

07/15/2003

**Viability Assessment Report
For
Mixed Mesophytic Forest Habitat Association**

Prepared by
Pamela J. Martin
Daniel Boone National Forest

I. Description of Habitat Association

Mixed mesophytic forests can be found primarily in the southern Appalachians. Mixed mesophytic forest sites tend to occur in lower north and east facing slopes and mesic coves up to an elevation of about 5,000 feet. Species dominance patterns vary with geographic location and site condition, such as topographic features, moisture and fertility (USDA Forest Service, 1997). Characteristic species in this habitat association are sugar maple, beech, hemlock, yellow-poplar, red maple, white oak, northern red oak, yellow buckeye and basswood (USDA Forest Service, 1997).

The Daniel Boone National Forest (DBNF) occurs in three ecological sections: Northern Cumberland Plateau, Interior Low Plateau and Highland Rim, Cumberland Mountains. Mixed mesophytic habitat occurs in all three of these ecological sections. The majority of the mixed mesophytic habitat on the DBNF occurs in the Northern Cumberland Plateau ecological section. In the Northern Cumberland Plateau, mixed mesophytic habitat occurs in the following landtype associations (LTAs) (see USDA Forest Service, 1997a; 1996):

- Northern Low Hills / Cliff Transition (221Hb005)
- Northern Escarpment (221Hb004)
- Central Knobstone Escarpment (221Hb001)
- North Fork Kentucky Cliffs (221Hb003)
- Central Cliff (221Hb002)
- Rolling Low Hills (221He001)
- London-Corbin Plain Transition (221HC007)
- Rockcastle Hills (221Hc005)
- London-Corbin Plain (221Hc006)
- Southern Cliff (221Hc003)

- Southern Knobstone Escarpment (221Hc001)
- Low Hills (221He002)
- Low Hills – Rugged Hills Transition (221Ha002)
- Southern Middle Breathitt Rugged Hills (221Ha001).

On the DBNF, Interior Low Plateau and Highland Rim, mixed mesophytic habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Triplett Creek Knobs (222En002)
- Knob Flats (222En001)
- Fox Creek Knobs (222En003).

In the Cumberland Mountain ecological section on the DBNF, mixed mesophytic habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Northern Jellico Mountains (M221Cd001),
- Northwest Face Pine Mountain (M221Ce001).

On the DBNF, this habitat association is concentrated on colluvial slopes, with some concentration on north facing aspects. Water on these sites is primarily from surface sources (rainfall). Occasionally, limited amounts of ground 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 mixed mesophytic habitat association, also provides energy sources. Typical soil series are Jefferson, Shelocta, Muse or Cranston, derived from sandstone, siltstone or shale. Some stands also occur on limestone covered by non-calcareous material on colluvial benches or alluvial terraces.

This is a complex type of habitat association on mixed sandstone and limestone talus (e.g. on Donahue soils), which beech, yellow-poplar and a mixture of Eastern hemlock, sugar maple and hardwood species can be observed. On both sandstone and limestone, American beech is particularly abundant on lower slopes and terraces near rivers and major creeks. Disturbance appears to have converted most beech forest to yellow-poplar or, especially on eroded soils, oak-hickory and pine (USDA Forest Service et al., 1989). In addition to the dominant tree species, cucumber tree, white basswood and butternut occur in this habitat association. In the transition to oak/hickory, there are few shrubs, except near streams. Ironwood, papaw, spicebush, wild hydrangea, strawberry bush, and blackhaw are relatively frequent. There is a rich herbaceous layer in this habitat association. Abundant species include yellow trout lily, large flowered trillium, May apple, long spurred violet, and white wood aster. In younger stands, hog peanut is often present. Other species that can be observed, especially on floodplains and in burnt areas, are black cohosh, Virginia creeper, and Christmas fern. Other frequent species include maidenhair fern, silvery gladefern, marginal woodfern, rue

anemone, wild geranium, wood vetch, white baneberry, goat's beard, alum root, sweet anise, short Joe-Pye weed, thin leaved sunflower, large leaf aster and yellow lady's slipper. Species that can be observed in habitat transition zones are wild ginger, hepatica, stoncrop and white snakeroot. Typical floodplain species are also locally abundant, especially on seeping talus slopes; these include wood nettle, pale jewelweed, bergamot, dog violet and in disturbed areas, golden ragwort can be observed. Sandstone rockhouses occur adjacent to beech forest or related types; the unique habitat beneath overhanging sandstone cliffs and rockhouses often occurs within or adjacent to hemlock forest. Frequent species include alum-root on drier sites and cliff meadow rue or little cliff meadow rue on wetter sites. Mountain spleenwort can be observed in cliff cracks. In this habitat association, columbine and round leaved catchfly occurs under both sandstone and limestone cliffs (USDA Forest Service et al., 1989).

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

The mixed mesophytic forest types on the DBNF as tracked in the Continuous Inventory of Stand Conditions (CISC), include cove hardwood/ white pine/ hemlock (41), yellow-poplar (50), yellow-poplar/ white oak and northern red oak (56) and sugar maple/ beech/ birch (81). The management codes in the mixed mesophytic habitat group, are defined as follows:

(41) – Of the dominant and co-dominant basal area 50 to 69 percent is cove hardwood, and 30-49 percent is conifer, the plurality of which is hemlock and/or white pine;

(50) – Of the dominant and co-dominant basal area, 70+ percent is hardwood and at least 50 percent is yellow-poplar;

(56) – Of the dominant and co-dominant basal area, 70+ percent is hardwood, and at least 50 percent is cove hardwood; and

(81) – Of the dominant and co-dominant basal area 70 percent is hardwood, and at least 50 percent is sugar maple and/or American beech (USDA Forest Service, 1992).

On the DBNF, approximately 665,000 acres are in forested land. Of this acreage, approximately 25 percent or 165,474 acres are within the mixed mesophytic forest type, as described. Utilizing the CISC database, the mixed mesophytic forest type on the DBNF was further divided to show distribution of this habitat association by age and acres (USDA Forest Service, 1998).

Table 1. Forest types within the Mixed Mesophytic Habitat Association by age and acres.

AGE	Cove Hardwood / White Pine / Hemlock (41)	Yellow Poplar (50)	Yellow Poplar / White Oak / Northern Red Oak (56)	Sugar Maple / Beech / Birch (81)
0-10	164	225	10898	459
11-20	57	262	7625	225
21-30	340	855	11071	209

AGE	Cove Hardwood / White Pine / Hemlock (41)	Yellow Poplar (50)	Yellow Poplar / White Oak / Northern Red Oak (56)	Sugar Maple / Beech / Birch (81)
31-40	215	1869	9663	445
41-50	286	2892	11541	272
51-60	119	2019	13400	82
61-70	801	1415	20310	265
71-80	719	776	19425	712
81-90	1853	652	15770	1343
91-100	1327	134	10374	1717
101-110	1060	96	5412	1088
111-120	490	0	1252	995
121-130	189	0	797	225
131-140	129	0	0	46
141-150+	427	0	360	122
TOTAL	8176	11195	137898	8205

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

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a significant component of habitat that contains the habitat modifiers required by various species.

- Evaluate habitats to determine those capable of supporting reintroduction of species at risk.
 - *Rationale: Specific species management within this habitat association may require reintroduction efforts to ensure continued persistence of that particular species or group of species in this association.*
- Mixed mesophytic forest types need to be represented in a range of age classes.
 - *Rationale: Mixed mesophytic forest types make up approximately 25 percent of the forest types on the Daniel Boone National Forest. The species identified in this habitat association require a variety of age classes, elevations and tract sizes. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. Age distribution management along with implementation of best management practices should ensure continued persistence of the species identified in this habitat association.*
- Where applicable, leave project unit boundaries with irregular and feathered edges.

- *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*
- Put an emphasis on high elevation management and land acquisitions for the forest.
 - *Rationale: Many species require the conditions provided for in higher elevations. Current national forest system lands on the Daniel Boone National Forest has limited high elevation habitat. However, high elevation acreage is present within the proclamation boundary.*
- Water sources should be maintained in a condition where they are suitable as water sources for bats and other wildlife, and as breeding habitat for resident amphibians and invertebrates (DBNF LRMP, Amendment 11, pg 7).
 - *Rationale: Some species in this association are closely linked to proximity of water. The continued existence of local water sources should help to ensure the continued persistence of those species in this habitat association.*

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

Monitoring and inventory of the Mixed Mesophytic Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, and infestations (high priority).
 - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the Mixed Mesophytic Habitat Association (high priority).
 - *Rationale: The use of FS Veg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*
- Continue to implement R8 landbird monitoring program (high priority).

- *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association. This monitoring program contains points linked to this association it would be considered an excellent tool for both species-specific and association monitoring.*

References

- USDA Forest Service. 1992. Southern Region. Silvicultural Examination and Prescription Field Book.
- USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region. Report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA. 117p.
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous Inventory of Stand Condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest, Winchester, KY.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.

07/15/2003

Attachment A.

Species List: Mixed Mesophytic Habitat Association

Class	Common Name/ Species
ANIMALS	
Amphibians	Jefferson Salamander/ <i>Ambystoma jeffersonianum</i>
Birds	Cerulean Warbler/ <i>Dendroica caerulea</i> Least Flycatcher/ <i>Empidonax minimus</i> Acadian Flycatcher/ <i>Empidonax virescens</i> Worm-eating Warbler/ <i>Helmitheros vermivorus</i> Wood Thrush/ <i>Hylocichla mustelina</i> Swainson's Warbler/ <i>Limnothlypis swainsonii</i> Kentucky Warbler/ <i>Oporornis formosus</i> Ovenbird/ <i>Seiurus aurocapillus</i> American Redstart/ <i>Setophaga ruticilla</i> Yellow-throated Vireo/ <i>Vireo flavifrons</i>
Insects	Sixbanded Longhorn Beetle/ <i>Dryobius sexnotatus</i> Diana Fritillary/ <i>Speyeria diana</i>
Mammals	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii rafinesquii</i> Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i> Cloudland Deermouse/ <i>Peromyscus maniculatus nubiterrae</i> Appalachian Cottontail/ <i>Sylvilagus obscurus</i>
Reptiles	Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i> Southeastern Crowned Snake/ <i>Tantilla coronata</i>
PLANTS	
Dicots	Monkshood/ <i>Aconitum uncinatum</i> (generic) Blue Monkshood/ <i>Aconitum uncinatum</i> spp. <i>uncinatum</i> Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i> Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i> var. <i>glaucus</i> Green-and-gold/ <i>Chrysogonum virginianum</i> var. <i>virginianum</i> Mountain Black Cohosh/ <i>Cimicifuga americana</i> Black Cohosh/ <i>Cimicifuga racemosa</i> Small Enchanter's-nightshade/ <i>Circaea alpina</i> ssp. <i>alpina</i> Beech Drops/ <i>Epifagus virginiana</i> Southern Heartleaf/ <i>Hexastylis contracta</i> Goldenseal/ <i>Hydrastis canadensis</i> Butternut/ <i>Juglans cinerea</i>

07/15/2003

Class	Common Name/ Species
Dicots	Smooth Veiny Peavine/ <i>Lathyrus venosus</i>
	American Gromwell/ <i>Lithospermum latifolium</i>
	Carolina Anglepod/ <i>Matelea carolinensis</i>
	Ginseng/ <i>Panax quinquefolius</i>
	Sanicle/ <i>Sanicula canadensis</i>
	Bay Starvine/ <i>Schisandra glabra</i>
	Southern Oconee Bells/ <i>Shortia galacifolia</i> var. <i>galacifolia</i>
	Wasioto Rosinweed/ <i>Silphium wasiotense</i>
	Big-flowered Snowbell/ <i>Styrax grandiflorus</i>
	Northern Mayflower/ <i>Trientalis borealis</i>
	Running Buffalo Clover/ <i>Trifolium stoloniferum</i>
Gymnosperms	Canada Yew/ <i>Taxus canadensis</i>
Monocots	Purple Caric Sedge/ <i>Carex purpurifera</i>
	Spotted Coralroot/ <i>Corallorhiza maculata</i>
	Small Yellow Lady's-slipper/ <i>Cypripedium parviflorum</i> var. <i>parviflorum</i>
	Loesel's Twayblade/ <i>Liparis loeselii</i>
	Wild Lily-of-the-valley/ <i>Maianthemum canadense</i>
	Small-flowered False Hellebore/ <i>Melanthium parviflorum</i>
	White Fringeless Orchid/ <i>Platanthera integrilabia</i>
Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>	
Mosses	Feather Moss or Log Moss / <i>Hypnum curvifolium</i>
	Feather Moss or Log Moss / <i>Hypnum imponens</i>
	Fern Moss or Log Moss / <i>Thuidium delicatulum</i>

Attachment B.

Mixed Mesophytic Species/Habitat Relationships with References

ANIMALS

Amphibians

Jefferson Salamander – *Ambystoma jeffersonianum* – Jefferson salamander is found primarily in shady deciduous forests or mixed woods, low woods and bottomlands. This salamander requires abundant leaf litter, rocks, decomposing logs and stumps. During breeding season, the Jefferson salamander requires temporary ponds, ideally with a pH between 5 and 6 (DeGraff and Rudis, 1986). This salamander is an opportunistic feeder consuming small invertebrates (Wilson, 1995).

Birds

Cerulean Warbler – *Dendroica caerulea* – Cerulean warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson, monitoring data suggest that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere. The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (1997). Hamel gives a minimum tracts size of 1750 ha (1992). Cerulean warblers would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory.

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 occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory.

Acadian Flycatcher – *Empidonax virescens* – This species is usually found near water generally near a stream course or some small waterway (Hamel, 1992). It generally uses an open, moderate understory for feeding in a stand with tall trees and closed canopy (DeGraaf et. al., 1991). It is associated with forested tracts at least 37 hectares (91.4 acres) in size (Hamel, 1992). DBNF monitoring data indicates that the greatest number of occurrences for this species were in mesophytic-cove habitats greater than 80 years old. Acadian flycatchers would be expected to be attracted to the shaded, moist coves of the mixed mesophytic forest where these coves are adjacent to streams.

Worm-eating Warbler – *Helmitheros vermivorus* – Worm-eating warblers inhabit moist, shady forest on moderate to steep slopes. In eastern KY, the birds are common on deeply shaded slopes

in mixed mesophytic woods and moist ravines (Mengel 1965). They are usually found in fairly mature deciduous or mixed forest with a dense understory, preferably of rhododendron and mountain laurel, but will also use younger forest and forest edge. Nesting is typically on sloping ground among leaf litter, while foraging is carried out on the ground or among understory vegetation. Although the species occurs in dissected woodland, it avoids isolated tracts (Palmer-Ball, 1996). Hamel lists the minimum necessary tract size as 370 ha (1992). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory combined with damp, shaded conditions.

Wood Thrush – *Hylocichla mustelina* – The wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. Rich hardwood and bottomland forests are favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory combined with damp, shaded conditions.

Swainson's Warbler – *Limnothlypis swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory. Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.). Swainson's warblers would be expected to be attracted to the shaded, moist coves of the mixed mesophytic forest where these coves are adjacent to streams.

Kentucky Warbler – *Oporornis formosus* – Kentucky warblers are most frequent in moist, shady, deciduous and mixed (with pine or hemlock) forest types with dense, shrubby understory. However, in eastern KY they occur in virtually all major associations except the most xeric pine and pine-oak communities, and may even invade them (Mengel 1965). Mature stands are required, though some younger stands and shrubby woodland borders are used, as well. These ground-nesting birds forage in understory vegetation, leaf litter, and soil. By providing a well-developed shrub layer, many tracts disturbed by selective logging are suitable for nesting even though the canopy has been disrupted (Palmer-Ball, 1996). In general, these birds have adjusted better to landscape disturbance than other woodland warblers. This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory and understory combined with damp, shaded conditions that are usually present in the mixed mesophytic forest.

Ovenbird – *Seiurus aurocapillus* – Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Birds are more common in stands with closed canopies and open ground—This is a ground nesting species that forages in the leaf litter or on the soil. Mengel observed nests on logging roads and under small logs, sheltered by ferns, on steep, mesophytic slopes (1965); however, Baker and Lacki note that birds are more abundant in non-harvested than in harvested areas (1997). Upland stands and sloping

terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel 1992). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory that provides leaf litter for nesting, foraging, and cover.

American Redstart – *Setophaga ruticilla* – This species typically utilizes younger forest and forest in early to mid stages of succession (Palmer-Ball, 1996). It usually occurs near water or streams preferring moist situations to dry ones (Barbour et. al., 1973)(Hamel, 1992). Occurs in altered forest situations including selectively logged areas (Palmer-Ball, 1996). DBNF monitoring data indicates this species most common in forests 41 to 80 years old. This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory combined with damp, mesic conditions.

Yellow-throated Vireo – *Vireo flavifrons* – Extensive tracts of relatively mature woodland are necessary for this interior breeding bird. Large, deciduous trees within a variety of forest types, including mixed mesophytic cove, pine-oak, and oak hickory upland forest, are favored. Isolated or much-dissected tracts are avoided; however, the bird will tolerate a certain amount of disturbance (from fire, selective logging) without being dramatically affected (Palmer-Ball, 1996). Rather, activities that serve to result in a fairly open midstory/understory can be beneficial, as the bird frequents trees within relatively open settings. Yellow-throated vireos on the DBNF are often observed in hardwoods within mixed pine-hardwood stands that have been burned or had midstory reduction (L.Perry, pers. obs.). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory.

Insects

Sixbanded Longhorn Beetle – *Dryobius sexnotatus* – The only occurrences are known from the Stanton Ranger District of the Daniel Boone, but it may occur in suitable habitat forest-wide. This insect requires large decadent trees, usually beech and sugar maples, for its larval stage.

Diana Fritillary – *Speyeria diana* – On the Daniel Boone, it 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 over-winter 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.

Mammals

Rafinesque's Big-eared Bat – *Corynorhinus (Plecotus) rafinesquii rafinesquii* – The Rafinesque big-eared bat is a year-round resident throughout the DBNF. During the summer it forages in a variety of forested habitats and in forest edges and open areas. During the day it will roost in limestone and sandstone rockhouses and caves, in hollow trees and under exfoliating bark.

During the summer males tend to be solitary roosters while females form maternity colonies. Several maternity colonies, usually associated with cliffline caves and rockhouses, occur on the forest. This species is insectivorous and feeds primarily on moths. Foraging sites often occur along clifflines or ridgelines in an oak-hickory habitat. Cliffline associated rock shelters are used as feeding sites. Clifflines are also thought to provide travel corridors for the Rafinesque's big-eared bat. During the summer this species normally forages within about one mile of the roost site. Hibernation sites occur mainly in caves, but some sites occur in rockshelters and in large cracks in sandstone cliffline. This species is very sensitive to human disturbance of both its hibernation and maternity colony sites.

Virginia Big-eared Bat – *Corynorhinus (Plecotus) townsendii virginianus* – The Virginia big-eared bat is a year-round resident on the northern half of the DBNF. Foraging habitat occurs in many different forest overstory types, but is commonly associated with sandstone and limestone clifflines and ridgetops. This species also forages over grassy forest openings (old fields) and along forest edge. Forest openings may provide uncluttered foraging space where preferred prey species occur and can be more easily captured. Sandstone rockshelters and small caves are utilized as temporary feeding roosts. In the summer female and young Virginia big-eared bats form nursery colonies while males are ordinarily solitary although some bachelor colonies do occur. Maternity colonies usually roost near the entrance of rockshelters or caves at the edge of the light zone. Thus, they are very susceptible to human disturbance. Food habits consist primarily of small moths, but also include butterflies, flies and beetles. Forest canopy around roost sites may provide important protection from potential predators such as owls. Virginia big-eared bats hibernate in large clusters in a few limestone caves on the DBNF. As in the summer, they are highly susceptible to human disturbance and may abandon a colony site after repeated human intrusion. Maintaining stable microhabitat conditions and forested communities around the maternity and hibernation caves is important to maintaining these sites.

Cloudland Deermouse – *Peromyscus maniculatus nubiterrae* – The cloudland deermouse is known from cool moist forests at higher elevations in the Black Mountain area of the DBNF. This nocturnal species occurs in both the conifer-northern hardwood and mixed mesophytic forest types with minimum edge. In these areas it is sometimes associated with talus or rock outcrops. Fallen logs, typical of older growth forest conditions are important components of their habitat. Food habits are about 50 percent insects with fruit and vegetation utilized in the spring and summer and seeds and nuts utilized in the fall and winter.

Appalachian Cottontail – *Sylvilagus obscurus* – The Appalachian cottontail rabbit is a forest dwelling species that occurs on the DBNF in areas ranging from conifer-northern hardwood to mixed mesophytic to dry-mesic oak forest. It is regarded as a forest interior species susceptible to habitat fragmentation. It prefers relatively cool, understory areas of ericaceous vegetation such as mountain laurel, rhododendron and blueberries. Large tracts of contiguous, relatively old forest overstory vegetation are needed to provide viable populations of this species.

Reptiles

Northern Coal Skink – *Eumeces anthracinus anthracinus* – The Appalachian population of this subspecies extends into eastern KY, while a disjunct population occurs in the west-central part of the State. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed

pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal Skinks feed primarily on insects and spiders.

Southeastern Crowned Snake – *Tantilla coronata* – The southeastern crowned snake ranges from south-central Virginia and southern Illinois to the Florida panhandle and eastern Louisiana. This secretive snake is an excellent burrower, spending much of its time concealed in rotting logs, under bark, stones, leaf litter, pine needles, or burrowed in the soil. The southeastern crowned snake apparently prefers relatively xeric, well-drained soils in pine flatwoods, sandhills and dry hillsides. This snake requires dry habitats with friable soil and sufficient debris for shelter. Females deposit eggs in rotting logs or sawdust piles. The southeastern crowned snake's diet consists of centipedes, spiders, termites, and other small, soft-bodied arthropods. (Wilson, 1995).

PLANTS

Dicots

Monkshood - *Aconitum uncinatum* (generic) – The Monkshood occurs on the DBNF and belongs to the subspecies *uncinatum*. See the description for this taxon below.

Blue Monkshood – *Aconitum uncinatum* ssp. *uncinatum* – The blue monkshood is a northern species that requires cool temperatures. On the DBNF, the species is restricted to mesic hardwood forest in sandy soil near streams. Most locations are at the southern end of the forest, but one is more northern.

Carolina Allspice or Sweetshrub – *Calycanthus floridus* (generic) – The Carolina Allspice or Sweetshrub occurs as var. *glaucus* on the DBNF. Species-habitat relationships are described for that variety below.

Carolina Allspice or Sweetshrub – *Calycanthus floridus* var. *glaucus* – This plant is a southern species found in a variety of habitats, but usually along waterways. It often grows in large colonies. On the DBNF is found on stream terraces which are well-drained and seldom subject to flooding. The overstory is usually open and composed of mixed oak-hardwoods, sometimes with southern yellow pine. One site occurs on the upper portions of a toe slope in oak forest.

Green-and-gold – *Chrysogonum virginianum* var. *virginianum* – Green-and-gold is a species of the eastern US that is found in forests with sandy soils, often on river terraces. On the DBNF, it is found along streams in sandy terrace forest. The habitat is seldom subject to flooding.

Mountain Black Cohosh – *Cimicifuga americana* – Mountain Black Cohosh is an Appalachian Mountain species, found in mesic cove forests, often at higher elevations. On the DBNF, this

species is known from the Pine Mountain area and the cliff portion of the forest. It occurs in rich, mixed mesophytic forest under moderate to high shade, where temperatures are moderated.

Black Cohosh – *Cimicifuga racemosa* – Black Cohosh grows in mesic woods throughout its range of much of the eastern North America. It appears to be a moderate calciphile and does best on well-drained soils. On the DBNF, it occurs in mixed mesophytic forest and at the transition from this forest to river floodplain forest. The species will grow in near open conditions, but is usually found in moderate shade. Root diggers have put pressure on populations of this species, but the extent of the collection is unknown. Collection of this species is currently allowed on the DBNF.

Small Enchanter's-nightshade – *Circaea alpina ssp. alpina* – This plant is a northern species with a range extending southward along the Appalachian Mountains. It requires cool, moist conditions. On the DBNF, it is found associated with cold air drainage and narrow sandstone hollows with high shade and humidity. Almost always it is near a stream, but usually out of the floodplain.

Beech Drops – *Epifagus virginiana* – Beech drops is found throughout the range of American beech in eastern North America. It is parasitic, deriving nutrients from an association with American beech (*Fagus grandifolia*) roots. The species, to maintain itself, depends on forests that include *Fagus*. These can be upland or lower slope forests.

Southern Heartleaf – *Hexastylis contracta* – Distribution of the southern heartleaf is centered on the Cumberland Plateau. In Kentucky most of the population is found in land managed by the Big South Fork National River and Recreation Area. It grows in open to closed yellow pine and yellow pine-oak forest in the vicinity of a stream. It is also known to grow in fescue-dominated roadsides in Tennessee. On the DBNF, the species is known from one drainage. It grows above the stream in moderate to heavy shade provided by mountain laurel and great bay under a canopy of yellow pine-oak forest with scattered eastern hemlock.

Goldenseal – *Hydrastis canadensis* – Goldenseal grows in a variety of habitats ranging from well-drained floodplain to mesic cove forest. On the DBNF, it is known from floodplain sites, mixed mesophytic forest, and drier hardwood forest on limestone. It usually occurs in clusters of not more than a few dozen plants, but a few sites have been found with 1000s of plants. The species is a moderate calciphile and does best in well drained soils with ample available moisture. Shade is usually moderate, and the largest colonies have little or no midstory.

Butternut or White Walnut – *Juglans cinerea* – This tree is distributed from southern Ontario to the southern Appalachians. In the northern portions of the range, the species is usually found on well-drained floodplains, either in open areas or as part of a forest canopy. To the south, the species also occurs in rich, mesic hollows. As young trees, they are intolerant, and require high light. On the DBNF, it is found in both habitat types, but most trees are infected with butternut canker.

Smooth Veiny Peavine – *Lathyrus venosus* – Smooth Veiny Peavine is widespread in eastern North America. It is often found in open dry forest, but may also be found in moist mesic or

terrace forest, and sometimes on stream banks. On the DBNF, it is found in dry-mesic oak and mixed mesophytic forest, often near gaps or other areas of higher light levels.

American Gromwell – *Lithospermum latifolium* – American Gromwell 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.

Carolina Anglepod – *Matelea carolinensis* – Carolina anglepod is a coastal plain species with range extensions along the southern Appalachian Plateaus. It grows in moist, open forest, either yellow pine or hardwood, and in sandy old fields and waste areas. On the DBNF, the single station is on a sandy roadside adjacent to open yellow pine-oak forest.

Ginseng – *Panax quinquefolius* – Ginseng is widely distributed in eastern North America. It grows in a variety of habitats, but is usually found in well drained, mixed mesophytic forest with moderate to high base cation saturation. Early accounts suggest this species was a common element in the herbaceous layer of mixed mesophytic forests. Today it is uncommon at best. Collection pressure for the valuable roots has reduced populations dramatically.

Sanicle – *Sanicula canadensis* – Sanicle is widespread across eastern North America. It occurs in dry-mesic to mesophytic forest. On the DBNF, it is locally common, usually occurring in dry-mesic oak and oak-mixed hardwood forest. It also occurs in mixed mesophytic forest, and occasionally in old fields.

Bay Starvine – *Schisandra glabra* – Bay Starvine is a piedmont and Gulf coastal plain species with outlying populations along the Mississippi River, the Atlantic Ocean and the Cumberland Plateau. In the main part of its range, the species is found in beech-magnolia forest. Elsewhere it is found on loess soils. The single population in Kentucky, partially located on the DBNF, is on talus slopes below sandstone cliffs in mesic tulip poplar-hemlock-beech-oak forest. While the plant can be high climbing, it will creep along the ground. Light to moderate shade with well-drained soils and ample moisture is needed.

Southern Oconee Bells – *Shortia galacifolia* var. *galacifolia* – This plant is a narrow endemic of the southern Appalachian Mountains. It grows in rich woods on stream banks. The only Kentucky record, an introduction in to the Red River Gorge Geological Area (DBNF) is maintaining itself in similar habitat.

Wasioto Rosinweed – *Silphium wasiostense* – Wasioto rosinweed is known only from Kentucky and Tennessee. Most populations are in eastern Kentucky, but one or two are known from the Ridge and Valley of Tennessee. Many of the Kentucky populations are on the DBNF. The plant is found on well-drained river terraces in open forest, scattered in open upland oak forest and on lower slopes. It occurs as one or two-leafed plants except in open areas along roadways, utility rights-of-way or stream terraces. In open areas the plants flower, reaching 6-7 feet tall. The species has a deep taproot suggesting is fire tolerant like many of the prairie silphiums. It is probable that fire once maintained habitat for the species-open oak forest or woodland.

Big-flowered Snowbell – *Styrax grandiflorus* – The big-flowered snowbell is a southern Appalachian Mountains and southeastern coastal plain species. It commonly grows in mixed or deciduous forest in upland locations. There is at least one reliable record for the species in

Kentucky from the DBNF area (McCreary County). Here the plant is growing in mixed mesophytic forest on a north aspect above the Cumberland River.

Northern Mayflower – *Trientalis borealis*- The northern mayflower is a northern species extending southward to Kentucky (interior) and Virginia (coastal plain). It is found in bogs and rich woods. The Kentucky stations, in the DBNF area, are in cool ravines with mixed mesophytic forest below sandstone cliffs.

Running Buffalo Clover – *Trifolium stoloniferum* – This plant 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.

Gymnosperms

Canada Yew – *Taxus canadensis* – Canada yew is a northeastern species with a range extension southward along the Appalachians. In the northern part of the range, it occurs in mixed mesophytic forest, hemlock forest, and in other hardwood forest where moderate shade and cool temperatures prevail. It is also known from bogs, swamps, gorges, ravine slopes, and rocky banks. On the DBNF, the species is primarily associated with cool air drainages near caves and in deep, shaded hollows. Here it usually is in mixed mesophytic forest. It also occurs on road cuts and cliffs on lower and midslopes within in this forest type.

Monocots

Purple Caric Sedge – *Carex purpurifera* – The purple caric sedge has a narrow range in the Central Hardwoods area. It grows in mesic forests, primarily hardwood. On the DBNF, it is known from several scattered locations all in dry-mesic oak or mixed mesophytic forest. Shade is moderate to light.

Spotted Coralroot – *Corallorhiza maculata* – The spotted coralroot is mostly a northern species with extensions into the Appalachian Mountains. Its habitat is hardwood forest, but occurs under a variety of conditions. In Kentucky, it is known only from Pine Mountain within the DBNF proclamation boundary. It occurs on dry-mesic oak-hardwood forest in rich soil.

Small Yellow Lady's-slipper – *Cypripedium parviflorum var. parviflorum* – The small yellow lady's slipper ranges from Canada to the southern Appalachian Mountains. It is most common to the north. It grows in sphagnum bogs and hemlock- white pine woods northward. On the DBNF, a few sites are known, all from open oak forest on lower slopes.

Loesel's Twayblade – *Liparis loeselii* – The Loesel's twayblade 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.

Wild Lily-of-the-valley- *Maianthemum canadense*-The wild lily-of-the-valley is a northern North American species with range extensions south along the Appalachian Mountains. It is found in acid, well-drained sites under eastern hemlock and mixed hardwood forest. It is commonly found on rotten logs or hummocks in wet woods. On the DBNF, it is found on lower slopes and upper terraces in eastern hemlock or mixed mesophytic forest. These sites are cool and shady.

Small-flowered False Hellebore – *Melanthium parviflorum* – The small-flowered false hellebore is a central and southern Appalachian Mountains species. It is associated with moist slopes in mesic hardwood forest. On the DBNF, it is known from a few areas from mixed mesophytic forest.

White Fringeless Orchid –*Platanthera integrilabia* – On the Daniel Boone NF, this species is found in streamhead seeps, or rarely streambanks in the vicinity of streamhead wetlands. This species requires the sterile, constantly wet to moist sandy soil found in this habitat. Water in these seeps is always flowing at least below the surface, and is never stagnant. It is possible that this helps keep the species endophyte fungus associate from damaging the plant. The species almost always grows in mats of *Sphagnum* mosses, but occasionally is associated with leaf litter or a thin layer of organic muck. It is probable *Sphagnum* helps to maintain moisture and soil pH. It is also known to serve as a nursery for seed germination. The canopy associated with these seeps ranges from open to closed. The open conditions encourage butterfly-attracting species such as joe pyeweed, which in turn increase the chances of pollination of the orchid flowers. The closed canopy condition may improve germination and establishment of seedlings.

Small Purple-fringed Orchid – *Platanthera psycodes* – This orchid 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.

Mosses

Feather Moss or Log Moss – *Hypnum curvifolium* – This moss has a wide distribution in North America. The species is uncommon to common and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Feather Moss or Log Moss – *Hypnum imponens* – This moss has a wide distribution in North America. The species is common to abundant and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Fern Moss or Log Moss – *Thuidium delicatulum* – This moss is a northern US and Canadian species which extends southward in the eastern US to the Gulf coast (and south to northern South

America). It is a usually common species in its habitat, which is on moist soil, humus, rocks, or logs in forest or sometimes meadows or fields. On the DBNF, it is most common in mixed mesophytic forest on rocks, logs and soil, but is also found in dry-mesic forest, and rarely in xeric forest. It also occurs on the DBNF in old fields and meadows, sometimes ruderal areas. This species is widely collected for the horticultural industry and in some areas is becoming scarce.

References:

- Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecology and Management* 96 (1997) 27-36.
- Barbour R.W. 1971. *Amphibians and reptiles of Kentucky*. The University Press of Kentucky, Lexington, KY.
- Barbour, R.W., C.T. Peterson, D. Rust, H.E. Shadowen and A.L. Whit. 1973. *Kentucky Birds-A Finding Guide*. The University Press of Kentucky, Lexington, KY. 305pp.
- Behler, J.L. and F.W. King. 1979. *The Audubon Society field guide to North American reptiles and amphibians*. Alfred A. Knopf, New York.
- Buehler, D.A., and C.P. Nicholson. 1997. *Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians*. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.
- Conant, R. and J.T. Collins. 1991. *Peterson field guide to reptiles and amphibians: eastern and central North America*. 3rd ed. Houghton Mifflin, Boston.
- DeGraff, R. M., and D.D. Rudis. 1986. *New England Wildlife: Habitat, natural history, and distribution*. NE Forest Experiment Station. US Forest Service. General Technical Report NE-108. 481pp.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. *Forest and rangeland birds of the United States - natural history and habitat use*. USDA Agriculture Handbook 688. 625 pp.
- Hamel, Paul B. 1992. *Land manager's guide to birds of the South*. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437pp.
- Mengel, R.M. 1965. *The birds of Kentucky*. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. (Accessed: July 25, 2001).
- Palmer-Ball, B.L. 1996. *The Kentucky breeding bird atlas*. The University Press of Kentucky, Lexington, KY. 372pp.

07/15/2003

Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.

Storm Damage DEIS

VA Dept of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001. Available: <http://www.dgif.state.va.us/>. (Accessed July 26, 2001).

Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and the U.S. Forest Service, Southern Region, Atlanta, GA.

07/15/2003

Attachment C.

Species List: Mixed Mesophytic Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
3-Mixed Mesophytic Hardwood	Mixed Mesophytic Forest	(blank)	INSEC	Sixbanded Longhorn Beetle/ <i>Dryobius sexnotatus</i>
			MAMM	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii</i>
				Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i>
			P-DIC	Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i>
				Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i> var. <i>glaucus</i>
				Green-and-gold/ <i>Chrysogonum virginianum</i> var. <i>virginianum</i>
				Black Cohosh/ <i>Cimicifuga racemosa</i>
				Beech Drops/ <i>Epifagus virginiana</i>
				Southern Heartleaf/ <i>Hexastylis contracta</i>
				Goldenseal/ <i>Hydrastis canadensis</i>
				Butternut/ <i>Juglans cinerea</i>
				Smooth Veiny Peavine/ <i>Lathyrus venosus</i>
				American Gromwell/ <i>Lithospermum latifolium</i>
				Carolina Anglepod/ <i>Matelea carolinensis</i>
				Sanicle/ <i>Sanicula canadensis</i>
				Bay Starvine/ <i>Schisandra glabra</i>
		Acidic Substrate		Southern Heartleaf/ <i>Hexastylis contracta</i>
			P-MOS	Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Aspect (SE to NW)	BIRD	Cerulean Warbler/ <i>Dendroica caerulea</i>
		Aspect (NW to SE)	P-DIC	Big-flowered Snowbell/ <i>Styrax grandiflorus</i>
				Northern Mayflower/ <i>Trientalis borealis</i>
		Closed Forest Canopy	BIRD	Acadian Flycatcher/ <i>Empidonax virescens</i>
			P-DIC	Wasioto Rosinweed/ <i>Silphium wasiotense</i>
			P-DIC	Small Enchanter's-nightshade/ <i>Circaea alpina</i> ssp. <i>alpina</i>
			P-GYM	Canada Yew/ <i>Taxus canadensis</i>
			P-MON	Wild Lily-of-the-Valley/ <i>Maianthemum canadense</i>
		Cool Temperatures	P-DIC	Ginseng/ <i>Panax quinquefolius</i>
				Northern Mayflower/ <i>Trientalis borealis</i>
			P-MON	Loesel's Twayblade/ <i>Liparis loeselii</i>
		Dense shrub understory	BIRD	Cerulean Warbler/ <i>Dendroica caerulea</i>
				Worm-eating warbler/ <i>Helmitheros vermivorus</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
				Kentucky Warbler/ <i>Oporornis formosus</i>
				Swainson's Warbler/ <i>Limnolophus swainsonii</i>
		Downed Logs	MAMM	Cloudland Deermouse/ <i>Peromyscus maniculatus nubiterrae</i>
			P-MOS	Feather Moss, Log Moss/ <i>Hypnum imponens</i>
			REPT	Southeastern Crowned Snake/ <i>Tantilla coronata</i>
		Dry		Southeastern Crowned Snake/ <i>Tantilla coronata</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
		Elevation (above 2300 ft)	BIRD	Least Flycatcher/ Empidonax minimus
			P-MON	Small-flowered False Hellebore/ Melanthium parviflorum
		Fire Tolerant/Enhanced	BIRD	Least flycatcher/ Empidonax minimus
				Yellow-throated Vireo/ Vireo flavifrons
		Forb/Grass Condition	INSEC	Diana Fritillary/ Speyeria diana
		Forest Interior (Minimal Edge)	BIRD	Cerulean Warbler/ Dendroica caerulea
				Worm-eating Warbler/ Helmitheros vermivorus
				Swainson's Warbler/ Limnolophus swainsonii
				Yellow-throated Vireo/ Vireo flavifrons
			MAMM	Appalachian Cottontail/ Sylvilagus obscurus
		High Shade	BIRD	Worm-eating Warbler/ Helmitheros vermivorus
			INSEC	Sixbanded Longhorn Beetle/ Dryobius sexnotatus
			P-DIC	Southern Oconee bells/ Shortia galacifolia var. galacifolia
			P-MON	Wild Lily-of-the-Valley/ Maianthemum canadense
				White Fringeless Orchid/ Platanthera integrilabia
			P-MOS	Feather Moss, Log Moss/ Hypnum curvifolium
		Large Decadent Trees	BIRD	Cerulean Warbler/ Dendroica caerulea
			INSEC	Sixbanded Longhorn Beetle/ Dryobius sexnotatus
		Leaf Litter	BIRD	Worm-eating Warbler/ Helmitheros vermivorus
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Mature forest	BIRD	Cerulean Warbler/ Dendroica caerulea
				Worm-eating Warbler/ Helmitheros vermivorus
				Wood Thrush/ Hylocichla mustelina
				Kentucky Warbler/ Oporornis formosus
				American Redstart/ Setophaga ruticilla
		Mid-age Forest		Wood Thrush/ Hylocichla mustelina
				Kentucky Warbler/ Oporornis formosus
		Moderate Shade		Wood Thrush/ Hylocichla mustelina
			P-MON	Spotted Coralroot/ Corallorhiza maculata
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Moist	BIRD	Worm-eating Warbler/ Helmitheros vermivorus
				Wood Thrush/ Hylocichla mustelina
				Kentucky Warbler/ Oporornis formosus
			MAMM	Cloudland Deermouse/ Peromyscus maniculatus nubiterrae
			P-DIC	Blue Monkshood/ Aconitum uncinatum spp. uncinatum
				Mountain Black Cohosh/ Cimicifuga americana
				Small Enchanter's-nightshade/ Circaea alpina ssp. alpina
				Southern Oconee bells/ Shortia galacifolia var. galacifolia
			P-MON	Spotted Coralroot/ Corallorhiza maculata
				Small Yellow Lady's-slipper/ Cypripedium parviflorum var. parviflorum
				Loesel's Twayblade/ Liparis loeselii
			P-MOS	Feather Moss, Log Moss/ Hypnum curvifolium
				Feather Moss, Log Moss/ Hypnum imponens
				Fern Moss, Log Moss/ Thuidium delicatulum

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
				Southeastern Crowned Snake/ Tantilla coronata
		Old Growth Condition	MAMM	Cloudland Deermouse/ Peromyscus maniculatus nubiterrae
		Open (Little or No Shade)	INSEC	Diana Fritillary/ Speyeria diana
		Open Forest Canopy	BIRD	Least Flycatcher/ Empidonax minimus
			P-DIC	Bay Starvine/ Schisandra glabra
				Running Buffalo Clover/ Trifolium stoloniferum
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Open Midstory/Understory	BIRD	Cerulean Warbler/ Dendroica caerulea
				Acadian Flycatcher/ Empidonax virescens
				Yellow-throated Vireo/ Vireo flavifrons
		Rich Soil	P-DIC	Mountain Black Cohosh/ Cimicifuga americana
				Beech Drops/ Epifagus virginiana
				Goldenseal/ Hydrastis canadensis
				Butternut/ Juglans cinerea
				Ginseng/ Panax quinquefolius
				Southern Oconee Bells/ Shortia galacifolia var. galacifolia
			P-MON	Purple Caric Sedge/ Carex purpurifera
				Spotted Coralroot/ Corallorrhiza maculata
		Riparian	BIRD	American Redstart/ Setophaga ruticilla
			INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Monkshood/ Aconitum uncinatum (generic)
				Blue Monkshood/ Aconitum uncinatum spp. uncinatum
				Black Cohosh/ Cimicifuga racemosa
				Goldenseal/ Hydrastis canadensis
				Butternut/ Juglans cinerea
				Southern Oconee Bells/ Shortia galacifolia var. galacifolia
			P-MON	Small Purple-fringed Orchid/ Platanthera psycodes
			REPT	Southeastern Crowned Snake/ Tantilla coronata
		Rocky/Rocks	P-DIC	Mountain Black Cohosh/ Cimicifuga americana
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
				Southeastern Crowned Snake/ Tantilla coronata
		Seep/Constant Water	P-MON	White Fringeless Orchid/ Platanthera integrilabia
				Small Purple-fringed Orchid/ Platanthera psycodes
		Shrub/Sapling Condition	BIRD	Least Flycatcher/ Empidonax minimus
				American Redstart/ Setophaga ruticilla
		Slope (hillside, steepness)		Worm-eating Warbler/ Helminthos vermivorus
				Ovenbird/ Seiurus aurocapillus
		Tract Size (Area Sensitive)		Cerulean Warbler/ Dendroica caerulea
				Acadian Flycatcher/ Empidonax virescens
				Worm-eating Warbler/ Helminthos vermivorus

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Trees > 20" dbh		Cerulean Warbler/ <i>Dendroica caerulea</i>
		Upland (usually mesic to dry, not subject to holding water)		Cerulean Warbler/ <i>Dendroica caerulea</i>
				Yellow-throated Vireo/ <i>Vireo flavifrons</i>
		Water (Distance Sensitive)	AMPHI	Jefferson Salamander/ <i>Ambystoma jeffersonianum</i>
			BIRD	Acadian Flycatcher/ <i>Empidonax virescens</i>
				American Redstart/ <i>Setophaga ruticilla</i>