

**BIOLOGICAL EVALUATION
FOR
REGIONAL FORESTER'S SENSITIVE PLANT SPECIES
AND SPECIES WITH VIABILITY EVALUATIONS**

**PRESCRIBED BURNING OF CAVE HILL, DENNISON HOLLOW, AND
STONEFACE RESEARCH NATURAL AREAS AND SIMPSON TOWNSHIP
BARRENS ECOLOGICAL AREA AND ADJACENT FOREST
COMMUNITIES**

SHAWNEE NATIONAL FOREST

September 23, 2010

I. Introduction

The purpose of this Biological Evaluation is to identify the likely effects of the proposed action and alternative in the Prescribed Burning of Cave Hill, Dennison Hollow, and Stoneface Research Natural Areas and Simpson Township Barrens Ecological Area and Adjacent Forest Communities Project to 32 Regional Forester's Sensitive Plant Species (RFSS) and Plant Species with Viability Evaluations (SVE). These species have been documented as occurring on Shawnee National Forest managed lands. This Biological Evaluation ensures that Forest Service actions do not contribute to a loss of viability or contribute to a trend toward Federal listing of any species and it provides a process and standard that ensures the RFSS and SVEs receive full consideration in the decision making process.

II. Project Alternatives Analyzed

Alternative 1 – No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. The Forest would not implement any action alternative considered. Under the no-action alternative, pulling and torching of about 100 to 150 acres of invasive species each year would continue. Inventory and mapping of invasive species infestations could also continue.

III. Rare Plant Resources Analysis

The following information in Table 2 includes the 32 Regional Forester's sensitive plant species and/or Species with Viability Evaluations. Species descriptions, habitat and location information, were obtained from NatureServe (2008, 2010), Plants Database (2008, 2010), and available data and literature (found in Literature Cited and Reviewed at the end of this document).

Table 2. Regional Forester's Sensitive Plant Species (RFSS) on the Forest known to occur or have been documented as historically occurring within the Johnson and Saline counties of southern Illinois. Species with Viability Assessments (SVE) are also listed in this analysis. An asterisk (*) denotes the assumption that the species is extirpated in that

county. A double asterisk (**) next to the scientific name indicates that the name follows Mohlenbrock (2002), otherwise nomenclature follows the PLANTS database (2010). A = Alexander, G = Gallatin, H = Hardin, Ja = Jackson, Jo = Johnson, M = Massac, P = Pope, S = Saline, U = Union, and W = Williamson.

| A | G | H | Ja | Jo | M | P | S | U | W | Scientific Name | Common Name |
|---|---|---|----|----|---|---|---|---|---|---|-------------------------------|
| | X | X | X | X | * | X | | | | 1. <i>Actaea rubifolia</i> | Appalachian bugbane |
| X | | | | | | X | X | | | 2. <i>Amorpha nitens</i> | Shining false indigo |
| | | | X | | | | X | X | | 3. <i>Asplenium bradleyi</i> | Bradley's spleenwort |
| | * | X | | * | | X | X | | | 4. <i>Carex communis</i> | Fibrous-root sedge |
| | * | | | X | | X | | X | | 5. <i>Carex decomposita</i> | Cypress-knee sedge |
| | | | X | X | X | | | X | | 6. <i>Carex gigantea</i> | Giant sedge |
| * | | * | * | * | * | * | * | * | | 7. <i>Carex lupuliformis</i> | False hop sedge |
| X | | | | X | X | X | X | X | | 8. <i>Carex socialis</i> | Low woodland sedge |
| * | * | | X | X | * | * | | * | | 9. <i>Chelone obliqua</i> <i>var. speciosa</i> | Red turtlehead |
| | X | X | X | X | | X | X | | | 10. <i>Cirsium carolinianum</i> | Soft thistle |
| X | | | X | X | X | X | | X | X | 11. <i>Cypripedium</i> <i>parviflorum</i> var. <i>pubescens</i> | Greater yellow lady's slipper |
| | | | | X | | X | | | | 12. <i>Dennstaedtia punctilobula</i> | Eastern hay-scented fern |
| | | | | X | | | | X | | 13. <i>Dichanthelium jorii</i> ** | Variable panic grass |
| | | | X | X | | X | X | X | X | 14. <i>Dodecatheon frenchii</i> | French's shootingstar |
| | | | X | X | | X | | X | X | 15. <i>Dryopteris goldiana</i> | Goldie's woodfern |
| | | X | | X | | X | | X | | 16. <i>Echinacea simulata</i> | Wavyleaf purple coneflower |
| | X | | X | | X | X | X | X | | 17. <i>Eleocharis wolfii</i> | Wolf's spikerush |
| | | | | X | | X | | | | 18. <i>Eupatorium hyssopifolium</i> | Hyssop leaf thoroughwort |
| | | | X | X | X | X | X | X | X | 19. <i>Festuca paradoxa</i> | Clustered fescue |
| | | | X | X | | X | | X | | 20. <i>Hottonia inflata</i> | American featherfoil |
| * | | | X | X | * | | | X | | 21. <i>Hydrolea uniflora</i> | One-flowered false fiddleleaf |
| | X | X | | | | X | X | | | 22. <i>Hylotelephium telephioides</i> | Allegheny stonecrop |
| X | | X | X | X | X | X | X | X | X | 23. <i>Juglans cinerea</i> | Butternut |
| | X | X | X | X | | X | | | X | 24. <i>Lilium superbum</i> | Turk's-cap lily |
| | | X | | X | | X | X | | | 25. <i>Matelea obliqua</i> | Climbing milkvine |
| X | X | X | X | X | X | X | X | X | | 26. <i>Panax quinquefolius</i> | American ginseng |
| | | | X | X | | X | X | | | 27. <i>Plantago cordata</i> | Heartleaf plantain |
| | X | | X | X | | X | X | X | | 28. <i>Polytaenia nuttallii</i> | Nuttall's prairie parsley |
| | | | | X | | X | | | | 29. <i>Rhynchospora glomerata</i> | Clustered beaksedge |
| | X | | X | X | * | X | | X | | 30. <i>Stenanthium gramineum</i> | Eastern featherbells |
| | X | X | | X | | X | | X | | 31. <i>Trichomanes boschianum</i> | Appalachian bristle fern |
| | * | | X | X | | | | | | 32. <i>Trifolium reflexum</i> | Buffalo clover |

Environmental Impacts and Cumulative Impacts of Alternatives on Regional Forester's Sensitive and Species with Viability Evaluations.

Spatial Boundary: The geographic boundary for the rare plant resources in this analysis is the proclamation boundary of the Shawnee National Forest. This boundary was selected because management actions, natural processes and various activities, which occur on the Forest, are confined to the Forest and the areas immediately adjacent to it.

Temporal Boundary: The temporal boundary for rare plant resources is estimated from the last 10 years in the past to 10 years in the reasonably foreseeable future. A past temporal boundary was selected since the majority of our knowledge of rare plant resources has only come about within the last 70 years. Ten years in the past and future is long enough to accurately gauge the management effects and short enough that any unforeseeable deleterious effects resulting could be addressed, reversed, and/or mitigated.

Past, Present and Reasonably Foreseeable Future Actions

Past, present and future actions for the project area are listed at the beginning of Chapter 3 of the Invasive Species Management Environmental Assessment. The effects of these projects are bounded in time and analyzed cumulatively with the anticipated effects of the proposed action for each resource. Reasons that the identified past, present or foreseeable future action will not have Cumulative Impacts should be based on one or more of the following:

- a) The proposed action has no direct or indirect effects relative to the issue.
- b) The identified past/present/future action has no direct/indirect effect relative to the issue.
- c) The identified past, present and future actions are removed, temporally or spatially, from the proposed action to an extent that there is no combined effect on the specific resource of issue.
- d) There is no difference in effects between the action alternatives and the No Action alternative.

Table 3a displays the past, present and reasonably foreseeable future actions that have been considered in this analysis. Table 3b was created for the Environmental Assessment for herbicide use and prescribed burning of 23 natural areas across the Forest. It is concluded that agriculture (cultivated and pastureland), wildfires, timber harvest/firewood cutting, timber stand improvement, ATV use, road maintenance, tree planting, utility right-of-way maintenance, trail construction (includes reconstruction and maintenance), non-system trails, special-use permits (telephone, electric, water, driveways), openlands management, and residential development will not contribute to Cumulative Impacts since there is no difference in the effects of the action alternatives and the No Action alternative.

In some cases, prescribed burning, recreational use, and invasive species control (private lands) may contribute to Cumulative Impacts for rare plant resources. These effects may be beneficial or may have negative impacts on rare plant resources depending on the species, its location, and the action involved. Cumulative Impacts are explained in detail under each species heading below.

| Table 3a. All past (in the last five years) and present actions within the project area watersheds with potential for cumulative effects. Data extracted from GIS layers (see GIS specialist report in Project File). | | |
|--|--------------------------------------|--|
| Type of Action | Action | Scope of Action |
| Private Land | Private land ownership | About 66,486 acres |
| | Agricultural land | About 36,525 acres |
| | Wildfires | Estimate less than 500 acres of private land |
| | Prescribed fire | Estimate less than 500 acres |
| | Forested land | About 17,142 acres |
| | Wetlands | About 5,325 acres |
| | Barren exposed land/surface water | About 17,142 acres |
| | ATV/OHM use | Variable use in the watersheds |
| Forest Service | Forest Service managed lands | About 19,214 acres |
| | Roads | About 192 miles |
| | ATV/OHM use | Variable use in the watersheds |
| | Prescribed burning | About 918 acres. |
| | Forested land | About 18,158 acres |
| | Openlands/brush | About 1,055 acres |
| | Wetlands | About 262 acres |
| | Trail maintenance and use | About 20 miles of trails |
| | Horseback riding | Across the watershed in the project area. |
| | User-developed (non-system) trails | Estimated less than 25 miles of trail. |
| | Wilderness Area – Garden of the Gods | About 1,728 acres |
| | Utilities | 12 main power lines |

| Table 3b. Past (last ten years), present and reasonably foreseeable future actions, with potential for Cumulative Impacts, 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). |

| Table 3b. Past (last ten years), present and reasonably foreseeable future actions, with potential for Cumulative Impacts, within the Forest watersheds (includes Forest Service and private lands). | |
|---|---|
| Action | Scope of Action |
| 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 12,000 acres) would be included in these acres. | |
| ** Based on the 2008 National Visitor Use Monitoring Survey. | |

Key to global and state ranks:

G1/S1 - Critically imperiled – because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the State. Typically 5 or fewer occurrences or very few remaining individuals (<1000).

G2/S2 - Imperiled – because of rarity or because of some factor(s) making it very vulnerable to extirpation from the Nation, State. Typically 6 to 20 occurrences or few remaining individuals (1000 to 3000)

G3/S3 - Vulnerable – either because rare and uncommon, or found only in a restricted range (even if abundant in some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3000 and 10,000 individuals.

G4/S4 - Apparently secure – uncommon but not rare and usually widespread. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals.

G5/S5 - Secure – common, widespread, and abundant. Essentially ineradicable under present conditions. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

1. *Actaea rubifolia* (Appalachian bugbane)

Actaea rubifolia is a perennial herb that occurs in portions of Virginia, Tennessee, Kentucky, Alabama, Indiana, and Illinois. It flowers from July through September. This species is limited in range and there are approximately 50 to 80 occurrences known.

Actaea rubifolia has been given a Global Heritage Status Rank of G3 by The Nature Conservancy in 2001 because of its rarity range-wide (NatureServe 2008, 2010). Threats range-wide include logging, land-use change and unregulated recreational use. It is presumed extirpated in Alabama, critically imperiled in Indiana, imperiled in Illinois, Kentucky, and Virginia, and vulnerable in Tennessee. Sightings in Pennsylvania are presumed to be exotic or introduced to the state.

Actaea rubifolia is found within Pope, Gallatin, Jackson, Johnson, and Hardin counties. A report exists for Massac County on private property but the population may be extirpated because of cattle grazing; the threat is not so much of this species being eaten as it is in the trampling associated with grazing. At least 24 populations are located in southern Illinois and include locations within Thacker Hollow, north of Camp Cadiz, Grindstaff Hollow, near Cedar Lake, Ferne Clyffe State Park, Gyp Williams Hollow Ecological Area, Bell Smith Springs Ecological Area, Burke Branch Research Natural Area, War Bluff, Lusk Creek Canyon Ecological Area, Lusk Creek Canyon Zoological Area, Lusk Creek Canyon Wilderness Area, Jackson Hollow Ecological Area, north of the Jackson Hollow Ecological Area, Cove Hollow, and Jackson Falls Recreation Area. In these areas it is found in rich woods and is considered rare.

The Grindstaff Hollow population, which was discovered by Robert H. Mohlenbrock on July 27, 1954 and was relocated in 1992 by Elizabeth Longo Shimp and Lawrence Stritch. Over 3000 plants were estimated but the population was threatened and being trampled because of a user-developed horse trail on a steep rocky slope. This population was not relocated in 1999 and was thought to be extirpated (Miller 1999), however, a botanical survey near the Grindstaff Hollow area by Adam O'Connor on October 13, 2009 revealed a user-developed horse trail through 3 metapopulations with approximately 300 plants total. The primary threat to this species in southern Illinois has been unregulated equestrian use, and more recently, illegal equestrian use in closed natural areas. In at least two cases, the threat is illegal all-terrain-vehicle use in closed natural areas.

At least 18 of the 24 populations in southern Illinois are currently unprotected on Forest managed lands, 6 being protected within natural areas. These populations will continue to be negatively impacted by equestrian use and ATV use unless trails continue to be designated and horses are restricted to these trails. There are at least 6 populations on private land, one is protected at Ferne Clyffe State Park, 3 appear to have no immediate threats, 1 has an unauthorized user-developed equestrian/ATV trail through the population at the railroad right-of-way, and the last population lost portions of its population from a logging event in 1994. This species is globally rare but found locally abundant in a few of its populations on the Forest. Continued negative impacts to unprotected populations will likely cause a trend to federal listing or loss of species viability.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Actaea rubifolia* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Actaea rubifolia* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

2. *Amorpha nitens* (Shining false indigo)

Amorpha nitens is a branching, leguminous shrub. It is a very rare species that has been documented from approximately 21 to 80 occurrences in Oklahoma, Arkansas, Louisiana, Alabama, Tennessee, Georgia, Kentucky, and Illinois. This species reaches its northern range limit in the thickets and streambanks of southern Illinois. It occurs in a variety of habitats within its range including dry rocky upland barrens-like habitat and prairies (Taft 2004a).

According to NatureServe (2008, 2010) primary threats to *Amorpha nitens* include the destruction of habitat through agricultural conversion, grazing, and hydrological perturbations (such as dam construction). Other threats are exotic species such as *Lonicera japonica* and *Rhamnus cathartica*. The Nature Conservancy assigned *Amorpha nitens* the Global Ranking of G3 in 1995 and has been determined it to be critically imperiled in Illinois, Alabama, and Georgia, and vulnerable in Kentucky. It is possibly extirpated from Louisiana. It is currently not ranked or is under review in South Carolina, Tennessee, Arkansas, and Oklahoma.

In Illinois, *Amorpha nitens* is historically known from Alexander, Pope, Pulaski, and Saline counties. The Pulaski location has not been relocated since 1968. The Pope and Saline locations occur on National Forest managed lands. One is along the Grand Pierre Creek (2 metapopulations on private land and a metapopulation on National Forest managed land) and the other within Cave Hill Research Natural Area, in the Saline River floodplain. Historic populations were documented by E.J. Palmer in 1919 as occurring along the Ohio River banks but these have not been relocated. The Alexander County population was recently discovered by Steve Hill (collections #31788 and #31819) and reported to originally consist of four colonies totaling about 22 plants. Since this discovery, highway construction appears to have destroyed about half of the population (Taft 2004a). A recent visit to the Grand Pierre population in Pope County on September 21, 2010 by Elizabeth Shimp and Troy Lear revealed only 12 plants, with one having flowered. The area is heavily used by deer and *Microstegium vimineum*, Nepalese browntop, is invading the creek bottoms where this species occurs. On September 22, 2010, Ms. Shimp and Jackie Stempien visited the Cave Hill site, which was heavily damaged by trees and being felled on the populations' habitat. A previous flood caused several trees to be hazardous and County road crews had no choice but to cut them down at the site. No plants were found at the Cave Hill RNA location.

Environmental Impacts:

Alternative 1 should have no direct and indirect short-term impacts on *Amorpha nitens*, however, there may be some negative indirect impacts in the long-term for this species where it occurs outside of natural areas and lands that are not being prescribed burned. This would be because prescribed fire would not be permitted in Alternative 1 for the purpose of TES species or habitat

enhancement unless covered under another analysis. This species is known from Cave Hill Research Natural Area (RNA) and at Grand Pierre Creek; Cave Hill is proposed for fire management in this Environmental Analysis. There is an extraordinary amount of cut trees and limbs that were removed by Saline County road crews following a flooding episode this past summer. Surrounding areas adjacent to this species' habitat are becoming encroached with woody vegetation and invasive exotic species, thus encouraging negative competition for light, nutrients, and habitat.

Alternative 2 is expected to have positive direct and indirect short-term and long-term impacts on *Amorpha nitens*. Observations on the Forest have been documented that this moderately shade-requiring species requires some sunlight reaching the forest floor. Populations thrive best when there are openings in the canopy. Grand Pierre Creek and the surrounding environs are not currently being considered for fire management. Prescribed fire will certainly contribute to positive direct and indirect short-term and long-term impacts to the Cave Hill population by stimulating native species and helping reduce the competition of invasive species.

Cumulative Impacts:

Cumulative impacts for all alternatives would be comparable to the Environmental Impacts. Fire may have some direct effects in the short term if the root crown is in an erosive area or if adventitious buds are directly burned in a fire (John Taft, personal communication with Elizabeth Shimp on August 25, 2004). The two locations on the Forest are in areas where very little fuel is available except, perhaps, following a period in the late fall/early winter when an accumulation of leaf litter may surround the plant. These locations are also densely shaded and plants appear to be more spindly than bushy. Literature on the effects of fire on *Amorpha nitens* is generally lacking, however, the resprouting habit observed for *Amorpha nitens* and its affiliation with light gaps, barrens-like habitat and prairies suggests that this is a species that may have tolerance to fire (Taft 2004a).

These plants have vigorous resprouting abilities when the tops are cut or when plants appear to be otherwise dead. Studies by Dr. John Taft (personal communication with Elizabeth Shimp on August 25, 2004) demonstrate that there is at least an 85% germination rate with seeds regardless if seeds are scarified or not. This means that fire is not necessary to induce germination. Dr. Taft also noted that although this species grows with native species in shaded conditions, it has a tendency to grow towards more ambient sunlight and away from neighboring species such as bladdernut and shrubby St. John's wort.

There may also be some negative indirect cumulative impacts for Alternatives 1 and 3 in the long term since there are no plans to use herbicides. These effects may come from exotic species encroachment, such as Japanese honeysuckle and Nepalese browntop, which may cause a reduction in health and vigor of *Amorpha nitens* populations on the Forest. Prescribed fire will help reduce or control that negative impact at Cave Hill RNA but no fires are planned for Grand Pierre Creek.

In both alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The

burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exception of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial impacts to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Amorpha nitens* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through roads where this species occurs. Since there should be no negative impacts to *Amorpha nitens* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the two alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

3. *Asplenium bradleyi* (Bradley's spleenwort)

Asplenium bradleyi is an evergreen, perennial fern found within the eastern and midwestern United States excluding New England and the states north of Illinois. It was historically documented from 19 states. It reaches its northern range limit in southern Illinois where it is very rare and occurs primarily on sandstone cliffs and chert outcrops.

Primary threats to *Asplenium bradleyi* in southern Illinois include drought conditions and over collecting. Drought conditions are associated by the destruction of habitat throughout much of the species' range. Examples of activities leading to drought conditions range-wide include strip mining activities, logging, rock climbing, and adjacent road and trail use. The Global Ranking by The Nature Conservancy changed from G3 to G4 in 1993 (NatureServe 2008, 2010). This species is presumed extirpated in New York, Maryland, and West Virginia; vulnerable in Georgia and Kentucky; imperiled in North Carolina, Virginia, Tennessee, Alabama, and Ohio; and critically imperiled in Illinois, Indiana, Pennsylvania, New Jersey, and South Carolina. It is not ranked or is under review by Missouri, Arkansas, and Louisiana. Through the risk analysis, this species was retained on the RFSS list by the Shawnee National Forest to aid in its protection.

Asplenium bradleyi has been found within Saline, Jackson, and Union counties. It was first discovered in Illinois in Randolph County at Piney Creek, west of West Point by Robert H. Mohlenbrock in 1954. On March 6, 1955 he discovered another population (collection #4988) along the Jackson County extension of the creek (Mohlenbrock, 1955). It is known to occur on the Forest within the LaRue-Pine Hills/Otter Pond (shaded, cherty slope) and Cave Hill Research Natural Areas, Panther Den Wilderness Area, and Garden of the Gods Ecological Area. Each of these sites has only a few plants per population. The Garden of the Gods population was last documented in 1980 as being scattered on the eastern cliff faces and overhangs.

Environmental Impacts:

Alternative 1 should have no direct and indirect short-term impacts on *Asplenium bradleyi*, however, there may be some negative indirect impacts in the long-term for this species where it occurs outside of natural areas and lands that are not being prescribed burned. This would be

because prescribed fire in adjacent areas would not be permitted in Alternative 1 for the purpose of TES species or habitat enhancement unless covered under another analysis. There would also be some negative indirect impacts in the long-term without the use of herbicide. Surrounding areas adjacent to this species' habitat will continue to become encroached with woody vegetation and invasive exotic species, thus encouraging negative competition for light, nutrients, and habitat. These effects may come from the aggressive native and exotic species encroachment, which may cause a reduction in health and vigor of *Asplenium bradleyi* populations on the Forest. Japanese honeysuckle, Virginia creeper and Poison ivy spreading on rockfaces, where these populations occur, may become detrimental to this species, as well as excessive shading from trees above the cliff face and those growing at the base of the cliffs.

Alternative 2 is expected to have positive direct and indirect short-term and long-term impacts on *Asplenium bradleyi* through prescribed burning at the Cave Hill RNA location. This species is readily identifiable and can be easily be seen on the rock faces where fire will most likely not reach. Fire management is expected to have positive indirect short-term and long-term impacts for Alternative 2 but fire may have some direct short-term and long-term negative effects in if the surrounding forest or that forest on the bluffs results in drying and erosion; on the otherhand, positive impacts may result from the burned forest adding nutrients to its microhabitat (Hill 2003a). The effects of fire are not well studied on this species but the Cave Hill RNA population has persisted, without apparent fluctuation in numbers, following previous prescribed fires. With the current information available, fire appears to be neither beneficial nor detrimental to the populations on the Forest other than it does allow the species to compete better when aggressive invasives are controlled.

Other populations have persisted following extensive wildfires between 1952 and 1955. According to former Forest Service employee Carl Joe Frick, intense wildfires occurred especially on the west side of the Forest during the 1950's to the point of some areas giving the appearance of clearcuts across the Jonesboro Ranger District (personal communication with Elizabeth Shimp during 1991 and August 25, 2004). Dry conditions and fuel buildup (a result of the suppression of wildfires which was directed by the State of Illinois at the turn of the century) provided wildfires with raging opportunities across federal and private lands alike. Fires burned annually with great intensity, yet the *Asplenium bradleyi* populations perpetuated and endured the harsh conditions.

Cumulative Impacts:

Cumulative impacts for all alternatives would be comparable to the Environmental Impacts. At Cave Hill RNA, for Alternative 1 in the long-term, populations of *Asplenium bradleyi* may become overshadowed, suppressed or out-competed by other aggressive woody native species, Japanese honeysuckle, Poison ivy, and/or Virginia creeper. In Alternative 2, prescribed fire may benefit the species by eliminating the competition from the other more aggressive species. The prescribed fire may also add nutrients back to the microhabitat.

In both alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive

species with the exception of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial impacts to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Asplenium bradleyi* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through hiking and equestrian use where this species occurs. Since there should be no negative impacts to *Asplenium bradleyi* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

4. *Carex communis* (fibrous-root sedge)

Carex communis is a tufted perennial sedge that occurs in the eastern United States, less Louisiana and Florida, and adjacent Canada. In Missouri this species tends to be found on rich, north-facing wooded slopes (Yatskievych 1999). In Indiana it was listed as common in dry woods of all types, particularly on rocky slopes (Deam 1940). This species has been found at only a few scattered localities in Illinois, primarily in open rocky woods. It generally flowers from May through July.

The primary threat to this species appears to be the loss of native habitat. It is critically imperiled in Illinois, Mississippi and New Foundland, Canada; and vulnerable in Iowa and North Carolina. It is known from 22 states where it is not ranked or is currently under review, and apparently secure or secure in 6 states and Ontario and Quebec. The Global Ranking by The Nature Conservancy was determined to be G5 in 1986 (NatureServe 2010).

In southern Illinois *Carex communis* is found within Pope, Saline, and Hardin counties. Unverified reports have been made for Gallatin and Johnson counties. It is known from Garden of the Gods, Bell Smith Springs, and Gibbons Creek Ecological Areas. It was also found in 2001 outside of the boundaries of Garden of the Gods Ecological Area where a user-developed equestrian trail had been created. It was discovered in Gibbons Creek Ecological Area by Mark Basinger during 2004 while establishing a pre-burn vegetation plot. The Bell Smith Springs population has not been relocated since 1984 (streambank).

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Carex communis* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Carex communis* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the

alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

5. *Carex decomposita* (Cypress-knee sedge)

Carex decomposita is a perennial cespitose sedge with thick, woody rhizomes. It is a species of swamps, often on floating logs or buttressed tree bases, ranging from New York to Michigan and south to Florida and Texas. This species reaches its northwestern range limit in the cypress swamps of southern Illinois.

The primary threat to this species is loss of native habitat (habitat conversion and drainage). The spotty distribution, specific habitat requirements, and continued habitat destruction are leading to an accelerated decline of this species. It is historically known from 22 states but is listed as presumed extirpated in Michigan and possibly extirpated in New York, and the District of Columbia. It is critically imperiled in Illinois, Ohio, Delaware, Maryland, Alabama, and Texas; imperiled in Indiana, Kentucky, Tennessee, Virginia, North Carolina, South Carolina, Georgia, and Arkansas; and vulnerable in Missouri, Louisiana, and Mississippi. It is possibly extirpated in New York and the District of Columbia, and extirpated in Michigan. It is not ranked or is currently under review in Florida and Oklahoma. The Nature Conservancy assigned the Global Ranking of G3 in 1997 (NatureServe 2008, 2010).

In southern Illinois it is found in Johnson, Pope, Pulaski, and Union counties. A Gallatin County population on private property was destroyed several years ago by logging activities (Herkert 1991). It is unclear where the Pulaski population is but with several swampy areas in the county, the probability of its existence is very good. The Johnson County population is located at Deer Pond, which is privately owned. On the Forest, this species is known from Grantsburg Swamp Ecological Area and along the lower road at LaRue-Pine Hills/Otter Pond Research Natural Area from Winters Pond to Otter Pond. It grows in the swamps, often on cypress knees, stumps, and downed logs. Range-wide there is a spotty distribution of this species and that is also the case locally. In southern Illinois it occurs in isolated patches within the swamps. Opportunities for seed dispersal are limited with reduced numbers of protected swamps and permanent wetlands. This species requires high-quality conditions without hydrologic alterations, such as water drainage, or chemical pollutants.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Carex decomposita* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Carex decomposita* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

6. *Carex gigantea* (Giant Sedge)

Carex gigantea is a perennial cespitose sedge that can also be found growing singly, from fibrous roots with long connected rhizomes. It is a species of swamps and wet woods primarily on the coastal plain from Delaware south to Florida, east to Texas and north in the Mississippi Embayment to southern Illinois and Indiana. Its northern range limit is southern Illinois, where it is known from wet woods and swamps.

The primary threat to this species is loss of native habitat (habitat conversion and drainage). The spotty distribution, specific habitat requirements, and continued habitat destruction are leading to an accelerated decline of this species. It is historically known from 18 states and but is listed as critically imperiled in Illinois, Indiana, Arkansas, and Missouri, imperiled in Kentucky, and vulnerable in Maryland and Delaware. It is apparently secure in Virginia and North Carolina, and secure in Mississippi. The 8 states of Oklahoma, Texas, Louisiana, Tennessee, Alabama, South Carolina, Georgia, and Florida currently do not have a rank or it is under review. The Nature Conservancy assigned this species the Global Ranking of G4 in 1984 (NatureServe 2010).

In southern Illinois it is historically known from Jackson, Johnson, Massac, Pulaski, and Union counties. On the Forest, this species is known from Grantsburg Swamp Ecological Area in a bottomland hardwood forest (Mark Basinger and John Rundle July 5, 1994; collection #8709 and #8725) and at LaRue-Pine Hills/Otter Pond Research Natural Area north of Otter Pond in a wet woods near the swamp (last observed November 28, 1967). A population discovered at Sielbeck Woods (private) in Massac County by Mike Homoya in 1976 was relocated and vouchered by John Schwegman August 1, 1997 and again observed September 6, 2001 by Mark Guetersloh. The Pulaski County site at Post Creek Cutoff (private) was discovered on June 23, 1992 by John Taft. Documentation for the Jackson County occurrence was lacking at the time of this writing. Opportunities for seed dispersal are limited with reduced numbers of protected bottomland hardwoods, swamps and permanent wetlands. This species requires high-quality conditions without hydrologic alterations, such as water drainage, or chemical pollutants.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Carex gigantea* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Carex gigantea* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

7. *Carex lupuliformis* (false hop sedge)

Carex lupuliformis is a caespitose or singularly growing perennial sedge. It is uncommon in eastern North America, west to southwestern Quebec, Wisconsin and Louisiana. It is found scattered throughout Illinois and occurs in wet woods, wooded swamps, marshes, meadows, and roadside ditches.

Being a wetland species, *Carex lupuliformis* is threatened by the destruction of its native habitat. Damming of rivers, ditching, channeling, floodplain cultivation, and spring flood cycle interruptions are major threats of this species throughout its range. Other threats have been documented as being habitat destruction and ATV use. The G4 Global Ranking for this species was assigned by The Nature Conservancy in 2000 and is listed as having widespread declines throughout its range. It is possibly extirpated in Iowa, critically imperiled in Quebec and Ontario, Canada, Wisconsin, Pennsylvania, New Jersey, North Carolina, Arkansas, and Texas. It is also listed as imperiled in Michigan, Indiana, Ohio, New York, Vermont, Connecticut, West Virginia, Virginia, Delaware, Maryland, and Tennessee, and vulnerable in Illinois and Connecticut. It is apparently secure in Kentucky and Mississippi. It is not ranked or is under review in 7 states (NatureServe 2010).

Carex lupuliformis is listed as historically occurring in Alexander, Pope, Johnson, Jackson, Massac, Pulaski, Saline, Hardin, and Union counties. This species is not as common as once thought to be in Illinois because original specimens have been previously misidentified and found to actually be *Carex gigantea* or *Carex lupulina*. There is a possibility that some of the above county records may be misidentifications that have perpetuated over the years. This species is not listed as threatened or endangered in the State of Illinois, which makes tracking collections and records more difficult. Although this species is not listed in Illinois, there have not been any sightings or collections made on the Shawnee National Forest or southern Illinois counties in over 40 years. Records from the Illinois Natural History Survey collections (specimen list provided to Elizabeth Longo Shimp by e-mail on December 17, 2004 from Loy R. Phillippe) indicate that the following specimens are available at the herbarium: Alexander (Evers #30438, 20 June 1951, east of Miller City, lake shore; Evers #32872, 19 September 1951, southeast of Olive Branch, bottomland ditch), Pope (Evers #23561, 10 June 1950, east of Dixon Springs, marsh), Pulaski (Evers #19997, 25 August 1949, south of Ullin, marsh land), and Union counties (Henry #2203, 22 July 1966, LaRue Swamp, wet ground).

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Carex lupuliformis* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Carex lupuliformis* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

8. *Carex socialis* (Low woodland sedge)

Carex socialis is a perennial, colonial sedge of floodplain forests from South Carolina and Georgia west to Texas and north in the Mississippi Embayment to southern Illinois and Indiana. Mohlenbrock and Schwegman (1969) first described this species in Illinois from specimens collected along the Ohio River in Massac County. At the northern margin of its range in southern Illinois, it is found in wet woods and floodplains.

According to NatureServe (2004) the primary threats to *Carex socialis* are clear-cutting and wetland drainage. Encroachment by exotic species such as Japanese honeysuckle and kudzu may pose an additional threat in disturbed areas.

In Illinois, it has been found in Johnson, Massac, Pope, Pulaski, Saline, and Union counties. On the Shawnee National Forest it is found in the floodplain forests at LaRue-Pine Hills/Otter Pond Research Natural Area in Union County, Grantsburg Swamp and Schwegman's Ecological Areas in Johnson County, within a flatwoods along Bay Creek and along Grand Pierre Creek in Pope County, on state property at Heron Pond and Goose Pond near the Cache River in Johnson County, on the privately owned Halesia Nature Preserve in Massac County near the Ohio River, and within a private flatwoods in Saline County near Harrisburg.

The Nature Conservancy assigned *Carex socialis* the Global Ranking of G4 in 1998 and has determined it to be vulnerable in Illinois and Kentucky, and imperiled in Missouri, Tennessee and Indiana. It is critically imperiled in Alabama, Georgia, South Carolina, and North Carolina, and apparently secure in Arkansas and Mississippi. It is not ranked or is under review in Oklahoma (NatureServe 2010). It is noted as being locally common at some locations in the Coastal Plain and lower Mississippi Valley (Homoya and Rayner 1987).

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Carex socialis* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Carex socialis* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

9. *Chelone obliqua* var. *speciosa* (Red turtlehead)

Chelone obliqua var. *speciosa* is a branching perennial in the figwort (snapdragon) family. It is a rare species of alluvial woods, swamps, low woods, and wet meadows, and ranges from Minnesota and Michigan south to Arkansas and Kentucky. There are accounts of historical populations of this species scattered throughout 25 counties in Illinois but only 12 are considered to be extant (Phillippe, 2004a). This species flowers from August through September and bears fruit September through October (Ambrose *et al.* 2002).

According to NatureServe (2004) primary threats to *Chelone obliqua* var. *speciosa* include the physical destruction of habitat and artificial changes in hydrology. Succession may also threaten this species as it does not do well with competition from robust shrubs and vines under a closed canopy. It is found scattered throughout Illinois and has been reported from eight of the southernmost counties. Records from the Illinois Natural History Survey collections (specimen list provided to Elizabeth Longo Shimp by e-mail on December 17, 2004 from Loy R. Phillippe) and Iverson *et al.* (1999) indicate that the following specimens are available at the herbarium: Alexander (last seen 1931), Gallatin (last seen 1960), Hardin (last seen 1988), Jackson (last seen 1989), Johnson (separate locations 1931, 1931/1978, 1960, 1969, 1990/1992, Massac (1951), Pulaski (1931) and Union (1960) counties. The only extant populations on the Shawnee National Forest may be the Johnson County collections of 1990/1992 at Grantsburg Swamp Ecological Area.

The Nature Conservancy assigned this species a Global Ranking of G4T3 in 1994 and has determined it to be vulnerable in Illinois, Indiana, and Kentucky, critically imperiled in Iowa and Michigan, and possibly extirpated in Arkansas. It is not ranked or is under review in Missouri and Minnesota. Southern Illinois, southern Indiana and western Kentucky are considered to be strongholds for this species, however, trends are not well known and populations are likely declining across its range due to loss of habitat (Ambrose *et al.* 1994). Management activities including selective thinning, maintenance of a dynamic hydrological cycle and periodic disturbances may be necessary to protect suitable habitats (Ambrose *et al.* 1994).

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Chelone obliqua* var. *speciosa* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Chelone obliqua* var. *speciosa* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

10. *Cirsium carolinianum* (Soft thistle)

Cirsium carolinianum is a fibrous-rooted biennial herb growing 0.5 to 1.5 meters tall with a range of southeastern United States. It is a species of dry acidic woodlands and reaches its northern range limit in extreme southern Illinois. Most of the populations in Illinois are in the Shawnee National Forest and appear increase in numbers in the areas that are prescribe burned. Here it is a species of open dry-mesic upland woods and it is associated with barrens areas and rocky woods.

The Nature Conservancy assigned this species the Global Ranking of G5 in 2003. Its Conservation Status is critically imperiled in Virginia, imperiled in Ohio, Indiana, Illinois, and

North Carolina, and vulnerable in Kentucky and Georgia. It is not ranked or is currently under review in Texas, Oklahoma, Louisiana, Arkansas, Missouri, Mississippi, Alabama, Tennessee, and South Carolina (NatureServe 2010). On the Forest, this species is known from Bell Smith Springs Ecological Area and Cave Hill Research Natural Area.

Environmental Impacts:

There may be some negative indirect long-term impacts resulting from Alternative 1. These impacts may come from aggressive native and exotic species encroachment, which may cause a reduction in health and vigor of *Cirsium carolinianum* populations within the Forest. In particular, Japanese honeysuckle may become detrimental to this species, as well as excessive shading from trees in the overstory and saplings and shrubs in the understory. Many of the barrens communities have already become invaded by exotic species and these rare community types will be lost from the Forest forever if intensive management is not implemented. Open sunny woodlands benefit *Cirsium carolinianum* and cannot be achieved without prescribed fire.

Alternative 2 is expected to have positive direct and indirect short-term and long-term impacts on *Cirsium carolinianum* through prescribed burning. Observations on the Forest have been documented that this species requires open sunlight reaching the forest floor. Populations thrive best when there are large openings in the canopy. Prescribed fire would contribute to positive impacts to these populations by stimulating native species and helping reduce the competition of invasive species. Habitat changes leading to closed canopies are detrimental to the vegetative performance of species that rely on some direct sunlight. This species appears to perform better in open woodlands in southern Illinois rather than closed canopy forest. Open sunny woodlands and barrens benefit *Cirsium carolinianum* and barrens species. This fire-adapted sedge will likely become enhanced following prescribed fire by opening up the canopy and reducing competition from other plants.

Cumulative Impacts:

Cumulative Impacts for all alternatives would be comparable to the Environmental Impacts. Alternative 1 will have negative indirect impacts in the long-term to populations of *Cirsium carolinianum*, which may become overshadowed, suppressed or out-competed by other aggressive woody native species, Japanese honeysuckle, Poison ivy, and/or exotics such as Nepalese browntop.

Prescribed fire use in Alternative 2 will benefit this species by reducing the competition from other more aggressive species. The prescribed fire may also add nutrients back to the microhabitat and will help stimulate the suppressed populations and open up the canopy for more light to the forest floor.

In all alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exception of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to

some indirect beneficial impacts to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Cirsium carolinianum* inhabits. Dispersed recreational use will still have some slight indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through hiking where this species occurs. Since there should be no negative impacts to *Cirsium carolinianum* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of very slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. Developed recreational sites may have slight negative impacts to this species in all alternatives because of the combination developed recreation site/natural area designations. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

11. *Cypripedium parviflorum* var. *pubescens* (Greater yellow lady's slipper)

Cypripedium parviflorum var. *pubescens* is a rhizomatous perennial orchid found in most of the United States (less 2 of the southern and 5 of the western states) and adjacent Canada. In Illinois it is found in both dry and moist open woodlands and although not common, is found scattered throughout the state.

The Nature Conservancy assigned this species the Global Heritage Status Rank of G5T5? in 2002 but all of the states it occurs in do not have their statuses ranked and available information suggests that this species is still in a decline. Although there are more than a thousand populations of this species range-wide, most are small in size. Primary threats to this species include loss of native habitat, horticultural collecting, and medicinal collecting. Most populations have fewer than 30 individuals and no known populations have more than 400 individuals. This species is currently critically imperiled in Idaho, Arizona, Delaware, Maryland, Utah, and Rhode Island, and imperiled in New Hampshire, Mississippi, Wyoming, New Mexico, and 3 Canadian provinces. It is considered as vulnerable in Illinois, Indiana, North Carolina, Alabama, South Carolina, New York, Vermont and 5 Canadian provinces. It apparently secure in Ohio, Pennsylvania, West Virginia, Kentucky, and Virginia and secure in 2 Canadian provinces. It is currently not ranked or is under review in 19 states and 2 Canadian provinces.

In southern Illinois it is considered rare with few individuals within a population reaching the flowering stage. Populations on the Shawnee National Forest are generally less than a dozen individuals each. Known populations on the Forest have been dug up by orchid enthusiasts for their beauty only to be extirpated from their native habitats. *Cypripedium parviflorum* var. *pubescens* has been historically documented from 52 Illinois counties including Alexander, Massac, Pope, Johnson, Jackson, Williamson, and Union counties in southern Illinois. In Illinois and Indiana it is described as rare or uncommon at each of these sites (Danderson 2004a). It is known to occur on an oak-hickory wooded slope within Lusk Creek Canyon Ecological Area and in Thacker Hollow on a rich mesic ravine area and on a rocky wooded slope. It is mostly known from unprotected sites across the Forest.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Cypripedium parviflorum* var. *pubescens* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Cypripedium parviflorum* var. *pubescens* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

12. *Dennstaedtia punctilobula* (Eastern hay-scented fern)

Dennstaedtia punctilobula is an arching perennial fern that occurs in the eastern United States and adjacent Canada. In Illinois this species is restricted to Johnson and Pope counties, primarily within the Shawnee National Forest, on moist, north-facing sandstone ledges. These ledges vary in length from a few inches to several hundred feet and *Sphagnum* spp. is a typical associate.

The Nature Conservancy assigned this species the Global Ranking of G5 in 1984. Its Conservation Status is critically imperiled in Michigan and New Foundland, Canada, imperiled in Illinois, Missouri, and Arkansas, vulnerable in Indiana and Alabama, apparently secure in Kentucky, and secure in North Carolina, West Virginia, Virginia, Delaware, New Jersey, New York, and Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island, Canada (NatureServe 2010).

Dennstaedtia punctilobula is known from Bell Smith Springs Ecological Area (mesic north-facing rocky slope and upland forest), Double Branch Hole Ecological Area (north-facing cliff), Lusk Creek Wilderness, and Hayes Creek/Fox Den Creek Ecological Area (mesic north-facing cliffs and lower slope of forest).

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Dennstaedtia punctilobula* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Dennstaedtia punctilobula* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

22. *Dichanthelium jorii* (Variable panic grass)

Dichanthelium jorii (= *D. commutatum*) is a tufted, warm-season perennial grass with decumbent culms found in floodplain and swamp forests of the southeastern United States. This species ranges from Texas and Florida in the south to Illinois, Michigan, New York and Maine in the north. The southern Illinois populations are disjunct from its normal range by over 300 miles. Here it is a species of low swamps and floodplain forests. Some botanists consider it a synonym of a broadly defined *Dichanthelium commutatum*.

The primary threats to this species are not listed in the available literature, but due to its preference for bottomland swamps and wet habitats, its primary threat is likely the loss of wetland habitat or disruption of historic hydrologic cycles. The Nature Conservancy assigned this species a Global Ranking of G5 in 1994 and it is listed as state endangered in Illinois. Little information is available on trends for this species. Considering the few locations where *Dichanthelium jorii* has been collected and the protection afforded in those locations, it is likely that populations of this species are remaining stable.

In southern Illinois it is known from floodplain forests in Johnson and Union counties. It has been collected from the floodplain forest at LaRue-Pine Hills/Otter Pond Research Natural Area in Union County, Bell Pond inside of Grantsburg Swamp Ecological Area and the state-managed Little Black Slough/Heron Pond along the Cache River in Johnson County.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Dichanthelium jorii* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Dichanthelium jorii* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

14. *Dodecatheon frenchii* (French's shootingstar)

Dodecatheon frenchii is a perennial herb known from Illinois, Indiana, Missouri, Kentucky, Arkansas, and Alabama. It is found in close association to sandstone ledges, overhangs and bluffs, preferring north and east-facing exposures. French's shooting-star grows in habitats which yield little competition from other plant species, often growing alone in bare soil. It is documented from a 10-mile wide belt in southern Illinois in six counties, all within the Greater Shawnee Hills Section of the Shawnee Hills Natural Division.

Primary threats to this species have been unregulated recreational use under sandstone overhangs, disturbances caused by artifact hunters, and other recreational activities such as rock climbing, ATV and equestrian use, and camping/campfires. Logging has also been considered a threat when sufficient buffer has not been afforded to populations. The Nature Conservancy assigned this species the Global Heritage Status Rank of G3 in 1990. Illinois appears to have the

most occurrences and is well in southern Illinois possibly because of its endemic nature. It is listed as vulnerable in Illinois and Kentucky, imperiled in Indiana and Arkansas, and it is critically imperiled in Missouri and Alabama. It is currently not ranked or under review in Wisconsin (NatureServe 2010)

In Illinois, *Dodecatheon frenchii* is found within Pope, Johnson, Jackson, Saline, Union, and Williamson counties. It is known to occur within several areas on the Forest including Lusk Creek Canyon Ecological Area, Lusk Creek Canyon Zoological Area, Lusk Creek Canyon Wilderness Area, Jackson Hole Ecological Area (sandstone overhang, although it has not been relocated at this site for several years), Jackson Hollow Ecological Area, Jackson Falls Dispersed Recreation Area, Bulge Hole Ecological Area, Little Grand Canyon/Horseshoe Bluff Ecological Area, Garden of the Gods Ecological Area, Schwegman Ecological Area, Bell Smith Springs Ecological Area (base of bluff in mesic upland forest), and Double Branch Hole Ecological Area. This species is found beneath sandstone overhangs and along drip lines at the base of bluffs. This species has also been found in the immediate adjacent woods and associated sandstone boulders. At this time, these populations are not threatened with extirpation because of habitat loss but without protecting the forest and sandstone ledges and shelters that this species is dependent on these populations could eventually become decreased or eliminated (Hill 2002).

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Dodecatheon frenchii* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Dodecatheon frenchii* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

15. *Dryopteris goldiana* (Goldie's woodfern)

Dryopteris goldiana is a short-creeping, scaly fern with fronds up to 1 meter in length. It grows in moist, shaded woodlands. Its range is from New Brunswick to Ontario, south to Iowa, Tennessee, and North Carolina. Although it is known from several northern Illinois counties and Jackson, Johnson, Pope, Union, and Williamson counties in southern Illinois, its previously known locations in southern Illinois are rarely relocated and several may be extirpated.

Dryopteris goldiana has been given a Global Heritage Status Rank of G4 by The Nature Conservancy in 1986 because of its status range-wide (NatureServe 2008). Threats range-wide include logging, development and agriculture. It is critically imperiled in Arkansas, Alabama, South Carolina, and Delaware, imperiled in Iowa, Missouri, New Hampshire and Maine, vulnerable in Minnesota, Georgia, North Carolina, Maryland, New Jersey, Connecticut, Massachusetts, and Quebec and New Brunswick, Canada. It is also listed as apparently secure in Ontario, Canada, Kentucky, West Virginia, Virginia, Vermont, and New York, and not ranked or

under review in Wisconsin, Michigan, Indiana, Ohio, Pennsylvania, Rhode Island, and the District of Columbia. In southern Illinois, there are known locations within the Lusk Creek Wilderness.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Dryopteris goldiana* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Dryopteris goldiana* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

16. *Echinacea simulata* (Wavyleaf purple coneflower)

Echinacea simulata is a perennial herb found from southern Illinois, southern Indiana, southeast Missouri, western Kentucky to central Tennessee and northern Georgia. Gleason and Cronquist (1991) report it from northeastern Arkansas. It is found in thin soil of dry open woods, prairies, and glades underlain by limestone bedrock. In Illinois its habitat includes the open woods and prairies. It strongly resembles *Echinacea pallida* and can only be distinguished from it while in flower by observing its pollen color, which is yellow versus white or cream-colored. It generally flowers from July through August.

Threats to this species include fire suppression, which allows open habitats to close; encroachment of habitat by eastern red cedar and other woody species; herbicide use on railroad rights-of-way; limestone quarries; recreational uses of glades, barrens, and hill prairies; development; and especially by digging of roots and excessive seed collection for medicinal purposes. It is listed as vulnerable in Kentucky, imperiled in Georgia, and critically imperiled in Tennessee. It is currently not ranked in Illinois. NatureServe (2010) erroneously lists it as an exotic in Illinois. This species is currently not ranked in Missouri, Arkansas, Indiana, and Alabama. The Global Rank of G3 was assigned by The Nature Conservancy in 2000.

In southern Illinois, *Echinacea simulata* is thought to occur in Hardin, Johnson, Pope, and Union counties. Its habitat is listed as limestone barrens and glades. It has been verbally reported from areas such as LaRue-Pine Hills/Otter Pond Research Natural Area, Simpson Township Barrens Ecological Area, and Whoopie Cat Research Natural Area but no voucher collections were available to verify at the time of this writing. The only three populations documented by collections are from Piatt, Richland and Madison counties (Danderson 2004b). These specimens may be possible misidentifications and require further study (Danderson 2004b).

Environmental Impacts:

It is unlikely that there will be any impacts to this species from Alternatives 1 or 2 since there are no valid vouchers from the Forest. Potential habitat does occur in prairie and barrens remnants, however, this species has not been seen or properly documented as actually existing on the Forest. However, if it does occur on the Forest, prescribed burns will only enhance the habitat.

Cumulative Impacts:

In all alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exception of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial effects to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Echinacea simulata* could possibly inhabit. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through trails, roads and cross-country use. Since there should be no negative impacts to *Echinacea simulata* resulting from prescribed fire use in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

17. *Eleocharis wolfii* (Wolf's spikerush)

Eleocharis wolfii is perennial, rhizomatous sedge of marshes, swamps, wet prairies and other wetland habitats from New York to North Dakota south to Texas and Georgia. This species flowers from May – July and requires high levels of light to produce seed (NatureServe 2004). In southern Illinois, this species is found in marshes, wet prairies, around lakes, rivers and ditches, flatwoods, swamps, floodplain forests, and ephemeral pools.

According to NatureServe (2004), the primary threats to this species are loss of native wetland and grassland habitats. It is also threatened by encroachment from exotic species and succession from woody species in prairie areas where the historic fire regime is now absent (NatureServe 2004). Indiscriminant herbicide application along railroad and highway right-of-ways has also threatened populations located in these areas. The Nature Conservancy ranked this species G3G4 in 2006 (NatureServe 2010). Continued drainage and alteration of wet areas for agriculture, development and grazing areas have resulted in this species being listed as ‘critically imperiled in Illinois, Iowa, Wisconsin, Minnesota, Ohio, Virginia, Tennessee, Georgia, Alabama, Kansas, and Texas. It is imperiled in Indiana and Nebraska, and vulnerable in Arkansas, Missouri, and Louisiana. It is also possibly extirpated in North Dakota, and listed as introduced (exotic) in New York. It is not ranked or under review in Mississippi, Oklahoma, and Saskatchewan, Canada (NatureServe 2010). The continued decline of *Eleocharis wolfii* is likely due to loss of wetlands and conversion/development of its preferred habitats.

In southern Illinois it is found in Gallatin (flatwoods 1.5 mi SE of Equality), Jackson (Oakwood Bottoms), Massac (flatwoods at Mermet Swamp Nature Preserve), Pope (unknown locations), Saline (flatwoods NE of Harrisburg), and Union (floodplain forest at LaRue-Pine Hills/Otter Pond Research Natural Area) counties. Historical populations are known from 20 counties in the state of Illinois but only 15 counties are known to have extant populations (Phillippe 2004b). Of the 41 discrete extant populations, 7 are known from Forest Service managed lands (Phillippe 2004).

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Eleocharis wolfii* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Eleocharis wolfii* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

18. *Eupatorium hyssopifolium* (Hyssop leaf thoroughwort)

Eupatorium hyssopifolium var. *hyssopifolium* is a composite that is found in the eastern United States. It is known from one location in southern Illinois in an open sandstone barrens and adjacent open woods at Dean East Ecological Area and a second location was reported along a state highway/interstate.

Eupatorium hyssopifolium var. *hyssopifolium* has been given a Global Heritage Status Rank of G5 by The Nature Conservancy in 1984 (NatureServe 2008). Threats range-wide include loss of prairie/barrens habitat. It is critically imperiled in Illinois and West Virginia, vulnerable in New York and Kentucky, secure in Virginia and North Carolina, and not ranked or under review in Rhode Island, New Jersey, Maryland, District of Columbia, Florida, Georgia, Alabama, Mississippi, Louisiana, and Texas.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Eupatorium hyssopifolium* var. *hyssopifolium* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Eupatorium hyssopifolium* var. *hyssopifolium* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

19. *Festuca paradoxa* (Clustered fescue)

Festuca paradoxa is tufted perennial grass found from Pennsylvania west to Minnesota south to Georgia and Texas. It is found in different habitats from dry glades and bluffs to wet open woods and prairies (Olson 2002). In Illinois, Mohlenbrock described the species as more commonly found on drier sites (Mohlenbrock in Olson 2002). It is scattered in the southern ¾ of Illinois and is known from eight counties in southern Illinois.

Primary threats to this species include loss of habitat from changes in land use patterns, encroachment of woody vegetation and exotic species. The Nature Conservancy ranked this species G5 in 1984 (NatureServe 2010). This species is currently listed as vulnerable in Illinois, Iowa and Virginia, it is critically imperiled in Indiana, Pennsylvania and Tennessee, and imperiled in Kansas. It is possibly extirpated in Nebraska and Wisconsin and presumed extirpated in Delaware. It is not ranked or is under review in 10 states.

Festuca paradoxa is known from Jackson, Johnson, Massac, Pope, Pulaski, Saline, Union and Williamson counties. There was no specific collection location information available at the time of this writing. The state of Illinois does not list *Festuca paradoxa* on its Endangered and Threatened species list (2009) but it has not been collected on the Forest in over 20 years. Trends for this species are not clearly stated in the available literature, but according to Vlaszek (In KSNPC 2004), he believes it may be extirpated from Illinois although Olson (2002) notes it from at least 20 counties in Illinois. According to the Illinois Natural History Survey Herbarium, collections of this species were made in 1952, 1990, 1999 and 2008 in Saline County and during 1993 in Jackson County.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Festuca paradoxa* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Festuca paradoxa* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

20. *Hottonia inflata* (American featherfoil)

Hottonia inflata is an aquatic winter annual that occurs in quiet water of swamps and permanently wet ditches from Maine west to Illinois and Missouri and south to Texas and Georgia. This species germinates and grows in the fall and winter, then reaches the waters surface and flowers in the spring. In southern Illinois it is known from Jackson, Johnson, and Union counties. It is known from swamps at LaRue-Pine Hills/Otter Pond Research Natural Area.

According to NatureServe (2010), the primary threats to this species are the loss/conversion of wetlands, alteration of hydrology and deteriorating water quality. Invasive species, severe floods and removal of beaver populations are also listed as threats to *Hottonia inflata* (NatureServe 2010). The Nature Conservancy assigned this species a rank of G4 in 1994 (NatureServe 2010). This species is currently listed as presumed extirpated in Pennsylvania, possibly extirpated in Ohio, critically imperiled in West Virginia, Maine, Rhode Island, New Jersey, Maryland, Georgia, South Carolina, North Carolina, New Hampshire, and Mississippi, imperiled in Illinois, Missouri, Indiana, Tennessee, New York, Delaware, and Alabama, and vulnerable in Connecticut, Massachusetts, Virginia and Texas. This species is apparently secure in Kentucky, and either not ranked or under review in Oklahoma, Arkansas, Louisiana, and Florida. *Hottonia inflata* populations are in decline over much of its range (NatureServe 2010). Populations in southern Illinois currently appear to be stable as most locations are protected, but many of the primary threats to this species including exotic species encroachment, severe fluctuations in water levels, wetland drainage and siltation remain a threat. (NatureServe 2010).

In southern Illinois it has been collected from: Cave Valley (Silvey Pond) in Jackson County, Heron Pond, Little Black Slough and private land near West Vienna in Johnson County, Round Pond in Pope County (this pond borders and drains into Massac County), near Carrier Mills in Saline County, and several locations from LaRue-Pine Hills/Otter Pond Research Natural Area (pool of water at base of cliff, LaRue Swamp and Winter's Pond) in Union County.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Hottonia inflata* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Hottonia inflata* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

21. *Hydrolea uniflora* (One-flowered false fiddleleaf)

Hydrolea uniflora is a decumbent perennial herb from southern Illinois, Indiana, and Missouri south to Florida and Texas. It occurs in swamps, wet shores, and roadside ditches. It reaches its northern range limit in southern Illinois.

Hydrolea uniflora has been given a Global Heritage Status Rank of G5 by The Nature Conservancy in 1988 (NatureServe 2008). Threats range-wide include loss of swamp habitat. It is critically imperiled in Illinois and Kentucky, and not ranked or under review in Indiana, Tennessee, Alabama, Mississippi, Missouri, Arkansas, Louisiana, Oklahoma, and Texas.

This species is known from LaRue-Pine Hills/Otter Pond Research Natural Area in Union County (LaRue Swamp and Winter's Pond), Route 3 ditch in Jackson County, Grantsburg Swamp in Johnson County, and on private property at Black Bottoms in Massac County.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Hydrolea uniflora* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Hydrolea uniflora* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

22. *Hylotelephium telephioides* (Allegheny stonecrop)

Hylotelephium telephioides is a succulent perennial herb that occurs in the eastern United States and adjacent Canada. It is found in dry, rocky places typically in the mountains and is disjunct in Louisiana, western Kentucky, southern Indiana, and southern Illinois. On the Forest, it occurs in thin soil pockets on sandstone cliffs, ledges, and slide blocks.

The Nature Conservancy assigned this species a rank of G4 in 1988 (NatureServe 2008). This species is currently listed as presumed extirpated in New Jersey, possibly extirpated in New York, imperiled in Indiana, and Kentucky, and vulnerable in Pennsylvania. This species is apparently secure in West Virginia, Virginia, and North Carolina, and either not ranked or under review in Illinois, Ohio, Louisiana, South Carolina, the District of Columbia, Maryland, and Connecticut. Ontario, Canada lists this species as an exotic. *Hylotelephium telephioides* is known from areas such as Jackson Hollow, Lusk Creek Canyon and Bell Smith Springs Ecological Area (mesic upland forest) of Pope County, Stoneface (Saline County), and Cave in Rock (Hardin County). The primary threats to this species in southern Illinois is the loss of habitat because of recreational use on the cliff tops and cliff faces.

Environmental Impacts:

Alternative 1 should have no direct and indirect short-term impacts on *Hylotelephium telephioides*, however, there may be some negative indirect impacts in the long-term for this species where it occurs outside of natural areas and lands that are not being prescribed burned. This would be because prescribed fire in adjacent areas would not be permitted in Alternative 1 for the purpose of TES species or habitat enhancement unless covered under another analysis. Surrounding areas adjacent to this species' habitat will continue to become encroached with woody vegetation and invasive exotic species, thus encouraging negative competition for light, nutrients, and habitat. These effects may come from the aggressive native and exotic species encroachment, which may cause a reduction in health and vigor of *Hylotelephium telephioides* populations on the Forest. Japanese honeysuckle, Virginia creeper and Poison ivy spreading on

rockfaces, where these populations occur, may become detrimental to this species, as well as excessive shading from trees above the cliff face and those growing at the base of the cliffs.

Alternative 2 is expected to have positive direct and indirect short-term and long-term impacts on *Hylotelephium telephioides* through prescribe burning. Prescribe burns have occurred a few times at Stoneface RNA and this species has persisted and done well here. It's adaptation to fire allows it to compete well with other vegetation for its position in the cliff and rock outcrop communities.

Cumulative Impacts:

Cumulative impacts for all alternatives would be comparable to the Environmental Impacts. In all alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exception of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial impacts to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Hylotelephium telephioides* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through hiking and equestrian use where this species occurs. Since there should be no negative impacts to *Hylotelephium telephioides* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

23. *Juglans cinerea* (Butternut)

Juglans cinerea is a deciduous, nut-bearing tree of the northeastern United States and adjacent Canada. It is a species of rich woodlands and is found scattered throughout the state of Illinois.

The Nature Conservancy assigned this species the Global Heritage Status Rank of G4 in 2006 reflecting more than 100 occurrences from at least 17 states. The abundance and condition of this species are in rapid decline due to butternut canker disease, with no remedy at this time. It is listed as critically imperiled in Alabama, the District of Columbia, and New Hampshire, imperiled in Georgia, Illinois, Missouri, Mississippi, North Carolina, and Maryland, and vulnerable in Minnesota, Wisconsin, Arkansas, Indiana, Michigan, Kentucky, West Virginia, Virginia, New Jersey, Tennessee, South Carolina, New Hampshire, Vermont, Delaware and 3 Canadian provinces. It is listed as introduced (exotic) in Washington and 2 Canadian provinces, and is either not ranked or currently under review in North Dakota, Iowa, Connecticut, Rhode Island, and Maine (NatureServe 2010).

Juglans cinerea is known from all of the counties on the Forest except for Gallatin County. It is known to occur within the LaRue-Pine Hills Research Natural Area and at a single site at Burke

Branch Research Natural Area where it is leaning into the creek. This species achieves its best growth on well-drained soils of bottomlands and floodplains, but rarely occurs in pure stands. It is seldom found on dry, compact, or infertile soils, and is shade-intolerant, growing best in full sunlight. Although butternut canker is the primary global threat to this species, *Juglans cinerea* is also threatened by plant succession where open conditions no longer exist. It is not known to occur at the project sites although potential habitat does occur.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Juglans cinerea* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Juglans cinerea* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

24. *Lilium superbum* (Turk's-cap lily)

Lilium superbum is a bulbous perennial occurring in the eastern United States. It is a species of the eastern half of the United States. Range-wide it is known from peaty meadows, swales, wet sand and swampy woods.

The Nature Conservancy has given this species the Global Heritage Status Rank of G5 (1990) because of its historically wide distribution within 26 states and the District of Columbia, but it is critically imperiled in Missouri, Arkansas, Kentucky, Louisiana, New Hampshire, and Florida. It is imperiled in Illinois and Alabama and is considered vulnerable in Indiana, Ohio, Georgia and Mississippi. This species is apparently secure in New York, New Jersey, North Carolina, and secure in Delaware, West Virginia, and Virginia. It is currently not ranked or under review in 9 states (NatureServe 2010). In Illinois, this species rarely blooms, most likely the result of excessive shading conditions.

Lilium superbum is a species of mesic woods and streambanks in southern Illinois. It is found within Gallatin, Pope, Johnson, Jackson, Williamson, and Hardin counties. It is known to occur within Lusk Creek Canyon, Jackson Hollow, Bell Smith Springs, Martha's Woods, Hayes Creek/Fox Den Creek (mesic woodland, north-facing slope), Fink Sandstone Barrens, Simpson Township Barrens, and Bulge Hole Ecological Areas, Ozark Hill Prairie Research Natural Area, Lusk Creek Canyon Zoological Area, and Lusk Creek Canyon Wilderness Area. It is also known from outside the Burke Branch Research Natural Area, east branch of Cedar Creek, Iron Furnace, along a tributary of Big Creek, Lake Kinkaid area, near Beaver Creek, on private land near Caney Creek, The Nature Conservancy's Gibbons Creek, State land at Lake Murphysboro, and US Fish & Wildlife land at Devils Kitchen Dam. Rarely do the populations reach a mature growth on the Forest. Typically, populations are non-flowering and remain in a juvenile stage, primarily because they are found in excessively shaded areas. At one site where a clear cut took

place on private property, approximately 51 flowering individuals and 147 juveniles appeared in a 200 square meter area during June 1991. These plants were exposed to full sunlight and appeared to be very healthy.

Environmental Impacts:

The majority of the populations of *Lilium superbum* occur along the streambanks and creeks and will not be affected in the short-term by Alternative 1 but in the long-term, over the next 10 years, most may experience negative indirect effects from the continued encroachment of invasive species. In many cases, the lack of prescribed fire will also have negative indirect long-term effects to these species. Many of these species are not located in areas that a prescribed burn would carry into, but the adjacent burned areas would have an influence on the habitat that these species occupy. *Lilium superbum* is currently threatened by Nepalese browntop and Chinese Yam along the creeks that it inhabits. This species cannot compete with the dense matting of the Nepalese browntop and Chinese Yam.

Alternative 2 will have beneficial direct and indirect short- and long-term effects on *Lilium superbum* at Simpson Township Barrens Ecological Area from the use of prescribed fire if the fire actually reaches this species in its habitat. Fires may not actually burn the immediate habitat that this species occurs, which is along the edges of creeks, because of little or no fuel available. The fires will burn adjacent areas that will benefit the species by opening up the canopy for more sun to reach the forest floor. In addition, if this species burns, its response will likely be positive like most grasses respond to fire.

Cumulative Impacts:

Cumulative Impacts for all alternatives would be comparable to the Environmental Impacts. With Alternatives 1 and 2, in the long-term, populations of *Lilium superbum* outside of the Simpson Township Barrens Ecological Area may become over-shaded, suppressed or out-competed by other aggressive woody native species, Nepalese browntop, Chinese yam and invasive plant species. Fires generally benefit *Lilium superbum* as seen with past fires at Simpson Barrens and Fink Sandstone Barrens. The prescribed fire at the sites that it does occur in may also add nutrients back to the microhabitat will help stimulate the suppressed populations.

In both alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exceptions of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial effects to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Lilium superbum* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through trails, roads and cross-country use. Since there should be no negative impacts to *Lilium superbum* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of slight negative cumulative impacts resulting from recreational

use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

25. *Matelea obliqua* (Climbing milkvine)

Matelea obliqua is a perennial herbaceous vine of the southeastern United States. Range-wide, it is found in rocky woods and thickets in acidic or alkaline soils. This species does well under a fire regime and in open woodlands where it receives bright sunlight. In southern Illinois it occurs in rocky dry to dry-mesic upland forests and limestone glades.

The Nature Conservancy assigned this species a rank of G4? in 1988 (NatureServe 2010). This species is currently listed as presumed extirpated in the District of Columbia, possibly extirpated in North Carolina, critically imperiled in Illinois, Maryland and Pennsylvania, imperiled in Mississippi, Georgia, and Indiana, vulnerable in Ohio and West Virginia, apparently secure in Kentucky, and either not ranked or under review in Alabama, Tennessee, and Virginia. On the Shawnee National Forest, it is known natural areas including Copperous Branch EA, Leisure City EA, Robnett Barrens EA, Dog Barrens EA, Whoopie Cat Mountain RNA, Simpson Township Barrens EA, Fink Sandstone EA, and Dennison Hollow RNA. It is also known from private property and other sites on the Forest including Cove Hollow, Thacker Hollow, Lusk Creek Wilderness, and the Bay Creek area.

Environmental Impacts:

Alternative 1 will have negative indirect long-term impacts to *Matelea obliqua* in the areas that will not be prescribe burned. This species occurs in fire-adapted and fire-dependent plant communities that are being encroached by maple trees, shrubs, and exotic invasive species. This species responds well to fire and is able to compete better in its habitat in those areas that are prescribe burned. Negative long-term impacts will mostly come from woody species encroachment and invasive species encroachment. Invasive species currently impacting the habitat that this species occurs in include Nepalese browntop, amur honeysuckle, Japanese honeysuckle, multiflora rose, and an overabundance of poison ivy. With time, possibly over the next ten years, this rare species may be outcompeted by the aggressive invasive species and may become extirpated from several of their previously known locations.

Alternative 2 will have positive direct and indirect short- and long-term impacts to *Matelea obliqua* from prescribe burning to control aggressive invasive species and woody encroachment. Controlling and/or eradicating aggressive invasive species that threaten these species and their community type will greatly enhance the ability of this rare species to compete and persist. The effects of fire are known to have positive effects on this species and its habitat on the Forest. The rich open woods on the Forest are habitat to several native fire-adapted species. Habitat for this species in southern Illinois occurs adjacent to fire-dependent communities and, likely, burned periodically. Populations have persisted following extensive wildfires between 1952 and 1955. According to former Forest Service employee Carl Joe Frick, intense wildfires swept the west side of the Forest during the 1950's to the point of some areas giving the appearance of clearcuts across the Jonesboro Ranger District (personal communication with Elizabeth Shimp

during 1991 and August 25, 2004). Dry conditions and fuel buildup (since the suppression of wildfires directed by the State of Illinois at the turn of the century) provided wildfires with raging opportunities across federal and private lands alike. Fires burned annually with great intensity, yet these populations perpetuated and endured the harsh conditions. The locations where this species exists today are no exception.

Cumulative Impacts:

In both alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exceptions of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial effects to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Matelea obliqua* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through trails, roads and cross-country use. Since there should be no negative impacts to *Matelea obliqua* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

26. *Panax quinquefolius* (American ginseng)

Panax quinquefolius is a perennial herb of the eastern United States and adjacent Canada. This species has a fleshy rootstock with medicinal value found and is frequently dug up for its roots. In Illinois it blooms during June and July and fruit is typically ripe in mid August (Fiebig *et al.* 2001). Throughout its range, it is found in rich mesic woods under the closed canopy of deciduous hardwoods (Anderson and Peterson 2000). This species is scattered throughout Illinois in rich dry-mesic to mesic upland and mesic floodplain forests and in southern Illinois it is known from Alexander, Hardin, Jackson, Johnson, Massac, Pope, Saline, and Union counties. It is known from LaRue-Pine Hills/Otter Pond Research Natural Area.

According to NatureServe (2010) the primary threats to *Panax quinquefolius* are commercial overharvest and logging of mesic hardwoods. Exotic species, although not mentioned specifically on NatureServe, could decrease the amount of suitable habitat and potentially outcompete *Panax quinquefolius*. Even in protected areas such as National Parks and Forests, there is a great deal of poaching due to its valuable root in overseas markets and the difficulty of enforcing existing laws (NatureServe 2010).

The Nature Conservancy gave this species a Global Heritage Status Rank of G3G4 in 2005 (NatureServe 2010). It is possibly extirpated in the District of Columbia, critically imperiled in Rhode Island, South Dakota, Nebraska, Kansas, Oklahoma, and Louisiana, imperiled in Ontario and Quebec, Canada, Michigan, New Jersey, Delaware, and New Hampshire, and listed as

vulnerable in Illinois, Indiana, Iowa, Minnesota, Kentucky, Tennessee, Mississippi, Georgia, West Virginia, Virginia, Maryland, New York, Connecticut, Vermont, and Maine. It is apparently secure in Wisconsin, Pennsylvania, Missouri, Arkansas, Alabama, South Carolina, and North Carolina and is not ranked or currently under review by Ohio. This species occurs at generally low densities over a very broad range. Population sizes of this plant have decreased significantly primarily because of the extensive root digging for commercial sale. Although various regulations are in effect to protect this species (including CITES listing), populations continue to decline because of noncompliance with these regulations and insufficient enforcement.

Panax quinquefolius is found within Alexander, Gallatin, Pope, Johnson, Jackson, Massac, Saline, Union, and Hardin counties. It very likely occurs in Williamson County although available literature does not have it listed. It is known to occur within Thacker Hollow, Lusk Creek Canyon Ecological Area, Lusk Creek Canyon Zoological Area, Lusk Creek Wilderness Area, Bulge Hole Ecological Area, Dennison Hollow Research Natural Area, Jackson Hollow Ecological Area, LaRue-Pine Hills/Otter Pond Research Natural Area, Burke Branch Research Natural Area, and Double Branch Hole Ecological Area among other areas on the Forest. This plant grows in rich woods, and low mesic woods. On the Shawnee National Forest, populations have been over-collected by illegal root-diggers. Population totals rarely exceed one or two dozen young plants. In Illinois, *Panax quinquefolius* is documented in 84 of 102 counties and is likely present in more (Anderson *et al.* 1993).

Environmental Impacts:

Alternative 1 may have negative indirect long-term impacts to *Panax quinquefolius* in several of the areas that will not be prescribed burned. This species is not fire-dependent but is adapted to fire and would respond well to prescribe burns. The plant communities that this species inhabits are being encroached by maple trees, shrubs, and exotic invasive species. Negative long-term impacts will mostly come from woody species encroachment and invasive species encroachment. Invasive species currently impacting the habitat that this species occurs in include Nepalese browntop, amur honeysuckle, Japanese honeysuckle, multiflora rose, and an overabundance of poison ivy. With time, possibly over the next ten years, this species may be outcompeted by the aggressive invasive species.

Alternative 2 will have positive direct and indirect short- and long-term impacts to *Panax quinquefolius* from the use of prescribed burning. This species' adaptations to fire will help it compete with aggressive invasive species as well as woody encroachment. The prescribed fire will also add nutrients back into the soil, which will benefit this species and others.

Cumulative Impacts:

In both alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exceptions of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to

some indirect beneficial effects to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Panax quinquefolius* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through trails, roads and cross-country use. Since there should be no negative impacts to *Panax quinquefolius* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

27. *Plantago cordata* (Heartleaf plantain)

Plantago cordata is a perennial aquatic herb that is known from the eastern and central United States and Ontario, Canada. In Illinois it usually occurs in sand or gravel bars of shallow, clear-water streams under a forest canopy. It has a very narrow habitat preference but can be locally common. In southern Illinois, this species rarely blooms nor gets very tall in stature, most likely the result of excessive shading conditions.

This species has declined throughout its range because of stream erosion and siltation from various activities. The Nature Conservancy gave this species the Global Heritage Status Rank of G4 in 1994 (NatureServe 2010) because populations have declined dramatically everywhere except for Missouri. It has been historically documented in 20 states and Ontario Canada but is possibly extirpated from Iowa, Kentucky, Virginia, Maryland, District of Columbia, and Florida. It is critically imperiled in Ontario, Wisconsin, Illinois, Michigan, Ohio, Indiana, Tennessee, Mississippi, Alabama, and North Carolina, and imperiled in Arkansas. New York, Missouri and Georgia list it as being vulnerable and South Carolina is the only state that has it under review but no documentation of occurrences is available.

Plantago cordata is known from Jackson, Johnson, Pope, and Saline counties. It has been documented as occurring at Lake Kinkaid, Cedar Lake, Cave Hill Research Natural Area, Simpson Township Barrens Ecological Area, north of Flat Rock Hollow (not relocated during 2004 searches; siltation evident in creek with horse trail and ATV use apparent, likely extirpated), state land at Lake Murphysboro, private land at Flat Lick Branch, Gyp Williams Hollow Ecological Area (not relocated, likely extirpated), and Copperous Branch Ecological Area.

Environmental Impacts:

The majority of the populations of *Plantago cordata* occur in and along the streambanks and creeks and will not be affected in the short-term by Alternative 1 but in the long-term, over the next 10 years, most may experience negative indirect effects from the continued encroachment of invasive species. In many cases, the lack of prescribed fire will also have negative indirect long-term effects to these species. Many of these species are not located in areas that a prescribed burn would carry into, but the adjacent burned areas would have an influence on the habitat that these species occupy. *Plantago cordata* is currently threatened by Nepalese browntop and

Chinese Yam along the creeks that it inhabits. This species cannot compete with the dense matting of the Nepalese browntop and Chinese Yam.

Alternative 2 will have positive direct and indirect short- and long-term effects on *Plantago cordata* at its known locations from the use of prescribed fire. Prescribed burns are not planned in this assessment for the areas that this species occurs in across the Forest, however, fires are planned for the Cave Hill and Simpson Barrens locations in this analysis. Fires may not actually burn the immediate habitat that this species occurs, which is within and along the edges of creeks, because of little or no fuel available. The fires will burn adjacent areas that will benefit the species by opening up the canopy for more sun to reach the forest floor. In addition, if this species burns, its response is known to be positive since it has done very well with past burns at Cave Hill and Simpson Barrens.

Cumulative Impacts:

Cumulative Impacts for all alternatives would be comparable to the Environmental Impacts. With Alternative 1 and 2, in the long-term, populations of *Plantago cordata* outside of Cave Hill and Simpson Barrens may become over-shaded, suppressed or out-competed by other aggressive woody native species, Nepalese browntop, Chinese yam and other invasive plant species. Fires generally benefit *Plantago cordata* as seen with past fires at Cave Hill and Simpson Barrens.

In both alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exceptions of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial effects to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Plantago cordata* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through trails, roads and cross-country use. Since there should be no negative impacts to *Plantago cordata* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

28. *Polytaenia nuttallii* (Nuttall's prairie parsley)

Polytaenia nuttallii is a perennial herb of prairies and the plains preferring loamy soils in full sun. In southern Illinois it is found in the barrens and glades; at one time, there were over 40 counties in Illinois that this species occurred, however, this species has been extirpated in many of these counties because of habitat destruction and development. The greatest threats to this species are habitat loss, decline in habitat quality, and fire suppression, a component known to enhance Nuttall's prairie parsley habitat. It is known from areas including Stoneface RNA,

Simpson Barrens EA, along a creek in a dry-mesic woods (Johnson County) and along a Forest Road in a dry oak woodland (Pope County).

The Nature Conservancy gave this species a Global Heritage Status Rank of G5 in 1984 (NatureServe 2008). It is extirpated in Michigan and Kentucky, critically imperiled in Indiana and Tennessee, imperiled in Mississippi, and listed as vulnerable in Wisconsin, Minnesota, Iowa, and Louisiana. It is apparently secure in Nebraska and is not ranked or currently under review by North Dakota, Illinois, Missouri, Arkansas, Alabama, Kansas, Texas, and New Mexico.

Environmental Impacts:

Alternative 1 will have negative indirect long-term impacts to *Polytaenia nuttallii* in the areas that will not be prescribed burned. This species occurs in fire-adapted and fire-dependent plant communities that are being encroached by maple trees, shrubs, and exotic invasive species. This species responds well to fire and is able to compete better in its habitat in those areas that are prescribed burned. Negative long-term impacts will mostly come from woody species encroachment and invasive species encroachment. Invasive species currently impacting the habitat that this species occurs in include Nepalese browntop, amur honeysuckle, Japanese honeysuckle, multiflora rose, and an overabundance of poison ivy. With time, possibly over the next ten years, this rare species may be outcompeted by the aggressive woody and invasive species and may become extirpated from several of their previously known locations.

Alternative 2 will have positive direct and indirect short- and long-term impacts to *Polytaenia nuttallii* from prescribed burning. Controlling and/or eradicating aggressive woody and invasive species that threaten these species and their community type will greatly enhance the ability of this rare species to compete and persist.

The effects of fire are known to have positive effects on this species and its habitat on the Forest. The rich open woods on the Forest are habitat to several native fire-adapted species. Habitat for this species in southern Illinois occurs adjacent to fire-dependent communities and, likely, burned periodically. Populations have persisted following extensive wildfires between 1952 and 1955. According to former Forest Service employee Carl Joe Frick, intense wildfires swept the west side of the Forest during the 1950's to the point of some areas giving the appearance of clearcuts across the Jonesboro Ranger District (personal communication with Elizabeth Shimp during 1991 and August 25, 2004). Dry conditions and fuel buildup (since the suppression of wildfires directed by the State of Illinois at the turn of the century) provided wildfires with raging opportunities across federal and private lands alike. Fires burned annually with great intensity, yet these populations perpetuated and endured the harsh conditions. The locations where this species exists today are no exception.

Cumulative Impacts:

In both alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exceptions of some grasses, such as Nepalese browntop. Likewise, invasive

species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial effects to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Polytaenia nuttallii* inhabits. Dispersed recreational use will still have some indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through trails, roads and cross-country use. Since there should be no negative impacts to *Polytaenia nuttallii* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for any of the three alternatives with the exception of slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

29. *Rhynchospora glomerata* (Clustered beaksedge)

Rhynchospora glomerata is a caespitose perennial sedge that occurs in the southeastern United States and reaches its northern range limit in southern Illinois. Within its range this sedge is found in wet, sandy soils near bogs, savannahs and meadows (Crow and Helquist 2000).

Threats to this species include the loss of native habitat, exotic species and natural succession. The Nature Conservancy has given this species a Global Heritage Status Rank of G5 (1990). *Rhynchospora glomerata* is possibly extirpated in the District of Columbia, critically imperiled in Illinois and imperiled in Delaware. It is listed as vulnerable in Maryland, apparently secure in North Carolina, and secure in Virginia, Kentucky, and Mississippi. It is currently not ranked or under review in Kansas, Oklahoma, Texas, Arkansas, Louisiana, Tennessee, Alabama, Georgia, Florida, South Carolina, and New Jersey.

This species is known from Johnson and Pope counties in southern Illinois. At Bell Smith Springs Ecological Area in Pope County it occurs along an intermittent stream in wet sandy soil (rocky stream bank). It is known from a second site near Camp Ondessonk in Johnson County. This population was found August 31, 1999 by John Schwegman in the bedrock crevices in the bed of rock-bottomed East Branch of Cedar Creek in a little sandstone gorge.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Rhynchospora glomerata* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Rhynchospora glomerata* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

30. *Stenanthium gramineum* (Eastern featherbells)

Stenanthium gramineum is a bulbous perennial herb that occurs in moist woods, floodplains, meadows, and streambanks from Texas east to Florida north to Pennsylvania, Michigan, and Illinois. It is scattered in the southern ½ of Illinois where it occurs in mesic floodplain forest and upland forests. In southern Illinois it is historically known from Gallatin, Jackson, Johnson, Massac, Pope, Pulaski, and Union counties. It is historically known from 13 counties in Illinois but is determined to be extant with 8 remaining populations in only 7 counties (Phillippe 2004c). Populations known to occur on Shawnee National Forest managed lands are 1 population in each of Gallatin and Johnson counties and 2 in Pope County (Phillippe 2004c).

Stenanthium gramineum is widespread but infrequent throughout its range. The Nature Conservancy assigned this species the rank of G4G5 in 1995. It is critically imperiled in Illinois, Indiana, Oklahoma, Mississippi, Pennsylvania, and Maryland, is imperiled in Ohio and Kentucky, and is listed as vulnerable in North Carolina, West Virginia, Arkansas and Louisiana. It is apparently secure in Virginia, however it is extirpated from the District of Columbia. It is currently not ranked or under review in Texas, Alabama, Georgia, Florida, South Carolina, Tennessee, and Missouri. Michigan lists it as an exotic (NatureServe 2010). Primary threats in Illinois include creek bank erosion, road construction, and trampling by equestrian use (Edgin 2002).

It is documented from rich mesic floodplains on the Forest. It is known from an unprotected area in a gravel wash in an intermittent stream in Gallatin County (horse trail going through colony), along the edge of a pond in Jackson County (not relocated in 2002), a gravel wash area in Ferne Clyffe State Park (not relocated in 2002), at Grantsburg Swamp in Johnson County, at Mermet Lake in Massac County (not relocated in 2002 and feared extirpated) (Edgin 2002), near Bay Creek, and in a mesic forest at Burke Branch Research Natural Area in Pope County, and a floodplain forest in Pulaski County.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Stenanthium gramineum* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Stenanthium gramineum* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

31. *Trichomanes boschianum* (Appalachian bristle fern)

Trichomanes boschianum is a perennial fern occurring in the southeastern United States. This species occurs in moist, humid crevices of sandstone overhangs and rockhouses where temperature and moisture are typically constant year round. This species is limited to the Greater Shawnee Hills Section of the Shawnee Hills Division. Habitat for *Trichomanes boschianum* consists of slightly acidic rock outcrops with full shade and a constantly moist environment where the species is often found hanging from rock ceilings (Hill 2003b). In the Shawnee, this species is found along some sandstone overhangs in the Shawnee Hills that match its strict habitat requirements (Hill 2003b).

According to NatureServe (2010), the primary threat to this species is its limited distribution. Plants are also very sensitive to drought and have been damaged by over-collection, recreational activities including camping, illegal artifact hunting and rock climbing (Hill 2003h). The Nature Conservancy ranked this species G4 in 1986. The Conservation Status of this species, which is only known from 13 states, is critically imperiled in Indiana, Ohio, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Tennessee, and Mississippi, imperiled in Illinois and Arkansas, and vulnerable in Alabama and Kentucky (NatureServe 2010). This species is listed as endangered in Illinois and it also a Regional Forester's Sensitive Species. Trends for *Trichomanes boschianum* are thought to be declining throughout much of its range (Hill 2003b)

Populations in Illinois have been documented from sites in Gallatin (3), Hardin (1), Johnson (7), Pope (5) and Union (1) counties (Hill 2003b). It was relocated at 16 of its 23 original locations and additionally found at 2 new sites near former locations (Schwegman 1999). Areas that were relocated on Forest lands were Bell Smith Springs (north-facing sandstone shelter), Double Branch Hole (north-facing sandstone cliff), Jackson Hollow (first discovered by Mary Steagall on August 2, 1932, collection #37), and Sand Ecological Areas, and Brown's Hole Zoological Area. Seven of the former locations are sites where the populations are feared extirpated.

Environmental Impacts:

Alternative 1 and the Proposed Action will have no direct and indirect impacts on *Trichomanes boschianum* since it is not known to occur within or near the proposed project areas.

Cumulative Impacts:

Since there will be no negative environmental impacts to *Trichomanes boschianum* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

32. *Trifolium reflexum* (Buffalo clover)

Trifolium reflexum is an annual or biennial clover that is found in the eastern and central United States and adjacent Canada. It is typically found in open upland forests and prairies. It generally flowers from May through July.

Threats to this species include fire suppression of open woodlands and prairies, habitat destruction for agriculture and development, and invasion of non-native species. It is listed as presumed extirpated in Ontario, Canada, Pennsylvania, New Jersey, and the District of Columbia, possibly extirpated in Maryland, critically imperiled in Illinois, Kentucky, Nebraska, North Carolina, Ohio, Tennessee, West Virginia, and Virginia, imperiled in Kansas, and vulnerable in Missouri. This species is not ranked or is currently under review in Indiana, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, Texas, and Indiana. Iowa lists it as an exotic. The Global Rank assigned by The Nature Conservancy in 2004 is a G3G4 (NatureServe 2010). The decline of this and other native clovers may be attributed to habitat destruction, poor dispersal to new habitat, loss of a natural grazing regime (buffalo), competition from exotic plant species, and reduced fire frequency (Campbell *et al.* 1988).

Trifolium reflexum was once scattered throughout Illinois in dry-mesic savannas, upland forests, prairies, and flatwoods. It is now nearly extirpated in the state and occurs in less than half of the counties that it did historically. In southern Illinois it is known from extant populations in Jackson and Johnson counties. There is an unconfirmed report of this species from Gallatin County. It is known from a rocky, dry-mesic upland forest adjacent to limestone barrens at Simpson Township Barrens Ecological Area in Johnson County (collection by Elizabeth Longo Shimp, July 1996) and at Little Grand Canyon/Horseshoe Bluff Ecological Area (discovered by David King and collected by Jody Shimp in 1996, collection #5290) in Jackson County.

Environmental Impacts:

There may be some negative indirect long-term impacts resulting from Alternative 1. These impacts may come from aggressive native and exotic species encroachment, which may cause a reduction in health and vigor of *Trifolium reflexum* populations within the prairie/barrens areas on the Forest. In particular, Japanese honeysuckle may become detrimental to this species, as well as excessive shading from trees in the overstory and saplings and shrubs in the understory. Many of the barrens communities have already become invaded by aggressive woody species and exotic species and these rare community types will be lost if intensive management is not implemented. Open sunny barrens benefit *Trifolium reflexum* and cannot be achieved without prescribed fire. This species is a fire-dependent species and does not do well in the absence of fire disturbance.

Alternative 2 is expected to have positive direct and indirect short-term and long-term impacts on *Trifolium reflexum* through prescribed fire. The effects of fire are known to have positive effects on this species and its habitat on the Forest. Simpson Barrens Ecological Area has had previous prescribed fires and this species appeared and has persisted as have other rare species.

Cumulative Impacts:

Cumulative impacts for all alternatives would be comparable to the environmental impacts. In all alternatives, prescribed burns that otherwise take place on the Forest and on private properties, will contribute to some beneficial effects to the unburned areas on the Forest. The

burns will help stimulate native vegetation while discouraging or suppressing most invasive species with the exception of some grasses, such as Nepalese browntop. Likewise, invasive species control (at up to 150 acres/year on the Forest and on private lands) will also contribute to some indirect beneficial impacts to this species by reducing (although to a very small degree) the spread of invasive plant species into the communities in which *Trifolium reflexum* inhabits. Dispersed recreational use will still have some slight indirect negative effects to this species in all alternatives resulting from the continued introduction of invasive species through hiking where this species occurs. Since there should be no negative impacts to *Trifolium reflexum* resulting from prescribed fire in the proposed project, there will be no cumulative impacts for either of the alternatives with the exception of very slight negative cumulative impacts resulting from recreational use and slight positive cumulative impacts from prescribed burning and invasive species control. These cumulative impacts take into account past, proposed, present and reasonably foreseeable future actions taken by the agency or others.

/s/Elizabeth Longo Shimp
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