)

EH26.1 (G) Forest-Interior Habitat

Forest-interior habitat management guidelines should be applied (FW26.6).

EH26.2 (G) Wildlife Openings

Permanent wildlife openings should be established and maintained based on recreational or habitat need.

EH26.3 (G) Herbaceous Openland

Retain all herbaceous openland, including barrens, glades and prairie remnants. See Appendix D for management guidelines.

EH26.4 (G) Permanent Water Sources

New waterholes may be provided when existing permanent water-sources are not sufficient to meet wildlife needs. Waterholes may range from .01- to .10-acre and should be located near permanent wildlife openings when possible.

EH28 MINERALS MANAGEMENT (2800)

(S) Standard lease stipulations apply. See Appendix G.

EH54 LAND OWNERSHIP (5400)

(G) The highest priorities for land-ownership adjustment should be the acquisition of land or rights-of-way for access and/or consolidation to improve management efficiency. Scenic, recreation or conservation easements are generally compatible and may be acquired. Acquisition of the land surface separate from the mineral estate is a low priority.

HERITAGE RESOURCE SIGNIFICANT SITE MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for the preservation and protection of sites listed on the National Register of Historic Places and other known significant sites. These sites occupy about 3,300 acres and include Millstone Bluff, the Illinois Iron Furnace, Battery Rock, Great Salt Springs, Fountain Bluff and Hamburg Hill. Additional significant heritage resources may be included in this management prescription as they are listed on the National Register. Management activities that may be seen include archaeological excavation, site interpretation, trail reconstruction and maintenance, tree and shrub removal, prescribed burning, timber management and non-native invasive species control.

Desired Future Condition of the Land: These areas are individually, culturally and historically unique and possess integrity of location, design, setting, materials, workmanship and association. They are very special places with regard to our prehistoric and historic heritage. They contain a variety of wildlife species and diverse vegetation, as well as evidence of past human activity. Through these culturally unique areas, the American public is able to touch, explore and learn about their cultural heritage, as well as to make a personal connection with the past, sense the diversity of the human experience, and begin to understand the fundamental relationship between the people and the land.

Standards and Guidelines

HR16 PUBLIC RELATIONS (1600)

(G) Visitor information should highlight the significance of these heritage resources in order to instill an understanding of prehistoric and historic cultures and a greater sense of resource stewardship. Visitor information should address the rules, regulations and policies relating to the protection and use of areas.

HR19 LAND AND RESOURCE MANAGEMENT (1900)

(G) Specific management strategies should be developed for each listed area as required, in consultation with cooperating agencies, specialists and groups, including the State Historic Preservation Office and the Advisory Council on Historic Preservation. Existing physical components and conditions should be maintained to complement the recognized value of the historic property.

HR19.1 (S) Monitoring

Annually assess the nature and degree of damage to heritage resources due to vandalism, visitor use and natural deterioration. Identify and implement protective measures. Millstone Bluff must be monitored quarterly per agreement with the Illinois Historic Preservation Agency.

HR19.2 (S) Vegetation Management

Vegetation management shall protect the unique values of an area. Activities may include non-earth-disturbing practices such as brushing, application of herbicide or mowing. Surface activities are allowed unless they affect aboveground cultural features, such as foundation remains, the natural setting or cultural landscape, or indirectly increase resource damage. Earth-disturbing practices are allowed only if they will ultimately enhance the values of an area.

HR23 RECREATION MANAGEMENT (2300)

(G) Recreation should be primarily interpretive, consistent with the protection of area values, and may provide roaded-natural opportunities. Recreational use may be prohibited or restricted as determined by site-specific management strategies.

HR23.1 (S) Recreational Facility Development

Recreational facilities that support the management objective of a site may be approved following consultation with the state historic preservation office.

HR23.2 (S) Trails

Trail construction, relocation or maintenance must be consistent with protection of the values of the site. Earth-disturbing practices are generally prohibited, but may be allowed if they will ultimately enhance the unique values of an area.

HR23.3 (G) Interpretive Services

Where usage and site-characteristics allow, offer and maintain an array of heritage interpretive opportunities and experiences, including on-site signs, trails, presentations, tours, volunteer projects, special events and heritage tourism.

HR23.4 (G) Visual-Resource Management

Management activities should meet the visual-quality objectives of retention for all visual resource sensitivity levels, distance zones and variety classes.

HR24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other site-specific objectives, such as the maintenance, restoration or enhancement of an area's unique features; the control of non-native invasive species; or the improvement of wildlife habitat. Surface activities are permitted unless they affect aboveground heritage features.

HR26 WILDLIFE HABITAT MANAGEMENT (2600)

HR26.1 (S) Ponds

Existing wildlife ponds and water-developments may be maintained. New pond or other water-development construction shall not be allowed.

HR26.2 (S) Wildlife Openings

Existing openings should be managed through the use of non-earth-disturbing activities. New openings shall not be developed.

HR27 SPECIAL-USE MANAGEMENT (2700)

(G) Existing utility corridors should be managed consistent with site-resource protection and be realigned or moved from significant sites whenever feasible. New corridors are discouraged.

HR28 MINERALS MANAGEMENT (2800)

HR28.1 (S) Common-Variety Minerals

Removal of common-variety federal minerals is not allowed.

HR28.2 (S) Oil and Gas

No-surface-occupancy stipulations apply. See Appendix G.

HR51 (5100) FIRE MANAGEMENT

HR51.1 (G) Prescribed Fire

The use of prescribed fire is allowed in areas where it will not adversely affect heritage resource values.

HR51.2 (S) Fire-Line Construction

Mechanically constructed fire-lines are not allowed unless required for protection of human health and safety.

HR54 LAND OWNERSHIP (5400)

(G) The highest priority for land-ownership adjustment should be consolidation of ownership to control access, increase efficiency of management and/or enhance the protection and management of heritage resources. Prevention of a significant loss of heritage resources is justification for acquisition. Scenic, recreation and conservation easements usually do not provide the control necessary to manage these special areas.

LARGE OPENLAND (LO) MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for large, high-quality openlands—generally greater than 80 acres—of grassland and oldfield habitat in a roaded-natural setting. The large openlands encompass about 3,700 acres and are generally mixtures of native and non-native grasslands, and oldfields in a variety of early-successional conditions, including some wildlife openings. These provide habitat for species such as Henslow’s sparrow and northern bobwhite, which require large contiguous grasslands and oldfields. The openlands have been identified by the Central Hardwoods Joint Venture as grass-shrubland focus areas in the Central Hardwoods Bird Conservation Region. Timber harvest may be used to meet objectives other than timber production, such as habitat management. Mineral activity is generally compatible, with stipulations. Both motorized and non-motorized recreation occurs within a roaded-natural setting. Management activities that may be seen include prescribed burning, non-native invasive species control, plowing and disking, pond maintenance and trail and minor recreation construction.

Desired Future Condition of the Land: Native and non-native grasses dominate the large openlands, with replacement of non-native grasses with native species a long-term management objective. Non-native, naturalized forbs and legumes, such as red and white clover and Korean lespedeza, are common throughout. Some sites are planted in food and cover-plants. Oldfields contain patches and rows of small, native trees and shrubs, such as sumac, eastern redcedar, blackberries and winged elm. Removal of non-native invasive species and some native, pioneer, woody species is a management emphasis. Some wildlife openings are associated with these areas, generally on their periphery. Small ponds are included in many for both recreational and wildlife benefits. The land supports wildlife—game and non-game species—associated with grasslands, oldfields, early-successional forests, wetlands, and forest and wetland edges. A system of roads provides access for general management activities and recreational use.

Standards and Guidelines

LO19 LAND AND RESOURCE MANAGEMENT (1900)

(G) These areas are managed to promote openland wildlife, with emphasis on the establishment of native grass and legume species. See Appendix G for species and planting rates. Management may include, but is not limited to, mowing, hydro-axing, bulldozing, plowing and/or disking, seeding, fertilizing and prescribed burning to maintain or restore both annual and perennial grasslands and shrubland communities.

LO22 RANGE MANAGEMENT (2200)

(G) Hay may be harvested to maintain some openlands.

LO23 RECREATION MANAGEMENT (2300)

(G) Non-motorized recreational opportunities should be emphasized, such as hunting, hiking, fishing and wildlife-viewing.

LO23.1 (G) Recreational Facilities

Only facilities that protect the resource, such as parking areas, trailheads, or interpretive or information sites should be allowed.

LO23.2 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and meet at least the following visual-quality objectives based on variety class, distance-zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident. PR – Partial Retention – Activities are visually subordinate to the characteristic landscape. M – Modification – Activities are visually dominant but blend with natural characteristics.				

LO24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as maintenance of grassland and shrubland habitats, other wildlife habitat management, management for endangered, threatened or sensitive species, restoration of native ecosystems, or control of non-native invasive species.

LO26 WILDLIFE HABITAT MANAGEMENT (2600)

LO26.1 (G) Fisheries Management

Structural improvements may be provided in streams and ponds as required to enhance fish populations, including the placement in water of brush, trees or rocks where appropriate and beneficial for both fish and anglers.

LO26.2 (S) Herbaceous Openlands

Retain all herbaceous openlands. See Appendix D for management.

LO26.3 (G) Wildlife Openings

Permanent wildlife openings should be established and maintained based on recreational or habitat need.

LO26.4 (G) Native Shrub Plantings

Establish native shrubs in patches where possible.

LO28 MINERALS MANAGEMENT (2800)

(S) Special stipulations apply to oil and gas leases. See Appendix G.

LO54 LAND OWNERSHIP (5400)

(G) The highest priorities for land-ownership adjustment should be to provide larger tracts and a higher percentage of ownership. Scenic, recreation or conservation easements are generally compatible and can be acquired when fee ownership is not necessary to achieve goals and objectives. Acquisition of the land surface separated from the mineral estate is acceptable.

LO77 TRANSPORTATION SYSTEM (7700)

(G) Stream-crossings without bridges should be minimized.

MATURE HARDWOOD FOREST (MH)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for recreation, wildlife, soil and water protection and visual quality on about 25,000 acres. Both motorized and non-motorized recreation may occur within a roaded-natural or semi-primitive setting. Management areas include some natural and some artificially created openlands; but, more typically, they provide habitat for wildlife requiring mature-hardwood forest conditions. Timber harvest may be used to meet objectives other than production, such as habitat management. Mineral activity is generally compatible. Management activities that may be seen include prescribed burning, timber harvest, temporary road construction, openings maintenance, trail and recreation area construction and maintenance, pond maintenance and non-native invasive species control.

Desired Future Condition of the Land: Overall, the area is a landscape of natural ecosystems. The usually dominant, mature, hardwood trees and associated vegetation are interspersed with openland ecosystems. In some areas, naturally occurring, herbaceous openland-communities may be dominant. Some areas are actively managed for forest-interior species. The land provides a variety of recreational opportunities, such as hunting, hiking, horseback riding, rock climbing, bicycle riding and wildlife viewing. Hunting and other recreational access may be seasonal. Because some trees are up to 200 years in age prior to harvest, the areas display some old-growth characteristics, such as multi-layered canopy, large snags, cavities and fallen logs. A system of roads and trails provides access for recreational use and management. Recreational facilities may provide interpretation and protect natural and heritage resources.

Standards and Guidelines

MH19 LAND AND RESOURCE MANAGEMENT (1900)

(G) The following vegetation-composition objectives apply:

Vegetation Condition		Management Area
Permanent Openings & Oldfield Successional Land		0 - 4%
Herbaceous Open-land		1 – 2% ¹
Mixed Pine/Hardwood Types		0-10%
Hardwood Types		80 – 85% ²
¹	All herbaceous open-land may be managed to retain its natural open character. The composition objectives shown above are an estimate of the amount that actually can be attained. Up to 80% of the opportunity areas composing the Big Barrens region of Pope and Massac Counties (the Burke Branch area) may be managed to enhance herbaceous open-land conditions.	
²	Oak-hickory composition objectives vary by ecological units as listed below: -- IL Ozarks - 60-75% in uplands and 25-50% on low slopes and alluvial plains; -- Greater and Lesser Shawnee Hills LTA's 1, 2, 4, 5, 7 -- 70-90% in uplands and 30-90% on low slopes and alluvial plains; -- Greater and Lesser Shawnee Hills LTA's 3 and 6 -- 85-100% on uplands and 30-85% on low slopes and alluvial plains.	

MH22 RANGE MANAGEMENT (2200)

(G) The mowing and sale of hay is allowed as a vegetation and/or wildlife habitat management tool.

MH23 RECREATION MANAGEMENT (2300)

(G) Roaded-natural or semi-primitive recreational settings should be provided, with motorized and non-motorized uses. New recreational developments may be constructed consistent with the recreation opportunity spectrum of roaded-natural or semi-primitive.

MH23.1 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and meet at least the following visual-quality objectives based on variety class, distance zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident.				
PR – Partial Retention-Activities are visually subordinate to the characteristic landscape.				
M – Modification -Activities are visually dominant but blend with natural characteristics.				

MH24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as wildlife habitat management, the enhancement of recreation or visual quality, management of endangered, threatened or sensitive species, fuels management, pest-management, control of non-native invasive species, prevention of significant resource loss and/or protection of existing investments or developments.

MH26 WILDLIFE HABITAT MANAGEMENT (2600)

MH26.1 (G) Forest-Interior Habitat

Forest-interior habitat management guidelines should be applied (FW26.6).

MH26.2 (G) Wildlife Openings

Permanent wildlife openings should be established and maintained based on recreational or habitat need.

MH26.3 (S) Herbaceous Openland

Retain all herbaceous openland. See Appendix D for management.

MH26.4 (G) Permanent Water Sources

Waterholes may be provided when existing, permanent water-sources are not sufficient. Waterholes should range in size from a .01- to .10-acre and be located near permanent wildlife openings when possible.

MH28 MINERALS MANAGEMENT (2800)

(S) Standard lease stipulations apply. See Appendix G.

MH54 LAND OWNERSHIP (5400)

(G) The highest priority for land-ownership adjustment should be consolidation for the improvement of management efficiency. Scenic, recreation or conservation easements are generally compatible and may be acquired. Acquisition of the land surface separate from the mineral estate is acceptable. Acquisition of separated mineral rights underlying national forest surface is a low priority.

MINIMUM MANAGEMENT AREA (MM)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for the protection and maintenance of environmental values and the health and safety of the public on about 8,000 acres. Areas managed under this prescription generally produce benefits that are incidental, rather than related, to direct investments by the Forest Service and management activities are at a minimal level. Incidental uses include dispersed recreation and the gathering of forest products. These areas are not expected to produce significant levels of revenue. Management activities that may be seen include prescribed burning, timber harvest, trail construction and maintenance and non-native invasive species control.

Desired Future Condition of the Land: Although a variety of land-conditions may occur, minimum vegetation manipulation, development, or capital investments are done. Whatever conditions exist are protected and generally changed only by natural forces. Management activities and facilities ensure the protection of public health and safety and the prevention of a significant loss of existing resources or production. Existing roads and trails, if any, provide access. Existing facilities may be maintained. Additional facilities or improvements are provided for protection of the land and/or public health. There is evidence in some areas of human activities, such as mineral exploration and/or development, archeological sites, dispersed recreation and salvage timber harvest.

Standards and Guidelines

MM19 LAND AND RESOURCE MANAGEMENT (1900)

(G) Manage vegetation only to protect threatened, endangered and sensitive species, to maintain the oak-hickory forest-type and to prevent significant resource damage.

MM23 RECREATION MANAGEMENT (2300)

(G) Opportunities for dispersed recreational uses may be provided within a roaded-natural environment.

MM23.1 (G) Recreational Facility Development

New recreational facilities should not be constructed.

MM23.2 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and meet at least the following visual-quality objectives based on variety class, distance zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident. PR – Partial Retention – Activities are visually subordinate to the characteristic landscape. M – Modification – Activities are visually dominant but blend with natural characteristics.				

MM24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives. No investments should be made or practices implemented related to timber management unless needed to prevent the loss of resources or protect existing investments or developments, to achieve management objectives for wildlife habitat and endangered, threatened or sensitive species, for fuels management, pest-management, or to control non-native invasive species.

MM26 WILDLIFE HABITAT MANAGEMENT (2600)

(G) Existing wildlife openings and waterholes may be maintained, but new developments should not be created.

MM28 MINERALS MANAGEMENT (2800)

(S) Standard lease stipulations apply. See Appendix G.

MM54 LAND OWNERSHIP (5400)

(G) Disposal through land-exchange of unconsolidated areas is generally the highest priority. Acquisition of mineral rights that are separated from national forest surface is a low priority. Acquiring rights-of-way to provide public access is a low priority.

MM73 BUILDINGS AND STRUCTURES (7300)

(G) Buildings and structures should not be provided.

MM74 PUBLIC HEALTH (7400)

(G) Drinking water should not be provided.

MM77 TRANSPORTATION SYSTEM (7700)

(G) Roads should be provided only as needed for access to adjacent areas or to protect resources.

MISSISSIPPI AND OHIO RIVERS FLOODPLAINS (MO) MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for wetland and floodplain management on about 8,600 acres of the historic floodplains of the Mississippi and Ohio Rivers. These areas offer large wetland and floodplain landscapes manipulated by levees and excavated drainage ditches. The management emphasis is to provide floodplain forest and wetland habitats for a wide variety of migratory birds, including wintering waterfowl and other game and non-game species, such as songbirds, raptors, reptiles and amphibians. The area has been identified by the Central Hardwoods Joint Venture as a wetland focus area in the Central Hardwoods Bird Conservation Region.

Although the area is classified as unsuitable for timber production, commercial or non-commercial timber harvest may be used to accomplish objectives such as the restoration of natural ecosystems or the provision of habitat for wildlife. Management is in accordance with the *Middle Mississippi Partnership Coordination Plan*, with recreational emphasis on the provision of non-motorized recreational opportunities. Management activities that may be seen include prescribed burning, temporary-road construction, trail and recreational area maintenance, openings maintenance, and levee and dam construction and maintenance.

Desired Future Condition of the Land: These areas have soil, vegetative and hydrologic conditions unique to the Forest. Wetland habitat and hydrologic restoration is the management emphasis. Hydrologic restoration is accomplished where possible to simulate natural-wetland functions. Some areas provide permanent-water conditions comparable to historical swamps and oxbows. Overall, the floodplains are a landscape of bottomland hardwoods with interspersed herbaceous wetlands, some of which are managed to promote annual-wetland habitat and vegetation. In areas ponded and wet for long periods, cypress may be selected for reforestation and management. There is some diversity of age-classes as a result of natural succession.

Some areas may be managed as openlands to support wildlife species and diversity. Native reptiles, amphibians, waterfowl, shorebirds, wading birds and water birds are common, as are aquatic mammals such as beaver, muskrat, mink and river otter. Forest habitat is managed generally for shade-intolerant tree species and bottomland hardwoods, including pin, swamp white, overcup and cherrybark oak, and green ash, pecan and hickory. A system of primarily public roads and broad levee-tops provides access. Non-motorized recreational use is emphasized. Mineral activity is generally compatible, but special stipulations apply.

Standards and Guidelines

MO19 LAND AND RESOURCE MANAGEMENT (1900)

MO19.1 (G) Vegetation Management

Acceptable composition ranges:

- 0 to 75 percent bottomland oak
- 0 to 75 percent non-mast bottomland hardwood species
- 0 to 25 percent herbaceous vegetation
- 0 to 50 percent cypress

MO19.2 (G) Forested and Herbaceous Wetlands

Wetlands should be managed as wildlife habitat. Open conditions may be maintained by ponding that utilizes water-retention and incremental drainage structures, as well as by disking, plowing and/or burning.

MO23 RECREATION MANAGEMENT (2300)

(G) Primarily roaded-natural recreational opportunities should be provided, with an emphasis on non-motorized activities.

MO23.1 (G) Recreational Facility Development

Recreational facilities should be developed with priority given to protecting the environment and complementing recreational or interpretive opportunities.

MO23.2 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and meet at least the following visual-quality objectives based on variety class, distance zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident.				
PR – Partial Retention – Activities are visually subordinate to the characteristic landscape.				
M – Modification – Activities are visually dominant but blend with natural characteristics.				

MO24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as wildlife habitat management; management for endangered, threatened or sensitive species; control of non-native invasive species and prevention of the loss of resources.

MO25 WATER, SOIL, AIR MANAGEMENT (2500)

MO25.1 (G) Wetland Restoration and Management

Restoration may include the impoundment of seasonal and/or perennial water to restore hydrologic conditions and/or revegetation with forest or herbaceous species, depending on objectives. Forest revegetation should be done using only native species. Where possible, ditches that do not hinder the drainage of surrounding private land should be plugged. In some areas, tilling, prescribed fire or ponding may be used to maintain open conditions.

MO25.2 (G) Floodplain Management

Areas to be managed include slight ridges or natural levees on the floodplains that have better-drained soils. These should be reforested with bottomland hardwoods.

MO25.3 (G) Filter-Strip Guidelines

Forest-wide filter-strip guidelines do not apply.

MO26 WILDLIFE HABITAT MANAGEMENT (2600)

MO26.1 (G) Moist-Soil Units

Moist-soil units that include water-management structures may be established and managed to promote native wetland and riparian wildlife. Management may include tillage, burning, mowing or ponding. Units may range in size from one to 100 acres. Wildlife-food crops may be planted in units that include grasses and herbaceous plants.

MO26.2 (G) Openland Units

Some areas may be left open to benefit wildlife such as northern bobwhite, rabbit and openland birds. These areas will typically be the natural levees and better-drained sites and may range in size from five to 150 acres. Management may include mowing, burning, tilling and planting in native grasses and legumes. Food crops may be planted.

MO26.3 (G) Fisheries Management

Structural improvements may be provided in streams and ponds as needed to enhance fish populations, including the placement in water of brush, trees or rocks where appropriate and beneficial for both fish and anglers.

MO26.4 (G) Waterfowl Management

Seasonal water levels may be managed to promote waterfowl habitat and foraging areas. Mast and annual, moist-soil, food crops should be promoted to enhance populations.

MO28 MINERALS MANAGEMENT (2800)

(S) Special stipulations shall apply to oil and gas leases. See Appendix G.

MO73 BUILDINGS AND STRUCTURES (7300)

(G) The construction of buildings or similar structures should be avoided.

MO77 TRANSPORTATION SYSTEM (7700)

(G) Stream-crossings should be minimized and roads constructed with a minimum amount of cutting and filling.

NATURAL AREA (NA) MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for the preservation, protection and/or enhancement of the unique scientific, educational or natural values found on about 15,000 acres of research natural areas, national natural landmarks, ecological areas, geological areas, zoological areas and botanical areas. The LaRue Pine Hills Ecological Area additionally has been designated by the National Audubon Society as an Important Bird Area for forest birds, and by the Central Hardwoods Joint Venture as both a wetland and forest focus area in the Central Hardwoods Bird Conservation Region. Appendix D provides a listing and description of all areas managed under this prescription. Management activities that may be seen include prescribed burning, tree and shrub removal, trail construction and maintenance and non-native invasive species control.

Desired Future Condition of the Land: The areas are biologically or geologically unique and contain a variety of wildlife species and diverse vegetation, predominantly in a natural-appearing condition. Because some trees in forested areas may be up to 200 years in age, the areas display some old-growth characteristics, such as multi-layered canopy, large snags, cavities and fallen logs. Existing public-use and other human activities range from unnoticeable to very evident. Road networks vary from none to low-density.

Standards and Guidelines

NA19 LAND AND RESOURCE MANAGEMENT (1900)

NA19.1 (S) Monitoring

Examine each site periodically to identify disturbances to natural-area features and corrective actions.

NA19.2 (S) Vegetation Management

The objective of vegetation management is to perpetuate natural communities, to maintain or enhance populations of significant wildlife or plants, or to protect other values. Non-native invasive species must be controlled or eradicated. Vegetation control may include practices such as prescribed burning, cutting of woody growth, application of herbicides or pesticides, or mowing. Disturbed portions of sites shall be restored to native plants typical of the communities of the area.

NA19.3 (S) Forest-Interior Habitat

Management objectives for the unique features found in the natural areas should not be compromised by application of the guidelines for forest-interior habitat management.

NA19.4 (S) National Natural Landmark

Where national natural landmark boundaries correspond with natural area boundaries, the landmark shall be managed according to the natural area management prescription. Where landmark boundaries are outside natural area boundaries, that portion of the

landmark outside the natural area shall be managed as the management area within which it lies. Management of all national natural landmarks must be in accordance with national natural landmark standards. (See Appendix D.)

NA23 RECREATION MANAGEMENT (2300)

(S) Recreational uses must be consistent with protection of natural area-specific values and may be prohibited or restricted as necessary.

NA23.1 (G) Interpretative Services

Facilities should be designed and constructed to reduce impacts on significant site features.

NA23.2 (S) Developed Recreational Sites

New developed recreational sites shall not be located within this management area.

NA23.3 (S) Trails

Trail construction, relocation or maintenance must be consistent with protection of the values of the site. Construction of trail-support facilities, such as high-lines, hitching racks and confinement areas, is prohibited.

NA23.4 (S) Rock climbing and Rappelling

Technical rock climbing and rappelling are not allowed.

NA23.5 (S) Camping and Open Fire

Camping and open fires are prohibited.

NA23.6 (G) Visual Resource Management

Management activities should normally meet the visual-quality objectives of retention for all sensitivity levels, distance zones and variety classes.

NA23.7 (G) Vistas

New vistas may be created only when consistent with natural area values.

NA24 TIMBER MANAGEMENT (2400)

NA24.1 (S) Timber Harvest

Areas managed under this prescription are classified as unsuitable for timber production. The commercial or non-commercial removal of timber may be used only to maintain or enhance an area's unique features.

NA24.2 (S) Firewood Removal

Firewood removal is prohibited except where necessary to achieve site-specific objectives.

NA26 WILDLIFE HABITAT MANAGEMENT (2600)

NA26.1 (G) Habitat Management

No habitat manipulation should be done unless necessary to maintain an area's characteristics or species.

NA26.2 (S) Species Collection

The collection of any species in a research natural area requires a permit from the Forest Service.

NA26.3 (S) Wildlife Openings

Wildlife openings must not be created or maintained. Herbaceous openlands will be maintained.

NA26.4 (G) Ponds

Existing ponds may be maintained when compatible with area objectives.

NA27 SPECIAL-USE MANAGEMENT (2700)

NA27.1 (S) Research and Recreational Plant-Collecting

Scientific research and plant-collecting in natural areas require a written permit or agreement issued by the Forest Service.

NA27.2 (S) Utility Corridors

Existing utility corridors must be managed consistent with site-resource protection and be realigned or moved from areas whenever feasible.

NA27.2.1 (G) New utility corridors and other special land-uses should not be permitted.

NA28 MINERALS MANAGEMENT (2800)

NA28.1 (S) Common-Variety Minerals

Removal of common-variety federal minerals is not allowed.

NA28.2 (S) Mineral Exploration, Leasing and Development

Special stipulations apply. See Appendix G. A no-surface-occupancy stipulation applies to oil and gas leases.

NA51 FIRE MANAGEMENT (5100)

(G) Use of prescribed fire within and adjacent to natural areas may be required to accomplish management objectives. Hand-raked or leaf-blown fire-lines are preferred within and adjacent to the natural-area boundaries.

NA54 LAND OWNERSHIP (5400)

(G) The highest priorities for land-ownership adjustment should be consolidation of ownership to control access, increased efficiency of management and enhanced protection and manageability of area values. Scenic, recreation and conservation easements usually will not provide the level of control necessary to manage these areas. Exceptions may be made for specific purposes when easements can be made compatible.

NON-MOTORIZED RECREATIONAL AREA (NM)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides direction for the management of the Camp Hutchins and Ripple Hollow areas. Management emphases are ecological integrity and non-motorized recreation. Camp Hutchins is a relatively undisturbed ecosystem adjoining the LaRue Pine Hills Ecological Area, the Clear Springs and Bald Knob Wildernesses and Hutchins Creek, a candidate wild and scenic river. Ripple Hollow contains unique botanical resources as a significant barrens natural area. Timber harvest will be used only when required to meet objectives other than timber production. Mineral activity is generally compatible, with special stipulations. These areas provide habitat for wildlife and plants requiring hardwood-forest and forest-interior conditions. The recreation management objective is roaded-natural on the recreation opportunity spectrum, with emphasis on non-motorized recreation. Management activities that may be seen include prescribed burning, timber removal, temporary road construction and maintenance, trail and recreational area construction and maintenance, wildlife-opening and pond maintenance and non-native invasive species control.

Desired Future Condition of the Land: The Camp Hutchins area provides a contiguous, closed canopy capable of sustaining natural upland and bottomland hardwood ecosystems. Ripple Hollow provides a hardwood overstory with open barrens areas and broken canopy along the trail system—a system of old, gravel roads. Because some trees may be up to 200 years in age, the areas display some old-growth characteristics, such as multi-layered canopy, large snags, cavities and large fallen logs. Both areas provide a variety of non-motorized recreational opportunities, such as hunting, hiking, horseback riding, bicycle riding and wildlife viewing. Trails provide access for recreation and management. Trail-related facilities may be present to provide resource protection or visitor safety.

Standards and Guidelines

NM19 LAND AND RESOURCE MANAGEMENT (1900)

(G) Vegetation should be managed to protect threatened, endangered and sensitive species, to protect adjacent property from fire or pests, and to maintain wildlife habitat and natural areas. Prescribed fire and other non-commercial vegetation treatments should be the predominant controls of vegetation type, size and density.

NM23 RECREATION MANAGEMENT (2300)

(G) Primarily roaded-natural recreational opportunities should be provided, with an emphasis on non-roaded activities.

NM23.1 (S) Recreational Facility Development

New developed recreational sites shall not be located within this management area. Recreational support-facilities such as parking areas and trailheads may be provided.

NM23.2 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and meet at least the following visual-quality objectives based on variety class, distance zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident. PR – Partial Retention – Activities are visually subordinate to the characteristic landscape. M – Modification – Activities are visually dominant but blend with natural characteristics.				

NM24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as wildlife habitat management; the enhancement of recreational or visual quality; management of endangered, threatened or sensitive species; fuels management; pest-management; control of non-native invasive species; prevention of significant resource loss; and/or protection of existing investments or developments.

NM26 WILDLIFE MANAGEMENT (2600)

(G) Retain all herbaceous openlands. See Appendix D for management guidelines.

NM28 MINERALS MANAGEMENT (2800)

(S) Controlled surface use applies to oil and gas leases. See Appendix G.

NM54 LAND OWNERSHIP (5400)

(G) The highest priority for land-ownership adjustment should be consolidation for the improvement of management efficiency. Scenic, recreation or conservation easements are generally compatible and may be acquired when fee-ownership is not necessary to achieve goals and objectives. Acquisition of the land surface separated from the mineral estate is acceptable. Acquisition of separated mineral rights underlying national forest surface is a high priority.

OAKWOOD BOTTOMS GREENTREE RESERVOIR (OB)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides direction for the Oakwood Bottoms Greentree Reservoir, a 4,700-acre bottomland-forest ecosystem in the Mississippi River floodplain. The area has been designated by the National Audubon Society as an Important Bird Area for waterfowl and wading birds, and by the Central Hardwoods Joint Venture as a wetlands focus area in the Central Hardwoods Bird Conservation Region. The management emphasis is to provide flooded habitat for migratory and over-wintering waterfowl and other game and non-game species, including songbirds, raptors, reptiles, amphibians and other native, wetland species.

Recreational opportunities are provided within a roaded-natural setting. Developed facilities are provided to protect the resource, provide for visitor safety, or to offer interpretation. Trails are provided for resource-protection or visitor-safety. Mineral activities are generally compatible, but special stipulations apply. Management activities that may be seen include prescribed burning, timber-stand improvement, reforestation, temporary road construction and maintenance, moist-soil areas/openings maintenance, levee, dam and ditch construction and maintenance, and controlled flooding.

Desired Future Condition of the Land: The area contains stands of pin oak and other bottomland hardwood trees and associated understory. A variety of mast-producing oak species make up 60 percent or more of the forest. Stands vary from seedling to mature sizes, with about the same acreage in each age-class. A system of levees divides the area into compartments that are annually flooded to provide wetland habitat. The land supports high populations of ducks and other waterfowl as well as other game and non-game species. A variety of recreational opportunities is provided in a primarily non-motorized setting, including hunting, hiking and wildlife-viewing. Roads provide non-motorized access for forest management and limited recreational use. Local roads are generally closed year-round.

Standards and Guidelines

OB19 LAND AND RESOURCE MANAGEMENT (1900)

(G) The following composition-objectives apply:

Species Composition		Management Area
Permanent Water Bodies		1%
Moist-soil Openings		2-4%
Bottomland Hardwood Types		91-95% ¹
Age-Class Distribution Objectives		10-20% Age 0-9; 40-60% Age 30-60; 10-20% Age 60-80
¹	At least 60% oak types. This will be primarily pin oak, with other oak species, such as cherrybark, chinquapin and willow, where appropriate.	

OB22 RANGE MANAGEMENT (2200)

(S) Grazing is not permitted.

OB23 RECREATION MANAGEMENT (2300)

(G) Provide primarily roaded-natural recreational opportunities with an emphasis on non-motorized activities.

OB23.1 (G) Recreational Facility Development

Recreational facilities will be designed to protect the environment and complement recreational or interpretive opportunities.

OB23.2 (S) Camping

Overnight camping is not allowed.

OB23.3 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and will meet at least the following visual-quality objectives based on variety class, distance zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident. PR – Partial Retention – Activities are visually subordinate to the characteristic landscape. M – Modification – Activities are visually dominant but blend with natural characteristics.				

OB24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as wildlife habitat management, especially waterfowl-habitat improvement; the enhancement of recreational or visual quality; management of endangered, threatened or sensitive species; fuels management; pest-management; control of non-native invasive species; prevention of significant resource loss and/or protection of existing investments or developments.

OB26 WILDLIFE HABITAT MANAGEMENT (2600)

OB26.1 (G) Capital Investments

A system of levees, pumps, ditches and control gates should be provided to operate the greentree reservoir. The existing facility should be rehabilitated and expanded in accordance with the “Oakwood Bottoms Greentree Reservoir Wildlife Management Plan” (Fredrickson and Lauhban, 1990). The management direction in this plan should be applied to land-base additions since 1990.

OB26.2 (G) Flooding

Certain compartments should be flooded beginning October 1. Drawdown can begin as early as January 15. Both flooding and drawdown dates, as well as flooding depths, may vary among compartments. In some cases compartments are not fully drained until May 1. Not all compartments are flooded in a given year. Fredrickson and Lauhban (1990) are used in determining flooding dates. Areas should not be flooded following a regeneration treatment until advanced oak regeneration is established.

OB26.3 (G) Moist-Soil Units

Up to 200 acres of permanent moist-soil openings should be provided, with a minimum size of five acres. Technical information concerning the development and management of moist-soil units is included in Fredrickson and Lauhban (1990).

OB26.4 (G) Ponds

Existing ponds not affected by flooding should be managed for sport fish.

OB28 MINERALS MANAGEMENT (2800)

OB28.1 (S) Exploration, Development, Leasing

Special lease stipulations apply.

OB28.2 (S) Oil and Gas

In order to provide habitat for migratory and wintering waterfowl, no surface-use is allowed from October 1 to March 15. This stipulation does not apply to the operation and maintenance of production facilities.

OB28.3 (S) Common-Variety Minerals

Removal of common-variety minerals should not be allowed unless it aids in meeting management objectives.

OB54 LAND OWNERSHIP (5400)

(G) The highest priority for land-ownership adjustment should be the consolidation of ownership for efficiency of operation. Scenic, recreation or conservation easements are compatible and may be acquired when control of water is a condition and vegetation is compatible with the purpose of the area, or control of vegetation is a condition.

OB77 TRANSPORTATION SYSTEM (7700)

(G) Roads located on levees (except the collector road on the Big Muddy River levee) should be open for administrative use only.

RESEARCH AREA (RA) MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for a variety of intensive research needs. The 7,693 acres managed under this prescription include the Kaskaskia Experimental Forest, Dixon Springs Experimental Station and the Palzo Reclamation Site. Management activities that may be seen include grazing, timber harvest, surface-mine restoration, prescribed fire, intensive research, pond and building maintenance and non-native invasive species control.

Desired Future Condition of the Land: The condition of the land is highly variable, indicating a high level of past and current disturbance. Past disturbance provides a wide range of vegetative and wildlife habitat. Forested areas with evidence of silvicultural treatments, prescribed fires and other activities are noticeable. Crop-fields, pastures, reclaimed mines and other evidence of human activity may also be noticeable.

Standards and Guidelines

RA19 LAND AND RESOURCE MANAGEMENT

(G) Vegetation should be managed for research purposes and to protect threatened, endangered and sensitive species.

RA22 RANGE MANAGEMENT (2200)

(G) Livestock-grazing associated with ongoing research at the Dixon Springs Agricultural Experimental Station is allowed through the agreement for research activities.

RA23 RECREATION MANAGEMENT (2300)

(G) Recreational opportunities and visual-quality objectives should be consistent with research objectives.

RA24 TIMBER MANAGEMENT (2400)

RA24.1 (S) Timber Harvest

The areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve research objectives.

RA24.2 (G) Harvest Openings

The size, shape, location and distribution of harvest openings will be governed by research objectives and site-specific environmental effects.

RA25 WATER, SOIL, AIR MANAGEMENT (2500)

RA25.1 (G) Disturbance Limitation

Activities will be designed and located to limit the timing, degree and/or duration of soil disturbance. Some exceptions may occur for research purposes.

RA25.2 (G) Filter Strips and Riparian Areas

Exceptions to Forest-wide standards and guidelines may be made in conjunction with a specific research proposal.

RA25.3 (G) Soil Productivity

The use of fertilizers, lime and other soil-treatments is allowed. Whole-tree removal and/or other treatments that result in complete vegetation removal may be allowed only in conjunction with specific research proposals and following appropriate environmental consideration.

RA26 WILDLIFE HABITAT MANAGEMENT (2600)

RA26.1 (G) Wildlife Openings

Wildlife openings should not be established or maintained, unless to meet specific research purposes.

RA26.2 (G) Pond Management

Ponds may be managed for sport fishing, consistent with research objectives.

RA28 MINERALS MANAGEMENT (2800)

(S) Special stipulations apply to oil and gas leases. See Appendix G.

RA54 LAND OWNERSHIP (5400)

(G) Acquisition of land to be managed under this prescription should be a relatively low priority, including acquisition of scenic, recreation or conservation easements. Land associated with the Dixon Springs Agricultural Center is available to the University of Illinois, the State of Illinois, or other party acting on their behalf.

WILDERNESS (WD)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides opportunities for challenge and solitude within the wildernesses designated in the Illinois Wilderness Act of 1990: Bald Knob, Bay Creek, Burden Falls, Clear Springs, Garden of the Gods, Lusk Creek and Panther Den, about 28,000 acres. The primary purpose of management is to protect existing, native ecosystems and the wilderness character. Areas are managed for a semi-primitive, non-motorized recreational experience. Hiking and horseback riding are emphasized. Opportunities for solitude are present. Timber removal is generally prohibited. Federally owned minerals are withdrawn from availability. Management activities that may be seen include prescribed burning, control of non-native invasive species, and trail construction and/or maintenance.

Desired Future Condition of the land: These are relatively primitive places where ecological succession is allowed to operate freely. Mature forests and forest-interior habitats with shade-tolerant vegetation and wildlife predominate. Unique plant communities, such as barrens, glades and savannas, are maintained in an open to semi-open condition. Because many trees may be up to 200 years in age, the areas display some old-growth characteristics, such as multi-layered canopy, large snags, cavities and fallen logs. Past human disturbances are becoming less evident. Trails and primitive facilities are provided to enhance the wilderness recreational experience or to protect the wilderness character.

Standards and Guidelines

WD15 EXTERNAL RELATIONS (1500)

WD15.1 (S) Search and Rescue

Search and rescue operations involving motorized equipment or mechanical transport in wilderness must be authorized by the Forest Service. The Forest search and rescue plan provides further direction for wilderness search and rescue operations.

WD15.2 (G) Cemetery Access

The preferred method of access to cemeteries for visitation or maintenance will be determined on a case-by-case basis. Seasons, weather conditions, or day of the week should be considered to reduce the potential for adverse effects on the environment or the wilderness character.

WD16 PUBLIC RELATIONS (1600)

(G) Information should be provided to wilderness visitors so they may be aware of wilderness values and practice a “leave-no-trace” ethic. It should emphasize that wilderness is primitive, that outdoor skills are essential for enjoyment, that visitors are responsible for their own safety, and that off-season use offers more opportunities for solitude than use during the season and on weekends.

WD19 LAND AND RESOURCE MANAGEMENT (1900)

WD19.1 (G) Rehabilitation

Natural forces should be relied upon to recover degraded wilderness resources, unless damage would continue without intervention.

WD19.2 (G) Vegetation Management

The use of management-ignited prescribed fire for native or fire-dependent communities is allowed with the appropriate level of approval.

WD19.3 (G) Motorized and Mechanized Use

The use of motorized and/or mechanized equipment and travel is prohibited, unless authorized by higher-level authority.

WD23 RECREATION MANAGEMENT (2300)

(G) Management for recreational use will be consistent with protection of the wilderness character. Emphasis should be on solitude or primitive and unconfined recreation. Non-motorized/non-mechanized recreational opportunities should be featured. If unacceptable environmental damage or significant user-dissatisfaction occurs (as indicated by statistically valid surveys), a range of options for corrective action should be considered:

- 1 Education, such as through brochures, administrative sites and the internet website, and temporary, on-site signing;
- 2 Natural-resource modification, such as the reinforcement or closure of trails or other degraded areas;
- 3 Regulatory approaches, such as law enforcement;
- 4 Visitor-use restrictions, such as group-size limits or permit requirements;
- 5 Construction of facilities for resource protection;
- 6 The limitation and/or restriction of open campfires or campsites to designated sites.

WD23.1 (G) Trails and Trail-Support Facilities

Trail standards should be consistent with national trail-management classes 1, 2 or 3. Trail-support facilities, such as highlines or designated confinement areas, should conform in design and materials with wilderness objectives, using native or natural-appearing materials. Facilities should be located out of view (during the leaf-on period) from the trail corridor.

WD23.2 (G) Bicycles and Motorized Vehicles

Bicycles and motorized vehicles are prohibited, unless authorized by higher-level authority.

WD23.3 (S) Visual-Resource Management

The desired visual-quality objective is preservation. Management practices must meet—at a minimum—a visual-quality objective of retention.

WD23.3.1 (S) Vistas

Vistas shall not be created or maintained. Pruning limbs or brush to expose a view may occur in conjunction with trail maintenance or construction.

WD24 TIMBER MANAGEMENT (2400)

WD24.1 (S) Timber Harvest

Areas managed under this prescription are classified as unsuitable for timber production. No investments should be made or practices implemented related to timber management, including salvage of timber, unless needed to protect wilderness values or to protect adjacent property from fire or pests.

WD24.2 (S) Firewood

Firewood may be gathered, but only for use within the wilderness.

WD25 WATER, SOIL, AIR MANAGEMENT (2500)

(G) Watershed-improvement projects should be limited to those necessary to maintain environmental values and to protect public health and safety within and adjacent to wilderness.

WD26 WILDLIFE HABITAT MANAGEMENT (2600)

(G) Fish and wildlife habitat management may occur to the extent consistent with wilderness objectives and to meet the needs of federally listed threatened and endangered species.

WD26.1 (S) Wildlife Openings

Wildlife openings shall not be created or maintained.

WD26.2 (S) Waterholes

Waterholes shall not be created or maintained. (See definition at EH26.4.)

WD26.3 (S) Ponds

Construction of new ponds is prohibited. Existing ponds shall not be maintained.

WD27 SPECIAL-USE MANAGEMENT (2700)

(S) Special land-uses in wilderness are not permitted except when in accordance with private rights or to enhance or promote wilderness character. Utility corridors are not permitted except where in accordance with private rights.

WD28 MINERALS MANAGEMENT (2800)

WD28.1 (S) Federal Minerals

The Illinois Wilderness Act of 1990 withdrew all leasing authority for federal minerals located within wilderness areas.

WD28.2 (G) Private Minerals

If private development occurs, the goal for the Forest Service administration is to honor private rights while reducing the impacts of development on visual quality, recreational opportunities, watershed values and wildlife habitat.

WD51 FIRE MANAGEMENT (5100)

WD51.1 (G) Fire

Lightning-ignited fires should be allowed to play their natural ecological role. Management-ignited prescribed fire may be utilized for other purposes, such as management of native and fire-dependent plant communities, with appropriate level of approval.

WD51.2 (S) Fire Suppression

All fire-suppression activities must be in accordance with established wilderness policy.

WD54 LAND OWNERSHIP (5400)

(G) The highest priority for land-ownership adjustment should be the consolidation of ownership to control motorized access, prohibit incompatible uses and enhance wilderness character. Scenic, recreation and conservation easements are generally not compatible, but may be acquired when consistent with the desired condition.

WD71 ENGINEERING OPERATIONS (7100)

WD71.1 (S) Surveying

Wilderness boundaries shall be marked in a manner consistent with wilderness character.

WD71.2 (G) Signs

Signing will be kept to a minimum and primarily used for direction and safety. Natural materials should be used when possible. If natural materials do not serve the intended purpose, natural-appearing non-native materials may be used.

WD73 BUILDINGS AND STRUCTURES (7300)

(S) Existing buildings and other structures should be decommissioned and sites restored to natural conditions. No new buildings or similar structures are allowed.

WD74 PUBLIC HEALTH (7400)

WD74.1 (G) Water Supply

Drinking water is not provided.

WD74.2 (G) Solid waste

Garbage collection and/or disposal is not provided. Carry-in/carry-out methods are encouraged.

WD75 WATER STORAGE AND DISTRIBUTION (7500)

(S) Existing facilities should be phased out unless required under private rights. No new facilities may be constructed.

WATER-SUPPLY WATERSHED (WW)

MANAGEMENT PRESCRIPTION

Description

Goods, Services and Uses: This management prescription provides for the protection of water quality on about 17,500 acres in municipal water-supply watersheds, including Kinkaid Lake, Cedar Lake and Lake of Egypt. These lakes provide potable water to Carbondale, Murphysboro and other communities. The watersheds provide openlands, as well as habitat for wildlife requiring mature-hardwood forests. Large openlands may be managed in the Kinkaid Lake watershed. Timber may be harvested to meet objectives other than timber production. Mineral activity is generally compatible, with special stipulations. Motorized and non-motorized recreation occur within a roaded-natural setting. Management activities that may be seen include prescribed burning, openings and pond maintenance and non-native invasive species control.

Desired Future Condition of the Land: Management emphasis is on protection of water supplies through implementation of filter-strip guidelines, best-management practices, shoreline-stabilization and the restriction of new road construction. Multiple-use trails are maintained to all-weather standards. The forest is a landscape of predominantly hardwood trees. Because some trees may be up to 200 years in age, the areas display some old-growth characteristics, such as multi-layered canopy, large snags, cavities and fallen logs. Management will be used to maintain or restore the oak-hickory ecosystem. Openland management includes small openings and a large openland in the Kinkaid watershed. A system of roads and trails provides access to the area.

Standards and Guidelines

WW19 LAND AND RESOURCE MANAGEMENT (1900)

WW19.1 (G) Vegetation Management

Acceptable composition ranges: Oak and hickory should range from 70 to 90 percent in the uplands and 30 to 90 percent on low slopes adjacent to stream terraces and floodplains.

WW22 RANGE MANAGEMENT (2200)

(G) Harvesting of hay may be used to maintain openlands.

WW23 RECREATION MANAGEMENT (2300)

(G) Emphasis should be on roaded-natural recreational opportunities. Recreational facilities should be established with priority given to complementing prescribed recreation or interpretive opportunities and watershed protection.

WW23.1 (G) Visual-Resource Management

Management activities should reflect and be similar in scale to the natural landscape and meet at least the following visual-quality objectives based on variety class, distance zone and sensitivity level.

VISUAL-QUALITY MATRIX				
Variety Class	Sensitivity Level			
	1. Most Sensitive		2. Sensitive	
	Foreground (fg)	Middle-ground (mg)	Foreground (fg)	Middle-ground (mg)
A (Distinctive)	R	R	PR	PR
B (Common)	R	PR	PR	M
C (Minimal)	PR	PR	M	M
R – Retention – Activities are not visually evident. PR – Partial Retention – Activities are visually subordinate to the characteristic landscape. M – Modification – Activities are visually dominant but blend with natural characteristics.				

WW24 TIMBER MANAGEMENT (2400)

(S) Areas managed under this prescription are classified as unsuitable for timber production; but the removal of timber by commercial or non-commercial means may be done to achieve other objectives, such as wildlife habitat management; control of non-native invasive species and prevention of significant resource loss.

WW25 WATER, SOIL, AIR MANAGEMENT (2500)

(G) Shoreline protection is allowed to protect water quality and retain lake storage-capacity and large woody debris, gabions, or riprap may be used.

WW26 WILDLIFE HABITAT MANAGEMENT (2600)

(G) Structural improvements may be provided in streams and ponds to enhance fish populations, including the placement of brush, trees or rocks as appropriate and beneficial.

WW26.1 (G) Wildlife Openings

Permanent wildlife openings should be established and maintained based on recreational or habitat need.

WW28 MINERALS MANAGEMENT (2800)

(S) Special stipulations apply to oil and gas leases. See Appendix G.

WW54 LAND OWNERSHIP (5400)

(G) Scenic, recreation, or conservation easements are generally compatible and may be acquired when fee ownership cannot. Acquisition of land surface separated from the mineral rights is acceptable.

WW73 BUILDINGS AND STRUCTURES (7300)

(G) The location of improvements on floodplains should be avoided to the extent possible.

WW77 TRANSPORTATION SYSTEM (7700)

WW77.1 (S) Design and Construction

No new permanent roads should be constructed except for administrative use.

WW77.2 (G) Local Restrictions

Stream-crossings should be minimized and temporary roads constructed with a minimum amount of cutting and filling.

CHAPTER VI. IMPLEMENTATION, MONITORING AND EVALUATION

Implementation, monitoring and evaluation are separate, sequential activities required by the NFMA regulations. This section explains how management direction will be implemented. Forest Plan monitoring and evaluation is the primary tool for revising the policy and vision for Forest management. Monitoring and evaluation involve more than merely collecting, analyzing and interpreting data. Data must be converted to useful information and stored in an accessible form. This Plan is intended to be an adaptable document that provides direction for management activities, but the direction must be able to address changing conditions. Monitoring and evaluation are intended to lead to the “long look ahead” and gauge the factors that indicate the Forest niche.

Data will be designed and collected according to appropriate data standards and entered into corporate databases. The information will then be accessed and analyzed to produce information such as monitoring reports available for publication.

I. IMPLEMENTATION

The approval of this Plan establishes direction for future Forest management decisions and includes an “interdisciplinary approach to achieve integrated consideration of physical, biological, economic and other sciences” (16 USC 1604[b]). Implementation of the Plan involves two levels of decision-making. The first is approval of the Plan. The second is implementation of the Plan through specific projects. The Forest Plan itself contains no commitment to the selection or execution of any specific project. For example, the Plan may identify a management area as suitable for oil and gas leasing, timber harvest, or use by motorized vehicles. That identification does not equal a decision or commitment to any specific land use. Land-use decisions implementing the Plan are based on the appropriate site-specific analyses of proposed projects.

A. APPROVAL OF THE REVISED PLAN

The Regional Forester issues a Record of Decision (ROD) approving one of the alternatives as the Forest Plan. The ROD provides the rationale for selection of the approved alternative. The objectives of the Plan are:

- To determine the capability of a planning area to supply goods and services in an environmentally sound manner.
- To determine the most cost-efficient method of supplying goods and services from a planning area to maximize net public benefits in response to society’s demands.
- To develop a fully integrated plan for management of the land and resources within a planning area.
- To display short and long-term management intent to the public, federal, state and local governments, commercial and industrial users, and others.

- To serve as a source of information in developing the RPA assessment and program and to provide the means for implementing the National Forest System portion of the Renewable Resources Program.

B. PROJECT-LEVEL DECISION-MAKING

The approval of site-specific, project-level decisions to implement Plan direction and programs, and to achieve the desired future condition is the second level of approval. Project-level decisions are made after appropriate site-specific environmental analyses. Analysis of any proposed project must consider the goals and objectives previously decided in the Forest Plan. By referencing the discussions in the Plan and FEIS, subsequent analyses can concentrate on issues and activities specific to a proposed project. Project-level decisions are analyzed and documented according to the NEPA and may be tiered to the Plan Revision FEIS.

Implementation of the Plan is the process of applying its management direction to each management area in order to achieve the desired future condition of those areas. Interdisciplinary analysis, teamwork and public involvement are integral components of Plan implementation. The principal steps in implementation are:

- Selecting land areas that best provide opportunities for accomplishing Plan management direction,
- Analyzing the situation and identifying multiple-resource projects that assure an integrated approach to achieving the desired future condition,
- Prioritizing, scheduling and budgeting those that best meet Plan direction,
- Designing projects that integrate the needs of all resources and values,
- Completing multiple-resource projects as designed, and
- Protecting and managing resources, and providing for public health and safety.

1. Budget Proposals

Annual program budget proposals identify and plan necessary expenditures. This Plan provides the basis for developing multiple-year program budget proposals. The final approved budget, appropriated by congress, determines the annual program of work. Elements within the program of work that are funded will be accomplished; activities not adequately funded cannot be implemented. The Forest program-development and budget process consists of evaluating fixed- and variable-cost activities, along with capital investment projects.

- Fixed-cost activities include those necessary to ensure public safety, environmental protection, and the maintenance of existing capital assets at a defined level of service/availability.
- Variable-cost activities include those outputs or uses that can be controlled or changed, such as trail construction and/or maintenance, landline recovery and wildlife habitat maintenance.
- Capital investments entail funds spent to provide or improve a facility or product for continued or future uses.

Annual funding could result in the implementation of practices at different rates than listed in Table 4-2, Schedule of Management Practices. These differences, over time, could require an amendment of the schedule. Such changes normally are considered non-significant amendments of the Plan, unless they significantly alter Plan goals and objectives.

2. Compliance with the Forest Plan

As soon as is practicable after approval of the Plan, the Forest Supervisor will ensure that all projects, outstanding and future permits, contracts, cooperative agreements and other instruments for occupancy, and the use of affected lands, subject to valid existing rights, are consistent with the Plan.

II. MONITORING AND EVALUATION PROGRAM

Monitoring and evaluation is required by the NFMA implementing regulations at 36 CFR 219.12(k). Monitoring and evaluation ensures compliance with, and determines the efficacy of, Forest Plan direction and assesses the quality of implementation. In the process of evaluating Plan implementation, any necessary changes are determined.

A. MONITORING

Monitoring is conducted to observe and/or record the results of actions and to inform management decisions, whether they are prescribed by the agency, implemented by users with agency authorization, or unauthorized. Information is collected from selected sources, on a sample basis, and is used to determine:

- If Forest Plan goals and objectives are being achieved,
- If management prescriptions are being applied as directed,
- If the results of compliance with the prescriptions address management problems, issues, concerns and opportunities,
- If effects are occurring as predicted,
- If the costs of implementation are as predicted, and
- If changes are warranted in standards, guidelines or other direction.

The role of management prescriptions is the key in monitoring. Management prescriptions describe the appropriate goods, services and uses, as well as the desired future condition of the land. The monitoring program is included in the Annual Program of Work that details the schedule of monitoring actions, specific locations, costs and responsibilities.

B. EVALUATION

Evaluation determines how well management outcomes are meeting Plan direction. It provides a “long look ahead” for trends and anticipated outcomes. The Forest Supervisor reviews and evaluates monitoring results in an annual report. Based on the results of the evaluation, amendments of Plan management direction are commonly recommended. A monitoring and evaluation chart is displayed in Table 6-1. It contains both the required and additional monitoring and evaluation steps the Forest has committed to performing. The

Forest prepares an annual monitoring and evaluation report for the Regional Forester. The report discusses monitoring results and recommended actions, including changes in management direction, and revisions or amendments of the Plan. This report is published to inform the public of the program, summarizing accomplishments, results of monitoring and evaluation, and expectations for future activities.

The Forest Supervisor annually reviews the conditions on the land addressed by the Plan and determines whether resource conditions or public issues have changed significantly and if amendments of the Plan are needed. In 10 to 15 years, during another revision of the Plan, an overall evaluation of the reports will be used as one measure to analyze the management situation and identify any need for change. The Management Review System (Forest Service Manual 1410) is an important part of the monitoring and evaluation process. The Forest Supervisor and Regional Forester, focusing on monitoring and evaluation information, perform management reviews periodically. Normally, every five years, the Regional Forester will conduct a General Management Review. This review evaluates the results of Plan implementation and monitoring and evaluation and makes recommendations on needed improvements.

C. AMENDMENTS AND REVISIONS

The Plan will be kept valid and current through the use of amendments and, if necessary, revisions. The guidance for making these changes is 36 CFR 219.7 and Forest Service Manual Section 1922. The need to amend the Forest Plan may come from several sources, such as recommendations of the interdisciplinary monitoring and evaluation team, changes in implementation schedules based on actual funding, changes in congressional direction, observed trends in resource condition, or changes in social conditions. A Plan amendment may add, modify or rescind one or more Plan directions. Decisions to amend must be based on identification and consideration of issues, and analysis of the effects of the proposed amendment. For each amendment proposal, the responsible official must complete appropriate analyses and public involvement in accordance with NEPA.

The Forest Supervisor will determine whether proposed changes of the Plan are significant or non-significant. This determination is based on the goals, objectives, standards, guidelines and other elements of the Plan. If an amendment is determined to be non-significant, the Supervisor may implement the change following public notification and completion of NEPA procedures and decision documents. If the change is determined to be significant, the Supervisor will follow the procedure for development and approval of a Forest Plan. These changes require approval of the Regional Forester. An annual summary of Forest Plan amendments will be prepared and incorporated into the Plan as additions, and made available to interested parties. This ensures that the Plan remains current. A summary of Plan amendments will be submitted to the Regional Forester with the year-end attainment report information.

This Plan will be reconsidered no later than 15 years from the date of approval. It may also be reconsidered when the Forest Supervisor determines that changes in the condition of the land, in public demands on resources, or in RPA policies, goals, or objectives would have a significant effect on the forest program.

D. LEGAL AND REGULATORY REQUIREMENTS

The Forest Plan addresses several types of monitoring as required in the planning regulations. These requirements fall into four broad categories:

- Category 1: Required monitoring items
- Category 2: Attainment of goals and objectives
- Category 3: Implementation of standards and guidelines
- Category 4: Effects of prescriptions and management practices

Category 1 monitoring items are mandatory components of every forest plan, whereas Categories 2 through 4 monitoring items are more flexible and tailored to address issues raised through public scoping and interdisciplinary team review (see table 6.1).

Table 6-1. Legal and regulatory Category 1 monitoring items.

Monitoring Description	Annual Posting	Five-Year Report
A program of monitoring and evaluation shall be conducted that includes consideration of the effects of National Forest management on land, resources and communities adjacent to or near the Forest being planned and the effects upon Forest management from activities on nearby lands managed by other federal or other government agencies or under the jurisdiction of local governments.		X
The Forest Supervisor shall review the conditions on the land covered by the Plan at least every five years to determine whether conditions or demands of the public have changed significantly.		X
Monitoring and evaluation requirements will provide a basis for a periodic determination of the effects of management practices.		
At intervals established in the Plan, implementation shall be evaluated on a sample basis to determine how well objectives have been met and how closely management standards and guidelines have been applied. Based upon this evaluation, the interdisciplinary team shall recommend to the Forest Supervisor such changes in management direction, revision or amendments of the Forest Plan as are deemed necessary.		X
Monitoring requirements identified in the Forest Plan shall provide for:		
[1] A quantitative estimate of performance, comparing outputs and services with those projected in the plan;	X	
[2] Documentation of measured prescriptions and effects, including significant changes in productivity of the land; and		X
[3] Documentation of costs associated with carrying out the planned management prescriptions as compared with costs estimated in the Plan.	X	
[4] A determination of compliance with the following standards:		
[i] Lands are adequately restocked as specified in the Plan;		X
[ii] Lands identified as not suited for timber production are examined at least every 10 years to determine if they have become suited; and that if determined suited, such lands are returned to timber production; ... Designated in the Plan for lands not suited for timber production shall be reviewed at least every 10 years...		X
[iii] Maximum size-limits for harvest-areas are evaluated to determine whether such size-limits should be continued; and		X
[iv] Destructive insects and pathogenic organisms do not increase to potentially damaging levels following management activities.		X
Population trends of the MIS will be monitored and relationships to habitat changes determined. This monitoring will be done in cooperation with fish and wildlife agencies, to the extent practicable.	X	
Forest planning shall evaluate the potential effects of vehicle use off roads and classify areas and trails of National Forest System lands as to whether or not off-road vehicle use may be permitted.	X	

E. MONITORING FRAMEWORK

Monitoring must be established based on a framework that complies with planning regulations, is consistent with corporate data-standards and protocols, and is developed by an interdisciplinary team addressing the ecological and socioeconomic dimensions of forest management in an integrated manner. To meet these objectives, the Forest's monitoring framework consists of four components:

- 1 Forest Plan monitoring providing broad and strategic direction: Focuses on what is required to monitor the Plan. It provides the overall monitoring strategy, including specific questions to be answered, what will be monitored, timetables for reporting, and other information.
- 2 Monitoring and evaluation implementation focused and technical guides: Describe how, where and when to accomplish the monitoring prescribed in the Plan. Provide the specific methods, protocols and analytical procedures. Intended to be flexible and able to be modified in response to new information, updated procedures, emerging issues and budgetary considerations without amending the Plan.
- 3 Annual monitoring schedule: Is specific, technical and prescriptive. Identifies what will be monitored, where, when and by whom for current and upcoming year. Schedule is tied to Plan and monitoring guide.
- 4 Annual monitoring evaluation review: Similar to schedule, review is specific, technical and prescriptive. The interdisciplinary team reviews current year's monitoring and evaluation results at the end of each year. Based on findings, team recommends to Forest Leadership Team necessary changes or supplements (if any) to Forest Plan Monitoring Guide, manuals, or handbooks.

F. MONITORING PRIORITIZATION

Similar to activities in other agencies and institutions, work can demand that the Forest exceed its available budget. Forest Plan monitoring is no exception; consequently, a prioritization plan will be developed as part of the monitoring guide to ensure efficient use of limited time, money and personnel. Monitoring priorities will be established each year based on information gained during the past year, budgets and other criteria. Some of the criteria that could be used to develop the prioritization plan are:

- Is monitoring of a particular question or resource mandated by regulation or court order?
- Is there a high degree of uncertainty associated with management assumptions or significance?
- Is there a high degree of disparity between existing and desired conditions?
- Are proposed management activities likely to affect resources of concern or ecological significance?
- How do monitoring items fit into national and regional priorities?
- How well do monitoring items fit with public comments?
- What are the consequences of not knowing resource conditions?
- Will monitoring respond to key issues?

G. INFORMATION MANAGEMENT

An extraordinary amount of monitoring information will be collected over time. This information must be documented in a manner that allows it be easily retrieved, shared with the public, accessible to all interested parties and useable by agency managers to foster better decisions. Information management will consist of:

- Management of the collection and storage of data,
- Evaluation and interpretation of data,
- Sharing of information internally and externally.

The interdisciplinary team will work with Forest Service employees and cooperators to insure that data is collected using standard methods found in the monitoring guide and entered into the appropriate databases.

H. EVALUATION AND INTERPRETATION OF DATA

Evaluation is the process of converting data to information. It is a process of synthesis that consolidates value, judgment and reason with monitoring information to answer selected monitoring questions. Successful adaptive management depends on this evaluation of data to move the National Forest towards the desired future condition.

Resource specialists and others will collect and synthesize data. The interdisciplinary team will review the current year's monitoring and evaluation results at the end of each year. Based on their findings, recommendations may be made to the Forest Leadership Team.

I. ANNUAL MONITORING AND EVALUATION REPORT

The annual monitoring and evaluation report provides an opportunity to track the progress of Plan implementation and the effectiveness of specific management practices. The focus of the evaluation is to provide short- and long-term guidance regarding ongoing management. The report should include components such as:

- Forest accomplishments advancing the desired condition
- Outputs of goods and services
- Status of other agency/institution cooperative monitoring
- Forest Plan amendment necessity
- Summary of available information on MIS and/or other species of concern
- Summary of large-scale or significant projects or programs
- Updates or revisions of research needs
- Public participation/disclosure plan

J. PUBLIC INVOLVEMENT

Although aware that agency decisions will not consistently please everyone, we are committed to using an open process for decision-making. Our goal is to foster public understanding of the rationale for individual decisions. The same principles will be applied to monitoring. Additionally, since our approach incorporates an adaptive strategy, frequent public feedback is necessary to facilitate monitoring prioritization, protocols, evaluation and, ultimately, better-informed decisions. Partnerships with interest groups, volunteer groups, other federal, state and local agencies and universities will be part of this strategy. Monitoring-information trips for the public will be encouraged to review findings and methods, as well as to address subsequent management implications. Other avenues of public involvement will include news releases, the Forest website, brochures and public reports.

K. MONITORING MATRIX

All of the previously identified monitoring categories are outlined on the monitoring matrix. The focal point for each monitoring item will be the *purpose* of the monitoring action. The purpose will reflect the requirement. Not all requirements will be monitored each year.

Table 6-2. Monitoring matrix.

Requirement	Purpose	Activity/ Output Monitored	Unit of Measure	Monitoring Frequency	Precision/ Reliability
A quantitative estimate of performance, comparing outputs/services with those projected in the Forest Plan	To compare planned and actual accomplishments	Various	Various	Annual	High/High
Document effects of implementing prescriptions, including significant changes in productivity of the land	To determine effects of implementing Plan prescribed practices and standards and guidelines	Various	Various	Annual	Moderate/ Moderate
Document actual versus estimated costs of implementing the Forest Plan	To verify unit costs for use in Plan revisions and budgeting	Unit costs of implementing practices and activities	Dollars	Annual	High/High
Evaluate how well prescriptions, practices, and standards and guidelines have been applied on the ground	To determine if prescribed practices and standards and guidelines are being applied correctly	Various	Various	Annual	Moderate/ Moderate
Lands are adequately restocked as specified in the Plan	To assure lands are adequately stocked with desired species within 5 years of regeneration harvest	Regeneration	Acres	3 years after reforestation	High/High
Determine size of timber harvest areas	To determine if standards and guidelines for maximum harvest area size are adequate	Harvest unit size	Acres	Annual	High/High
Lands identified as not suited for timber production are examined to determine if they are now suited	To review status of lands unsuited for timber production for possible return to timber production	Lands classified as unsuited for timber production	Acres	Every 10 years	Moderate/ Moderate
Destructive insects/disease	So destructive organisms do not increase to potentially damaging levels following management activities	Populations and occurrence of destructive organisms	Acres affected and severity	Annual	Moderate/ Moderate
Population trends and some nesting-success trends of MIS	To determine the effect of management activities on habitats and populations	MIS	Acres of suitable habitat, populations and some nesting-success measurements	Annual	Moderate/ Moderate

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Requirement	Purpose	Activity/ Output Monitored	Unit of Measure	Monitoring Frequency	Precision/ Reliability
Population trends of federally listed threatened, endangered and sensitive species and species with viability concerns	To determine changes in populations resulting from management, and the need to add or remove species from listing	Threatened, endangered and sensitive species	Acres of suitable habitat or populations	As needed to support species recovery plans	Moderate to High
Effects of Forest management on adjacent land resources and communities, and effects of management of nearby lands administered by other government agencies on Forest management	To identify emerging issues, concerns and opportunities for agency coordination	Various effects and issues	None	Annual	Moderate/ Moderate
Identify and obliterate roads not needed for administration and public use	To identify and obliterate unneeded roads	Roads to be obliterated/ roads obliterated	Miles	Annual	High/High
Identify research needs to support or improve Forest management	To determine research needs	Research needed, in progress, and accomplished	Various	Annual	Moderate/ Moderate
<u>Response to revision topic:</u> Watershed resources and Ohio & Mississippi Rivers floodplain management	To determine effectiveness of wetland and floodplain standards and guidelines in protecting wetland habitat and hydrology	Reports from Forest Service, cooperating agencies and user groups regarding the quality of the habitat, conditions, trends and other elements of the habitat	Subjective analysis and documented observations of effects of management	Annual	Moderate/ Moderate
Watershed Resources: Potable water-supply watershed	To determine effectiveness of standards and guidelines in protecting and restoring water quality for watersheds that provide local drinking-water supplies	Reports from Forest Service, cooperating agencies and user groups regarding the quality of the water, including conditions, trends, sediment load and other elements of the water quality	Subjective analysis and documented observations of effects of management	Annual	Moderate/ Moderate
Watershed resources: riparian ecosystems	To determine effectiveness of filter-strip guidelines in reducing sedimentation and improving water quality	Surface-disturbing management practices implemented within filter strips	Various including bare-soil exposure elements	Annual	Moderate/ Moderate

Requirement	Purpose	Activity/ Output Monitored	Unit of Measure	Monitoring Frequency	Precision/ Reliability
Response to revision topic: Biological diversity and wildlife and aquatic habitat: Threatened, endangered and sensitive species and species with viability concerns	To determine effectiveness of standards and guidelines in promoting recovery and contributing to viability	Reports from Forest Service and cooperating agencies regarding habitat condition and suitability	Various	Annual	Moderate/ Moderate
Biological diversity and wildlife and aquatic habitat: Identify and protect ecosystems and communities at risk of loss or degradation	To determine if recreational practices or management activities are causing degradation to rare ecosystems or communities, or other resources	Reports from Forest Service, researchers, cooperating agencies and others regarding habitat condition and suitability	Various	Annual	Moderate/ Moderate
Biological diversity and wildlife and aquatic habitat: Key successional-stage habitats being provided	To determine if the balance between early, mid- and late-successional habitat conditions is appropriate	Reports from Forest Service, researchers, cooperating agencies and others regarding habitat condition and stability	Various	Annual	Moderate/ Moderate
Biological diversity and wildlife and aquatic habitat: Aquatic habitats	To determine if the status and trend in aquatic habitat conditions are suitable	Reports from Forest Service, researchers, cooperating agencies and others regarding habitat condition and stability	Various	Annual	Moderate/ Moderate
Biological diversity and wildlife and aquatic habitat: Invasive species control	To determine if standards and guidelines for the control of invasive species are effective	Reports from Forest Service, researchers, cooperating agencies and others regarding habitat condition and suitability	Various	Annual	Moderate/ Moderate
Biological diversity and wildlife and aquatic habitat: MIS	To determine if the MIS list effectively portrays the elements of habitat and ecosystem quality, along with offering the potential to be effectively monitored	Reports from Forest Service researchers, cooperating agencies and others regarding changes in habitat and ecosystem condition	Various	Annual	Moderate/ Moderate
Biological diversity and wildlife and aquatic habitat: Pesticide use for fish and wildlife habitat improvement	To determine if site-specific analysis of proposed pesticides use was effectively implemented and provided the desired resource response	Reports from Forest Service, cooperating agencies and others regarding site-specific effects of pesticide application	Acres of habitat treated	Annual	Moderate/ Moderate

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Requirement	Purpose	Activity/ Output Monitored	Unit of Measure	Monitoring Frequency	Precision/ Reliability
Biological diversity and wildlife and aquatic habitat: Species of recreational interest	To determine how Forest management affects species of recreational interest	Reports from cooperating agencies on whitetail deer, wild turkey and largemouth bass	Various	Annual	Moderate/ Moderate
Response to Revision Topic: Recreation management: Non-motorized designated trail system for hikers, equestrians and bicycles and restriction of equestrians and bicycles to trails	To determine if system trails are designed for the appropriate user-type, protecting resources, and marked, maintained and mapped to meet user needs	Reports from Forest Service, user groups, cooperating agencies and others regarding the condition of trail system	Miles of trail meeting design and maintenance standards	Annual	Moderate/ Moderate
Recreation management: Licensed motorized vehicle use	To determine if vehicular and non-motorized uses on low-maintenance road system are adversely affecting resources	Use on maintenance-level 1 and 2 roads	Road condition, use-encounters, accidents reported	Annual	Moderate/ Moderate
Recreation management: Level of use of trail system	To determine if use-level is appropriate to protect resources and manage user encounters	Reports from Forest Service, user groups, cooperating agencies and others on use of trails	Use-levels on trails, encounter reports, observations	Annual	Low/Moderate
Recreation management: Recreation demand	To determine if recreational facilities meet user needs and recreational demands, as well as protect resources	Recreational facility use and condition, recreational activities	Numbers of recreational facilities meeting standard, of users of some areas, of annual use in number of visits	Annual to every five years	Moderate/ Moderate
Recreation management: Heritage resources	To identify areas that have significant historical or archeological resources and eligibility for the National Register of Historic Places	Areas determined to be potentially eligible, nominated and/or accepted	Numbers and acres	Annual	High/High
Recreation management: Sanitation	To determine if potable water standards are being met where provided, and determine if sewage disposal is being accomplished	Water and sewage testing results	Number of satisfactory and unsatisfactory tests	Annual	High/High

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Requirement	Purpose	Activity/ Output Monitored	Unit of Measure	Monitoring Frequency	Precision/ Reliability
Recreation management: Safety and security	To determine if security and protection levels for forest visitors and facilities are adequate	Citation or violations notices issued, along with reported incidents	Number and type	Annual	High/High
Response to revision topic: Forest ecosystem health and sustainability: Land suitable for timber production	To determine if the allocation of land to the suitable timber base is appropriate	Acres of land allocated to special management prescriptions and considered unsuited for timber production	Acres	Every 10 Years	Moderate/ Moderate
Forest ecosystem health and sustainability: Oak-hickory forest-type	To determine if the objective of maintaining the dominance of the oak-hickory forest-type is being achieved	Regeneration samples within regeneration sites that have occurred through timber harvest or ecosystem restoration	Acres dominated by the oak-hickory forest-type	Annual	High/High
Forest ecosystem health and sustainability: Invasive species control	To determine if invasive and exotic species are adversely affecting forest ecosystem health and sustainability	Reports from Forest Service, researchers, cooperating agencies and others regarding habitat condition and suitability	Acres dominated by invasive species	Annual	Moderate/ Moderate
Forest ecosystem health and sustainability: Fire-dependent communities	To determine if the stability of fire-dependent communities is being maintained	Reports from Forest Service, researchers, cooperating agencies and others regarding habitat condition and stability	Acres of prescribed fire	Annual	Moderate/ Moderate
Response to revision topic: Mineral resources	To determine the status of mineral exploration and development on the federal mineral estate	National Forest records related to leases, permits and contracts, along with inspection records related to sites of potential development	Number of leases, permits, or contracts, along with description of activities	Annual	High/High
Response to revision topic: Wilderness, roadless areas, wild and scenic rivers: Roadless evaluation	To determine if Burke Branch, Camp Hutchins, Ripple Hollow, or other areas have changed in a manner that would meet roadless characteristics	Roadless evaluation criteria and status of roads, land-base and other physical features	Narrative related to evaluation criteria	Annual to every five years	Moderate/ Moderate
Wilderness, roadless areas, wild and scenic rivers: Wilderness management	To determine if visitor experience needs (e.g., primitive recreational opportunities, solitude), biophysical requirements (e.g., soil/water quality, vegetation), management presence are being met	Soil, water, air, vegetation quality, recreational use	Various	Annual	Moderate/ Moderate

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Wild and scenic rivers: Stream corridors	To determine if management actions and use comply with standards and guidelines for recreational or scenic rivers	Elimination of Incompatible uses	Numbers and types	Annual	High/High
Response to revision topic: Land adjustment: Recreation enhancement	To verify recreation benefits from land adjustment	Recreation capacity added	M-RVDs or number of visits	Every 5 to7 years	Moderate/ Moderate
Land adjustment: Ecosystem health	To verify benefits to ecosystem health from land adjustment	Acres of restoration or protection opportunity	Acres	Annual	High/High
Land adjustment: Threatened, endangered and sensitive species	To verify benefits to species from land adjustment	Species habitat acquired	Acres of habitat for species	Annual	Moderate/ Moderate
Land adjustment: Wetland and floodplain protection	To verify benefits to wetland and floodplains and compliance with E.O. 11988 and 11990.	Wetlands and floodplains acquired or areas with potential for restoration	Acres acquired	Annual	High/High
Land adjustment: Heritage resources	Verify benefits to heritage resources from land adjustment	Potential National Register site acquired	Acres of potential Sites	Annual	Moderate/ Moderate

APPENDIX A

GLOSSARY AND ACRONYMS

I. GLOSSARY

Activity Fuels – Fuels that have been directly generated or altered by management action such as timber harvest or thinning, as opposed to naturally created fuels.

ATV/OHM Travelway – A road or trail that has been designated for use by all-terrain vehicles (ATV) and off-highway motorcycles (OHM).

All-Terrain Vehicle (ATV) – Any motorized vehicle designed for off-highway use that is 50 inches or less in width, with an unladen, dry weight of 600 pounds or less, traveling on three or more tires and having a seat designed to be straddled by the operator and handlebars for steering control.

Analysis Area – One or more sites combined for the purpose of analysis in formulating alternatives and estimating various impacts and effects.

Analysis of the Management Situation (AMS) – A determination of the ability of the planning area to supply goods and services in response to society's demand for those goods and services.

Animal Unit Months (AUM) – The quality of forage required by one mature cow (1,000 pounds) or equivalent for one month.

Allowable Sale Quantity (ASQ) – The quantity of timber that may be sold from the area of land identified as suitable for timber production 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.

Aquatic Ecosystem – The stream channel, lakebed, or water-related biotic communities and the habitat features that occur there.

Arterial Roads – Travelways that provide service to large land areas and usually connect with public highways or other Forest arterial roads to form an integrated network of primary travel routes. Their location and standard are often determined by a demand for maximum mobility and travel efficiency rather than specific resource-management service. They are usually developed and operated for long-term land and resource management purposes and constant service.

Background (Visual Distance Zone) – The distance element of a landscape; surroundings, especially those behind something, that provide harmony and contrast; the area located from 3-5 miles to infinity from the viewer.

Barrens – Rare, naturally occurring communities—including hill prairies and glades—composed of dry-forest and dry-prairie grass and forb species, with a woody overstory composed of scattered, stunted, limby oaks and hickories. Lichens and mosses are typically scattered amongst the grasses and forbs. Thin soils, patches of bare grounds and rock exposures devoid of vegetation are commonly encountered. Conservative and rare species are often found in these communities. Canopy-closure ranges from less than 20 percent over the sandstone glades to up to 70 percent in

the Cretaceous Hills Subsection. In absence of fire, succeeds toward xeric or dry-upland forest or dry woodland.

Basal Area – Measurement of the extent to which a site is occupied by trees; determined by estimating the cross-section area at breast height (4.5 feet) of all the trees in an area.

Base Sale Schedule – A schedule in which the planned sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade of the planning period, and this planning sale and harvest for any decade is not larger than the long-term sustained-yield capacity.

Benchmark Analysis – An approximation of the maximum, minimum, or optimum resource potential of the Forest. Benchmarks emphasize single-resource objectives and are used to delimit the range within which feasible alternatives can be constructed and as reference points against which alternatives can be compared.

Benefit-Cost Ratio – The total discounted benefits of an activity divided by the total discounted cost.

Big Game – The large species of animals that are hunted. (White-tailed deer are the only big-game species on the Forest.)

Biodiversity – See biological diversity.

Biological Diversity – The sum total of the variety of life and its interactions, subdivided into genetic diversity, species diversity and ecological or ecosystem diversity.

Biological Potential – The maximum production of a selected organism that can be obtained under optimum management.

Board Foot – The amount of wood equivalent to a piece 12 inches by 12 inches by 1 inch.

Botanical Area – An area designated by the Regional Forester containing plants, plant groups and plant communities significant because of form, color, occurrence, habitat, location, life history, arrangement, ecology, environment, rarity and/or other features.

Burning Prescription – Written direction stipulating fire-environment conditions, techniques and administrative constraints necessary to achieve specified resource-management objectives by use of fire on a given area of land.

Canopy – The more or less continuous cover of branches and foliage formed collectively by the crowns of trees adjacent to one another, and other woody growth.

Cave – A natural cavity in the earth formed by *solutional* processes in calcareous rock and large enough to allow free movement by humans seeking access to its cavities. Excludes Sand Cave or other caverns formed principally by *mechanical* processes.

Cave community, aquatic – The collection of biotic organisms in or dependent for their existence on pools, streams, or waterfalls in a cave.

Chief's Designation or Higher – Describes the formal dedication of certain national forest lands for specified uses by the chief, congress, the president, or cabinet secretaries. On the SNF are Kaskaskia Experimental Forest, Dixon Springs Agricultural Experiment Station, national natural landmarks, sites on the national register of historic places, and research natural areas.

Clearcut – The removal of a timber stand in one cut under the even-aged silvicultural system.

Collector Road – Travelway serving smaller land areas than an arterial road, usually connected to an arterial road or public highway. Collects traffic from Forest local roads and/or terminal facilities. May be operated for either constant or intermediate service.

Commercial Forest Land – Forest land producing or capable of producing crops of industrial wood and (a) has not been withdrawn by congress, the secretary, or the chief; (b) existing technology and knowledge can ensure timber production without irreversible damage to soils, productivity, or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be attained with five years after final harvesting.

Common (Variety Class B) – Refers to prevalent, usual, or widespread landscape variety within a character-type, ordinary or undistinguished visual variety.

Common-Variety Mineral – Natural materials of low economic value, such as common stone, rock, gravel, sand and clay.

Concern – See Management Concern.

Concession Permit – Authorizes private individuals or corporations to operate Forest Service-owned facilities as a commercial profit-making venture.

Condemnation – In real property law, the process by which the property of a private owner is taken for public use without consent, requiring payment of just compensation.

Confinement Area – A defined area with highlines and/or hitching posts typically used for stock.

Conifer – Any cone-bearing, predominantly evergreen tree, such as pine, spruce, hemlock, or fir.

Constraint – A qualification of minimum or maximum amount of an output or cost that could be produced or incurred in a given time-period.

Cord – A unit of volume measurement for stacking a round of split wood; standard cord is 4 feet x 4 feet x 8 feet, or 128 cubic feet, and may contain 60-100 cubic feet of solid wood, depending on the size of the pieces and compactness of the stacks.

Cost Efficiency – The usefulness of specified inputs (cost) to produce specified outputs (benefits). In measuring cost efficiency, some outputs (such as environmental, economic, or social impact) are not assigned monetary values, but are achieved at specified levels in a least-cost manner.

Considerable Adverse Effect – A term applied to the results of monitoring the effects of ATM/OHM use. A considerable adverse effect is or may become irreparable because of the impossibility or impracticability of performing corrective or remedial measures.

Cove Hardwood – A plant community found in isolated patches across the Forest on level recesses, or small valleys in an otherwise hilly area. Typical species include American beech, yellow poplar, sugar maple and black walnut.

Creek Bottom Prairie – Colloquial reference to mesic, wet-mesic, or wet prairie, or mesic or sand barrens.

Cubic Foot – Common unit of measure for wood volume. Equivalent to a cube 12 inches on all sides.

Culmination of Mean Annual Increment (CMAI) – The point in time in the growth of a stand of trees when the average annual increment begins to decline.

Cultural Resource – The physical remains of human cultural systems in places of importance in human history or prehistory.

Decision Memo – A document issued to implement actions that do not individually or cumulatively have a significant effect on the human environment and are, therefore, categorically excluded from documentation in an environmental assessment or environmental impact statement.

Demand Trends – The expected future need or desire for outputs, services and uses.

Departure – A schedule which deviates from the principle of non-declining flow by exhibiting a planned decrease in the timber sale and harvest schedule at any time in the future. Can be characterized as a temporary increase, usually in the early decade(s) of the planning period, over the base sale schedule that would otherwise be established, without impairing the future attainment of the Forest's long-term sustained-yield capacity.

Developed Recreation – Recreation that results in the concentrated use of an area and facilities, such as roads, campgrounds, parking lots, picnic tables, toilets, drinking water sources and buildings. Includes significant investment in facilities and management. Development scales range from 1—"almost no site modification"—to 5—"extensive site modification."

Developed Recreational Site – Area or facility designed to accommodate concentrated recreational use. (See Developed Recreation.)

Dispersed Recreation – Use in areas not developed for intensive recreational use; includes generally undeveloped areas, roads, trails and water areas not treated as developed sites.

Distance Zones – Areas of landscapes denoted by specified distances from the observer. Used as a frame of reference in which to describe landscape characteristics or human activities and described as foreground (fg), middle ground (mg), or background (bg).

Distinctive (Variety Class A) – Refers to unusual and/or outstanding landscape varieties that stand out from the common features in the character-type.

Distribution System – Transmission lines, pipelines, utility lines and the like.

Diversity – The relative degree of abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

Dixon Springs Agricultural Center – Established in 1935 under the New Deal as a cooperative effort of the University of Illinois, the USDA Farm Security Administration and other federal agencies to improve the quality of life in southern Illinois. The university oversees the center on an area of national forest land under a titular right based on the 1938 agreement conveying management authority from the USDA Farm Security Administration to the Forest Service. The center operates and maintains a research, experimental and demonstration area to develop sound farming practices and practical agricultural programs for crops, livestock, forestry, horticulture and wildlife.

Dry-Mesic–Upland Forest – A community in an intermediate position along a soil moisture gradient that is neither dry nor excessively drained nor ideal. Trees grow well, but the canopy is usually more open than in mesic forests. The most prevalent forest community in Illinois, it occurs on slopes throughout the state. Dominant plants include white, red and black oaks.

Dry-Upland Forest – The soils are dry, excessively drained and poorly developed due to steep, exposed slopes, or bedrock, gravel, or sand at or near the surface. Trees have slow growth, but are not as stunted as in xeric-upland-forest, usually with a well-developed understory and ground layer. (Open canopy and presence of prairie plants indicates a dry barren, not dry-upland forest.) Many dry-upland forests of today were once most likely maintained as barrens by fire. Occur on steep ridges at crest of river bluffs and the edges of escarpments throughout Illinois, but most common on bedrock outcrops along Mississippi River and in Shawnee Hills. Dominant plants include pin, bur, blackjack, chestnut, post and black oaks.

Ecological Area – An area designated by the Regional Forester as containing significant examples of the interrelationships of biotic organisms and their abiotic environment. The area may represent diverse conditions from xeric to hydric, or a combination. Ecological areas are classified under 36 CFR 294.1.

Ecological Integrity – The unimpaired biodiversity of a particular ecosystem or landscape; land-management activities can impair, maintain, or support integrity. For example, if an herbaceous-openland community is tilled and planted to fescue and forbs (as a managed wildlife opening), its ecological integrity would be severely diminished. However, if that openland is restored through the reintroduction of forbs and woody species (post oaks, black oaks, hazelnuts, etc.) native to that community, its ecological integrity would be restored or enhanced.

Ecological Land-Type (ELT) – An area of land with a distinct combination of natural, physical, chemical and biological properties causing it to respond in a predictable and relatively uniform manner to the application of given management practices. An ELT in a relatively undisturbed state and/or at a given stage (sere) of plant succession is usually occupied by a predictable and relatively uniform plant community. Typical size generally ranges from tens to hundreds of acres.

Ecological Restoration – The healing of an ecosystem through the application of management practices intended to restore the condition and/or stability that existed prior to a non-natural disturbance.

Ecosystem – A biological community of interacting organisms and their physical environment.

Endangered Species (E) – Plants or animals in danger of extinction throughout all or a significant portion of their ranges and identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Endemic – Native or confined to a certain region; having a comparatively restricted distribution.

Enhancement – A short-term visual-quality management alternative intended to increase positive visual variety where minimal variety currently exists.

Environment – 1) The complex of climatic, soil and biotic factors that act upon an organism or ecological community and ultimately determine its form and survival (Holland, 1970); 2) All the conditions, circumstances and influences surrounding and affecting the development of an organism or group of organisms (Forest Service, 1971); 3) The aggregate of all the external conditions and influences affecting the life and development of an organism, society, etc. (after Webster, 1963).

Environmental Analysis – An assessment of the nature and significance of the physical, biological and economic effects of a proposed action (FSH 1909.15 Chapter 20).

Environmental Assessment (EA) – A concise document that serves to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or finding of no significant impact, and that aids in an agency's compliance with NEPA when no environmental impact statement is necessary (40 CFR 1508.9a).

Environmental Effect – Net change (beneficial or adverse) in the physical, biological, or socioeconomic components of the environment resulting from human actions. (Synonymous with effects and impacts as discussed in this EIS.)

Environmental Impact Statement (EIS) – A statement/disclosure of environmental effects, required for major federal actions under Section 102 of NEPA, released to the public and other agencies for review and comment; a formal document that must satisfy the requirements of NEPA, CEQ guidelines and directives of the agency responsible for the project proposal.

Ephemeral Stream – Very small, natural drainage-ways with a bank and a bed that flow only in direct response to precipitation, with channels above the water table at all times, and annually cleared of debris and litter. Not identified on US Geological Survey 7½-minute quadrangle maps or the Forest GIS mapping coverage.

Equipment, Heavy – Tracked or wheeled machinery used in forest-resource management activities, such as wheeled tractors, bulldozers, graders and skidders.

Even-Aged Management – The application of a combination of actions that result in the creation and growth of stands of trees essentially the same age. Managed even-aged forests are characterized by the 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 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 (36 CFR 219.3).

Excepted Area Notice – See Special Notification.

Experience-Level – See User Experience-Level.

Filter Strip – A defined protective area in a riparian corridor, the vegetation and undisturbed forest floor of which reduce sediment and nutrient amounts from runoff water by deposition, adsorption, plant uptake and other processes. See also Riparian Corridor.

Fire Break – See Fuel Break

Fire Use – The application of wildland fire or prescribed fire to meet resource objectives.

Floodplain – The lowland and relatively flat areas adjacent to waterways, including at a minimum areas subject to a one percent or greater chance of flooding in any given year (or 100-year recurrence).

Forage – All non-woody plants (grass, grass-like plants and forbs) and portions of woody plants (browse) available to domestic livestock and wildlife for food.

Foreground (Visual Distance Zone) – That part of a scene or landscape nearest the viewer, in which detail is evident, usually one-half to one-quarter mile from the viewer.

Forest Development Transportation System – See Transportation System.

Forest Highway – A road on the Forest under the jurisdiction of and maintained by a public authority and open to public travel (Title 23 USC 101, as amended by the Surface Transportation Act of 1978).

Forest-Interior Habitat – Areas of land at least 1-mile diameter, without power-lines, paved roads, levees and lakes, that are managed to a desired condition of contiguous forest capable of sustaining a fully functioning natural upland or bottomland forest ecosystem, including forest-interior plant and animal species. Within 400 meters from edge (edges are paved or graveled roads, levees, major power-line corridors and large reservoirs or lakes) is considered buffer area in the 1-mile diameter area. Greater than 400 meters from edge is interior habitat. Generally described along major streams or ravine bottoms where possible.

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 non-forest use.

Forest Plan – A long-range framework for the management of National Forest System land and resources. Provides direction for all management programs and practices, resource uses and protection measures.

Forest-Type – Descriptive term for group stands of similar character and species composition due to specific ecological factors by which they may be differentiated from other groups of stands.

Fuel Break – A strategically located strip, normally 100 to 400 feet wide, in which fuel has been reduced or modified; used as a safe location from which firefighters can attack and control a fire.

Fuel Loading – An index used in fire management for estimating the natural accumulation of woody material deposited on the forest floor, usually expressed in cubic feet or tons per acre.

Fuel Management – The practice of planning and executing treatment or control of any vegetative material adversely affecting consistency with fire-management direction based upon resource-management goals and objectives.

Fuel Treatment – A rearrangement or disposal of natural or activity fuels to reduce fire hazard. Fuels are living and dead vegetative materials consumable by fire.

Fuels – Flammable wildland vegetative materials. Usually aboveground living and dead surface vegetation, although roots and organic soils such as peat can be included.

Gabion – A wire-mesh basket filled with rocks; used to protect erodible streambanks or to create dams, deflectors, or other in-stream structures.

Game Species – Wild animal hunted for sport or food.

Gap-Phase Dynamics – The ecological process of stand replacement in which most trees die, either as single trees or in small groups, and are replaced by regeneration. Gap-phase tree species germinate and establish under the existing forest canopy. and are sufficiently shade-tolerant to survive in small numbers until a local disturbance causes openings in the canopy, releasing the regeneration to grow and penetrate the canopy. White ash, black cherry, white and red oak and black walnut are representative gap-phase species.

General Forest Area – All lands available for recreational use outside of wilderness, developed recreational sites, trails and administrative sites.

General Public Motorized Use – Motor vehicle use subject to applicable state traffic laws and operator codes. Roads are open to general public motorized use unless ordered closed or restricted to particular types of vehicles under 36 CFR 261.

Geological Feature – An outstanding or unique example of the history and life of the earth as recorded in rocks.

Glade – An opening in the forest caused by bedrock at or near the surface and (usually) with a steep southern or western exposure; usually a mosaic of stunted trees, shrubs, patches of herbaceous vegetation and open areas with little or no vegetation. (In the Plan, glades are included as a subcommunity of barrens.) Soil is thin or absent, and the site is either dry or xeric, so the soil-moisture class is not part of the natural community name. Defined by their rock type: sandstone or limestone.

Glade, Limestone – Found on steep south and west-facing spurs and bluffs of limestone. Soil is deeper than in a sandstone glade, but rocky and usually clayey. Both pH and nutrient levels are higher, resulting in a fairly diverse community. Best distinguishing features are presence of limestone outcrops, shallow soil and (usually) relatively many trees, shrubs and vines. Occurs in the Shawnee Hills Division and on the Mississippi River and Illinois River bluffs.

Glade, Sandstone – Limited to the Shawnee Hills, this community occupies the tops of cliffs and steep upper slopes of south-facing escarpments. Sandstone crops out; soil is poorly developed. Trees are stunted, with open growth; shrubs are common. Overstory usually covers less than half of the area, and herbaceous vegetation is sparse. Often inter-grade with bordering zone of dry-upland forest.

Goods and Services – The various outputs, including on-site uses, produced by forest and rangeland resources.

Grassland – An ecosystem or plant community dominated by grasses and forbs, such as a prairie.

Greentree Reservoir – Artificially regulated wetlands flooded annually to provide habitat for migrating and wintering waterfowl.

Group-Selection Cutting – A cutting method used in uneven-aged management involving the removal of small groups of trees to meet a predetermined goal of size, distribution and species in their remaining stands.

Guideline – In Forest Plan, a course of action that should be followed in most circumstances, but which could require flexibility related to site-specific factors. Uses words that convey discretion, such as “should,” “may,” where possible.

Habitat – The abode, natural or otherwise, of a plant or animal species considered particularly in relation to all the environmental influences affecting it.

Hardwood – A broad-leaved flowering tree, as distinguished from a conifer, belonging to the angiosperm botanical group.

Harvest (Timber Harvest) – The cutting and removal of trees for utilization.

Harvest Entry Area – A stand or group of stands entered for timber harvest.

Herbaceous Openland – Naturally occurring open area with native herbaceous plant cover (such as little bluestem, big bluestem, Indian grass, poverty oat grass and native forbs). Principle examples are barrens, glades and prairie remnants usually occurring on south and west aspects and ridge-tops. Locations of native barrens that occurred in presettlement southern Illinois as described by Engleman (1963), Anderson and Anderson (1975) and Heikens (1991).

Herbicide – Any chemical substance used to kill plants or to check their growth.

Human Resource Programs – Congressionally authorized programs designed to provide experience, training and/or employment for specific groups in the field of natural resource management.

Illinois-Listed Endangered Species – Any species listed by the state as in danger of extinction as a breeding species in Illinois.

Illinois-Listed Threatened Species – Any species listed by the state as likely to become endangered in Illinois within the foreseeable future.

Implementing Regulations – Regulations generated by an agency to implement an act of congress (for example, 36 CFR 219 contains implementing regulations for RPA and NFMA). Part of the code of federal regulations

Indicator Species – See Management Indicator Species.

Indigenous Species – Species historically native to an area, not introduced.

Integrated Pest Management – The comprehensive systems approach to achieving economical pest control in an environmentally acceptable manner. The individual components in forestry include prescribed fire and cultural, mechanical, manual, biological, chemical and regulatory means.

Integrated Resource Management – Full recognition of the values and needs of all related resources in the planning and implementations of activities associated with any one resource.

Interdisciplinary Team (IDT) – A group of individuals with skills related to different resources assembled for environmental analysis because no single scientific discipline is sufficient to adequately identify and resolve issues and problems. Team member interaction provides necessary insight to all stages of the process.

Intermediate Harvest – Any removal of trees from an even-age stand between the time of its formation and the regeneration cutting.

Intermediate (Use) Road – A travelway developed and operated for periodic service and closed for more than one year between periods of use.

Intermittent Stream – Drainage-ways that do not flow continuously, but only at certain times of the year when water is received from springs, surface sources, or precipitation. Intermittent streams have functional channels with identifiable streambed and banks; are identified on US Geological Survey 7½-minute quadrangle maps and the Forest GIS mapping system.

Interpretation – The communicative or educational process of introducing people to the natural, cultural or historical environments on the Forest; designed to help people relate to, identify with, understand and develop a positive attitude toward Forest resources.

Interpretive Sites – A developed area in which a broad range of natural or cultural history is interpreted or described for the enjoyment of the public.

Kaskaskia Experimental Forest – A portion of the Forest utilized by the North Central Forest Experiment Station for research in aspects of silviculture.

K-V Funds – Refers to the Knutson-Vanderberg Act (K-V Act) of 1930 that authorized the collection of funds (K-V funds) for reforestation and timber-stand improvement on areas cut over by a timber sale.

Land Adjustment – The alteration of National Forest System land-ownership through acquisition, exchange or disposal of land or interests in land.

Land Allocation – The commitment of a given area and its resources to the compatible combination of goods, services and uses specified by a management prescription.

Landline – Property boundaries on the national forest.

Land Management – The intentional process of planning, organizing, programming, coordinating, directing and controlling use-actions.

Land-Type Association (LTA) – A grouping of ecological land-types based on similarities in geomorphic process, geologic rock-types and soil complexes. LTAs generally range in size from hundreds to thousands of acres.

Land Use – The occupation or reservation of a land or water area for any defined purposes. (In this EIS, the terms "use" and "land use" are interchangeable.)

Largest-Diameter Tree (LDT) – In uneven-aged management, the target diameter of the largest-size tree in a stand. Trees with diameters equal to or greater than the LDT are considered mature.

Leasable Minerals – Coal, oil, gas, phosphate, sodium, potassium, oil shale and geothermal steam.

Limit of Acceptable Change (Limit of Acceptable Use) – That level of change or use at which the productivity of the resource is equal to the ability of the resource to maintain productivity. As applied to wilderness, the point at which an area remains representative of wilderness while accommodating its maximum use.

Litter – The uppermost layer of organic debris on the ground under a vegetation cover, essentially the freshly fallen or slightly decomposed vegetative material from foliage mainly, but also from bark fragments, twigs, flowers and fruits.

Local Road – A travelway connecting terminal facilities with Forest collectors or arterial roads, or public highways, developed and operated for either long-term or short-term service. Location and standard are usually dictated by specific resource activities rather than travel efficiency.

Locatable Minerals – Hard-rock minerals mined and processed for the recovery of metals; includes certain nonmetallic and/or uncommon minerals such as limestone or silica. May include any solid,

natural, inorganic substance in the crust of the earth except for common varieties of materials and leasable minerals.

Long Term – Period of time longer than ten years from the present applied to actions governed by the Forest Plan.

Long-Term Sustained Yield (LTSY) – Highest uniform wood-yield from lands managed for timber production that can be maintained under specified management intensity, consistent with multiple-use objectives.

Management Area – A unit (or units) of the Forest managed under a specific management prescription designed to achieve the desired future condition of the land in that area. The entire Forest is divided into management areas.

Management Concern – A matter of importance to the management of National Forest system lands identified by the agency.

Management Direction – A statement of multiple use and other goals and objectives; management prescriptions and associated standards and guidelines governing them.

Management Goal – A concise statement describing a desired condition of the land to be achieved some time in the future.

Management Indicator Species (MIS) – A species whose presence in a certain location or situation as part of a given population indicates a particular environmental condition. Their population changes are believed to indicate effects of management activities on a number of other, similar species or water quality.

Management Intensity – The management practice or practices and associated costs designed to obtain different levels of goods and services.

Management Practice – A specific action, measure, or treatment.

Management Prescription – Specifies and guides the practices necessary to achieve the desired future condition of the land in a particular unit (or units) of the Forest, which are called management areas. It includes a description of the desired future condition of the land and the standards and guidelines necessary to achieve and maintain the desired future condition.

Management Team – Decision-making group consisting of the Forest Supervisor, staff officers and district rangers.

Market Value (Market Output) – Goods, services and uses commonly bought and sold, and priced or valued directly from existing markets.

Maximum Modification (MM) – A visual-quality objective in which human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background area.

Middle Ground (Visual Distance Zone) – That part of a screen or landscape extending from the foreground to 3 to 5 miles from the observer, and in which texture is discernible.

Minerals Development – The inventory and extraction of mineral materials.

Mineral Rights – The ownership of the minerals under a given surface with the legal right to enter that area and remove them, including the right to use as much of the land surface as may be reasonably necessary for the conduct of operations.

Mineral Exploration – A search for mineral materials.

Minimal (Variety Class C) – Refers to little or no visual variety in the landscape; monotonous or below average compared to the common features in the character-type.

Modification (M) – A visual-quality objective in which human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color and texture. It should appear as a natural occurrence when viewed in foreground or middle ground.

Moist-Soil Unit – An area managed to provide native herbaceous species associated with artificially created or natural wetlands.

Motorized Use – Activities requiring or largely dependent on motor vehicles and roads.

Multiple Use – The management of the renewable resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough for sufficient latitude in periodic adjustments of use; that some land would be used for less than all of the resources; in a harmonious and coordinated management of productivity of the land, with consideration being given to the relative values of the various resources and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output (Multiple-Use Sustained Yield Act of 1960).

National Forest System Land – The earth's surface administered by the Forest Service, title to which is vested in the United States.

National Forest Visit – The entry of one person into a national forest to participate in recreational activities for an unspecified period of time.

National Natural Landmark – An area with geological or ecological character so designated to preserve the educational and scientific value of the sites and foster greater concern in the conservation of the nation's heritage.

National Register of Historic Places – A list maintained by the National Park Service of areas designated as being of historical significance.

Natural – Existing and/or formed by nature; not artificial.

Natural Area – A location managed to ensure that the biotic diversity of the natural communities within is maintained and/or enhanced

Nature Preserve – A tract of land under the supervision of the Illinois Department of Natural Resources and the Illinois Nature Preserves Commission formally dedicated to be protected in its natural state.

Niche – Specific and unique opportunities and benefits offered on a Forest or subunit that are most suited to add value to the agency and society. Recreational programs are emphasized to facilitate and complement the opportunities and benefits.

No-Action Alternative – The most likely condition expected to exist in the future if current management direction would continue unchanged.

Non-declining Yield – A level of timber production planned so that the sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade.

Non-forest Land – Lands never having or incapable of having ten percent or more of the area occupied by forest trees or lands previously having such cover and currently developed for non-forest use.

Non-game Species – Animal species not usually hunted in this state; determined by the state legislature.

Non-market Value (Non-market Output) – Goods, services and uses not commonly bought or sold in existing markets; assigned dollar values for some have been derived from willingness-to-pay analyses for use in comparing alternatives.

Non-motorized Use – Activities requiring or largely dependent on isolation from motor vehicles and/or roads.

Non-native Invasive Species – A plant or animal, including seeds, eggs, spores or other biological material, that is non-native to the affected ecosystem and whose introduction causes or is likely to cause economic or environmental harm (Executive Order 13112).

Objective – A concise, time-specific statement of measurable planned results that responds to pre-established goals; forms the basis for further planning to define the precise steps to be taken.

Obliteration – The returning to production of the land occupied by a road or trail.

Occupancy Trespass – The illegal occupancy or possession of National Forest System land.

Off-Highway Motorcycle (OHM) – A motorized vehicle designed for off-highway use that is 20 inches or less in width, having an unladen dry weight of 600 pounds or less, traveling on two tires, having a seat designed to be straddled by the operator, and handlebars for steering control.

Off-Road Vehicle – Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain; excluding (a) any registered motor boat, (b) any fire, military, emergency, or law enforcement vehicle when used for emergency purposes, and any combat or combat support vehicle when used for national defense purposes and (c) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract.

Oldfield Successional Lands – Abandoned agricultural lands (crop or pasture) in the early and middle stages of succession to central hardwood forest (Bazzaz, 1968). Early and mid-stages of oldfield succession display high density and diversity of annual and perennial herbaceous plants and woody shrubs, providing excellent habitat for openland-dependant wildlife. Most oldfields on the Forest have been abandoned less than 50 years. After 40-50 years, the areas have typically succeeded to hardwood forest.

Old Growth – Forests ecosystems distinguished by old trees and related structural attributes, encompassing the latter stages of stand-development. These typically differ from earlier successional stages in a variety of characteristics, including tree size; accumulations of large, dead woody material; number of canopy layers; species composition; and ecosystem function.

Old-Growth Characteristics – Those environmental components associated with old-growth forests that can be provided in forests not managed as old growth. These include a multi-layered canopy; large snags and large, live and dead cavity trees; scattered, large fallen logs with up-tipped root masses; and naturally occurring groups of trees up to 160 years old with approximately 25 percent of these groups older than the normal 120-year rotation age for hardwoods.

Opportunity Costs – The value of benefits foregone due to a choice of management that either affects existing outputs or shifts resources away from other activities, so that they are no longer produced and their benefits are lost.

Overstory – Relative to even-aged stands, the mature trees that overtop the younger.

Palzo Reclamation Site – A 313-acre, abandoned surface mine on the Forest purchased in 1966.

Partial Retention (PR) – A visual-quality objective in which human activities generally may be evident, but must remain subordinate to the characteristic landscape.

Perennial Stream – Permanently inundated watercourses that flow most of the year. They are identified on the US Geological Survey 7½-minute quadrangle maps and the Forest GIS mapping system.

Permanent Openings – Openings created from any forest-type with cereal, legume, warm season grasses or grass/forb plants established and maintained.

Persons-At-One-Time – A recreation-capacity measurement indicating the number of people that can comfortably occupy or use a facility or an area at the same time.

Pest - Plant or insect adversely affecting other plants or animals.

Pesticide – A chemical used to control or kill pests. There are several categories for different uses, such as insecticides for use on insects, or herbicides for use on vegetation.

Physiographic Province – Region of similar structure and climate with a unified landform history.

Pit – Opening made in the earth by removal of earthen material.

Planning Area – The area on or near a national forest addressed by a Forest Plan.

Planning Criteria – Prepared to guide the planning process and management direction.

Plantation – A forest crop or stand raised artificially either by seeding or the planting of young trees.

Pole Timber – A size-class definition used in timber survey; trees 5.0 to 8.9 inches DBH. As used in logging operations, trees from which pole products are produced.

Pond Community – A small, still body of water sufficiently shallow to allow establishment of aquatic plants. Has natural-community status only if permanent or semi-permanent, not seasonal or ephemeral.

Population (species) – All the individuals of a given species in a specific area or region at a certain time. Populations contain genetic variation within themselves and between other populations.

Preferred Alternative – The alternative favored for selection and implementation, as identified in a draft EIS based on relative merits, including physical, biological and socioeconomic considerations and agency statutory missions.

Prescribed Fire – Any management-ignited fire intended to meet specific objectives. Prior to ignition, prescribed fire plans must be prepared, approved, and meet NEPA requirements (where applicable).

Prescription – See Management Prescription.

Present Net Value (PNV) – Discounted benefits less discounted costs associated with providing all outputs to which monetary values can be assigned.

Preservation (P) – A visual-quality objective that provides for ecological change only.

Primitive ROS Class – The classification characterized by an essentially unmodified environment in which trails may be present but structures are rare, and the probability of isolation from the sights and sounds of other people is extremely high.

Pulpwood – The wood of various types of trees used to make pulp and paper.

q-value (or q-factor) – An average quotient of the number of trees in consecutive smaller-diameter classes for a stand; used in uneven-aged management stand-structure evaluation to create an idealized diameter-distribution table for the evaluated stand.

Rangeland – Land on which the natural plant cover is composed principally of native grasses, forbs, or shrubs valuable for forage.

Raptor – A predatory bird.

Reclamation – The return of disturbed lands to an ecologically balanced form and productivity in conformity with a predetermined plan.

Record of Decision (ROD) – The documentation of a decision resulting from an EIS, including the date and a statement of reasons for taking the decision.

Recreation Opportunity Spectrum (ROS) – A system for classifying the range of recreational experiences, opportunities and settings available on a given area of land; classifications include: primitive, semi-primitive motorized, semi-primitive non-motorized, roaded natural, rural and urban.

Recreation Visitor Days (RVD) – Recreational use of National Forest System land in 12-hour aggregates; it may consist of one person for twelve hours, two people for six hours, or any similar combination totaling 12 hours.

Recreational River (in Wild and Scenic Rivers Act Usage) – Watercourses or sections of watercourses readily accessible by road or railroad, with some development along their shorelines, and that may have been impounded or diverted in the past.

Reforestation – The natural or artificial restocking of an area with forest trees.

Regeneration – Seedlings and saplings existing in a stand; the act of establishing young trees naturally or artificially.

Regeneration Cut – Removal of trees with the intention of establishing a new crop of seedlings.

Regulated – Forested land managed for production under sustained-yield principles.

Rehabilitation – A short-term visual-quality management alternative used to return existing visual impacts on the natural landscape to a desired visual quality.

Release – The elimination of competing vegetation from around or over a desired species.

Relict Species – One that occurs in a small, disjunctive population that has survived a formerly more-widespread population. The range of the species has disintegrated or retreated because of climatic changes, and the species remains in a local, specialized habitat that provides a suitable microclimate allowing it to survive competition.

Research Natural Area – Land areas classified by order of the Chief of the USDA Forest Service containing natural plant communities that have not been modified by man and are protected and studied to obtain more information about the ecosystem.

Research Plot – Parcels of land on which Forest Service research is being conducted.

Residual Basal Area – A measurement of tree-stocking after a treatment has been completed. See also Basal Area.

Retention (R) – A visual-quality objective in which human activities generally are not evident to the casual Forest visitor.

Revegetation – The reestablishment of plant cover occurring naturally, or artificially through practices such as site preparation, planting, or seeding.

Riparian Area – Geographically delineable areas related to a watercourse(s), with distinctive resource values and characteristics comprised of aquatic and riparian ecosystems and wetlands.

Riparian Corridor – An area of land between upland sediment-source areas and watercourses.

Riparian Ecosystem – A transition area between an aquatic ecosystem and adjacent terrestrial ecosystems; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

Road Density – The measure of the degree to which a length of road occupies a given land area, e.g., one mile per square mile.

Roaded-Natural ROS Class – A classification characterizing a predominantly natural environment. Evidence of human sights and sounds is moderate but in harmony with the environment. Opportunities exist for both social interaction and moderate isolation.

Rodenticide – An agent that kills, repels, or controls rodents.

ROS Class – See Recreation Opportunity Spectrum.

Rotation – The time period between initial establishment of a timber stand and the time when it is considered ready for cutting and regeneration.

Roundwood – Trees used without being milled, such as for fence posts or telephone poles.

Rural ROS Class – A classification characterizing a landscape in which human sights and sounds are prevalent and which has been considerably altered by human activity.

Salvage – The harvest of trees that are dead, dying or deteriorating before the timber becomes worthless.

Sandstone Cliff Community – Vertical exposures of resistant bedrock and unconsolidated materials. Soils are generally nonexistent. North- and east-facing slopes support the most vegetation. Sandstone cliffs large enough to be recognized as distinct communities are abundant in the Shawnee Hills Division. Characteristic plants include *Dryopteris marginalis*, *Heuchera parviflora* and *Cheilanthes lanosa*.

Sandstone Overhang – A natural community occurring when sandstone cliffs form a shelter. The soil beneath may consist of sandy residuum or unweathered loess. Light intensities are low; soil moisture ranges from dry to wet. Overhangs large enough to be considered as natural communities are common in the Shawnee Hills, but rare in the rest of the state. Characteristic plants are *Trichomanes boshchianum* and *Dodecatheon frenchii*; characteristic animals include the eastern phoebe.

Sanitation – The removal of dead, diseased, infested, damaged, or susceptible trees to prevent the spread of pests or pathogens and, so, promote forest hygiene.

Sapling – A size-class definition used in timber survey; trees 1.0 to 4.9 inches DBH.

Savanna Remnants – Surviving remains of a savanna. (Savannas are communities with a grassy groundcover and average tree canopy-cover less than 80 percent, but greater than 10 percent, although some may have shrubby areas, and the tree canopy may be greater or less; soils are transitional between forest and prairie.)

Sawtimber – A size-class definition used in timber survey; softwoods larger than 9 inches DBH and hardwoods 11 inches DBH.

Scarification – Loosening the topsoil in open areas to prepare for regeneration by direct seeding or natural seed-fall.

Scenic Easement (Relative to the Wild and Scenic Rivers Act) – By definition in the act, the right to control the use of land (including the air space above such land) within the authorized boundaries of the component of the wild and scenic river system, for the purpose of protecting the natural qualities of the designated river area; but such control shall not affect, without the owner's consent, any regular use exercised prior to the acquisition of the easement.

Scenic River (in Wild and Scenic Rivers Act Usage) – Watercourses or sections of watercourses free of impoundments, where shorelines or watersheds remain largely primitive and shorelines largely undeveloped, but accessible at places by road.

Sediment – Solid material, mineral or organic, in suspension, being transported or already transported from its site of origin by air, water, gravity, or ice and resting on the Earth's surface either above or below sea level.

Seedling – A size class definition used in timber survey; trees less than 1 inch DBH.

Selection Harvest Cut – A system that removes trees individually in a scattered pattern from a large area each year. Individual-tree selection cutting involves removal of selected trees of all size-

classes on an individual basis. Regeneration is established under the partial shade of the overstory canopy after each cut. Group-selection cutting involves removal of selected trees of all size-classes and groups from a fraction of an acre up to 2 to 3 acres. Regeneration occurs under conditions similar to small clearcuts.

Semi-primitive Motorized ROS Class – A classification characterized by moderately dominant human alterations with strong evidence of permanent road and/or trails.

Semi-primitive Non-motorized ROS Class – A classification characterized by few and/or subtle human modifications and with a large probability of isolation from the sights and sounds of others.

Sensitive Areas – Areas of high erosion hazard, that may be susceptible to compaction, or of unstable slopes.

Sensitive Species (S) – Species designated for protection by the Regional Forester (Regional Forester sensitive species).

Sensitivity Level – As used in visual-quality management, a particular degree or measure of viewer interest in the scenic qualities of the landscape: 1=most sensitive, 2=sensitive and 3=less sensitive.

Shade-Intolerant Plant Species – Vegetation requiring uninterrupted sunlight for optimum growth.

Shade-Tolerant Species – Vegetation having the capacity to grow without receiving direct sunlight.

Shelterwood Cutting – A cutting method used in even-aged management; the removal of a tree-stand through a series of cuttings designed to establish a new crop with seed, with protection provided by a portion of the stands.

Shelterwood with Reserves – A cutting method similar to shelterwood, except that some or all of the shelter trees from a shelterwood are retained for an indefinite period of time after establishment of regeneration, to attain goals other than regeneration.

Short-Term Facility (Road) – A facility developed and operated for a limited period of time, after which the occupied land is reclaimed.

Shrub Swamp – A wetland dominated by woody plants, with at least 50-percent coverage by shrubs and less than 20-percent coverage by trees. A waterbody with less shrub-coverage is a pond, with greater tree-coverage, a swamp. Often associated with ponds in wet-floodplain forest. Dominant plants include buttonbush, red-osier dogwood, pussy willow, long-leaf willow and speckled alder.

Silviculture – The growth, tending, harvesting and replacement of trees/forests.

Site Preparation – Manipulation of the ground surface before planting or preparing a seedbed for natural regeneration, includes removal of unwanted vegetation, slash, stumps and roots.

Skid Trail – Travelway used to drag or transport trees from the stump to the road.

Slash – Debris remaining after logging, pruning, thinning, brush-cutting, or wind and fire. It includes logs, branches, bark and stumps.

Smoke Management – The control of amount, duration, drift and intensity of smoke produced from prescribed burning.

Snag – A standing dead tree used by birds for nesting, roosting, perching, courting and/or foraging food, and by many mammals for denning and foraging food.

Softwood – A coniferous tree belonging to the gymnosperm botanical family.

Soil Profile – A progression of soil layers, beginning at the surface, that reveals the alterations of the soil-forming processes, such as leaching, oxidation and accretion.

Soil Survey – A field investigation of the soils of a specific area, including identification and determination of extent. Information is mapped and an accompanying report describes, defines, classifies and interprets the findings. Interpretations predict the behavior of soils under different uses and their response to management.

Spatial Feasibility – The capacity of a management prescription to be implemented on the ground.

Special Area Management – The occupation or reservation of land or water for a particular land use or uses, to the exclusion of other uses.

Special Features – Areas, plants, animals, cultural and/or historic sites requiring site-specific management for their protection, perpetuation and/or research.

Special Forest Products – Materials derived from biological resources collected in forests and grasslands for personal, educational, or scientific uses. Commonly referred to as non-timber forest products, they include plants, parts of plants and other biological material, including fungi, lichens and mosses.

Special Notification – Advisory stipulation in permits that warns the permittee that the area described in the application contains environmentally sensitive land dedicated to specific uses.

Spectrum – A linear-program model designed for use in Forest Service planning.

Special Stipulations – Legally binding conditions of lease/permit consent and approval developed to protect the use, management, administration and development of National Forest System land.

Spring Community – A natural community with spring water-flow across a broad area. Large communities are limited to the Ozark Hills and Shawnee Hills divisions. Characteristic plants include the lakecress.

Stand (Timber-Stand) – An aggregation of trees in a specific area and sufficiently uniform in composition, age-arrangement and condition as to be distinguishable from the forest in adjoining areas.

Standard – In Forest Plan, a course of action that must be followed, or level of attainment that must be reached, to achieve Forest goals. Written in the imperative or with words that convey mandatory compliance, such as “shall,” “shall not,” “must” or “must not.”

Standard Stipulations – Legally binding conditions of lease/permit consent and approval included in every lease/permit application.

Stream Community – Flow of watercourse must be permanent, not intermittent or ephemeral, to be considered as distinct natural community rather than a feature of another community.

Structural Range Improvement – Any type of non-natural range improvement, such as fences or corrals.

Subsoil – The layer below the soil surface in which roots normally grow.

Subsurface (Mineral) Rights – Ownership of, or right to use, the resources and improvements under the surface of the land, including the right of temporary surface use and reasonable ingress and egress.

Succession – An orderly process of biotic community development involving changes in species, structure and community processes; it is reasonably directional and, therefore, predictable.

Suitable Range – Land area accessible to livestock or wildlife that can be grazed on a sustained-yield basis without damage to other resources.

Suitable Timber Lands – Forest land managed for timber production.

Surface Rights – Ownership of the surface of the land only; right to use the surface of the land on a regulated basis.

Sustained Yield – The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of national forests without impairment of the productivity of the land (Multiple-Use Sustained-Yield Act).

Temporary Facility (Road) – A temporary use of the land for transportation purposes; usually constructed to serve a specific resource activity. Occupied land is returned to resource production upon termination of the activity requiring its use.

Thinning – A cultural treatment done to reduce the stand-density of trees and so improve growth, enhance forest health, or recover potential mortality.

Threatened Species (T) – Plants or animals whose existence is threatened throughout all or a significant portion of their ranges and identified by the Secretary of the Interior as threatened in accordance with the 1973 Endangered Species Act.

Tiering – Incorporating by reference in subsequent environmental documents the information contained in an EIS.

Timber-Stand Improvement (TSI) – An intermediate treatment made to improve the composition, structure, condition, health and growth of even-aged or uneven-aged tree-stands. Includes thinning, pruning and control of undesirable vegetation.

Topsoil – The original or present dark-colored upper soil that ranges from a fraction of an inch to several feet deep.

Trail – A travelway to facilitate travel by foot, horse, or other conveyance from one point to another.

Transportation System – Access facilities provided for the protection of resources, utilization of natural resource commodities and public use. Includes roads, highways, trails and other special facilities.

Uneven-Aged Management – The application of a combination of actions required 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 (36 CFR 219.3).

Urban ROS Class – A classification characterized by a natural setting dominated by artificial structures and where human sights and sounds predominate.

User-Developed Trail – A trail that is not a part of the Forest Service trail system.

User Experience-Level – An objective for trail design and maintenance. Trails are designed and maintained for one of three user experience levels: Level 1—easiest—accommodates moderate to heavy traffic on a safe and well-marked trail; level 2—more difficult—accommodates moderate use on a trail safe for users with backcountry experience and good physical ability; or level 3—most difficult—accommodates a low number of users seeking to test their skills in rugged terrain.

Utility Corridor – A tract of land of varying width serving as a passageway through which various commodities, such as oil, gas and electricity, are transported.

Variety Class – A particular level of visual variety or diversity of landscape character, described as distinctive (Class A), common (Class B), or minimal (Class C).

Vegetative Diversity – The variety of associations composing a plant community and, by extension, the variety of plant communities that compose a landscape. For example, on a typical cross-section of the Shawnee Hills, one would encounter, (ascending the south slope) cedar glades, post oak woodland and a white oak forest, then (proceeding down the north slope) a white oak-red oak-black oak forest, a yellow poplar-mixed oak forest, and a maple-beech forest in the bottom of the hollow.

Vertical Diversity – The diversity in an area that results from the complexity of the aboveground structure of the vegetation: the more tiers of vegetation or the more diverse the species makeup, or both, the higher the degree of vertical diversity.

Viewshed – The total landscape seen or potentially seen from all or a logical part of a travel route, use area, or waterbody.

Viewshed Map – A site-specific map showing the direction for managing the visual resources.

Visitor Information Service (VIS) – A service provided by national forests to the public, supplying information regarding opportunities or activities on National Forest System land; usually, but not necessarily, restricted to recreational opportunities.

Visual Distance Zones – Areas of landscapes denoted by specified distances from the observer; used as a frame of reference in which to describe landscape characteristics or human activities; described as foreground (fg), middle ground (mg), or background (bg).

Visual Management Program – Also referred to as Landscape Management or Visual-Resource Management; the art and science of planning and administering the use of national forest lands so that the visual effects of activities maintain or upgrade visitors' psychological welfare.

Visual-Quality Objective (VQO) – A desired level of excellence based on physical and sociological characteristics of an area; refers to the degree of acceptable alteration of the characteristic

landscape; five levels are preservation, retention, partial retention, modification and maximum modification.

Waterhole – An artificial installation developed and maintained to provide a year-round source of water for wildlife; generally less than 1/2 acre.

Water Yield – The total net amount of water produced on the Forest including stream flow and groundwater recharge.

Watershed – The entire area that contributes water to a drainage or stream.

Wetland Habitat – Includes natural communities flooded or with hydric soils, and with a vegetative cover; subclasses include marsh, swamp, bog, fen, sedge meadow, seep and spring, recognized mainly by differences in vegetation.

Wetlands – Areas inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, vegetation or aquatic life requiring saturated or seasonally saturated soil conditions for growth and reproduction; include swamps, marshes, bogs and sloughs, potholes, wet meadows, river overflows and flats, and natural ponds.

Whole-Tree Removal – Felling and transporting a whole tree with its crown and, sometimes, even its roots for trimming and crosscutting at a landing or mill.

Wildland Fire Use – The application of naturally-ignited wildland fires to accomplish specific resource management objectives in predefined, designated areas outlined in Fire Management Plans.

Wildlife Opening – An administratively designated development maintained to improve wildlife habitat; may include cereal grain openings, warm-season grass openings, legume openings, oldfield successional lands, or native herbaceous openlands.

Wild River (in Wild and Scenic Rivers Act Usage) – Those watercourses or sections of watercourses free of impoundments and generally inaccessible except by trail, with watersheds and shorelines essentially primitive and waters unpolluted.

Wilderness – An area of undeveloped, federally owned land designated by congress, affected primarily by the forces of nature, where humans visit but do not remain; possessing outstanding opportunities for solitude or a primitive and unconfined type of recreation; (possibly) with ecological, geological, or other features of scientific, educational, scenic, or historical value; and an area large enough that continued use will not change its unspoiled natural condition.

Wilderness Recreation – Outdoor recreation occurring in wilderness areas.

Wildfire – A wildland fire that requires a suppression response.

Wildlife Guild – An association of faunal species with similar habitat needs.

Wildlife Habitat Improvement Structure – A site-specific improvement of a wildlife or fish habitat, such as a spring development to provide water, a brush pile for cover, a nest box for birds, or a rock and log placement in a stream for fish cover and pool creation.

Xeric-Upland Forest – The soil is extremely shallow over bedrock or gravel, and canopy trees may be so stunted and low-crowned that there is no understory, making impenetrable thickets with shrubs

and small trees; groundcover is sparse, grasses usually not important. The forest intergrades with two other communities: If the soil is deeper and the canopy more open, a glade occurs. Xeric-upland forests are limited to the Shawnee and Cretaceous Hills. Dominant plants include blackjack oak, post oak and tree sparkleberry.

II. ACRONYMS

ACHP	Advisory Council on Historic Preservation
AMS	Analysis of the Management Situation
ARPA	Archaeological Resources Protection Act
ASQ	Allowable Sale Quantity
ATV	All-Terrain Vehicle
AUM	Animal unit month
BA	Biological Assessment; <i>a/so</i> basal area
BF	Board feet
BLM	Bureau of Land Management (DOI)
BMP	Best-Management Practices
BO	Biological Opinion
CAA	Clean Air Act
CCC	Civilian Conservation Corps
CE	Categorical Exclusion (NEPA)
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CR	Candidate Wild and Scenic River management area
CV	Cave Valley management area
CMAI	Culmination of mean annual increment
DBH	Diameter at breast height
DEIS	Draft Environmental Impact Statement
DR	Developed Recreational Area management area
EH	Even-Aged Hardwood Forest management area

EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
FWS	US Fish and Wildlife Service (DOI)
FEIS	Final Environmental Impact Statement
FIA	Forest Inventory Analysis (R&D)
FONSI	Finding of No Significant Impact
FS	Forest Service; also Forest Supervisor
FSH	Forest Service Handbook
FSM	Forest Service Manual
FVS	Forest Vegetation Simulator
FY	Fiscal Year (October-September)
GIS	Geographic Information System
GPS	Global positioning system
Ha	Hectare
HR	Heritage Resource Significant Site management area
HU	Hydrologic units
HUC	Hydrologic unit code
IDNR	Illinois Department of Natural Resources
IDT	Interdisciplinary Team
IMPLAN	Input Model Plan (measure economic effects changes in program-related activities)
IMS	Information Management System
INFRA	Infrastructure Application System; used to manage programs and property information
IPM	Integrated Pest Management
LO	Large Openland management area
LRMP	Land and resource management plan

LTA	Land-type association
M&E	Monitoring and evaluation
MA	Management area
MAUM	Thousand animal unit months
MBF	Thousand board feet
MCF	Thousand cubic feet
MH	Mature Hardwood Forest management area
MIS	Management Indicator Species
MM	Minimum Management Area management area
MMBF	Million board feet
MMCF	Million cubic feet
MO	Mississippi and Ohio Rivers Floodplains management area
MRVD	Thousand recreation visitor-days
MUSYA	Multiple Use Sustained Yield Act
NA	Natural Area management area
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969; establishes a national policy for the environment and the Council on Environmental Quality (CEQ)
NF	National forest
NFMA	National Forest Management Act of 1976; produces Land and Resource Management Plans, or Forest Plans
NM	Non-motorized Recreational Area management area
NNIS	Non-native invasive species
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	No surface occupancy
NTMB	Neotropical migratory birds

OB	Oakwood Bottoms Greentree Reservoir management area
OHM	Off-highway motorcycle
OHV	Off-highway vehicle
ORV	Off-road vehicle
PAOT	Persons at One Time
PM	Particulate matter
PNV	Present net value
RA	Research Area management area
RACR	Roadless Area Conservation Rule
RARE	Roadless Area Review and Evaluation
RNA	Research Natural Area
ROD	Record of decision
ROS	Recreation Opportunity Spectrum
RPA	Forest and Rangeland Renewable Resources Planning Act
SNF	Shawnee National Forest
SHPO	State Historical Preservation Officer
T&E	Threatened and endangered
TES	Threatened, endangered and sensitive
TSI	Timber-stand improvement
USDA	United States Department of Agriculture
USDI	United States Department of Interior; <i>see also</i> DOI
USFS	United States Forest Service; <i>see also</i> FS
USFWS	US Fish and Wildlife Service (DOI)
VQO	Visual-quality objective
W&SR	Wild and Scenic River
WD	Wilderness management area
WW	Water-Supply Watershed management area

APPENDIX B

VEGETATION TREATMENTS THROUGH TIMBER SALES

This appendix addresses the suitability of National Forest lands for timber production, the allowable sale quantity, long-term sustained yield and expected future forest conditions that would contribute to timber production. The sale schedule for the Forest is presented in Tables B-3 and B-4.

I. Land Suitability for Timber Production

Table B-1 identifies the lands suitable and unsuitable for timber production according to NFMA regulations. Lands unsuitable for timber production are shown by management area in Table B-2. Forest land not suitable for timber production includes areas assigned to prescriptions CH, CR, CV, DR, FI, FR, HR, LO, MH, MM, MO, NA, NM, RA (other than Dixon Springs Agricultural Center and Kkaskia Experimental Forest), WD and WW. The acreages of these prescriptions are shown in Table B-2. Forest land not appropriate for timber production includes areas assigned to management prescriptions other than EH and does not include areas withdrawn from timber production.

Table B-1. Land classification.

Classification	Acre
1. Water	3,400
2. Non-Forest Land	3,000
3. Forest Land	278,200
4. Forest Land withdrawn from Timber Production ¹	41,400
5. Forest Land Not Producing Crops of Industrial Wood	0
6. Forest Land Physically Unsited	0
7. Forest Land – Inadequate Information ²	0
8. Tentatively Suitable Land (Item 3 minus items 4, 5, 6 and 7)	236,800
9. Forest Land Not Appropriate for Timber Production ⁴	119,500
10. Forest Land Not Sited for Timber Production (items 4, 5, 6, 7 and 9)	160,900
11. Total Suitable Land (Items 3 minus Item 10) ⁵	117,300
12. Total Net National Forest Area (Items, 1, 2 and 3)	284,600

¹ Includes wilderness, Kaskaskia Experimental Forest, national natural landmarks, Dixon Springs Agricultural Center.

² Current information is inadequate to project responses to timber management.

³ Suitable for timber production.

⁴ Not appropriate: due to assignment of land to other resource uses to meet Forest Plan objectives; in order to meet management requirements; and not cost efficient in meeting objectives in the planning period.

⁵ Only 98,755 acres of total suitable forestland was utilized in the Spectrum model for timber harvest scheduling.

Table B-2. Lands (in acres) suitable and unsuitable for timber production.¹

Management Area	Suitable	Unsuitable	Total Forest Lands
CH	117,300	0	0
CR		14,600	14,600
CV		2,000	2,000
DR		1,600	1,600
EH		20,400	137,700
HR		3,300	3,300
LO		3,700	3,700
MH		24,900	24,900
MM		7,900	7,900
MO		8,700	8,700
NA		15,400	15,400
NM		6,900	6,900
OB		4,700	4,700
RA		7,700	7,700
RW		0	0
UH		0	0
WD		28,100	28,100
WW		17,400	17,400
TOTAL	117,300	167,300	284,600

¹ Includes lands withdrawn from timber production and lands not appropriated for timber production, as well as water and non-forest land. Lands not appropriate for timber production were tentatively suitable, but harvest was not scheduled due to other Plan objectives.

II. Allowable Sale Quantity and Long-Term Sustained Yield

Table B-3 displays the allowable sale-quantity levels for the next five decades on lands suitable for timber production. The long-term sustained yield volume is 3,352.5 thousand cubic feet (Mcf) per year on the suitable timber base. The allowable sale quantity is calculated 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. It cannot be greater than the long-term sustained yield capacity.

Both the allowable sale quantity and long-term sustained yield are based only on the timber volume in the suitable timber base that will be scheduled for sale.

Table B-3. Allowable sale quantity: Harvest volume per decade in Mcf.

Decade	Hardwood		Pine		Allowable Sale Quantity
	Sawtimber	Other Products	Sawtimber	Other Products	
1	1,298	516	2,111	3,826	7,751
2	5,318	2,192	3,443	5,246	16,199
3	5,623	2,778	3,713	4,085	16,199
4	6,167	3,174	3,581	3,277	16,199
5	10,589	5,608	1	0	16,198
Long-term Sustained Yield					33,628

Additional volume could be available for the timber-sale program quantity as a by-product of vegetation treatments on lands not part of the suitable timber base. These volumes are not scheduled and do not contribute to the long-term sustained yield or allowable sale quantity. Potentially, about 1,355 Mcf of timber could be available the first decade and about 3,736 Mcf in the second decade from vegetation management for improved wildlife habitat.

III. Timber Harvest Methods

Table B-4 displays the proposed harvest area for the allowable sale quantity by probable harvest method and timber-type for the first decade. Additional areas could be harvested as a result of vegetation treatments on lands not part of the suitable timber base. Acres of all vegetation management treatments are presented in Table 4-2 for the proposed and probable management practices.

Table B-4. Timber harvest acres per year by probable method and timber-type during first decade.

Harvest Method	Pine	Hardwood	Total
Shelterwood	0	320	320
Shelterwood with Reserves	381	150	531
Intermediate Treatments	0	26	26
TOTAL	381	496	877

IV. Other Timber Information

Table B-5 presents a classification of the Forest on the basis of timber productivity for both suitable and unsuitable lands. Productivity data is based on 1998 Forest Inventory and Analysis plot data and the proportion of suited and unsuited land.

Table B-5. Forest timber productivity classification (in acres).

Potential Growth (cubic feet/acre/year)	Suitable Lands	Unsuitable Lands
Less than 20	0	0
20-49	32,800	45,100
50-84	31,700	43,400
85-119	21,100	29,000
120-164	25,800	35,400
165-224	2,300	3,200
225+	3,400	4,800
TOTAL	117,300	160,900

The first decade and future forest-types and size/age-classes for the Forest are presented in Table B-6. Present-condition data is based on the SNF Combined Data System (CDS) information.

The timber-sale schedule for the Forest is represented in Tables B-3 and B-4. Sufficient information is not available at this time to enable a listing of specific, proposed timber sales anticipated in the next three years. The schedule is based on current conditions and information available at the time this Plan is approved. If conditions change or new information becomes available, the program could be modified. The schedule includes all anticipated sales in the Forest's normal program. Salvage sales, sales from land classified as unsuitable for timber production, and firewood removals are not included.

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Appendix B – Vegetation Treatments through Timber Sales

Table B-6. Species and size/age-class distribution (in acres).

Forest-Type	Size/Age-Class	First Decade	Future Condition – projected at 2150
Oak-Hickory	Seedlings/Saplings	15,376	13,848
	Posts/Poles	7,752	54,957
	Sawtimber	181,376	59,136
	Old Growth	0	64,835
	Total	204,504	192,776
Maple-Beech	Seedlings/Saplings	0	2,852
	Posts/Poles	702	5,704
	Sawtimber	453	8,701
	Old Growth	0	42,858
	Total	1,155	60,115
Pine	Seedlings/Saplings	0	0
	Posts/Poles	15,510	0
	Sawtimber	29,360	0
	Old Growth	0	0
	Total	44,870	0
Other Hardwoods	Seedlings/Saplings	3,639	1,324
	Posts/Poles	11,085	2,517
	Sawtimber	10,220	2,615
	Old Growth	0	16,128
	Total	24,944	22,582

APPENDIX C

SILVICULTURAL MANAGEMENT PRACTICES

I. INTRODUCTION

Similar to many other forests (Sheffield and Dickson, 1998), the SNF is under pressure to provide more and better products and benefits for more and more people. This pressure has accelerated the development of procedures for integrated resource management planning to provide a mix of goods and services when and where they are needed. In turn, management of the forest cover is being directed more toward the establishment and care of the forest for these broad combinations of uses. This trend requires an increasing flexibility and knowledge of the silvicultural choices available for the important forest-cover types of the SNF.

The Resources Planning Act of 1974 as amended by NFMA [Sections 6(e)(2) and 6(g)(3)(A)] and the resulting secretary's regulations [36 CFR 219.15 and 27(b)] require the silvicultural method being used for vegetative manipulation of tree-cover be best suited to the multiple-use goals established for the area, taking into consideration outdoor recreation (including wilderness), range, timber, watershed, wildlife and fish.

The principal references for the major forest-cover types on the SNF are found in *Silvicultural Systems for the Major Forest Types in the United States* (Burns, 1983), *Silvics of North America* (Burns, 1990) and *Forest Cover Types of the United States and Canada* (Eyre, 1980)

II. SILVICULTURAL SYSTEMS

The Society of American Foresters (Helms, 1998) defines silviculture generally as the science and art of controlling the establishment, growth, composition, health and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis. Silviculture is normally directed at the creation and maintenance of the kind of forest that will best fulfill the objective of the owner (Smith *et al.*, 1997). Since the American public, with its diverse interests and viewpoints, is the ultimate owner of the National Forest System, meeting the objectives, needs and values of the landowner can be very difficult.

The term "silvicultural system" represents all silvicultural treatments that would be applied during the lifetime of a stand. This could include regeneration harvests, intermediate cuttings, prescribed burning and other required cultural treatments. The principal objective of silvicultural treatments is to maintain the stand in a healthy, vigorous condition to meet various management objectives, including creating or maintaining desired conditions for species composition, wildlife habitat, visual quality, timber quality and integrated pest management.

A silvicultural system is not selected at random, but is applied in response to a specific set of circumstances while remaining sufficiently dynamic to adjust as circumstances change and knowledge of them improves. While achieving the management objectives of the forest is the foremost consideration in selecting a silvicultural system, there are many other factors that must be considered, including:

- The biological characteristics of the species involved
- Features of the site on which the trees are growing
- The potential for damage or mortality
- Public attitudes

The biological characteristics of the trees in the forest, both preferred and competing species, determine the range of management treatments that can be prescribed. One of the more important characteristics to be considered is shade tolerance. Species more tolerant of shade are better adapted to regenerate under a forest canopy and will eventually dominate a site. Through natural disturbances, conditions conducive to the regeneration of light-demanding species are created. It follows, then, that regeneration cutting-methods should be selected to provide for the light requirements of the desired species.

The site on which the tree grows includes all the physical, chemical, climatic and biological features of an area that influence a tree's regeneration and growth. Site factors affect not only the growth of trees but also the sensitivity of the area to soil compaction, erosion and stream sedimentation. All these factors must be considered when evaluating the erosion hazard, slope, drainage and fertility of a site before choosing and applying a silvicultural system or harvest method.

The susceptibility of trees to damage or mortality from insects or pathogens is related to stand and site conditions, and overmature forests are particularly vulnerable (Loftus and Fitzgerald, 1989). Additionally, as trees age they become increasingly subject to heavy mortality due to senescence, drought and other antagonistic factors (McGee, 1984). The silvicultural system selected should consider these risks and be applied in a manner that maintains tree vigor and creates diversity within and among stands in the forest.

Although a variety of regeneration-harvest methods may be used, only two silvicultural systems are generally recognized: uneven-aged and even-aged management. These systems differ in regeneration, stand-composition and stand-structure. Under uneven-aged management, regeneration is a continuing process, stand-composition is usually restricted to the more shade-tolerant species, and the stand-structure is characterized by the presence of all size classes. Under even-aged management, regeneration occurs during a short period before or just following the final harvest, and the stand composition may be composed of either shade-tolerant or shade-intolerant species. Stand-structure is characterized by trees of essentially the same age-class, although there may be different size-classes due to differences in growth-rates (Gibbs, 1963).

A. UNEVEN-AGED SYSTEM

Management of the forest under the uneven-aged system attempts to simultaneously provide for continuous high cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of age- or diameter-classes (Gibbs, 1978).

A forest-stand is considered to be uneven-aged when three or more distinct tree age- or diameter-classes are maintained (Mills, *et al.*, 1987). This clarification is necessary due to the fact that, in the strictest sense, there are really no truly uneven-aged stands, for when a single tree dies, there are usually several new trees that replace it. Thus the larger uneven-aged stand is simply a tool required to comprehend and bring order into what would otherwise be a chaos of little stands created by the removal of single trees or small groups of trees (Smith, *et al.*, 1997). The maximum size of the small openings to be considered as a "group" depends on individual viewpoints. Minckler (1989) and Twight and Minckler (1972), in their studies of uneven-aged management of southern Illinois hardwoods utilized groups a little more than one acre in size.

The regeneration-harvest methods used under the uneven-aged system are single-tree and group selection. These methods involve the cutting of both mature and immature trees, singly or in groups, in order to provide space and light for new regeneration to become established and grow. They are also used to regulate the stand-composition and to maintain a desired diameter-distribution.

1. Single-Tree Selection

Single-tree selection consists of the periodic removal of individual trees throughout several or all diameter-classes within the stand. The goal is to maintain a specified number of trees per acre in each age-class, and should not be confused with high-grading, where only large trees are cut. Trees selected for removal are evaluated on the basis of their characteristics in relation to the established stand-structure goals.

The ability of a tree species to survive and grow in the shaded conditions of a forest understory is referred to as tolerance (of shade). Tree species are classified as very tolerant, tolerant, intermediate, intolerant, or very intolerant. Very tolerant species include sugar maple and beech; intermediate species include most oaks and hickories; and the intolerant species include black cherry, yellow poplar and black walnut (Spurr and Barnes, 1980).

The openings created by the selection and cutting of individual trees are relatively small and similar to those resulting from scattered natural mortality. This shaded condition favors the regeneration of tolerant species that can become established and survive for a long time in the understory, as opposed to those that are intolerant. When single-tree selection is used in stands containing intolerant species, the species composition will gradually change to domination by the most tolerant species capable of growing on the site. It follows that, if the desired species to be regenerated are intolerant, single-tree selection should not be used.

Oaks cannot be perpetuated successfully with single-tree selection, since the establishment and development of oak regeneration is not possible using this method (Sander, 1988). Single-tree selection is appropriate for stands in which the desired species-composition is primarily tolerant (Sander and Clark, 1971; Marquis, 1978; Mills *et al.*, 1987; Marquis and Johnson, 1989; Loftus and Fitzgerald, 1989). Johnson *et al.* (2002) discuss the application of single-tree selection on sites that are intrinsic accumulators of oak reproduction; however, the long-term sustainability of this method remains to be verified in practice.

2. Group Selection

Group selection consists of the periodic removal of trees in small groups of a few to many, with the intent of ultimately creating a balance of age- or diameter-classes in a mosaic of small contiguous groups throughout the forest (Marquis, 1978; Burns, 1983).

The manner in which group selection is applied may demonstrate considerable variation. On one hand, small groups of a fraction of an acre are created whenever a logical grouping of trees can be removed together. On the other hand, cutting may result in larger openings of up to two acres, where stems larger than 2 inches DBH are cut without examination or consideration of each individual stem. These are two different methods that should not be considered the same. If the group is not identified and recorded as a separate stand, and regulation of the larger area in which the group occurs is achieved through control of diameter-distribution, then this is considered group selection under the uneven-aged management system (Marquis, 1978).

The selection of ecological groupings of trees is a way to simulate the natural process of forest regeneration referred to as gap-phase replacement (Spurr and Barnes, 1980) or patch dynamics (White and Pickett, 1985). A gap is an opening in the forest created either by a small-scale disturbance, such as the death of one to several trees, or a larger disturbance, such as a tornado or fire. The response of species to the size of the gaps is related to their shade tolerance. Tolerant species are favored by small gaps, while the intolerant are favored by the larger gaps (Runkle, 1985; Lorimer, 1989). In small-size openings, intolerant species may reproduce, but will soon diminish in importance as the result of shading from the border trees (Marquis and Johnson, 1989).

As small openings are created for new regeneration in the stand by the removal of groups of trees, more light can reach the forest floor, creating micro-environmental conditions allowing for the release of sub-canopy shrubs, seedlings and saplings (Minckler *et al.*, 1973). The size, shape and placement of openings are varied to meet the silvical requirements of the desired species (Mills *et al.*, 1987; Loftus and Fitzgerald, 1989; Fischer, 1979).

B. EVEN-AGED SYSTEM

Under even-aged management, the intent is to maintain stands of manageable size of the same age or age-class scattered throughout the forest. A stand is considered even-aged if the difference in age between the oldest and youngest trees does not exceed 20 percent of the length of rotation (Helms, 1998; Smith *et al.*, 1997; Loftus and Fitzgerald, 1989).

The rotation age under an even-aged management system is the number of years between establishment of a stand and when it is considered ready for another regeneration harvest. Several factors must be considered when determining the length of the rotation, such as physical productivity and pathological, entomological and silvicultural factors (Davis, 1966). During the rotation, there may be one or more thinnings prior to the next regeneration harvest. The regeneration methods used under the even-aged management system are seed-tree, shelterwood and clearcutting.

1. Seed-Tree Method

The seed-tree method involves the harvest of all but a few well-distributed trees of the desired species, which are left to provide seed for natural regeneration. After adequate regeneration has been established, the seed-trees are normally harvested (Burns, 1983; Smith *et al.*, 1997; Loftus and Fitzgerald, 1989). Leaving seed-trees usually is not necessary for regeneration of the central hardwoods, because most hardwoods reproduce from advance seedlings, from sprouts and root suckers, or from seed stored in the humus (Marquis and Johnson, 1989).

2. Shelterwood Method

The shelterwood method involves removal of the overstory canopy in a series of two or three cuts with the intent of establishing regeneration prior to complete removal of the overstory. This process involves three operations: 1) a preparatory cut to set the stage for regeneration, 2) a cut to establish the new crop of seedlings and 3) a removal-cut to release the established seedlings (Smith *et al.*, 1997; Loftus and Fitzgerald, 1989).

The shelterwood method is appropriate for species or sites where the shelter of a partial overstory is needed to establish reproduction, or to give regeneration of desirable species an advantage over those less desirable. It is also appropriate where a forested overstory is necessary to meet wildlife-habitat or visual-quality objectives.

Where specific wildlife-habitat or visual-quality requirements are the primary concern, shelterwood with reserves may be used. Using this method, the removal of reserved trees may be deferred temporarily or permanently. If the reserved trees are not harvested for an extended period, a two-aged stand could result.

3. Clearcut Method

The clearcut method involves the removal of all trees in a selected area in one operation, except for those left for wildlife or visual purposes, with the expectation that a new stand will be established from seeds, advanced regeneration, or sprouting. Undesirable trees in competition with new regeneration are also cut (Smith *et al.*, 1997; Mills *et al.*, 1987; Loftus and Fitzgerald, 1989; Marquis and Johnson, 1989).

To obtain desirable natural regeneration in central hardwood stands, clearcutting is an effective method. However, to successfully regenerate large numbers of oak and hickory, it is necessary to have adequate numbers of advanced reproduction of these species present within the area prior to the clearcut harvest (Johnson *et al.*, 2002; Roach and Gingrich,

1968; Sander and Clark, 1971; Sander, 1972; Sander *et al.*, 1976; Sander, 1977; Mills *et al.*, 1987; Sander, 1988; Loftis, 1988). Clearcutting may be especially appropriate for stands extensively damaged from natural causes, such as tornadoes, wildfire or insects, or at high risk for significant mortality within the next ten years.

III. MAJOR FOREST-COVER TYPES

A. HISTORY

With the settlement of Illinois during the early 19th century, the demand for wood for housing, fuel and fence-posts dramatically increased (Rolfe, 1990). As sawmills were introduced into the area, and with the rapid increase in towns and villages, the harvest of timber stands for high-value products greatly accelerated. The practice of cutting only the desired high-value species, known as high-grading, left residual stands of trees that were defective, cull, misshapen, and generally of little value (Den Uyl, 1962; Westveld, 1949). Horwitz (1974) states:

"Such logging persists to this day hidden under the cloak of selection management. There are still loggers who take only what is commercially useful, leaving inferior, unhealthy trees to take over the area."

The differences in growth rate, longevity and value contributed to the condition of the forest-cover today. Stands clearcut in the late 1800's for fuel-wood and other uses regenerated to a mixture of tree species that are essentially even-aged. Because it could require 40 years or more for the slower-growing, understory-tolerant species to mature, as compared with the intolerant species (Marquis *et al.*, 1984), these early cuttings produced stands that were not only a mixture of species, but also a mixture of sizes. Such stands are often mistaken for all-aged, even though they are even-aged (Marquis and Johnson, 1989; Gibbs, 1963; Roach and Gingrich, 1968).

Harvest in the Illinois forestlands increased until the turn of the century, then it began a steady decline due to the earlier poor management. Commercial forestlands continued to undergo changes in the 1900's. Between 1962 and 1985, more than half of the state's bottomland-hardwood types had been eliminated, either through disease or conversion to other land uses (Rolfe, 1990). During this same period, the upland oak-hickory type decreased by 12 percent and the maple-beech increased by over 1,130 percent (Hahn, 1987).

Two national forest purchase units were established in 1933 and the SNF in 1939. At that time, the Forest was mostly oak-hickory, with most of the big timber cut long before. Most timber was found on slopes with abandoned farm fields above and below. The upland hardwoods were mostly culls (poor trees of little value), and it was stated in an early report that "if the poor trees were removed, there would be few left".

Using the 1998 forest inventory and analysis plots, Haugen (2003) shows the major forest-types of the SNF to be 68 percent oak-hickory, 16 percent maple-beech, 12 percent pine and 4 percent other species. A different inventory, the Forest timber-stand data, which is based primarily on stand inventories performed primarily in the 1980's, shows about 72

percent oak-hickory, about 16 percent pine, less than 1 percent maple–beech and about 9 percent other hardwoods (including bottomland hardwoods).

B. OAK-HICKORY

1. Description

Within this broad grouping, there are several forest-cover types listed as "oak." Various oak and hickory species are also listed as components of many other forest-types (Eyre, 1980). This type is found on all topographic terrains, from dry, rocky ridges to deep coves.

The great range of soils and topography on the Forest result in widely different species composition. Typically, white oak, northern red oak, southern red oak and black oak are found throughout the type. Other common oaks on drier sites are post and blackjack, with minor occurrences of scarlet. Hickories such as pignut, mockernut and shagbark are consistent but minor components. Other overstory species that may occur are sugar maple, yellow poplar and beech. Some understory woody species that may occur are flowering dogwood, sassafras, hop hornbeam and serviceberry.

2. Oak Regeneration

The transition from regenerating just any commercial hardwood species to regenerating a specific component of oak has been challenging to many practicing foresters. It has long been recognized that the composition of the stand following harvest is dependent on: a) reproduction that becomes established after harvesting, b) reproduction present on the ground at the time of harvesting, and (c) sprouting from harvested stems. Carvell (1967) reported:

"Unless some drastic measure for eradicating the existing understory is employed at the time mature oak types are harvested, the composition of the new stand is determined primarily by the understory species present prior to the harvest cut. In other words, those species which will dominate the next rotation can be accurately predicted from the composition of the existing understory."

Research has shown that there generally is a large number of germinating acorns on the forest floor. A West Virginia University study in 1958 reported a large amount of reproduction under fully stocked stands, with an average site index of 68. Of 39,000 stems per acre, over 6,400 consisted of oak species. However, almost 4,800 of the oak were less than 1 foot in height (Tryon and Carvell, 1958). The problem then becomes getting enough of the smaller oak into a dominant or co-dominant position in the stand. Merely having a large amount of oak regeneration in the understory prior to harvest does not ensure the stand composition following harvest will have a large percentage of oak (McQuilkin, 1975)

The need for advanced oak reproduction started to become an issue in the late sixties and early seventies. It was recognized that, although a large number of oak seedlings may be established, not all would have sufficient vigor and size to successfully compete with other vegetation in order to form a portion of the dominant stand after harvest. Thus, advanced

reproduction was found to be particularly important for the oaks, for if oak advance reproduction were scarce, there would be few oaks in the new stand. This means that the oak component of the new stand is fixed when the harvest is done, and to obtain adequate stocking of oaks in the new stand, careful attention must be given to the amount of oak advance reproduction under the old stand (Sander and Clark, 1971).

Trimble (1973) observed that an undetermined number of advance reproduction died during the first few years after sudden exposure. He also suspected that small stems (less than 4 feet tall) of suppressed reproduction of oak could not compete successfully with the flush of new plant growth that follows clearcutting. At about the same time, Sander (1972) was drawing the same conclusions, reporting that the oak component of newly regenerated stands is sometimes inadequate even when oak advance reproduction is abundant, because it fails to grow quickly enough to compete successfully. Thus, numbers alone do not indicate how many oaks will become dominant in the new stand.

Sander's studies indicated that mortality of advanced oak reproduction was related to the size and relative vigor of the various reproduction-types, as well as to the amount of overstory remaining. Basically, the small reproduction-types (new seedlings established after treatment, seedling advanced reproduction less than 4.5 feet in height, and new sprouts from small seedlings) grew slowly following partial cutting and would be of doubtful value for replacing the stand that was removed. He suggested that only the large (greater than 4.5 feet in height) advance reproduction should be relied upon to regenerate partially cut stands. He further stated that careful consideration should be given to the size as well as the amount and distribution of oak advance reproduction when planning harvest cuttings to regenerate oak stands (Sander, 1972).

Further work by Sander, Johnson and Watt (1976) developed guidelines, based on research plots and personal observations, to be used in evaluating the adequacy of advanced oak regeneration and predicting the amount of sprouting. These original guidelines were later incorporated into an oak management publication by Sander (1977) and Johnson *et al.* (2002). One aspect of these guidelines often overlooked is the establishment of a future stocking-goal. Sander *et al.* (1976) stated:

The determination of the minimum amount of oak advance reproduction for adequate stocking in a new stand requires first defining "adequate stocking." At some future stage of stand-development there must be enough dominant and co-dominant oaks in the stand to furnish some minimum stocking level.

Sander chose to define "adequate stocking" for oak as 30 percent in dominant and co-dominant stems at age 20. All of his calculations from this point on were based on obtaining this 30-percent objective. However, if the objective is to obtain a different stocking-level, then his calculations cannot be applied (Sander *et al.*, 1976).

Refinements of the concept of the relationship of oak advance reproduction-size and probability of survival to reach dominant or co-dominant size at age 20 were incorporated into later works by Sander, Johnson and Rogers (1984), Sander (1988), and Loftis (1988). Loftis (2002) concludes that the keys to the natural regeneration of upland oak components are 1) to ensure the presence of competitive regeneration sources and 2) to provide timely,

sufficient release of these sources. Crow (1988) has stated that a prescription for regenerating oak includes:

- controlling competing vegetation
- reducing overstory densities
- ensuring adequate supplies of propagules
- managing for seedling-sprouts
- removing the overstory after seedling establishment.

a. Evaluation of Single-Tree Selection Harvest Method

The single-tree selection method is often recommended to retain a closed tree-canopy; however, using this method will not perpetuate oaks or other intolerant species because they need full sunlight for best development (Arend and Scholz, 1969; Sander and Clark, 1971; Sander *et al.*, 1983; Sander and Graney, 1993). Although oak seedlings may become established, they will be unable to compete and grow into saplings. Also, as the existing oak-poles and larger sizes grow and are harvested, the small-tree component will become dominated by tolerant species until eventually the entire stand is composed of tolerant species (Mills *et al.*, 1987; Sander *et al.*, 1983; Trimble, 1973; Sander and Craney, 1993).

Arend and Scholz (1969), in referring to a regeneration-cutting experiment using single-tree selection on the Kaskaskia Experimental Forest, stated that nine years of selective harvesting had "reduced a 24-acre merchantable stand to one consisting mainly of saplings, poles and small sawtimber." Den Uyl (1962), commenting on the same area, stated: "The cuttings produced an unbalanced diameter-class distribution and undesirable composition of reproduction, and resulted in lost time in putting the stand in good condition." If the objective for a timber stand is other than maintenance of the oak component, then single-tree selection would be appropriate. However, based on review of technical and scientific literature and appropriate evaluation of this knowledge, it appears the single-tree selection method would have little merit in regenerating oak and, thus, would be inappropriate when the objective is to maintain the oak component.

b. Evaluation of Group-Selection Harvest Method

Group selection properly applied can be used to regenerate oak to a limited degree. As with the clearcutting method, adequate oak advance reproduction is essential to the successful regeneration of group-openings (Johnson *et al.*, 2002). If oak advance reproduction is not adequate to fill the opening, cutting the trees to create the opening will not result in oak reproduction, and the opening will be filled with whatever species are present in the understory (Sander and Graney, 1993). Generally, openings of at least 1/2 acre are recommended (Sander and Clark, 1971; Fischer, 1979; Mills *et al.*, 1987). Smaller openings will also work, but it must be recognized that the smaller the opening, the more competition from the surrounding stand will retard the growth of the reproduction (Sander and Clark, 1971; Minckler *et al.*, 1973; Mills *et al.*, 1987).

A 20-year study of group selection that involved three cycles of cuttings plus an intensive treatment of killing culls, resulted in a drastic reduction in the number of red oak. Prior to beginning treatments, red oak was the dominant species in the stand, 42 percent of the

commercial species and 65 percent of the oaks. After 20 years of treatment, red oak had been reduced to 34 percent of the commercial species and only 51 percent of the oaks. Reproduction data for the same area showed that red oak accounted for only 5 percent of the reproduction and white oak only 17 percent, indicating that the stand was losing its oak component (Twight and Minckler, 1972; Minckler, 1989).

Since the amount of light in openings is directly correlated to opening-size, the use of slope and the height of surrounding trees is a method that quantifies the size of opening required to provide the light necessary for oak to survive (Minckler et al., 1973; Fischer, 1979; Minckler, 1989). Fischer (1979) determined that to provide the minimum light requirements for regenerating oaks, certain guidelines should be followed. These are displayed in Table C-1.

Table C-1. Minimum opening-size to provide light necessary for oak regeneration.

Aspect	Number of Tree-Heights	Perimeter Tree-Height			
		60 Ft.	70 Ft.	80 Ft.	90 Ft.
South	1.0	0.1 acre	0.1 acre	0.1 acre	0.2 acre
Level	1.5	0.2	0.2	0.3	0.3
North	2.0	0.3	0.4	0.5	0.6

Based on review and evaluation of technical and scientific literature, it appears that the use of the group-selection method would be appropriate for limited management of the upland oak-type. However, uneven-aged management using group selection would be not be a practical means of preserving the diversity of tree species similar to that existing in the region due to conversion of oak-hickory stands to mixed hardwoods (Mills *et al.*, 1987). In addition, compared to shelterwood or clearcutting, the group-selection method has higher logging and administrative costs (Clark and Watt, 1971).

c. Evaluation of Seed-Tree Harvest Method

The seed-tree method is not recommended for oak regeneration because acorns do not disperse very far, thus the retention of a few trees per acre would not ensure a good distribution of seedlings, and because seed-trees provide too little reproduction too late (Johnson *et al.*, 2002). Advanced oak regeneration should also be established when the stand is harvested, so any new seedlings would probably not survive to become part of the future stand (Sander *et al.*, 1981; Sander and Clark, 1971).

d. Evaluation of Shelterwood Harvest Method

When the regeneration potential of the existing oak advance reproduction is inadequate to replace the stand, the shelterwood method should be used (Sander and Graney, 1993). To successfully regenerate oak, sufficient advanced regeneration must be present prior to final harvest, or some treatment must be applied to the stand to develop adequate numbers of regeneration (Sander, 1977). Although the shelterwood method appears to be "safe" for regenerating oak, since the final cut is not made until after adequate advance reproduction is established, early results were not encouraging, since these early applications failed to provide for the continuing survival and growth of oak seedlings that became established (Sander, 1979; Sander and Clark, 1971).

Other publications have shown that, in order for this method to be successful, the overstory must be reduced to allow sufficient light for adequate growth of oak seedlings and the competing understory vegetation must be controlled (Arend and Scholz, 1969; Sander, 1979; Sander *et al.*, 1983; Sander, 1988; Beck, 1988; Loftis, 1988; Pubanz *et al.*, 1989; Hill and Dickmann, 1988; Johnson *et al.*, 2002).

Based on review and evaluation of technical and scientific literature, it appears that the use of the shelterwood method would be appropriate for management of the upland oak-type. The advantage of shelterwood when properly applied is that a vigorous growth of advanced reproduction is established prior to the final harvest. This may make the final cut more aesthetically pleasing, and the overstory would probably provide for continued mast production. The disadvantages are the risk of degradation or windthrow of the remaining trees and the increased cost of logging (Clark and Watt, 1971). Shelterwood with reserves can be used to avoid dramatic change to the visual resource or to maintain a portion of the canopy for other resource needs, such as forest-interior habitat.

e. Evaluation of Clearcut Harvest Method

The clearcutting method has probably generated more controversy than all other methods combined. Proponents cite the advantages of developing uniform stands, regenerating intolerant species, lower harvesting costs, and more efficient management. Opponents cite disadvantages, such as pure stands, the poor appearance after harvesting, the lack of mast production from the area for a period of time, and poor wildlife habitat in the dense pole-size stands (Clark and Watt, 1971; Smith *et al.*, 1997).

Clearcutting has been proven to be a very effective method of regenerating oak when these factors are considered prior to prescribing the harvest. Failure to consider these factors or to apply treatments in response to these factors will yield erratic regeneration results.

- Stand size: The size of the stand should be at least one acre in order to minimize the effect of shading from edge trees and provide for best regeneration growth. If the area has a high deer population, minimum stand-size should be larger in order to reduce the impact of browsing on the regeneration (Sander and Clark, 1971; Arend and Scholz, 1969; Sander, 1988).
- Stand shape: The shape and delineation of the cut areas should follow ecological boundaries (Fischer, 1987).
- Regeneration objectives: Objectives must be clearly defined so that monitoring can be effective (Fischer, 1987). Composition of the new stand is determined by the composition of the understory prior to harvest (Carvell, 1967; Hill and Dickmann, 1988; Johnson *et al.*, 2002). Advanced regeneration of adequate quantity and size for the site and management objective must be present prior to the regeneration harvest (Sander *et al.*, 1976; Sander, 1977; Sander *et al.*, 1976; Johnson *et al.*, 2002).
- Pre-harvest understory control: The understory must be evaluated to ensure that undesirable species are not preventing desired species to reach required size prior to regeneration harvest and treatment applied if necessary (Sander, 1988).

- Post-harvest understory control: Following harvest, competition between desirable species and undesirable species is intense. Follow-up treatments are required within a year to prevent the undesirable species from gaining the advantage and reducing the number of desirable trees (Roach and Gingrich, 1968; Arend and Scholz, 1969; Sander, 1977; Hill and Dickmann, 1988).
- Monitor growth of new stand: Periodic monitoring of the new stand is required to evaluate whether additional treatments are necessary to ensure that desirable trees are maintained in a "free-to-grow" condition (Arend and Scholz, 1969).

Based on review and evaluation of technical and scientific literature, it appears that use of the clearcutting method would be appropriate for management of upland oak. Even-aged management with clearcutting would be a practical means of preserving the diversity of tree species similar to that existing in the region (Mills *et al.*, 1987). Clearcutting would provide more species diversity, including a variety of tolerant, intolerant and intermediate species, while selection cutting would convert the stands to tolerant species (Smith 1979).

f. Intermediate Treatments

Thinning, commercially or non-commercially, could be needed in some bottoms for forest-interior wildlife habitat management. Recurrent fire promotes the accumulation of oak reproduction (Johnson *et al.*, 2002). Prescribed burning is a treatment that can be used to alter the seedbed for increased establishment of oak seedlings, and kill or inhibit the development of competing vegetation (Loftis, 2002). Timber-stand improvement activities will likely be needed to release oak and hickory reproduction from competing vegetation.

g. Summary of Harvest Method Evaluations

Except where noted, any of the harvest methods would:

- Be best suited to the multiple-use goals established for the area.
- Ensure adequate restocking within 5 years of cutting.
- Not be chosen only because of greatest dollar return or timber output.
- Consider potential effects on residual trees and adjacent stands.
- Avoid permanent impairment of site productivity.
- Provide the desired effects on regeneration of desired tree species.
- Be practical in terms of harvesting requirements and total costs of preparation, logging and administration.
- If oak-hickory regeneration is not a management objective for the stand involved, any of the harvest methods would be appropriate.
- If the management objective is to retain an oak-hickory component within the stand, the single-tree selection and seed-tree methods would not be appropriate because they would not meet requirements (1), (2) and (6).
- If the management objective is to retain an oak-hickory component within the stand, but adequate advanced regeneration is not present, the shelterwood method would be appropriate in conjunction with intermediate treatments, including prescribed burning and timber-stand improvement activities.

- If the management objective is to retain an oak-hickory component within the stand, but adequate advanced regeneration is in scattered pockets (groups), the group-selection method would be appropriate.
- If the management objective is to retain an oak-hickory component within the stand and adequate advanced regeneration exists throughout the stand, the clearcutting method would be appropriate.

C. MAPLE-BEECH

1. Description

The SNF is at the juncture of three forest-cover-type regions and, because of this, the maple-beech-type includes a variety normally found in the northern, central and southern forest regions, as described by Eyre (1980). These occur on a variety of sites, including sheltered coves, moist but well-drained stream bottoms, and moist lower and north-facing slopes. Typical are maples, yellow poplar, sweetgum, beech and oaks and hickories.

Maple and beech are part of the understory of many other types and, because of their tolerance and longevity, the type is rapidly expanding in Illinois. In 1962, maple-beech composed only 2 percent of the timberland area; but, by 1985, this had increased to 26 percent (Raile and Leatherberry, 1988). Using FIA data for the SNF, Haugen (2003) found that, between 1985 and 1998, hard maples increased by 19 percent in the 1.0 to 2.9-inch DBH size-class and 79 percent in the 3.0 to 4.9-inch DBH class. The maple-beech-type is likely to occupy a much larger percentage of the forest-type compositions on the Forest in the future, especially in areas where little to no vegetation disturbance is taking place. The information for management of these types comes mostly from Beck and Della-Bianca (1981), Tubbs *et al.* (1983), Smith *et al.* (1983), Beck and Sims (1983) and Tubbs (1977).

2. Regeneration

Regeneration is mainly from seed and, with the variety of species in this type, good seed-crops in one or more species occur almost annually. The most consistent seed-producers are yellow poplar and sugar maple. In addition to the current-year seed-crop, seeds of several species, such as yellow poplar, black locust and white ash, remain viable on the forest floor for at least three years. Additional sources of reproduction include stump sprouts, root suckers and advanced reproduction.

Seedbed conditions and tolerance of shade varies from species to species and, within this type, there is such a variety of species that all requirements may be represented. Yellow poplar requires exposed mineral soil and full sunlight, while sugar maple can become established in deep leaf-litter under heavy shade.

a. *Evaluation of Single-Tree Selection Harvest Method*

This method is appropriate for management of those areas where stand-composition of primarily shade-tolerant species is acceptable or desired. Almost pure stands of sugar maple can be managed and reproduced using this method. If the desired species is intolerant, like yellow poplar, the single-tree selection method would not be appropriate.

b. Evaluation of Group-Selection Harvest Method

Group selection may be used, but will only regenerate the more light-demanding species near the center of the opening. Openings less than 1/2 acre would not be as effective in reproducing these species as larger openings, due to the greater proportion of edge shading.

c. Evaluation of Seed-Tree Harvest Method

Regeneration using this method is almost never required, since reproduction is either already established or there are viable seeds in the forest litter.

d. Evaluation of Shelterwood Harvest Method

In stands where required advanced regeneration is not adequate, this method can be used to reproduce seedlings of species that are intermediate in tolerance. Following the shelterwood cut to encourage seeding establishment, the overstory should be removed after the advanced regeneration is determined to be adequate and before it becomes detrimental to the new stand. Shelterwood with reserves can be used to avoid dramatic change to the visual resource or to maintain a portion of the overstory canopy for other resource needs, such as forest-interior habitat.

e. Evaluation of Clearcut Harvest Method

If the desired composition of the new stand is of intolerant species that retain viable seed on the forest floor for a period of years, a clearcut can be successfully applied with reasonable confidence that the new stand will be established the first growing season after cutting. If required advance regeneration or predicted sprouting is determined to be sufficiently adequate to regenerate the stand, the clearcut method would be appropriate to release the regeneration and promote rapid development of desirable species.

f. Summary of Harvest Method Evaluations

Regardless of resource management objectives, the seed-tree method would not be appropriate in any of the forest-cover-types included under the maple-beech heading. Depending on the desired species composition of the new stand, any method other than the seed-tree method would be acceptable. Single-tree selection would create stands composed primarily of tolerant species, while the other methods would create stands composed of varying mixtures of tolerant, intermediate and intolerant species.

D. PINE

1. Description

This type includes shortleaf and loblolly, as well as a minor amount of eastern white pine. Except for a few, remnant stands of native shortleaf pine on the bluffs overlooking the Mississippi River, all other pine has been planted and exists in almost pure stands, usually in old farmfields. The planted pine was to control soil erosion and recover lands deforested for farming and then abandoned. Pine is a pioneer species and, in the later stages of

succession, it is slowly replaced with a variety of hardwood species, including oaks, hickories and gum (Baker and Balmer, 1983; Lawson and Kitchens, 1983). The information for managing the pine-type comes mostly from Westveld (1949), Baker and Balmer (1983), Lawson and Kitchens (1983), Baker and Langdon (1990) and Lawson (1990).

2. Timber Resource Land Suitability

Based on analysis of Plan management objectives, the pine-type outside LaRue Pine Hills (where it naturally occurs) likely will not be maintained over the planning horizon because it is not a native species and because native hardwoods provide greater biological diversity. Although a variety of vegetation-management activities could be done in the pine-type for other resource objectives, there will be no activities to manage the pine for future pine-timber production or maintenance of the forest-type. The summary of silvicultural methods will discuss modifications to facilitate the accomplishment of other resource objectives.

3. Pine Regeneration

Pine is established by either planting or natural reproduction from seeds. Pine begin to produce seed at about 20 to 25 years of age and produce heavy seed-crops about every 3 to 6 years. Since pine will not be managed for timber production, no planting is anticipated, and natural regeneration would be a detriment to other resource objectives. Survival of seedlings is directly related to the degree of overstory and understory competition. Growth is inversely related to the stocking of the overstory, and seedlings growing beneath a hardwood overstory are not likely to survive more than a few years.

a. Evaluation of Single-Tree Selection Harvest Method

This method is not appropriate for the regeneration of the pine-type and, therefore, could be used if conversion to native hardwoods is an important objective, several age-classes are desired, and relatively frequent entries are not objectionable.

b. Evaluation of Group-Selection Harvest Method

This method could be applied to those areas where some pine reproduction can be tolerated and other objectives of uneven-aged management are desired.

c. Evaluation of Seed-Tree Harvest Method

This method could be applied to those areas where some pine reproduction can be tolerated. Timber-stand improvement should be done 3-5 years after the overstory harvest to help eliminate the competing pine reproduction.

d. Evaluation of Shelterwood Harvest Method

This method could be applied to those areas where some pine reproduction can be tolerated. Timber-stand improvement should be done 3-5 years after the overstory is removed to help eliminate the competing pine reproduction. Shelterwood with reserves could be used to avoid the dramatic change to the visual resource of overstory removal.

e. Evaluation of Clearcut Harvest Method

Clearcutting could be used where the total removal of the pine seed-source is desired, and where natural hardwood regeneration is present or expected.

f. Summary of Harvest Method Evaluations

Since the management objective for the pine-type is reversion to pre-settlement conditions, any harvest method that reduces the pine component and regeneration potential could be used. The single-tree selection method would be an appropriate method of meeting this objective as long as desired hardwood regeneration is encouraged. The group-selection method could be used to advantage if there were existing pockets of advanced, desirable, non-pine regeneration that could be released from a pine overstory.

Seed-tree and clearcut methods should only be used when there is advanced, desirable, non-pine regeneration or other acceptable groundcover throughout the stand that could be released from a pine overstory. The shelterwood method, including shelterwood with reserves, could be used if the objective is to stimulate establishment of desirable non-pine reproduction or other acceptable groundcover. Care must be taken to ensure that no efforts are made to prepare a seedbed favorable to pine.

E. OTHER HARDWOODS

1. Description

Within the broad grouping of “other hardwoods” is a number of forest cover-types recognized by the Society of American Foresters (Eyre, 1980). On the Forest, this includes upland and bottomland hardwoods other than oak-hickory and maple-beech. Past practices resulted in these types being composed of mostly low-value species (Westveld, 1949; Hosner, 1962). Commonly associated with this group are yellow poplar, ash, black cherry, sweetgum, river birch, sycamore, cottonwood and boxelder. The number of understory woody species is also very diverse. In upland mixed-hardwood stands, sugar maple and beech are the most common understory species (Parker and Ruffner, 2004).

2. Timber Resource Land Suitability

Other mixed hardwoods in the uplands may or may not be part of the suitable timber base. In the Plan, floodplains and riparian areas are identified as inappropriate for timber production due to other resource-management objectives. Within the bottomland hardwood-types a variety of vegetation-management treatments could be performed for other management objectives. However, there would be no activities to manage these types for hardwood timber-production. The summary of silvicultural methods will discuss modifications to facilitate the accomplishment of other resource objectives.

3. Regeneration

Due to the large number of species that occur within these types, regeneration requirements and characteristics range from those that require no shade and bare mineral

soil to those that can reproduce in the understory. The more desirable species are intolerant or intermediate.

a. Evaluation of Single-Tree Selection Harvest Method

The single-tree method is not recommended since the small openings created would not allow sufficient light to regenerate the more desirable species. This method would ultimately result in the conversion of the stand to tolerant species.

b. Evaluation of Group-Selection Harvest Method

Group selection could be used, but it would regenerate more light-demanding species near the center of the opening. Openings of less than 1/2 acre would not be as effective in reproducing these species as larger openings, due to the greater proportion of edge shading.

c. Evaluation of Seed-Tree Harvest Method

The seed-tree method is not recommended because it has not been successful in regenerating bottomland hardwoods due to the conditions required to establish new regeneration.

d. Evaluation of Shelterwood Harvest Method

In stands where advanced regeneration is inadequate, this method could be used to reproduce seedlings of species with intermediate tolerance. Following the shelterwood cut to encourage seeding establishment, the overstory should be removed within 5-10 years after the advanced regeneration is determined to be adequate. Shelterwood with reserves could be used to avoid the dramatic change to the visual resource of overstory removal, or to retain part of the overstory for other needs, such as forest-interior habitat.

e. Evaluation of Clearcut Harvest Method

If advance regeneration or predicted sprouting is determined to be adequate to regenerate the stand, the clearcut method would be appropriate to release regeneration and promote rapid development of desirable species. If a history of high-grading has left the stand in a poor condition, clearcutting the remaining stand may be desired to convert it to a healthy, desirable stand.

f. Intermediate Treatments

Intermediate treatments, such as commercial or non-commercial thinning and timber-stand improvement, could be used to enhance the health, vigor, composition, structure, growth and quality of the stand after establishment and prior to final harvest. Thinning could be needed in some bottoms for forest-interior wildlife habitat management to help maintain the white oak component.

g. Summary of Harvest Method Evaluations

Although most bottomland hardwood-types will not be managed for timber production, various harvest methods could be used to accomplish other resource-management objectives, such as maintenance or enhancement of habitat for TES species, maintenance of a healthy riparian environment, or regeneration of pin oak in Oakwood Bottoms.

If tolerant hardwood species are acceptable, and intolerant or intermediate species are not desired to meet the resource management objective for the stand, then the single-tree selection method would be appropriate. If intolerant or intermediate species are desired to meet the management objective, and adequate advanced regeneration of desired species is established, either the group-selection method or the clearcut method would be appropriate.

If intolerant or intermediate species are desired to meet the management objective, and adequate advanced regeneration of desired species has not been established, the shelterwood method would be appropriate to establish regeneration. The seed-tree method would not be appropriate under any circumstances. Thinning could be used to help maintain healthy riparian habitat where needed for forest-interior management objectives.

IV. TIMBER-STAND IMPROVEMENT

Timber-stand improvement typically involves release of the desired species from competition and the use of pre-commercial thinning in stands where density could result in excessive mortality or prevent establishment of the desired species. Some timber-stand improvement methods are presented in Table C-2.

Table C-2. Timber-stand improvement methods.

Species Type	TSI Objective	Method	Description
All hardwoods	Removal of trees competing with desired species; achievement of habitat objectives for MIS	Felling, girdling, or burning	Felling or girdling live trees mechanically, or with hand tools or prescribed burning
All hardwoods	Release of seedlings/saplings up to large-size trees from competing vegetation; achievement of habitat objectives for MIS	Herbicide application by hand-injection, basal bark, or stump treatment	Ground application to shrubs and trees by hand-injection, basal bark spray, or stump treatment following cutting
All hardwoods	Release of seedlings/saplings up to large-size trees from competing vegetation; achievement of habitat objectives for MIS	Herbicide application by hand-applied foliar spray	Foliar spray-application to small shrubs and trees to release seedling/saplings
Black walnut	Increase the value of sawtimber product	Pruning of branches from selected crop trees	Hand-pruning of branches done in stages until the first 9' to 17' of bole is clear
All hardwoods	Reduce damage from grapevines within pole stands while maintaining required wildlife habitat	Grapevine control by severing, prescribed burning, or herbicide treatment	Basal spray or cut-stem treatment with herbicides, landscape burning, or severing with hand tools.

REFERENCES

- Arend, John L. and Harold R. Scholz. 1969. Oak forests of the Lake States and their management. Research Paper NC-31, USDA, FS, North Central Exp. Sta., St. Paul, MN.
- Baker, James H. and William E. Balmer. 1983. Loblolly pine. In: Burns, Russell M., tech. comp., Silvicultural systems for major forest types of the United States. Agriculture Handbook No. 445. USDA, FS, Washington, DC.
- Baker, James H. and O. Gordon Langdon. 1990. Loblolly pine. In: Burns, Russell M., and Barbara H. Honkala, tech coords. Silvics of North America. Agriculture Handbook No. 654. USDA, FS, Washington, DC. 2 vols.
- Beck, Donald E. 1988. Clearcutting and other regeneration options for upland hardwoods. In: Proceedings, sixteenth annual hardwood symposium of the hardwood research council. Cashiers, NC.
- Beck, Donald E. and Lino Della-Bianca. 1981. Yellow-poplar: characteristics and management. Agriculture Handbook No. 583. USDA, FS, Washington, DC.
- Beck, Donald E. and Daniel H. Sims. 1983. Yellow-poplar. In: Burns, Russell M., tech. comp., Silvicultural systems for major forest types of the United States. Agriculture Handbook No. 445. USDA, FS, Washington, DC. 191 p.
- Burns, Russell M., tech. comp. 1983. Silvicultural systems for major forest types of the United States. Agriculture Handbook No. 445. USDA, FS, Washington, DC. 191 p.
- Burns, Russell M., and Barbara H. Honkala, tech coords. 1990. Silvics of North America. Agriculture Handbook No. 654. USDA, FS, Washington, DC. 2 vols.
- Carvell, Kenneth L. 1967. The response of understory oak seedlings to release after partial cutting. WVU Agri. Expt. Sta. Bull. 553. Morgantown, WV.
- Clark, F. Bryan and Richard F. Watt. 1971. Silvicultural methods for regenerating oaks. In: White, D.E. and B.A. Roach, co-chairmen, Oak Symposium Proceedings, USDA, FS, Northeastern For. Exp. Sta., Upper Darby, PA.
- Crow, T.R. 1988. Reproductive mode and mechanisms for self-replacement of northern red oak (*Quercus rubra*C) - a review. Forest Science, Vol 34, No. 1
- Davis, Kenneth P. 1966. Forest management: regulation and valuation. McGraw-Hill Inc., N.Y., NY. 519 P.
- Den Uyl, Daniel. 1962. The central region. In: Barrett, John W., ed., Regional silviculture of the United States, Ronald Press Co., New York, NY.
- Eyre, F.H., editor. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Washington, D.C.
- Fischer, Burnell C. 1979. Managing light in the selection method. In: Holt, Harvey A. and Burnell C. Fischer, eds., Regenerating oaks in upland hardwood forests: Proceedings, the 1979 John S. Wright Forestry Conference, Purdue University, W. Lafayette, IN. 132 p
- Fischer, Burnell C. 1987. The regeneration response to clearcutting on the U.S. Forest Service Hoosier National Forest. Purdue Univ., W. Lafayette, IN.
- Gibbs, Carter B. 1963. Tree diameter a poor indicator of age in West Virginia hardwoods. Research Paper NE-11. USDA, FS, Northeast Exp. Sta., Upper Darby, PA. 4 p.
- Gibbs, Carter B. 1978. Uneven-aged silviculture and management. In: Uneven-aged silviculture and management in the United States. Agricultural General Tech. Report WO-24, USDA, FS, Washington, DC. 234 p
- Hahn, Jerold T. 1987. IL forest statistics, 1985. Res Bull NC-103, USDA, FS, North Central Exp. Sta., St. Paul, MN.
- Haugen, David E. 2003. The forest resources of the Shawnee National Forest, 1998. Resource Bulletin NC-222, USDA, FS, North Central Res. Sta., St. Paul, MN. 54 p.

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2006 Forest Plan Appendices
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- Helms, John A. 1998. *The Dictionary of Forestry*. Society of American Foresters, Bethesda, MD. 210 p.
- Hill, John P., and Donald I. Dickmann. 1988. A comparison of three methods for naturally reproducing oak in southern Michigan. *North. J. Appl. For.* 3:113-117
- Horwitz, Eleanor C.J. 1974. *Clearcutting: a view from the top*. Acropolis Books, Washington, DC. 179 p.
- Hosner, John F. 1962. The southern bottomland hardwood region. In: Barrett, John W., ed., *Regional silviculture of the United States*, Ronald Press Co., New York, NY. 610 p.
- Johnson, Paul S., Stephen R. Shifley, and Robert Rogers. 2002. *The ecology and silviculture of oaks*. CABI Publishing, New York, NY. 503 p.
- Johnson, R.L. and F.W. Shropshire. 1983. Bottomland hardwoods. In: Burns, Russell M., tech. comp., *Silvicultural systems for major forest types of the United States*. Agriculture Handbook No. 445. USDA, FS, Washington, DC.
- Lawson, Edwin R. 1990. Shortleaf pine. In: Burns, Russell M., and Barbara H. Honkala, tech coords. *Silvics of North America*. Agriculture Handbook No. 654. USDA, FS, Washington, DC. 2 vols.
- Lawson, Edwin R. and Robert N. Kitchens. 1983. Shortleaf pine. In: Burns, Russell M., tech. comp., *Silvicultural systems for major forest types of the United States*. Agriculture Handbook No. 445. USDA, FS, Washington, DC.
- Loftis, David L. 1988. Guidelines for regenerating appalachian oak stands. In: Smith, H.C., Perkey, A.W., and W.E. Kidd, Jr., eds. *Proceedings: guidelines for regenerating appalachian hardwood stands*, SAF Publication 88-03, Morgantown, WV. 293 p.
- Loftis, David L. 2002. Upland oak regeneration and management. In: Spetich, M A., ed. *Upland Oak Ecology, symposium: history, current conditions and sustainability*. GTR SRS-73. USDA FS, S Research Station, NC.
- Loftus, Nelson S., and Richard O. Fitzgerald. 1989. An overview of the ecological basis for silvicultural systems. In: Burns, Russell M., tech. comp., *The scientific basis for silvicultural and management decisions in the national forest system*. Agricultural General Tech. Report WO-55, USDA, FS, Washington, DC. 180 p
- Lorimer, Craig G. 1989. Relative effects of small and large disturbances on temperate hardwood forest structure. *Ecology* 70(3), 565-567
- Marquis, David A. 1978. Application of uneven-aged silviculture and management on public and private lands. In: *Uneven-aged silviculture and management in the United States*. Agricultural General Tech. Report WO-24, USDA, FS, Washington, DC. 234 p
- Marquis, David A. and Robert L. Johnson. 1989. Silviculture of eastern hardwoods. In: Burns, Russell M., tech. comp., *The scientific basis for silvicultural and management decisions in the national forest system*. Agricultural General Tech. Report WO-55, USDA, FS, Washington, DC. 180 p
- Marquis, David A., Ernst, Richard L., and Susan L. Stout. 1984. Prescribing silvicultural treatments in hardwood stands of the Alleghenies. *Gen. Tech. Report NE-96*, USDA, FS, Northeastern Station, Broomall, PA. 90 p.
- McGee, Charles E. 1984. Heavy mortality and succession in a virgin mixed mesophytic forest. *Research Paper SO-209*, USDA, FS, Southern Forest Exp. Sta., New Orleans, LA. 9 p
- McQuilkin, Robert A. 1975. Growth of four types of white oak reproduction after clearcutting in the Missouri Ozarks. *Research Paper NC-116*, USDA, FS, North Central Exp. Sta., St. Paul, MN. 5 p.
- Mills, W.L., Fischer, B.C., and T.W. Reisinger. 1987. Upland hardwood silviculture a review of the literature. *Agriculture Station Bulletin 527*, Purdue University, W.Lafayette, IN. 29 p
- Minckler, Leon S. 1989. Intensive group selection silviculture in central hardwoods after 40 years. In: Rink, G. and Carl A. Budelsky, eds. *Proceedings of the seventh central hardwood conference*, Agricultural General Tech. Report NC-132, USDA, FS, North Central For. Exp. Sta., St.Paul, MN. 314 p

- Minckler, Leon S., Woerheide, John D., and Richard C. Schlesinger. 1973. Light, soil moisture and tree reproduction in hardwood forest openings. Research Paper NC-89, USDA, FS, North Central Exp. Sta., St. Paul, MN. 6 p.
- Parker, G.R.; Ruffner, C.M. 2004. Current and historical vegetative conditions and disturbance regimes in the Shawnee-Hoosier ecological assessment area. p. 23-58.
- Pubanz, D.M., Lorimer, C.G., and R.P. Guires. 1989. Effects of understory control on survival and vigor of red oak seedlings beneath a shelterwood. In: Rink, G. and Carl A. Budelsky, eds. Proceedings of the seventh central hardwood conference, Agricultural General Tech. Report NC-132, USDA, FS, N Central For. Exp. Sta., St. Paul, MN.
- Putnam, John H. 1951. Management of bottomland hardwoods. Paper 116, USDA FS, S Forest Exp. Sta. LA.
- Putnam, John H., Furnival, George M., and J.S. McKnight. 1960. Management and inventory of southern hardwoods. Agriculture Handbook 181, USDA, FS, Washington, DC. 102 p
- Raile, Gerhard K. and Earl C. Leatherberry. 1988. Illinois' forest resource. Resource Bulletin NC-105, USDA, FS, North Central Exp. Sta., St. Paul, MN. 113 p
- Roach, Benjamin A. and Samuel F. Gingrich. 1968. Even-aged silviculture for upland central hardwoods. Agriculture Handbook 355, USDA, FS, Washington, DC. 39 p
- Rolfe, Gary L. 1990. A long range plan for IL forest resources. IL Council Forestry Development, Urbana, IL.
- Runkle, James R. 1985. Disturbance regimes in temperate forests. In: Pickett, S.T.A. and P.S. White, eds. The ecology of natural disturbance and patch dynamics. Academic Press Inc. San Diego, CA, 472 p.
- Sander, Ivan L. 1972. Size of oak advance reproduction: key to growth following harvest cutting. Research Paper NC-79, USDA, FS, North Central Exp. Sta., St. Paul, MN. 6 p.
- Sander, Ivan L. 1977. Manager's handbook for oaks in the north central states. Gen. Tech. Report NC-37, USDA, FS, North Central Exp. Sta., St. Paul, MN. 35 p.
- Sander, Ivan L. 1979. Regenerating oaks with the shelterwood system. In: Holt, Harvey A. and Burnell C. Fischer, eds., Regenerating oaks in upland hardwood forests: Proceedings, the 1979 John S. Wright Forestry Conference, Purdue University, W.Lafayette, IN. 132 p
- Sander, Ivan L. 1988. Guidelines for regenerating appalachian oak stands. In: Smith, Perkey, and Kidd, Jr., eds. Proceedings: guidelines for regenerating appalachian hardwood stands, SAF Publication 88-03, Morgantown, WV.
- Sander, Ivan L. and F. Bryan Clark. 1971. Reproduction of upland central hardwood forests in the central states. Agriculture Handbook No. 405. USDA, FS, Washington, DC. 25 p.
- Sander, Ivan L. and David L. Graney. 1993. Regenerating oaks in the central states. In: Loftis, David L. and Charles E. McGee, eds. Symposium proceedings: Oak regeneration: serious problems, practical solutions. Gen. Tech. Report SE-84, USDA, FS, Southeastern Forest Exp. Sta., Asheville, NC. 319 p.
- Sander, Ivan L., Johnson, Paul S. and Robert Rogers. 1984. Evaluating oak advance reproduction in the Missouri ozarks. Research Paper NC-251, USDA, FS, N. Cent. Exp. Sta., St. Paul, MN.
- Sander, Ivan L., Johnson, Paul S. and Richard F. Watt. 1976. A guide for evaluating the adequacy of oak advance reproduction. Gen. Tech. Report NC-23, USDA, FS, N. Cent. Exp. Sta., St. Paul, MN
- Sander, Ivan L., McGee, Charles L., Day, Kenneth G., and Ralph E. Willard. 1983. Oak-hickory. In: Burns, R M., tech. comp., Silvicultural systems for major forest types of the US. AgHandbook No. 445. USDA, FS, Washington, DC.
- Sander, Ivan L., Merritt, Clair, and E.H. Tryon. 1981. Oak-hickory. In: Choices in silviculture for American forests. Society of American Foresters, Washington, DC. 80 p

Shawnee National Forest
2006 Forest Plan Appendices
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Sheffield, R.M. and J.G. Dickson. 1998. The south's forestland – on hot seat to provide more. In: Transactions 63rd North American Wildlife and Natural Resources Conference. p. 316-331.

Smith, David M., Bruce C. Larson, Matthew J. Kelty, and P. Mark S. Ashton. 1997. The practice of silviculture—applied forest ecology. John Wiley & Sons, Inc., New York, NY,

Smith, H. Clay. 1979. Natural regeneration and intensive cultural practices in central appalachian hardwood stands using clearcutting and selection cutting practices. In: Holt, Harvey A. and Burnell C. Fischer, eds., Regenerating oaks in upland hardwood forests: Proceedings, the 1979 John S. Wright Forestry Conference, Purdue University, W.Lafayette, IN.

Smith, H. Clay., Della-Bianca, Lino and Harvey Fleming. 1983. In: Burns, Russell M., tech. comp., Silvicultural systems for major forest types of the United States. Agriculture Handbook No. 445. USDA, FS, Washington, DC.

Spurr, Stephen H. and Burton V. Barnes. 1980. Forest ecology. John Wiley & Sons, Inc., New York, NY, 687 p.

Trimble, G.R., Jr. 1973. The regeneration of central appalachian hardwoods with emphasis on the effects of site quality and harvesting practice. Research Paper NE-282. USDA, FS, NE Exp. Sta., Upper Darby, PA. 14 p.

Tubbs, Carl H. 1977. Manager's handbook for northern hardwoods in the north central states. Gen. Tech. Report NC-39, USDA, FS, North Central Exp. Sta., St. Paul, MN. 29 p.

Tubbs, Carl H., Jacobs, Rodney D., and Dick Cutler. 1983. In: Burns, Russell M., tech. comp., Silvicultural systems for major forest types of the United States. Agriculture Handbook No. 445. USDA, FS, Washington, DC. 191 p.

Twight, Peter A. and Leon S. Minckler. 1972. Ecological forestry for the central hardwood forest. National Parks and Cons. Assoc., Washington DC. 12 p

Twight, P.A. and L.S. Minckler. 1972. Ecological Forestry for the central hardwood forest. National Parks and Conservation Association, Washington D.C. 12 p.

Tyron, E.H. and K.L. Carvell. 1958. Regeneration under oak stands. WVU Agri. Sta. Bull. 424T. Morgantown, WV.

Westveld, R.H. 1949. Applied silviculture in the United States. John Wiley & Sons, Inc., New York, NY, 590 p.

White, P.S. and S.T.A. Pickett. 1985. Natural disturbance and patch dynamics: an introduction. In: Pickett, S.T.A. and P.S. White, eds. The ecology of natural disturbance and patch dynamics. Academic Press. San Diego CA, 472 p

APPENDIX D

SPECIAL FEATURES

I. INTRODUCTION

This appendix discusses areas with significant physical, biological, ecological and cultural features and provides management-implementation information.

II. NATURAL AREA

Natural areas provide for the preservation and protection of their unique scientific or educational values and are classified according to the dominant or outstanding special feature of each area: research, botanical, ecological, geological and zoological. Some natural areas exhibit two or more outstanding features, but only one classification is applied to each.

Each area will be managed under the natural area management prescription for the protection and perpetuation of its significant and exceptional features, including areas located within other management areas. Research natural areas are classified according to the significant and exceptional features for which they were designated.

A. BOTANICAL AREA (BA)

Botanical areas contain specimens or plant groups and communities that are significant because of form, color, occurrences, habitat location, life-history, arrangement, ecology, environment, rarity and/or other features. Table D-1a presents the botanical areas on the Forest.

Table D-1a. Botanical areas.

Bear Creek Relict Site	Panther Hollow RNA
Cane Creek	Reddick Hollow
Chimaphila Site	Saltpeter Relict
Clear Creek Swamp	Silvey Pond
East Fork <i>Oxalis illinoensis</i>	Sulphur Springs
Greentree Reservoir	Teal Pond
Opossum Trot Trail	Wolf Creek

B. ZOOLOGICAL AREA (ZA)

Zoological areas possess authentic, significant and interesting evidence of the national heritage as it pertains to fauna. These areas are meaningful because they embrace animals, animal groups, or animal communities that are natural and important due to occurrence, habitat, location, life-history, ecology, environment, rarity, or another feature. Table D-1b presents the zoological areas on the Forest.

Table D-1b. Zoological areas.

Ava	Lusk Creek (bank to bank)
Big Creek (bank to bank)	Rich's
Brown's	Toothless
Hutchison	

C. ECOLOGICAL AREA (EA)

Ecological areas possess the significant characteristics of both botanical and zoological areas. Table D-1c presents the ecological areas on the Forest.

Table D-1c. Ecological areas.

Atwood Ridge	Kickasola Cemetery
Barker Bluff	LaRue-Pine Hills/Otter Pond RNA
Bell Smith Springs	Leisure City Barrens
Big Brushy Ridge	Little Grand Canyon-Horseshoe Bluff
Bulge Hole	Lusk Creek Canyon
Burke Branch RNA	Lusk Creek North
Caney Branch Barrens	Martha's Woods
Cave Hill RNA	Massac Tower Springs
Copperous Branch Limestone Barrens	Millstone Bluff (historic site)
Cretaceous Hills	Odom Tract
Crow Knob	Ozark Hill Prairie
Dean Cemetery East Barrens	Pine Hills Annex
Dean Cemetery West Barrens	Pine Hollow
Dennison Hollow RNA	Pleasant Valley Barrens
Dog Barrens	Poco Cemetery East
Double Branch Hole	Poco Cemetery North
Dutch Creek Chert Woodland	Pounds Hollow
Fink Sandstone Barrens	Provo Cemetery
Garden of the Gods	Reid's Chapel
Gibbons Creek	Robnett Barrens
Grantsburg Swamp	Russell Cemetery Barrens
Gyp Williams Hollow	Sand
Hayes Creek-Fox Den Creek	Schwegman
Jackson Hole	Simpson Township Barrens
Jackson Hollow	Snow Springs
Kaskaskia Woods	Split Rock Hollow
Keeling Hill North	Stoneface RNA
Keeling Hill South	Whoopie Cat Mountain (includes RNA)

D. GEOLOGICAL AREA (GA)

Geological areas are units of land with outstanding formations or unique geological features of the earth's development, including caves and fossils.

Table D-1d. Geological areas.

Bald Knob	Fountain Bluff
Clear Springs	

E. NATIONAL NATURAL LANDMARK (NNL)

Some natural areas have been designated national natural landmarks. Their management as natural areas ensures conformance with the US Department of the Interior management standards for these areas.

Table D-1e. National natural landmarks.

Bell Smith Springs EA	Little Grand Canyon EA
LaRue Pine Hills EA	Lusk Creek Canyon EA

F. RESEARCH NATURAL AREA (RNA)

Some natural areas are also designated research natural areas and managed cooperatively between the Forest and North Central Experiment Station. Direction for management is found in Forest-wide and Natural Area management prescription standards and guidelines.

Table D-1f. Research natural areas.

Atwood Ridge EA	LaRue-Pine Hills/Otter Pond EA
Barker Bluff EA	Ozark Hill Prairie EA
Burke Branch EA	Panther Hollow BA
Cave Hill EA	Stoneface EA
Dennison Hollow EA	Whoopie Cat Mountain EA

III. WILDERNESS

Several congressionally designated wildernesses are managed under management prescription WD. Table D-5 displays these areas and their size.

Table D-2. Wilderness areas.

Name	Size in Acres
Bald Knob	5,786
Bay Creek	2,769
Burden Falls	3,687
Clear Springs	4,789
Garden of the Gods	3,996
Lusk Creek	6,298
Panther Den	839
Total	28,144

IV. NATIONAL REGISTER OF HISTORIC PLACES

Areas listed on the national register of historic places are managed under the heritage resource significant site (HR) management prescription to provide for the preservation and protection of their unique values. Table D-3 displays these sites.

Table D-3. Heritage resource significant sites.

Battery Rock	Millstone Bluff
Illinois Iron Furnace	Saline Springs

During the planning period, additional sites will be studied, and if suitable, nominated for listing on the national register. Any additional sites will be placed under management prescription HR.

V. CANDIDATE WILD AND SCENIC RIVER

Some watercourses are candidates for possible inclusion in the national wild and scenic river system and are managed under the CR management prescription. Table D-4 lists these watercourses.

Table D-4. Candidate wild and scenic rivers.

Bay Creek	Hutchins Creek
Big Creek	Lusk Creek
Big Grand Pierre Creek	Big Muddy River

VI. INTENSIVE RESEARCH AREAS

Intensive research areas provide for on-going, manipulative, natural resource research and management and are managed under the RA management prescription. Table D-5 presents these areas.

Table D-5. Intensive research areas.

Dixon Springs Agricultural Center
Kaskaskia Experimental Forest
Palzo Reclamation Project

VII. MANAGEMENT OBJECTIVES FOR NATURAL AREAS

This section outlines the management objectives for the ecological communities of the Forest. Table D-6 presents a listing of plant species characteristic of each community-type. The discussion of each community-type includes the site names of the natural area containing each community.

A. FOREST COMMUNITY-TYPE

Forests are the most widespread and diverse natural communities on the SNF. This community-type is dominated by trees, with an average canopy-cover of 80 percent or greater, and has an understory of saplings and shrubs. Forests are subdivided into three subtypes, two of which are defined by their topographic position: upland and bottomland (floodplain). Upland and bottomland forests are easily distinguishable because upland forest does not normally flood. Because the periodic flooding they receive affects their biotic and abiotic features, bottomland forests are distinct from the upland forest. Upland and bottomland forests are divided into natural communities based upon soil-moisture gradients. The third subtype is flatwoods, which is dependent upon a specific soil structure, and the fourth is woodland.

Table D-6. Natural community classifications for the Forest.

Community-Type	Community-Subtype	Natural Community
Forest	Upland forest	Xeric upland forest Dry upland forest Dry-mesic upland forest Mesic upland forest
	Floodplain (bottomland) forest	Mesic floodplain forest Wet-mesic floodplain forest Wet floodplain forest
	Woodland Flatwood	Dry woodland Flatwood
Savanna	Barrens	Barrens
Primary	Cliff	Sandstone cliff Sandstone overhang Limestone cliff
	Cave	Cave
Wetland (Aquatic)	Seep and spring	Acid seep Spring
	Swamp	Swamp (forested) Shrub swamp
	Open water	Pond Perennial stream

1. Upland Forest Community-Subtype

a. Xeric-Upland Forest Natural Community

Xeric-upland forests occur within the Ozark Highlands and Shawnee Hills sections and are limited to sites of extremely dry exposures, commonly of southern and southwestern aspects, on shallow or extremely tight soils. This community is never extensive and intergrades with barrens and dry forest. It is characterized by stunted and gnarled trees and a depauperate herbaceous layer.

Xeric upland forests generally form impenetrable thickets of post, blackjack and scarlet oaks (*Quercus stellata*, *Q. marilandica* and *Q. coccinea*), farkleberry (*Vaccinium arboreum*) and eastern redcedar (*Juniperus virginiana*) with an herbaceous layer dominated by little bluestem (*Schizachyrium scoparium*), poverty oat grass (*Danthonia spicata*) and forbs belonging to the aster family. Farkleberry is the only conspicuous shrub.

Herbaceous vegetation covers only about 30 percent of the ground; the remainder is rock and gravel. Other characteristic species include prairie wedge-scale (*Sphenopholis obtusata*), black hickory (*Carya texana*), twoflower dwarf-dandelion (*Krigia biflora*), common serviceberry (*Amelanchier arborea*), blunt-lobed cliff fern (*Woodsia obtusa*) and Blue Ridge blueberry (*Vaccinium pallidum*). Other associated plants are woman's tobacco (*Antennaria plantaginifolia*), Virginia tephrosia (*Tephrosia virginiana*), elm-leaf goldenrod (*Solidago ulmifolia*) and creeping bush-clover (*Lespedeza repens*). Rare species, such as shortleaf pine (*Pinus echinata*) and arching dewberry (*Rubus enslenii*), can also be found.

Table D-7a. Natural areas with xeric-upland forest.

Caney Branch Barrens EA	LaRue-Pine Hills/Otter Pond RNA/EA
Copperous Branch Limestone Barrens EA	Pleasant Valley Barrens EA
Gyp Williams Hollow EA	

Restoration

Apply management activities that will restore the xeric-upland forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. Analysis of current inventory and monitoring data, combined with sequential, historical, aerial photography, indicates that extant xeric-upland forests may be in need of restoration in those places where more-mesic species and exotic species are encroaching.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the xeric upland forest.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the xeric-upland forest site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the forest community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed.

Application of prescribed fire to the xeric-upland forest should be carried out once every five to eight years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances. Note that the application of prescribed fire for fire-dependent communities in wilderness areas requires approval of the Chief of the Forest Service. Affected areas are Caney Branch Barrens in Burden Falls Wilderness and a portion of the LaRue Pine Hills EA in Clear Springs Wilderness.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this forest community type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

b. Dry-Upland Forest Natural Community

Dry-upland forests occur within the Ozark Highlands and Interior Low Plateau of the Shawnee Hills section. This community is limited to sites on dry, excessively drained soils poorly developed because of steep, exposed slopes, or because of bedrock or gravels at or near the surface. Trees and shrubs grow slowly, but are not as stunted as those found in xeric-upland forests. Generally, there are well-developed herbaceous and understory layers. These communities are most often on ridge-tops or high on south- to west-facing slopes. Dry-upland forests grade imperceptibly into barrens and xeric forest on more extreme sites and into dry-mesic forests under moderated moisture conditions.

A variety of oaks typically dominate dry-upland forests, including post, blackjack, scarlet, black (*Quercus velutina*) and white (*Q. alba*). Other characteristic trees are mockernut hickory (*Carya tomentosa*), shagbark hickory (*C. ovata*), pignut hickory (*C. glabra*), black hickory and black gum (*Nyssa sylvatica*). Common serviceberry, farkleberry and Blue Ridge blueberry are frequent in this habitat. Characteristic herbs include little bluestem, poverty oatgrass, prairie wedge-scale, rosy sedge (*Carex rosea*), cypress panic-grass (*Dichanthelium dichotomum*), common dittany (*Cunila origanoides*), creeping bush-clover (*Lespedeza repens*), woodland sunflower (*Helianthus divaricatus*), early blue violet (*Viola palmata*) and two-flower dwarf-dandelion.

On strongly acidic sites with thin soils, solid chestnut oak (*Quercus prinus*) stands almost invariably occur, but black or white oak may occupy part of the canopy. Here, the most abundant understory trees are red maple (*Acer rubrum*), common serviceberry and flowering dogwood (*Cornus florida*). Roundleaf greenbrier and cat greenbrier (*Smilax rotundifolia* and *S. glauca*) form dense mats. Poverty oatgrass is the most abundant grass and characteristic herbs are common dittany, violet lespedeza (*Lespedeza violacea*) and queendevil (*Hieracium gronovii*).

On sites with calcareous substrates, chinquapin oak (*Quercus muehlenbergii*) is often common in the canopy. A number of calciphilic herbs are also present in these areas, including American columbo (*Frasera caroliniensis*), sicklepod (*Arabis canadensis*) and heartleaf noseburn (*Tragia cordata*).

Rare species found in these dry upland forests include stellate sedge (*Carex albicans* var. *australis*), Ravenel's rosette grass (*Dichanthelium ravenelii*), soft thistle (*Cirsium carolinianum*), early saxifrage (*Saxifraga virginianensis*), bashful bulrush (*Scripus verecundus*), sand hickory (*Carya pallida*), chestnut oak (*Quercus prinus*) and Atlantic goldenrod (*Solidago arguta*).

Table D-7b. Natural areas with dry-upland forest.

Atwood Ridge RNA/EA	Leisure City Barrens EA
Barker Bluff RNA/EA	Little Grand Canyon-Horseshoe Bluff EA
Bell Smith Springs EA	Lusk Creek Canyon EA
Burke Branch RNA/EA	Massac Tower Springs EA
Cane Creek BA	Millstone Bluff EA
Cave Hill RNA/EA	Opossum Trot Trail BA
Copperous Branch Limestone Barrens EA	Ozark Hill Prairie RNA/EA
Cretaceous Hills EA	Panther Hollow RNA/EA
Dennison Hollow RNA/EA	Pine Hollow EA
Double Branch Hole EA	Pleasant Valley Barrens EA
Fink Sandstone Barrens EA	Pounds Hollow EA
Garden of the Gods EA	Russell Cemetery Barrens EA
Gyp Williams Hollow EA	Sand EA
Jackson Hollow EA	Simpson Township Barrens EA
Keeling Hill North EA	Stoneface RNA/EA
Keeling Hill South EA	Whoopie Cat Mountain RNA/EA
LaRue-Pine Hills/Otter Pond RNA/EA	

Restoration

Apply management activities that will restore the dry-upland forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. Analysis of current inventory and monitoring data, combined with sequential,

historical, aerial photography, indicates that extant dry-upland forests may be in need of restoration.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the dry-upland forest.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the dry-upland forest site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the forest community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed.

Application of prescribed fire to the dry-upland forest should be carried out once every five to eight years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances. Note that the application of prescribed fire for fire-dependent communities in wilderness areas requires approval of the Chief of the Forest Service. Affected areas are Garden of the Gods EA in Garden of the Gods Wilderness, a portion of LaRue Pine Hills EA in Clear Springs Wilderness, and Lusk Creek Canyon EA in Lusk Creek Wilderness.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this forest community type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

c. Dry-Mesic Upland Forest Natural Community

Dry-mesic upland forests occur throughout the Forest and are probably the most widespread forest-type in the region. Trees and shrubs grow well because they are less inhibited by the poor site conditions associated with xeric- and dry-upland forest communities. As with the dry-upland forest, there are well-developed herbaceous and understory layers, but species diversity is greater. These forests are usually found on south- to west-facing slopes, but they may also occur in a band high on north- to east-facing slopes, and on ridges. Dry-mesic upland forests grade into dry-upland forests higher on slopes, and into mesic forests below.

Dry-mesic upland forests generally can be regarded as oak-hickory forests, because they are usually dominated by oaks and hickories. Characteristic species include black oak, white oak, northern red oak (*Quercus rubra*), shagbark hickory and pignut hickory. Additional common trees in this community are bitternut hickory (*Carya cordiformis*),

mockernut hickory, American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*) and yellow poplar (*Liriodendron tulipifera*). Within the Cretaceous Hills, southern red oak (*Quercus falcata*) is frequent, and on calcareous sites chinquapin oak and Shumard's oak (*Q. shumardii*) are common. The herbaceous and sub-canopy layers are very diverse and contain a rich assemblage of species. Lack of periodic disturbances is allowing this community to succeed towards a mixed mesophytic community in which shade-tolerant species will dominate the canopy instead of the current association of oak-hickory. The sub-canopy layer has several common small trees and shrubs, such as flowering dogwood, eastern redbud (*Cercis canadensis*), American plum (*Prunus americana*), American bladdernut (*Staphylea trifolia*), blackhaw (*Viburnum prunifolium*), rusty blackhaw (*Viburnum rufidulum*) and hophornbeam (*Ostrya virginiana*). Although there is not a complete cover of ground vegetation, common herbs are fairly diverse. Among these are cutleaf toothwort (*Cardamine concatenata*), Virginia spring-beauty (*Claytonia virginica*), rue anemone (*Anemonella thalictroides*), spotted geranium (*Geranium maculatum*), eastern beebalm (*Monarda bradburiana*), pointed leaf tick-trefoil (*Desmodium glutinosum*), nakedflower tick-trefoil (*Desmodium nudiflorum*), elm-leaf goldenrod (*Solidago ulmifolia*), common blue violet (*Viola sororia*), marginal woodfern (*Dryopteris marginalis*), broad beechfern (*Phegopteris hexagonoptera*), Christmas fern (*Polystichum acrostichoides*) and, on calcareous sites, wild comfrey (*Cynoglossum virginianum*).

Common graminoids are openflower rosette grass (*Dichanthelium laxiflorum*), Bosc's panic-grass (*Dichanthelium boscii*), bearded shorthusk (*Brachyelytrum erectum*), rosy sedge, spreading sedge (*Carex laxiculmis*) and James' sedge (*Carex jamesii*). Infrequently found are rare species such as striped prince's pine (*Chimaphila maculata*), early saxifrage (*Saxifraga virginienensis*) and Kentucky yellowwood (*Cladrastis lutea*).

Table D-7c. Natural areas with dry-mesic upland forest.

Atwood Ridge RNA/EA	Leisure City Barrens EA
Bear Creek Relict Site BA	Little Grand Canyon-Horseshoe Bluff EA
Bell Smith Springs EA	Lusk Creek Canyon EA
Burke Branch RNA/EA	Lusk Creek North EA
Cane Creek BA	Massac Tower Springs EA
Caney Branch Barrens EA	Millstone Bluff EA
Cave Hill RNA/EA	Odum Tract EA
Chimaphila Site BA	Ozark Hill Prairie EA
Cretaceous Hills EA	Panther Hollow RNA/EA
Dean Cemetery West Barrens EA	Pine Hills Annes EA
Dennison Hollow RNA/EA	Pine Hollow EA
Double Branch Hole EA	Pounds Hollow EA
Fink Sandstone Barrens EA	Saltpeter Relict BA
Garden of the Gods EA	Schwegman EA
Grantsburg Swamp EA	Silvey Pond BA
Hayes Creek-Fox Den Creek EA	Snow Springs EA
Jackson Hollow EA	Stoneface RNA/EA
Kaskaskia Woods EA	Whoopie Cat Mountain RNA/EA
LaRue-Pine Hills/Otter Pond RNA/EA	Wolf Creek BA

Restoration

Apply management activities that will restore the dry-mesic upland forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. Analysis of current inventory and monitoring data, combined with sequential,

historical, aerial photography, indicates that extant dry-mesic upland forests may be in need of restoration.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the dry-mesic upland forest.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the dry-mesic upland forest site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the forest community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed.

Application of prescribed fire to the dry-mesic upland forest should be carried out once every five to eight years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances. Note that the application of prescribed fire for fire-dependent communities in wilderness areas requires approval of the Chief of the Forest Service. Affected areas are Caney Branch Barrens EA in Burden Falls Wilderness; a portion of LaRue Pine Hills EA and Pine Hills Annex EA in Clear Springs Wilderness; Garden of the Gods EA in Garden of the Gods Wilderness; and the Chimaphila Site BA, Lusk Creek Canyon EA and Lusk Creek North EA in Lusk Creek Wilderness.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this forest community type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

d. Mesic-Upland Forest Natural Community

Mesic-upland forests are common throughout the assessment area. Trees are tall and straight-trunked, with few low branches. The canopy is essentially complete, but stands have a well-developed vertical structure of shade-tolerant tree, shrub and herbaceous species. Under optimal conditions, these forests are quite open below the canopy. Herbs are very abundant and diverse, especially early in the growing season. The richest sites tend to be in deep ravines. Mesic-upland forests are usually developed in colluvial materials in valleys and ravines, or less frequently in deep loess on broad ridges. They are also found low on north- to east-facing slopes and on narrow creek bottoms. These forests grade into mesic-floodplain forests where creek bottoms widen, and into dry-mesic upland forests higher on the slopes.

The canopy-composition of mesic-upland forests varies, depending on local relief and depth of soil. In deep ravines surrounded by cliffs, common trees include American beech, sugar maple, northern red oak, white oak, yellow poplar, bitternut hickory, white ash (*Fraxinus americana*) and black cherry (*Prunus serotina*). Near intermittent and ephemeral streams, beech and sugar maple are co-dominant, and American sycamore (*Platanus occidentalis*) is found near the streambanks.

In areas with limestone bedrock near the surface, black maple (*Acer nigrum*), chinquapin oak and Shumard's oak are present. Other trees encountered include southern sugar maple (*Acer barbatum*), red maple (*Acer rubrum*), river birch (*Betula nigra*) and bitternut hickory (*Carya cordiformis*). Kentucky yellowwood (*Cladrastis kentuckea*) is found in one natural area on the Forest, associated with the rare bigleaf snowbell bush (*Styrax grandifolia*). Common understory trees in this habitat are American hornbeam (*Carpinus caroliniana*), pawpaw (*Asimina triloba*), flowering dogwood and, on calcareous sites, Ohio buckeye (*Aesculus glabra*). Two common thicket-forming shrubs are northern spicebush (*Lindera benzoin*) and American bladdernut (*Staphylea trifolia*). Eastern leatherwood (*Dirca palustris*) is an infrequent species found associated with limestone.

The herbaceous layer can be notably diverse, particularly before canopy trees leaf out in the spring. Among the more familiar spring ephemerals are shining bedstraw (*Galium concinnum*), white baneberry (*Actaea pachypoda*), dwarf larkspur (*Delphinium tricorne*), Dutchman's breeches (*Dicentra cucullaria*), goldenseal (*Hydrastis canadensis*), dogtooth violet (*Erythronium americanum*), Greek valerian (*Polemonium reptans*) and bloodroot (*Sanguinaria canadensis*). Virginia bluebells (*Mertensia virginica*) can form extensive colonies on intermittent stream terraces. Where limestone bedrock is near the surface, twinleaf (*Jeffersonia diphylla*) may occur. Canadian wildginger (*Asarum canadense*), Jack-in-the-pulpit (*Arisaema triphyllum*), jewelweed (*Impatiens capensis*), eastern greenviolet (*Hybanthus concolor*), Adam and Eve orchid (*Aplectrum hyemale*) and celandine poppy (*Stylophorum diphyllum*) are also encountered in the rich woods.

Ferns are also diverse in this community, with northern maidenhair fern (*Adiantum pedatum*), silver false-spleenwort (*Deparia acrostichoides*), glade fern (*Diplazium pycnocarpon*) and Christmas fern (*Polystichum acrostichoides*) widespread and common. The uncommon maidenhair spleenwort (*Asplenium trichomanes*) may be found, as well as the rare eastern hay-scented fern (*Dennstaedtia punctilobula*). Lowland bladderfern (*Cystopteris protrusa*) forms large colonies on stream terraces. Common graminoids include Indian woodoats (*Chasmanthium latifolium*), sweet wood-reed (*Cinna arundinacea*), hedgehog woodrush (*Luzula echinata*) and white bear sedge (*Carex albursina*). On stream terraces, eastern bottlebrush grass (*Elymus hystrix*) and eastern woodland sedge (*Carex blanda*) are common.

Rare species found within the mesic-upland forest include Appalachian bugbane (*Cimicifuga rubifolia*), butternut (*Juglans cinerea*), along creek banks Fraser's yellow loosestrife (*Lysimachia fraseri*) and, within the spring-fed creeks, is the heartleaf plantain (*Plantago cordata*). Other rare species that may be found are blackedge sedge (*Carex nigromarginata*), shaved sedge (*Carex tonsa*), Guadeloupe cucumber (*Melothria pendula*), twining screwstem (*Bartonia paniculata*), purple fiveleaf orchid (*Isotria verticillata*), New York fern (*Thelypteris noveboracensis*), autumn bluegrass (*Poa autumnalis*), yellow

honeysuckle (*Lonicera flava*), turk's-cap lily (*Lilium superbum*), Illinois woodsorrel (*Oxalis illinoensis*) and early saxifrage.

Table D-7d. Natural areas with mesic-upland forest.

Atwood Ridge RNA	Lusk Creek Canyon EA
Bear Creek Relict Site BA	Lusk Creek North EA
Bell Smith Springs EA	Martha's Woods EA
Clear Creek Swamp BA	Massac Tower Springs EA
Copperous Branch EA	Ozark Hill Prairie RNA/EA
Cretaceous Hills EA	Panther Hollow RNA/EA
Dean Cemetery West Barrens EA	Pine Hollow EA
East Fork <i>Oxalis illinoensis</i> Site BA	Pounds Hollow EA
Fink Sandstone Barrens EA	Reddick Hollow BA
Hayes Creek-Fox Den Creek EA	Saltpeter Relict BA
Jackson Hollow EA	Snow Springs EA
LaRue-Pine Hills/Otter Pond RNA/EA	Split Rock Hollow EA
Little Grand Canyon-Horseshoe Bluff EA	Wolf Creek EA

Restoration

Apply management activities that will restore the mesic-upland forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. Analysis of current inventory and monitoring data, combined with sequential, historical, aerial photography, indicates that extant mesic-upland forests may be in need of restoration.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the mesic-upland forest.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the mesic-upland forest site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the forest community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed.

Application of prescribed fire to the mesic-upland forest should be carried out once every five to eight years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances. Note that the application of prescribed fire for fire-dependent communities in wilderness areas requires approval of the Chief of the Forest Service. Affected areas are East Fork *Oxalis illinoensis* Site BA, Lusk Creek Canyon EA, Lusk Creek North EA and Martha's Woods EA in Lusk Creek Wilderness.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this forest community type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

2. Floodplain (Bottomland) Forest Community-Subtype

a. Mesic-Floodplain Forest Natural Community

Mesic-floodplain forests occur along the floodplains of major streams on the Forest, on landforms of relatively higher local relief, thereby subject to only short and infrequent flooding. The distinction of this natural community from the mesic-upland forest is subtle; many of the woody-overstory and sub-canopy species are common to both communities and the differences lie in herbaceous-species composition.

Dominant trees of the mesic-floodplain forest are white oak, sugar maple and American beech. Other species characteristically found in this habitat include American elm (*Ulmus americana*), black walnut (*Juglans nigra*), white ash, bur oak (*Quercus macrocarpa*), shellbark hickory (*Carya laciniata*), swamp white oak (*Quercus bicolor*), pecan (*Carya illinoensis*) and butternut (*Juglans cinerea*). American hornbeam is the most frequent understory tree. Spicebush and bladdernut are the most commonly occurring shrubs, as well as possumhaw (*Ilex decidua*). Common herbs are bottomland aster (*Symphyotrichum ontarione*), golden ragwort (*Senecio aureus*), Virginia spring beauty (*Claytonia virginica*), common blue violet, smallspike false nettle (*Boehmeria cylindrical*), Indian woodoats, limestone wild petunia (*Ruellia strepens*), smooth hedgenettle (*Stachys tenuifolia*), sweet wood-reed, groundnut (*Apios americana*), sparselobe grapefern (*Botrychium biternatum*) and Canada germander (*Teucrium canadense*).

On the Forest, lizard's tail (*Saururus cernuus*), cardinal flower (*Lobelia cardinalis*), Pennsylvania knotweed (*Polygonum pennsylvanicum*), white panicle aster (*Symphyotrichum lanceolatum*), groundnut (*Apios americana*), Canada germander (*Teucrium canadense*) and sweet woodreed (*Cinna arundinacea*) are useful in delineating upland, mesic-floodplain forest from mesic-upland forest.

Table D-7e. Natural areas with mesic-floodplain forest.

Burke Branch RNA/EA	Little Grand Canyon-Horseshoe Bluff EA
LaRue-Pine Hills/Otter Pond RNA/EA	

Restoration

Apply management activities that will restore the mesic-floodplain forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. Analysis of current inventory and monitoring data, combined with sequential, historical, aerial photography, indicates that extant mesic-floodplain forests are not in need of restoration, but should be monitored for hydrological changes.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the mesic-floodplain forest.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the mesic-floodplain forest site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the forest community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the mesic-upland forest should be carried out once every five to eight years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this forest community type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

b. Wet-Mesic Floodplain Forest Natural Community

Wet-mesic floodplain forests occur along major streams on the Forest. Canopy trees are well-formed, but generally shorter than those on better-drained sites. There are only scattered shrubs, but the herbaceous layer may be quite thick. Flooding is frequent, but does not persist long enough to seriously inhibit tree growth. This community intergrades with other floodplain forests, delineated by soil-type, average soil-moisture and flooding regime.

This natural community contains the greatest biotic diversity of the floodplain natural community types. Commonly found in the canopy are several species, including American elm, sweetgum (*Liquidambar styraciflua*), honeylocust (*Gleditsia triacanthos*), black walnut, silver maple, red maple, common hackberry (*Celtis occidentalis*), sugarberry (*C. laevigata*), bottomland aster and possumhaw. Giant cane (*Arundinaria gigantea*) occasionally forms dense stands and bristly greenbrier (*Smilax hispida*) and spotted St. John's-wort (*Hypericum punctatum*) are usually present. Herbaceous species such as groundnut, Gray's sedge (*Carex grayi*), cattail sedge (*C. typhina*), muskingum sedge (*C. muskingumensis*), ditch stonecrop (*Penthorum sedoides*) and cutleaf coneflower (*Rudbeckia laciniata*) are indicators of wet-mesic floodplain forest. Poison ivy (*Toxicodendron radicans*) is frequently a dominant groundcover, tree-climbing vine and occasional shrub.

Habitat exists in this community for eastern swampprivet (*Forestiera acuminata*), rice cutgrass (*Leersia oryzoides*), cherrybark oak (*Quercus pagoda*), overcup oak (*Q. lyrata*), willow oak (*Q. phellos*), common moonseed (*Menispermum canadense*), fringed loosestrife (*Lysimachia ciliata*), false-hop sedge (*Carex lupuliformis*), red turtlehead (*Chelone obliqua* var. *speciosa*) and giant sedge (*Carex gigantea*).

Table D-7f. Natural areas with wet-mesic floodplain forest.

Grantsburg Swamp EA	LaRue Pine Hills RNA/EA
Greentree Reservoir BA	Little Grand Canyon-Horseshoe Bluff EA

Restoration

Apply management activities that will restore the wet-mesic floodplain forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. Analysis of current inventory and monitoring data, combined with sequential, historical, aerial photography, indicates that extant wet-mesic floodplain forests are not in need of restoration, but should be monitored for hydrological changes.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the wet-mesic floodplain forest.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this forest community type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

c. Wet-Floodplain Forest Natural Community

Wet floodplain forest occurs along major streams on the Forest. Diversity and abundance of tree and herbaceous species are low due to prolonged or frequent flooding. The understory is open and the canopy frequently contains numerous gaps. Wet-floodplain forest is found in association with swamp and wet-mesic floodplain forest.

River birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), silver maple (*Acer saccharinum*), or red maple may form nearly pure, even-aged stands. Sometimes these species intermingle with each other and with eastern cottonwood (*Populus deltoides*) and American sycamore. Canadian woodnettle (*Laportea canadensis*) often forms large monotypic colonies. Sweet wood-reed and whitegrass (*Leersia virginica*) are the most common grasses, but a wide variety of sedges, such as false hop sedge, Gray's sedge (*Carex grayi*), hop sedge (*C. lupulina*), shallow sedge (*C. lurida*), Davis' sedge (*C. davisii*), Muskingum sedge (*C. muskingumensis*) and ravenfoot sedge (*C. crus-corvi*) also occur in this habitat.

Other species that may be found in the wet-floodplain forest include black willow (*Salix nigra*), swamp cottonwood (*Populus heterophylla*), coastal plain willow (*Salix caroliniana*), boxelder (*Acer negundo*), red maple (*Acer rubrum*), Drummond's maple (*Acer rubrum* var. *drummondii*), buttonbush (*Cephalanthus occidentalis*), eastern swampprivet, common moonseed, roundleaf greenbrier (*Smilax rotundifolia*), yellow passionflower (*Passiflora lutea*), dodder (*Cuscuta* spp.) and wild yam (*Dioscorea villosa*). Uncommon species are finger dogshade (*Cynoscadium digitatum*), copper iris (*Iris fulva*), ribbed mock-bishopsweed (*Ptilimnium costatum*) and traveler's delight (*Apios priceana*).

Table D-7g. Natural areas with wet-floodplain forest.

Grantsburg Swamp EA	LaRue Pine Hills RNA/EA
Greentree Reservoir BA	

Restoration

Apply management activities that will restore the wet-floodplain forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. Analysis of current inventory and monitoring data, combined with sequential, historical, aerial photography, indicates that extant wet-floodplain forests are not in need of restoration, but should be monitored for hydrological changes.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the wet-floodplain forest.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this forest community type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

3. Flatwoods Forest Community-Subtype

Flatwoods Natural Community

Flatwoods is a distinctive forest-type found on level terrain. Vernal wet from cool-season precipitation, internal drainage is very poor due to clay pans in the soil. Water stands on these sites for prolonged periods, but the ground is very dry during the summer. Understory trees and shrubs are scattered. Overall diversity is low. There are no flatwoods in any Forest natural area.

The canopy is often pin oak (*Quercus palustris*) or post oak and cherrybark oak (*Quercus pagoda*). Spicebush may occasionally be found. An extensive groundcover of sedges, including Gray's and Muskingum, is often intermixed with little bluestem, white wild indigo (*Baptisia alba*) and rough blazingstar (*Liatris aspera*).

4. Woodland Forest Community-Subtype

Woodland is a natural-community class unrecognized by many community ecologists in Illinois. It is not included in the Illinois Natural Area Inventory "Classification of Natural Communities in Illinois," which classified most examples of woodland as either dry barrens or dry-upland forest. Woodland, as defined here, is a community dominated by trees and grasses/forbs. The mean potential height of trees is usually 15 meters (about 50 feet). The shapes of woodland and forest trees differ, even among the same species. Woodland trees have a highly branched trunk with spreading limbs (or "wolf tree"), while forest trees are relatively narrow with few low branches. The canopy, which can be very open, is generally interrupted, with an average closure of 30-80 percent. The understory is sparse of young

trees or shrubs and the herbaceous layer is dominated by grasses and forbs commonly associated with barrens or dry-upland forest. Fire is of great importance, since the open nature of the woodland is dependent upon fire.

Dry-Woodland Natural Community

Dry woodland occurs within the Ozark Highlands, Upper Gulf Coastal Plain and Interior Low Plateau, Shawnee Hills sections on the Forest. This community is delimited to sites on dry exposures, commonly of southern aspect on shallow soils. Dry woodland is never extensive in its spatial arrangement and intergrades with barrens or dry-upland forest. It is characterized by a park-like understory with a scattering of “old wolf trees” (currently or previously open-grown with outward lower branching). Dominant trees tend to be post oak, blackjack oak and black hickory (*Carya texana*). The understory is dominated by farkleberry and the herbaceous layer is habitat for the woodland sunflower (*Helianthus divaricatus*) and prairie wedge-scale (*Sphenopholis obtusata*) and generally dominated by little bluestem, poverty oat grass and forbs belonging to the aster family.

The dry woodland community also is habitat for the rare Mead's milkweed (*Asclepias meadii*), roundstem false-foxglove (*Agalinis gattereri*) and American bluehearts (*Buchnera americana*).

Table D-7h. Natural areas with dry woodland.

Atwood Ridge RNA/EA	Gyp Williams Hollow EA
Cave Hill RNA/EA	LaRue-Pine Hills/Otter Pond RNA/EA
Dennison Hollow RNA/EA	Stoneface RNA/EA

Restoration

Apply management activities that will restore the wet-floodplain forest community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. All open-grown, native oaks and hickories are to be retained in such a manner as to resemble pre-settlement character, unless the tree is detrimental to the survival of a listed species. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they are to be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the dry-woodland site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the forest community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, woodland, herbaceous

species. Future burns would depend on the control of encroaching woody and non-native species.

This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances. Note that the application of prescribed fire for fire-dependent communities in wilderness areas requires approval of the Chief of the Forest Service. Affected is a portion of LaRue Pine Hills EA in Clear Springs Wilderness.

Maintenance

Apply management activities that maintain and/or enhance the pre-settlement character of the dry-woodland.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the mesic-floodplain forest site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the woodland community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the woodland should be carried out once every five to eight years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the woodland have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

B. SAVANNA COMMUNITY-TYPE

1. Barrens Community-Subtype

Barrens is a complex natural community owing its fragile existence to a delicate balance of natural forces that prevent its succession to a forest community. They have dual, dominant components: the herbaceous layer composed of dry-forest and dry-prairie grass and forb species, and a woody overstory composed of scattered, stunted, limby oaks and hickories. Vines are commonplace, with catbriers (*Smilax* spp.) and grapevines (*Vitis* spp.). Lichens and mosses are scattered in and among the grasses and forbs. Patches of bare ground and rock exposures devoid of vegetation often contribute to unstable soil surface conditions. The soils are generally droughty, usually highly leached, alkaline or acidic, rarely neutral, eroded and often deficient in certain minerals or nutrients.

They are among the rarest of Midwestern natural communities. In the absence of periodic fire, barrens soon succeed to dry-upland forests, and even though grazing or tilling may eliminate these communities, some are on sites where native barrens vegetation has re-colonized disturbed areas. With proper management and time, these natural communities can be restored.

Barrens are characterized by species of canopy trees tolerant of xeric conditions, with a stunted, open-grown appearance, by the dominance of native warm-season grasses and prairie forbs, and, in glades, significant exposures of bedrock. The mix of plants and animals inhabiting these sites varies with canopy-openness, the internal structure of the stands, slope, aspect and other less tangible variables. Barrens are recognized at sites in the Cretaceous Hills, Greater Shawnee Hills and Lesser Shawnee Hills subsections; and the Illinois Ozarks subsection has more and larger communities. The Forest contains representatives of ten types of barrens: loess (Cretaceous, Shawnee and Ozark Hills types), gravel (Cretaceous and Ozark Hills types), sand, limestone (Shawnee and Ozark Hills type), sandstone and shale.

Sandstone barrens in the Shawnee Hills are dominated by white oak, post oak and blackjack oak, but scarlet oak, pignut hickory and black hickory are common. Where the soil is deeper, white oak and post oak dominate. Canopy closure is about 60 percent. There are few shrubs, but oak saplings are common. The only common shrub is farkleberry, which often associates with tangles of cat greenbrier. The ground is well covered by little bluestem, arrowfeather threeawn (*Aristida purpurascens*), cypress panic-grass (*Dichanthelium dichotomum*) and Indiangrass (*Sorghastrum nutans*). Where the canopy is more closed, poverty oatgrass is dominant. Common forbs include clasping Venus' looking-glass (*Triodanis perfoliata*), woodland sunflower, gravelweed (*Verbesina helianthoides*), slender bush-clover (*Lespedeza virginica*), waxyleaf aster (*Symphotrichum undulatum*), common dittany, showy goldenrod (*Solidago speciosa* var. *erecta*), panicled leaf ticktrefoil (*Desmodium paniculatum*), Virginia tephrosia, woman's tobacco, St. Andrew's cross (*Hypericum hypericoides*) and early blue violet (*Viola palmata*).

Nearby sites with less soil development may be dominated by chestnut oak in a few small locales or by post and blackjack oaks throughout the Forest. Roundleaf greenbrier is usually common in these areas. The shrub layer has Blue Ridge blueberry, sassafras (*Sassafras albidum*) and oak shrubs. There are few herbs, mostly poverty oatgrass, with some white edge sedge (*Carex debilis*), Virginia tephrosia (*Tephrosia virginiana*) and cypress panic-grass.

Sandstone glades in Illinois are barrens with little more than exposed bedrock and have a variety of lichens and mosses such as reindeer lichen (*Cladonia subtenuis*), cup lichens (*Cladonia cristatella* and *C. squamosa*), Dicranum moss (*Dicranum scoparium*) and Leucobryum moss (*Leucobryum glaucum*) covering much of the rock. Vascular plants are poverty oatgrass, orange grass (*Hypericum gentianoides*) and devil's-tongue (*Opuntia humifusa*). The few trees are mostly blackjack oak, post oak, black hickory and eastern redcedar.

Limestone barrens or glades are very open, often with less than 20 percent canopy of post oak and chinquapin oak, with a few eastern redcedar trees. Dominant vegetation in the opening consists of Indiangrass, big bluestem (*Andropogon gerardii*) and little bluestem. Flowering dogwood, rusty blackhaw and New Jersey tea (*Ceanothus americanus*) are present as shrubs. Purple cliffbrake (*Pellaea atropurpurea*) and hairy lipfern (*Cheilanthes lanosa*) occur in fractures of exposed bedrock. Other common herbs include late purple aster (*Symphotrichum patens* var. *patens*), Virginia wildrye (*Elymus virginicus*), false boneset (*Brickellia eupatorioides* var. *eupatorioides*), eastern purple coneflower (*Echinacea purpurea*), prairie rosinweed (*Silphium terebinthinaceum*), tall blazingstar, pinnate prairie coneflower (*Ratibida pinnata*), false aloe (*Agave virginica*), purpletop tridens (*Tridens flavus*), button eryngo (*Eryngium yuccifolium*), green comet milkweed (*Asclepias viridiflorum*), Mead's sedge (*Carex meadii*), hoary puccoon (*Lithospermum canescens*) and trailing lespedeza (*Lespedeza procumbens*).

The barrens in the Cretaceous Hills Subsection are on the upper slope of gravel knobs. There is a 70-percent canopy of large black oak and southern red oak, with smaller blackjack oak. Post oak is frequently present as a shrub. Farkleberry, flameleaf sumac (*Rhus copallinum*) and flowering dogwood are also found around the barrens. Common herbs include poverty oatgrass, white edge sedge, cypress panic-grass, Virginia tephrosia, St. Andrew's cross, western bracken fern (*Pteridium aquilinum*), little bluestem, hairy lespedeza (*Lespedeza hirta*), Carolina sedge (*Carex caroliniana*), cat greenbrier and hairy pinweed (*Lechea mucronata*).

Barrens formed on Peoria loess in the Greater Shawnee Hills are dominated by little bluestem and big bluestem. Canopy closure is about 25 percent provided by post oak. Prairie June grass (*Koeleria macrantha*) and prairie dropseed (*Sporobolus heterolepis*) are also found. Conspicuous, but not necessarily common, forbs are woodland sunflower, slender lespedeza, Nuttall's prairie parsley (*Polytaenia nuttallii*) and tall blazingstar.

a. Loess (Dry-Mesic) Barrens Natural Community

Cretaceous Hills Type

The loess barrens of the Cretaceous Hills subsection of the Upper Gulf Coastal Plain section once covered a landscape of approximately 175 square miles. In pre-settlement times, it was a gently rolling landscape of long, loess-mantled ridges, gravel knobs and narrow valleys with wide, shallow, gravel-bottomed streams. It was on the loess-mantled ridges that the commonest of the barrens communities occurred. The loess derived soils are from 2 to 12 feet in thickness and generally have adequate soil-moisture to allow for a lush growth of herbaceous flora. Trees are somewhat stunted, gnarled and limby; many oak and hickories have a more-shrubby appearance due to frequent fires.

Table D-8a. Characteristic species of loess barrens of the Cretaceous Hills.

<i>Agalinis gattingeri</i> (roundstem false foxglove)	<i>Pycnanthemum torrei</i> (Torrey's mountainmint)
<i>Andropogon gerardii</i> (big bluestem)	<i>Quercus alba</i> (white oak)
<i>Andropogon gyrans</i> (Elliott's broomsedge)	<i>Quercus falcate</i> (southern red oak)
<i>Buchnera americana</i> (American bluehearts)	<i>Quercus marilandica</i> (blackjack oak)
<i>Carya ovata</i> (shagbark hickory)	<i>Quercus stellata</i> (post oak)
<i>Carya texana</i> (black hickory)	<i>Rhexia mariana</i> (Maryland meadow beauty)
<i>Corylus Americana</i> (American hazelnut)	<i>Rubus</i> spp. (blackberry)
<i>Elymus</i> spp. (wild rye)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Helianthus angustifolius</i> (swamp sunflower)	<i>Smilax</i> spp. (catbriers)
<i>Lespedeza</i> spp. (bushclover)	<i>Sorghastrum nutans</i> (Indian grass)
<i>Liatris</i> spp. (blazing star)	<i>Tripsacum dactyloides</i> (eastern gamagrass)
<i>Malus ioensis</i> (prairie crabapple)	<i>Vitis</i> spp. (grape)

Table D-8b. Natural areas with loess barrens of the Cretaceous Hills.

Cretaceous Hills EA	Kickasola Cemetery EA
Dean Cemetery East Barrens EA	Poco Cemetery East EA
Dean Cemetery West Barrens EA	Poco Cemetery North EA
Dog Barrens EA	

Restoration

Apply management activities that will restore the loess-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the loess barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy

equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the loess barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

Shawnee Hills Type

The loess barrens of the Shawnee Hills section occur as narrow bands on the extreme upper slopes of cuestas, flaring back along the dipslopes, having a southeast-to-southwest aspect. The loess-derived soils are 1 to 8 feet thick, generally have low-to-moderate soil moisture, and can be extremely droughty in mid- to-late summer. The herbaceous layer reaches an average height of 2 to 5 feet. The trees have a greater density than the Cretaceous and Ozark Hills types, giving the community a woodland appearance (giving rise to the name oak barrens or oak openings by early settlers). Most of this type of barrens succeeded to dry-upland forest after settlement due to the suppression of natural fires.

Table D-8c. Characteristic species of loess barrens of the Shawnee Hills.

<i>Agalinis gattingeri</i> (roundstem false-foxglove)	<i>Lespedeza</i> spp. (bushclover)
<i>Andropogon gerardii</i> (big bluestem)	<i>Liatris squarosa</i> (scaly blazing-star)
<i>Asclepias meadii</i> (Mead's milkweed)	<i>Liatris suarrulosa</i> (Appalachian blazing-star)
<i>Buchneria Americana</i> (American bluehearts)	<i>Quercus marilandica</i> (blackjack oak)
<i>Carya glabra</i> (pignut hickory)	<i>Quercus prinus</i> (chestnut oak)
<i>Carya ovata</i> (shagbark hickory)	<i>Quercus stellata</i> (post oak)
<i>Carya texana</i> (black hickory)	<i>Quercus velutina</i> (black oak)
<i>Ceanothus Americana</i> (New Jersey tea)	<i>Rhus copallinum</i> (flameleaf sumac)
<i>Clitoria mariana</i> (Atlantic pigeonwings)	<i>Sassafras albidum</i> (sassafras)
<i>Danthonia spicata</i> (poverty oatgrass)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Elymus</i> spp. (wild rye)	<i>Sorghastrum nutans</i> (Indian grass)
<i>Helianthus divaricatus</i> (woodland sunflower)	<i>Vitis</i> spp. (grape)
<i>Koeleria macrantha</i> (prairie junegrass)	

Table D-8d. Natural areas with loess barrens of the Shawnee Hills.

Cave Hill RNA/EA	Stoneface RNA
Gyp Williams Hollow EA	

Restoration

Apply management activities that will restore the loess-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can

achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the loess barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the loess barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

Ozark Hills Type

The loess barrens of the southern section of the Ozark Hills natural division were once a widespread natural community occurring on the high prominent ridges and associated upper slopes of the hills bordering the east side of the Mississippi River valley. In pre-settlement times, the landscape was dissected with narrow ridges, steep slopes and extremely narrow valleys, with wide, shallow, chert-gravel-bottomed streams. It was upon the thick loess deposits of these upper slopes and ridges with southwest aspect that the loess barrens occurred. The loess-derived soils are 10 to 25 feet thick and generally have low soil-moisture. The flora is not as diverse as the Cretaceous Hills type, especially the forbs component. The exclusion of natural fires has been a major factor in allowing the invasion of the barrens by brush and tree species, particularly sassafras and flowering dogwood.

Natural areas with loess barrens of the Ozark Hills are Opossum Trot Trail BA and Ozark Hill Prairie RNA.

Table D-8e. Characteristic species of loess barrens of the Ozark Hills.

<i>Agalinis gattingeri</i> (roundstem false-foxglove)	<i>Koeleria macrantha</i> (prairie junegrass)
<i>Andropogon gerardii</i> (big bluestem)	<i>Lespedeza</i> spp. (bushclover)
<i>Carya glabra</i> (pignut hickory)	<i>Liatris squarrosa</i> (Appalachian blazing-star)
<i>Carya ovata</i> (shagbark hickory)	<i>Quercus marilandica</i> (blackjack oak)
<i>Carya texana</i> (black hickory)	<i>Quercus stellata</i> (post oak)
<i>Ceanothus Americana</i> (New Jersey tea)	<i>Quercus velutina</i> (black oak)
<i>Clitoria mariana</i> (Atlantic pigeonwings)	<i>Rhus copallinum</i> (flameleaf sumac)
<i>Cornus florida</i> (flowering dogwood)	<i>Sassafras albidum</i> (sassafras)
<i>Danthonia spicata</i> (poverty oatgrass)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Echinacea pallida</i> (pale purple coneflower)	<i>Sorghastrum nutans</i> (Indian grass)
<i>Elymus</i> spp. (wild rye)	<i>Ulmus alatus</i> (winged elm)
<i>Helianthus divaricatus</i> (woodland sunflower)	<i>Vitis</i> spp. (grape)

Restoration

Apply management activities that will restore the loess-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation

and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the loess barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the loess barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

b. Limestone Barrens Natural Community

Ozark Hills Type

The limestone barrens of the southern section of the Ozark Hills natural division are delimited to the steep, rugged, southwestern limestone exposures. Limestone barrens are characterized by abundant patches of bare ground intermixed with sparse patches of herbaceous vegetation associated with occasional stunted trees and shrubs. Due to their spatial isolation from the limestone barrens of the Missouri Ozarks, their biotic diversity is not as great. Soils are thin or locally absent, and the sites are xeric. This community is contained within the mosaic of natural community-types, such as loess barrens, dry- and xeric-upland forests and woodlands, located above the limestone cliffs. LaRue-Pine Hills/Otter Pond Research Natural Area and Ecological Area is the only example of this type on the Forest.

Table D-8f. Characteristic species of limestone barrens of the Ozark Hills.

<i>Agalinis gattereri</i> (roundstem false-foxglove)	<i>Liatris aspera</i> (tall blazing-star)
<i>Bouteloua curtipendula</i> (sideoats grama)	<i>Quercus marilandica</i> (blackjack oak)
<i>Carya texana</i> (black hickory)	<i>Quercus prinoides</i> (chestnut oak)
<i>Danthonia spicata</i> (poverty oatgrass)	<i>Quercus stellata</i> (post oak)
<i>Elymus</i> spp. (wild rye)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Helianthus divaricatus</i> (woodland sunflower)	<i>Symphytotrichum oblongifolium</i> (aromatic aster)
<i>Juniperus virginiana</i> (eastern redcedar)	<i>Ulmus alatus</i> (winged elm)

Restoration

Apply management activities that will restore the limestone-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the limestone-barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the limestone barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

Shawnee Hills Type

The limestone barrens of the Lesser Shawnee Hills of the Shawnee Hills section are delimited to steep-to-moderate south-to-southwest limestone exposures capped with sandstone. Generally these barrens are found on the middle to lower slopes. Due to their topographic positions, they are relatively small and generally have loess soils over the bedrock. These barrens are characterized by abundant patches of herbaceous vegetation interspersed with patches of bare ground and exposures of limestone pavement, with a sparse woody component of stunted trees and shrubs. Unlike their Ozark Hills counterpart, this community is more dependent upon fire than drought to retard woody invasion (this is due in part to better soil-moisture conditions and because more soil is present). As a result, most of the inventoried Shawnee Hills limestone barrens are overgrown with woody vegetation, especially eastern redcedar, and will not persist long without fire management. These barrens generally are contained within a mosaic of natural community-types, including xeric- and dry-upland forests and woodlands.

Table D-8g. Characteristic species of limestone barrens of the Shawnee Hills.

<i>Arnoglossum plantagineum</i> (groovestem Indian plantain)	<i>Matelea obliqua</i> (climbing milkvine)
<i>Bouteloua curtipendula</i> (sideoats grama)	<i>Physostegia virginiana</i> (obedient plant)
<i>Brickellia eupatorioides</i> (false boneset)	<i>Quercus marilandica</i> (blackjack oak)
<i>Carya texana</i> (black hickory)	<i>Quercus muehlenbergii</i> (chinquapin oak)
<i>Echinacea pallida</i> (pale purple coneflower)	<i>Quercus stellata</i> (post oak)
<i>Eryngium yuccifolium</i> (button eryngo)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Hexalectris spicata</i> (spiked crested coralroot)	<i>Silphium terebinthinaceum</i> (prairie rosinweed)
<i>Juniperus virginiana</i> (eastern redcedar)	<i>Smilax bona-nox</i> (saw greenbrier)
<i>Liatris aspera</i> (tall blazing-star)	<i>Symphytrotrichum patens</i> (late purple aster)
<i>Lithospermum canescens</i> (hoary puccoon)	<i>Ulmus alatus</i> (winged elm)

Table D-8h. Natural area with limestone barrens of the Shawnee Hills.

Barker Bluff RNA	Millstone Bluff EA
Copperous Branch Limestone Barrens EA	Pleasant Valley Barrens EA
Keeling Hill South EA	Simpson Township Barrens EA
Leisure City Barrens EA	Whoopie Cat Mountain RNA/EA

Restoration

Apply management activities that will restore the limestone-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the limestone-barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the limestone barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

c. Sandstone Barrens Natural Community

Sandstone barrens are located on the southwest-facing crests and back-slopes of cuestas where sandstone bedrock is at or near the surface, as well as on crests along the interior canyons cut into the cuestas on sandstone outcrops with thin soils. This barrens-type is characterized by a diversity of vegetation-types, ranging from extensive pavements of sandstone bedrock interspersed with pockets of vegetation where soil accumulates to grassy balds on droughty soils. The sparse vegetation is characterized by species adapted to acidic conditions; woody plants are extremely stunted, twisted and gnarled and are very slow-growing. Sandstone barrens with extensive grass and forb vegetation are fire disclimaxes and, in most cases, have become overgrown with woody invaders without the effects of extreme drought or fire. Sandstone barrens are contained within a mosaic that contains xeric-upland forest and woodland.

Table D-8i. Characteristic species of sandstone barrens.

<i>Andropogon gerardii</i> (big bluestem)	<i>Quercus marilandica</i> (blackjack oak)
<i>Asclepias meadii</i> (Mead's milkweed)	<i>Quercus stellata</i> (post oak)
<i>Carya texana</i> (black hickory)	<i>Quercus velutina</i> (black oak)
<i>Croton monanthogynus</i> (prairie tea)	<i>Rhus copallinum</i> (flameleaf sumac)
<i>Danthonia spicata</i> (poverty oatgrass)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Elymus</i> spp. (wild rye)	<i>Sedum pulchellum</i> (widow's cross)
<i>Hypericum gentianoides</i> (orange grass)	<i>Sorghastrum nutans</i> (Indian grass)
<i>Liatris spicata</i> (dense blazing-star)	<i>Talinum parviflorum</i> (sunbright)
<i>Liatris squarrosa</i> (scaly blazing-star)	<i>Vaccinium arboreum</i> (huckleberry)
<i>Opuntia humifusa</i> (devil's-tongue)	<i>Vitis</i> spp. (grape)
<i>Quercus coccinea</i> (scarlet oak)	

Table D-8j. Natural areas with sandstone barrens.

Bell Smith Springs EA	Lusk Creek Canyon EA
Caney Branch Barrens EA	Odum Tract EA
Cave Hill RNA/EA	Panther Hollow RNA/EA
Dennison Hollow RNA/EA	Pine Hollow EA
Double Branch Hole EA	Pounds Hollow EA
Fink Sandstone Barrens EA	Russell Cemetery Barrens EA
Garden of the Gods EA	Schwegman EA
Jackson Hollow EA	Stoneface RNA/EA
Little Grand Canyon-Horseshoe Bluff EA	

Restoration

Apply management activities that will restore the sandstone-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the sandstone-barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

d. Shale Barrens Natural Community

This is an extremely rare natural community that occurs in association with outcroppings of shale. There are currently no Forest managed lands containing this community-type.

e. Sand Barrens (Mesic) Natural Community

Sand barrens occur within the stream floodplains of the Cretaceous Hills subsection of the Upper Gulf Coastal Plain section. This barrens type occurs on sand lenses deposited on the inside bend of the stream channel. Herbaceous species are robust and lush within the barrens, often exceeding 1 meter (about 40 inches) in height. This rare community-type has all but vanished from the landscape because of woody plant invasion in the absence of fire. Only one example remains in the Cretaceous Hills: at Burke Branch Research Natural Area and Ecological Area.

Table D-8k. Characteristic species of sand barrens.

<i>Andropogon derardii</i> (big bluestem)	<i>Quercus falcata</i> (southern red oak)
<i>Gentiana alba</i> (plain gentian)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Gymnopogon ambiguus</i> (bearded skeletongrass)	<i>Silphium integrifolium</i> (wholeleaf rosinweed)
<i>Liatris squarrosa</i> (scaly blazing-star)	<i>Sorghastrum nutans</i> (Indian grass)
<i>Quercus alba</i> (white oak)	

Restoration

Apply management activities that will restore the sand-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the sand-barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the sand barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

f. Gravel Barrens Natural Community

Cretaceous Hills Type

The gravel barrens of the Cretaceous Hills subsection of the Upper Gulf Coastal Plain section once dotted a landscape of approximately 175 square miles. In pre-settlement times, it was a gently rolling landscape of long, loess-mantled ridges, gravel knobs and narrow valleys, with wide, shallow, gravel-bottomed streams. It was upon the gravel knobs that this rare natural community occurred. The soil surface is composed of Lafayette gravel of the McNairy and Tuscaloosa formation with small amounts of loess and sand intermixed. The herbaceous flora is sparse and composed of species adapted to xeric conditions. Overstory trees are somewhat widely spaced and make slow growth. The sub-canopy layer is moderately dense and dominated by flowering dogwood and farkleberry. The absence of natural fires has led to the succession of this community to a xeric forest as the sub-canopy species have increased in density, resulting in a correlated increase in sub-canopy closure and marked decrease in herbaceous-flora density. There are two examples of this type on the Forest: Dean Cemetery West Barrens EA and Kickasola Cemetery EA.

Table D-8I. Characteristic species of gravel barrens of the Cretaceous Hills.

<i>Carya glabra</i> (pignut hickory)	<i>Liatris squarrosa</i> (scaly blazing-star)
<i>Carya ovata</i> (shagbark hickory)	<i>Pycnanthemum torrei</i> (Torrey's mountainmint)
<i>Carya texana</i> (black hickory)	<i>Quercus marilandica</i> (blackjack oak)
<i>Ceanothus americanus</i> (New Jersey tea)	<i>Quercus stellata</i> (post oak)
<i>Clitoria mariana</i> (Atlantic pigeonwings)	<i>Quercus velutina</i> (black oak)
<i>Cornus florida</i> (flowering dogwood)	<i>Sassafras albidum</i> (sassafras)
<i>Danthonia spicata</i> (poverty oatgrass)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Elymus</i> spp. (wild rye)	<i>Ulmus alata</i> (winged elm)
<i>Helianthus divaricatus</i> (woodland sunflower)	<i>Vaccinium arboreum</i> (farkleberry)
<i>Lechea villosa</i> (hairy pinweed)	<i>Vitis</i> spp. (grape)
<i>Lespedeza hirta</i> (hairy lespedeza)	

Restoration

Apply management activities that will restore the gravel-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in

such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the gravel-barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the gravel barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

Ozark Hills Type

The gravel barrens of the Ozark Hills are locally referred to as "chert" barrens. The chert barrens of the southern section of the Ozark Hills natural division were once the commonest of the Ozark Hills barrens communities. This community occurred on the chert gravels and outcrops of the ridges and associated upper slopes of the Ozark Hills with a southwest

aspect. These chert gravels and outcrops are derived from the Clear Creek, Backbone, Grassy Knob and Bailey formations. Herbaceous flora is sparse and dominated by poverty oatgrass and sedges. Soil-moisture is dry to xeric, resulting in slow-growing trees and shrubs. A fire disclimax community, the chert barrens rapidly succeeded to a dry-upland forest once natural fires were excluded from the landscape. Examination of 1938 aerial photography of the southern section of the Ozark Hills natural division shows that most of today's dry-upland forests occurring on southwest slopes were chert barrens at one time.

Table D-8m. Characteristic species of gravel barrens of the Ozark Hills.

<i>Asplenium bradleyi</i> (Bradley's spleenwort)	<i>Pycnanthemum torrei</i> (Torrey's mountainmint)
<i>Carex</i> spp. (sedges)	<i>Quercus alba</i> (white oak)
<i>Carya glabra</i> (pignut hickory)	<i>Quercus marilandica</i> (blackjack oak)
<i>Carya ovata</i> (shagbark hickory)	<i>Quercus muehlenbergii</i> (chinquapin oak)
<i>Carya texana</i> (black hickory)	<i>Quercus prinus</i> (chestnut oak)
<i>Danthonia spicata</i> (poverty oatgrass)	<i>Quercus stellata</i> (post oak)
<i>Hieracium gronovii</i> (queen-devil)	<i>Rhododendron</i> spp. (azalea)
<i>Krigia biflora</i> (twoflower dwarf-dandelion)	<i>Schizachyrium scoparium</i> (little bluestem)
<i>Liatris squarrulosa</i> (Appalachian blazing-star)	<i>Solidago petiolaris</i> (downy ragged goldenrod)

Table D-8n. Natural areas with gravel barrens of the Ozark Hills.

Atwood Ridge RNA	Ozark Hill Prairie RNA/EA
LaRue-Pine Hills/Otter Pond RNA/EA	Wolf Creek BA

Restoration

Apply management activities that will restore the chert/gravel-barrens community to as near an approximation of its pre-settlement character that restoration-ecology technology can achieve. If monitoring indicates that restoration objectives have been achieved prior to the end of the five-year restoration period, the maintenance guidance should be implemented.

Selective tree and shrub removal: Cutting and/or girdling should be done with both hand and power tools, and the cut material hand-removed from the site, piled and burned, or left for wildlife habitat. Some open-grown, native, barrens oaks and hickories are to be retained in such a manner as to resemble pre-settlement character. Native shrubs should be cut as needed to allow for herbaceous plant and seed-bank regeneration; however, they may be allowed to re-sprout if not detrimental to listed species.

Prescribed Fire: The burning season will be open-ended to the extent allowed for the protection of listed species. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Following the initial burn, fire should be applied annually for at least four successive years. This is necessary to reduce woody vegetation and control re-sprouting, and to favor the re-establishment and growth of native, barrens, herbaceous species. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Maintenance

This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the chert/gravel-barrens natural community.

Prescribed Fire: Fire generally should be prescribed in autumn or spring; however, during the height of a drought-cycle, fire applied in late summer could be optimal in simulating pre-settlement occurrence. Fire-lines outside of the barrens site may be constructed with heavy equipment if it is determined that such construction will not indirectly affect the barrens community, and that terrain and soils are suitable for heavy-equipment use. In order to accomplish management objectives, the burn should be as hot as possible with as rapid a rate of spread that safety will allow. Unburned areas should not be re-ignited after initial ignition has been completed. Application of prescribed fire to the barrens should be carried out once every three years, unless monitoring and site-specific evaluation determine the need for more or less frequent application. This guidance should be viewed as means to reach a goal and not firm burning direction that must be met in all instances.

Species Reintroduction: Some herbaceous species native to the chert/gravel barrens have declined in frequency and distribution, or have become extirpated from particular sites due to past grazing, fire-exclusion or other disturbances. These species may be reintroduced to ensure ecospecies survival and to enhance community diversity. When local genotypes are available, they should be selected over non-bioregional genotypes.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

C. PRIMARY COMMUNITY-TYPE

1. Cliff Community-Subtype

Cliff communities are on vertical rock faces and are locally distributed across the Forest. They have practically no soil, although sand may be deposited at their bases and on small ledges. Most in this region are composed of sandstone, but some are of limestone. They can be moist to dry, depending on their aspect and the surrounding natural communities. The associated plant communities are, for the most part, uniform across the region. Differences in plant and animal life are due to differing rock characteristics, aspect and soil-moisture regimes that result from shading from adjacent forests. In general, north and east-facing cliffs support lush and more diverse vegetation.

a. Sandstone Cliff Natural Community

Sandstone cliffs, large and sheer enough to contain distinct communities, are abundant within the Shawnee Hills section, many in association with sandstone overhangs and xeric-to mesic-upland forest communities. The plant communities that develop on sandstone cliffs are extremely similar to the vegetation of the plant community above or below the cliff. Generally this means that if the community has a southerly or westerly aspect, and is not shaded, it will be xeric-adapted. Species include those commonly associated with sandstone barrens, xeric or dry upland forests or woodlands. Sandstone cliff communities are dominated by herbaceous species.

Dry Sandstone Cliff

Lichens are scattered and locally abundant on dry sandstone cliffs, especially *Lepraria finkii*, which give many cliffs a distinct greenish-blue color. Cracks and ledges are often occupied by littleflower alumroot (*Heuchera parviflora*), lobed spleenwort (*Asplenium pinnatifidum*), maidenhair spleenwort (*Asplenium trichomanes*) and common woodsia. In the sand at the base of these cliffs are Standley's goosefoot (*Chenopodium standleyanum*) and Pennsylvania pellitory (*Parietaria pensylvanica*).

Moist Sandstone Cliff

Shaded sandstone cliffs retain more moisture and have greater species-diversity than drier cliffs. Upland bentgrass, walking fern (*Asplenium rhizophyllum*), shining clubmoss (*Huperzia lucidulum*), rock clubmoss (*H. porophila*) and intermediate woodfern (*Dryopteris intermedia*) occur at scattered locations throughout the Forest. Wild hydrangea (*Hydrangea arborescens*), marginal woodfern (*Dryopteris marginalis*), littleflower alumroot and partridgeberry (*Mitchella repens*) are common in the region."

Table D-9a. Characteristic species of sandstone cliffs.

<i>Amerlanchier arborea</i> (common serviceberry)	<i>Juniperus virginiana</i> (eastern redcedar)
<i>Asplenium bradleyi</i> (Bradley's spleenwort)	<i>Lonicera flava</i> (yellow honeysuckle)
<i>Carex pensylvanica</i> (Pennsylvania sedge)	<i>Mitchella repens</i> (partridge-berry)
<i>Cheilanthes lanosa</i> (hairy lipfern)	<i>Osmunda cinnamomea</i> (cinnamon fern)
<i>Danthonia spicata</i> (poverty oatgrass)	<i>Waldsteinia fragarioides</i> (Appalachian barren strawberry)
<i>Dennstaedtia punctilobula</i> (eastern hayscented fern)	

Table D-9b. Natural areas with sandstone cliffs.

Barker Bluff RNA/EA	Lusk Creek Canyon EA
Bear Creek Relict Site BA	Lusk Creek North EA
Bell Smith Springs EA	Odum Tract EA
Bulge Hole EA	Panther Hollow EA
Caney Branch Barrens EA	Pine Hollow EA
Double Branch Hole EA	Pounds Hollow EA
Fink Sandstone Barrens EA	Reddick Hollow BA
Garden of the Gods EA	Salt peter Relict BA
Gyp Williams Hollow EA	Sand EA
Hayes Creek-Fox Den Creek EA	Schwegman EA
Jackson Hollow EA	Split Rock Hollow EA
Little Grand Canyon-Horseshoe Bluff EA	

Management

Any management required for the restoration or maintenance of a sandstone cliff community will be specified through site-specific analysis.

b. Sandstone Overhang Natural Community

Sandstone overhang communities exist in cliff shelters of the Shawnee Hills section and are characterized by low-light intensities and sheltered microclimates. These are fragile communities easily damaged by visitors trampling or camping beneath the shelters. Sandstone overhang communities have greater moisture and less light than moist sandstone cliffs, creating conditions that only a few species can tolerate. At the drip line, a narrow strip (1 to 3 feet wide) where water drips across a shelter entrance, is a special ecosystem for certain unique plants. Among these are French's shootingstar (*Dodecatheon*

frenchii). Further inside the shelters, moist and stable conditions protect other rare and unusual plants, such as Appalachian bristle-fern (*Trichomanes boschianum*) and thalloid liverworts (*Conocephalum conicum*), and animals (mostly invertebrate species) from temperature and humidity changes. Some shelters or other cracks and fissures in cliffs create a cave-like environment, suitable for roosting by bats or inhabitation by other cave-dwelling animals. Soils beneath overhangs are commonly of sandy residuum, derived from the breakdown of sandstone.

Table D-9c. Characteristic species of sandstone overhangs.

<i>Asplenium bradleyi</i> (Bradley's spleenwort)	<i>Sayornis phoebe</i> (eastern phoebe)
<i>Myrmeleonidea</i> spp. (antlion larvae)	

Table D-9d. Natural areas with sandstone overhangs.

Bear Creek Relict BA	Odum Tract EA
Bell Smith Springs EA	Pine Hollow EA
Bulge Hole EA	Pounds Hollow EA
Garden of the Gods EA	Sand EA
Jackson Hollow EA	Schwegman EA
Little Grand Canyon-Horseshoe Bluff EA	

Management

Any management required for the restoration or maintenance of a sandstone cliff community will be specified through site-specific analysis.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this community-type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

c. Limestone Cliff Natural Community

Limestone cliffs occur in the Illinois Ozarks subsection along the Mississippi River and in the Shawnee Hills subsection along the Ohio River and its tributaries. These cliffs have a more diverse flora than sandstone cliffs. Limestone cliffs are more susceptible to weathering than sandstone cliffs and are alkaline in nature; this also allows for a more diverse flora than on sandstone cliffs. The plant communities on limestone cliffs are extremely similar to the vegetation of the community above or below the cliff. Generally this means that if the community has a southerly or westerly aspect and is not shaded, it will develop a xeric-adapted plant community. Species include those commonly associated with limestone barrens, xeric- or dry-upland forests or woodlands. Limestone cliff communities are dominated by herbaceous species. Often, they are capped with limestone barrens, xeric- or dry-upland forest or woodland communities, or loess barrens. They sometimes contain caves. Talus areas often exist at the bases of limestone bluffs, forming unstable and rugged slopes with forest cover. Frequent species in this community are walking fern, red columbine (*Aquilegia canadensis*), sharplobe hepatica (*Hepatica nobilis* var. *acuta*), bulblet bladderfern (*Cystopteris bulbifera*) and sicklepod.

Table D-9e. Characteristic species of limestone cliffs.

<i>Asplenium bradleyi</i> (Bradley's spleenwort)	<i>Pellaea atropurpurea</i> (purple cliffbrake)
<i>Asplenium resiliens</i> (blackstem spleenwort)	<i>Solidago rugosa</i> ssp. <i>subaspera</i> (wrinkleleaf goldenrod)
<i>Cheilanthes feei</i> (slender lipfern)	<i>Solidago sphacelata</i> (autumn goldenrod)
<i>Neotoma floridana</i> (eastern woodrat)	

Table D-9f. Natural areas with limestone cliffs.

Atwood Ridge RNA/EA	LaRue-Pine Hills/Otter Pond RNA/EA
Ava ZA	Pine Hills Annex EA
Clear Creek Swamp BA	

Management

Any management required for the restoration or maintenance of a sandstone cliff community will be specified through site-specific analysis.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this community-type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

2. Cave Community-Subtype

Cave communities are distinguished by a complete lack of light and vascular plants. Caves on the Forest are of two types, terrestrial and aquatic, and are found in the Shawnee Hills and Ozark Highlands sections. They are recognized for their essentially undisturbed ecosystems, with an intact fauna of cave-adapted animals, or containing rare or outstanding fauna (such as a variety of cave invertebrates or bat colonies). On the Forest, they are generally formed in limestone, with most portions not penetrated by sunlight. Smaller caves formed in sandstone in the Shawnee Hills are typically categorized as sandstone overhang communities.

a. Terrestrial Cave Natural Community

Terrestrial caves are air-filled cavities in rock that usually occur in association with aquatic caves and upland-forest communities.

Table D-9g. Characteristic species of terrestrial caves.

<i>Eptesicus fuscus</i> (big brown bat)	<i>Myotis lucifugus</i> (little brown bat)
<i>Eurycea lucifuga</i> (cave salamander)	<i>Myotis sodalis</i> (Indiana bat)
<i>Myotis austroriparius</i> (southeastern bat)	<i>Myotis subulatus leibii</i> (eastern small-footed bat)
<i>Myotis grisecens</i> (gray bat)	<i>Pipistrellus subflavus</i> (eastern pipistrell)
<i>Myotis keenii</i> (Keen's myotis)	<i>Plecotus rafinesquii</i> (Rafinesque's big-eared bat)

Table D-9h. Natural areas with terrestrial caves.

Ava ZA	Hutchison ZA
Brown's ZA	LaRue-Pine Hills/Otter Pond RNA/EA
Cave Hill RNA/EA	Toothless ZA

b. Aquatic Cave

Aquatic caves occur in association with terrestrial caves, as pools, streams and waterfalls. These cave areas sometimes fill completely with water and surface as seeps or springs. Characteristic species of aquatic caves are *Chologaster agassize* (spring cavefish) and *Troglobitic* (aquatic invertebrates). Natural areas with aquatic caves are Ava and Hutchison ZAs and LaRue-Pine Hills/Otter Pond RNA/EA.

Management

All caves are to be closed to recreational use from August 31 through April 15 unless allowed by the Forest Supervisor or specified official. This is to protect migrating and hibernating bats from direct and indirect harassment by humans. The Forest Service will continue to enter into cooperative agreements to conduct surveys of Forest cave resources to determine those that require additional protection due to their association with threatened, endangered or sensitive species. The need for additional management will be determined through site-specific analysis.

D. WETLANDS (AQUATIC) COMMUNITY-TYPE

Only a few wetland communities are known to exist in the bottomlands of the Ohio and Cache Rivers Alluvial Plain and the Mississippi River Alluvial Plain subsections, and scattered along tributary streams elsewhere on the Forest. Acid seeps and springs occur within portions of the Cretaceous Hills Subsection. Streams are herein considered separately from other wetland community-types due to their large watersheds and diversity.

1. Seep and Spring Community-Subtypes

a. Acid-Seep Natural Community

Acid seeps (acid-gravel seeps) are restricted to a small area of the Cretaceous Hills subsection. These seeps have shallow deposits of peat moss (*Sphagnum* spp.) and exhibit an acidic pH, the result of the water percolating through the Cretaceous sands and gravels. They are generally located in small stream floodplains or issuing from the lower or middle slopes of the moderately rolling Cretaceous Hills.

The vegetation of seeps in the Cretaceous Hills Subsection is dominated by river birch, red maple or yellow poplar, with occasional black willow (*Salix nigra*); the herbaceous layer by sedges and ferns, including leafy bulrush (*Scirpus polyphyllus*), prickly bog sedge (*Carex atlantica* var. *atlantica*), subarctic lady fern (*Athyrium filix-femina* var. *angustum*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*) and netted chainfern (*Woodwardia areolata*). The twining screwstem (*Bartonia paniculata*) is restricted to this community. Several uncommon orchids are also known to occur in association with this rare community.

Table D-10a. Natural areas with acid seeps.

Cretaceous Hills EA	Massac Tower Springs EA
Dean Cemetery West Barrens EA	Snow Springs EA
Kickasola Cemetery EA	

Management

Any management required for the restoration or maintenance of an acid-seep community will be specified through site-specific analysis.

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this community-type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

b. Spring Natural Community

Within the Ozark Highlands, Upper Gulf Coastal Plain and Shawnee Hills sections, larger springs may be prominent features within stream-systems or at the bases of bluffs or cliffs. Although no areas are recognized solely for their spring communities, some natural areas have springs among their natural communities. Vascular plant communities are generally not well developed within the springs proper, but the site may have species typical of the surrounding natural community. Some species associated with clear springs include the heartleaf plantain (*Plantago cordata*), oneflower false fiddleleaf (*Hydrolea uniflora*), lakecress, (*Neobeckia aquatica*) and the spring cavefish (*Chologaster agassizi*).

Table D-10b. Natural areas with springs.

Big Creek ZA	Hutchison ZA
Cave Hill RNA/EA	LaRue-Pine Hills/Otter Pond RNA/EA
Clear Creek Swamp BA	Lusk Creek ZA
Grantsburg Swamp EA	Simpson Barrens EA
Gyp Williams Hollow EA	

Management

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this community-type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

2. Swamp Community-Subtype

a. Swamp (Forested) Natural Community

Swamps are freshwater, woody communities with surface water throughout most or all of the year. The water-level can vary from several feet in winter to an inch or less in summer; however, it is not unusual to be up to 5 feet deep in summer. In this community-type the forest canopy covers at least 50 percent of the water.

Trees characteristic of swamps in southern Illinois are bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), water hickory (*Carya aquatica*), pumpkin ash (*Fraxinus tomentosa*), water locust (*Gleditsia aquatica*) and Drummond's red maple, as well as swamp cottonwood (*Populus heterophylla*) and black willow (*Salix nigra*). The shrubby layer consists of Virginia sweetspire (*Itea virginica*), swamp rose (*Rosa palustris*), swamp loosestrife (*Decodon verticillatus*) and common buttonbush (*Cephalanthus occidentalis*). Common herbaceous species include pondweed (*Potamogeton* spp.), waternymphs (*Najas* spp.), duckweeds (*Lemna* spp.), watermeal (*Wolffia* spp.), cypressknee sedge (*Carex decomposita*) and sedges (*Carex* spp.). Uncommon species found in the swamps include American featherfoil (*Hottonia inflata*), Bladderwort (*Utricularia* spp.), heartleaf nettle (*Urtica chamaedryoides*) and copper iris (*Iris fulva*).

Table D-10c. Natural areas with swamps.

Clear Creek Swamp BA	LaRue-Pine Hills/Otter Pond RNA/EA
Grantsburg Swamp EA	

Management

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this community-type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

b. Shrub-Swamp Natural Community

Shrub-swamps are often found in association with ponds in the vegetation mosaic of the floodplain forest in southern Illinois. An open canopy of trees may be present, but the shrub layer is clearly dominant. There are aquatic herbaceous plants in these areas. Tree species include those associated with forested swamps, such as bald cypress, pumpkin ash and Drummond's red maple. Shrub species include crimson-eyed rosemallow (*Hibiscus moscheutos*), common buttonbush, swamp rose and Virginia sweetspire. Herbaceous species are similar to those encountered in a forested swamp. In this community-type at least 50 percent of the coverage of the water is by the shrub canopy and less than 20 percent is by trees. Shrub swamps are often found in association with ponds. Uncommon species found in shrub-swamps include one-flower false fiddleleaf, lakecress, cypressknee sedge, false hop sedge (*Carex lupuliformis*), Arkansas mannagrass (*Glyceria arkansana*), heartleaf nettle, copper iris, simplestem bur-reed (*Sparganium chlorocarpum*) and kidneyleaf mudplantain (*Heteranthera reniformis*).

Table D-10d. Characteristic species of shrub-swamps.

<i>Carex</i> spp. (sedge)	<i>Nyssa aquatica</i> (water tupelo)
<i>Carya aquatica</i> (water hickory)	<i>Populus heterophylla</i> (swamp cottonwood)
<i>Decodon verticillatus</i> (swamp loosestrife)	<i>Salix nigra</i> (black willow)
<i>Gleditsia aquatica</i> (water locust)	<i>Utricularia</i> spp. (bladderwort)
<i>Najas minor</i> (brittle waternymph)	

Table D-10e. Natural areas with shrub-swamps.

Grantsburg Swamp EA	LaRue-Pine Hills/Otter Pond RNA/EA
Clear Creek Swamp BA	

Management

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this community-type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

3. Open-Water Community-Subtype

a. Pond Natural Community

Ponds are limited to abandoned river meanders (sloughs) in the southern section of the Mississippi River Alluvial Plain. Water must be permanent or semi-permanent and the community open. Vegetation is characterized by floating aquatics, submergents and emergents.

Aquatic species characteristically found in ponds includes watermeal, duckweeds, pondweeds, Mexican mosquito fern (*Azolla mexicana*), American spongeplant (*Limnobium spongia*), brittle waterlily and coon's tail (*Ceratophyllum demersum*). A variety of emergent plants are found in the shallows at the edges of ponds, including American lotus (*Nelumbo lutea*), yellow pond-lily (*Nuphar lutea* var. *advena*), green arrow-arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*) and broadleaf arrowhead (*Sagittaria latifolia*). Uncommon species found in the ponds include cypressknee sedge, false hop sedge, one-flower false fiddleleaf and lakecress.

Table D-10f. Characteristic species of ponds.

<i>Brasenia schreberi</i> (watershield)	<i>Potamogeton</i> spp. (pondweed)
<i>Cabomba caroliniana</i> (Carolina fanwort)	<i>Sagittaria latifolia</i> (broadleaf arrowhead)
<i>Echinodorus cordifolius</i> (creeping burhead)	<i>Spirodela polyrhiza</i> (giant duckweed)
<i>Lemna minor</i> (common duckweed)	<i>Spirodela punctata</i> (dotted duckweed)
<i>Peltandra virginica</i> (green arrow-arum)	<i>Wolffia columbiana</i> (Columbian watermeal)
<i>Pontederia cordata</i> (pickerel weed)	<i>Wolffiella gladiata</i> (Florida mudmidget)

Two natural areas contain ponds: LaRue-Pine Hills/Otter Pond RNA/EA and Little Grand Canyon-Horseshoe Bluff EA.

Management

Species Reintroduction: Except for the reintroduction of threatened, endangered or sensitive species, or other at-risk species, there are currently no known needs for reintroductions associated with this community-type.

Non-native Invasive Species Control: Except for removal by cutting or prescribed fire, the control of non-native species control by other management technologies would necessitate a species-specific evaluation.

b. Perennial Stream Natural Community

Streams are bodies of flowing water in a clearly defined channel. Their character is determined by the amount of water they carry, as well as by the bedrock and terrestrial communities through which they flow. Streams must be permanent (perennial), not intermittent or ephemeral (flowing only after rains), otherwise they are considered as features of another natural community. Two community classes are recognized on the basis of size: creek and river.

Creek

A creek is a perennial stream with a watershed smaller than 200 square miles (520 square kilometers). Three creek communities are defined based on their gradients: high-, medium- and low-gradient. Twisted sedge (*Carex torta*) is regularly found along clear streams in Illinois, fringed sedge (*Carex crinita*) infrequently. Heartleaf plantain (*Plantago cordata*) is a rare species also found in these areas on the Forest.

High-gradient Creek:

A high-gradient creek has a gradient of 10 or more feet per mile. They are characterized by riffles, pools, and sand and gravel beds and generally occur at the headwater area of a stream. American water-willow (*Justicia americana*) is a characteristic plant of a high-gradient creek. Characteristic animals include the banded sculpin, blackspotted topminnow, common stoneroller, southern redbelly dace and pickerel frog.

Most high-gradient creeks on the Forest are ephemeral. Only portions of Lusk Creek and Big Creek ZAs fit the definition. Therefore, other high-gradient creeks within natural areas are features of another natural community. Forest natural areas containing high-gradient creek features include Big Creek ZA, Cave Hill RNA/EA, Bell Smith Springs EA, Double Branch Hole EA, Gyp Williams Hollow EA, Jackson Hole EA, Lusk Creek ZA, Pounds Hollow EA and Simpson Township EA.

Medium-gradient Creek:

A medium-gradient creek has a gradient of between 1 and 10 feet per mile. Characteristic animals include the longear sunfish, hornyhead chub, red shiner and suckermouth minnow.

Low-gradient Creek:

A low-gradient creek has a gradient of less than 1 foot per mile and a sluggish current, generally without riffles, with sediments of silt and organic matter. This community is characteristic of prairie/barrens uplands and the bottomlands of major rivers. Characteristic animals include the creek chubsucker, yellow bullhead, slough darter, creek chub and redbelly shiner.

Low Gradient Creek (Mississippi Bottomland Type):

The Mississippi Bottomland-type creek consists of gravel and silt bed-material. The current is normally sluggish. Gravel deposits amid the silt bed provide habitat for a variety of fish

species. Rock tributary-streams of the main creek offer excellent aquatic habitats for some unusual species. Water quality is enhanced by the spring-fed tributaries. There are no natural areas with this type creek.

Low-Gradient Creek (Shawnee Hills Type):

The Shawnee Hills-type creek consists of a rock and gravel bed, lively ripples, and deeper pools. Deposits of gravel or sand and large sandstone blocks may provide differing habitats along the stream. Many springs and smaller tributaries are present. Water quality is good to excellent because of many springs and the forested watersheds. The Indiana bat (*Myotis sodalis*) may occur within all streams with suitable summer breeding and foraging habitat. Other animals that may be present include the spring cavefish (*Cholagaster agassizi*) and river otter (*Lutra canadensis*). Uncommon plant species include Fraser's yellow loosestrife (*Lysimachia fraseri*), heartleaf plantain and heartleaf nettle. Big Creek and Lusk Creek ZAs are natural areas with creeks.

APPENDIX E

VISUAL QUALITY GUIDELINES FOR PRACTICES AND ACTIVITIES

Table E-1 lists recommended measures that may be needed so that management practices and activities meet specified visual quality objectives. The specific measures selected for an individual project will be determined through site-specific analysis. Each item listed will be considered by the interdisciplinary team during project analysis, but it is not required that each item be implemented on every project.

Table E-1. Recommended measures by activity to meet visual-quality objectives.

Management Practice/Activity	Visual-Quality Objective ¹		
	Retention	Partial Retention	Modification
Clearcut	Not Applicable	ABCD FHMN	ADFI
Individual Tree Selection	FGM	FHM	FI
Group Selection (including site preparation)	CFG M	CFHM	FI
Shelterwood	ACDFGM	ACDFHM	ADFI
Commercial Thinning	CEFGM	CFHM	FI
Prescribed Burning	KN	K	
Special uses (structures, utilities) and Mineral Exp/Dev structures	FJN	FJ	FJ
Road Construction	FLN	FL	FL
Wildlife Opening establishment/maintenance	CDF	CDF	DF

¹See code chart in Table F-2.

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Appendix E – Visual Quality Guidelines for Practices and Activities

Table E-2. Detailed measures to meet the visual-quality objective recommendations of Table E-1.

A. Stand-shaping	Establish irregular stand-shape, avoiding straight lines or geometric forms except as necessary along land-lines, for example; follow natural land features.
B. Edge treatment	Feather the edge of the cut or adjacent stand by retaining (if present) mid-story and understory trees in a 50'-150' zone. For clearcuts, see also Plan Appendix H, Snag/Cavity Management.
C. Flowering plants	Leave flowering and ornamental forms of vegetation where practical to enhance vegetative variety.
D. Openings	Reduce as much as possible the length of openings along arterial and collector roads (1/8-mile is preferred maximum in pine, 300 feet in hardwoods). Utilize existing, attractive, character trees to frame and soften the effects of the opening. Extend peninsulas of vegetation from adjacent stands. When there is a need to reduce the perception that an opening is too large to meet visual-quality objectives, provide groups/islands of vegetation rather than single, scattered trees. This may include the use of wildlife clumps. Leave groups of pine and/or eastern redcedar vegetation to provide visual variety. Avoid sky-lighting openings or creating notch effects on ridge-lines.
E. Thinning	Vary the densities of thinnings.
F. Slash treatment	See Table 4-9 for slash treatment and table 4-10 for Root-Wad and Stump treatment.
G. Log landings	Log landings should not be visible from travel or use areas, except where terrain or other resources dictate (minimum of 300 feet from viewer). Restoration of site must be accomplished during or immediately after harvest activities are completed.
H. Log landings	Log landings should be no closer than 150' from the edge of arterial and collector roads, except where terrain or other resources dictate. Restoration of site must be accomplished within one year from completion of project.
I. Log landings	Log landings should be no closer than 150' from edge of arterial and collector roads, except where terrain or other resources dictate. Restoration of site must be accomplished within two years from completion of project.
J. Special uses	See Agriculture Handbook 478, Volume 2 - Chapter 2, Utilities and Agricultural Handbook 483, Volume 2 - Chapter 4, Roads. The Utilities handbook describes methods of analyzing and reducing visual impacts of utility installations. Visual considerations include selection of construction materials, colors, shapes and locations. The Roads handbook suggests methods of reducing visual impacts of roads with respect to location, landform, vegetation and structures.
K. Burning	Keep bark scorch to a minimum.
L. New roads	Where terrain permits, keep new system roads a minimum of 1/4 mile apart. For both system and temporary road construction, intersect existing roads at right angles. Include a dogleg or offset curve of 150'± in alignment of new access road to prevent a continuous view of the new road.
M. Tree-marking	Apply marking paint on trees so it is not visible from travelway or use areas (except that stump marks will be placed on the lowest side of the tree).
N. LA assistance	Measures required to meet the visual-quality objectives of retention or partial retention for the practices indicated will be developed on a case-by-case basis with direct input from the landscape architect. The measures shown in Table 4-8, as well as other specific requirements, should be considered during the analysis.

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Table E-3. Slash-treatment guidelines.

Visual-Quality Objective	Distance from Viewing Location	Travel Speed (MPH)	Viewing Location	Desired Condition*	Time of Treatment
Retention	0 to 100 feet	0-5 6-25 26+	Trails, occupancy spots or areas. Low-speed roads and trails. High-speed roads.	1 2 2	Concurrently, or immediately following action.
Retention	100 to 300 feet	0-5 6-25 26+	Trails, occupancy spots or areas. Low-speed roads and trails. High-speed roads.	2 2 3	Concurrently, or immediately following action.
Partial Retention	0 to 100 feet	0-5 6-25 26+	Trails, occupancy spots or areas. Low-speed roads and trails. High-speed roads.	2 3 3	Within one year.
Partial Retention	0 to 100 feet	0-5 6-25 26+	Trails, occupancy spots or areas. Low-speed roads and trails. High-speed roads.	3 4 4	Within one year.
Modification	0 to 100 feet	0-5 6-25	Trails, occupancy spots or areas. Low-speed roads and trails.	3 4	Within one year.
<p>*Desired Condition (of slash to be achieved following treatment):</p> <p>1 – Limbs or tops in the disturbed areas, not screened from view, will either be removed from the site, hand-piled and burned, or lopped and scattered to no more than 12 inches high.</p> <p>2 – Limbs or tops in the disturbed areas, not screened from view, will be lopped and scattered to no more than 24 inches high.</p> <p>3 - Throughout the seen area, the residue will not be greater than 4 feet high.</p> <p>4 - Throughout the seen area, the residue will not be greater than 6 feet high.</p>					

Table E-4. Root-wad and stump-treatment guidelines.

Visual-Quality Objective	Root-Wad/Stump Treatment	Time of Treatment
Retention	Treat by either shearing the stump at ground level with a stump grinder, removing to a designated site, burning, or burying in a approved location.	Concurrently, or immediately following action.
Partial Retention	Drag back a minimum of 100 feet and place root-wad in an upright position, or drag out of sight where terrain permits.	Within one year.
Modification	Turn root-wad upright behind immediate screening of vegetation.	Within two years.

APPENDIX F

SOIL MANAGEMENT INTERPRETATIONS

I. INTRODUCTION

This appendix contains soil management interpretations and guidelines designed to provide the Forest resource manager/planner with information regarding the suitabilities and limitations of specific land-units for various uses and management practices associated with the timber, recreation and watershed program on the Forest.

A. ADMINISTRATION OF WATERSHED IMPROVEMENT PROGRAM

The direction for administration of the watershed improvement program on the Forest can be found in FSM 2500 Watershed and Air Management Chapter 2520- Watershed Protection and Management. This manual direction covers program planning, selection of project areas, and watershed improvement guidelines. The projects addressed include roads and trails, sheet erosion, mine restoration, borrow-pit stabilization, mass movement, abandoned wells and cisterns, streambank and lakeshore stabilization, and gully control.

B. RIPARIAN AND WETLAND MANAGEMENT

Riparian and wetland management on the Forest shall be governed by the Plan Forest-wide standards and guidelines

II. REVEGETATION OF DISTURBED AREAS

In addition to Forest Service Manual and Handbook direction, the following are good references to consult before beginning soil and water resource improvement or rehabilitation projects:

- National Handbook of Conservation Practices, developed by the NRCS
- Stream Corridor Restoration Handbook, developed by the NRCS
- Illinois Urban Manual, developed by the NRCS and IEPA
- National Forestry Manual, developed by the NRCS
- National Soil Survey Manual, developed by the NRCS

Revegetation of major watershed projects shall be accomplished through watershed-improvement prescriptions prepared by the watershed staff. Two examples of major projects are gully and shoreline stabilization. Revegetation of minor watershed projects shall be handled by the districts. The following information is provided as a guideline for specific projects. The watershed staff shall provide additional technical information and guidance as necessary to ensure successful revegetation and erosion control.

A. OBLITERATION OF ROADS AND TRAILS

Roads should be blocked to prevent entry. Waterbars and drainage dips should be installed and berms removed as necessary to prevent water-concentration on the road surface. Waterbars shall be spaced and constructed in accordance with FS Handbook direction and/or Illinois best-management practices guidelines. All ruts, potholes and low areas that hold water shall be drained and/or filled before the roadbed is prepared for seeding. Direction for seedbed preparation, lime and fertilizer rates, seeding mix and rates and mulching is covered in this appendix.

B. FIRE-LINES

Fire-lines constructed with a bulldozer, skid-steer or fire-plow on a steep grade or in loess soils have a high potential for erosion if not treated. Length and percent of slope are important factors in determining treatments. Roads, streams, rock-outcrops, trails and streams should all be utilized as fire-breaks where possible, reducing the overall length of fire-line needed.

Fire-lines constructed with equipment shall be evaluated and treated as necessary to prevent excessive erosion. Fire-lines made with a leaf blower do not require further mitigation. Mitigation measures for firelines can be found in the FS Handbook and/or Illinois best-management practices guidelines.

C. SEEDBED PREPARATION

Proper seedbed preparation is important for good seed-germination and early growth. The soil, if not freshly prepared by construction, should be tilled to produce from two to four inches of loose soil. Lime and fertilizer should be applied prior to preparation. It may be necessary to deep-rip severely compacted areas to prepare a proper seedbed.

The seedbed should be free of clods and debris larger than 6 inches in diameter. Seed should be sown on the seedbed, lightly covered (raked in) and firmed to assure good soil-seed contact. Planting equipment can be used, but special attachments may be necessary for some type of seeds, such as most warm-season grasses.

D. SOIL TREATMENTS

1. Lime and Fertilizer

If no soil test is available, the following minimum amount of lime and fertilizer per acre should be applied and incorporated into the soil before seeding:

- 2 tons of agricultural lime for grass, or 3 tons of agricultural lime for legumes and grass/legume mixtures;
- 250 lbs. of 33-0-0 (or equivalent) for grasses, or 200 lbs. of 33-0-0 (or equivalent) for legume and grass/legume mixtures;
- 500 lbs. of 6-24-24 (or equivalent) for all areas.

If a soil test is available, Table F-1 shall be used to determine the rate of lime and/or fertilizer to apply before seeding.

Table F-1. Lime and fertilizer rates.

Soil Test Results pH	Tons/Acre Ag-Lime	
	Grasses and Lespedeza	Legume and Grass Legume Mix
4.0 - 4.5	4	5
4.6 - 5.0	3	4
5.1 - 5.5	2	3
5.6 - 6.0	1	2
6.1+	0	1
Soil Test Results N	Lbs/Acre 33-0-0 (or equivalent)	
	Legume and Grass Legume Mix	Grasses
0	200	250
15+	150	200
20+	100	150
Soil Test Results P1 test	Lbs/Acre 0-46-0 (or equivalent)	
	All Areas (Grasses and Legumes)	
5	250	
15	200	
25	150	
40+	0	
Soil Test Results K test	Lbs/Acre 0-46-0 (or equivalent)	
	All Areas (Grasses and Legumes)	
50	400	
100	300	
150	200	
200	0	

2. Rates of Seeding

Seed shall be sown during the specified season, or mitigating actions such as mulching shall be used to assure successful germination and provide erosion control. The seed should be drilled or broadcast and lightly covered by raking or dragging and firmed to assure good soil-seed contact. All legume-seed shall be inoculated with the proper nitrogen-fixing bacteria before seeding. Seeding-rates should be high enough to allow for a minimum coverage of 75 pure live seeds per square foot.

The recommended seed-mixtures in Table F-2 do not include the seed-rates in pounds per acre (lb/acre) of pure live seed (PLS), as some of the desired native species may not always be available, or cost-efficient when needed. Thus, other desirable native and non-native species could be made a part of a chosen seed-mix for the particular application and soil character. The PLS is determined by multiplying the percent of germination of the seed by the percent of purity. Both of the values are listed on the seed tag or label. For example, a batch of seed with germination of 84% and purity of 95% would be: 84% X 95%= 80% PLS. This means that in a 100-pound bag of seed, only 80 pounds would be viable seed. Thus, it would be necessary to apply bulk seed at 1 1/4 times the suggested PLS rate to achieve the desired PLS seeding-rate. To calculate the quantity of bulk seed

that must be sown to satisfy PLS requirements, divide the recommended PLS seeding-rate by the percent of PLS and multiply by 100.

Table F-2. Grass, forb/legume seed information.

Grass (cool season)	*	Shade Tolerance	Seeding-Rate (PLS) Lbs/acre (seeded alone)
Canada wild rye (<i>Elymus canadensis</i>)	P	MOD	15
June grass (<i>Koeleria cristata</i>)	P	INTOL	5
Orchardgrass (<i>Dactylis glomerata</i>)	P	VERY	8-10
Perennial ryegrass (<i>Lolium perenne</i>)	P	YES	8-10
Redtop (<i>Agrostis alba</i>)	P	MOD	4
Sedges (<i>Carex</i> spp.)	P	VAR	8
Timothy (<i>Phleum pratense</i>)	P	YES	8
Annual ryegrass	A	MOD	10-15
Wheat	A	MOD	120
Smooth brome grass (<i>Bromus inermis</i>)	P	MOD	8-10
Grass (warm season)	*	Site Condition	Seeding-Rate (PLS) Lbs/acre (seeded alone)
Big bluestem (<i>Andropogon gerardi</i>)	P	Well drained	10
Little bluestem (<i>Andropogon scoparius</i>)	P	Low fertility	10
Indian grass (<i>Sorghastrum nutans</i>)	P	Needs burns	10
Sideoats grama (<i>Bouteloua curtipendula</i>)	P	Shallow soils	10
Switchgrass (<i>Panicum virgatum</i>)	P	Wet and dry soils	6-8
Weeping lovegrass (<i>Eragrostis curvula</i>)	P	Acid tolerant	8
Eastern gama Grass	P	Wet and dry soils	12
Legumes/Forbs	*	Shade Tolerance	Seeding-Rate (PLS) Lbs/acre (seeded alone)
Red clover (<i>Trifolium pratense</i>)	B	MOD	8-12
Ladino (white) clover (<i>Trifolium repens</i>)	P	MOD	3
Alsike clover (<i>Trifolium hybridum</i>)	B	MOD	10
Korean lespedeza (<i>Lespedeza stipulacea</i>)	A	MOD	15-20
Dutch white clover	P	MOD	3
Partridge pea (<i>Cassia fasciculata</i>)	A	INTOL	12-15
Black-eyed Susan (<i>Rudbeckia subtomentosa</i>)	P	MOD	*
Illinois tick trefoil (<i>Desmodium illinoensis</i>)	P	MOD	*
Showy tick trefoil (<i>Desmodium canadense</i>)	P	INTOL	*
Slender bush clover (<i>Lespedeza virginica</i>)	P	MOD	*
Sunflower (<i>Helianthus grosseserratus</i>)	P	INTOL	10-12
Knotweeds (<i>Polygonum</i> spp.)	A	MOD	*

* P=perennial A=annual B=biennial

Native forbs are usually planted at a low rate (< 1 lb/acre), due to cost. Plant in a mixture with grasses or with a grass-legume mixture.

EXAMPLE: Assume Korean lespedeza has 80 percent PLS and recommended PLS seeding rate is 15 lb/acre.

$$(15/80) \times 100 = 19 \text{ lb/acre bulk seeding rate}$$

For severely eroded areas, the rate should be twice the recommended rate. On areas where a proper seedbed cannot be prepared, 1½ times the recommended rate should be applied.

Following are the recommended seed-types to be used for erosion control and wildlife applications. Specific rates for each seed-type are not given. This allows for a range of species to be used for different applications where some species may not be available or cost prohibitive.

An erosion-control mix, as found in Table F-3a, shall be used on critical areas where the main objective is to control erosion. For quick establishment, wheat or annual ryegrass should always be used as a companion crop in the mix. Also, fertilizer is recommended to enhance revegetation for erosion control.

The wildlife mixtures in Tables F-3b and F-3c focus on the soil character of a given area, such as our mesic to dry-upland sites, herbaceous openland areas and wetlands. The mixture rates can be determined by using Table F-2 and adjusting seeding rates according to the percentage make-up of the mix. The choice of plant species must meet the minimum coverage of 75 pure live seeds per square foot.

Example seeding mixture:

50 % orchardgrass 10 lb/acre (Table 7) x 50 % = 5 lb/acre
 25 % alsike clover 10 lb/acre “ x 25 % = 2.5 lb/acre
 25 % switchgrass 8 lb/acre x 25% = 2 lb/acre
 100%

Table F-3a. Erosion-control seed mix.

Winter wheat (seed at ½ to 1 bushel in a mixture) 1 bushel = 60 pounds	
Annual ryegrass	Redtop (<i>Agrostis alba</i>)
Switch grass (<i>Panicum virgatum</i>)	Partridge pea (<i>Cassia fasciculata</i>)
Orchard grass (<i>Dactylis glomerata</i>)	Timothy (<i>Phleum pratense</i>)
Korean lespedeza	Alsike clover

Table F-3b. Wildlife seed mix (moist to dry).

Indian grass (<i>Sorghastrum nutans</i>)	Switch grass (<i>Panicum virgatum</i>)
Canada wild rye (<i>Elymus canadensis</i>)	Big bluestem (<i>Andropogon gerardii</i>)
Little bluestem (<i>Andropogon scoparium</i>)	June grass (<i>Koeleria cristata</i>)
Eastern gama grass	Slender bush clover (<i>Lespedeza virginica</i>)
Round-headed bush clover (<i>Lespedeza capitata</i>)	Partridge pea (<i>Cassia fasciculata</i>)
Showy tick trefoil (<i>Desmodium canadense</i>)	Illinois tick trefoil (<i>Desmodium illinoensis</i>)
Ladino (white) clover (<i>Trifolium repens</i>)	Red clover (<i>Trifolium pratense</i>)
Korean lespedeza	

Table F-3b. Wildlife seed mix (moist to dry).

Alsike clover	Eastern gama grass
Switch grass (<i>Panicum virgatum</i>)	Canada wild rye (<i>Elymus canadensis</i>)
Slough grass (<i>Spartina pectinata</i>)	Sedges (<i>Carex</i> spp.)
Knotweeds (<i>Polygonum</i> spp.)	Black-eyed Susan (<i>Rudbeckia subtomentosa</i>)
Sunflower (<i>Helianthus grosseserratus</i>)	

3. Time of Seeding

The normal seeding dates for the erosion-control mix are from March 1 through May 31 and from August 1 through September 30. The seeding dates for the wildlife seed mix are from April 1 through June 30 and from August 1 through September 15.

Wheat or annual ryegrass should be added to the seeding mix for areas seeded after the normal spring seeding dates. The fall seeding dates can be extended to October 15 if wheat or annual ryegrass is added to the mixture. Clovers should not be planted after September 15.

If the disturbed area cannot be seeded before October 15, a temporary cover of 120 lbs/acre winter wheat should be planted and mulched, and the area reseeded with the appropriate seed mixture the following season. A new seedbed may be prepared before spring seeding, but late-winter frost-seeding can also be used. Re-vegetate and, if necessary, mulch disturbed areas as soon as possible following soil exposure.

Native warm season grasses and forbs can be dormant-seeded in November and December. It is recommended that dormant-seeding occur only on nearly level sites (<2 percent slopes). On more-sloping sites, no-till drills may be used in fields where existing residue or vegetation is sufficient to control erosion and is allowed to remain over winter.

4. Mulch

The application of mulch is desirable in most areas and essential for resource protection and/or successful establishment of vegetative cover in many areas. The purpose of mulch is to help reduce erosion and to make the site more favorable for vegetation establishment. Mulch intercepts direct rainfall, reduces runoff and crusting and increases infiltration. Mulching also provides a micro-climate favorable for seed germination and early growth by conserving soil moisture and buffers the soil from extreme temperature changes.

Wood chips, straw or other mulch material shall be placed immediately following soil exposure when needed to reduce soil erosion. Mulch should be applied immediately after seeding. When temporary erosion control is the objective, mulch may be applied anytime site conditions are suitable for spreading and anchoring. Bare areas should not be left over winter without mulch protection.

All areas to be mulched shall be free of rills and small gullies. Mulch shall be applied at the rate of 1 1/2 - 2 tons per acre (2 bales/1,000 sq. ft.) and provide 75 - 85% coverage of evenly distributed air dry straw, hay, wood chips or other suitable material. On extremely steep or high runoff areas, excelsior wood fiber mats, jute or other approved material may be used for added protection.

E. WATER-CONTROL PRACTICES

Direction for implementing practices for controlling excess water and minimizing erosion on roads, skid trails and log landings on the Forest can be found in the FS Handbook and/or the Illinois best-management practices. Water-control practices control erosion by shortening the

length of slope, and by reducing and redirecting the flow of water from areas of exposed soil, such as roads, skid trails, horse trails, ATV trails and log landings. Some practices are included in road design; they are constructed before logging operations begin. Others are constructed and maintained during operations or after hauling and skidding is completed.

After skid trails or haul roads are abandoned, natural drainage-ways should be opened to allow free flow. This will shorten the slope-length along the trail or road. Steep and/or long sections of road and trails should be water-barred before seeding.

The approaches (ingress and egress points) to stream-crossings should be hardened to reduce erosion and sedimentation into the streams. Check-dams can also be used to protect approaches. Streambeds themselves normally should not be hardened, in order to maintain normal stream flow. Small amounts of gravel from the streambeds can be used to harden approaches to stream-crossings, but should not be used to harden long trail segments beyond the crossings.

F. COMMON SOILS

Table F-4 lists the more commonly occurring soil-series of the Forest. Soil-management interpretations for watershed, timber and recreation management, rated by soil-map unit, are presented in Tables F-5 through F-7 for the most common soils.

Table F-4. Common soils of the Forest.

Soil Series	Series Symbol	Soil Series	Series Symbol
Alford	308	Hosmer	214
Baxter	599	Jacob	85
Beasley	691	Karnak	426
Bedford	598	Lax	628
Belknap	382	Manfro	79
Berks	955	Muskingum	425
Bonnie	108	Neotoma	977
Burnside	427	Sharon	72
Cairo	590	Wakeland	333
Clarksville	471	Ware	456
Elsah	475	Wellston	339
Grantsburg	301	Zanesville	340

The interpretive tables provide information on soil productivity, suitability and limitations for management of watershed, timber and recreation resources. Forest land-units to be interpreted are soil map-units. These interpretation-ratings were generated using the National Soil Survey Handbook (1993) part 620 soil interpretation rating guides, and the NASIS National Soil Information System (2003) version 5.1.1 developed by the USDA Natural Resource Conservation Service, Soil Survey Staff, Lincoln, Nebraska.

1. Forest Productivity

Table F-5 lists the soil-mapping units of the Forest, in numerical order. Soil mapping units are phases of soil series; soil series are groups of soils with horizons and properties similar in arrangement and characteristics, such as texture, pH, parent material and color. The map unit is usually an erosion and/or slope phase of the soil series. Site-index values for

the four tree species commonly found in southern Illinois are listed in Table F-5 for each soil map-unit for which they are adapted.

The table indicates prime timberland and prime farmland. Prime timberland is land that has soil capable of growing wood at the rate of 85 cubic feet or more/acre/year (at culmination of mean annual increment) in natural stands, and is not in urban or built-up land uses or water. Generally speaking, this is land currently in forest, but does not exclude qualifying lands that could realistically be returned to forest.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban, built-up, or water). It has the soil quality, growing season and moisture supply needed to produce an economically sustained high-yield of crops when treated and managed, including water management, according to acceptable farming methods. (These definitions are from USDA Regulation # 9500-003, March 22, 1983.)

Table F-5. Forest productivity.

Map Unit Symbol	Map Unit Name	Site Indices				Prime Timberland	Prime Farmland
		White Oak	Northern Red Oak	Eastern Cottonwood	Pin Oak		
79B	Menfro silt loam, 2 to 5 percent slopes	82	84			X	X
79C	Menfro silt loam, 5 to 10 percent slopes	75	77			X	
79C2	Menfro silt loam, 5 to 10 percent slopes, eroded	75	77			X	
79C3	Menfro silt loam, 5 to 10 percent slopes, severely eroded	69	71			X	
79D	Menfro silt loam, 10 to 18 percent slopes	70	71			X	
79D2	Menfro silt loam, 10 to 18 percent slopes, eroded	70	71			X	
79D3	Menfro silt loam, 10 to 18 percent slopes, severely eroded	62	64				
79E	Menfro silt loam, 18 to 25 percent slopes	66	68			X	
79 E2	Menfro silt loam, 18 to 25 percent slopes, eroded	61	62				
79 E3	Menfro silt loam, 18 to 25 percent slopes, severely eroded	55	56				
79F	Menfro silt loam, 25 to 35 percent slopes	53	54				
79G	Menfro silt loam, 35 to 70 percent slopes	39	40				
214B	Hosmer silt loam, 2 to 5 percent slopes	72	75			X	X
214C	Hosmer silt loam, 5 to 10 percent slopes	69	72			X	
214C2	Hosmer silt loam, 5 to 10 percent slopes, eroded	64	67			X	
214C3	Hosmer silt loam, 5 to 10 percent slopes, severely eroded	53	55				
214D	Hosmer silt loam, 10 to 18 percent slopes	64	67			X	
214D2	Hosmer silt loam, 10 to 18 percent slopes, eroded	58	61				
214D3	Hosmer silt loam, 10 to 18 percent slopes, severely eroded	48	49				
214 E2	Hosmer silt loam, 18 to 25 percent slopes, eroded	52	54				
301B	Grantsburg silt loam, 2 to 5 percent slopes	70	73			X	X
301C	Grantsburg silt loam, 5 to 10 percent slopes	68	70			X	
301C2	Grantsburg silt loam, 5 to 10 percent slopes, eroded	63	65			X	
301C3	Grantsburg silt loam, 5 to 10 percent slopes, severely eroded	51	53				
301D	Grantsburg silt loam, 10 to 18 percent slopes	63	65			X	
301D2	Grantsburg silt loam, 10 to 18 percent slopes, eroded	57	59				
301D3	Grantsburg silt loam, 10 to 18 percent slopes, severely eroded	46	48				

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Map Unit Symbol	Map Unit Name	Site Indices				Prime Timberland	Prime Farmland
		White Oak	Northern Red Oak	Eastern Cottonwood	Pin Oak		
308B	Alford silt loam, 2 to 5 percent slopes	77	78			X	X
308B2	Alford silt loam, 2 to 5 percent slopes, eroded	74	75			X	X
308C	Alford silt loam, 5 to 10 percent slopes	75	76			X	
308C2	Alford silt loam, 5 to 10 percent slopes, eroded	72	73			X	
308C3	Alford silt loam, 5 to 10 percent slopes, severely eroded	66	66			X	
308D	Alford silt loam, 10 to 18 percent slopes	70	71			X	
308D2	Alford silt loam, 10 to 18 percent slopes, eroded	66	67			X	
308D3	Alford silt loam, 10 to 18 percent slopes, severely eroded	59	60				
308E	Alford silt loam, 18 to 25 percent slopes	64	65			X	
308 E2	Alford silt loam, 18 to 25 percent slopes, eroded	58	59				
308 E3	Alford silt loam, 18 to 25 percent slopes, severely eroded	52	53				
308F	Alford silt loam, 18 to 35 percent slopes	50	51				
308F2	Alford silt loam, 25 to 35 percent slopes, eroded	45	46				
308G	Alford silt loam, 35 to 70 percent slopes	37	37				
339B	Wellston silt loam, 2 to 5 percent slopes	69	71			X	
339C	Wellston silt loam, 5 to 10 percent slopes	67	68			X	
339C2	Wellston silt loam, 5 to 10 percent slopes, eroded	62	63				
339C3	Wellston silt loam, 5 to 10 percent slopes, severely eroded	51	53				
339D	Wellston silt loam, 10 to 18 percent slopes	62	63				
339D2	Wellston silt loam, 10 to 18 percent slopes, eroded	56	58				
339D3	Wellston silt loam, 10 to 18 percent slopes, severely eroded	46	47				
339 E2	Wellston silt loam, 18 to 25 percent slopes, eroded	50	51				
339F	Wellston silt loam, 18 to 35 percent slopes	43	45				
340B	Zanesville silt loam, 2 to 5 percent slopes	72	70			X	
340C2	Zanesville silt loam, 5 to 10 percent slopes, eroded	64	62				
340C3	Zanesville silty clay loam, 5 to 10 percent slopes, severely eroded	53	51				

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Map Unit Symbol	Map Unit Name	Site Indices				Prime Timberland	Prime Farmland
		White Oak	Northern Red Oak	Eastern Cottonwood	Pin Oak		
340D	Zanesville silt loam, 10 to 18 percent slopes	64	62				
340D2	Zanesville silt loam, 10 to 18 percent slopes, eroded	58	57				
340D3	Zanesville silty clay loam, 10 to 18 percent slopes, severely eroded	48	46				
471D2	Clarksville cherty silt loam, 10 to 18 percent slopes, eroded	54	63				
471D3	Clarksville cherty silt loam, 10 to 18 percent slopes, severely eroded	44	51				
471F	Clarksville cherty silt loam, 18 to 25 percent slopes	52	62				
471G	Clarksville cherty silt loam, 35 to 70 percent slopes	30	35				
598B	Bedford silt loam, 2 to 5 percent slopes	67	73			X	
598C	Bedford silt loam, 5 to 10 percent slopes	64	72			X	
598C2	Bedford silt loam, 5 to 10 percent slopes, eroded	62	69			X	
598C3	Bedford silt loam, 5 to 10 percent slopes, severely eroded	56	63				
598D	Bedford silt loam, 10 to 18 percent slopes	60	68			X	
598D2	Bedford silt loam, 10 to 18 percent slopes, eroded	57	64				
598D3	Bedford silt loam, 10 to 18 percent slopes, severely eroded	51	57				
598 E2	Bedford silt loam, 18 to 25 percent slopes, eroded	50	56				
599D	Baxter cherty silt loam, 10 to 18 percent slopes	66	71			X	
599F	Baxter cherty silt loam, 18 to 25 percent slopes	59	64				
599G	Baxter cherty silt loam, 35 to 70 percent slopes	34	37				
628D	Lax silt loam, 10 to 18 percent slopes	64	70			X	
628D3	Lax silt loam, 10 to 18 percent slopes, severely eroded	54	59				
628 E2	Lax silt loam, 18 to 25 percent slopes, eroded	53	58				
691C	Beasley silt loam, 5 to 10 percent slopes	65	58			X	
691C2	Beasey silt loam, 5 to 10 percent slopes, eroded	62	55				
691D	Beasley silt loam, 10 to 18 percent slopes	61	54				
691D2	Beasley silt loam, 12 to 18 percent slopes, eroded	58	51				
691E	Beasley silt loam, 18 to 35 percent slopes	48	42				
691F	Beasley silt loam, 18 to 35 percent slopes	46	41				

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Map Unit Symbol	Map Unit Name	Site Indices				Prime Timberland	Prime Farmland
		White Oak	Northern Red Oak	Eastern Cottonwood	Pin Oak		
691G	Beasley silt loam, 35 to 70 percent slopes	32	28				
852F	Alford-Wellston Complex, 18 to 35 percent slopes	54	55				
852G	Alford-Wellston Complex, 35 to 70 percent slopes	34	35				
930G	Goss-Alford Complex, 35 to 70 percent slopes	30	37				
940D	Zanesville-Westmore silt loams, 10 to 18 percent slopes	64	63				
953D2	Hosmer-Lax silt loams, 10 to 18 percent slopes, eroded	58	61				
953D3	Hosmer-Lax silt loams, 10 to 18 percent slopes, severely eroded	48	49				
953 E2	Hosmer-Lax silt loams, 18 to 35 percent, eroded	44	46				
954D	Alford-Baxter Complex, 10 to 18 percent slopes	70	71			X	
954D2	Alford-Baxter Complex, 10 to 18 percent slopes, eroded	66	67			X	
954 E2	Alford-Baxter Complex, 18 to 35 percent slopes, eroded	49	50				
954F	Alford-Baxter Complex, 18 to 35 percent slopes	58	59				
955D	Muskingum and Berks soils, 10 to 18 percent slopes	51	60				
955D2	Muskingum and Berks soils, 10 to 18 percent slopes, eroded	46	54				
955F	Muskingum-Berks soils, 18 to 35 percent slopes	39	46				
955G	Muskingum-Berks soils, 35 to 70 percent slopes	26	30				
986D	Wellston-Berks Complex, 10 to 18 percent slopes	62	63				
986D2	Wellston-Berks Complex, 10 to 18 percent slopes, eroded	56	58				
986D3	Wellston-Berks Complex, 10 to 18 percent slopes, severely eroded	46	47				
986F	Wellston-Berks Complex, 18 to 35 percent slopes	48	50				
986G	Berks-Wellston Complex, 35 to 70 percent slopes	31	32				
1845A	Darwin, undrained frequently flooded			87	79		
1845A	Jacob, undrained, frequently flooded			87	79		
3072A	Sharon silt loam, 0 to 2 percent slopes, frequently flooded			103	93	X	
3108A	Bonnie silt loam, 0 to 2 percent slopes, frequently flooded			100	90	X	
3333A	Wakeland silt loam, 0 to 2 percent slopes, frequently flooded			99	90	X	
3382A	Belknap silt loam, 0 to 2 percent slopes, frequently flooded			102	92	X	

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Map Unit Symbol	Map Unit Name	Site Indices				Prime Timberland	Prime Farmland
		White Oak	Northern Red Oak	Eastern Cottonwood	Pin Oak		
3456BL	Ware loam, 1 to 6 percent slopes, frequently flooded, long duration			103	93	X	
3590A	Cairo silty clay, 0 to 2 percent slopes, frequently flooded (inside levee)			97	87		
8427B	Burnside silt loam, 1 to 4 percent slopes, occasionally flooded			114	102	X	X
8456B	Ware loam, 1 to 6 percent slopes, occasionally flooded			102	92	X	X
8475B	Elsah silt loam, 1 to 5 percent slopes, occasionally flooded			97	87		X
8590A	Cairo silty clay, 0 to 2 percent slopes, occasionally flooded (outside levee)			97	87		
	Prime Timberland (Somewhat poorly, Moderately Well, Well and Excessively Drained Soils)						
	Site Index > 65 for White or Red Oak						
	Prime Timberland (Very Poorly, Poorly and Somewhat Poorly Drained Soils)						
	Site Index > 90 for Pin Oak						

References: Bulletin 810, Average Crop, Pasture and Forestry Productivity Ratings for Illinois Soils, University of Illinois; woodland ordination symbols and woodland suitability tables from soil survey reports; Soil Survey Report for Pope, Hardin and Massac Counties, Illinois; Soil Survey Report for Jackson County, Illinois; Soil Survey Report for Union County, Illinois; FSH 1909.15 NEPA Procedures Handbook Shawnee Supplement 12.6—1; Important Farmlands Correlated Soil Mapping Units in Illinois that qualify as Prime Farmland USDA Soil Conservation Service 1988.

2. Forest Management

Table F-6 relates to timber-harvesting activities, including haul roads and major skid trail location, log-landing locations and equipment operability. The following describes the information found in this table.

a. Haul Roads and Major Skid Trails

This rating indicates the degree and kind of limitations for the location and construction of haul roads, and the location of major skid trails associated with timber-harvesting activities. These ratings apply primarily to low-standard haul roads, but should also be indicative of problems and relative costs associated with higher-standard roads.

Considerable soil compaction can be expected on haul roads and major skid trails. Soils are rated on the properties that influence traffic-ability and use of hauling equipment. The properties considered are strength, texture, Unified and AASHTO groups, depth to bedrock, duration of water table, drainage, flooding, slope, surface stoniness, rock outcrops, erodibility and stability. Strength affects traffic-ability and erodibility.

The degree of limitation is rated as slight, moderate, or severe according to the following definitions:

- Slight – No serious limitations to location, construction, long-term maintenance, season of use, or returning the area to forest production;
- Moderate – There are some limitations that can be overcome through the application of routine construction techniques. Initial location, construction and/or maintenance costs will be higher than if the rating is slight. Temporary facilities locations may be more difficult to return to desired condition than if rated slight. Season of use may be somewhat limited.
- Severe – There are some limitations that would require the application of extraordinary and/or expensive techniques to overcome. Location, construction and/or maintenance costs would be high, or season of use may be severely restricted. There may be significant risk of environmental damage from constructing roads or locating trails on these areas unless special design and construction techniques are used. Temporary road and trail locations may be difficult or impossible to return to a desired condition.

The limiting site characteristic(s) is/are listed for the corresponding limitation rating.

b. Log-Landing Location

This rating indicates the soil map-units' suitability for log-landing locations. This rating is intended to be a guide to the relative physical suitability of alternative locations. Soils are rated on the properties that influence traffic-ability and the use of hauling and loading equipment.

Soil properties considered are strength, slope, stoniness, depth to bedrock, drainage class, wetness, flooding and stability. Slope affects equipment use, cut and fill requirements and erodibility. Large stones and boulders affect equipment operability, configuration and the location of landings. Wetness and flooding affect the frequency and duration of landing use. Strength is related to soil texture that affects erodibility and traffic-ability. Stability reflects the potential for slippage or mass movement during and following use.

Suitability is rated as well-suited, moderately suited, or poorly suited according to the following definitions:

- Well-Suited – Little or no restrictions to road or log-landing location, season of use or returning the area to forest production.
- Moderately Suited – One or more restrictions reduce site suitability. Usually more difficult to return to forest production or season of use may be restricted.
- Poorly Suited – One or more restrictions generally make the use of the site for a landing very difficult. May be difficult to return to desired condition and season of use may be severely restricted. Costs of establishment and maintenance could be high.

The limiting site characteristic(s) is/are listed for the corresponding suitability rating.

c. Equipment Operability for Logging Areas

Logging area refers to the general area from the stump to a major skid trail. The well-suited, moderately suited and poorly suited ratings apply primarily to rubber-tired skidders. Soils are rated on the properties that influence traffic-ability, erodibility and stability. The site characteristics considered are slope, stability, wetness, drainage, stoniness and surface texture.

Suitability is rated as well suited, moderately suited, or poorly suited according to the following definitions:

- Well-Suited – Little or no restrictions to equipment operability. There are few if any restrictions on time of operation or type of equipment.
- Moderately Suited – One or more restrictions reduce the effective and safe use of equipment. Kind of equipment and/or time of operation are restricted.
- Poorly Suited – One or more restrictions generally make the use of equipment impractical or unsafe. Special equipment and/or techniques are needed and/or time of efficient operation is very limited.

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Table F-6. Forest management.

Map Unit Symbol and Soil Name	Limitation of Haul Roads and Major Skid Trails Rating class and limiting feature	Suitability of Log Landings Rating class and limiting features	Suitability of equipment operability Rating class and limiting features
79B:			
Menfro-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
79C:			
Menfro-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
79C2			
Menfro, eroded-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
79C3:			
Menfro, severely eroded-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
79D:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
79D2:			
Menfro, eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
79D3:			
Menfro, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
79E:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
79E2:			
Menfro, eroded-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
79E3:			
Menfro, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
79F:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
79G:			
Menfro-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
214B:			
Hosmer-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
214C:			
Hosmer-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
214C2:			
Hosmer, eroded----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
214C3:			
Hosmer, severely eroded-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
214D:			
Hosmer-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
214D2:			
Hosmer, eroded----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
214D3:			
Hosmer, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
301B:			
Grantsburg-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
301C:			
Grantsburg-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
301C2:			
Grantsburg-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
301C3:			
Grantsburg, severely eroded-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
301D:			
Grantsburg-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
301D2:			
Grantsburg, eroded-	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
301D3:			
Grantsburg, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
308B:			

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
Alford-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
308C:			
Alford-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
308C2:			
Alford, eroded----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
308C3:			
Alford, severely eroded-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
308D:			
Alford-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
308D2:			
Alford, eroded----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
308D3:			
Alford, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
308E:			
Alford-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
308E2:			
Alford, eroded----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
308E3:			
Alford, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
308F:			
Alford-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
339B:			
Wellston-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
339C:			
Wellston-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
339C2:			
Wellston, eroded---	Moderate	Moderately suited	Moderately suited
	Restrictive layer	Strength	Strength
	Strength	Slope	

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
339C3:			
Wellston, severely eroded-----	Moderate	Moderately suited	Moderately suited
	Restrictive layer	Strength	Strength
	Strength	Slope	
339D:			
Wellston-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
339D2:			
Wellston, eroded---	Moderate	Poorly suited	Moderately suited
	Restrictive layer	Slope	Strength
	Strength	Strength	
339D3:			
Wellston, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Restrictive layer	Slope	Strength
	Strength	Strength	
339F:			
Wellston-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Restrictive layer	Strength	Slope
	Strength		
340B:			
Zanesville-----	Moderate	Moderately suite	Moderately suited
	Strength	Strength	Strength
340C2:			
Zanesville, eroded--	Moderate	Moderately suite	Moderately suited
	Strength	Strength	Strength
		Slope	
340C3:			
Zanesville, severely eroded-----	Moderate	Moderately suite	Moderately suited
	Strength	Strength	Strength
		Slope	
340D:			
Zanesville-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
340D2:			
Zanesville, eroded-	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
340D3:			
Zanesville-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
471D2:			
Clarksville, eroded-	Slight	Poorly suited	Well suited
		Slope	
471D3:			
Clarksville, severely eroded---	Slight	Poorly suited	Well suited
		Slope	
471F:			
Clarksville-----	Moderate	Poorly suited	Moderately suited

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
	Stickiness/slope	Slope	Slope
471G:			
Clarksville-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
598B:			
Bedford-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Wetness	
598C:			
Bedford-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
		Wetness	
598C2:			
Bedford, eroded----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
		Wetness	
598C3:			
Bedford, severely eroded-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
		Slope	
		Wetness	
598D:			
Bedford-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
		Wetness	
598D2:			
Bedford, eroded----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
		Wetness	
598D3:			
Bedford, severely eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
		Wetness	
599D:			
Baxter-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
599F:			
Baxter-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
599G:			
Baxter-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
691C:			
Beasley-----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
	Stickiness/slope	Slope	

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
691C2:			
Beasley, eroded----	Moderate	Moderately suited	Moderately suited
	Strength	Strength	Strength
	Stickiness/slope	Slope	Stickiness
		Stickiness	
691D:			
Beasley-----	Moderate	Poorly suited	Moderately suited
	Stickiness/slope	Slope	Strength
	Strength	Strength	
691D2:			
Beasley, eroded----	Moderate	Poorly suited	Moderately suited
	Stickiness/slope	Slope	Strength
	Strength	Strength	Stickiness
		Stickiness	
691F:			
Beasley-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Stickiness/slope	Strength	Slope
	Strength		
691G:			
Beasley-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
692D:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Wellston-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
692D2:			
Menfro, eroded----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Wellston, eroded---	Moderate	Poorly suited	Moderately suited
	Restrictive layer	Slope	Strength
	Strength	Strength	
692F:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Strength	Strength	Slope
Wellston-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Restrictive layer	Strength	Slope
	Strength		
694D:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Baxter-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
694D2:			
Menfro, eroded----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Baxter, eroded----	Moderate	Poorly suited	Moderately suited

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
	Strength	Slope	Strength
		Strength	
694F:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
Baxter-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
717F:			
Stookey-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
Clarksville-----	Moderate	Poorly suited	Moderately suited
	Stickiness/slope	Slope	Slope
717G:			
Clarksville-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
Stookey-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
832F:			
Menfro-----	Moderate	Poorly suited	Moderately suited
		Strength	Slope
Clarksville-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Slope
	Stickiness/slope		
832G:			
Clarksville-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
Menfro-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
833F:			
Menfro-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
Goss-----	Moderate	Poorly suited	Moderately suited
	Stickiness/slope	Strength	Slope
		Slope	
833G:			
Goss-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
		Strength	Strength
Menfro-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
834D:			
Wellston-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Westmore-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
834D2:			
Wellston, eroded---	Moderate	Poorly suited	Moderately suited

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
	Restrictive layer	Slope	Strength
	Strength	Strength	
Westmore, eroded--	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
834F:			
Wellston-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Restrictive layer	Strength	Slope
	Strength		
Westmore-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
834G:			
Wellston-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
Westmore-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
940D:			
Westmore-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Zanesville-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
940D2:			
Westmore, eroded--	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Zanesville, eroded-	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
954D:			
Alford-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Baxter-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
954D2:			
Alford, eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Baxter, eroded-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
954F:			
Alford-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Strength	Strength	Slope
Baxter-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
	Strength	Strength	Slope
955D:			
Muskingum-----	Moderate	Poorly suited	Moderately suited
	Restrictive layer	Slope	Strength
	Strength	Strength	
Berks-----	Severe	Poorly suited	Well suited
	Stoniness	Slope	
955D2:			
Muskingum, eroded--	Moderate	Poorly suited	Moderately suited
	Restrictive layer	Slope	Strength
	Strength	Strength	
Berks, eroded-----	Severe	Poorly suited	Well suited
	Stoniness	Slope	
955F:			
Muskingum-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Restrictive layer	Strength	Slope
	Strength		
Berks-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Slope
955G:			
Muskingum-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
Berks-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
977F:			
Neotoma-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Slope
	Restrictive layer		
Wellston-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Restrictive layer	Strength	Slope
	Strength		
977G:			
Neotoma-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
Wellston-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
986D:			
Wellston-----	Moderate	Poorly suited	Moderately suited
	Strength	Slope	Strength
		Strength	
Berks-----	Severe	Poorly suited	Well suited
	Stoniness	Slope	
986D2:			
Wellston, eroded---	Moderate	Poorly suited	Moderately suited
	Restrictive layer	Slope	Strength
	Strength	Strength	
Berks, eroded-----	Severe	Poorly suited	Well suited
	Stoniness	Slope	
986D3:			
Wellston, severely eroded-----	Moderate	Poorly suited	Moderately suited

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Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
	Restrictive layer	Slope	Strength
	Strength	Strength	
Berks, severely eroded-----			
	Severe	Poorly suited	Well suited
	Stoniness	Slope	
986F:			
Wellston-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Strength
	Restrictive layer	Strength	Slope
	Strength		
Berks-----	Moderate	Poorly suited	Moderately suited
	Slope	Slope	Slope
986G:			
Wellston-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
	Strength	Strength	Strength
Berks-----	Severe	Poorly suited	Poorly suited
	Slope	Slope	Slope
1845A:			
Darwin, undrained, frequently flooded-			
	Severe	Poorly suited	Poorly suited
	Flooding	Ponding	Wetness
	Wetness	Flooding	Strength
	Strength	Strength	Stickiness
	Stickiness/slope	Wetness	
		Stickiness	
Jacob, undrained, frequently flooded-			
	Severe	Poorly suited	Poorly suited
	Flooding	Ponding	Wetness
	Wetness	Flooding	Strength
	Stickiness/slope	Stickiness	Stickiness
	Strength	Strength	
		Wetness	
3072A:			
Sharon-----	Severe	Poorly suited	Moderately suited
	Flooding	Flooding	Strength
	Strength	Strength	
3108A:			
Bonnie-----	Severe	Poorly suited	Poorly suited
	Flooding	Ponding	Wetness
	Wetness	Flooding	Strength
	Strength	Strength	
		Wetness	
3333A:			
Wakeland, frequently flooded-----			
	Severe	Poorly suited	Moderately suited
	Flooding	Flooding	Strength
	Strength	Strength	
		Wetness	
3382A:			
Belknap-----	Severe	Poorly suited	Moderately suited
	Flooding	Flooding	Strength
	Strength	Strength	
		Wetness	
3426A:			

Map Unit Symbol	Limitation of Haul Roads and Major Skid Trails	Suitability of Log Landings	Suitability of equipment operability
Karnak, frequently flooded-----	Severe	Poorly suited	Poorly suited
	Flooding	Ponding	Wetness
	Wetness	Flooding	Strength
	Strength	Strength	Stickiness
	Stickiness/slope	Wetness	
		Stickiness	
3590A:			
Cairo, frequently flooded-----	Severe	Poorly suited	Poorly suited
	Flooding	Ponding	Wetness
	Wetness	Flooding	Strength
	Stickiness/slope	Stickiness	Stickiness
	Strength	Strength	
		Wetness	
8427B:			
Burnside, occasionally flooded-----	Severe	Poorly suited	Moderately suited
	Flooding	Flooding	Strength
	Strength	Strength	
8456B:			
Ware, occasionally flooded-----	Severe	Poorly suited	Well suited
	Flooding	Flooding	
8475B:			
Elsah, occasionally flooded-----	Severe	Poorly suited	Moderately suited
	Flooding	Flooding	Strength
	Strength	Strength	

3. Mechanized Site Preparation and Prescribed Burning

Table F-7 rates the soil-mapping units for the forest management activities of mechanized site preparation and prescribed burning.

a. Mechanized Site Preparation and Planting Suitability

This column of Table F-7 shows the rating of suitability of the soil map-unit to mechanized operations, such as site preparation, planting and/or row seeding. Ratings are based on soil characteristics favorable to efficient equipment operation, and hazards to the site from the operation of equipment. They are based on the assumption that operating techniques do not displace or remove topsoil from the site, or create channels to concentrate storm runoff. Planting and row seeding equipment should be operated on the contour as much as possible, to minimize channeling of storm runoff.

There are many different methods and kinds of equipment used to prepare a site for regeneration. Most of the mechanical methods and techniques result in some soil disturbance. The degree of soil disturbance needed to achieve regeneration objectives varies according to species, regeneration methods and site conditions, and according to kind of equipment, how it is operated and the soil site conditions at the time of operation.

Suitability is rated as well suited, poorly suited and unsuited, according to the following definitions:

- Well-suited – Little or no restrictions to surface mechanical site preparation.
- Poorly suited – One or more restrictions reduce the effective and safe use of equipment.
- Unsuited – One or more restrictions generally prevent the effective and safe use of equipment.

The restricting site characteristic(s) is/are listed for the corresponding suitability rating.

b. Prescribed Burning

Prescribed burning may be used for fuel reduction, for slash disposal during site preparation, for wildlife habitat improvement, to reduce or eliminate plant competition, to prepare a seedbed, to release seeds, or for any combination of these objectives. The application of prescribed fire can be manipulated by season, soil-moisture content, wind-fire relationships, fuel conditions, etc. Research has shown both beneficial and adverse effects of fire on soils. Generally, the adverse effects are related to the intensity and duration of heat at the soil surface; the higher the temperature and the longer the duration, the more adverse the effect. Prescribed fires are usually low in intensity with high soil moisture conditions. Most adverse effects are associated with uncontrolled wildfires.

The degree of limitation is rated slight, moderate, or severe according to the following definitions:

- Slight – No special precautions needed. Prescribed fire will not normally result in significant adverse impacts.
- Moderate – In order to avoid significant adverse impacts, more care is required to plan, schedule and conduct prescribed burns under conditions of lower air temperatures, higher soil moisture conditions, etc.
- Severe – Burning on these sites runs a risk of significant long-term adverse effects on the site unless accompanied by extraordinary mitigation measures to minimize the duration and intensity of surface heating.

The limiting site characteristic(s) is/are listed for the corresponding limitation rating.

Table F-7. Mechanized Site Preparation and Prescribed Fire.

Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
	Rating class and limiting feature	Rating class and limiting feature
79B		
Menfro-----	Well suited	Slight
79C:		
Menfro-----	Well suited	Slight
79C2:		
Menfro, eroded-----	Well suited	Slight
79C3:		
Menfro, severely eroded-----	Well suited	Slight
79D:		

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Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
Menfro-----	Well suited	Slight
79D2:		
Menfro, eroded-----	Well suited	Slight
79D3:		
Menfro, severely eroded-----	Well suited	Slight
79E:		
Menfro-----	Poorly suited Slope	Slight
79E2:		
Menfro, eroded-----	Poorly suited Slope	Slight
79E3:		
Menfro, severely eroded-----	Poorly suited Slope	Slight
79F:		
Menfro-----	Poorly suited Slope	Slight
79G:		
Menfro-----	Unsuited Slope	Moderate Slope
214B:		
Hosmer-----	Well suited	Slight
214C:		
Hosmer-----	Well suited	Slight
214C2:		
Hosmer, eroded-----	Well suited	Slight
214C3:		
Hosmer, severely eroded-----	Well suited	Slight
214D:		
Hosmer-----	Well suited	Slight
214D2:		
Hosmer, eroded-----	Well suited	Slight
214D3:		
Hosmer, severely eroded-----	Well suited	Slight
301B:		
Grantsburg-----	Well suited	Slight
301C:		
Grantsburg-----	Well suited	Slight
301C2:		
Grantsburg-----	Well suited	Slight
301C3:		
Grantsburg, severely eroded-----	Well suited	Slight
301D:		
Grantsburg-----	Well suited	Slight
301D2:		
Grantsburg, eroded--	Well suited	Slight
301D3:		
Grantsburg, severely eroded-----	Well suited	Slight
308B:		
Alford-----	Well suited	Slight
308C:		
Alford-----	Well suited	Slight

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Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
308C2:		
Alford, eroded-----	Well suited	Slight
308C3:		
Alford, severely eroded-----	Well suited	Slight
308D:		
Alford-----	Well suited	Slight
308D2:		
Alford, eroded-----	Well suited	Slight
308D3:		
Alford, severely eroded-----	Well suited	Slight
308E:		
Alford-----	Poorly suited Slope	Slight
308E2:		
Alford, eroded-----	Poorly suited Slope	Slight
308E3:		
Alford, severely eroded-----	Poorly suited Slope	Slight
308F:		
Alford-----	Poorly suited Slope	Slight
339B:		
Wellston-----	Well suited	Slight
339C:		
Wellston-----	Well suited	Slight
339C2:		
Wellston, eroded---	Well suited	Slight
339C3:		
Wellston, severely eroded-----	Well suited	Slight
339D:		
Wellston-----	Well suited	Slight
339D2:		
Wellston, eroded---	Well suited	Slight
339D3:		
Wellston, severely eroded-----	Well suited	Slight
339F:		
Wellston-----	Poorly suited Slope	Slight
340B:		
Zanesville-----	Well suited	Slight
340C2:		
Zanesville, eroded--	Well suited	Slight
340C3:		
Zanesville, severely eroded-----	Well suited	Slight
340D:		
Zanesville-----	Well suited	Slight
340D2:		
Zanesville, eroded--	Well suited	Slight
340D3:		
Zanesville-----	Well suited	Slight

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Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
471D2:		
Clarksville, eroded-	Well suited	Moderate
		Somewhat Excessive
		Drainage
471D3:		
Clarksville,		
severely eroded----	Well suited	Moderate
		Somewhat Excessive
		Drainage
471F:		
Clarksville-----	Poorly suited	Moderate
	Slope	Somewhat Excessive
		Drainage
471G:		
Clarksville-----	Unsuited	Moderate
	Slope	Somewhat Excessive
		Drainage
		Slope
598B:		
Bedford-----	Well suited	Slight
598C:		
Bedford-----	Well suited	Slight
598C2:		
Bedford, eroded----	Well suited	Slight
598C3:		
Bedford, severely eroded-----	Well suited	Slight
598D:		
Bedford-----	Well suited	Slight
598D2:		
Bedford, eroded----	Well suited	Slight
598D3:		
Bedford, severely eroded-----	Well suited	Slight
599D:		
Baxter-----	Well suited	Slight
599F:		
Baxter-----	Poorly suited	Slight
	Slope	
599G:		
Baxter-----	Unsuited	Moderate
	Slope	Slope
691C:		
Beasley-----	Well suited	Moderate
		Root Restriction
691C2:		
Beasley, eroded----	Well suited	Moderate
		Root Restriction
691D:		
Beasley-----	Well suited	Moderate
		Root Restriction
691D2:		
Beasley, eroded----	Well suited	Moderate
		Root Restriction
691F:		
Beasley-----	Poorly suited	Moderate
	Slope	Root Restriction
691G:		

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Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
Beasley-----	Unsuited	Moderate
	Slope	Slope
		Root Restriction
692D:		
Menfro-----	Well suited	Slight
Wellston-----	Well suited	Slight
692D2:		
Menfro, eroded-----	Well suited	Slight
Wellston, eroded----	Well suited	Slight
692F:		
Menfro-----	Poorly suited	Slight
	Slope	
Wellston-----	Poorly suited	Slight
	Slope	
694D:		
Menfro-----	Well suited	Slight
Baxter-----	Well suited	Slight
694D2:		
Menfro, eroded-----	Well suited	Slight
Baxter, eroded-----	Well suited	Slight
694F:		
Menfro-----	Poorly suited	Slight
	Slope	
Baxter-----	Poorly suited	Slight
	Slope	
717F:		
Stookey-----	Poorly suited	Slight
	Slope	
Clarksville-----	Poorly suited	Moderate
	Slope	Somewhat Excessive
		Drainage
717G:		
Clarksville-----	Unsuited	Moderate
	Slope	Somewhat Excessive
		Drainage
		Slope
Stookey-----	Unsuited	Moderate
	Slope	Slope
Menfro-----	Poorly suited	Slight
	Slope	
Clarksville-----	Poorly suited	Moderate
	Slope	Somewhat Excessive
		Drainage
832G:		
Clarksville-----	Unsuited	Moderate
	Slope	Somewhat Excessive
		Drainage
		Slope
Menfro-----	Unsuited	Moderate
	Slope	Slope
833F:		
Menfro-----	Poorly suited	Slight
	Slope	
Goss-----	Poorly suited	Slight
	Slope	
833G:		
Goss-----	Unsuited	Moderate
	Slope	Slope

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Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
Menfro-----	Unsuited	Moderate
	Slope	Slope
834D:		
Wellston-----	Well suited	Slight
Westmore-----	Well suited	Slight
834D2:		
Wellston, eroded----	Well suited	Slight
Westmore, eroded----	Well suited	Slight
834F:		
Wellston-----	Poorly suited	Slight
	Slope	
Westmore-----	Poorly suited	Slight
	Slope	
834G:		
Wellston-----	Unsuited	Moderate
	Slope	Slope
Westmore-----	Unsuited	Moderate
	Slope	Slope
940D:		
Westmore-----	Well suited	Slight
Zanesville-----	Well suited	Slight
940D2:		
Westmore, eroded----	Well suited	Slight
Zanesville, eroded--	Well suited	Slight
954D:		
Alford-----	Well suited	Slight
Baxter-----	Well suited	Slight
954D2:		
Alford, eroded-----	Well suited	Slight
Baxter, eroded-----	Well suited	Slight
954F:		
Alford-----	Poorly suited	Slight
	Slope	
Baxter-----	Poorly suited	Slight
	Slope	
955D:		
Muskingum-----	Well suited	Moderate
		Root Restriction
Berks-----	Well suited	Moderate
		Root Restriction
955D2:		
Muskingum, eroded---	Well suited	Moderate
		Root Restriction
Berks, eroded-----	Well suited	Moderate
		Root Restriction
955F:		
Muskingum-----	Poorly suited	Moderate
	Slope	Root Restriction
Berks-----	Poorly suited	Moderate
	Slope	Root Restriction
955G:		
Muskingum-----	Unsuited	Moderate
	Slope	Slope
		Root Restriction
Berks-----	Unsuited	Moderate
	Slope	Slope
		Root Restriction
977F:		

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Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
Neotoma-----	Poorly suited	Slight
	Slope	
Wellston-----	Poorly suited	Slight
	Slope	
977G:		
Neotoma-----	Unsuited	Moderate
	Slope	Slope
Wellston-----	Unsuited	Moderate
	Slope	Slope
986D:		
Wellston-----	Well suited	Slight
Berks-----	Well suited	Moderate
		Root Restriction
986D2:		
Wellston, eroded----	Well suited	Slight
Berks, eroded-----	Well suited	Moderate
		Root Restriction
986D3:		
Wellston, severely eroded-----	Well suited	Slight
Berks, severely eroded-----	Well suited	Moderate
		Root Restriction
986F:		
Wellston-----	Poorly suited	Slight
	Slope	
Berks-----	Poorly suited	Moderate
	Slope	Root Restriction
986G:		
Wellston-----	Unsuited	Moderate
	Slope	Slope
Berks-----	Unsuited	Moderate
	Slope	Slope
		Root Restriction
1845A:		
Darwin, undrained, frequently flooded-	Unsuited	Slight
	Wetness	
Jacob, undrained, frequently flooded-	Unsuited	Slight
	Wetness	
3072A:		
Sharon-----	Well suited	Slight
3108A:		
Bonnie-----	Unsuited	Slight
	Wetness	
3333A:		
Wakeland, frequently flooded-----	Well suited	Slight
3382A:		
Belknap-----	Well suited	Slight
3426A:		
Karnak, frequently flooded-----	Unsuited	Slight
	Wetness	
3590A:		
Cairo, frequently		

Map symbol and soil name	Suitability for Mechanized Site Preparation	Limitation of Prescribed Burning
flooded-----	Unsuited	Slight
	Wetness	
8427B:		
Burnside,		
occasionally		
flooded-----	Well suited	Slight
8456B:		
Ware, occasionally		
flooded-----	Well suited	Slight
8475B:		
Elsah, occasionally		
flooded-----	Well suited	Slight

4. Forest Roads and Trails

Table F-8 displays Forest soils and the rating of their ability to support and sustain natural-surface trails and roads without excess erosion or soil-resource degradation. Slope and soil erodibility (K value) are important factors when determining this limitation on the Forest. Water control-structures, maintenance, and proper design and location of roads and trails will reduce the effects of road and trail use.

a. Potential Erosion Hazard of Road/Trail

This column of Table F-8 indicates the rating of the degree of limitation a soil has related to the risk of erosion from unsurfaced roads and/or trails. The degree of limitation is rated slight, moderate, or severe, according to the following definitions:

- Slight – Little or no erosion is likely.
- Moderate – Some erosion is likely; occasional maintenance may be needed; simple erosion control measures are needed.
- Severe – Significant erosion can be expected; roads require frequent maintenance; costly erosion control measures are needed.

The limiting site characteristic(s) is/are listed for the corresponding limitation rating.

b. Suitability for Roads

This interpretation rates the suitability of using the natural surface of the soil component for roads by trucks for the transport of logs and other wood products from the site. The degree of suitability is rated as well-suited, moderately suited, or poorly suited, according to the following definitions.

- Well Suited – Little or no restrictions to natural road suitability.
- Moderately Suited – One or more restrictions reduce site suitability.
- Poorly suited – One or more restrictions generally make the use of the site for a natural road very difficult or unsafe.

The limiting site characteristic(s) is/are listed for the corresponding suitability rating.

Table F-8. Soil suitability for Forest roads and trails.

Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
79B:		
Menfro-----	Moderate	Moderately suited
	Slope/erodibility	Strength
79C:		
Menfro-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
79C2:		
Menfro, eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
79C3:		
Menfro, severely eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
79D:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
79D2:		
Menfro, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
79D3:		
Menfro, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
79E:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
79E2:		
Menfro, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
79E3:		
Menfro, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
79F:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
79G:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
214B:		
Hosmer-----	Moderate	Moderately suited
	Slope/erodibility	Strength
214C:		

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
Hosmer-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
214C2:		
Hosmer, eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
214C3:		
Hosmer, severely eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
214D:		
Hosmer-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
214D2:		
Hosmer, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
214D3:		
Hosmer, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
301B:		
Grantsburg-----	Moderate	Moderately suited
	Slope/erodibility	Strength
301C:		
Grantsburg-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
301C2:		
Grantsburg-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
301C3:		
Grantsburg, severely eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
301D:		
Grantsburg-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
301D2:		
Grantsburg, eroded--	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
301D3:		
Grantsburg, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
308B:		
Alford-----	Moderate	Moderately suited
	Slope/erodibility	Strength

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
308C:		
Alford-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
308C2:		
Alford, eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
308C3:		
Alford, severely eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
308D:		
Alford-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
308D2:		
Alford, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
308D3:		
Alford, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
308E:		
Alford-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
308E2:		
Alford, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
308E3:		
Alford, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
308F:		
Alford-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
339B:		
Wellston-----	Moderate	Moderately suited
	Slope/erodibility	Strength
339C:		
Wellston-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
339C2:		
Wellston, eroded----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
339C3:		
Wellston, severely eroded-----	Moderate	Moderately suited

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
	Slope/erodibility	Strength
		Slope
339D:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
339D2:		
Wellston, eroded----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
339D3:		
Wellston, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
339F:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
340B:		
Zanesville-----	Moderate	Moderately suited
	Slope/erodibility	Strength
340C2:		
Zanesville, eroded--	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
340C3:		
Zanesville, severely eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
340D:		
Zanesville-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
340D2:		
Zanesville, eroded--	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
340D3:		
Zanesville-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
471D2:		
Clarksville, eroded-	Severe	Poorly suited
	Slope/erodibility	Slope
471D3:		
Clarksville, severely eroded----	Severe	Poorly suited
	Slope/erodibility	Slope
471F:		
Clarksville-----	Severe	Poorly suited
	Slope/erodibility	Slope
471G:		
Clarksville-----	Severe	Poorly suited
	Slope/erodibility	Slope
598B:		

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
Bedford-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Wetness
598C:		
Bedford-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
		Wetness
598C2:		
Bedford, eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
		Wetness
598C3:		
Bedford, severely eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
		Wetness
598D:		
Bedford-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
		Wetness
598D2:		
Bedford, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
		Wetness
598D3:		
Bedford, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
		Wetness
599D:		
Baxter-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
599F:		
Baxter-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
599G:		
Baxter-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
691C:		
Beasley-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
691C2:		
Beasley, eroded-----	Moderate	Moderately suited
	Slope/erodibility	Strength
		Slope
		Stickiness
691D:		

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
Beasley-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
691D2:		
Beasley, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
		Stickiness
691F:		
Beasley-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
691G:		
Beasley-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
692D:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
692D2:		
Menfro, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Wellston, eroded----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
692F:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
694D:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Baxter-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
694D2:		
Menfro, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Baxter, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
694F:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Baxter-----	Severe	Poorly suited
	Slope/erodibility	Slope

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
		Strength
717F:		
Stookey-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Clarksville-----	Severe	Poorly suited
	Slope/erodibility	Slope
717G:		
Clarksville-----	Severe	Poorly suited
	Slope/erodibility	Slope
Stookey-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
832F:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Clarksville-----	Severe	Poorly suited
	Slope/erodibility	Slope
832G:		
Clarksville-----	Severe	Poorly suited
	Slope/erodibility	Slope
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
833F:		
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Goss-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
833G:		
Goss-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Menfro-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
834D:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Westmore-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
834D2:		
Wellston, eroded----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Westmore, eroded----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
834F:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
Westmore-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
834G:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Westmore-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
940D:		
Westmore-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Zanesville-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
940D2:		
Westmore, eroded----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Zanesville, eroded--	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
954D:		
Alford-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Baxter-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
954D2:		
Alford, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Baxter, eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
954F:		
Alford-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Baxter-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
955D:		
Muskingum-----	Moderate	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks-----	Severe	Poorly suited
	Slope/erodibility	Slope
955D2:		
Muskingum, eroded---	Moderate	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks, eroded-----	Moderate	Poorly suited
	Slope/erodibility	Slope

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
955F:		
Muskingum-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks-----	Severe	Poorly suited
	Slope/erodibility	Slope
955G:		
Muskingum-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks-----	Severe	Poorly suited
	Slope/erodibility	Slope
977F:		
Neotoma-----	Severe	Poorly suited
	Slope/erodibility	Slope
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
977G:		
Neotoma-----	Severe	Poorly suited
	Slope/erodibility	Slope
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
986D:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks-----	Severe	Poorly suited
	Slope/erodibility	Slope
986D2:		
Wellston, eroded----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks, eroded-----	Moderate	Poorly suited
	Slope/erodibility	Slope
986D3:		
Wellston, severely eroded-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks, severely eroded-----	Moderate	Poorly suited
	Slope/erodibility	Slope
986F:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks-----	Severe	Poorly suited
	Slope/erodibility	Slope
986G:		
Wellston-----	Severe	Poorly suited
	Slope/erodibility	Slope
		Strength
Berks-----	Severe	Poorly suited
	Slope/erodibility	Slope
1845A:		

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Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
Darwin, undrained, frequently flooded-	Slight	Poorly suited
		Ponding
		Flooding
		Strength
		Wetness
		Stickiness
Jacob, undrained, frequently flooded-	Slight	Poorly suited
		Ponding
		Flooding
		Stickiness
		Strength
		Wetness
3072A: Sharon-----	Slight	Poorly suited
		Flooding
		Strength
3108A: Bonnie-----	Slight	Poorly suited
		Ponding
		Flooding
		Strength
		Wetness
3333A: Wakeland, frequently flooded-----	Slight	Poorly suited
		Flooding
		Strength
		Wetness
3382A: Belknap-----	Slight	Poorly suited
		Flooding
		Strength
		Wetness
3426A: Karnak, frequently flooded-----	Slight	Poorly suited
		Ponding
		Flooding
		Strength
		Wetness
		Stickiness
3590A: Cairo, frequently flooded-----	Slight	Poorly suited
		Ponding
		Flooding
		Stickiness
		Strength
		Wetness
8427B: Burnside, occasionally flooded-----	Moderate Slope/erodibility	Poorly suited
		Flooding
		Strength

Map Unit Symbol and Soil Name	Erosion Hazard on Roads and Trails – Rating and Limiting Features –	Suitability for Natural-Surface Roads – Rating and Limiting Features –
8456B:		
Ware, occasionally		
	Slope/erodibility	Flooding
8475B:		
Elsah, occasionally		
flooded-----	Moderate	Poorly suited
	Slope/erodibility	Flooding
		Strength

5. Pesticide Use

Pesticides are sometimes the most effective way to control or eliminate non-native invasive species or forest pests such as the tent caterpillar.

Chemical site-preparation is sometimes used to reduce existing plant competition and improve the survivability of seedlings. It is also used to knock down existing vegetation to allow for more effective use of mechanical planters.

The interpretations displayed in Table F-9 were developed for use in evaluating the potential for pesticides to leach through the soil profile to groundwater, and to evaluate the potential for pesticides to be transported by surface runoff beyond the application-site. For the purpose of these interpretive-rating guides, it is assumed that the pesticides are applied to bare soil by either surface or aerial methods. Depth to the water table, slope, wetness, surface-layer depth and organic-matter content are important soil properties that affect pesticide loss. When applying pesticides, the label instructions will be strictly followed.

a. Pesticide Loss Potential through Leaching

The degree of soil-limitation is rated slight, moderate, or severe, according to the following definitions:

- Slight – No special precautions needed. Pesticide leaching through the soil is unlikely.
- Moderate – This rating is given to soils that have properties moderately susceptible to pesticide leaching. This degree of limitation can be overcome or modified by planning and/or the timing of the application.
- Severe – This rating is given to soils that have one or more properties extremely susceptible to pesticide leaching. This degree of limitation generally requires major soil mitigation, special preventative measures, special planning and/or timing of application.

The limiting site characteristic(s) is/are listed for the corresponding limitation rating.

b. Pesticide Loss Potential from Surface Runoff

The degree of soil-limitation is rated slight, moderate, or severe, according to the following definitions:

- Slight – No special precautions needed. Pesticide runoff from the site is unlikely.
- Moderate – This rating is given to soils that have properties moderately favorable for pesticide runoff. This degree of limitation can be overcome or modified by special planning, preventative measures and/or timing of application.
- Severe – This rating is given to soils that have one or more properties unfavorable for pesticide runoff. This degree of limitation generally requires major soil mitigation, special planning, special preventative measures and/or timing of application.

The limiting site characteristic(s) is/are listed for the corresponding limitation rating.

Table F-9. Soil suitability for pesticide use.

Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
79B: Menfro silt loam, 2 to 5 percent slopes		
Menfro-----	Moderate: low adsorption	Slight
79C: Menfro silt loam, 5 to 10 percent slopes		
Menfro-----	Moderate: low adsorption	Moderate: Excess Runoff
79C2: Menfro silt loam, 5 to 10 percent slopes, eroded		
Menfro, eroded-----	Moderate: low adsorption	Moderate: Excess Runoff
79C3: Menfro silt loam, 5 to 10 percent slopes, severely eroded		
Menfro, severely eroded-----	Moderate: low adsorption	Moderate: Excess Runoff
79D: Menfro silt loam, 10 to 18 percent slopes		
Menfro-----	Slight	Moderate: Excess Runoff
79D2: Menfro silt loam, 10 to 18 percent slopes, eroded		
Menfro, eroded-----	Slight	Moderate: Excess Runoff
79D3: Menfro silt loam, 10 to 18 percent slopes, severely eroded		
Menfro, severely eroded-----	Slight	Moderate: Excess Runoff
79E: Menfro silt loam, 18 to 25 percent slopes		
Menfro-----	Slight	Severe: Excess Runoff
79E2: Menfro silt loam, 18 to 25 percent slopes, eroded		
Menfro, eroded-----	Slight	Severe: Excess Runoff
79E3: Menfro silt loam, 18 to 25 percent slopes, severely eroded		
Menfro, severely eroded-----	Slight	Severe: Excess Runoff
79F: Menfro silt loam, 25 to 35 percent slopes		

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
Menfro-----	Slight	Severe: Excess
		Runoff
79G: Menfro silt loam, 35 to 70 percent slopes		
Menfro-----	Slight	Severe: Excess
		Runoff
214B: Hosmer silt loam, 2 to 5 percent slopes		
Hosmer-----	Moderate: wetness	Moderate: Excess
		Runoff
214C: Hosmer silt loam, 5 to 10 percent slopes		
Hosmer-----	Moderate: wetness	Moderate: Excess
		Runoff
214C2: Hosmer silt loam, 5 to 10 percent slopes, eroded		
Hosmer, eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
214C3: Hosmer silt loam, 5 to 10 percent slopes, severely eroded		
Hosmer, severely eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
214D: Hosmer silt loam, 10 to 18 percent slopes		
Hosmer-----	Moderate: wetness	Moderate: Excess
		Runoff
214D2: Hosmer silt loam, 10 to 18 percent slopes, eroded		
Hosmer, eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
214D3: Hosmer silt loam, 10 to 18 percent slopes, severely eroded		
Hosmer, severely eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
301B: Grantsburg silt loam, 2 to 5 percent slopes		
Grantsburg-----	Moderate: wetness	Moderate: Excess
		Runoff
301C: Grantsburg silt loam, 5 to 10 percent slopes		
Grantsburg-----	Moderate: wetness	Moderate: Excess
		Runoff
301C2: Grantsburg silt loam, 5 to 10 percent slopes, eroded		
Grantsburg-----	Moderate: wetness	Moderate: Excess
		Runoff
301C3: Grantsburg silt loam, 5 to 10 percent slopes percent slopes, severely eroded		
Grantsburg, severely eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
301D: Grantsburg silt loam, 10 to 18 percent slopes		
Grantsburg-----	Moderate: wetness	Moderate: Excess
		Runoff
301D2: Grantsburg silt loam, 10 to 18 percent slopes, eroded		

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
Grantsburg, eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
301D3: Grantsburg silt loam, 10 to 18 percent slopes, severely eroded		
Grantsburg, severely eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
308B: Alford silt loam, 2 to 5 percent slopes		
Alford-----	Moderate: low adsorption	Slight
308C: Alford silt loam, 5 to 10 percent slopes		
Alford-----	Moderate: low adsorption	Moderate: Excess
		Runoff
308C2: Alford silt loam, 5 to 10 percent slopes, eroded		
Alford, eroded-----	Moderate: low adsorption	Moderate: Excess
		Runoff
308C3: Alford silt loam, 5 to 10 percent slopes, severely eroded		
Alford, severely eroded-----	Moderate: low adsorption	Moderate: Excess
		Runoff
308D: Alford silt loam, 10 to 18 percent slopes		
Alford-----	Slight	Moderate: Excess
		Runoff
308D2: Alford silt loam, 10 to 18 percent slopes, eroded		
Alford, eroded-----	Slight	Moderate: Excess
		Runoff
308D3: Alford silt loam, 10 to 18 percent slopes, severely eroded		
Alford, severely eroded-----	Slight	Moderate: Excess
		Runoff
308E: Alford silt loam, 18 to 25 percent slopes		
Alford-----	Slight	Severe: Excess
		Runoff
308E2: Alford silt loam, 18 to 25 percent slopes, eroded		
Alford, eroded-----	Slight	Severe: Excess
		Runoff
308E3: Alford silt loam, 18 to 25 percent slopes, severely eroded		
Alford, severely eroded-----	Slight	Severe: Excess
		Runoff
308F: Alford silt loam, 25 to 35 percent slopes		
Alford-----	Slight	Severe: Excess
		Runoff
339B: Wellston silt loam, 2 to 5 percent slopes		
Wellston-----	Moderate: low adsorption	Slight
339C: Wellston silt loam, 5 to 10 percent slopes		
Wellston-----	Moderate: low	Moderate: Excess

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
	adsorption	Runoff
339C2: Wellston silt loam, 5 to 10 percent slopes, eroded		
Wellston, eroded-----	Severe: low	Moderate: Excess
	adsorption	Runoff
339C3: Wellston silt loam, 5 to 10 percent slopes, severely eroded		
Wellston, severely eroded-----	Severe: low	Moderate: Excess
	adsorption	Runoff
339D: Wellston silt loam, 10 to 18 percent slopes		
Wellston-----	Slight	Moderate: Excess
		Runoff
339D2: Wellston silt loam, 10 to 18 percent slopes, eroded		
Wellston, eroded-----	Moderate: low	Moderate: Excess
	adsorption	Runoff
339D3: Wellston silt loam, 10 to 18 percent slopes, severely eroded		
Wellston, severely eroded-----	Moderate: low	Moderate: Excess
	adsorption	Runoff
339F: Wellston silt loam, 18 to 35 percent slopes		
Wellston-----	Slight	Severe: Excess
		Runoff
340B: Zanesville silt loam, 2 to 5 percent slopes		
Zanesville-----	Slight	Moderate: Excess
		Runoff
340C2: Zanesville silt loam, 5 to 10 percent slopes, eroded		
Zanesville, eroded-----	Slight	Moderate: Excess
		Runoff
340C3: Zanesville silt loam, 5 to 10 percent slopes, severely eroded		
Zanesville, severely eroded-----	Slight	Moderate: Excess
		Runoff
340D: Zanesville silt loam, 10 to 18 percent slopes		
Zanesville-----	Slight	Moderate: Excess
		Runoff
340D2: Zanesville silt loam, 10 to 18 percent slopes, eroded		
Zanesville, eroded-----	Slight	Moderate: Excess
		Runoff
340D3: Zanesville silt loam, 10 to 18 percent slopes, severely eroded		
Zanesville-----	Slight	Moderate: Excess
		Runoff
471D2: Clarksville gravelly silt loam, 10 to 18 percent slopes, eroded		
Clarksville, eroded-----	Slight	Moderate: Excess
		Runoff
471D3: Clarksville gravelly silt loam, 10 to 18 percent slopes, severely eroded		
Clarksville, severely eroded-----	Slight	Moderate: Excess

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
		Runoff
471F: Clarksville gravelly silt loam, 25 to 35 percent slopes		
Clarksville-----	Slight	Severe: Excess
		Runoff
471G: Clarksville gravelly silt loam, 35 to 70 percent slopes		
Clarksville-----	Slight	Severe: Excess
		Runoff
598B: Bedford silt loam, 2 to 5 percent slopes		
Bedford-----	Moderate: wetness	Moderate: Excess
		Runoff
598C: Bedford silt loam, 5 to 10 percent slopes		
Bedford-----	Moderate: wetness	Moderate: Excess
		Runoff
598C2: Bedford silt loam, 5 to 10 percent slopes, eroded		
Bedford, eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
598C3: Bedford silt loam, 5 to 10 percent slopes, severely eroded		
Bedford, severely eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
598D: Bedford silt loam, 10 to 18 percent slopes		
Bedford-----	Moderate: wetness	Moderate: Excess
		Runoff
598D2: Bedford silt loam, 10 to 18 percent slopes, eroded		
Bedford, eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
598D3: Bedford silt loam, 10 to 18 percent slopes, severely eroded		
Bedford, severely eroded-----	Moderate: wetness	Moderate: Excess
		Runoff
599D: Baxter gravelly silt loam, 10 to 18 percent slopes		
Baxter-----	Slight	Moderate: Excess
		Runoff
599F: Baxter gravelly silt loam, 18 to 35 percent slopes		
Baxter-----	Slight	Severe: Excess
		Runoff
599G: Baxter gravelly silt loam, 35 to 70 percent slopes		
Baxter-----	Slight	Severe: Excess
		Runoff
691C: Beasley silt loam, 5 to 10 percent slopes		
Beasley-----	Slight	Moderate: Excess
		Runoff
691C2: Beasley silt loam, 5 to 10 percent slopes, eroded		
Beasley, eroded-----	Slight	Moderate: Excess
		Runoff

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
691D: Beasley silt loam, 12 to 18 percent slopes		
Beasley-----	Slight	Moderate: Excess Runoff
691D2: Beasley silt loam, 12 to 18 percent slopes, eroded		
Beasley, eroded-----	Slight	Moderate: Excess Runoff
691F: Beasley silt loam, 18 to 35 percent slopes		
Beasley-----	Slight	Severe: Excess Runoff
691G: Beasley silt loam, 35 to 70 percent slopes		
Beasley-----	Slight	Severe: Excess Runoff
692D: Menfro-Wellston silt loams, 10 to 18 percent slopes		
Menfro-----	Slight	Moderate: Excess Runoff
Wellston-----	Slight	Moderate: Excess Runoff
692D2: Menfro-Wellston silt loams, 10 to 18 percent slopes, eroded		
Menfro, eroded-----	Slight	Moderate: Excess Runoff
Wellston, eroded-----	Moderate: low adsorption	Moderate: Excess Runoff
692F: Menfro-Wellston silt loams, 18 to 35 percent slopes		
Menfro-----	Slight	Severe: Excess Runoff
Wellston-----	Slight	Severe: Excess Runoff
694D: Menfro-Baxter complex, 10 to 18 percent slopes		
Baxter-----	Slight	Moderate: Excess Runoff
Menfro-----	Slight	Moderate: Excess Runoff
694D2: Menfro-Baxter complex, 10 to 18 percent slopes, eroded		
Baxter, eroded-----	Slight	Moderate: Excess Runoff
Menfro, eroded-----	Slight	Moderate: Excess Runoff
694F: Menfro-Baxter complex, 18 to 35 percent slopes		
Baxter-----	Slight	Severe: Excess Runoff
Menfro-----	Slight	Severe: Excess Runoff
717F: Stookey-Clarksville complex, 18 to 35 percent slopes		
Clarksville-----	Slight	Severe: Excess Runoff
Stookey-----	Moderate: low	Severe: Excess

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
	adsorption	Runoff
717G: Clarksville-Stookey complex, 35 to 70 percent slopes		
Clarksville-----	Slight	Severe: Excess
		Runoff
Stookey-----	Moderate: low	Severe: Excess
	adsorption	Runoff
832F: Menfro-Clarksville complex, 18 to 35 percent slopes		
Clarksville-----	Slight	Severe: Excess
		Runoff
Menfro-----	Slight	Severe: Excess
		Runoff
832G: Clarksville-Menfro complex, 35 to 70 percent slopes		
Clarksville-----	Slight	Severe: Excess
		Runoff
Menfro-----	Slight	Severe: Excess
		Runoff
833F: Menfro-Goss complex, 18 to 35 percent slopes		
Goss-----	Slight	Severe: Excess
		Runoff
Menfro-----	Slight	Severe: Excess
		Runoff
833G: Goss-Menfro complex, 35 to 70 percent slopes		
Goss-----	Slight	Severe: Excess
		Runoff
Menfro-----	Slight	Severe: Excess
		Runoff
834D: Wellston-Westmore silt loams, 10 to 18 percent slopes		
Wellston-----	Slight	Moderate: Excess
		Runoff
Westmore-----	Slight	Moderate: Excess
		Runoff
834D2: Wellston-Westmore silt loams, 10 to 18 percent slopes, eroded		
Wellston, eroded-----	Moderate: low	Moderate: Excess
	adsorption	Runoff
Westmore, eroded-----	Slight	Moderate: Excess
		Runoff
834F: Wellston-Westmore silt loams, 18 to 35 percent slopes		
Wellston-----	Slight	Severe: Excess
		Runoff
Westmore-----	Slight	Severe: Excess
		Runoff
834G: Wellston-Westmore silt loams, 35 to 70 percent slopes		
Wellston-----	Slight	Severe: Excess
		Runoff
Westmore-----	Slight	Severe: Excess
		Runoff
940D: Zanesville-Westmore silt loams, 10 to 18 percent slopes		

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
Westmore-----	Slight	Moderate: Excess Runoff
Zanesville-----	Slight	Moderate: Excess Runoff
940D2: Zanesville-Westmore silt loams, 10 to 18 percent slopes, eroded		
Westmore, eroded-----	Slight	Moderate: Excess Runoff
Zanesville, eroded-----	Slight	Moderate: Excess Runoff
954D: Alford-Baxter complex, 10 to 18 percent slopes		
Alford-----	Slight	Moderate: Excess Runoff
Baxter-----	Slight	Moderate: Excess Runoff
954D2: Alford-Baxter complex, 10 to 18 percent slopes, eroded		
Alford, eroded-----	Slight	Moderate: Excess Runoff
Baxter, eroded-----	Slight	Moderate: Excess Runoff
954F: Alford-Baxter complex, 18 to 35 percent slopes		
Alford-----	Slight	Severe: Excess Runoff
Baxter-----	Slight	Severe: Excess Runoff
955D: Muskingum and Berks soils, 10 to 18 percent slopes		
Berks-----	Slight	Moderate: Excess Runoff
Muskingum-----	Slight	Moderate: Excess Runoff
955D2: Muskingum and Berks soils, 10 to 18 percent slopes, eroded		
Berks, eroded-----	Slight	Moderate: Excess Runoff
Muskingum, eroded-----	Slight	Moderate: Excess Runoff
955F: Muskingum and Berks soils, 18 to 35 percent slopes		
Berks-----	Slight	Severe: Excess Runoff
Muskingum-----	Slight	Severe: Excess Runoff
955G: Muskingum and Berks soils, 35 to 70 percent slopes		
Berks-----	Slight	Severe: Excess Runoff
Muskingum-----	Slight	Severe: Excess Runoff
977F: Wellston-Neotoma complex, 18 to 35 percent slopes		
Neotoma-----	Slight	Severe: Excess Runoff
Wellston-----	Slight	Severe: Excess

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
		Runoff
977G: Wellston-Neotoma complex, 35 to 70 percent slopes		
Neotoma-----	Slight	Severe: Excess
		Runoff
Wellston-----	Slight	Severe: Excess
		Runoff
986D: Wellston-Berks complex, 10 to 18 percent slopes		
Berks-----	Slight	Moderate: Excess
		Runoff
Wellston-----	Slight	Moderate: Excess
		Runoff
986D2: Wellston-Berks complex, 10 to 18 percent slopes, eroded		
Berks, eroded-----	Slight	Moderate: Excess
		Runoff
Wellston, eroded-----	Moderate: low adsorption	Moderate: Excess
		Runoff
986D3: Wellston-Berks complex, 10 to 18 percent slopes, severely eroded		
Berks, severely eroded-----	Slight	Moderate: Excess
		Runoff
Wellston, severely eroded-----	Moderate: low adsorption	Moderate: Excess
		Runoff
986F: Wellston-Berks complex, 18 to 35 percent slopes		
Berks-----	Slight	Severe: Excess
		Runoff
Wellston-----	Slight	Severe: Excess
		Runoff
986G: Wellston-Berks complex, 35 to 70 percent slopes		
Berks-----	Slight	Severe: Excess
		Runoff
Wellston-----	Slight	Severe: Excess
		Runoff
1845A: Darwin and Jacob silty clays, undrained, 0 to 2 percent slopes, frequently flooded		
Darwin, undrained, frequently flooded-	Severe: wetness	Severe: flooding
Jacob, undrained, frequently flooded--	Severe: wetness	Severe: flooding
3072A: Sharon silt loam, 0 to 3 percent slopes, frequently flooded		
Sharon-----	Moderate: wetness, low adsorption	Severe: flooding
3108A: Bonnie silt loam, 0 to 2 percent slopes, frequently flooded		
Bonnie-----	Severe: wetness	Severe: flooding
3333A: Wakeland silt loam, 0 to 2 percent slopes, frequently flooded		
Wakeland, frequently flooded-----	Severe: wetness	Severe: flooding
3382A: Belknap silt loam, 0 to 2 percent slopes, frequently flooded		

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Map symbol and soil name	Pesticide Loss Potential - Leaching	Pesticide Loss Potential - Runoff
Belknap-----	Severe: wetness	Severe: flooding
3426A: Karnak silty clay, 0 to 2 percent slopes, frequently flooded		
Karnak, frequently flooded-----	Severe: wetness	Severe: flooding
3590A: Cairo silty clay, 0 to 2 percent slopes, frequently flooded		
Cairo, frequently flooded-----	Severe: wetness	Severe: flooding
8427B: Burnside silt loam, 1 to 4 percent slopes, occasionally flooded		
	Moderate: low adsorption	Moderate: flooding
8456B: Ware loam, 1 to 6 percent slopes, occasionally flooded		
Ware, occasionally flooded-----	Moderate: low adsorption	Moderate: flooding
8475B: Elsayh silt loam, 1 to 4 percent slopes, occasionally flooded		
Elsah, occasionally flooded-----	Moderate: low adsorption	Moderate: flooding

Reference: USDA, NRCS. 2003. National Soil Information System (NASIS) version 5.1.1, Soil Survey Staff, National Soil Survey Center, Lincoln, Nebraska

Table F-10a. Floodplain soil-map units on the Forest.

IL Map Symbol	Floodplain Soil-Map Unit Name
1071	Darwin silty clay, undrained, 0 to 2 percent slopes, frequently flooded
1085	Jacob clay, 0 to 2 percent slopes, undrained, occasionally flooded
1288A	Petrolia silty clay loam, undrained, 0 to 2 percent slopes, frequently flooded
1334A	Birds silt loam, undrained, 0 to 2 percent slopes, frequently flooded
1426A	Karnak silty clay, undrained, 0 to 2 percent slopes, frequently flooded
1457	Booker silty clay, undrained, 0 to 2 percent slopes, occasionally flooded
1843A	Bonnie and Petrolia soils, undrained, 0 to 2 percent slopes, frequently flooded
1845A	Darwin and Jacob silty clays, undrained, 0 to 2 percent slopes, frequently flooded
1846A	Karnak and Cape silty clay, undrained, 0 to 2 percent slopes, frequently flooded
3070A	Beaucoup silty clay loam, 0 to 2 percent slopes, frequently flooded
3070A+	Beaucoup silty clay loam, overwash, 0 to 2 percent slopes, frequently flooded
3070L	Beaucoup silty clay loam, 0 to 2 percent slopes, freq flooded, long duration
3071A	Darwin silty clay, 0 to 2 percent slopes, frequently flooded
3071L	Darwin silty clay, 0 to 2 percent slopes, frequently flooded, long duration
3072A	Sharon silt loam, 0 to 2 percent slopes, frequently flooded
3072L	Sharon silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3085A	Jacob clay, 0 to 2 percent slopes, frequently flooded (unprotected by levee)
3092BL	Sarpy fine sand, 1 to 8 percent slopes, frequently flooded, long duration
3108A	Bonnie silt loam, 0 to 2 percent slopes, frequently flooded
3108L	Bonnie silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3162A	Gorham silty clay loam, 0 to 3 percent slopes, frequently flooded, long duration

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IL Map Symbol	Floodplain Soil-Map Unit Name
3162L	Gorham silty clay loam, 0 to 3 percent slopes, frequently flooded, long duration
3180A	Dupo silt loam, 0 to 2 percent slopes, frequently flooded
3180L	Dupo silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3284A	Tice silty clay loam, 0 to 2 percent slopes, frequently flooded
3284L	Tice silty clay loam, 0 to 2 percent slopes, frequently flooded, long duration
3288A	Petrolia silty clay loam, 0 to 2 percent slopes, frequently flooded
3288L	Petrolia silty clay loam, 0 to 2 percent slopes, frequently flooded, long duration
3306A	Allison silty clay loam, 0 to 2 percent, frequently flooded
3331A	Haymond silt loam, 0 to 3 percent slopes, frequently flooded
3331L	Haymond silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3333A	Wakeland silt loam, 0 to 2 percent slopes, frequently flooded
3333L	Wakeland silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3334A	Birds silt loam, 0 to 2 percent slopes, frequently flooded
3334L	Birds silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3382A	Belknap silt loam, 0 to 2 percent slopes, frequently flooded
3382L	Belknap silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3420A	Piopolis silty clay loam, 0 to 2 percent slopes, frequently flooded
3422A	Cape silty clay loam, 0 to 2 percent slopes, frequently flooded
3422A+	Cape silty clay loam, 0 to 2 percent slopes, overwash, frequently flooded
3426A	Karnak silty clay, 0 to 2 percent slopes, frequently flooded
3426A+	Karnak silty clay, 0 to 2 percent slopes, overwash, frequently flooded
3426L	Karnak silty clay, 0 to 2 percent slopes, frequently flooded, long duration
3449L	Armiesburg-Sarpy Complex, 0 to 2 percent slopes, frequently flooded, long duration
3452A	Riley silty clay loam, 0 to 2 percent slopes, frequently flooded
3452L	Riley silty clay loam, 0 to 2 percent slopes, frequently flooded, long duration
3456B	Ware loam, 1 to 6 percent slopes, frequently flooded
3456BL	Ware loam, 1 to 6 percent slopes, frequently flooded, long duration
3465A	Montgomery silty clay, 0 to 2 percent slopes, frequently flooded
3589B	Bowdre silty clay, 0 to 2 percent slopes, frequently flooded (inside levee)
3590A	Cairo silty clay, 0 to 2 percent slopes, frequently flooded (inside levee)
3590L	Cairo silty clay, 0 to 2 percent slopes, frequently flooded, long duration
3597A	Armiesburg Silty Clay loam, 0 to 2 percent slopes, frequently flooded
3597L	Armiesburg Silty Clay loam, 0 to 2 percent slopes, frequently flooded, long duration
3600A	Huntington silt loam, 0 to 2 percent slopes, frequently flooded
3682B	Medway silty clay loam, 1 to 6 percent slopes, frequently flooded
3682BL	Medway silty clay loam, 1 to 6 percent slopes, frequently flooded, long duration
3787A	Banlic silt loam, 0 to 2 percent slopes, frequently flooded
5333A	Wakeland silt loam, karst, 0 to 2 percent slopes

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IL Map Symbol	Floodplain Soil-Map Unit Name
7428A	Coffeen silt loam, 0 to 2 percent slopes, rarely flooded
7430A	Raddle silt loam, 0 to 2 percent slopes, rarely flooded
7457A	Booker silty clay, undrained, 0 to 2 percent slopes, rarely flooded
7469A	Emma silty clay loam, 0 to 2 percent slopes, rarely flooded
7469B	Emma silty clay loam, 2 to 5 percent slopes, rarely flooded
7469D2	Emma silty clay loam, 10 to 18 percent slopes, eroded
8070A	Beaucoup silty clay loam, 0 to 2 percent slopes, occasionally flooded
8071A	Darwin silt loam, 0 to 2 percent slopes, occasionally flooded
8072A	Sharon silt loam, 0 to 3 percent slopes, occasionally flooded
8085A	Jacob clay, 0 to 2 percent slopes, occasionally flooded (protected by levee)
8092B	Sarpy sand 1 to 8 percent slopes, occasionally flooded
8108A	Bonnie silt loam, 0 to 2 percent slopes, occasionally flooded
8162A	Gorham silty clay loam, 0 to 3 percent slopes, occasionally flooded
8180A	Dupo silt loam, 0 to 2 percent slopes, occasionally flooded
8284A	Tice silty clay loam, 0 to 3 percent slopes, occasionally flooded
8288A	Petrolia silty clay loam, 0 to 2 percent slopes, occasionally flooded
8331A	Haymond silt loam, 0 to 3 percent slopes, occasionally flooded
8333A	Wakeland silt loam, 0 to 3 percent slopes, occasionally flooded
8334A	Birds silt loam, 0 to 2 percent slopes, occasionally flooded
8382A	Belknap silt loam, 0 to 2 percent slopes, occasionally flooded
8420A	Piopolis silty clay loam, 0 to 2 percent slopes, occasionally flooded
8422A	Cape silty clay loam, 0 to 2 percent slopes, occasionally flooded
8422A+	Cape silt loam, overwash, 0 to 2 percent slopes, occasionally flooded
8426A	Karnak clay, 0 to 2 percent slopes, occasionally flooded
8426++	Karnak silty clay loam, ashy, 0 to 2 percent slopes, occasionally flooded
8426A+	Karnak silt loam, overwash, 0 to 2 percent slopes, occasionally flooded
8427B	Burnside silt loam, 1 to 4 percent slopes, occasionally flooded
8452A	Riley silty clay loam, 0 to 2 percent slopes, occasionally flooded
8452B	Riley silty clay loam, 2 to 5 percent slopes, occasionally flooded
8456B	Ware loam, 1 to 6 percent slopes, occasionally flooded
8469A	Emma silty clay loam, 0 to 2 percent slopes, occasionally flooded
8469B	Emma silty clay loam, 2 to 5 percent slopes, occasionally flooded
8469C2	Emma silty clay loam, 5 to 10 percent slopes, eroded, occasionally flooded
8475B	Elsah silt loam, 1 to 5 percent slopes, occasionally flooded
8524A	Zipp silty clay loam, 0 to 2 percent slopes, occasionally flooded
8524A+	Zipp silty clay loam, overwash, 0 to 2 percent slopes, occasionally flooded
8589B	Bowdre silty clay, 0 to 2 percent slopes, occasionally flooded (outside levee)
8590A	Cairo silty clay, 0 to 2 percent slopes, occasionally flooded (outside levee)

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IL Map Symbol	Floodplain Soil-Map Unit Name
8590B	Cairo silty clay, 2 to 5 percent slopes, occasionally flooded
8597A	Armiesburg silty clay loam, 0 to 2 percent slopes, occasionally flooded
8682B	Medway silty clay loam, 1 to 6 percent slopes, occasionally flooded
8787A	Banlic silt loam, 0 to 3 percent slopes, occasionally flooded

Table F-10b. Wetland soil-map units of the Forest.

IL Map Symbol	Wetland Soil-Map Unit Name
1071	Darwin silty clay, undrained, 0 to 2 percent slopes, frequently flooded
1085	Jacob clay, 0 to 2 percent slopes, undrained, occasionally flooded
1288A	Petrolia silty clay loam, undrained, 0 to 2 percent slopes, frequently flooded
1334A	Birds silt loam, undrained, 0 to 2 percent slopes, frequently flooded
1426A	Karnak silty clay, undrained, 0 to 2 percent slopes, frequently flooded
1457	Booker silty clay, undrained, 0 to 2 percent slopes, occasionally flooded
1843A	Bonnie and Petrolia soils, undrained, 0 to 2 percent slopes, frequently flooded
1845A	Darwin and Jacob silty clays, undrained, 0 to 2 percent slopes, frequently flooded
1846A	Karnak and Cape silty clay, undrained, 0 to 2 percent slopes, frequently flooded
3070A	Beaucoup silty clay loam, 0 to 2 percent slopes, frequently flooded
3070A+	Beaucoup silty clay loam, overwash, 0 to 2 percent slopes, frequently flooded
3070L	Beaucoup silty clay loam, 0 to 2 percent slopes, freq flooded, long duration
3071A	Darwin silty clay, 0 to 2 percent slopes, frequently flooded
3071L	Darwin silty clay, 0 to 2 percent slopes, frequently flooded, long duration
3085A	Jacob clay, 0 to 2 percent slopes, frequently flooded (unprotected by levee)
3108A	Bonnie silt loam, 0 to 2 percent slopes, frequently flooded
3108L	Bonnie silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3162A	Gorham silty clay loam, 0 to 3 percent slopes, frequently flooded, long duration
3162L	Gorham silty clay loam, 0 to 3 percent slopes, frequently flooded, long duration
3284A	Tice silty clay loam, 0 to 2 percent slopes, frequently flooded
3284L	Tice silty clay loam, 0 to 2 percent slopes, frequently flooded, long duration
3288A	Petrolia silty clay loam, 0 to 2 percent slopes, frequently flooded
3288L	Petrolia silty clay loam, 0 to 2 percent slopes, frequently flooded, long duration
3334A	Birds silt loam, 0 to 2 percent slopes, frequently flooded
3334L	Birds silt loam, 0 to 2 percent slopes, frequently flooded, long duration
3420A	Piopolis silty clay loam, 0 to 2 percent slopes, frequently flooded
3422A	Cape silty clay loam, 0 to 2 percent slopes, frequently flooded
3422A+	Cape silty clay loam, 0 to 2 percent slopes, overwash, frequently flooded
3426A	Karnak silty clay, 0 to 2 percent slopes, frequently flooded
3426A+	Karnak silty clay, 0 to 2 percent slopes, overwash, frequently flooded
3426L	Karnak silty clay, 0 to 2 percent slopes, frequently flooded, long duration

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IL Map Symbol	Wetland Soil-Map Unit Name
3465A	Montgomery silty clay, 0 to 2 percent slopes, frequently flooded
3590A	Cairo silty clay, 0 to 2 percent slopes, frequently flooded (inside levee)
3590L	Cairo silty clay, 0 to 2 percent slopes, frequently flooded, long duration
7084A	Okaw silt loam, 0 to 2 percent slopes, rarely flooded
7178A	Ruark fine sandy loam, 0 to 2 percent slopes, rarely flooded
7208A	Sexton silt loam, 0 to 2 percent slopes, rarely flooded
7401A	Okaw silty clay loam, 0 to 2 percent slopes, rarely flooded
7457A	Booker silty clay, undrained, 0 to 2 percent slopes, rarely flooded
7460A	Ginat silt loam, 0 to 2 percent slopes, rarely flooded
8070A	Beaucoup silty clay loam, 0 to 2 percent slopes, occasionally flooded
8071A	Darwin silt loam, 0 to 2 percent slopes, occasionally flooded
8085A	Jacob clay, 0 to 2 percent slopes, occasionally flooded (protected by levee)
8108A	Bonnie silt loam, 0 to 2 percent slopes, occasionally flooded
8109A	Racoon silt loam, 0 to 2 percent slopes, occasionally flooded
8162A	Gorham silty clay loam, 0 to 3 percent slopes, occasionally flooded
8178A	Ruark fine sandy loam, 0 to 2 percent slopes, occasionally flooded
8180A	Dupo silt loam, 0 to 2 percent slopes, occasionally flooded
8284A	Tice silty clay loam, 0 to 3 percent slopes, occasionally flooded
8288A	Petrolia silty clay loam, 0 to 2 percent slopes, occasionally flooded
8334A	Birds silt loam, 0 to 2 percent slopes, occasionally flooded
8420A	Piopolis silty clay loam, 0 to 2 percent slopes, occasionally flooded
8422A	Cape silty clay loam, 0 to 2 percent slopes, occasionally flooded
8422A+	Cape silt loam, overwash, 0 to 2 percent slopes, occasionally flooded
8426A	Karnak clay, 0 to 2 percent slopes, occasionally flooded
8426++	Karnak silty clay loam, ashy, 0 to 2 percent slopes, occasionally flooded
8426A+	Karnak silt loam, overwash, 0 to 2 percent slopes, occasionally flooded
8524A	Zipp silty clay loam, 0 to 2 percent slopes, occasionally flooded
8524A+	Zipp silty clay loam, overwash, 0 to 2 percent slopes, occasionally flooded
8590A	Cairo silty clay, 0 to 2 percent slopes, occasionally flooded (outside levee)
8590B	Cairo silty clay, 2 to 5 percent slopes, occasionally flooded

APPENDIX G

FEDERAL MINERAL RESOURCE MANAGEMENT

I. INTRODUCTION

This appendix describes leasing notices and stipulations; guidance and direction for mineral operators; legislative history; federal mineral categories; trends in demand and supply; and the reasonably foreseeable development scenario for federal mineral management on the Forest.

Federal mineral resources on the Forest are classified as leasable minerals or common-variety mineral materials, also known as salable. Leasable minerals include energy-related materials such as oil, gas and coal, and hardrock leasables such as fluorspar and tripoli. The USDI Bureau of Land Management (BLM) is the agency responsible for the administration of leasable minerals; the Forest Service is the surface-managing agency. Salable minerals, such as limestone and gravel, are administered by the Forest Service.

II. OIL AND GAS STANDARD LEASE TERMS AND STIPULATIONS

Lease-notices and stipulations for oil and gas leasing were developed for each management area to respond to surface-management goals. Standard BLM lease terms, notices to lessees 1 and 2 (stipulations 1 and 2), and lease-notice 3 (stipulation 3) apply to all leases. Standard lease terms are incorporated in the standard BLM Offer to Lease and Lease for Oil and Gas (Form 3100-11). Stipulations 1 and 2 (examples shown) are administrative in nature. Stipulation 3 (example shown) advises lessees that an area is subject to the Endangered Species Act of 1973 and project proposals may be modified or limited. Stipulation 4—no surface occupancy—will be applied to management areas CR, CV, DR, HR and NA and filter strips and riparian areas. This stipulation prohibits the placement of drilling and production equipment, buildings, roads, ponds and well-pads and the clearance of pipeline rights-of-way.

Stipulation 5—controlled surface use—will be applied to leases in management areas MH, OB, MO, NM and WW. This stipulation allows the placement of drilling and production equipment, buildings, roads, ponds and well-pads and the clearance of pipeline rights-of-way vegetation if site-specific analysis determines the environmental effects would not be significant. Stipulation 6 (example shown) is required for wetland areas. Stipulation 7—timing limitation (example shown)—will be applied to leases in management areas MH, MO and OB, in accordance with the timing limitations specified in the corresponding management prescription.

Standard BLM Lease Terms

The Offer to Lease and Lease for Oil and Gas, section 6, states:

Conduct operations in a manner that minimize adverse impacts to the land, air and water, to cultural, biological, visual and other resources and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications to reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historical or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects.

Stipulation 1 NOTICE TO LESSEE

Provisions of the Mineral Leasing Act (MLA) of 1920, as amended by the Federal Coal Leasing Amendments of 1976, affect an entity's qualifications to obtain an oil and gas lease. Sections 2(a)(2)(A) of the MLA, 30 U.S.C. 201(a)(2)(A), requires that any entity that holds and has held a federal coal lease for 10 years beginning on or after August 4, 1976 and who is not producing coal in commercial quantities from each such lease, cannot qualify for the issuance of any other mineral lease granted under the MLA. Compliance by coal lessees with Section 2(a)(2)(A) is explained in 43 CFR 3472.

In accordance with the terms of this oil and gas lease with respect to compliance by the initial lessee with qualifications concerning federal coal lease holdings, all assignees and transferees are hereby notified that this oil and gas lease is subject cancellation if: (1) the initial lessee as assignor or as transferor has falsely certified compliance with Section 2(a)(2)(A), or (2) because of a denial or disapproval by a State Office of a pending coal action, i.e., arms-length assignment, relinquishment, or logical mining unit, the initial lessee as assignor or as transferor is no longer in compliance with Section 2(a)(2)(A). The assignee, sublessee or transferee does not qualify as a bona fide purchaser and, thus, has no rights to bona fide purchaser protection in the event of cancellation of this lease due to noncompliance with Section 2(a)(2)(A). Information regarding assignor, sublessor or transferor compliance with Section 2(a)(2)(A) is contained in the lease case file as well as in other Bureau of Land Management records available through the state office issuing this lease.

Stipulation 2
STIPULATION FOR LANDS OF
THE NATIONAL FOREST SYSTEM UNDER THE
JURISDICTION OF DEPARTMENT OF AGRICULTURE

The licensee/permittee / lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of Interior in the license/prospecting permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of the Interior, (2) uses of all existing improvements, such as forest development roads, within and outside the area licensed, permitted or leased by the Secretary of the Interior and (3) use and occupancy of the NFS not authorized by a permit / operating plan approved by the Secretary of the Interior. All matters related to this stipulation are to be addressed to:

Shawnee National Forest
50 Highway 145 South
Harrisburg, IL 62946

U.S. Department of the Interior
Bureau of Land Management
Eastern States Office
7450 Boston Boulevard
Springfield, VA 22153

Stipulation 3
LEASE NOTICE #3

All or part of the leased lands may contain animal or plant species classified under the Endangered Species Act of 1973, as amended. Other species may have been identified as sensitive in accordance with Forest Service Manual 2670 and be listed on the current Regional Forester's list of sensitive plant and animal species. Further information concerning the classification of these species may be obtained from the authorized Forest officer.

Exploration and development proposals may be limited or modifications required if activity is planned within the boundaries of a threatened, endangered or sensitive plant or animal species location as it then exists. All activities within these areas must be conducted in accordance with existing laws, regulations and the Forest Land and Resource Management Plan guidelines. All available land in T_N R_W, 3rd Principal Meridian, _____ County, Illinois.
Serial No. _____

**Stipulation 6
LEASE NOTICE #4**

All or part of the leased lands may be classified as wetlands in accordance with Executive Order 11990, "Protection of Wetlands" or a floodplain in accordance with Executive Order No. 11988, "Floodplain Management." Additional management requirements for the protection of riparian areas are contained in 36 CFR 219.27(e) and the National Forest Management Act of 1976. All activities within these areas may require special measures to mitigate adverse impacts to the resource values. They must comply with the above referenced executive orders, regulations, laws and be in accordance with the Forest Land and Resource Management Plan guidelines.

Further information concerning the classification and management of these lands may be obtained from the authorized Forest officer.

Lands in T_N R_W, 3rd Principal Meridian, _____ County, Illinois.

**Stipulation 7
TIMING LIMITATION STIPULATION**

No surface use is allowed during the following time period(s). This stipulation does not apply to operation and maintenance of production facilities.

Site-specific proposals for activities within these areas will be analyzed. Such analysis could result in establishment of protective requirements, limitations for the affected site, or possibly require relocation of the activities during the specified time period.

October 1 to March 15.

On the lands described below:

T-N, R-W

OAKWOOD BOTTOMS GREENTREE RESERVOIR

For the purpose of:

to provide habitat for migratory and wintering waterfowl

Any changes to this stipulation will be made in accordance with the land use plan and / or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

In accordance with 36 CFR 228, subpart E, the federal mineral lands on the Forest have been identified as administratively available for oil and gas leasing, subject to standard lease terms, lease notices and lease stipulations. All wilderness areas were withdrawn by congress and unavailable for leasing. Table G-1 presents a summary of lease terms and stipulations applicable to each management area.

Table G-1. Oil and gas lease terms and stipulations by management area.

Management Area/Forest-Wide Standard	Applicable Lease Terms and Stipulations
CR – Candidate Wild and Scenic River	Stipulation 4
CV – Cave Valley	Stipulation 4
DR – Developed Recreational Area	Stipulation 4
EH – Even-Aged Hardwood Forest	Standard BLM lease terms, Stipulations 1-3
HR – Heritage Resource Significant Site	Stipulation 4
LO – Large Openland	Standard BLM lease terms, Stipulations 1-3
MH – Mature Hardwood Forest	Standard BLM lease terms, Stipulations 1-3 Stipulation 5 Stipulation 7: No surface use allowed during the following time period: April 1-July 15 for the protection of habitat of migratory birds. Does not apply to operation and maintenance of production facilities
MM – Minimum Management Area	Standard BLM lease terms, Stipulations 1-3
MO – Mississippi and Ohio Rivers Floodplains	Standard BLM lease terms, Stipulations 1-3 Stipulations 5 and 6 Stipulation 7: No surface use allowed during the following time period: April 1-July 15 for the protection of habitat of migratory birds. Does not apply to operation and maintenance of production facilities
NA – Natural Area	Stipulation 4
NM – Non-motorized Recreational Area	Standard BLM lease terms, Stipulations 1-3 Stipulation 5
OB – Oakwood Bottoms Greentree Reservoir	Standard BLM lease terms, Stipulations 1-3 Stipulations 5 and 6 Stipulation 7: No surface use allowed during the following time period: October 1-March 15 for the protection of habitat of migrating and wintering waterfowl. Does not apply to operation and maintenance of production facilities
RA – Research Area	Standard BLM lease terms, Stipulations 1-3
WW – Water-Supply Watershed	Standard BLM lease terms, Stipulations 1-3 Stipulations 4 and 5
Riparian Areas and Filter Strips	Stipulation 4 (Outside of MO management area.)

III. HARDROCK PERMIT AND LEASE STIPULATIONS

The following standard stipulations apply to all hardrock permits:

R9-2800-6a (3/83)	
USDA – FOREST SERVICE STANDARD STIPULATIONS - PERMIT (FSM 2820)	
Serial No.: Permittee: National Forest:	
The permittee is notified and agrees:	
All work and any operations authorized under this permit shall be done according to an approved operating plan on file with the _____ at _____. Plans generally require a minimum of 45 days for Forest Service review. Bureau of Land Management must also review and also approve.	
Operating plan will contain information the Forest officer determines reasonable for assessment of (1) public safety, (2) environmental damage and (3) protection for surface resources. Content of such plans will vary according to location and type of activity and may contain:	
<ol style="list-style-type: none">1. Steps taken to provide public safety.2. Location and extent of areas to be occupied during operations.3. Operation methods including size and type of equipment.4. Capacity, character, standards of construction and size of all structures and facilities to be built.5. Location and size of areas where vegetation will be destroyed or soil lay bare.6. Steps taken to prevent and control soil erosion.7. Steps taken to prevent water pollution.8. Character, amount and time of use of explosives or fire, including safety precautions during their use.9. Program proposed for rehabilitation and revegetation of disturbed land.	
Copies of all permits obtained from State or Federal agencies pertaining to work might be required. Archeological studies, if required, will accompany plan.	
The Forest Supervisor or his/her designated agent has authority to temporarily suspend or modify operations in whole or in part due to emergency forest conditions such as high fire danger or other unsafe situations.	
The permittee must keep the _____ informed about progress of operations to the extent reasonably necessary for assuring public safety. This is especially important with geophysical inventory and testing activities because of their mobile nature. The _____ will alert the permittee to circumstances, which may affect safe and efficient conduct of work activities.	
Terms of this permit are considered violated if not done according to these stipulations. See Special Stipulations & Notifications	
_____ Permittee	
R9-2800-6b (3/83)	

The following special stipulation applies to all prospecting permits:

<p style="text-align: center;">SPECIAL STIPULATION</p> <p>Pursuant to the provisions of the Act of March 4, 1917 (16 USC 520), Section 402 of the Re-Organization Plan No. 3 of July 16, 1946 (60 Stat. 1097, 1099), the Act of August 7, 1947 (30 USC 352) and the National Environmental Policy Act of 1969 (42 USC 4321 et seq.) as said authorities have been or may hereafter be amended, no mineral development of any type is authorized hereby, and consent to the issuance of this prospecting permit as required by law and regulation (43 CFR 3500.9-1(b)) is given subject to the express stipulation that no mineral lease may be issued for the land under permit without the prior consent of the Forest Service, USDA and the proper rendition of an environmental analysis in accordance with the National Environmental Policy Act of 1969, the findings of which shall determine whether and under what terms and conditions for the protection of the land involved the lease may issue.</p> <p style="text-align: right;">R9 FSM 2822.42 – Exhibit 1</p>
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The following special stipulation applies to all prospecting permits:

<p style="text-align: center;">USDA – FOREST SERVICE STANDARD STIPULATIONS - LEASE (FSM 2820)</p> <p style="text-align: right;">Serial No.: Lessee: National Forest:</p> <p>The lessee is notified and agrees:</p> <p>All work and any operations authorized under this permit shall be done according to an approved operating plan on file with the _____ at _____ Plans generally require a minimum of 45 days for Forest Service review. Bureau of Land Management must also review and also approve.</p> <p>Operating plan will contain information the Forest officer determines reasonable for assessment of (1) public safety, (2) environmental damage and (3) protection for surface resources. Content of such plans will vary according to location and type of activity and may contain:</p> <ol style="list-style-type: none">1. Steps taken to provide public safety.2. Location and extent of areas to be occupied during operations.3. Operation methods including size and type of equipment.4. Capacity, character, standards of construction and size of all structures and facilities to be built.5. Location and size of areas where vegetation will be destroyed or soil lay bare.6. Steps taken to prevent and control soil erosion.7. Steps taken to prevent water pollution.8. Character, amount and time of use of explosives or fire, including safety precautions during their use.9. Program proposed for rehabilitation and revegetation of disturbed land. <p>Copies of all permits obtained from State or Federal agencies pertaining to work might be required. Archeological studies, if required, will accompany plan.</p> <p>The Forest Supervisor or his/her designated agent has authority to temporarily suspend or modify operations in whole or in part due to emergency forest conditions such as high fire danger or other unsafe situations.</p>
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The lessee must keep the _____ informed about progress of operations to the extent reasonably necessary for assuring public safety. This is especially important with geophysical inventory and testing activities because of their mobile nature. The _____ will alert the lessee to circumstances, which may affect safe and efficient conduct of work activities.

Terms of this lease are considered violated if not done according to these stipulations.

See Special Stipulations & Notifications

Standard permit and lease notices and stipulations for hardrock operations address surface-management concerns. Additional stipulations for hardrock operations are considered on a case-by-case basis, as determined by site-specific analysis.

IV. CONDITIONS OF APPROVAL

Conditions of approval (COA) provide guidance and direction to mineral operators and are determined during the site-specific environmental analysis of a submitted Surface-Use Plan (Application for Permit to Drill for Oil and Gas) or Plans of Operation for mining. COAs are applied to surface operations to aid in achieving desired outcomes for safe, environmentally sound resource development, by preventing, minimizing, or mitigating adverse effects and reducing conflicts with other management goals. COAs have been developed in consideration of the best management practices of the BLM and the State of Illinois, and current industry practices. It is encouraged that these conditions be applied to private mineral operations.

The following conditions may be used in part, or in their entirety, depending on the recommendations of the site-specific analysis. These conditions should supplement, not duplicate, conditions in the Surface-Use Plan of Operations (SUPO, oil and gas) or a submitted operating plan (hardrock or common variety) for a permit or lease.

Table G-2a. Conditions of Approval (COA) applicable to all mineral operations.

COA-1	Permittee/operator will notify the authorized Forest officer immediately of any change in address, point of contact, or ownership.
COA-2	Permittee/operator will comply with all applicable federal, state and local laws, regulations, standards and other relevant environmental laws, including public health and safety.
COA-3	The Permittee/operator shall maintain the improvements and permit area to standards of repair, orderliness, neatness, sanitation and safety acceptable to the authorized Forest officer and consistent with other provisions of this authorization. If requested, the holder shall comply with inspection requirements deemed appropriate by the authorized officer.
COA-4	The Permittee/operator has a continuing responsibility to identify all hazardous conditions on the permit area that would affect the improvements and/or resources, or pose a risk of injury to individuals. Any non-emergency actions to abate such hazards shall be performed after consultation with the authorized officer. In emergency situations, the Permittee/operator shall notify the authorized officer of its actions as soon as possible, but not more than 48 hours after such actions have been taken.
COA-5	The Permittee/operator shall be responsible for the prevention and control of soil erosion or other resource damage on the area covered by this permit and lands adjacent thereto, and shall provide preventive measures as required by the authorized Forest officer and made a part of this permit/lease.
COA-6	No waste or by-products shall be discharged containing any substances in concentrations that could result in significant harm to fish and wildlife, or to human water supplies. Storage facilities for materials capable of causing water pollution if accidentally discharged shall be located so as to

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	prevent any spillage into waters, or to channels leading into water, that would result in significant harm to fish and wildlife or to human water supplies.
COA-7	The Permittee/operator shall protect the scenic aesthetic values of the area under this permit, and the adjacent land, associated with the authorized use, during construction, operation and maintenance of the improvements.
COA-8	All access roads will be built on locations and to specifications approved in advance of construction by the authorized Forest officer.
COA-9	The authorized operation may be temporarily suspended due to excessively wet soil conditions when unacceptable resource damage is anticipated or occurring as determined by the authorized officer.
COA-10	No member or delegate of Congress shall be admitted to any share or part of this agreement or to any benefit that may arise herefrom unless it is made with a corporation for its general benefit. This does not apply to outstanding minerals.
COA-11	The Permittee/operator shall fully and currently repair all damage other than ordinary wear and tear to national forest roads and trails caused by the Permittee/operator in the exercise of the privilege granted by this permit.
COA-12	If prior to or during excavation work, items of archeological, paleontological, or historic value are reported or discovered, or an unknown deposit of such items is disturbed, the Permittee/operator will immediately cease excavation in the area and notify the Forest Service. Operations will not resume work until written approval is given by the authorized officer.
COA-13	The Permittee/operator or an authorized representative will: Immediately after site construction and as needed throughout the life of the authorization, install or construct erosion devices where appropriate. The following will be installed as directed by the authorized Forest officer: <ul style="list-style-type: none"> ➤ Sediment dams in gullies, etc. ➤ Contour terraces on areas that exceed three percent gradient. ➤ Diversion terraces if there is potential for heavy waterflow onto or across the site. ➤ Erosion-control blankets on all cut or fill slopes that cannot be shaped to a 3:1 gradient or less. ➤ Fences around treated areas on sensitive soils until new vegetation is firmly established.
COA-14	Prior to drilling associated water well(s), the operator will provide the district ranger with the appropriate approved state permits authorizing such a well(s).
COA-15	Notify the district ranger at least five working days in advance of all work that will result in surface disturbance for a pre-operations inspection.
COA-16	Obtain the district ranger's approval for any changes in an approved site plan that would result in additional surface disturbance.
COA-17	Notify any subcontractors of required permits for activity not covered under the terms and conditions of this permit.
COA-18	Fencing the site will be required. The Permittee/operator may choose the type of fencing, but the design and material must be approved by the Forest officer.
COA-19	Stockpile the surface soil from the entire area to be disturbed in approved locations. Stockpiles should be leveled or rounded on top and smoothed on the sides to 3:1 slope and vegetated as specified by the authorized Forest officer.
COA-20	Brush, slash and other debris may only be burned if authorized by Forest officer, or otherwise will be disposed of as directed.
COA-21	Stumps and woody material will not be buried in pits or fill areas, unless approved by the authorized Forest officer.
COA-22	Follow these sanitation guidelines: <ul style="list-style-type: none"> ➤ All litter and garbage deposited on and off the site as a result of this project will be kept in a container and disposed of as necessary. ➤ Portable toilets will be used, and waste will be hauled to an approved disposal facility. ➤ In lieu of portables, flush toilets such as those in trailers used for office space or crew quarters may be used — when connected to a closed sewage system. Tanks will be pumped prior to reaching system capacity. Wastes will be hauled to an approved disposal facility.
COA-23	Coordinate the proposed site-surfacing (boards or gravel) with the Forest officer in the planning phase. No changes should be made without approval of the Forest officer.
COA-24	Remove all surfacing material (gravel) from the areas not needed for production operations; reseed according to Forest standards, within 30 days unless otherwise directed by the authorized Forest officer.
COA-25	Roads and operating areas will be adequately maintained during the life of the authorization. This maintenance shall include blading and shaping to smooth surfaces and pulling surfacing material back onto roadway, resurfacing, spot graveling, ditch work and culvert repair or additional work

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	as specified. This work shall be conducted as needed or as directed by the authorized Forest officer.
COA-26	Except for the driving surface, the road right-of-way will be revegetated according to Forest standards.
COA-27	The road may be left for the use of the Forest Service at the district ranger's discretion.
COA-28	Upon termination of operations, if the district ranger wants the road closed, the Permittee/operator or his authorized representative will: <ul style="list-style-type: none"> ➤ Remove all surfacing, bridging and water-handling materials and, unless otherwise authorized by the district ranger, remove from national forest land. ➤ Recontour the abandoned roadway as nearly as practical to original condition. ➤ Revegetate the abandoned roadway according to Forest Service standards.
COA-29	Use of roads other than those constructed by the Permittee/operator may be subject to additional requirements. Inquiry will be made to the Forest officer prior to use of pre-existing roads.
COA-30	A permanent vegetation cover will be established on all disturbed areas where bare mineral soil is exposed. The following are procedures recommended and commonly used to accomplish this reclamation. <ul style="list-style-type: none"> ➤ Except for those areas needed for access and/or production, areas where soil has been disturbed shall not ordinarily be left unseeded for more than 30 days. If it is anticipated the area will be left exposed for a longer period, seeding should occur immediately— before 30 days have elapsed. ➤ Areas to be seeded include cut-and-fill slopes, all ditches, shoulders and any other areas exposed by the project. ➤ Sites, such as pit walls and topsoil stockpiles, that will be exposed only one fall growing season, will be seeded according to the Forest officer. ➤ Stockpile soil—During initial clearing for the project, the topsoil (to a depth determined by the Forest officer at the pre-operations meeting) from the site will be removed and stockpiled for later use in restoration. Remove woody material prior to stockpiling soil. ➤ Waterbars and terraces—During occupancy and restoration, slopes or gradients three percent or greater will require the construction and maintenance of waterbars and/or terraces. The Forest officer will specify where these structures will be placed. ➤ Baled hay and silt fence for erosion control—Temporary erosion, sediment, and water pollution control measures will be required as determined by the authorized Forest officer. ➤ Seedbed preparation—Spread stockpiled soil evenly over the site, to produce about two to five inches of loose soil; seed and fertilize as directed by the authorized Forest officer. Rip subsoil on pads and roads prior to spreading topsoil as directed by the Forest officer.
COA-31	Reclamation may be approved not earlier than one year following the successful establishment of vegetative cover. Vegetative cover of at least 80 percent of the entire disturbed area will be considered successful establishment, if no gullies or other erosion-related problems exist.
COA-32	All equipment or rubbish must be removed prior to Forest Service acceptance of the site as restored.
COA-33	Performance bonds (if applicable) will not be released until satisfactory reclamation is complete.
COA-34	Pesticides, including herbicides, may not be used to control undesirable woody and herbaceous vegetation, aquatic plants, insects, rodents, or trash fish without prior written approval of the Forest officer. A request for approval of planned uses and schedule of applications of pesticides will be submitted annually by the Permittee/operator. Exceptions to this schedule may be allowed only when unexpected outbreaks of pests require control measures which were not anticipated at the time the annual report was submitted. At that time an emergency request and approval may be made.
COA-35	Only those materials registered by the US Environmental Protection Agency for the specific purpose planned will be considered for use on national forest land. Label instructions will be strictly followed in the application of pesticides and disposal of excess materials and containers.
COA-36	Any chemicals stored on site will be prominently labeled and stored off the ground out of direct sunlight.
COA-37	A list of chemicals (including MSOS sheets) on site will be provided to the district ranger's office for emergency response planning.
COA-38	Site-access roads will be gated only upon the approval of the Forest officer. Gate specifications must also be approved by the Forest officer. Gates shall be signed and comply with the <i>Manual of Uniform Traffic Control Devices</i> (MUTCD).
COA-39	Signs restricting public access will be placed only with the approval of the district ranger. All signs will be removed by the Permittee/operator at the conclusion of operations.
COA-40	All vehicles used on the construction sites will be equipped with a fire extinguisher.
COA-41	All gasoline- and diesel-powered equipment must have Forest Service-approved spark arrestors

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	and mufflers.
COA-42	Take all reasonable action to prevent and suppress forest fires and require all employees to do likewise.
COA-43	Pay for the cost of suppressing forest fires and damages to government property caused by fires resulting from acts of the Permittee/operator, his subcontractors, operators, or his employees.
COA-44	Notify the district ranger in case of fire and take immediate action to control the fire. The district ranger will provide the Permittee/operator with phone numbers where fires shall be reported.
COA-45	The permittee/operator shall protect, in place, all public land survey monuments, private property corners, and Forest boundary markers. In the event that any such land markers or monuments are destroyed in the exercise of the privileges authorized by this permit, depending on the type of monument destroyed, the holder shall see that they are reestablished or referenced in accordance with (1) the procedures outlined in the <i>Manual of Instructions for the Survey of the Public Land of the United States</i> , (2) the specifications of the county surveyor, or (3) the specifications of the Forest Service.

Table G-2b. Conditions of Approval (COA) applicable to oil/gas operations.

COA-46	Locate the well-site on the most level upland location that will accommodate the intended use, away from drainages and riparian areas. Site layout will be oriented to conform to the best topographic situation given the geologic target and any safety considerations. The site will be staked and reviewed to determine its compliance with environmental analysis documentation. Any timber-cutting will be in accordance with and under the direction of the authorized Forest officer.
COA-47	The method of disposal of drilling fluids and cuttings must be approved by the authorized officer.
COA-48	Construct mud/reserve pits so that they will not leak, break, or allow any discharge of liquids. The need for lining production pits and other types of pits with either an impervious clay material or an artificial liner will be determined by the Forest officer. If a liner is required, it will be installed along the bottom and sides of pits and be equivalent to three continuous feet of recompact or natural clay. Such liners include: <ul style="list-style-type: none"> ➤ Natural liner ➤ Soil mixture liner ➤ Recompact clay liner ➤ Manufactured liners ➤ Combination liners
COA-49	Pits are not to be located in stream channels. At least 50 percent of the pit should be constructed in an excavation (cut) of the pad site. Pit walls shall be smoothed and keyed. Side slopes shall not exceed 3:1. Outside pit walls shall be vegetated if drilling time exceeds 12 months.
COA-50	Protect pits from surface waters by levees or walls and by drainage ditches, where needed, and place no siphons or openings in or over levees or walls that would permit the escape of contents so as to cause pollution or contamination.
COA-51	After drilling operations cease: <ul style="list-style-type: none"> ➤ The disposal of fluids and cuttings will be accomplished within 30 days of completion of the drilling operations ➤ Materials may be pumped back down-hole only after proper approval from the state or BLM, as applicable.
COA-52	Pit sludge and cuttings may be buried on site in the existing pit only if an independent laboratory has tested the material and provided the Forest Service with proof that all federal and state waste-disposal requirements are met. If burial is allowed, only existing pits may be utilized. If burial is not allowed, all drilling sludge and cuttings will be removed and disposed of appropriately. If man-made pit-liners are used, they will be removed from the pit and disposed of off the national forest.
COA-53	Pits will be backfilled when dry and the site smoothed and recontoured as near as practicable to the original topography, with stockpiled topsoil respread evenly.
COA-54	Reserve pit closure—Pits will be closed in accordance with state standards.
COA-55	Within 90 days of termination of oil or gas production, or plugging of the well, remove the wellhead control device and appurtenances, unless Permittee/operator has approval from the BLM not to remove them. Remove gravel or other surfacing, recontour the site and revegetate according to Forest Service specifications.
COA-56	Conditions specific to petroleum/gas production equipment: <ul style="list-style-type: none"> ➤ Petroleum product and water storage tanks will be placed on level ground and surrounded by a dike capable of holding 1½ times the volume of the largest tank. A sump shall be installed inside the dike and routinely pumped to prevent overflow.

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	<ul style="list-style-type: none"> ➤ Tanks will be placed on a stable, solid foundation six inches or more in height to ensure that they remain clear of standing water. The foundation will be designed so that it will not subside and cause the tanks to sink or lean. Trenching within diked areas will not be allowed. ➤ Dikes will not be dug from a level surface. Instead, a level surface will be used as a base with the dike built upon that. The dike core will be of clay or other similarly impermeable material. The top of the dike will be level and maintained so that it does not become beaten down at any point. The top of the dike should be a minimum of 18 inches in width, and side slopes no greater than 3:1. It is recommended that the sides and top of all dikes be covered with a thick plastic sheet topped with washed gravel. This will help prevent erosion and sloughing of dike material. Also, this will help solve the problem of vegetation growth and fire hazards: spraying or mowing should not be necessary. Dikes must be constructed before any liquid is stored in the tanks. ➤ Any liquids collected within dikes, including liquids that may be rainwater, will not be drained off the site (outside dike area). Drains will not be installed. Liquids will be removed by vacuum truck to an approved disposal or injection facility. ➤ All lines used to drain oil or saltwater will have well-maintained and sealed valves to prevent leaks and vandalism. Load-out valves shall be located within dike area. ➤ Only that amount of the site that is needed to contain production facilities, a reasonable adjacent work area, and the access road will be occupied. The remaining authorized area will be restored as per Forest Service standards. Guy wires left on site from work-over rigging will be well marked. ➤ A fence is required to exclude casual foot traffic and cattle. It will enclose all surface-production equipment. Its location will be approved by the Forest officer. Construction standards will be to specifications supplied by the Forest officer. These specifications, at a minimum, include safety signs and fencing. Forest Service requirements for signing gates will be met. ➤ On-site equipment will be kept well maintained, neatly arranged, and painted where appropriate. It is the intent that a neat, orderly appearance is presented. Facilities will be painted to blend into the surrounding environment; specific painting requirements will be determined by the authorized Forest officer.
COA-57	Upon a spill occurrence, the permittee shall take immediate containment and cleanup action and notify the Forest officer at the earliest opportunity—not more than 48 hours. The plan shall include all pipelines.
COA-58	Upon plugging and abandonment of the well bore, the casing will be cut off below ground level as per state and BLM specifications.
COA-59	All non-essential equipment for the production facility will be removed from national forest land within 30 days of being excessed.
COA-60	It is the permittee's responsibility to notify the district ranger when flaring of the formation gas is to begin. Prior to flaring, the permittee must have approval from the state or BLM, as appropriate.
COA-61	Maintain a fuel break by mowing around all production equipment to reduce fire danger during the months from May through September.
COA-62	If H ₂ S is encountered during the drilling process, the Forest Service must be notified within 12 hours. If the operator is drilling into a zone known to contain H ₂ S, a safety plan must be prepared and attached to the permit. This plan should identify safety equipment to be maintained on site, how the area will be posted, emergency procedures, and a secondary exit in case of an emergency. All H ₂ S wells will be fenced and posted accordingly. These wells will be monitored according to the level of H ₂ S being emitted.
COA-63	Related mechanical facilities such as pumps, pump stations and tanks shall be designed, constructed, operated and maintained in accordance with safe and proven engineering practice, and meet or exceed recognized engineering standards for the type of facility.
COA-64	Pipeline rights-of-way outside the lease area will be authorized by a special-use permit. Conditions of use, including restoration and abandonment, will be included in the permit.

V. LEGISLATIVE HISTORY

A. ACTS AFFECTING ACQUISITION OF LANDS

- **Act of March 1, 1911 (Weeks Act):** Authorized the Secretary of Agriculture to examine, locate and purchase forested, cut-over or denuded lands for the regulation of flow of navigable streams or the production of timber.
- **Act of June 7, 1924 (Clarke-McNary Act):** Authorized the Secretary of Agriculture to obtain lands for the protection of forest lands, reforestation of denuded areas and the extension of national forests. Reservations of mineral rights were limited to 20 years.
- **Act of July 22, 1937 (Title III of the Bankhead-Jones Farm Tenant Act):** Authorized the Secretary of Agriculture to acquire submarginal land for conservation purposes, such as controlling soil erosion, protecting fish and wildlife, preventing impairment of dams and reservoirs, developing energy resources and protecting the public lands.

B. ACTS AND ORDERS AFFECTING ACQUIRED FEDERAL MINERALS

- **Act of March 4, 1917:** Authorized the Secretary of Agriculture to permit prospecting, development and utilization of mineral resources acquired under Act of March 1, 1911 (36 Stat. 961), as he/she may deem to be in the best interests of the United States; and all moneys received on account of charges, if any, made under this Act shall be disposed as is provided by existing law for the disposition of receipts from national forests (16 U.S.C. 520).
- **Mineral Leasing Act of 1920:** Specified that mineral deposits of coal, phosphate, oil, oil shale, gas and sodium could be acquired through a leasing system on public domain minerals.
- **1946–President’s Reorganization Plan Number 3: Section 402:** Transferred the authority of minerals acquired under the Weeks Act (Act of March 4, 1917) to the Secretary of Interior, with the consent of the Secretary of Agriculture:

That mineral development on such lands shall be authorized by the Secretary of Interior only when he is advised by the Secretary of Agriculture that such development will not interfere with the primary purposes of which the land was acquired and only in accordance with such conditions as may be specified by the Secretary of Agriculture in order to protect such purposes.

- **The Mineral Leasing Act for Acquired Lands August 7, 1947:** "Acquired lands" or "lands acquired by the United States" include all lands heretofore or hereafter acquired by the United States to which the "mineral leasing laws" have not been extended, including such lands acquired under the provisions of the Act of March 1, 1911 (36 Stat. 961, 16 U.S.C., sec. 552). May be leased by the Secretary under the same conditions as contained in the leasing provisions of the mineral leasing laws, subject to the provisions hereof.

- **Materials Act of 1947 and Multiple Use Mining Act of 1955:** Authorized the Secretary of Agriculture to dispose of common varieties of stone, gravel, sand and clay on Forest Service System lands. Under these and subsequent laws, the Forest Service was given authority to sell, give away, generally "dispose" of common materials. The Forest Service has discretion to approve or deny requests for removals from national forest system lands.
- **Mining and Minerals Policy Act of 1970:** Declared it the "continuing policy of the Federal government to foster and encourage private enterprise..." in the development of the nation's mineral resources.
- **Surface Mining Control and Reclamation Act of August 3, 1977:** Provided for cooperation between the Secretary of the Interior and the states in the regulation of surface coal mining. Provides for restrictions or prohibitions of surface mining operations on National Forest System lands.
- **National Materials and Minerals Policy, Research and Development Act of 1980:** Reiterates the policies stated in the 1970 Act and directs the Secretary of the Interior to "improve the availability and analysis of mineral data in Federal land-use decision-making..."
- **Energy Security Act of 1980:** Declared it "the intent of Congress that the [Forest Service] shall process applications for leases of National Forest System lands and for permits to explore, drill and develop resources on land leased from the Forest Service..."
- **Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA):** Directed that all federal land open to leasing be leased under a competitive system to the "highest responsible qualified bidder..." and that the government establish regulations "to ensure the complete and timely...restoration of any lands adversely affected by lease operations..."
- **Energy Policy and Conservation Act Reauthorization and Strategic Petroleum Reserve Act of 2000:** Directed an inventory of onshore oil and natural gas reserves and constraints on access.
- **Executive Orders 13212, 13302: Actions to Expedite Energy Related Projects.**
- **Energy Policy Act of 2005.**

C. LAWS/AUTHORITIES THAT ADDRESS PUBLIC LAND MANAGEMENT

- **Multiple-Use Sustained-Yield Act of 1960:** Stated "[I]t is the policy of Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed and wildlife and fish purposes...Nothing herein shall be construed so as to affect the use or administration of the mineral resources of national forest lands..."
- **National Environmental Policy Act of 1970:** Required federal agencies to use a systematic, interdisciplinary approach to ensure the integrated use of natural and social science in planning and decision-making.
- **Forest and Rangeland Renewable Resources Planning Act of August 17, 1974 as Amended by National Forest Management Act of October 22, 1976:** Required consideration of the geologic environment through identification of hazardous conditions and the prevention of irreversible damages. Requires the Secretary of Agriculture to use a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic and other sciences in the development and maintenance of land-management plans.
- **Forest Service Manual 2800: (2802 OBJECTIVES)** States "...the Forest Service administers its mineral program to:
 1. Encourage and facilitate the orderly exploration, development and production of mineral and energy resources within the National Forest System in order to maintain a viable, healthy minerals industry and to promote self-sufficiency in those mineral and energy resources necessary for economic growth and the national defense.
 2. Ensure that exploration, development and production of energy and mineral resources are conducted in an environmentally sound manner and that these activities are considered fully in the planning and management of other National Forest resources.
 3. Ensure that lands disturbed by mineral and energy activities are reclaimed for other productive uses."

VI. CATEGORIES OF MINERALS

Statutes and federal regulations separate federally owned minerals into three categories: locatable, leasable and salable. The Forest Service Manual and federal regulations provide guidance for their management and administration.

A. LOCATABLE MINERALS

This category only applies to federal minerals that have remained in the Public Domain and are subject to the 1872 mining law. Examples include "valuable minerals" such as metallic minerals and uncommon varieties of sand, stone, gravel or cinders. The Bureau of Land Management, under the Department of Interior (BLM) is the agency responsible for the

administration of these minerals. The agency which owns the surface (Surface Managing Agency), such as the Forest Service would be responsible for the protection of the surface resources. Almost all Forest mineral ownership was acquired; consequently there are no locatable minerals.

B. LEASABLE MINERALS

This category applies to acquired federal minerals considered valuable, such as gold, copper, silver and uncommon varieties of sand, stone and gravel, known as Hardrock Leasables; and those minerals identified in the Mineral Leasing Act of 1920 and subsequent acts specific to a mineral commodity and or state. Oil, gas and coal are categorized as Energy Leasables.

1. Hardrock Leasables

Examples of hardrock leasable minerals known to occur within or adjacent to the Forest are fluorite, lead, zinc, barite, rare-earth elements, tripoli (microcrystalline silica) and refractory clays. In areas where a mineral deposit has not been proven, the BLM may issue a prospecting permit to explore for unproven deposits. The Forest Service may either approve or disapprove the permit, based on submitted operating plans. If the BLM determines a valuable deposit has been discovered, the permittee may apply for a lease from the BLM to further explore and develop the mineral resource. In the event a valuable deposit is known and there is public interest in development, the BLM may offer the mineral leases competitively. However, prior to issuing any lease, the Forest Service must give consent to BLM to any conditions necessary to protect the surface resources. Royalties, generally 12.5 percent, are collected by the USDI Mineral Management Services. A portion of the collected royalties are disbursed to the affected local units of government.

2. Energy Leasables—Oil, Gas and Coal

The Mineral Leasing Act of 1920 specified that mineral deposits of coal, phosphate, oil, oil shale, gas and sodium could be acquired through a leasing system on public domain minerals. This direction differentiated these minerals from locatable minerals. The Mineral Leasing Act for Acquired Lands of 1947 extended the previous act to those minerals acquired under the Weeks Law. The specified mineral deposits may only be obtained through leasing. Of these minerals, oil, gas and coal, referred to as energy leasables, are known to occur adjacent to and within the Forest. Oil and gas leases may be obtained by competitive lease-sale or, if the lands are not leased during the sale, non-competitively within a two-year period from the sale date. For coal, BLM may issue a license to explore for a discovery. If a discovery is found, a lease may be issued. No lease or exploration license may be issued without the consent of the Forest Service and any conditions or terms necessary to protect the surface resources.

C. SALABLE MINERALS (COMMON-VARIETY MINERAL MATERIAL)

This mineral category includes common varieties of stone, gravel, sand and clay, as defined by the Materials Act of 1947, Public Law 167 of July 23, 1955 and subsequent acts. The authority to dispose of these minerals, given to the Secretary of Agriculture by the Materials Act of 1947, has been delegated to the national forests. Disposal methods include contract for the sale of material, leases and free-use permits.

D. NON-FEDERAL (PRIVATE) MINERALS

Private minerals are those severed from the surface estate through a reservation stated in a conveyance instrument within the title history to a specific parcel of land. If the subsurface estate was severed through reservation in a conveyance document to the United States, the Secretary of Agriculture's rules and regulations are applicable. Additionally, some of the reservations involving the conveyance document to the United States included expiration dates. If the subsurface estate was severed in reservation prior to the transaction involving the United States, the language in the conveyance document is applicable. Approximately 30 percent of the mineral estate on the Forest is private.

APPENDIX H

STRATEGIES AND GUIDELINES FOR CONSERVATION OF BIOLOGICAL DIVERSITY

I. FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

The strategies and guidelines specified for federally listed threatened and endangered species are mandated by the US Fish and Wildlife Service in its biological opinion of the 2006 Forest Plan.

A. PLANTS

a. *Mead's Milkweed*

- Manage in accordance with the US Fish and Wildlife Service Recovery Plan.
- Expand current populations into restored habitat through the use of propagated plants.
- Where adverse effects occur, or are expected to occur, as a result of recreational use near known populations, implement corrective actions as needed to avoid or prevent the adverse effects.
- Manage and expand existing habitat through the use of prescribed burning and other management tools.
- Remove critical shading-trees and shrubs as needed to perpetuate the species.
- Where non-native species are invading occupied habitat, utilize control measures necessary to eradicate the undesirable species. To avoid adverse effects on the milkweed, treatments should be done during the dormant season—between the end of October and the end of March.

B. BIRDS

a. *American Bald Eagle*

- Prohibit disturbances within approximately 300 feet of each occupied eagle nest to protect the nest.

- Prohibit significant changes in the landscape within approximately 600 feet of an occupied eagle nest.
- Restrict management activities that could result in adverse disturbance to nesting birds within approximately 1,300 feet of an eagle nest during the nesting period.
- Identify winter bald eagle feeding and roosting areas and prohibit land use that would destroy or otherwise render these areas unsuitable.

b. Least Tern

This species nests on islands in the Mississippi River in Alexander County. Documentation by the US Fish and Wildlife Service indicates that terns have also nested on agricultural lands adjacent to the Mississippi River. The tern is not known to nest on the Forest; however, should this occur, the following guidelines will apply.

- Prohibit controllable disturbances within identified nest-colony sites between May 15 and August 31.
- Prohibit sand and gravel operations that could remove or destroy identified nesting colonies.
- Implement management recommendations as developed in the Recovery Plan.

C. MAMMALS

1. Gray and Indiana Bat

a. Caves and Abandoned Mines

- In caves and mines with documented summer use, prohibit access as necessary to prevent disturbance of bats between March 15 and October 31 and, in those with documented winter use, prohibit access as necessary to prevent disturbance between September 15 and April 30.
- Prohibit any significant disturbance within approximately 100 feet of a cave entrance or open, abandoned-mine entrance when occupied by bats.
- Retain a forested corridor between caves or abandoned mines utilized by bats and foraging areas (e.g., stream or reservoir).
- Consider acquisition of caves or abandoned mines found to contain populations of Indiana and/or gray bats, and those caves determined to be of regional significance within the Forest proclamation boundary. (The Indiana Bat Recovery Team will identify regionally significant caves or mines.)

b. Indiana Bat Roosting Habitat

- Known habitats include bottomland hardwoods, shrub-swamps and riparian forests. In known roosting habitats, 50 to 75 percent of the basal area of live trees should be greater than 11 inches DBH. Since this guideline would not be possible to accomplish on every acre, and in order to provide for retention, recruitment and mortality in hardwood forests, it should be applied mainly to entire maternity-roost habitat areas, such as Oakwood Bottoms Greentree Reservoir. The habitats should include a preponderance of species with exfoliating bark, such as American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*), eastern cottonwood (*Populus deltoides*), bitternut hickory (*Carya cordiformis*), shellbark hickory (*Carya laciniosa*), shagbark hickory (*Carya ovata*) and species in the red oak (*Quercus* spp.) group. Known roosting habitats should contain an abundance of canopy-gaps. Crown-closure of live trees greater than 11 inches DBH of all species should be between 30 and 80 percent, where possible, specifically excluding shrub-swamps.
- Within five miles of known roosts or hibernacula, known roost-trees will not be removed through harvesting. Management of forested areas should maintain a diversity of age-, size- and species-classes of potential roost-trees. It should also include the maintenance of existing forested landscapes, snag and live-tree retention, riparian-corridor and hibernacula protection, and improvement projects. When the removal from these areas of dead trees or trees with exfoliating bark is required for safety or to accomplish project objectives between April 1 and November 15, the areas must be evaluated for bat-usage prior to removal, including exit surveys if necessary. Potential roost-trees cannot be removed during this period unless they are evaluated and/or surveyed to confirm non-use by roosting bats, and documented in a biological evaluation. Surveys could include mist-netting of sale areas, exit surveys for individual trees, or other surveys approved by the US Fish and Wildlife Service.
- Greater than five miles from known hibernacula and maternity-roost areas, potential roost-trees, including live hardwood trees with exfoliating bark, should not be removed during the roosting period—April 1 to September 30—unless necessary for human safety or to accomplish project objectives. Removal of these trees during the roosting period requires evaluation and/or surveys to determine non-use by roosting bats. Surveys could include the mist-netting of sale areas, exit surveys for individual trees, or other surveys approved by the US Fish and Wildlife Service.
- In all project areas where large, overstory, hardwood trees could be cut, mist-netting surveys, exit surveys, or other surveys approved by the US Fish and Wildlife Service, must be done to identify known roosting habitats prior to harvest or cutting. Mature leave-trees in areas where the shelterwood or shelterwood-with-reserves harvest methods are applied (including the uplands) should include mixtures of tree species preferred by Indiana bats for roosting: 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*) and slippery elm (*Ulmus rubra*).

c. Dead Trees

Retain all standing, dead trees unless removal is necessary for human safety or to accomplish project objectives. Greater than five miles from known hibernacula or maternity-roosting habitats, dead trees that are potential roost trees cannot be removed between April 1 and September 30, unless they are evaluated and/or surveyed to confirm non-use by roosting bats and documented in a biological evaluation. Less than or equal to five miles from known hibernacula or maternity-roosting habitats dead trees that are potential roost trees cannot be removed between April 1 and November 15, unless they are evaluated and/or surveyed to confirm non-use by roosting bats and documented in a biological evaluation.

d. Snag and Cavity Management

i. Snag/Cavity Management for Clearcut, Seedtree and Shelterwood

Retain a minimum number of cavity trees in clumps within the harvest area. Identify large existing or potential cavities and snags and reserve a portion of the stand around them. Retain all snags as required by guidelines for Indiana Bat.

Suggested Clump Spacing - Optimally the clump should contain one or more large cavity tree (greater than 10 inches DBH). Clump size should be 1/3 to 1/5 acre in size. One clump per 5 acres of regeneration should be retained.

The following criteria, arranged in order of priority, should be used to select clump locations:

- 1 Select the largest-diameter trees with obviously active cavities and reserve 3 to 5 dominant or co-dominant trees around them, regardless of topography or proximity to stand boundary.
- 2 Select areas to be reserved, such as finger-draws that protrude into the regenerated stand. Reserve all cavity and surrounding trees within the draw.
- 3 Select cavity trees and clumps of reserve trees near the lower end of a slope or just below the top of a ridge.
- 4 In ridge-top stands, reserve clumps of trees surrounding cavity trees located near the edges of stands.
- 5 If clumps are reserved in the center of the regeneration area they should be connected to the adjacent forest by a row or finger of reserved trees.
- 6 When more than enough cavity trees exist to meet management objectives, select tree species that have long life expectancies and attain larger diameters.
- 7 When possible, utilize leave-areas needed to meet visual-quality objectives.

Once designated, no harvest or TSI activities should occur within the clump.

ii. Snag/Cavity Management for Thinning and Timber-Stand Improvement (TSI)

Retain all snags as required under guidelines for the Indiana bat. Strive for an even distribution of cavity trees within the stand. Favor cavity-tree species such as American elm, American sycamore, northern red oak, yellow poplar and green ash, all of which are relatively rot-resistant and long-lived.

Cavity-tree objectives in Tables H-1 and H-2 should be met with live trees; but dead trees are acceptable if insufficient live cavity trees are not available. If selected, dead cavity trees may also be counted as part of the snag objective.

When objectives for cavity trees larger than 19" cannot be met, select from among the 11"-19" size-class. When cavity trees in the 11"-19" size-class are unavailable, select the largest trees available with potential as cavity trees or snags. If necessary, snags may be created by killing selected, rot-resistant trees of the appropriate diameter class. When creating snags, deaden trees larger than 19 inches DBH only after cavity tree objectives have been met.

For intermediate treatments within upland hardwood habitat types, mark and retain snags and cavity trees as shown in Table H-1.

Table H-1. Snag and cavity-tree objectives for upland habitat-types under even-aged management.

Tree Size	Snags	Cavity Trees
Diameter greater than 19"	0	1/Acre
Diameter 11" to 19"	4/Acre	4/Acre
Diameter 10" or less	1/Acre	2/Acre

For treatments in bottomland and riparian habitats, the following guidelines apply:

- Snags in riparian habitats should be managed through natural mortality only.
- When the minimum number of cavity trees greater than 19 inches DBH does not exist within areas having suitable wood duck habitat, artificial nest structures (wood duck boxes) may be used to supplement natural cavities.
- Nest boxes placed on metal structures should be 4 to 5 feet above the high water mark and preference given to grouping boxes in clusters of 5 to 10 boxes. Clusters should be spaced 50 to 100 feet apart. The recommended nest box density is 2 to 3 boxes per acre of suitable habitat. Boxes should be placed in trees as high as possible up to about 45 feet. The direction of the entrance is immaterial as long as it is easily visible.
- Cavity trees within these habitat types should be marked and retained as shown in Table H-2.

Table H-2. Snag and cavity-tree objectives for bottomland habitat-types under even-aged management.

Tree Size	Riparian Areas	Other Bottomland Areas
Diameter greater than 19"	2+/Acre	1/Acre
Diameter 11" to 19"	14+/Acre	7/Acre
Diameter 10" or less	9+/Acre	4/Acre

iii. Snag/Cavity Management for Uneven-Aged Selection Harvest

Snag and cavity tree objectives listed in Tables H-2 and H-3 also apply to selection harvest. All snags will be retained as required by guidelines for the Indiana bat. Cavity-tree objectives will be met through retention of old-growth characteristics.

iv. Snag/Cavity Management for Herbaceous Openland (including Semi-open Habitats)

Management activities within this habitat-type should give priority to maintaining cavity-tree objectives. Objectives for open/semi-open habitats apply only to those areas with sufficient trees to meet the stated objectives. Snags may be created to meet objectives once cavity-tree objectives have been met. In such circumstances, the best cavity trees should be protected and snags chosen from among the residuals. Strive for an even distribution of snags throughout the stand. Cavity-tree objectives should be met with live trees, but dead trees are acceptable if insufficient live cavity trees are unavailable. If selected, dead cavity trees may also be counted as part of the snag-objective. The snag/cavity tree objectives listed in Table H-3 apply to this habitat type:

Table H-3. Snag and cavity-tree objectives for herbaceous openland habitat-types.

Tree Size	Snags	Cavity Trees
Diameter greater than 19"	0	3/Acre
Diameter 11" to 19"	4/Acre	4/Acre
Diameter 10" or less	2/Acre	3/Acre

d. Monitoring and Reporting

- Personnel conducting mist-netting, cave surveys and other monitoring activities requiring the handling of bats must be adequately trained by experienced personnel. Mist-netting procedures developed by Garner and Gardner (1992), or other bat monitoring procedures approved by the US Fish and Wildlife Service, will be used.
- An annual report of bat-monitoring activities and involved personnel must be provided to the Marion, Illinois office of the US Fish and Wildlife Service. Any bats incidentally killed during monitoring must be placed on ice or frozen and brought to the Marion office as soon as possible. Any incidental taking of Indiana and/or gray bats must be reported to the Marion office within three business days.
- During site-specific project planning, the effects of management on suitable roosting and foraging habitat within a five-mile radius of known hibernacula and maternity colonies must be considered, and such habitat must be maintained or enhanced in that area. The maintenance or enhancement of Indiana bat habitat can be accomplished through implementation of Indiana bat standards and guidelines and/or additional site-appropriate measures.
- Continue monitoring occupied Indiana bat hibernacula and maternity colonies on the Forest to assess changes in population numbers, variations in microclimate, and the effectiveness of protective structures that have been installed.

- Continue monitoring the extent of use by Indiana bats of the Forest. This should include currently accepted techniques to gather information on the Indiana bat. Surveys should be prioritized based on the probability of Indiana bat use and/or more optimal habitat conditions.
- Habitat use at all sites where Indiana bats are documented on the Forest should be characterized and quantified at both the local and landscape levels using GIS and/or other advanced computer software.
- Develop and implement methods to determine estimated Indiana bat habitat available before and after site-specific project implementation. Provide that information in project-specific biological evaluations.
- Monitor the number of suitable roost trees available to the species on the Forest using Forest Inventory Assessment data, once every five years at a minimum.
- The results of monitoring activities shall be provided to the Marion, Illinois Ecological Services Field Office and the Illinois Department of Natural Resources no later than December 31 of each year.
- Provide to personnel of the Marion, Illinois Ecological Services Field Office, and to the Illinois Department of Natural Resources, an opportunity to conduct site visits to the Forest to evaluate compliance with monitoring requirements. Site visits will be scheduled by mutual consent of the US Fish and Wildlife Service and Forest personnel.
- Care must be taken in handling found dead bats in order to preserve the biological material in the best possible condition. Any dead specimens should be placed in a plastic bag and refrigerated as soon as possible following discovery.
- Upon locating any dead, injured or sick Indiana bats, initial notification must be made to the US Fish and Wildlife Service Ecological Services Field Office at Marion, Illinois. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of the cause of injury or death.
- Provide the US Fish and Wildlife Service with an annual report—due by December 21 of each year—that specifies:
 - a. The amount of suitable habitat affected by timber harvest and mineral management activities in the current year and the total amount affected since issuance of the 2005 Biological Opinion and Incidental Take Statement;
 - b. The amount of habitat affected by timber-stand improvement and wetland management in the current year and the total amount since issuance of this Biological Opinion and Incidental Take Statement;

- c. The progress and results of any required terms and conditions identified during project-evaluation; and,
- d. The number of live or dead Indiana bats encountered.

D. FISH

1. Pallid Sturgeon

The species is known from the Mississippi River in the vicinity of the Forest; however, it is not known to occur on the Forest. Riparian filter-strip standards that minimize sedimentation from Forest management activities will mitigate any measurable, adverse, indirect effects on this species.

E. MUSSELS

2. Fanshell, Fat Pocketbook, Pink Mucket and Orange-Footed Pimpleback

All four species are known to occur in the Ohio River; however, none of these species are known to occur on the Forest in tributaries of the Ohio. Monitor and regulate land use in upstream tributaries to minimize sediment movement into the Ohio River.

II. REGIONAL FORESTER SENSITIVE SPECIES

A. PLANTS

<i>Asplenium bradleyi</i> (Bradley's spleenwort) and <i>Asplenium resiliens</i> (black-stem spleenwort): In known and historical locations maintain moist, crevice habitats in weathered sandstone/ limestone cliff faces and outcrops. Promote indirect light and/or open forested conditions at or adjacent to cliff communities. Avoid adverse modifications of hydrological or sunlight conditions at or adjacent to known sites.
<i>Bartonia paniculata</i> (twining screwstem), <i>Isotria verticillata</i> (purple fiveleaf orchid) and <i>Thelypteris noveboracensis</i> (New York fern): Avoid hydrologic disturbances to acid gravel seeps and natural spring wetland communities. Maintain open woodland/prairie-like conditions avoiding complete shade and eliminating tree species that affect required moisture regimes. Control non-native invasive species that invade or are adjacent to the seeps.
<i>Berberis canadensis</i> (American barberry), <i>Lonicera dioica</i> var. <i>glaucescens</i> (limber honeysuckle) and <i>Lonicera flava</i> (yellow honeysuckle): In known and historical locations, maintain natural conditions of dry sandstone cliffs in dry woodlands. Avoid construction of trails at or adjacent to known sites. Avoid pesticides and the removal of Japanese honeysuckle until positive identifications are made.
<i>Calamagrostis porteri</i> ssp. <i>insperata</i> (Porter's reedgrass): Maintain dry, open rocky woods and wooded ravines, on north-and northwest-facing slopes on dry limestone or dolomite cliffs and sandstone outcrops. Dry upland habitats for this species can be exposed to full sun or in partial shade.
<i>Carex decomposita</i> (cypress-knee sedge): Maintain the natural conditions of swamps as much as possible. Avoid disturbing downed logs, stumps and cypress "knees" where this species often grows. Monitor for habitat decline and/or pollution that could change water quality and affect the reproduction and survival of this species.
<i>Cimicifuga rubifolia</i> (Appalachian bugbane): Avoid ground-disturbing activities at known locations of this species in mesic-floodplain woods and adjacent talus slopes. Found in highly

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erodible soils, this species typically occupies cool, moist, north-facing slopes in relatively undisturbed mesic woods above the high-water line near and adjacent to streams.
<i>Dodecatheon frenchii</i> (French's shooting star) and <i>Trichomanes boschianum</i> (Appalachian bristle fern): Avoid ground-disturbing and recreational activities along drip-lines and beneath extending or overhanging sandstone ledges where these species occur. These species are rarely exposed to direct sunlight.
<i>Gentiana alba</i> (plain gentian), <i>Polygala incarnata</i> (procession flower) and <i>Trifolium reflexum</i> (buffalo clover): Maintain dry-mesic and mesic barrens and glades with the periodic use of prescribed fire.
<i>Isotria verticillata</i> (whorled pogonia): Included with <i>Bartonia paniculata</i> , above.
<i>Lilium superbum</i> (Turk's-cap lily): Maintain an open canopy in mesic woods and along streams where this species is known to occur. Direct sunlight enhances the species, whereas excessive shading suppresses vigorous growth and reproduction.
<i>Lonicera dioica</i> var. <i>glaucescens</i> (limber honeysuckle) and <i>Lonicera flava</i> (yellow honeysuckle): Included with <i>Berberis canadensis</i> , above for p.
<i>Lysimachia fraseri</i> (Fraser's yellow loosestrife): Maintain an open canopy at known locations of this species by allowing natural and artificial disturbances to occur along the floodplains of streams.
<i>Oxalis illinoensis</i> (Illinois wood sorrel): Avoid soil-disturbing activities at known locations of this species in mesic, limestone forest habitats. These areas are generally found in floodplains and along streambanks.
<i>Plantago cordata</i> (heartleaf plantain): Avoid soil-disturbing activities and pesticide-use near and adjacent to streams in areas known to contain populations of this plant.
<i>Polygala incarnata</i> (procession flower): Included with <i>Gentiana alba</i> , above.
<i>Silene ovata</i> (Blue Ridge catchfly): Avoid soil-disturbing activities at known locations. Habitat is upland forest communities of varying moisture-regimes on moderate-to-steep slopes that are often very rocky, with cliffs and slide blocks common, and with shallow loess-derived soils and rocky talus above sandstone rock.
<i>Thelypteris noveboracensis</i> (New York fern): Included with <i>Bartonia paniculata</i> , above.
<i>Trichomanes boschianum</i> (Appalachian bristle fern): Included with <i>Dodecatheon frenchii</i> , above.
<i>Trifolium reflexum</i> (buffalo clover): With <i>Gentiana alba</i> , above.
<i>Vaccium stamineum</i> (deerberry): Maintain open canopies at locations where this species is known to occur. These include a sandstone bluff-top and a ridge-top.
<i>Waldsteinia fragarioides</i> (Appalachian barren strawberry): This is a species of wet, mesic, north-facing sandstone cliffs. Prohibit harvest of trees immediately north of suitable habitat for a distance of 120 feet. Do not allow soil or substrate disturbances, hydrologic alterations, or vegetative disturbances above suitable habitat for a distance of 80 feet.

B. INVERTEBRATES

Orconectes indianensis* (Indiana crayfish), *Orconectes kentuckiensis* (Kentucky crayfish), *Orconectes placidus

All three species live in rocky riffles and pools of small-to-medium-size streams. Important habitat components include gravel and cobble substrate and woody debris. Identify core populations and monitor long-term trends in abundance. In streams known to contain these species, minimize stream impoundment, in-stream removal of gravel and cobble, and input of sediment or toxins from runoff. Prohibit the use of non-native crayfishes as fishing bait in streams containing known populations of these species, as well as the inter-basin transfer of non-native crayfish.

Land Snail and Subtle Cave Amphipod

Protect and /or manage habitat for known populations in Jackson and Union Counties. Improve and/or maintain groundwater quality in karst areas of Jackson and Union counties.

C. AMPHIBIANS AND REPTILES

Timber Rattlesnake

Protect known den sites from human disturbances. Maintain oak-hickory forests, including both early- and late-successional stages, and barrens habitats, as summer foraging habitats where they exist within a two-to-five-mile radius of known den sites, and generally throughout upland and bottomland forest areas in Jackson, Union and Alexander Counties.

Northern Copperbelly Watersnake

Maintain habitat-quality in wooded and permanent waterbodies, such as sloughs, the shallow, marshy edges of lakes and ponds, brushy ditches and floodplain woods in Johnson, Pope, Hardin, Gallatin, Massac and Saline Counties.

Bird-voiced Treefrog

Maintain and/or restore high-quality, bald cypress-tupelo swamp habitat across the Forest.

D. FISH

Bluehead Shiner and Bantam Sunfish

The bluehead shiner historically has been restricted to Wolf Lake and southern portions of LaRue Swamp within the LaRue Pine Hills Ecological Area. The bantam sunfish is restricted to all of LaRue Swamp, Wolf Lake and Grantsburg Swamp. Prohibit the introduction of live fish or crayfish in waters known to contain these fish, except as needed to maintain or restore historic populations. Maintain high-quality, bald cypress swamp habitat for both species. Continue reintroduction of the bluehead shiner into Otter Pond and other sites, as needed to insure their continued existence, until the Illinois Department of Natural Resources and the Forest agree to the re-evaluation of these efforts.

E. BIRDS

Cerulean Warbler

Manage large, contiguous tracts of at least 500 acres of sawtimber-sized and/or old-growth deciduous hardwood forests under a system of long rotations, with intermediate treatments directed toward fostering long boles, large diameters (more than 11 inches DBH), and full canopies of dominant trees with open understories and some canopy gaps. Strive to produce a varied, three-dimensional stand with extensive development of vertical diversity, such as canopies of dominants and canopy-emergents towering above midstory or intermediate trees. White oak is an important habitat component for this species. When possible, utilize existing oldfield-successional land rather than developing new openings.

Henslow's Sparrow

Manage occupied grassland/oldfield habitat with a rotational regime in order to create a mosaic of moderately tall, dense vegetation with little ground-litter. Management may utilize fire, herbicides, grazing, haying, or mowing, and depend upon timing and frequency. Management regimes may vary by habitat-type. In occupied habitats larger than 200 acres, prescribed burns should occur on an annual rotation of 20 to 30 percent of the area. Smaller, occupied sites can be burned, but should not total 50 to 60 percent of the occupied habitat. Utilize fire as the preferred treatment to control woody encroachment in early

spring (March –April) or late fall (October-November), or when it becomes taller than the fully grown, herbaceous vegetation. Mowing and/or haying in occupied habitat should be delayed until mid-August or September to permit vegetation regrowth so that birds can use sites the following spring. Grassland restoration areas in unoccupied habitats should be at least 125 acres, and preferably more than 250 acres.

Loggerhead Shrike

Composition objectives for herbaceous openland and oldfield-successional lands are included in each management prescription. Maintain these habitat components through prescribed burning and retention of herbaceous openlands, along with associated shrubby vegetation.

Swainson's Warbler

In Cave Valley, maintain dense overstory and understory canopies and extensive leaf-litter conditions overlying moist soils. Refer to the Cave Valley management prescription for a description of management activities.

F. MAMMALS

Eastern Woodrat

Determine the presence of Eastern woodrat activity-sites prior to vegetation removal or making changes in vegetative composition within 500 feet of rock outcroppings and/or bluff formations. Maintain a vegetative composition and structure that will produce abundant, hard mast and/or openings dominated by native herbaceous vegetation within 500 feet of known activity-sites. Continue reintroduction into previously occupied habitats.

Southeastern *Myotis*

This species occupies much of the same winter and summer roosting and foraging habitats as the Indiana bat. Maintain existing winter and summer roosting habitat for the southeastern *myotis* through Forest-wide standards and guidelines that apply to Indiana bat and riparian filter strips, and implementation of the management prescription for the Mississippi and Ohio Rivers Floodplains.

III. OTHER SPECIES OF VIABILITY CONCERN

A. PLANTS

***Cirsium carolinianum* (soft thistle), *Matelea obliqua* (climbing milkvine) and *Polytaenia nuttallii* (Nuttall's prairie parsley)**

Maintain open canopy with use of prescribed fire and tree/shrub removal in dry to dry-mesic, upland woodlands and barrens. Avoid ground-disturbing activities that could adversely affect known locations of populations.

***Pinus echinata* (shortleaf pine) and *Rhododendron prinophyllum* (early azalea)**

Maintain the dry to dry-mesic oak-hickory/native, shortleaf-pine matrix by promoting regeneration and canopy openings through prescribed fire. Avoid ground-disturbing activities on the steep thin-soiled slopes where these species occur.

B. ANIMALS

American Woodcock

Improve and/or maintain the quantity of early-successional, deciduous hardwood and riparian forests, and shrubby, oldfield patches in the CR, EH, LO, MH, MO and WW management areas, especially in close proximity to mature, deciduous forest edges.

Gray Treefrog

Maintain a diversity of fish-less, shallow-water breeding areas across the Forest in both upland and bottomland forests.

Northern Bobwhite

Optimum management opportunities for Northern bobwhite exist where managed, openland habitat consists of 30-to-40-percent grassland and 5-to-20-percent brushy cover surrounded by land containing 40-to-60-percent cropland and 5-to-40-percent woodland cover. Manage openlands, oldfields, wildlife openings and early-successional habitats in order to provide a mix of native and non-native grass species, including naturalized forbs, legumes and cereal grains that provides breeding, nesting and foraging habitat. To accomplish this, utilize mechanical disturbances, including mowing, disking and seeding, and frequent vegetation-disturbances, such as prescribed burning (every one to five years) of 50 to 75 percent of the understory vegetation annually. Retain abundant, woody-edge cover adjacent to managed openlands for optimum breeding densities. Retain old fencerows and hedgerows.

Red-Headed Woodpecker

Maintain snags and dead trees in accordance with Forest-wide standards and guidelines and the snag guidelines in this appendix. Improve or maintain diverse, oak-hickory forests, including open, savannah-like oak-hickory-dominated areas in the EH, MH, MO, OB and some CR and NA management areas.

River Otter

Protect and/or manage known populations in accordance with Illinois regulations. Leave all debris, such as brush piles and slash, along perennial streams, lakes, swamps and wetlands to provide habitat where possible. Maintain high-quality streams, rivers, wetlands and swamps through compliance with Forest-wide, riparian filter-strip standards and guidelines, and in the MO, OB and some CR and NA management areas.

Spring Cavefish

Maintain hydrology, water quality and fish passage at springheads and spring runs and adjacent swamp habitats in known spring cavefish locations.

Wood Thrush

Maintain large blocks greater than 500 acres of diverse, upland, deciduous forest in the EH, MH, WD, NM and some CR and NA management areas. Manage coves and lower slopes and riparian filter strips in upland, deciduous forests and mature, riparian forests to maintain moderate-to-dense overstory canopy, shrub understories and/or mid-stories in EH, MH, WD, WW and some CR and NA management-prescription areas.

Worm-Eating Warbler

Maintain large blocks greater than 500 acres of diverse, upland, deciduous forest, including a variety of age-classes, directly in the EH and MH, and indirectly in NM and WD management areas. Maintain some unburned areas on steeper slopes during prescribed burning in deciduous hardwoods.

Yellow-Breasted Chat

Maintain large patches greater than one acre of early-successional, deciduous hardwoods well-distributed throughout the Forest in the EH, MH, MO, OG and some CR and NA management areas, and large, well-distributed, dense, brushy patches of shrubs and/or briars in openland and riparian areas in the EH, LO, MH, MO and some CR and NA management areas.

C. HABITAT-MANAGEMENT GUIDELINES

Implementation of the following, generalized, habitat-management guidelines will provide for viable populations of all native species on the Forest.

- **Barrens and other native grasslands**
Maintain the diversity of native barrens and grasslands through active management in the EH, MH, LO and NA management areas.
- **Bottomland deciduous forests**
Maintain or increase the ecological diversity and quantity of bottomland deciduous forests in the CR, EH, MO and OB management areas.
- **Caves**
Maintain the quality and diversity of cave habitats through the Forest-wide standards and guidelines for cave management.
- **Cliffs**
Maintain or improve the diversity of cliff habitats directly in the NA and indirectly in the WD management areas.
- **Mesic deciduous forests**
Maintain or increase the acreage and diversity of mesic, deciduous forests through management or plant succession in the CR, NM, WD and portions of the EH and MH management areas.
- **Oak-hickory deciduous forests**
Maintain a variety of age-classes of oak-hickory deciduous forest through active vegetation management in the EH, MH, NA and OB management areas.
- **Riparian deciduous forests**
Maintain the quality and quantity of this habitat through Forest-wide standards and guidelines for filter-strip management, and through the MO, NA and WW management prescriptions.
- **Springs/seeps**
Protect existing springs/seeps and other water-areas critical to wildlife and plants. Remove non-native invasive species and encroaching woody species. Identify sites requiring protection prior to implementing nearby management activities.

- **Streams**
Improve or maintain the abundance and diversity of streams through the CR and NA management prescriptions and Forest-wide riparian filter-strip standards and guidelines.
- **Swamps**
Improve or maintain the quality and quantity of swamp habitats through Forest-wide riparian filter-strip standards and guidelines, and through the CR and MO management prescriptions.
- **Wetlands**
Maintain or improve the overall diversity and abundance of wetland habitats in the CR, MO, NA and OB management areas and, in other management areas, through implementation of Forest-wide riparian filter-strip standards and guidelines.

IV. POND AND LAKE MANAGEMENT

In consultation with the Illinois Department of Natural Resources, develop management prescriptions for fish habitat and populations in ponds and lakes. Maintain a desirable distribution of age-/size-classes of sport fish to ensure that a quality fisheries resource is provided to meet recreational demand. Specific population-objectives should be included in the management prescriptions for each lake or pond.

Manage existing ponds and lakes ½-acre or larger for sport fisheries, as well as existing woodland waterholes and ponds smaller than ½ acre that contain fish. Woodland waterholes and ponds smaller than ½ acre that do not presently (in 2006) contain sport fish will not be managed. Ponds and lakes over five acres and managed for sport fisheries should be surveyed, at a minimum, once every three years. Ponds less than five acres should be surveyed on an average of once every three to five years. All ponds and lakes should be evaluated once per decade to determine the level of public use and quality of the fishery.

When management activities are done at a pond or lake, such as aquatic weed control, use of pesticides and drawdown, an annual evaluation of the management will be made. This evaluation will consist, minimally, of an assessment of the age-/size-class distribution of the sport fishery and a description of habitat parameters. Control of excessive vegetation in lakes and ponds will be undertaken when vegetative cover impedes the resource use-objective for the waterbody. Control may be mechanical, biological, or chemical and will generally be done between May 1 and September 1.

Construction of ponds should be based on site-availability and an analysis of anticipated recreational demand. Newly constructed lakes and ponds will be at least one acre and have a minimum depth of ten feet over a quarter of the pond surface-area. Water along at least two-thirds of the shoreline should rapidly reach a four-foot depth, in order to inhibit the growth of shallow-water vegetation. A valve will be provided that allows drainage of the waterbody within a two-week period.