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# **Viability Assessment Report For Grassland Habitat Association**

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## **I. Description of Habitat Association**

Nine distinct habitat types are included in this association. They may occur on almost any part of the landscape although typically are found on upland sites. The presence of graminoid vegetation, such as grasses, rushes and sedges, found in these habitats, ties together this association. Most of the habitats were produced through the direct influence of cultural practices, but a few may occur as natural habitats. The habitats most likely to occur naturally are Warm Season Grassland, and Meadows. The other habitats in this association are Old Field, Wet Field, Cool Season Grassland, Pasture, Cropland, Fescue-Sericea Grassland, and Ruderal/Waste Areas. Each of the nine habitats will be addressed individually. In addition, Canebrake, a naturally occurring grassland type, which usually occurs in a riparian setting on floodplains or terraces, is described under the Riparian Habitat Association.

### **A. Warm Season Grassland**

Warm season grassland is characterized by grass species that flower in late summer to early fall. These are species characteristic of prairies. Prairies are not currently known from the Daniel Boone National Forest (DBNF), but patches of open areas characterized by these species are. These areas may be natural, or more commonly, associated with wildlife openings or utility rights-of-way. They are distributed across the Cliff portion of the Forest, but are rare elsewhere on the Forest. This habitat type occurs in every forest landtype association (LTA) within the Central Escarpment and Southwestern Escarpment Subsections (see USDA Forest Service, 1997; 1996). Most of these areas are on ridges and upper slopes, but may occur on lower slopes and terraces. Bedrock under warm season grasslands is usually sandstone or limestone, but may also be shale, siltstone or mudstone. Soils are usually well drained and sandy, but these grasslands also occur on clayey soils. Water at these sites is many from surface sources (rainfall). On some sites, limited amounts of water help maintain the sites. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the grasslands, also provide energy sources.

Warm season grasses dominate the vegetation of these grasslands. The most common species are Indian grass, little bluestem and big bluestem. Purpletop, switchgrass, side-oats grama, and a variety of panic grasses may also be present. Common forbs include aster and goldenrod species, sunflowers, native flax, cinquefoils, upland buttonweed, and American feverfew. Woody species such as lowbush blueberry, poison ivy, and stunted seedlings of oaks, hickories, and yellow pines are sometimes present.

## **B. Meadows**

As defined here, meadows are moist, cool season grasslands dominated by native species. Meadows are rare on the DBNF and are found only in a few locations along the Cliff section of the Forest. These are generally high elevation habitats, but occasionally occur at lower elevations, as on the Forest. On the DBNF, they occur associated with terraces along larger streams. Underlying bedrock is sandstone, shale, siltstone, or limestone depending on location. Soils are somewhat well drained, usually sandy loams. Water is primarily from surface (rainwater) sources, but may be supplemented by seeps. The habitat tends to stay moist, but does dry out. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the grasslands, also provide energy sources.

Meadow vegetation consists primarily of caric sedges, rushes and grasses such as wedge grass, redtop, and panic grasses. Forbs present may include, small-flowered agrimony, Canada lily, joe pye-weed, mist flower, blue lobelia, and cinquefoils. Weeds, such as sweet vernal grass and stoloniferous redtop are often common components in degraded meadows. Mesic tree species such as white ash, black walnut, butternut, and maples may take hold in these sites.

## **C. Old Fields**

Old fields range from grassy to brushy conditions, but in general have forbs or shrubs about as abundant as graminoid species. They occur throughout the Forest, on all ranger districts and in all DBNF LTAs. Some are maintained as old fields and others are grassy fields that have not been maintained. Some represent a successional stage in the change from an old pasture or crop field to forest. They may occur on ridges, upper and mid slopes or on terraces and floodplains. Underlying bedrock may be sandstone, siltstone, shale, or limestone. Soils are widely varied including moderately well- to well-drained sandy to clayey loams. Most old fields receive moisture from rainfall, although some may receive floodwaters from nearby streams. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the fields, also provide energy sources.

Old field graminoid vegetation on the DBNF is usually comprised of several of the following species: tall fescue, Kentucky bluegrass, redtop, purpletop, panic grasses, and caric sedges. Weedy species such as velvet grass, crabgrass, and stoloniferous redtop may be present. Common forbs are goldenrods, sundrops, glaucous sunflower, nettle-leaf verbena, prairie petunia, tickseeds, and ground cherries. Weedy species such as wild carrot, chicory, oxeye daisy, and common dock may be present. Woody species such as blackberry, winged sumac, smooth sumac, persimmon, poison ivy, tulip poplar, sycamore, and white are often present. Multiflora rose and autumn olive are weedy woody species that are often present. This vegetation is short-lived without disturbance, becoming shrub land or young forest in 20 years or less.

#### **D. Wet Fields**

Wet fields are usually grassy, but may be shrubby. They occur across the DBNF on all ranger districts and in all Forest LTAs, but are not common. They most often occur on terraces of larger streams, but may be present on almost any topographic position. Many are maintained as grassy fields while others represent a successional stage in the change from crop field or pasture to forest. Underlying bedrock may be sandstone, siltstone, shale, or limestone. Wet fields tend to stay damp throughout the year and may actually have water standing on them (generally under 0.5 in, 1 cm). Water is received primarily from rainfall, but may be supplemented by floodwaters or seeps. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the fields, also provide energy sources.

Some wet fields may resemble old fields in their composition. Others are dominated by species such as deertongue and small-flowered panic grass. Goldenrods and asters may be present. Blackberry is common on these sites. Alder may also be present. Multiflora rose is a common weedy species in wet fields. The wetter sites maybe somewhat edaphically maintained, but most require mowing or other disturbance to prevent woody vegetation from invading and occupying the site.

#### **E. Cool Season Grassland**

Cool season grasslands are grassy. They occur across the DBNF, on all ranger districts and in all Forest LTAs. They are most common on upland sites, but are found on all physiographic positions. In most cases, these are habitats maintained as wildlife openings. Some represent temporary seeding of an area following ground disturbance and are expected to revert to shrub or forest condition. These grasses will grow on most soil types that are not water logged, and hence, the habitat is found on sandstone, siltstone, shale, and limestone. Water is received from rainfall, and in a few cases, floodwaters. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the fields, also provide energy sources.

Cool season grassland on the DBNF is usually in small parcels surrounded by forest and isolated from other similar lands or developments on adjacent private land. Domestic livestock grazes none of the DBNF cool season grassland. As a result, feral animal presence on DBNF cool grassland tends to be considerably less than on similar habitat on private land, and microconditions are somewhat different. Tall fescue and Kentucky bluegrass dominate cool season grassland on the DBNF. These areas are frequently nearly pure stands of fescue or more often, mixes of fescue with other grasses and forbs. Most of this fescue is 'Kentucky 31' or other endophyte-containing cultivar. Common milkweed, dogbane, chicory, and curly dock maybe found as well. Blackberry often invades the areas. These grasslands last for only 5-10 years with disturbance, such as mowing, before they become dominated by forb and shrub or tree species.

## **F. Pasture**

Pasture is land maintained in more or less grassy condition to provide forage for livestock. Livestock themselves help provide some of the disturbance required to keep woody vegetation at a minimum. On the DBNF, only one area of active pasture exists, that on the Stanton Ranger District. This area is located primarily on bottomland. Two additional areas are located on the Stearns Ranger District, but neither is active except to provide occasional forage for visitor's horses. One of these sites is located on bottomland and other one is upland. The underlying bedrock at all three sites is sandstone/siltstone/shale. Soils are well drained, sandy to clayey loams. Rainfall is the primary source of water for all. The Stanton site periodically floods, while the Stearns bottomland site rarely floods. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and manure from resident or visiting animals also provides energy sources.

Vegetation on these sites is varied, but 'Kentucky 31' fescue is present at all three sites and Johnsongrass is an invasive exotic present on the two bottomland sites. The Stanton site is similar to an old field, but wet at the lower end. The upland Stearns site closely resembles an old field, but has some damp to wet areas near the intermittent creek which passes through it. The bottomland Stearns site most closely resembles cool season grassland. Woody vegetation will encroach on all with out active management to keep it out.

## **G. Fescue-Sericea Grassland**

Forbs or grasses may dominate this habitat type. It is found across the DBNF, but is most abundant on the London, Somerset, Stearns, and Redbird districts in the following LTAs: North Fork Kentucky Cliffs (221Hc003), Northern Escarpment (221Hc004), Rockcastle Hills (221Hc005), and Southern Middle Breathitt Rugged Hills (221Ha001) (USDA Forest Service, 1997; 1996). This habitat is formed as a result of reclamation activities following coal surface mining. Mine tailings are shaped to approximate initial land contours, and then a soil-rock fragment mix is packed on this surface. The sites are usually seeded in 'Kentucky 31' tall fescue and sericea lespedeza. The underlying bedrock is a mix of sandstone, siltstone, shale, and coal. Soils are generally classified as Fairpoint (acid) or Bethesda (basic) series, which are 'cultural' soils composed of rock and coal fragments, and some remnant top and subsoils. They tend to be excessively drained, coarse, acid, and infertile. Occasional pockets of wet soils are encountered. Water is usually received from rainfall, but small seep pockets may be present. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the areas, also provide energy sources.

Sericea lespedeza, tall fescue, or a combination of both, dominates this habitat type. Other species adapted to disturbed ground may be found including goldenrods, horseweed, oxeye daisy, sweet clovers, and crown vetch. Shrubs and trees including autumn olive, Virginia pine, and black locust may be present as planted or naturalized components of the vegetation. In areas that remain damp to wet, mosses may form dense mats under the other species. Swamp furrow moss is especially common in these areas.

Ponds associated with these grasslands maybe have either low or high quality water. Vegetation around and in them is similar to that described under the Lake and Pond Margins Habitat Association and General Standing Water Habitat Association.

## **H. Ruderal/Waste Areas**

Grasses or forbs may dominate this habitat type. It is found across the DBNF, on every district and in every forest LTA. This habitat may be found along roadsides, on vacant ground, along old woods roads, at old house or building sites, old mine sites, and sometimes along streams. These sites often have areas of bare ground and may have small to large trash piles on them. Vehicles often travel through these areas, and foot traffic may be high. The underlying bedrock may be sandstone, siltstone, shale, or limestone. Soils are varied, ranging from sand to clay to loams to subsoil. Water is received primarily from rainfall. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation, and other organic matter, also provides energy sources.

Vegetation on this habitat is varied. It is often dominated by exotic species adapted to disturbed habitat. Fescue and sericea lespedeza are frequent on the sites. Chicory, oxeye daisy, spotted spurge, chickweed, tree-of-heaven, and mimosa are frequently found. Japanese knotweed is often present on moist or wet sites. Native species often encountered include ragweeds, panic grasses, rushes and sedges on wetter sites, winged sumac, and blackberries.

## **II. Current Status of the Habitat Association on the Daniel Boone National Forest**

The Grassland Habitat Association is widespread on the DBNF and Cumberland Plateau, although all habitat types within it are not. The extent of the association is unknown, but individual occurrences can be found easily. On the DBNF, warm season grassland habitat is most abundant under powerline rights-of-way. More than 130 miles (209 km) of powerline right-of-way is present on the forest (USDA Forest Service, 1995). Estimates of 120 ac (49 ha) of wildlife openings maintained on the DBNF, are of this habitat type. Some of this habitat also occurs on private land, but the extent is unknown.

Meadows are rare throughout. Other than a few sites known near or on the forest, not much is known about the distribution and locations of this habitat. Old fields are found throughout the Cumberland Plateau. The extent of this type is unknown, but about 15 percent (292 ac, 118 ha) of the 1948 ac (788 ha) of wildlife openings documented on the DBNF (USDA Forest Service, 2001) is estimated to be of this type. Wet fields are scattered across the Cumberland Plateau; however, little is known about their distribution. Estimates of 30 ac (12 ha) of this habitat are present on the forest. Cool season grassland is not common on the Cumberland Plateau. About 80 percent (1558 ac, 630 ha) of the wildlife openings maintained on the Forest are cool season grassland. Pastureland is scattered across the Cumberland Plateau. It is more abundant on private land than on the DBNF, where about 400 ac (162 ha) of pastureland are present. Of this about 100 ac (40 ha) is not being maintained and is moving toward old field habitat conditions.

Fescue-sericea grassland is found throughout the Cumberland Plateau, but most abundantly in eastern Kentucky, east of the forest. Several large tracts (100-200 ac, 40-90 ha) of this habitat are found on the forest, on the Somerset and Redbird Ranger districts. Elsewhere the habitat is found as small (5-20 ac, 2-9 ha) tracts or narrow strips associated with contour mines. Ruderal/waste area habitat is found throughout the Cumberland Plateau. About 1980 mi (3187 km) of road corridor is present on the DBNF. Within the proclamation boundary, but outside National Forest land, another 2265 mi (3645 km) of road corridor is present (USDA Forest Service, 1997a). At least part of this corridor is in ruderal/waste area condition, but the extent is unknown. The amount of habitat provided by other areas is unknown. It is likely that this habitat is more abundant on private land than on National Forest land.

Warm season grassland is probably less common than it was 200-300 years ago when fire and grazing were more widespread across the Plateau. As open ground reverted to forest, this habitat type was reduced. Numerous records, both extant and historical, on the Plateau and Forest, of species associated with warm season grass suggest that the habitat was once much more abundant, especially on the southern portions of both. On the Plateau, the DBNF is and probably will be the primary provider of this habitat.

Meadow habitat, while rare, is probably most abundant in the higher elevations of eastern Kentucky. The few sites on or near the Forest are important for local diversity, and should be maintained for overall diversity. The forest is unlikely to be able to create any additional areas of this habitat because of the complex hydrology and species composition. There are probably fewer sites of this habitat on the Plateau than prior to European settlement. These areas would have provided immediate forage for livestock, and after draining, easy to work fields. Following disturbance, many would have grown up in woody vegetation.

Old fields are less common now than they would have been 70-80 years ago when farmland was abandoned and much sold to the government. Old fields are more abundant now than would have been the case 200-300 years ago. However, about 500 years ago and prior, old fields probably were abundant as Native Americans moved from area to area leaving behind parcels of previously cultivated land. Cool season grassland is probably not a habitat that existed on the Plateau prior to National Forest management, except as a wet field or meadow variant. Even these variants would not have been the same as the variants were and are dominated by native species. Cool season grassland on the Forest is now maintained specifically to provide forage and other habitat for a variety of species in a setting little disturbed by domestic predatory animals (i.e., dogs and cats) and other daily human influences such as tractors, cattle and people, associated with pastureland. The DBNF will be the primary provider of this habitat on the Plateau.

Pastureland is scattered across the Plateau. It is less common today, including on the DBNF than it was 70-100 years ago. Much of what was cleared for pasture in the 1800s has reverted to forest. The forest provides little of the total amount of this habitat on the Cumberland Plateau, and is unlikely to provide any additional in the foreseeable future. Many areas of pastureland are immediately adjacent to DBNF lands and these will for some time provide benefit to those species that can use it.

Fescue-sericea grassland is common on the Cumberland Plateau, but most abundant in southern and eastern portions. This habitat type did not exist prior to the large surface and contour mining projects that began about 1950 and continue today. The DBNF is not likely to maintain this habitat, and will continue to allow natural succession to occur or actively modify the existing vegetation. The forest is not likely to be actively providing this habitat for species on the forest or Plateau. Ruderal/waste area habitat is found throughout the Plateau. The habitat has probably existed in some form on the Plateau as long as humans have maintained a farming or other non-nomadic life style. It is probably more abundant on non-DBNF land than on the forest. This is habitat that is more abundant today than 200 years ago. The forest is unlikely to maintain this habitat as such, but it is likely to continue to exist on the forest.

### **III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability**

The management goal for the Grassland Habitat Association is to maintain the physical and biological conditions that will result in a high likelihood that species dependent on this association will persist on the forest over the planning period.

The strategy to accomplish this goal focuses on maintaining areas of unforested land in a variety of vegetative conditions. Additional standards and guidelines are also recommended when other management measures are needed to insure the viability of a particular species associated with this habitat association.

The desired future condition of this habitat association is a system of open, grass, grass/forb, or low shrub areas within a matrix of forested land.

#### **A. Habitat Association General Direction and Standards and Guidelines**

##### **1. Management activities to maintain association.**

- Grassland openings will be distributed forest wide. They will not be created or maintained in wilderness areas or other designated areas where specific direction prohibits this activity.
  - *Rationale: The organisms that require or make use of this habitat type occur across the forest.*
- The placement and management of grassland openings on the forest will take into consideration the available amount and type of grassland opening available on National Forest and adjacent property (FLRMP, IV:14-15, in part).
  - *Rationale: Regulations require the Forest Service to manage habitat within ownership, but ecosystem management practices dictate consideration of all adjacent land conditions when making decisions.*
- An array of grassland types will be distributed across the forest and placed by type based on ecological capabilities, and needs of species at risk.

- *Rationale: Ecosystem management requires that species be promoted on sites best suited to grow them. A variety of grassland types should be present across the forest to supply habitat for species at risk where they occur.*
- Maintain an average of 2300 acres of grassland openings across the forest across the planning period.
  - *Rationale: This amount is about 350 acres above the amount present on the ground in 2001. The increase is to allow maintenance of large blocks of open land on the Somerset Ranger District. The 2300-acre amount is the amount that funding and personnel can reasonably support based on amount maintained at peak funding and staffing in last planning period. Historically much of this habitat was provided by barrens, not openings per se and additional needs may be met with this habitat type.*
- Grassland areas within generally forested areas will usually be between 1 and 15 acres area. Smaller or larger areas may be maintained as needed to provide habitat to provide for continued existence of species at risk, on a site-specific basis. (FLRMP, IV:15, in part)
  - *Rationale: Grassland areas smaller than 1 ac are difficult to maintain with cost effectiveness. Grassland areas larger than 15 ac within a forest matrix may contribute to habitat fragmentation affecting species at risk. If required for viability needs, openings outside this range are permissible.*
- Grassland areas of 0.5 ac or larger should be created and managed with irregular boundaries. (FLMRP, IV: 15, in part)
  - *Rationale: Regular edges, such as straight lines and circles, are not natural features. Such edges increase edge sharpness and potential barriers to species movements. Areas under 0.5 ac size with irregular edge are difficult to maintain and are less likely to create edge barriers.*
- Except for large areas greater than 15 ac, grassland areas will be placed to provide escape cover on at least one side (FLRMP, IV:15, in part).
  - *Rationale: Animal species either requiring grasslands or which make use of them may be subject to undo natural or cultural risk without escape cover.*
- Warm season grassland will be favored in habitat matrices dominated by oak, yellow pine, or mixed type barrens (low BA, open forest) or pine and mixed type forest.
  - *Rationale: This combination of habitat occurs naturally, and based on recent studies, was more common on the forest than is found today. Fire is important in the maintenance of both, and species dependent on one often will use the*

*other, or in the case of many butterflies, including Diana fritillary, tend to make use of the ecotone between them.*

- Grassland areas will be mowed, burned under prescription, disked, or otherwise managed to maintain a desirable mix of nonforest vegetation on the sites. Emphasize prescribed burning for old field and warm season habitat types, and in others where burning will meet objectives.
  - *Rationale: In most cases, tall shrub or tree species will, over time, invade grassy or low shrub vegetation changing the physical and biological characteristics of the sites. These species must be removed or set back to maintain grassland opening characteristics. Fire is an important element for the health of some habitat types, and may be an effective and cost efficient tool in others.*
- Native vegetation, appropriate for the site conditions, will be emphasized in grassland openings. Non-native species, such as endophyte-free fescue, are permitted where specific viability needs are provided by such species. No species listed on the Regional Forester's Invasive Exotic Plant Species list, Category 1, will be intentionally planted or maintained in grassland areas. The use of Category 2 species must be justified in writing, on a site-specific basis.
  - *Rationale: Ecosystem management, and management for forest health, emphasize healthy, natural systems. Off-site species tend to be less vigorous than species not suited to the given conditions. Exotic species have a place in management for specific, specialized uses, but in widespread use, are not consistent with healthy, native systems. Invasive species are known to cause damage to healthy ecosystems. Others suspected of causing damage should be used sparingly.*
- Ponds, either ephemeral or permanent, or both, may be incorporated in grassland areas.
  - *Rationale: Ponds in grassland provide a readily accessible water source for many species, including aquatic and semi-aquatic species requiring open conditions. The open conditions of grassland areas facilitate the construction of ponds. Grouping habitat features together may reduce maintenance costs.*
- Activities such as roads, trails, and scenic vistas may be permitted in and along grassy habitat areas as long as they do not negatively impact PETS species or their potential habitat.
  - *Rationale: Limited use of the grassy habitat areas may not affect species viability on a site-specific basis.*
- Open grassy areas under and along rights-of-way may provide grassland habitat, and such contributions should be considered in the management of the Grassland

Habitat Association, but are not counted in the forest total. In addition, this habitat will be managed according to permit standards and agreements made with permit holders. When possible, enter into agreements with permittees to manage specific sections of rights-of-way in a manner conducive to viability needs while maintaining permit obligations. (FLRMP, IV:41, 129; in part)

- *Rationale: Within the limits of permitted activities, and policy or regulation regarding PETS species, permit holders have the right and responsibility to manage the vegetation consistent with operation of the right-of-way. This supercedes guidelines for the grassy habitat association.*
- Fescue-Sericea grassland will not be maintained as such. Where possible, it will be converted to other desirable grassland or barrens types, taking into consideration the amount and type of grassland habitat on nearby National Forest and private land. Where conversion is impractical or creates unacceptable erosion hazards, fescue-sericea grassland will be either planted to trees or allowed to revert to forest through natural processes.
  - *Rationale: Neither of the dominant species in fescue-sericea grassland is native nor is considered a desirable non-native species. Recent direction from the Regional Forester encourages, but does not require the removal of these species from National Forest lands. These areas lend themselves to creating other grassland habitat, and often provide larger parcels of land for this purpose if needed.*
- Protective measures such as informational signing, posting sites closed and/or barrier construction may be applied to sites that are receiving resource damage through inadvertent human activity.
  - *Rationale: Human use of site-specific areas may need to be modified or restricted.*
- Management activities concentrating public use in the vicinity of sensitive grassy areas would be avoided if detrimental impacts were likely to occur.
  - *Rationale: Site-specific activities need to be evaluated to determine the level of potential inadvertent human impacts to species associated with this habitat association.*

(S&Gs developed based on direction in SHNS amendment for other limited or rare habitats or features providing specialized habitat, and on personal observations; by Taylor, 2001)

## 2. Protect or enhance habitat for PETS species.

- Maintain all grassland habitat supporting PETS species.
  - *Rationale: In consideration of all available grassland habitat in the area on both National Forest and private land, some parcels supporting PETS might not be needed for overall distribution objectives. However, site specifically they are needed for these species at risk.*
- Employ management tools and cycles for maintenance of grassland habitats that favor PETS species using the habitats.
  - *Rationale: Any number of management tools and cycles may maintain the habitat in grassy condition, but not all create the same microhabitat conditions on the ground.*
- Evaluate grassland habitat sites to determine the capacity of the site to support reintroduction of species at risk.
  - *Rationale: Reintroduction of native species extirpated from the DBNF or present in low numbers likely to adversely affect viability may be appropriate action, but is not warranted if habitat conditions will not support the species.*
- Specific grassland sites will be signed or gated to restrict entry where needed.
  - *Rationale: If use of specific grassland areas results in damage to PETS species or their habitat, measures need to be taken to alert the public of the damage and ways to avoid the damage, or to restrict entry if needed to repair the damage.*
- Sites providing potential (undocumented) habitat PETS species will be managed to provide the conditions needed by these species.
  - *Rationale: Many sites are undocumented, especially small, possibly natural, sites. Systematic inventories of both grassland habitat and the organisms that live in them have not been completed.*
- Acquire private lands from willing sellers with known grassland sites supporting PETS species.
  - *Rationale: The need for protecting grassland sites supporting PETS is needed considering these species are rare or have their existence in some way threatened.*

(S&Gs added based on general PETS management goals per ESA and FS policy (FSM 2670); Taylor 2001)

#### **IV. Management Needs: Monitoring and Inventory to Ensure Species Viability**

- Maintain an inventory of grassland areas with spatial and tabular attributes including but not limited to, location, size, type of grassland, condition, and the presence of any species at risk. (High Priority)
  - *Rationale: An inventory of grassland openings provides information on which to base management decisions, track yearly and plan period maintenance accomplishments, and estimate habitat suitable for various species at risk.*
- Monitor MAR and other reporting systems to help determine accomplishments for each year and the planning period. (High Priority)
  - *Rationale: MAR and other reporting systems will be filled out yearly. Use data as reported to help verify inventory.*
- Monitor grassland areas for invasive exotic species, primarily plants, which may compromise habitat conditions. (High Priority)
  - *Rationale: Invasive exotics can spread quickly, taking over and rendering unusable or marginal grassland habitat, as well as choking out plants at risk.*

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**Attachment A.****Species List: Grassland Habitat Association**

<b>Class</b>	<b>Common Name/ Species</b>
<b>ANIMALS</b>	
<b>Amphibians</b>	Green Frog/ <i>Rana clamitans</i>
<b>Birds</b>	Bachman's Sparrow/ <i>Aimophila aestivalis</i> Henslow's Sparrow/ <i>Ammodramus henslowii</i> Grasshopper sparrow/ <i>Ammodramus savannarum</i> Ruby-throated hummingbird/ <i>Archilochus colubris</i> Chuck-will's widow/ <i>Caprimulgus carolinensis</i> Whip-poor-will/ <i>Caprimulgus vociferus</i> Lark sparrow/ <i>Chondestes grammacus</i> Northern Harrier/ <i>Circus cyaneus</i> Sedge Wren/ <i>Cistothorus platensis</i> Northern Bobwhite/ <i>Colinus virginianus</i> Prairie warbler/ <i>Dendroica discolor</i> Chestnut-sided warbler/ <i>Dendroica pensylvanica</i> Gray catbird/ <i>Dumetella carolinensis</i> Least flycatcher/ <i>Empidonax minimus</i> Common yellowthroat/ <i>Geothlypis trichas</i> Yellow-breasted Chat/ <i>Icteria virens</i> Migrant Loggerhead Shrike/ <i>Lanius ludovicianus migrans</i> Eastern Towhee/ <i>Pipilo erythrophthalmus</i> American Woodcock/ <i>Scolopax minor</i> Chipping sparrow/ <i>Spizella passerina</i> Field sparrow/ <i>Spizella pusilla</i> Bewick's Wren/ <i>Thryomanes bewickii altus</i> Golden-winged warbler/ <i>Vermivora chrysoptera</i>
<b>Insects</b>	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i> Diana Fritillary/ <i>Speyeria diana</i> Regal Fritillary/ <i>Speyeria idalia</i>
<b>Mammals</b>	Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i>
<b>Reptiles</b>	Corn Snake/ <i>Elaphe gutta gutta</i> Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i> Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
<b>PLANTS</b>	
<b>Dicots</b>	Running Serviceberry/ <i>Amelanchier stolonifera</i> Brook Saxifrage/ <i>Boykinia acontifolia</i>

<b>Class</b>	<b>Common Name/ Species</b>
	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
	Prairie Redroot/ <i>Ceanothus herbaceus</i>
	White-leaf Leather-flower/ <i>Clematis glaucophylla</i>
	Sweet-fern/ <i>Comptonia peregrina</i>
	Yucca-leaved Rattlesnake Master/ <i>Eryngium yuccifolium</i>
	Yellow Gentian/ <i>Gentiana alba</i>
	St. Peter's-wort/ <i>Hypericum crux-andreae</i>
	Vetchling Peavine/ <i>Lathyrus palustris</i>
	American Gromwell/ <i>Lithospermum latifolium</i>
	Nuttall's Lobelia/ <i>Lobelia nuttallii</i>
	Fraser's Loosestrife/ <i>Lysimachia fraseri</i>
	Barbara's Buttons/ <i>Marshallia grandiflora</i>
	American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>lineare</i>
	Thread-leaf Sundrops/ <i>Oenothera linifolia</i>
	Small Sundrops/ <i>Oenothera perennis</i>
	Mountain Lover/ <i>Paxistima canbyi</i>
	Cross-leaf Milkwort/ <i>Polygala cruciata</i> var. <i>cruciata</i>
	Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i>
	Hairy Snout Bean/ <i>Rhynchosia tomentosa</i>
	Slender Marsh-pink/ <i>Sabatia campanulata</i>
	Short-stem Ragwort/ <i>Senecio pauperculus</i>
	Royal Catchfly/ <i>Silene regia</i>
	Velvet Bush Pea/ <i>Thermopsis mollis</i> (generic)
	Nettle-leaf Noseburn/ <i>Tragia urticifolia</i>
	Narrow-leaved Bluecurls/ <i>Trichostema setaceum</i>
	Running Buffalo Clover/ <i>Trifolium stoloniferum</i>
	New York Ironweed/ <i>Vernonia noveboracensis</i>
	Bird's-foot Violet/ <i>Viola pedata</i>
<b>Ferns</b>	Engelmann's Quillwort/ <i>Isoetes engelmannii</i>
<b>Gymnosperms</b>	Eastern Redcedar/ <i>Juniperus virginiana</i>
<b>Monocots</b>	Grass-pink/ <i>Calopogon tuberosus</i>
	Carex Sedge/ <i>Carex emoryi</i>
	Uptight Caric Sedge/ <i>Carex stricta</i>
	Wild Yam/ <i>Dioscorea villosa</i>
	Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i>
	Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i>
	Loesel's Twayblade/ <i>Liparis loeselii</i>
	Plains Muhlygrass/ <i>Muhlenbergia cuspidata</i>
	Yellow-crested Orchid/ <i>Platanthera cristata</i>
	Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
	Globe Beaked-rush/ <i>Rhynchospora globularis</i> var. <i>globularis</i>
	Shining Ladies'-tresses/ <i>Spiranthes lucida</i>
	Great Plains Ladies'-tresses/ <i>Spiranthes magnicamporum</i>

07/15/2003

Rough Dropseed/ *Sporobolus clandestinus*

**Mosses**

Cataract Metal Moss/ *Scopelophila cataractae*

## **Attachment B.**

### **Grassland Species/Habitat Relationships with References**

#### **Amphibians**

Green frog – *Rana clamitans* – This frog is a semi-aquatic species occupying many of the same habitats as the large bullfrog, e.g. permanent bodies of water. The green frog can be observed in shallow water, such as springs, seeps, ponds, reservoirs, creeks, beaver ponds, ditches, bogs, floodplain pools, and swamps. The green frog requires semi-permanent water and is an opportunistic feeder. The green frog's diet includes arthropods, snails and worms (Martof et al., 1980). The green frog prefers ponds, floodplain swamps or marshy habitat with grassy edges and emergent vegetation. (Wilson, 1995)

#### **Birds**

Bachman's Sparrow – *Aimophila aestivalis* – This species typically requires dense grassy places where scattered trees or saplings are present, usually in pine forests (Hamel, 1992). Historically found in mature to old growth southern pine woodlands subject to frequent growing-season fires (NatureServe, 2001). This provided the grassy undergrowth required by this species. This species formerly inhabited a variety of early successional habitats in KY (Palmer-Ball, 1996). This species would be expected to occur in stands with a well-developed warm-season grass understory or in meadows in which native species predominate.

Henslow's Sparrow – *Ammodramus henslowii* – This species is typically found in open habitats dominated by thick, grassy vegetations (Palmer-Ball, 1996). Some typical habitat requirements include dense herbaceous vegetation, ground litter, an intermediate moisture range, and singing perches (DeGraaf et. al., 1991). This species is usually associated with grassland habitat such as warm-season grass prairie remnants.

Grasshopper Sparrow – *Ammodramus savannarum* – This species inhabits grasslands that are dominated by relatively sparse or short vegetation (Palmer-Ball, 1996). It may use fields of several types where the vegetation is approximately 1 foot high (Hamel, 1992). Brushy situations are typically not occupied by this species, as it requires rather open fields with herbaceous cover. This species would be expected to occur in large tracts of fescue or cool season grasslands.

Whip-poor-will – *Caprimulgus vociferous* – Whip-poor-wills occupy areas with medium growth hardwood and mixed forest, often in upland and edge habitats. The birds forage for insects in grassy forest openings and fields. Breeding is in forest and forest edges, usually near fields and open habitat. This species requires areas of extensive forest. Whip-poor-wills would frequent grassland areas primarily for foraging.

Northern Harrier – *Circus cyaneus* – This is a species of open country, weedy fields, and marshes. Wooded habitats are not used. Northern Harriers were more prevalent in

Kentucky in the past, before the destruction of native prairies. Harriers have bred in small numbers on reclaimed surface mines in the State, nesting amid dense cover of tall grasses. When trees are planted during reclamation...the harriers probably use the mines only for a limited number of years (Palmer-Ball 1996). On the DBNF, this species has been observed over Anso strip mines on the Somerset Ranger District and over large hayfields on the Stearns R.D. and would be expected to frequent un-mowed sericea-fescue grasslands and large tracts of un-mowed pasture, cool season grasslands and meadows (L.Perry, pers. obs.).

Sedge Wren – *Cistothorus platensis* – This is a species of low, wet grasslands. Moist meadows and the grassy margins of marshes and bogs are favored. In Kentucky, the birds also inhabit hayfields, overgrown pastures and fallow fields; areas that provide the thick, herbaceous cover the birds require (Palmer-Ball 1996). Nests are in grasses and sedges of weedy fields and in dense clumps of sedges growing in moist spots (Mengel 1965).

Northern Bobwhite – *Colinus virginianus* – Bobwhite utilize a variety of open and semi-open habitats, including woodland (especially pine), fields, fencerows, cedar thickets, and forest edges. Bobwhite prefer abandoned fields, warm season grasses and clover, although they do occur in smaller numbers in fescue. They are particularly fond of brushy conditions. Nests are made in grassy/weedy, fairly open areas near cover provided by forest edge or brushy borders. On the DBNF, birds are frequently observed with broods in open, pine-hardwood stands that have been heavily burned and have open, well-lit understory with scattered warm-season grasses and forbs (L. Perry, pers. obs.).

Prairie Warbler – *Dendroica discolor* – Prairie Warblers occur in semi-open, early successional, and woodland habitats. Mixed forest types—especially those that have been cutover or burned—with pines and cedars are occupied. Forest edges, clearings, brushy borders, and overgrown fields with scattered saplings or small trees are commonly used. On the DBNF, the birds are nearly always found in early successional habitat, especially young clearcuts and the undergrowth of shelterwood cuts, and often at wood edges and in stands that have been burned (L. Perry, pers. obs.). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Chestnut-sided Warbler – *Dendroica pensylvanica* – This is typically a bird of early successional openings and forest edge where a dense shrub layer of weeds, briars, and young trees predominate (Palmer-Ball, 1996). This species is usually found in the mountains above 3500 feet but may occur sparingly down to 2000 feet (Hamel, 1992). Tends to inhabit rather open and dry areas having some woody vegetation in the form of shrubs and small trees (DeGraaf et. al. et. al., 1991). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Gray Catbird – *Dumetella carolinensis* – This species most frequently inhabits old fields, woodland edge, forest clear-cuts and rural settlement areas. Wherever it occurs the species is typically associated with dense brushy cover (Palmer-Ball, 1996). Prefers moist, dense, dark, tangled vegetation especially in shrubbery (Hamel, 1992).

Monitoring records on the DBNF indicate that this species is most common in the non-forested habitat group. This indicates that most occurrences were in old fields or openings. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel observed male birds in alders and willows in a marshy, Laurel County meadow (1965). Most of the breeding population frequents elevations above 2500 feet. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Common Yellowthroat – *Geothlypis trichas* – This species is typical of areas with shrubs, brush or tall herbs generally in more open country that is somewhat moist in nature (Hamel, 1992). Usually found in abandon fields, areas with grassy or shrubby borders, marshes, low damp meadows with a profusion of rank growth, and remnants of tallgrass prairies (Palmer-Ball, 1996). Monitoring data collected on the DBNF indicates that this species was most common in non-forested areas less than 10 years old. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Yellow-breasted Chat – *Icteria virens* – This is a species of early successional habitats, including: thickets; overgrown fields; hedgerows; forest edges; and openings. The key requirement is dense cover of shrubs and/or saplings. These birds avoid mature forest interiors and nest in shrubby, brushy areas. On the DBNF, they are often encountered in thickets, (regenerating) clear-cut, and dense undergrowth of shelterwood cuts—nearly always in cutover or early successional habitat (L. Perry, pers. obs.). The species tends to be more abundant in harvested than in non-harvested areas (Baker and Lacki 1997). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Migrant Loggerhead Shrike – *Lanius ludovicianus migrans* – Loggerhead Shrikes are more common in south-central and western KY than in the Cumberland Plateau (Palmer-Ball 1996); they are rarely found in areas of extensive forest. Fields, pastures, cultivated fields and other semi-open to open habitats with short grasses, sparse ground cover, or bare soil is frequented. Scattered trees and snags, shrubs, fences, or telephone wires must be present for perching. Nesting is in dense trees and shrubs, with thorny species being preferred.

Eastern Towhee – *Pipilo erythrophthalmus* – This species typically occurs in managed or artificial situations such as brushy forest edge, regenerating clear-cuts, and forest

disturbed by selective logging (Palmer-Ball, 1996). It may also be found in the lower growth of open or cutover forest (Mengel, 1965). This species is dependent on dense brushy cover (DeGraaf et. al., 1991) that may be found in a variety of situations. Monitoring data collected on the DBNF indicates that this species is most common in mixed pine habitat less than 10 years old. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

American Woodcock – *Scolopax minor* – This species typically requires moist woodlands in early stages of succession. It may use open fields, cultivated land, pastures and clearings at least ¼ acre in size (DeGraaf et. al. et. al., 1991). It generally requires poorly drained soils with an abundance of earthworms for feeding, nearby fields or small forest openings for courtship and roost site (DeGraaf et. al. et. al., 1991) and is largely absent from extensive areas of mature forest (Palmer-Ball, 1996). The presences of edge habitat and a high shrub stem density may be important for nest site selection in some areas (NatureServe, 2001). Appears to be partial to sheltered wet thickets along meandering streams (Barbour et. al., 1973). Within the grassland association, this species would be most expected to be found in wet fields which it would utilize for feeding and nesting and will often select grassy openings as sites in which to conduct aerial breeding displays.

Chipping Sparrow – *Spizella passerina* – This species occurs mainly in grassland areas with scattered trees (DeGraaf et. al., 1991) or in open woodlands where the understory is sparse as a result of grazing, burning or soil conditions (Mengel, 1965). It may occur in moderate numbers in open pine-oak upland forest on dry ridges of the Cumberland Plateau (Mengel, 1965). In KY this species is frequently found in forested areas dissected by numerous small to moderate sized openings (Palmer-Ball, 1996). DBNF monitoring data indicates that the greatest number of occurrences were in mixed-pine habitat less than 10 years old. The chipping sparrow would be likely to feed in stands of open cool season grasses and other grassland areas where the grass is not dense or tall (L. Perry, pers. obs).

Field Sparrow – *Spizella pusilla* – Primary habitats for this species include weedy fields, broomsedge fields, hedgerows and thickets (Hamel, 1992). These habitats may occur in association with other forested conditions. They typically nest in open, brushy situations although they sometimes use woodland edges (Palmer-Ball, 1996). May use cut over pine forests and burned over woodlands wherever briars and brush have regenerated (DeGraaf et. al., 1991). Monitoring on the DBNF indicates that this species is most common in non-forested areas such as old fields and wildlife openings. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Bewick's Wren – *Thryomanes bewickii altus* – Habitat requirements for this species are open country with shrubs, saplings and/or brushpiles and snags at least 6 inches in diameter (Hamel, 1992). May occur in open forests but requires a brushy understory (DeGraaf et. al. et. al., 1991). Nest are built in cavities, crannies, or placed on ledges.

This species does not construct its own cavities (Hamel, 1992). In KY small numbers may also inhabit suburban yards in towns, brushy forest margins and forest clear-cuts (Palmer-Ball, 1996). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Golden-winged Warbler – *Vermivora chrysoptera* – This species favors abandon fields with scattered deciduous trees (Hamel, 1992). It occurs in greatest numbers at elevations between 2000 and 4000 feet but may rarely occur lower (Hamel, 1992). In Kentucky the species is generally a bird of the drier slopes that have been cleared in the recent past, including reverting clear-cuts (Palmer-Ball, 1996). Kentucky populations are basically restricted to the higher elevations in the mountainous region in the southeastern part of the state. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

### **Insects**

Appalachian Grizzled Skipper – *Pyrgus wyandot* – In Kentucky, *Pyrgus wyandot* is only known from eastern shale barrens in Harlan County. Elsewhere it is known to occur in open areas near woods, including valley bottoms, barrens, meadows, grassy hillsides and scrub oak openings. Its food sources include wild strawberry, Canadian cinquefoil, blueberry, and plants belonging the rose family.

Diana Fritillary – *Speyeria diana* – On the Daniel Boone, *Speyeria diana* is found in open areas and within the forest especially those that are open and well-lit. These conditions mimic open prairies and pine barrens from which the species is known out west and may be found along grassland/forest edge or in forests that have been maintained in an open condition by repeated fires. The caterpillar feeds almost exclusively on violets and overwinter above-ground making them sensitive to spring and fall fires. Midstory removal and prescribed fire can create high quality foraging habitat for adults by increasing nectar sources. A variety of species are used, including common and swamp milkweeds, ironweed, red clover, coneflowers and butterfly bush. Individuals will use small openings and roadsides along forest edges in search of nectar plants, but do not go far from the woods.

Regal Fritillary – *Speyeria spedia* – was once considered common in the natural grasslands, pastures and wet meadows of the northeastern United States. In the mid-west, fire-maintained oak-pine barrens supplied significant amounts of habitat for the Regal Fritillary. Food sources include violets, milkweeds, thistles, and other nectar producers. This species is now considered to be extirpated from Kentucky.

### **Reptiles**

Northern Scarlet Snake – *Cemophora coccinea copei* – This is a burrowing species that is rarely seen, typically venturing out only at night or after heavy rains. It is usually found under logs, stones, leaf litter, pine needles, or bark; it is occasionally turned up during

plowing or excavation work (Behler and King 1979; Conant and Collins 1991). While they have occasionally been found in open fields and residential areas, Scarlet Snakes primarily occur in woodlands, including pine, hardwood, and mixed forests (Barbour 1971) with sandy or other friable, well-drained soils that are suitable for burrowing. They are most common in open habitat and benefit from management practices, such as periodic burning and selective thinning, that retain open canopy, early successional conditions (Wilson 1995). Scarlet Snakes feed on the eggs of other reptiles, and on mice, insects, smaller snakes, lizards, and salamanders.

Corn Snake – *Elaphe guttata guttata* – Although this subspecies occurs in disjunct populations in eastern and west-central KY, Corn Snakes in general are much more common in other southeastern States. Typical habitat includes pine and pine-hardwood forests, rocky hillsides, old fields, openings within bottomland hardwoods, and, to a lesser extent, forested swamps. Open woodland, ranging from uplands to lowlands, with an abundance of rocks and logs for cover is preferred--especially when bordering old or cultivated fields that increase foraging success. Corn snakes are fairly secretive, spending much of their time concealed under surface cover, in stumps, under bark, or in the burrows of other animals (Wilson 1995). However, they readily climb trees and enter abandoned houses and barns in search of prey: mice, rats, birds, and bats (Behler and King 1979). These snakes are most often encountered along woodland edges, overgrown fencerows, and around farmsteads (Barbour 1971).

Eastern Slender Glass Lizard – *Ophisaurus attenuatus longicaudus* – This is a species of dry, often sandy, soil conditions. It occurs in relatively open, typically upland, habitats--including Virginia and Shortleaf Pine and pine-oak stands, forest edges, grassy fields and prairies--which have loose, friable soils. This secretive, legless lizard tends to stay in old rodent burrows and under mats of dead grass and decomposing plants; when it basks in the sun, it is often hidden in tall grass or with only part of its body showing (VA Dept. of Game and Inland Fisheries 2001). Slender Glass Lizard diets include insects, spiders, birds' eggs, smaller lizards, and snakes. Prescribed burning and other management practices that help to create open canopy conditions benefit this lizard species.

Eastern Earth Snake – *Virginia valeriae valeriae* – This is a small, highly secretive snake about whose habits much remains unknown. It is sometimes seen on the ground surface following heavy rains, but spends most of its time under leaf litter, logs, warm rocks and stones. Diet consists of earthworms, insects and their larvae, and other small arthropods. Its habitats include: damp, open, deciduous and pine-hardwood forests; abandoned fields; trail and back roads areas; wooded residential areas; forest edge and openings; moist, rocky slopes and hillsides with open canopies. Earth Snakes may congregate in small numbers prior to hibernation in pockets of woodland debris or under large rocks (Behler and King 1979).

## **Plants**

### **Dicots**

Running serviceberry – *Amelanchier stolonifera* – is a montaine Appalachian species that

is found in rocky and sandy soil in dry, open hardwood forest. The only Kentucky record is from the DBNF area. It is located on rocky soils on a limestone ridge in dry open oak-cedar forest.

Brook Saxifrage – *Boykinia acontifolia* – is found throughout its range associated with stream banks. It may also grow in wet meadows. It grows on continually wet, sandy or rocky banks just above summer water levels. It is usually found in moderate shade.

Scarlet Indian Paintbrush – *Castilleja coccinea* – is found in warm season grasslands, open upland hardwood or pine forest and occasionally along roadsides. The species requires moderate to high levels of light. It responds favorably to fire, which helps to maintain the species habitat.

Prairie Redroot – *Ceanothus herbaceus* – is a midwestern species associated with rocky soils in grasslands and along streams. The Kentucky records occur in the DBNF area, where it occurs only on boulder and cobble bars associated with larger streams. The habitat is open and is maintained open by periodic scouring during flood events.

White-leaf Leather-flower – *Clematis glaucophylla* – is a southern species. On the DBNF, it occurs associated with sandstone or conglomerate cobble-boulder bars along larger rivers, and at the edge of prairie-like areas.

Throughout most of its range, sweet fern – *Comptonia peregrina* – is associated with open, sterile, sandy ground where it forms dense, low thickets. In this habitat, fires probably helped maintain the habitat. On the DBNF, this species inhabits open cobble/boulder bars along free-flowing rivers. The plants are found rooted deep in the crevices between boulders. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition.

Yucca-leaved Rattlesnake Master – *Eryngium yuccifolium* – is coastal plain and prairie species associated with moist to wet warm season grassland. It is also found in open, wet yellow pine savanna and moist to wet fields. On the DBNF, it is known from two sites, one, a moist warm season grassland in a powerline right-of-way, and the other in a moist area of an old field. The species requires moderate to high light and moist conditions.

Yellow Gentian – *Gentiana alba (flavida)* – is a prairie species with range extensions into the Appalachian Plateaus. It occurs in open warm season grassland and open oak or oak-yellow pine forest. On the DBNF it occurs in prairie-like areas, dominated by warm season grasses.

St. Peter's-wort – *Hypericum crux-andreae* – is a coastal plain species with scattered populations in the interior. The species grows on usually damp sandy soil, in roadside ditches, and in open, wet yellow pine forest. On the DBNF, it occurs in open, wet warm season grassland. These sites were likely forested, but open prior to their current condition.

Vetchling Peavine – *Lathyrus palustris* – is found on the coastal plain and in the mountains of eastern North America. It is typically found in or at the edge of floodplain forest, swamps, wet meadows or streamside fields, and riverbanks. On the DBNF, this species occurs on terrace forest of larger streams.

American Gromwell – *Lithospermum latifolium* – occurs in the northeastern US down through the central Appalachians. It grows in open, dry-mesic forest. On the DBNF, it is usually found on calcareous sites in dry-mesic oak forest or mesic mixed hardwoods.

Nuttall's Lobelia – *Lobelia nuttalli* – is a coastal plain species with stations inland along the southern Appalachian Plateaus. The species is found in open sandy swamps, wet yellow pine savannas, and wetlands. On the DBNF, it is known from wet meadows and wet warm season grassland.

Fraser's Loosestrife – *Lysimachia fraseri* – is a southern Appalachian Mountains species. It is found in open meadows and along roadsides. On the DBNF, one site is known from open, forested river terrace.

*Marshallia grandiflora* – This species inhabits open cobble/boulder bars along free-flowing rivers. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition. Currently this species is not known from the DBNF, but habitat for it may exist on some streams within the Cumberland River drainage.

The DBNF variety of American Cow-wheat – *Melampyrum lineare* var. *pectinatum* – has been carried as var. *lineare* on the DBNF based on a literature citation. Medley (1993) argues against this and places all plants in the DBNF area in var. *pectinatum*. This is a coastal plain species. It is found in sandy, open yellow pine forest. On the DBNF, the sole station for the species is from ridgetop dry-xeric oak and oak-yellow pine forest.

Thread-leaf Sundrops – *Oenothera linifolia* – is a central US species found in sandy grassland and open rocky areas. On the DBNF, the species is found in sandy warm season grassland and on sandstone glades.

Small Sundrops – *Oenothera perennis* – is a midwestern species found in open forest, prairies, meadows and fields. On the DBNF, it is known from open dry-mesic ridge top oak forest. The species requires moderate to full sunlight. It and its habitat are probably enhanced by fire.

*Paxistima canbyi* – This species is an Appalachian provinces species that occurs on thin soils associated with limestone (or other calcareous) cliffs. These sites are usually within a hundred feet or so from the cliff edge, are dry, and tend to have a southerly (SE to NW) aspect. The sites often have a closed canopy, but the midstory and shrub layers are thin and open. It rarely is found in old fields. At one site observed on private land, the cutting of the overstory (usually eastern red cedar, *Juniperus virginiana* and oak species, *Quercus* spp.) resulted in a thick coppice of tree and shrub species. Over a two-year

period, the *Paxistima* population was nearly eliminated. The species is probably not tolerant of fire.

Cross-leaf Milkwort – *Polygala cruciata* var. *cruciata* – is coastal plain species with inland records along the Appalachian Plateaus and in midwestern prairie states. It is known from damp to wet meadows, yellow pine savannas, and bogs. On the DBNF, it is known from wet meadows and open, wet non-forested areas such as warm season grassland.

Gaywings – *Polygala pauciflora* – is a northern species with extend range through the southern Appalachians. It is found in rich moist forest. On the DBNF, one station is known from a mesic ravine in oak-hardwood forest.

Racemed Milkwort – *Polygala polygama* var. *polygama* – has a midwestern and coastal plain distribution. It is usually found on dry, sandy soil in open forest or grassland. The DBNF sites are on sandy soil in open, ridge top, yellow pine-oak forest or sandy, grassy openings.

Hairy Snout Bean – *Rhynchosia tomentosa* (var. *tomentosa*) – is found throughout most of the southeastern US. It grows in dry, open, often sandy, oak or yellow pine forest, at forest margins, in sandhills, and occasionally in mesic forest. The DBNF sites are all in warm season grassland, or low disturbed vegetation along roads or under powerline rights-of-way.

Short-stem Ragwort – *Senecio pauperculus* – is northern US and Canada species with range extensions southward along the Appalachian provinces. It is commonly found in bogs and wet meadows. On the DBNF, the species is found on boulder/cobble bars of Cumberland River drainage streams. In this habitat, moisture levels may be maintained, and habitat it maintained in an open condition.

Royal catchfly – *Silene regia* – is rare to uncommon throughout its range. It is found in warm season grasslands or in grassy areas of barrens. No extant populations of the species are present on the forest. There are historical records for it from the southern end of the forest. It requires open, high light conditions, and fire, in addition to maintaining habitat, probably also promotes the species.

Velvet Bush Pea – *Thermopsis mollis* (generic) – exists as two varieties, a piedmont variety, which is found in Kentucky, and a montaine variety. The latter occurs in dry-mesic forest on slopes and ridges.

Nettle-leaf Noseburn – *Tragia urticifolia* – is a prairie species with scattered stations eastward. It is commonly found in dry prairies and open (low tree density) rocky areas. It is known to Kentucky from only one site in the DBNF area. Here it occurs on a limestone glade above the Big South Fork River.

Narrow-leaved Bluecurls – *Trichostema setaceum* – is found on the coastal plain and the central Appalachians. It is found in dry sandy soils in open forest and fields. The DBNF records are from dry open oak forest and open grassland.

Running buffalo clover – *Trifolium stoloniferum* – inhabits open grassland, open woodland and the transition area between them. Light shade does not harm the plant. The species throughout its range is a calciphile, i.e., it shows a preference for limestone or otherwise base cation-rich soils. Periodic disturbance such as might have occurred while large ungulates passed through a population appears to benefit the plant. A large population in central Kentucky appears to do best with moderate disturbance from grazing/resting cattle. The sole population within the Daniel Boone NF proclamation boundary occurs in an open field.

New York Ironweed – *Vernonia noveboracensis* – is a coastal plain species with scattered interior stations. It is found in open floodplain forest, roadside ditches, marshes, and other wet places. On the DBNF, the species is found in streamhead wetlands and occasionally in roadside ditches. A canopy may be present, but if so, the midstory and shrub layers are sparse.

Bird's-foot violet – *Viola pedata* – occurs over most of the eastern US in dry, well-drained soils. On the Daniel Boone NF, it is most frequently encountered along sandy roadbanks and slopes in open yellow pine or yellow pine-oak forests. High light levels appear to be required by the species. The species also occurs in dry, upland pastures or grassy slopes that have thin vegetation.

### **Ferns**

Engelmann's quillwort – *Isoetes engelmannii* – is a semi-aquatic species. The plants can survive entirely submerged, or for several months out of water if the soil remains moist. At the time spores are released, the leaf bases must be submerged for sexual reproduction to be successful. The plants are generally in shallow water (under 2 feet deep) and are found in both permanent and seasonal water including ruts, roadside ditches, ponds, lake margins, and occasionally in streamhead wetlands and streams.

### **Gymnosperms**

Eastern redcedar – *Juniperus virginiana* – is known from eastern and central North America. It is abundant in some areas, and often dominant on old fields, especially those on basic substrates. In Kentucky, it is widespread and not rare, but in most cases, it occurs as a pioneer species following extensive, and often long-term disturbance. On the Forest, most eastern redcedar occurs in more natural situations along dry limestone cliffs and flats, and rocky flats, and on dry, rocky siltstone flats. In this habitat, the species is uncommon to rare on the DBNF, and it is here that concerns for the species exist.

### **Monocots**

Grass-pink – *Calopogon tuberosus* – is a coastal plain species found in wet to moist pine savannas, roadside ditches, pitcher plant bogs, and other open, wetland habitats. A few historic Kentucky stations occurred in dry, sandy soil on ridgetops under open oak or oak-yellow pine forest. On the DBNF, a few extant stations are known from streamhead wetlands, slope seeps or wet warm season grassland. It may have occurred on drier sites in the past. The species requires constant moisture and more or less open conditions.

Streamside carex sedge – *Carex emoryi* – grows in open gravel bars and occasionally mud banks along medium to large streams. The plants grow in thick bands along the stream and are frequently standing in a few inches of water. The bars are subject to scouring during flooding events, which keeps the bars open. The species appears to require constant water and high light.

Upright caric sedge – *Carex stricta* – is similar to and easily confused with streamside caric sedge. Its range is primarily the northern US, but with extensions into the Appalachian Mountains. This species may grow along streamsides in gravel or mud bars subjected to flooding, but is more commonly found in swamps. It forms tight clumps, which are usually in several inches of standing water. The water is often stagnant. The canopy provides moderate to heavy shade. The DBNF stations are in swamps.

Appalachian Spreading Pogonia – *Cleistes bifaria* – ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the DBNF, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Wild yam – *Dioscorea villosa* – is a widespread species, occurring in a variety of wooded habitats throughout its range. It occurs as single plants or in small clumps. It appears to be at least a weak calciphile. On the DBNF, it is most frequent in dryish forest, under moderate to light shade. The tuber produced by the plant is collected for medicinal purposes.

Wood Lily – *Lilium philadelphicum* var. *philadelphicum* – occurs from New England to NC and Kentucky. It is found in open, usually dry forest or in open fields or warm season grass areas. On the DBNF, it is known from open yellow pine-oak forest, roadsides, warm season grassland, and old fields. It requires open conditions and is soon choked out by heavy cover of herbaceous or woody species. Fire maintains its habitat and promotes the plant.

Loesel's Twayblade – *Liparis loeselii* – is a northern and midwestern North American species. It is found in wet to damp forest. On the DBNF, it is known from wet seeps on roadsides, a seep at the base of an abandoned limestone quarry, and at the edge of a strip mine pond.

Plains Muhlygrass – *Muhlenbergia cuspidate* – is a prairie species with disjunct populations in Kentucky. It grows in prairies or other open grassland on dry, usually gravelly or rocky soil. On the DBNF, the few locations occur on limestone in open glade areas.

Yellow crested orchid – *Platanthera cristata* – occurs in a wide variety of habitats across its range. On the DBNF, it occurs in streamhead wetlands, seeps, and in permanently damp to wet areas in warm season grassland. It occurs in low to moderate shade

conditions. This species is an alternative host to an endophyte fungus that is the sole fungal associate for white fringeless orchid (*P. integrilabia*). Maintaining this orchid helps to maintain a diverse stock for the fungal symbiont.

Small Purple-fringed Orchid – *Platanthera psycodes* – is a northern species with a range extension south along the Appalachian Mountains. It is found in wet meadows and wet, open forest. On the DBNF, there are tentative records for this species from wet stream terraces under high canopy closed forest. The identity of the plants in question is not certain.

Globe Beaked-rush – *Rhynchospora globularis* var. *globularis* – is a coastal plain species with stations in the interior. It commonly occurs on wet sand and in swamps and bogs, either in the open or under open canopy. The DBNF populations occur in wet open, usually sandy areas in warm season grassland or disturbed ground.

Slender Marsh-pink – *Sabatia campanulata* – is coastal plain species found in salt or brackish marshes. It occurs inland in a few areas. The DBNF sites are from wet meadows.

Shining Ladies'-tresses – *Spiranthes lucida* – is a northeastern to central US species. It is commonly found in damp forest and marshes, and on wet shores. On the DBNF, the species at all sites is found on open limestone streambanks, often in thin mud.

Great Plains Ladies'-tresses – *Spiranthes magnicamporum* – was erroneously reported from the DBNF and the species carried on a conservation species list for several years. It is unlikely that this species occurs on the Forest, although a few areas, e.g., Clack Mountain, with apparently suitable habitat exist.

Rough Dropseed – *Sporobolus clandestinus* – is tall grass prairie species, which also occurs on the coastal plain. It is found in dry sandy soil of prairies, openings, barrens, and along roadways and other rights-of-way. On the DBNF, the species is found in McCreary and Pulaski Counties on limestone cliffs and open, sandy yellow pine or yellow pine-oak forest.

## **Mosses**

Cataract Metal Moss – *Scopelophila cataractae* – is found in isolated populations in the Appalachians and a few western states within the US. It is known from thin soil over rock and from a roadcut near a stream. In Kentucky, it is known from one site (Wolfe County) in the Red River Gorge on the DBNF. It was found in a sandstone rockhouse, most likely in a shaded, damp location.

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07/15/2003

## Attachment C.

### Grassland Species/Habitat Relationships with References

Association	Habitats	Modifier	Class	Common/Species	
11-Grasslands	Cool Season Grassland	(blank)	BIRD	Common Yellowthroat/ <i>Geothlypis trichas</i>	
				Chipping Sparrow/ <i>Spizella passerina</i>	
					Field Sparrow/ <i>Spizella pusilla</i>
		Forb/Grass Condition			Henslow's Sparrow/ <i>Ammodramus henslowii</i>
					Grasshopper Sparrow/ <i>Ammodramus savannarum</i>
					Northern Bobwhite/ <i>Colinus virginianus</i>
		Low (wet, i.e. subject to holding water)			Sedge Wren/ <i>Cistothorus platensis</i>
		Moist			Henslow's Sparrow/ <i>Ammodramus henslowii</i>
					Sedge Wren/ <i>Cistothorus platensis</i>
					Common Yellowthroat/ <i>Geothlypis trichas</i>
				P-DIC	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
					Yellow Gentian/ <i>Gentiana alba</i>
					Vetchling Peavine/ <i>Lathyrus palustris</i>
			Open (Little or No Shade)	BIRD	Gray Catbird/ <i>Dumetella carolinensis</i>
				Common Yellowthroat/ <i>Geothlypis trichas</i>	
				Field Sparrow/ <i>Spizella pusilla</i>	
	Cropland			Northern Bobwhite/ <i>Colinus virginianus</i>	
		Rich Soil		American Woodcock/ <i>Scolopax minor</i>	
		Seep/Constant Water	P- MON	Yellow-crested Orchid/ <i>Platanthera cristata</i>	
	Meadows (native species predominate)	(blank)	AMPHI	Green Frog/ <i>Rana clamitans</i>	
			BIRD	Common Yellowthroat/ <i>Geothlypis trichas</i>	
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>	
				Diana Fritillary/ <i>Speyeria diana</i>	
				Regal Fritillary/ <i>Speyeria idalia</i>	
			P-DIC	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>	
			P- MON	Grass-pink/ <i>Calopogon tuberosus</i>	
		Acidic Substrate	P-DIC	Nuttall's Lobelia/ <i>Lobelia nuttallii</i>	
		Forb/Grass Condition	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>	
				Whip-poor-will/ <i>Caprimulgus vociferus</i>	
				Northern Bobwhite/ <i>Colinus virginianus</i>	
		Low (wet, i.e. subject to holding water)		Sedge Wren/ <i>Cistothorus platensis</i>	
			INSEC	Regal Fritillary/ <i>Speyeria idalia</i>	
			P-DIC	Nuttall's Lobelia/ <i>Lobelia nuttallii</i>	
		Moist	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>	
				Sedge Wren/ <i>Cistothorus platensis</i>	
				Common Yellowthroat/ <i>Geothlypis trichas</i>	

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
			P-DIC	Brook Saxifrage/ Boykinia acontifolia
				Scarlet Indian Paintbrush/ Castilleja coccinea
				Slender Marsh-pink/ Sabatia campanulata
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
		Open (Little or No Shade)	BIRD	Gray Catbird/ Dumetella carolinensis
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
				Field Sparrow/ Spizella pusilla
			P-DIC	Nuttall's Lobelia/ Lobelia nuttallii
		Rich Soil	P-DIC	Fraser's Loosestrife/ Lysimachia fraseri
	Old Field	(blank)	BIRD	Eastern Towhee/ Pipilo erythrophthalmus
				Field Sparrow/ Spizella pusilla
			INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Running Serviceberry/ Amelanchier stolonifera
				Nettle-leaf Noseburn/ Tragia urticifolia
			P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
			REPT	Corn Snake/ Elaphe gutta gutta
		Burrows, Holes, Tunnels (Secondary Users)		Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Dense shrub understory	BIRD	Gray Catbird/ Dumetella carolinensis
		Dry	P-DIC	Narrow-leaved Bluecurls/ Trichostema setaceum
				Bird's-foot Violet/ Viola pedata
			P-MON	Wood Lily/ Liliun philadelphicum var. philidelphicum
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Elevation (above 2300 ft)	BIRD	Chestnut-sided warbler/ Dendroica pensylvanica
				Golden-winged warbler/ Vermivora chrysoptera
			P-MON	Wood Lily/ Liliun philadelphicum var. philidelphicum
		Forb/Grass Condition	BIRD	Bachman's Sparrow/ Aimophila aestivalis
				Henslow's Sparrow/ Ammodramus henslowii
				Whip-poor-will/ Caprimulgus vociferus
				Northern Bobwhite/ Colinus virginianus
			MAMM	Virgina Big-eared Bat/ Plecotus townsendii virginianus
		Low (wet, i.e. subject to holding water)	BIRD	Sedge Wren/ Cistothorus platensis
		Moist	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Sedge Wren/ Cistothorus platensis
				Gray Catbird/ Dumetella carolinensis
				American Woodcock/ Scolopax minor
			P-DIC	Barbara's Buttons/ Marshallia grandiflora
				New York Ironweed/ Vernonia noveboracensis
			P-MON	Shining Ladies'-tresses/ Spiranthes lucida
		Open (Little or No Shade)	BIRD	Gray Catbird/ Dumetella carolinensis
				Common Yellowthroat/ Geothlypis trichas
				Field Sparrow/ Spizella pusilla

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
			P-DIC	American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>lineare</i>
				Small Sundrops/ <i>Oenothera perennis</i>
				Velvet Bush Pea/ <i>Thermopsis mollis</i> (generic)
				Bird's-foot Violet/ <i>Viola pedata</i>
		Riparian		White-leaf Leather-flower/ <i>Clematis glaucophylla</i>
				New York Ironweed/ <i>Vernonia noveboracensis</i>
		Rocky/Rocks	REPT	Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
		Sandy Soil	P-DIC	American Gromwell/ <i>Lithospermum latifolium</i>
				Narrow-leaved Bluecurls/ <i>Trichostema setaceum</i>
				Bird's-foot Violet/ <i>Viola pedata</i>
		Seep/Constant Water		Short-stem Ragwort/ <i>Senecio pauperculus</i>
			P-MON	Carex Sedge/ <i>Carex emoryi</i>
				Uptight Caric Sedge/ <i>Carex stricta</i>
				Loesel's Twayblade/ <i>Liparis loeselii</i>
				Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
		Shrub/Sapling Condition	BIRD	Prairie warbler/ <i>Dendroica discolor</i>
				Common Yellowthroat/ <i>Geothlypis trichas</i>
				Yellow-breasted Chat/ <i>Icteria virens</i>
				Bewick's Wren/ <i>Thryomanes bewickii altus</i>
				Golden-winged warbler/ <i>Vermivora chrysoptera</i>
		Tract Size (Area Sensitive)		American Woodcock/ <i>Scolopax minor</i>
		Tree and Snags (Cavity Nesters)		Bewick's Wren/ <i>Thryomanes bewickii altus</i>
		Upland (usually mesic to dry, not subject to holding water)	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
	Pasture (general, unspecified)	(blank)	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
				Diana Fritillary/ <i>Speyeria diana</i>
				Regal Fritillary/ <i>Speyeria idalia</i>
			P-DIC	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
				American Gromwell/ <i>Lithospermum latifolium</i>
			P-MON	Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
		Burrows, Holes, Tunnels (Secondary Users)	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Drainage Good		Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Dry		Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Forb/Grass Condition	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>
				Grasshopper Sparrow/ <i>Ammodramus savannarum</i>
				Whip-poor-will/ <i>Caprimulgus vociferus</i>
				Northern Harrier/ <i>Circus cyaneus</i>
				Northern Bobwhite/ <i>Colinus virginianus</i>
		Leaf Litter	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus</i>

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				longicaudus
		Low (wet, i.e. subject to holding water)	BIRD	Sedge Wren/ Cistothorus platensis
			INSEC	Regal Fritillary/ Speyeria idalia
		Moist	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Sedge Wren/ Cistothorus platensis
			P-DIC	New York Ironweed/ Vernonia noveboracensis
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
		Open (Little or No Shade)	BIRD	Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
				Field Sparrow/ Spizella pusilla
		Riparian	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Sandy Soil	P-DIC	Sweet-fern/ Comptonia peregrina
		Seep/Constant Water		Cross-leaf Milkwort/ Polygala cruciata var. cruciata
		Upland (usually mesic to dry, not subject to holding water)	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Water (Distance Sensitive)		Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
	Ruderal/Waste Areas	(blank)	INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Scarlet Indian Paintbrush/ Castilleja coccinea
				St. Peter's-wort/ Hypericum crux-andreae
				Mountain Lover/ Paxistima canbyi
		Acidic Substrate		Racemed Milkwort/ Polygala polygama var. polygama
		Elevation (above 2300 ft)	P-MOS	Cataract Metal Moss/ Scopelophila cataractae
		Moist	P-DIC	New York Ironweed/ Vernonia noveboracensis
		Open (Little or No Shade)	P-DIC	Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
				Fraser's Loosestrife/ Lysimachia fraseri
				Racemed Milkwort/ Polygala polygama var. polygama
			P-MON	Wild Yam/ Dioscorea villosa
		Rocky/Rocks	P-MOS	Cataract Metal Moss/ Scopelophila cataractae
		Sandy Soil	P-DIC	Sweet-fern/ Comptonia peregrina
				American Gromwell/ Lithospermum latifolium
		Seep/Constant Water	P-FER	Quillwort/ Isoetes englemannii
			P-MON	Globe Beaked-rush/ Rhynchospora globularis var. globularis
	Sericea-Fescue Grassland	(blank)	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Chipping Sparrow/ Spizella passerina
				Field Sparrow/ Spizella pusilla
		Forb/Grass Condition		Henslow's Sparrow/ Ammodramus henslowii
				Grasshopper Sparrow/ Ammodramus savannarum
				Northern Bobwhite/ Colinus virginianus
		Low (wet, i.e. subject to holding water)		Northern Harrier/ Circus cyaneus

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Sedge Wren/ Cistothorus platensis
		Moist		Henslow's Sparrow/ Ammodramus henslowii
				Sedge Wren/ Cistothorus platensis
		Open (Little or No Shade)		Northern Harrier/ Circus cyaneus
				Gray Catbird/ Dumetella carolinensis
				Common Yellowthroat/ Geothlypis trichas
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
		Snags > 6" dbh	BIRD	Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
	Warm Season Grassland	(blank)		Common Yellowthroat/ Geothlypis trichas
				Chipping Sparrow/ Spizella passerina
				Field Sparrow/ Spizella pusilla
			INSEC	Diana Fritillary/ Speyeria diana
				Regal Fritillary/ Speyeria idalia
			P-DIC	Royal Catchfly/ Silene regia
				Running Buffalo Clover/ Trifolium stoloniferum
			P-MON	Plains Muhlygrass/ Muhlenbergia cuspidata
		Acidic Substrate	P-DIC	Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
				Yellow Gentian/ Gentiana alba
			P-MON	Grass-pink/ Calopogon tuberosus
		Basic Substrate		Great Plains Ladies'-tresses/ Spiranthes magnicamporum
		Burrows, Holes, Tunnels (Secondary Users)	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Drainage Good	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
				Regal Fritillary/ Speyeria idalia
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Drainage Poor	INSEC	Regal Fritillary/ Speyeria idalia
		Dry	P-DIC	Thread-leaf Sundrops/ Oenothera linifolia
			P-MON	Great Plains Ladies'-tresses/ Spiranthes magnicamporum
				Rough Dropseed/ Sporobolus clandestinus
		Elevation (above 2300 ft)	INSEC	Regal Fritillary/ Speyeria idalia
		Fire Tolerant/Enhanced		Appalachian Grizzled Skipper/ Pyrgus wyandot
				Diana Fritillary/ Speyeria diana
				Regal Fritillary/ Speyeria idalia
			P-DIC	Hairy Snout Bean/ Rhynchosia tomentosa
		Forb/Grass Condition	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Grasshopper Sparrow/ Ammodramus savannarum
				Northern Bobwhite/ Colinus virginianus
		Leaf Litter	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Moist	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Common Yellowthroat/ Geothlypis trichas
			INSEC	Regal Fritillary/ Speyeria idalia
			P-DIC	Scarlet Indian Paintbrush/ Castilleja coccinea

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
			P-MON	Grass-pink/ Calopogon tuberosus
				Appalachian Spreading Pogonia/ Cleistes bifaria
		Open (Little or No Shade)	BIRD	Gray Catbird/ Dumetella carolinensis
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
				Field Sparrow/ Spizella pusilla
			INSEC	Regal Fritillary/ Speyeria idalia
			P-MON	Wood Lily/ Liliium philadelphicum var. philidelphicum
		Riparian	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Rocky/Rocks	P-DIC	Prairie Redroot/ Ceanothus herbaceus
			P-MON	Rough Dropseed/ Sporobolus clandestinus
		Sandy Soil	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
				Regal Fritillary/ Speyeria idalia
			P-MON	Rough Dropseed/ Sporobolus clandestinus
		Shrub/Sapling Condition	BIRD	Bachman's Sparrow/ Aimophila aestivalis
		Snags > 6" dbh		Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
		Water (Distance Sensitive)	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
	Wet Fields	(blank)	BIRD	Gray Catbird/ Dumetella carolinensis
				Common Yellowthroat/ Geothlypis trichas
			INSEC	Regal Fritillary/ Speyeria idalia
			P-DIC	Vetchling Peavine/ Lathyrus palustris
		Dense shrub understory	BIRD	Gray Catbird/ Dumetella carolinensis
		Forb/Grass Condition		Henslow's Sparrow/ Ammodramus henslowii
				Northern Bobwhite/ Colinus virginianus
			P-MON	Yellow-crested Orchid/ Platanthera cristata
		Low (wet, i.e. subject to holding water)	BIRD	Sedge Wren/ Cistothorus platensis
			INSEC	Diana Fritillary/ Speyeria diana
		Moist	BIRD	Sedge Wren/ Cistothorus platensis
		Open (Little or No Shade)		Least flycatcher/ Empidonax minimus
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
		Rich Soil		American Woodcock/ Scolopax minor
		Shrub/Sapling Condition		Prairie warbler/ Dendroica discolor
				Least flycatcher/ Empidonax minimus
		Snags > 6" dbh		Migrant Loggerhead Shrike/ Lanius ludovicianus migrans