Natural Community Types for 4 Natural Areas
Impacts of fire management

Cumulative Effects Table from Chapter 3 of the Environmental Analysis.

Table 6. Past (last ten years), present and reasonably foreseeable future actions, with potential for cumulative effects, within the Forest watersheds (includes Forest Service and private lands).	
Action	**Scope of Action**
Agriculture (cultivated - row-cropping)	About 526,500 acres (past, present and future).
Agriculture (pastureland)	About 59,200 acres (past, present and future).
Prescribed burning *	About 3,000 acres per year (past). About 10,000 acres (present and future).
Wildfires	About 85 acres per year (past). About 1,000 acres per year (future).
Timber harvest/firewood cutting	About 1,000 acres per year (past, present and future).
Timber stand improvement	About 800 acres per year (past, present and future).
Recreational use **	About 300,000 people visited the Forest for recreation. About 37,000 for horseback riding About 150,000 for hiking or walking About 37,000 for hunting About 16,000 for fishing About 5,000 for gathering forest products (mushrooms, berries, and others). About 600 for bicycling.
ATV use	Variable use in watersheds (past, present and future).
Road (including right of way) maintenance	About 300 miles per year (past, present and future). About 1000 acres per year (past, present and future).
Tree planting	About 500 acres per year (past, present and future).
Utility right of way maintenance	About 250 miles per year maintained with herbicide (past, present and future).
Trail construction, reconstruction and maintenance	About 75 miles maintained per year (past, present and future). About 10 miles per year constructed or reconstructed.
Non-system trails	Estimate less than 100 miles of trail (past, present and future).
Special-use permits (telephone, electric, water and driveways).	Estimate less than 20 acres per year (past, present and future).
Invasive species control (private land)	About 200 acres treatment per year (past and present). About 400 acres herbicide treatment (future).
Openlands management	Disking and planting about 200 acres (past). Disking and planting about 100 acres (future).
Residential development	About 2,000 houses per decade (past and future).
* The Forest is planning on burning about 8,000-12,000 acres per year in the future. The prescribe burns in the proposed project (about 3,602 acres) would be included in these acres. ** Based on the 2008 National Visitor Use Monitoring Survey.	

I. NATURAL AREA TYPES

Four of the 80 natural areas are analyzed in the "Prescribed Burning of Cave Hill, Dennison Hollow, and Stoneface Research Natural Areas and Simpson Township Barrens Ecological Area and Adjacent Forest Communities" Environmental Analysis (Environmental Analysis). 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 (RNA) 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.

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.

C. ECOLOGICAL AREA (EA)

Ecological areas possess the significant characteristics of both botanical and zoological areas. Table 1 presents the ecological areas analyzed in the Environmental Analysis.

Table 1. Ecological areas.

Cave Hill RNA	Simpson Township Barrens
Dennison Hollow RNA	Stoneface

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.

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.

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 2 lists research natural areas.

Table 2. Research natural areas.

Cave Hill	Stoneface
Dennison Hollow	

II. MANAGEMENT OBJECTIVES FOR NATURAL AREAS

This section outlines the management objectives for the ecological communities of the Forest. Table 3 presents each community-type, community-subtype, and natural community name. The discussion of each community-type includes the site names of the natural area containing each community. The following information is a combination of the Illinois Natural Areas Inventory (1978), the Forest Plan (2006), and Olson *et al.* (2006). Segments are also a subset of the Forest Plan (2006).

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 3. 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	Dry woodland
	Flatwood	Flatwood
Savanna	Barrens	Barrens
Primary	Cliff	Sandstone cliff Sandstone overhang

	Cave	Limestone cliff Cave
Wetland (Aquatic)	Seep and spring Swamp Open water	Acid seep Spring Swamp (forested) Shrub swamp 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-lobe 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.

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.

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 rossette grass (*Dichanthelium ravenelii*), soft thistle (*Cirsium carolinianum*), early saxifrage (*Saxifraga virginiensis*), bashful bulrush (*Scripus verecundus*), sand hickory (*Carya pallida*), chestnut oak (*Quercus prinus*) and Atlantic goldenrod (*Solidago arguta*). Table 4 lists natural areas with dry-upland forest.

Table 4. Natural areas with dry-upland forest.

Cave Hill RNA/EA	Simpson Township Barrens EA
Dennison Hollow RNA/EA	Stoneface RNA/EA

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.

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 virginiensis*) and Kentucky yellowwood (*Cladrastis lutea*). Table 5 lists natural areas with dry-mesic upland forest.

Table 5. Natural areas with dry-mesic upland forest.

Cave Hill RNA/EA	Simpson Township Barrens EA
Dennison Hollow RNA/EA	Stoneface RNA/EA

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.

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 occcur. 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.

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.

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 laciniosa*), swamp white oak (*Quercus bicolor*), pecan (*Carya illinoiensis*) 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 pensylvanicum*), 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.

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.

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*).

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 may not be in need of restoration, but should be monitored for hydrological changes.

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 (*Cynosciadium digitatum*), copper iris (*Iris fulva*), ribbed mock-bishopsweed (*Ptilimnium costatum*) and traveler's delight (*Apios priceana*).

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 may not be in need of restoration, but should be monitored for hydrological changes.

3. 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 gattingeri*) and American bluehearts (*Buchnera americana*). Table 6 lists natural areas with dry-mesic upland forest.

Table 6. Natural areas with dry woodland.

Cave Hill RNA/EA	
Dennison Hollow RNA/EA	Stoneface RNA/EA

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.

***Maintenance by prescribed Fire*:** Apply management activities that maintain and/or enhance the pre-settlement character of the dry-woodland. 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.

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 (*Symphyotrichum 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 (*Cladina 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, orangegrass (*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 (*Symphyotrichum 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 7 lists some of the characteristic species of loess barrens of the Cretaceous Hills Type.

Table 7. Characteristic species of loess barrens of the Cretaceous Hills.

Agalinis gattingeri (roundstem false foxglove)	*Pycnanthemum torrei* (Torrey's mountainmint)
Andropogon gerardii (big bluestem)	*Quercus alba* (white oak)
Andropogon gyrans (Elliott's broomsedge)	*Quercus falcata* (southern red oak)
Buchnera americana (American bluehearts)	*Quercus marilandica* (blackjack oak)
Carya ovata (shagbark hickory)	*Quercus stellata* (post oak)
Carya texana (black hickory)	*Rhexia mariana* (Maryland meadow beauty)
Corylus Americana (American hazelnut)	*Rubus* spp. (blackberry)
Elymus spp. (wild rye)	*Schizachyrium scoparium* (little bluestem)
Helianthus angustifolius (swamp sunflower)	*Smilax* spp. (catbriers)
Lespedeza spp. (bushclover)	*Sorghastrum nutans* (Indian grass)
Liatris spp. (blazing star)	*Tripsacum dactyloides* (eastern gamagrass)
Malus ioensis (prairie crabapple)	*Vitis* spp. (grape)

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 with Prescribed Fire: This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the loess barrens natural community. 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.

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 8 lists natural areas with Shawnee Hills Type loess barrens.

Table 8. Natural areas with Shawnee Hills Type loess barrens.

Cave Hill RNA/EA	Stoneface RNA/EA

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. Table 9 lists characteristic species of limestone barrens of the Ozark Hills Type.

Table 9. Characteristic species of limestone barrens of the Ozark Hills.

Agalinis gattingeri (roundstem false-foxglove)	*Liatris aspera* (tall blazing-star)
Bouteloua curtipendula (sideoats grama)	*Quercus marilandica* (blackjack oak)
Carya texana (black hickory)	*Quercus prinoides* (chestnut oak)

Danthonia spicata (poverty oatgrass)	*Quercus stellata* (post oak)
Elymus spp. (wild rye)	*Schizachyrium scoparium* (little bluestem)
Helianthus divaricatus (woodland sunflower)	*Symphyotrichum oblongifolium* (aromatic aster)
Juniperus virginiana (eastern redcedar)	*Ulmus alatus* (winged elm)

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 with Prescribed Fire*:** This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the limestone-barrens natural community. 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.

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. Simpson Township Barrens EA is the only natural areas analyzed in the Environmental Analysis that contains the limestone barrens of the Shawnee Hills Type.

Table 10. Characteristic species of limestone barrens of the Shawnee Hills.

Arnoglossum plantagineum (groovestem Indian plantain)	*Matelea obliqua* (climbing milkvine)
Bouteloua curtipendula (sideoats grama)	*Physostegia virginiana* (obedient plant)
Brickellia eupatorioides (false boneset)	*Quercus marilandica* (blackjack oak)
Carya texana (black hickory)	*Quercus muehlenbergii* (chinquapin oak)
Echinacea pallida (pale purple coneflower)	*Quercus stellata* (post oak)
Eryngium yuccifolium (button eryngo)	*Schizachyrium scoparium* (little bluestem)
Hexalectris spicata (spiked crested coralroot)	*Silphium terebinthinaceum* (prairie rosinweed)
Juniperus virginiana (eastern redcedar)	*Smilax bona-nox* (saw greenbrier)
Liatris aspera (tall blazing-star)	*Symphyrotrichum patens* (late purple aster)
Lithospermum canescens (hoary puccoon)	*Ulmus alatus* (winged elm)

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 with Prescribed Fire: This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the limestone-barrens natural community. 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.

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 11 lists characteristic species of sandstone barrens. Table 12 lists the natural areas analyzed in the Environmental Analysis that contain sandstone barrens.

Table 11. Characteristic species of sandstone barrens.

Andropogon gerardii (big bluestem)	*Quercus marilandica* (blackjack oak)
Asclepias meadii (Mead's milkweed)	*Quercus stellata* (post oak)
Carya texana (black hickory)	*Quercus velutina* (black oak)
Croton monathogynus (prairie tea)	*Rhus copallinum* (flameleaf sumac)
Danthonia spicata (poverty oatgrass)	*Schizachynum scoparium* (little bluestem)
Elymus spp. (wild rye)	*Sedum pulchellum* (widow's cross)
Hypericum gentianoides (orangegrass)	*Sorghastrum nutans* (Indian grass)
Liatris spicata (dense blazing-star)	*Talinum parviflorum* (sunbright)
Liatris squarrosa (scaly blazing-star)	*Vaccinium arboreum* (farkleberry)
Opuntia humifusa (devil's-tongue)	*Vitis* spp. (grape)
Quercus coccinea (scarlet oak)	

Table 12. Natural areas with sandstone barrens.

Cave Hill RNA/EA	Stoneface RNA/EA
Dennison Hollow RNA/EA	

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 with Prescribed Fire: This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the sandstone-barrens natural community. 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.

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. Table 13 lists some characteristic species of mesic sand barrens.

Table 13. Characteristic species of mesic sand barrens.

Andropogon derardii (big bluestem)	*Quercus falcata* (southern red oak)
Gentiana alba (plain gentian)	*Schizachyrium scoparium* (little bluestem)
Gymnopogon ambiguous (bearded skeletongrass)	*Silphium integrifolium* (wholeleaf rosinweed)
Liatris squarrosa (scaly blazing-star)	*Sorghastrum nutans* (Indian grass)
Quercus alba (white oak)	

f. Gravel Barrens Natural Community

<u>Cretaceous Hills Type</u>

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. Table 14 lists some of the characteristic species of gravel barrens of the Cretaceous Hills Type.

Table 14. Characteristic species of gravel barrens of the Cretaceous Hills.

Carya glabra (pignut hickory)	*Liatris squarrosa* (scaly blazing-star)
Carya ovata (shagbark hickory)	*Pycnanthemum torrei* (Torrey's mountainmint)
Carya texana (black hickory)	*Quercus marilandica* (blackjack oak)
Ceanothus americanus (New Jersey tea)	*Quercus stellata* (post oak)
Clitoria mariana (Atlantic pigeonwings)	*Quercus velutina* (black oak)
Cornus florida (flowering dogwood)	*Sassafras albidum* (sassafras)
Danthonia spicata (poverty oatgrass)	*Schizachyrium scoparium* (little bluestem)
Elymus spp. (wild rye)	*Ulmus alata* (winged elm)
Helianthus divaricatus (woodland sunflower)	*Vaccinium arboreum* (farkleberry)
Lechea villosa (hairy pinweed)	*Vitis* spp. (grape)
Lespedeza hirta (hairy lespedeza)	

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 with Prescribed Fire: This prescription calls for the application of management activities that maintain and/or enhance the pre-settlement character of the

gravel-barrens natural community. 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.

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 15 lists some of the characteristic species of gravel barrens of the Ozark Hills Type.

Table 15. Characteristic species of gravel barrens of the Ozark Hills.

Asplenium bradleyi (Bradley's spleenwort)	*Pycnanthemum torrei* (Torrey's mountainmint)
Carex spp. (sedges)	*Quercus alba* (white oak)
Carya glabra (pignut hickory)	*Quercus marilandica* (blackjack oak)
Carya ovata (shagbark hickory)	*Quercus muehlenbergii* (chinquapin oak)
Carya texana (black hickory)	*Quercus prinus* (chestnut oak)
Danthonia spicata (poverty oatgrass)	*Quercus stellata* (post oak)
Hieracium gronovii (queen-devil)	*Rhododendron* spp. (azalea)
Krigia biflora (twoflower dwarf-dandelion)	*Schizachyrium scoparium* (little bluestem)
Liatris squarrulosa (Appalachian blazing-star)	*Solidago petiolaris* (downy ragged goldenrod)

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 with Prescribed Fire*:** 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. 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.

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 lusher 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 16 lists characteristic species of sandstone cliffs.

Table 16. Characteristic species of sandstone cliffs.

Amerlanchier arborea (common serviceberry)	*Juniperus virginiana* (eastern redcedar)
Asplenium bradleyi (Bradley's spleenwort)	*Lonicera flava* (yellow honeysuckle)
Carex pensylvanica (Pennsylvania sedge)	*Mitchella repens* (partridge-berry)
Cheilanthes lanosa (hairy lipfern)	*Osmunda cinnamomea* (cinnamon fern)
Danthonia spicata (poverty oatgrass)	*Waldsteinia fragarioides* (Appalachian barren strawberry)
Dennstaedtia punctilobula (eastern hayscented fern)	

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 17 lists a few of the characteristic species of sandstone overhangs.

Table 17. Characteristic species of sandstone overhangs.

Asplenium bradleyi (Bradley's spleenwort)	*Sayornis phoebe* (eastern phoebe)
Myrmeleontidea spp. (antlion larvae)	

Management

Any management required for the restoration or maintenance of a sandstone cliff community will be specified through site-specific analysis.

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 18 lists characteristic species of limestone cliffs.

Table 18. Characteristic species of limestone cliffs.

Asplenium bradleyi (Bradley's spleenwort)	*Pellaea atropurpurea* (purple cliffbrake)
Asplenium resiliens (blackstem spleenwort)	*Solidago rugosa* ssp. *subaspera* (wrinkleleaf goldenrod)
Cheilanthes feei (slender lipfern)	*Solidago sphacelata* (autumn goldenrod)
Neotoma floridana (eastern woodrat)	

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. Cave Hill RNA/EA is the only natural area that contains a terrestrial cave. Table 19 lists characteristic species of terrestrial caves.

Table 19. Characteristic species of terrestrial caves.

Eptesicus fuscus (big brown bat)	*Myotis lucifugus* (little brown bat)
Eurycea lucifuga (cave salamander)	*Myotis sodalis* (Indiana bat)
Myotis austroriparius (southeastern bat)	*Myotis subulatus leibii* (eastern small-footed bat)
Myotis grisecens (gray bat)	*Pipistrellus subflavus* (eastern pipistrell)
Myotis keenii (Keen's myotis)	*Plecotus rafinesquii* (Rafinesque's big-eared bat)

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).

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.

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*). Cave Hill RNA/EA is the only natural area in the Environmental Analysis that contains springs.

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*).

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 20 lists characteristic species of shrub-swamps.

Table 20. Characteristic species of shrub-swamps.

Carex spp. (sedge)	*Nyssa aquatica* (water tupelo)
Carya aquatica (water hickory)	*Populus heterophylla* (swamp cottonwood)
Decodon verticillatus (swamp loosestrife)	*Salix nigra* (black willow)
Gleditsia aquatica (water locust)	*Utricularia* spp. (bladderwort)
Najas minor (brittle waternymph)	

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 waternymph 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 21. Characteristic species of ponds.

Brasenia schreberi (watershield)	*Potamogeton* spp. (pondweed)
Cabomba caroliniana (Carolina fanwort)	*Sagittaria latifolia* (broadleaf arrowhead)
Echinodorus cordifolius (creeping burrhead)	*Spirodela polyrhiza* (giant duckweed)
Lemna minor (common duckweed)	*Spirodela punctata* (dotted duckweed)
Peltandra virginica (green arrow-arum)	*Wolffia columbiana* (Columbian watermeal)
Pontederia cordata (pickerel weed)	*Wolffiella gladiata* (Florida mudmidget)

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 mericana*) 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 Simpson Township Barrens EA and Cave Hill RNA/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 redfin 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.

Table Summaries of Natural Community Types and Natural Areas

I. Forest
- 1. Upland forest
  - A. Xeric upland forest
  - B. Dry upland forest
    - Cave Hill RNA/EA
    - Dennison Hollow RNA/EA
    - Simpson Township Barrens EA
    - Stoneface RNA/EA
  - C. Dry-mesic upland forest
    - Cave Hill RNA/EA
    - Dennison Hollow RNA/EA
    - Simpson Township Barrens EA
    - Stoneface RNA/EA
  - D. Mesic upland forest
- 2. Floodplain (bottomland) forest
  - A. Mesic floodplain forest
  - B. Wet-mesic floodplain forest
  - C. Wet floodplain forest
- 3. Woodland
  - A. Dry woodland
    - Cave Hill RNA/EA
    - Dennison Hollow RNA/EA
    - Stoneface RNA/EA

II. Savanna
- 1. Barrens
  - A. Loess(dry-mesic) barrens
    - Cretaceous Hills Type
    - Shawnee Hills Type
      - Cave Hill RNA/EA
      - Stoneface EA
  - B. Limestone barrens
    - Ozark Hills Type
    - Shawnee Hills Type
      - Simpson Township Barrens EA
  - C. Sandstone barrens
    - Cave Hill RNA/EA
    - Dennison Hollow RNA/EA

Stoneface RNA/EA
D. Gravel barrens
Cretaceous Hills Type
Ozark Hills Type
III. Primary
1. Cliff
A. Sandstone cliff
Cave Hill RNA/EA
Dennison Hollow RNA/EA
Stoneface RNA/EA
B. Sandstone overhang
C. Limestone cliff
2. Cave
A. Terrestrial cave
Cave Hill RNA/EA
B. Aquatic cave
IV. Wetland (aquatic)
1. Seep and spring
A. Acid seep
B. Spring
Cave Hill RNA/EA
2. Swamp
A. Swamp (forested)
B. Shrub-swamp
3. Open water
A. Pond
B. Perennial stream
High gradient creek
Cave Hill RNA/EA
Simpson Township Barrens EA

Natural Areas and their Community Types

1. Cave Hill RNA/EA:

Dry upland forest, dry-mesic upland forest, dry woodland, loess (dry-mesic) barrens [Shawnee Hills Type], sandstone barrens (and glade), sandstone cliff, terrestrial cave, spring, and high gradient creek.

2. Dennison Hollow RNA/EA:

Dry upland forest, dry-mesic upland forest, dry woodland, sandstone barrens and glade (and shale glade), and sandstone cliff.

3. Simpson Township Barrens EA:

Dry upland forest, dry-mesic upland forest, limestone barrens (Shawnee Hills Type), and high gradient creek.

4. Stoneface RNA/EA:

Dry upland forest, dry-mesic upland forest, dry woodland, loess (dry-mesic) barrens [Shawnee Hills Type], sandstone barrens (and glade), and sandstone cliff.